TIMBER SUPPLY ANALYSIS REPORT
FOR TREE FARM LICENCE 44

MANAGEMENT PLAN NO. 4

Weyerhaeuser Company Limited
B.C. Coastal Group
Nanaimo Woodlands

Prepared by:

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Version 2

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EXECUTIVE SUMMARY

A timber supply analysis has been completed as a component of Management Plan No. 4 for Weyerhaeuser Company Ltd. Tree Farm Licence (TFL) 44. 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. The analysis uses company inventory and growth-and-yield information and Timberline's proprietary simulation model (CASH6).

The analysis was completed for three separate areas of TFL 44:

- Alberni East and Alberni West Working Circles, the main portions of TFL 44, contributing 93% of the total area;
- Clayoquot Working Circle, which has management requirements based on the Clayoquot Sound Scientific Panel recommendations; and
- Ucluelet Working Circle, which will possibly be removed from TFL44 by the end of the year.

The base case results indicate the following annual initial harvest levels:

Alberni East/Alberni West Working Circles	1,675,000 m^3
Clayoquot Working Circle	28,000 m^3
Ucluelet Working Circle	60,000 m^3
Total TFL 44	1,763,000 m^3

In total, the base case results are similar to the current MP No. 3 AAC of 1,766,200 m^3. A decrease of 49,000 m^3 attributed to Alberni East and Alberni West is almost matched by increases indicated for Ucluelet and Clayoquot.

While these figures represent the short-term harvest level, there is an associated harvest flow that represents the expected timber availability over the next 250 years. This analysis is based on a harvest flow objective of a gradual adjustment of the harvest levels towards the best estimate of the Long-Term Harvest Level (LTHL) for the forest. The base case results indicate a decline in harvest of 6% over the next 20 years, reaching a LTHL of 1,653,000 m^3.

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 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.

The sensitivity analyses, done as part of this report, support the initial harvest levels of the base cases. They can be generally maintained under a variety of different assumptions.

1.0 Introduction

An analysis of timber supply has been completed as a component of Management Plan (MP) No. 4 for Weyerhaeuser Company Ltd., Nanaimo Woodlands Tree Farm Licence (TFL) 44. 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 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 44 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 representing different growth and yield and management scenarios have been identified for analysis. The AAC recommendations are based on an evaluation and review of the results of these different options.

2.0 General Description of the Land Base and Tenure

Tree Farm Licence (TFL) 44 is located in west-central Vancouver Island in the vicinity of the communities of Port Alberni, Ucluelet and Bamfield. It extends from Strathcona Park in the north to Walbran Creek in the south, including land from the Pacific Ocean to the Beaufort Range and Mount Arrowsmith (Figure 2.1).

TFL 44 is managed by Franklin and Sproat Lake operations, both part of Weyerhaeuser BC Coastal Group's West Island Timberlands. The South Island Forest District, based in Port Alberni administers the TFL.

The TFL originates from the awarding of Forest Management Licences (FMLs) No. 20 (Tofino) and No. 21 (Alberni) to Weyerhaeuser's predecessor companies in 1955. In 1984, the two TFLs were combined as Tree Farm Licence No. 44.

Most of the Clayoquot Sound portion of TFL 44 was transferred to TFL 57 and hence to Iisaak Forest Resources, effective from October 27, 1999. Iisaak Forest Resources is a new company owned 51% by Ma Mook Natural Resources Ltd. (owned by five First Nations of the Nuu-chah-nulth Central Region) and 49% by Weyerhaeuser.

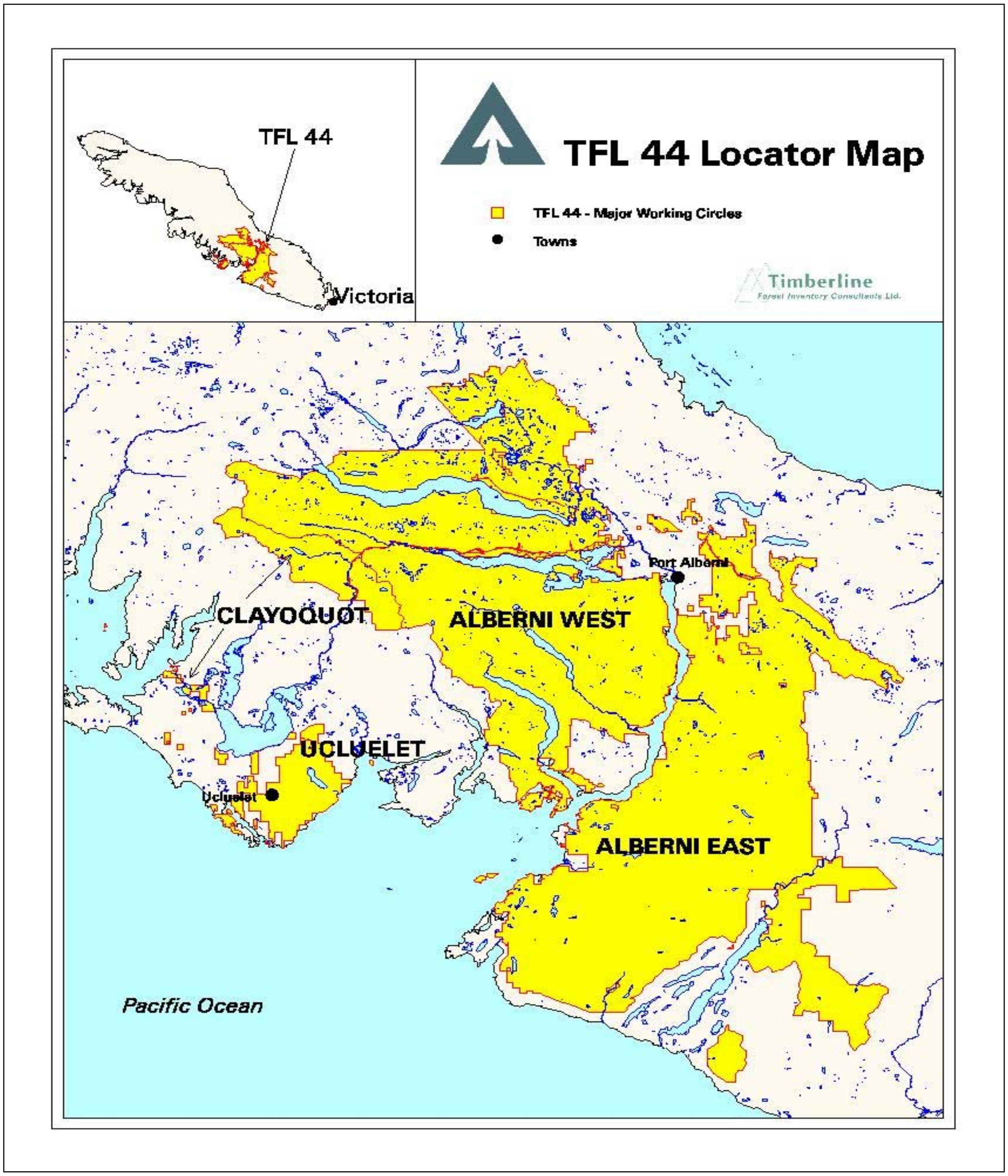

Figure 2.1 Location of TFL 44

TFL 44 covers 321 900 ha, of which 268,000 ha (83%) is productive forest land. The major tree species include Western hemlock, Western red cedar, Balsam (Amabilis fir), Douglas-fir and Yellow cypress. Approximately 120,300 hectares of TFL 44, 37% of the total, is Schedule A land (private ownership and timber licences).

The current MP No.3 AAC is 1,766,200 cubic meters per year. This includes a partition of 6,200 m^3 to the Clayoquot Sound portion of the TFL and allocations of 81,608 m^3 to the Small Business Forest Enterprise Program (SBFEP) and 48,994 m^3 as crown takeback for the transfer of TFL 44 from MacMillan Bloedel Ltd to Weyerhaeuser in 1999.

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 possible alternative harvest flows. In this analysis, the proposed harvest flow reflects a balance of the following objectives:

- Gradually adjust harvest levels towards the best estimate of the Long Term Harvest Level (LTHL) for the forest;
- Attempt to limit harvest reductions per decade to no more than 10% unless greater reductions are necessitated by timberland reallocation to higher land use; and
- Achieve a stable long-term harvest level (this is defined by the total THLB volume (growing stock) varying by less than 4% over the last 100 years of the 250 year projection).

4.0 Forest Information

The Information Package was submitted in September of 2001 and accepted subject to stated conditions in April 2002. As requested, a revised Information Package (dated June 2002) has been submitted as a separate document with this report. For a complete description of the information used in the Weyerhaeuser TFL 44 MP No. 4 timber supply analysis refer to the document "Timber Supply Analysis Information Package for TFL 44, Version 2", dated June 2002.

4.1 Growth and Yield

Refer to Section 8 in the Information Package (Timber Supply Analysis Information Package for TFL 44, Version 2, June 2002).

4.1.1 Mature Stands (age > 125)

Volume estimates for these stands are based on inventory cruise information. The inventory volumes were reduced to allow for cull and decay, waste and breakage. These older stands were then aggregated into analysis units as explained in section 4.2.4. The area-weighted average net volume was assigned to each grouping in the model. These volumes are assumed to be static (to neither increase nor decrease) over time.

4.1.2 Second-growth Stands (<126)

The Weyerhaeuser growth and yield model Y-XENO was used to develop yield curves for younger stands. Y-XENO is calibrated to more than 2000 company growth and yield plots in coastal BC. Y-XENO accepts inputs for species, growing site quality, establishment density, establishment site occupancy, planted and natural stand establishment, and thinning and spacing treatments if required. Y-XENO simulates growth of an individual stand according to the input parameters, and reports total and merchantable volumes, average stand diameters, height, basal area, and stocking over time.

The approach used to assign yield curves to younger stands (currently less than 125 years of age) varies according to the availability of cruise information and the management strategy in place at the time the stands were established.

Three different management periods (based on two major changes in management) are recognized. The first major event was the start of the Intensive Forest Management Program in Weyerhaeuser BC Coastal operations in 1962. The second event is the Forest Project and the transition to variable retention harvesting. The move to variable retention also approximates the introduction of genetically improved seedlings. These two initiatives (variable retention and tree improvement) are combined in the growth and yield assumptions and are assumed to commence with stands regenerated in 2001, the first year of the analysis.

Cruised older second-growth stands have been assigned to the closest yield curve according to volume or basal area at the time of cruise, age, site index and species (Douglas-fir or hemlock).

For those second-growth stands that have not been cruised and were established before 1962 a single yield curve (by species type and site index class) was assigned. A correction factor was assigned based on a analysis of cruised stand mean annual increment trends for stands established before 1962 compared to the yield table for a given site index class.

Areas established since 1962 and not cruised were assigned to one of three yield tables (by species type and site index class). The percentage area assigned to each of the three yield tables varies with biogeoclimatic variant. The intent is for the three yield tables to broadly cover the range of management and stocking situations. They include a well-stocked planted stand, a low stocked natural stand and a higher stocked natural stand.

A similar approach is used for assigning yield tables to stands regenerated in the model. However, the percentage allocation to the three yield curves or management types (for each of the 8 combinations of two species types (Douglas-fir and hemlock) and four site index classes) varies by stewardship zone as well as by biogeoclimatic variant. In general more natural regeneration is expected in the habitat stewardship zone and particularly in the old-growth stewardship zones.

Yield adjustments to the yield tables vary according to the method for assigning yield tables and the management period. Adjustments for breakage and waste (Douglas-fir – 5%, hemlock – 6.5%) and insects and disease (2%) are applied to all situations. A 5% allowance for non-productive areas is applied to second-growth stands that have not been cruised. Gains for tree improvement (planted stands – Douglas-fir – 13%, hemlock – 6.5%) and deductions for additional crown competition from variable retention (timber zones – 3%, habitat zones – 11%, old-growth zones – 30%) are also applied to stands regenerated in the model runs.

Harvest of second-growth stands does not occur until after a volume of 350 m^3/ha is achieved. The exceptions are poor site stands that may be harvested at volumes lower than the 350 rule after age 200.

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 4.1 and 4.2. The total net harvestable land base of 177,689 hectares includes 2,422 hectares of NSR lands, scheduled to be restocked. It represents harvestable area in conventional and aerial operability classes.

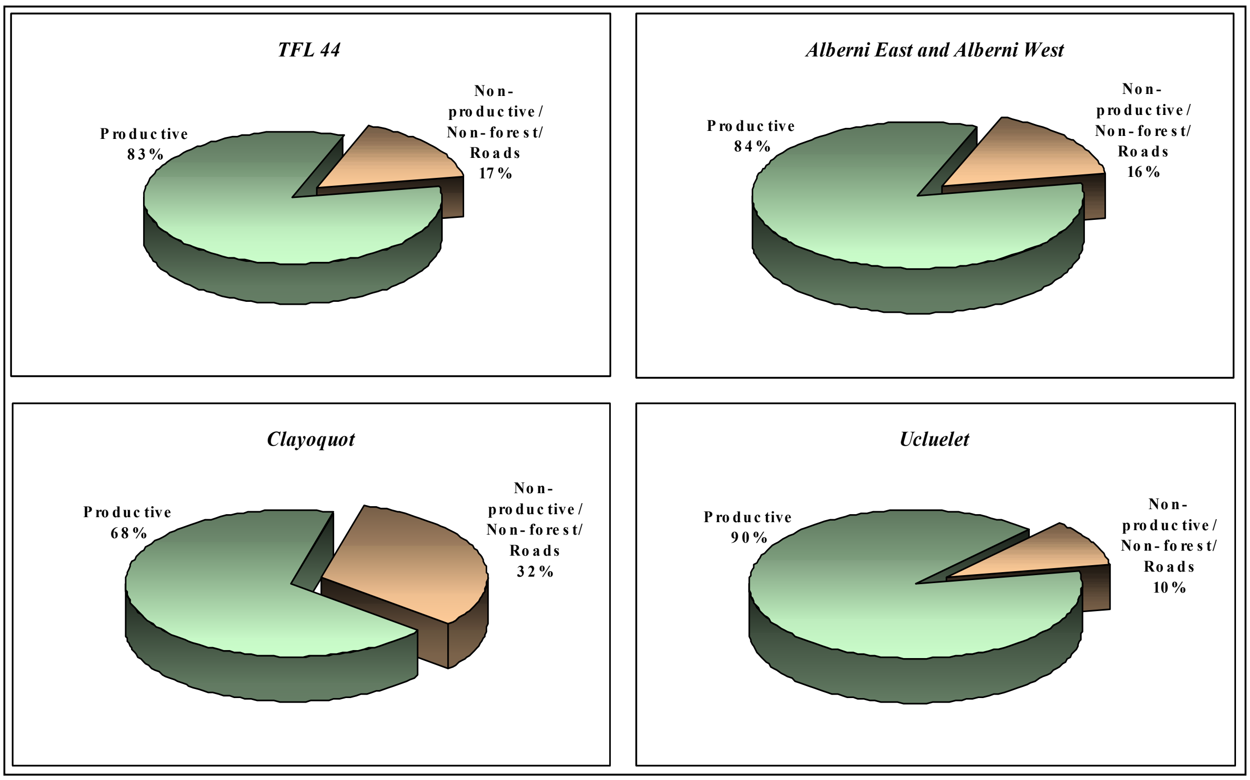

Figure 4.1. Distribution of total area (321 941 hectares)

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 timber harvesting landbase is reduced for inoperable areas, sensitive sites (unstable terrain and riparian areas) and for non-timber values (e.g. habitat and recreation). Table 4.1 presents the results of the landbase classification process to identify the timber harvesting landbase.

The areas in Table 4.1 are determined by the order in which the landbase reductions were made and so they do not describe the total area under each classification. For example Marbled Murrelet areas cover 5,988 ha of productive forest, but are represented as 4,934 ha in Table 4.1. The difference (5,988 – 4,934) is represented by other classifications that overlap on some of the Marbled Murrelet areas.

Table 4.1. Timber harvesting landbase determination by working circle (ha)

Classification	Net Area (ha) Alberni East	Alberni West	Alberni East&West	Clayoquot	Ucluelet	Total
Total Land Base	**152,682**	**145,001**	**297,683**	**13,112**	**11,146**	**321,941**
Non-forest/Roads	9,771	25,994	35,764	2,480	852	39,097
Total Forested	***142,911***	***119,007***	***261,919***	***10,632***	***10,294***	***282,844***
Reductions to Forested:						
Non-productive	4,089	8,558	12,648	1,702	308	14,657
Total Productive	***138,822***	***110,449***	***249,271***	***8,930***	***9,986***	***268,187***
Reductions to Productive:						
Inoperable	2,077	6,424	8,501	953	0	9,454
Nahmint old-growth reserve/Recreation	2,388	3,079	5,468	471	229	6,168
Ungulate winter range	2,206	2,178	4,384	105	0	4,489
Marbled Murrelet	3,610	1,324	4,934	0	0	4,934
Riparian reserves/management	9,572	8,816	18,388	282	753	19,424
Uneconomic	1,507	6,361	7,868	635	268	8,771
Slope/Terrain/Avalanche	8,602	6,367	14,969	851	507	16,328
Stewardship zones (VR)	6,297	6,375	12,672	438	457	13,567
Deciduous	740	216	956	1	26	982
WTP/CMT	2,712	1,840	4,552	146	207	4,904
Clayoquot Sound Scientific Panel	0	0	0	1,476	0	1,476
NSR	1,627	795	2,422	0	0	2,422
Total Reductions	41,339	43,775	85,114	5,359	2,447	92,920
Net Current Land Base	***97,483***	***66,674***	***164,157***	***3,571***	***7,538***	***175,267***
Land Base Additions:						
Roads	2,722	1,683	4,405	154	184	4,743
NSR	1,627	795	2,422	0	0	2,422
Net Long-term Land Base	***96,388***	***65,786***	***162,174***	***3,417***	***7,354***	***172,946***

Figure 4.2 provides a graphic representation of the land base reductions for TFL 44.

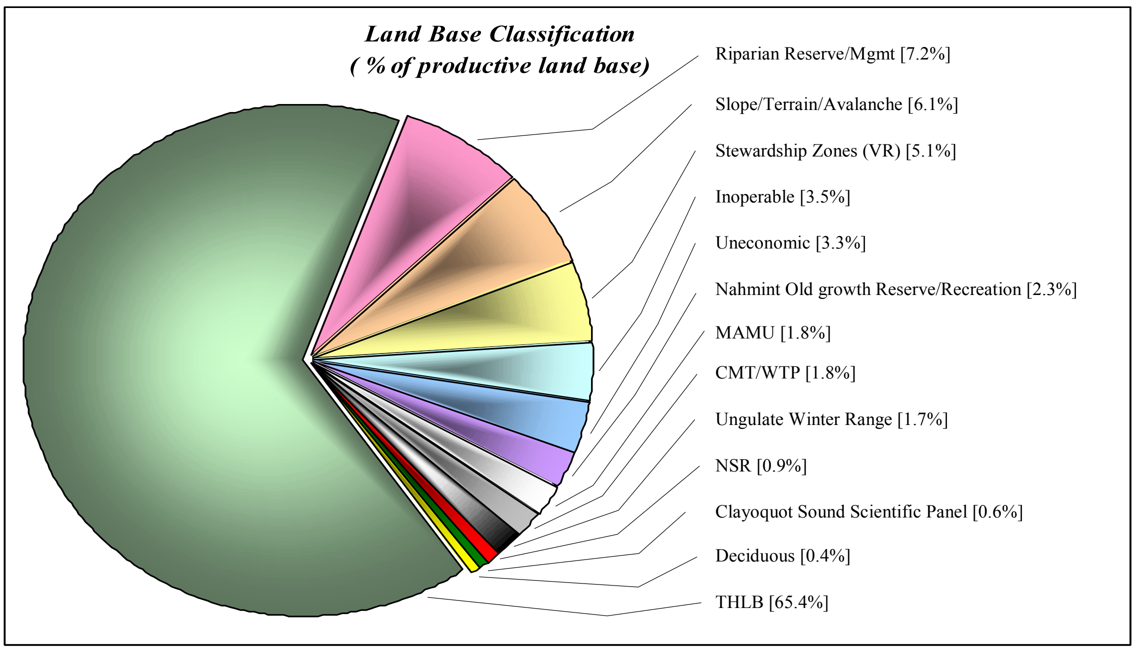

Figure 4.2. Distribution of total productive area (268 187 hectares)

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 on the basis of similar species and site productivity captures biological similarity.

4.2.2 Landscape Units

For planning purposes, TFL 44 has been subdivided into 23 landscape units. In the timber supply analysis, all forest cover requirements must be met within the boundaries of these landscape units. Figure 4.3 summarizes the distribution of net operable area by landscape unit.

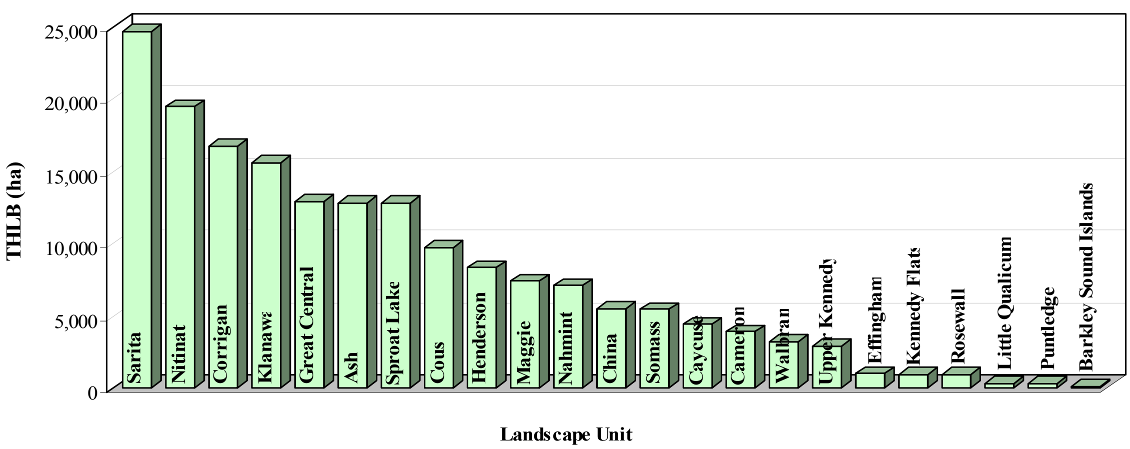

Figure 4.3. Distribution of productive area by landscape unit

Figure 4.4 summaries the distribution of net operable area by biogeoclimatic zone (BEC) / natural disturbance type (NDT) zone.

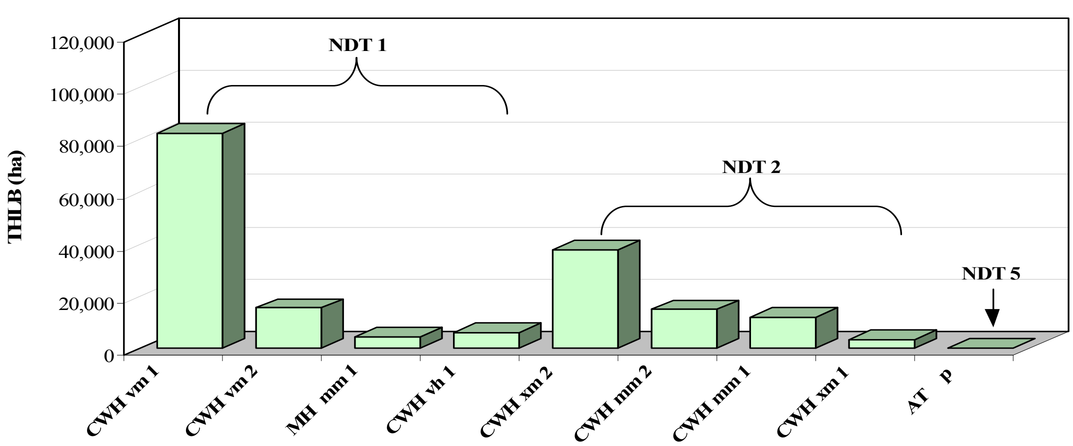

Figure 4.4. Distribution of productive area by BEC/NDT

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 community watersheds;
- Polygonal-based Coastal Watershed Assessment Procedure (CWAP) zones;
- Avalanche run-out zone;
- Stewardship zones; and
- An integrated resource management (IRM) zone.

4.2.4 Analysis Units

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

- Site index;
- Primary (leading) species
- Current age class;
- Broad harvest economics for mature (currently > 125 years) stands
- Stewardship zone;
- Stand density; and
- Biogeoclimatic classification.

The distribution of area in the timber harvesting land base by leading species is shown Figure 4.5.

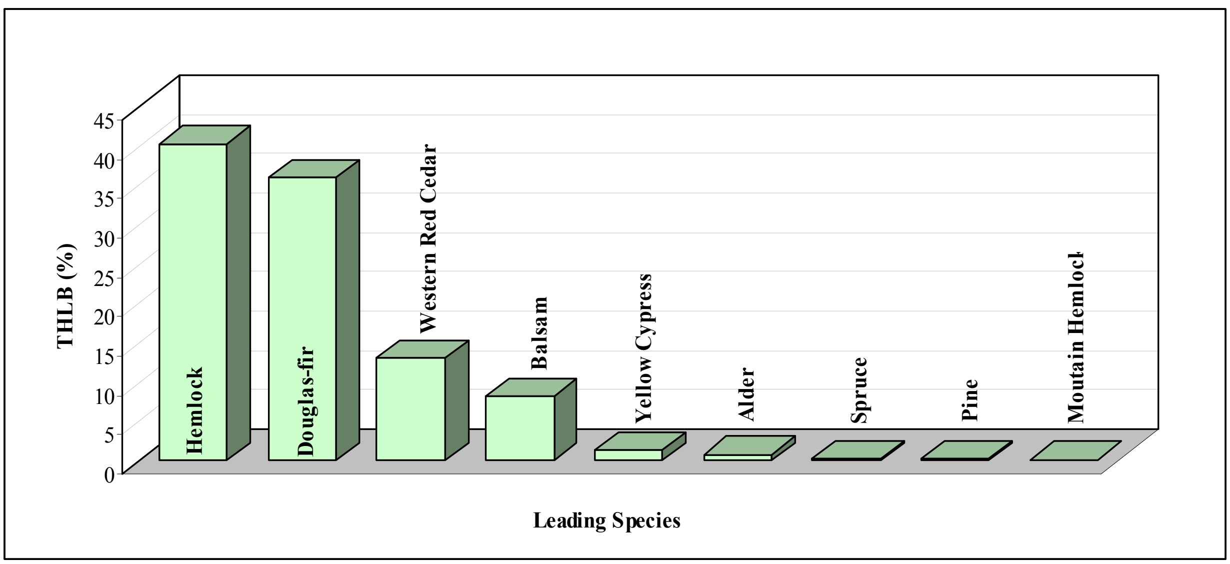

Figure 4.5. Distribution of net operable area by leading species

For analysis these are grouped into two species associations; Douglas-fir and western hemlock as Y-XENO equations are available for projecting the growth of these two species.

- Douglas-fir species association – includes stands with leading species that are Douglas-fir, yellow cypress and pine; and
- Western hemlock species association – includes stands with leading species that are hemlock, western red cedar, balsam, spruce or alder.

Figure 4.6 shows the distribution of net operable area by working circle and the site productivity classes used in the analysis.

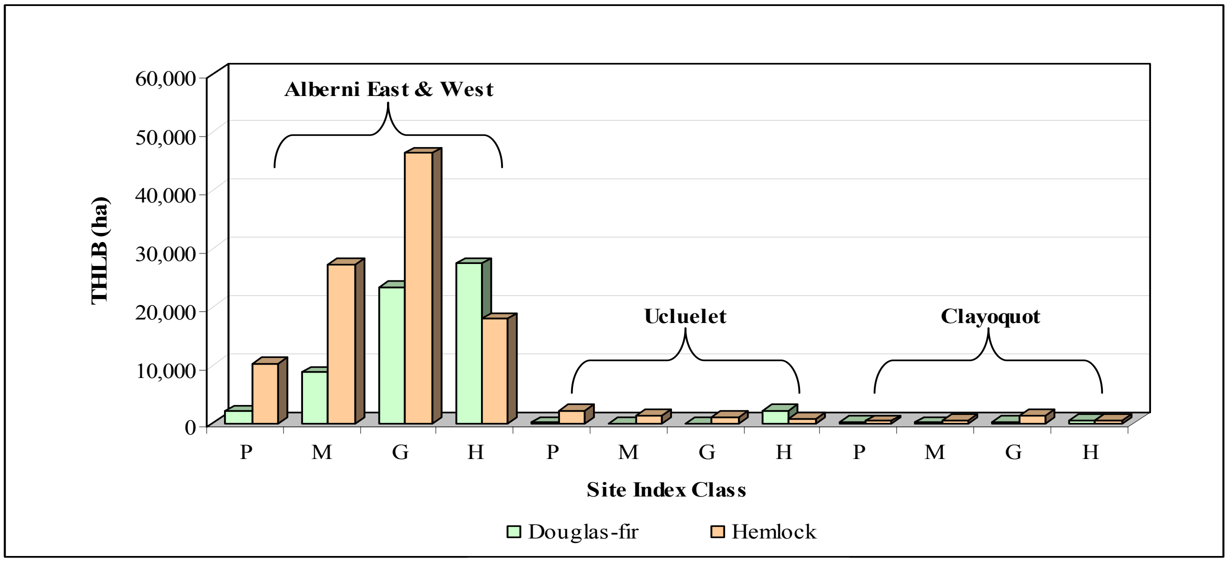

Figure 4.6. Distribution of productive area site by index class

5.0 Timber Supply Analysis Methods

Timberline's proprietary simulation model CASH6 (**C**ritical **A**nalysis by **S**imulation of **H**arvesting), Version 6.2g was used to develop harvest schedules for all options and sensitivity analyses included in the TFL 44 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, harvest forecasts commence in 2001. Both harvest rates and timber availability are forecasted in five -year time steps (periods). A major 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 (1%). ***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 percent. 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 Timber Supply Analysis Results

6.1 Introduction

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

- Inventory updated to December 31, 1995 for changes in landbase and ownership, fire and reforestation. In addition the inventory has been updated to the end of 2000 for logging;
- Mature inventory volumes have been recompiled to incorporate more recent operational cruising and to exclude logged samples;
- Current management regimes;
- Updated map base to TRIM NAD 83;
- Existing physical operability mapping;
- Allowances for uneconomic areas;

- Some updated terrain mapping (revised netdowns for unstable terrain);
- Existing recreation features inventory;
- Updated visual landscape inventory and known scenic areas;
- Definition of biodiversity in accordance with Landscape Unit Planning Guide (LUPG);
- Definition of riparian buffers consistent with Riparian Management Area Guidebook;
- Grandparented ungulate winter ranges;
- Updated stream / riparian classifications;
- Updated inventory of Marbled Murrelet habitat areas;
- Community watersheds;
- Rate of harvest constraints from Coastal Watershed Assessment procedures;
- Forest Stewardship Zones and Variable Retention Harvesting (VRH);
- An allowance for Culturally Modified Trees (CMTs);
- Reduced green-up of 1.3m for adjacency in Enhanced Forestry Zones (EFZs);
- Definition of merchantable stands and utilization standards;
- Definition of non-recoverable losses (NRLs); and
- Minimum harvest ages.

Three separate portions of TFL 44 were modelled, specifically:

1. *Alberni East and Alberni West Working Circles*

   These areas were analyzed and reported on as a single unit (Section 6.2).

2. *Clayoquot Working Circle (Upper Kennedy / Marion Creek and private lots mostly in the Kennedy Lake / Lower Kennedy River area)*

   The timber supply analysis of this area recognized additional management requirements defined in the report by the Clayoquot Sound Scientific Panel (1995). These included rate of cut constraints by watershed basin and a minimum requirement for forest of 140 years of age and older (Section 6.4).

3. *Ucluelet Working Circle (also known as the Barkley Block)*

   Weyerhaeuser and the MoF are discussing the removal of this area from TFL 44 and the addition of much of it to the Arrowsmith TSA. It is expected that this process will be completed before the end of the year (2002).

   The analysis of this area includes a base option (Section 6.3).

6.2 Alberni East and West – Timber Supply Analysis

Table 6.1 compares MP No.4 and MP No.3 base option harvest schedules. The MP No.3 harvest schedule has been adjusted to fit the five-year periods, commencing with 2001-2005.

Table 6.1. Net harvest levels – Alberni East and West

	Annual Harvest Level (000 m^3 / year)	
Years	**MP No. 3**	**MP No. 4**
1 - 5	1,652	1,675
6 - 10	1,571	1,625
11 - 15	1,515	1,575
16 - 20	1,465	1,555
21 - 25	1,439	1,555
26 - 30	1,437	1,555
31 - 35	1,487	1,555
36 - 40	1,499	1,555
41 - 45	1,499	1,555
46 - 100	1,499	1,555
101+	1,516	1,555

In this analysis (MP No.4), the initial harvest level is 1,675,000 cubic meters per year.. Subsequent drops of 50,000 m^3 per five-year period (3%) provide a gradual transition to the net long-term steady level of 1,555,000 cubic meters. This is approximately 5% below the theoretical long-term LRSY (1,637,600 cubic meters) based on maximizing MAI.

The base option harvest levels in the medium-term and long-term are higher than for the MP #3 analysis. The main contributors to the medium term difference are a larger volume of available mature volume and less restrictive visual landscape constraints in MP #4. Approximately one-third of the additional mature volume is from lower than expected harvest rates between 1996 and 2000. The remainder is from a change in the location of net-down areas (for example in the MP #4 base option compared to that for MP #3, allowances are made for variable retention but not for Forest Ecosystem Networks).

In the longer-term, the MP #4 harvest schedule (relative to MP #3) benefits from higher yields in second-growth, particularly higher site Douglas-fir areas (e.g. higher gains from tree improvement). Less restrictive visual landscape constraints also contribute to the increase in MP #4. These gains are partially offset by a 2.1% reduction in the THLB (166,579 ha in MP #4 compared to 170,119 ha in MP #3).

Figure 6.1 displays the 250-year growing stock (inventory) profile associated with this harvest profile. Operable inventory within the harvestable land base declines 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 5. ***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 periods 14 and 32. The harvest flow is largely controlled by these minimum's. Further increases prior to period 14 could result in the medium and long-term harvest falling below the long-term steady level, which is contrary to the harvest flow policy adopted in these analyses.

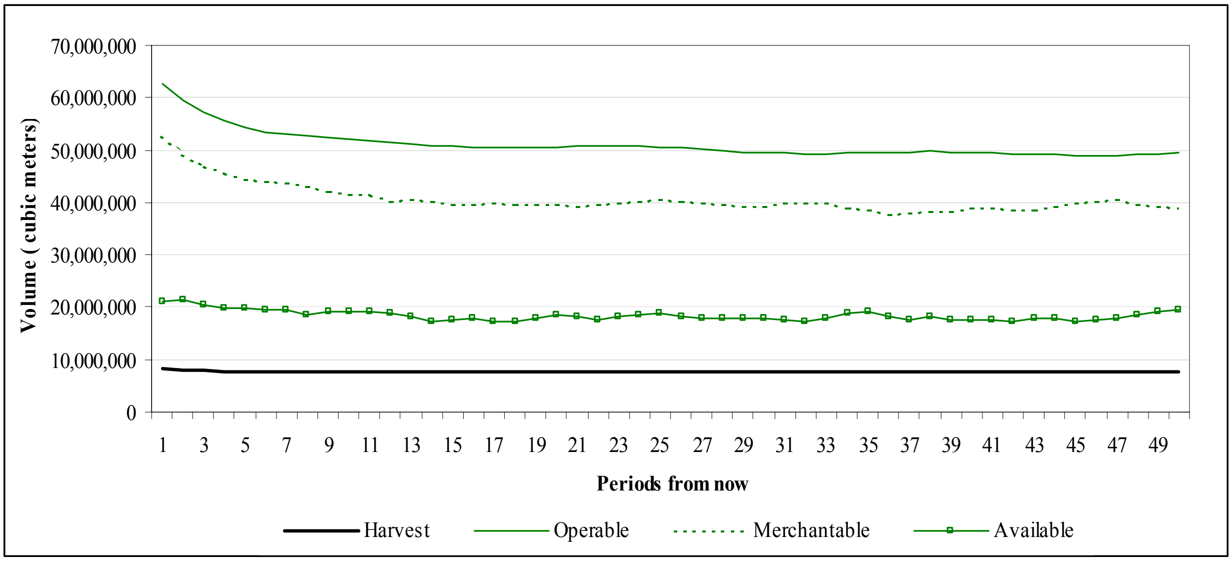

Figure 6.1. Growing stock profile – Alberni East and West

Figure 6.2 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 and existing older (currently 39 years plus) second-growth forest. This reflects the management strategy, which is to maximize harvest by capturing volume in the mature and second-growth forest. At year 40, harvest begins to shift to the younger second-growth (currently less than 39 years of age) and harvest is predominately from the future managed forest after 70 years.

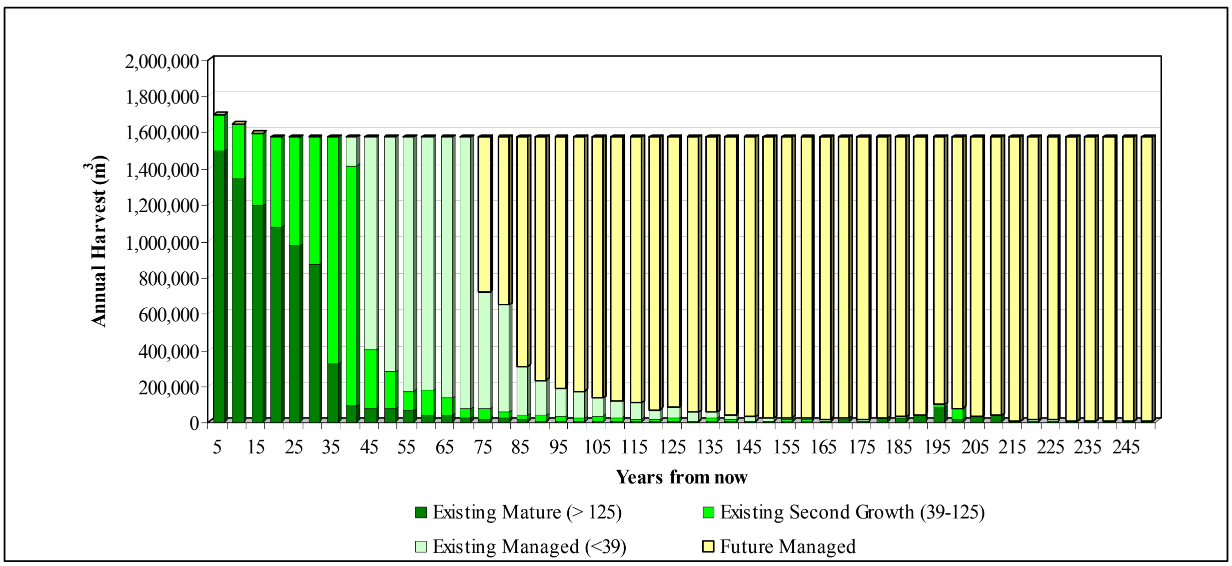

Figure 6.2. Timber supply sources – Alberni East and West

Figures 6.3 through 6.5 show average harvested age, volume per hectare and area harvested per year. The average harvest age declines sharply as harvesting shifts from mature to second-growth types.

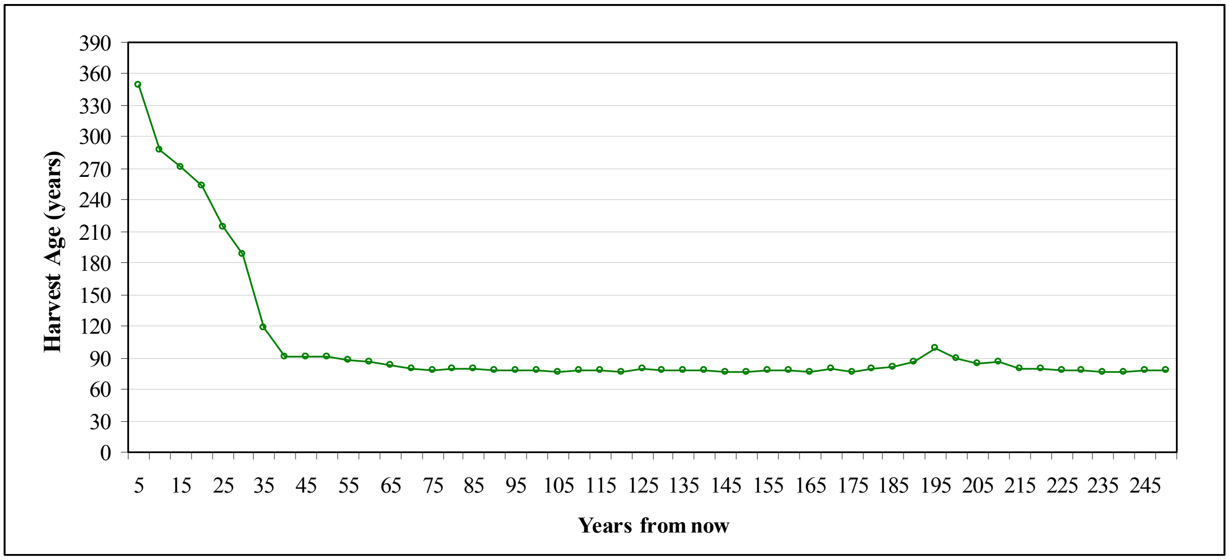

Figure 6.3. Average harvested age – Alberni East and West

As seen in Figure 6.4, the average volume per hectare remains relatively constant over the planning horizon. Although the average harvested age drops sharply during the shift to the managed forest, the volume per hectare remains stable due to managed stand yield expectations.

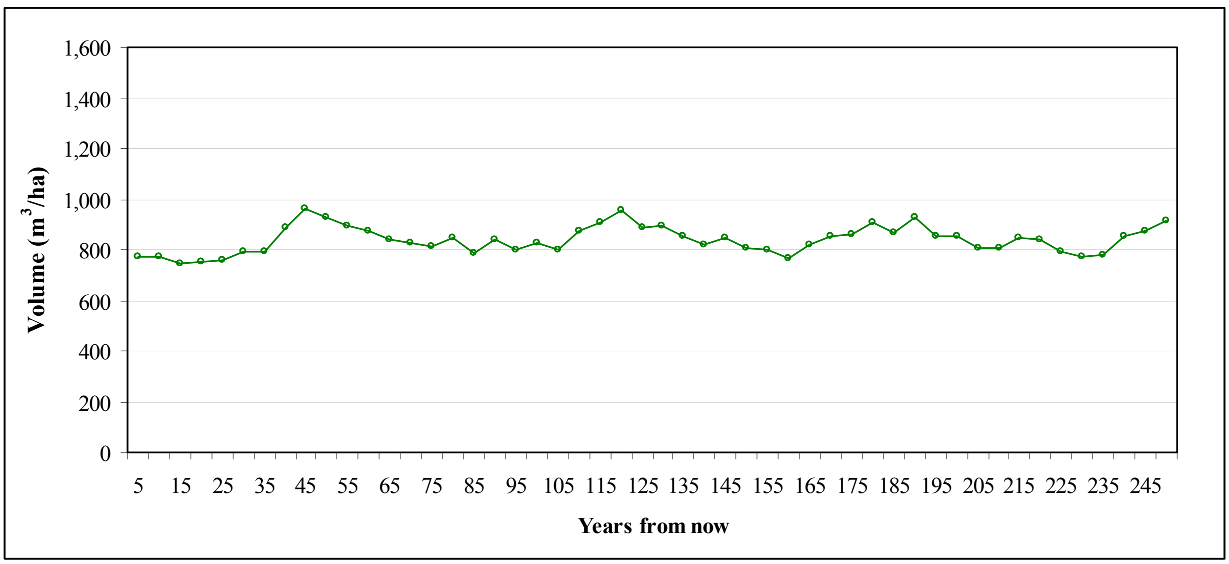

Figure 6.4. Average harvested volume per hectare – Alberni East and West

The average area harvested remains relatively constant over the planning horizon at approximately 2,100 hectares per year (Figure 6.5).

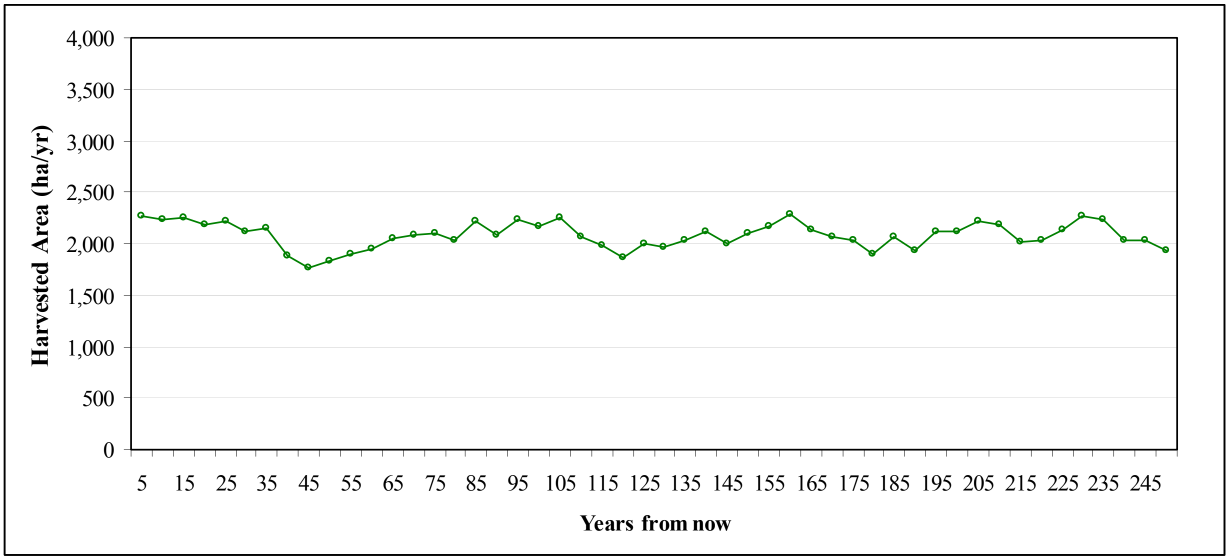

Figure 6.5. Average area harvested – Alberni East and West

6.2.1 Ageclass distribution

Figure 6.6 show the changes in forest structure over time. Each figure indicates the ageclass structure of the total productive forest, including the unharvestable (non-contributing) components.

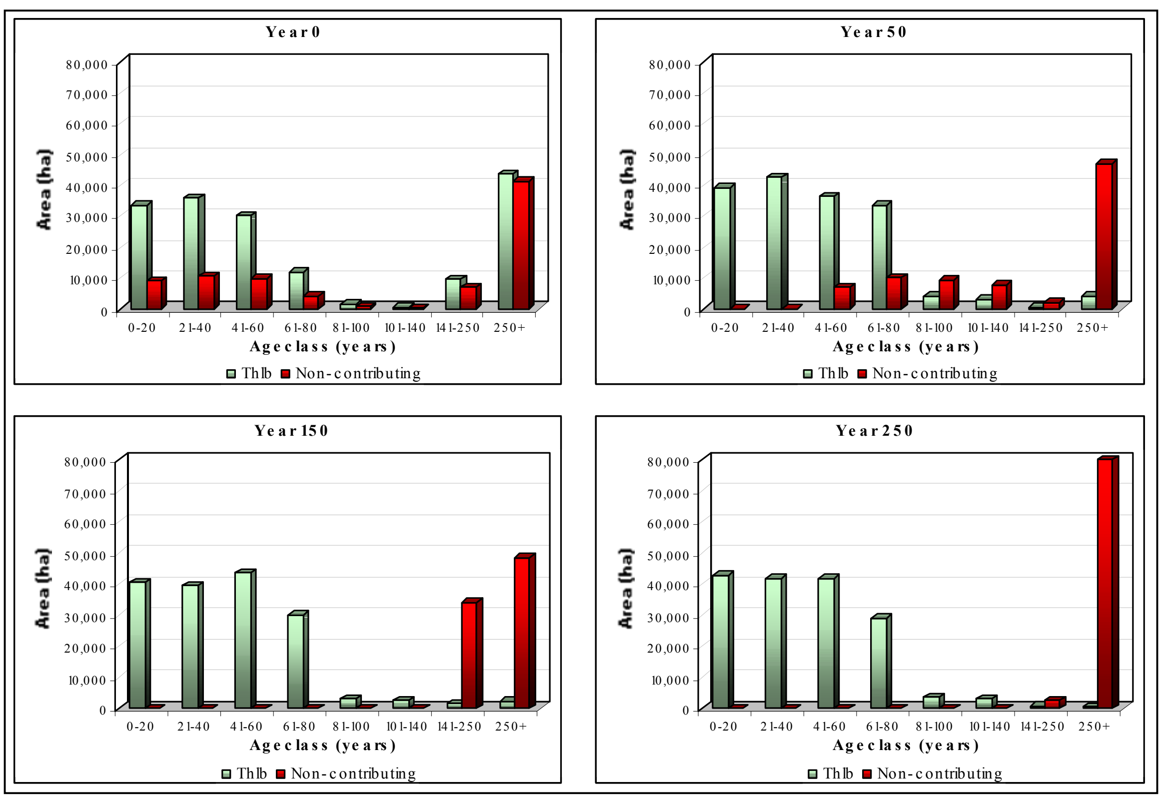

Figure 6.6. Age class distribution over time – Alberni East and West

The total area of old-growth (age 250 years plus) decreases to 51,000 ha (20% of the productive forest area) in the first 50 years as harvest occurs in the THLB. It then increases over time as recruitment occurs in reserved (non-contributing) areas, amounting to 80,000 ha (32% of the productive forest area) in 250 years time.

This has very positive implications with respect to retention objectives on the TFL. It should be noted that small areas of old-growth continue to be harvested over the long-term (50 to 250 years) as old seral requirements in some landscape units and the more restrictive visual landscape constraints in some areas affect the timing for harvest access.

Seral stage objectives are modeled at the Landscape Unit (LU) / BEC variant level, and forest cover objectives are modelled at the Resource Emphasis Area (REA) or LU / REA level. Figure 6.7 illustrates the approach used to model these requirements. The Somass Landscape Unit RM disturbance constraint is portrayed in the example. The figure shows how the disturbance area (THLB below the green up age of 10 years) varies over time, but at no time rises above the maximum set at 25% of the THLB.

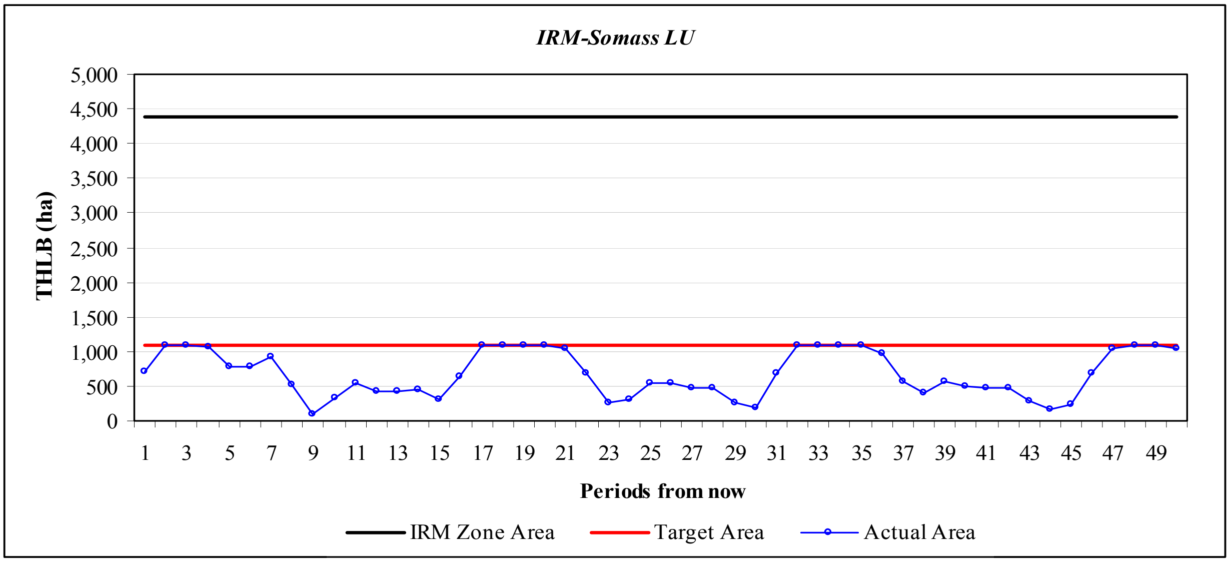

Figure 6.7. IRM post-harvest disturbance constraint status – Somass Landscape Unit

Old-growth seral constraints represent minimum retention levels of the productive forest to be maintained above age 250. As seen in Table 6.2, old-growth levels substantially exceed the minimum thresholds in nearly all cases. The few exceptions, for example the Sproat Lake CWH xm1, are relatively small in size and achieve the old seral targets within the time-frame of the analysis through recruitment.

Table 6.2. Periodic old-growth compliance

Landscape Unit	BEC Variant	BEO	NDT	Area (ha)	Old -growth (% > years)	Target (ha)	Status at Year of Simulation 0	50	100	150	200	250
Ash	CWH mm 1	Intermediate	2	2,184	9.0 > 250	189	365	263	269	269	307	542
Ash	CWH mm 2	Intermediate	2	2,548	9.0 > 250	220	721	408	438	438	439	589
Ash	CWH xm 2	Intermediate	2	11,047	9.0 > 250	955	420	572	610	616	1,082	2,250
Ash	MH mm 1	Intermediate	1	921	19.0 > 250	170	419	305	333	333	333	358
BSIs	CWH vh 1	Low(1)	1	145	4.35 > 250	6	134	125	110	110	110	110
Cameron	CWH mm 2	Intermediate	2	3,786	9.0 > 250	332	713	721	727	731	761	1,715
Cameron	CWH xm 2	Intermediate	2	1,714	9.0 > 250	150	390	345	353	357	419	761
Cameron	MH mm 1	Intermediate	1	1,637	19.0 > 250	304	625	566	591	591	591	782
Caycuse	CWH mm 1	Intermediate	2	355	9.0 > 250	30	0	0	0	0	0	34
Caycuse	CWH vm 1	Intermediate	1	3,877	13.0 > 250	485	1,778	638	660	660	711	983
Caycuse	CWH vm 2	Intermediate	1	1,134	13.0 > 250	142	653	261	256	256	257	300
Caycuse	CWH xm 2	Intermediate	2	577	9.0 > 250	50	27	29	29	29	130	141
China	CWH mm 2	Intermediate	2	2,284	9.0 > 250	199	527	335	343	343	499	717
China	CWH xm 2	Intermediate	2	4,398	9.0 > 250	381	570	396	396	396	994	1,133
China	MH mm 1	Intermediate	1	1,096	19.0 > 250	202	364	256	259	259	259	387
Corrigan	CWH mm 2	Intermediate	2	3,541	9.0 > 250	306	912	347	363	363	515	671
Corrigan	CWH vm 1	Intermediate	1	9,050	13.0 > 250	1,129	1,282	1,177	1,177	1,177	1,491	1,805
Corrigan	CWH vm 2	Intermediate	1	1,992	13.0 > 250	251	1,338	767	760	760	786	842
Corrigan	CWH xm 2	Intermediate	2	6,515	9.0 > 250	563	856	586	586	586	1,304	1,384
Corrigan	MH mm 1	Intermediate	1	801	19.0 > 250	148	495	369	369	369	370	382
Cous	CWH mm 1	Low(1)	2	5,475	3.0 > 250	158	853	470	474	476	478	1,220
Cous	CWH mm 2	Low(1)	2	1,446	3.0 > 250	42	355	171	155	155	155	248
Cous	CWH vm 2	Low(1)	1	2,450	4.35 > 250	103	995	687	686	684	684	900
Cous	CWH xm 2	Low(1)	2	3,593	3.0 > 250	104	485	336	329	389	523	849
Effingham	CWH vm 1	Intermediate	1	1,434	13.0 > 250	181	778	520	517	517	517	596
Effingham	CWH vm 2	Intermediate	1	397	13.0 > 250	51	210	269	269	269	269	271
Great Central	CWH mm 1	Intermediate	2	3,011	9.0 > 250	263	1,124	1,031	990	990	1,026	1,210
Great Central	CWH mm 2	Intermediate	2	4,870	9.0 > 250	426	2,664	1,979	1,977	1,977	2,006	2,159
Great Central	CWH xm 1	Intermediate	2	1,180	9.0 > 250	103	106	106	106	106	257	311
Great Central	CWH xm 2	Intermediate	2	9,580	9.0 > 250	830	970	862	862	862	1,901	2,386
Great Central	MH mm 1	Intermediate	1	1,037	19.0 > 250	193	909	535	534	534	534	537
Henderson	CWH vm 1	Low(1)	1	11,957	4.35 > 250	505	5,713	3,896	3,752	3,736	3,774	4,676
Henderson	CWH vm 2	Low(1)	1	2,484	4.35 > 250	106	1,806	1,443	1,431	1,431	1,434	1,505
Klanawa	CWH vm 1	Intermediate	1	21,177	13.0 > 250	2,655	7,382	3,643	3,683	3,727	3,926	5,893
Klanawa	CWH vm 2	Intermediate	1	1,385	13.0 > 250	174	924	464	474	474	474	494
Little Qualicum	MH mm 1	Intermediate	1	384	19.0 > 250	70	73	73	73	73	73	73

(1) In low biodiversity emphasis units the requirement is to achieve at least one third of the target percentage now and to meet the full target by the end of the third rotation, target levels depicted reflect first rotation requirement

Table 6.2 (cont.). Periodic old-growth compliance

Landscape Unit	BEC Variant	BEO	NDT	Area (ha)	Old -growth (% > years)	Target (ha)	Status at Year of Simulation 0	50	100	150	200	250
Nahmint	CWH vm 1	High	1	9,064	19.0 > 250	1,677	4,602	3,504	3,399	3,393	3,671	4,342
Nahmint	CWH vm 2	High	1	4,411	19.0 > 250	818	3,352	2,462	2,290	2,264	2,253	2,311
Nahmint	MH mm 1	High	1	1,117	28.0 > 250	313	1,013	989	983	983	980	987
Nitinat	CWH mm 1	Intermediate	2	205	9.0 > 250	18	**9**	18	18	18	18	18
Nitinat	CWH mm 2	Intermediate	2	1,511	9.0 > 250	130	537	212	214	214	216	295
Nitinat	CWH vh 1	Intermediate	1	489	13.0 > 250	61	318	64	64	64	64	64
Nitinat	CWH vm 1	Intermediate	1	19,270	13.0 > 250	2,408	4,628	2,505	2,505	2,505	2,505	3,829
Nitinat	CWH vm 2	Intermediate	1	3,148	13.0 > 250	394	1,645	746	748	748	753	849
Nitinat	MH mm 1	Intermediate	1	509	19.0 > 250	93	365	134	134	134	134	140
Puntledge	CWH xm 2	Low(1)	2	437	3.0 > 250	13	62	28	28	28	54	147
Rosewall	CWH xm 2	Intermediate	2	1,014	9.0 > 250	87	100	91	91	91	133	150
Sarita	CWH vh 1	Low(1)	1	3,124	4.35 > 250	131	818	432	425	429	444	768
Sarita	CWH vm 1	Low(1)	1	26,952	4.35 > 250	1,128	6,230	3,331	3,163	3,145	3,425	6,080
Sarita	CWH vm 2	Low(1)	1	2,178	4.35 > 250	91	1,095	439	433	432	432	519
Somass	CWH mm 2	Low(1)	2	254	3.0 > 250	7	29	18	18	18	24	51
Somass	CWH xm 1	Low(1)	2	618	3.0 > 250	18	**5**	5	19	21	70	86
Somass	CWH xm 2	Low(1)	2	6,074	3.0 > 250	175	462	284	268	298	1,044	1,263
Sproat Lake	CWH mm 1	Intermediate	2	6,451	9.0 > 250	565	1,898	1,562	1,565	1,565	1,644	2,739
Sproat Lake	CWH mm 2	Intermediate	2	1,895	9.0 > 250	165	650	571	580	574	578	789
Sproat Lake	CWH vm 1	Intermediate	1	414	13.0 > 250	53	194	157	160	160	160	212
Sproat Lake	CWH vm 2	Intermediate	1	4,969	13.0 > 250	634	3,124	2,670	2,637	2,634	2,644	2,918
Sproat Lake	CWH xm 1	Intermediate	2	2,329	9.0 > 250	201	**127**	140	143	210	341	433
Sproat Lake	CWH xm 2	Intermediate	2	5,490	9.0 > 250	478	571	494	494	494	794	1,705
Sproat Lake	MH mm 1	Intermediate	1	1,213	19.0 > 250	231	1,077	1,045	1,039	1,039	1,039	1,061
Walbran	CWH vm 1	Intermediate	1	3,227	13.0 > 250	403	1,616	610	584	583	583	790
Walbran	CWH vm 2	Intermediate	1	1,210	13.0 > 250	152	901	431	430	430	430	469
Walbran	MH mm 1	Intermediate	1	147	19.0 > 250	27	106	54	68	68	68	68
AT	AT p	Intermediate	5	42	85.0 > 250	38	**36**	36	36	36	36	36

(1) In low biodiversity emphasis units the requirement is to achieve at least one third of the target percentage now and to meet the full target by the end of the third rotation, target levels depicted reflect first rotation requirement

6.2.2 Summary – Alberni East and Alberni West Working Circles

This analysis provides for an initial harvest level of 1,675,000 cubic meters and a gradual reduction of 7% over 20 years to a mid and long-term harvest level of 1,555,000 cubic meters.

Short and medium term harvest levels are largely dictated by the availability of mature timber (> 125 years of age) and currently older second-growth stands. Changes in the timber harvesting landbase, inventory information, estimates of volumes in these stands or forest cover requirements that affect the timber availability 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 Alberni East/West base case are shown in Table 6.3.

Table 6.3. Managed forest LRSYs

Description	Managed
THLB (including NSR) (ha)	166,575
- future roads (ha)	4,405
= net long-term land base (ha)	162,170
* average MAI (m^3/ha) at culmination age	10.20
= ***theoretical GROSS long-term (m^3)***	**1,654,137**
- NRLs (m^3)	16,541
= ***theoretical NET long-term (m^3)***	**1,637,596**

In the Alberni East and Alberni West base case, the theoretical long-term harvest level of 1,637,600 cubic meters (net NRL volumes) could be attained if all stands were harvested at MAI culmination age. The realized long-term net level of 1,555,000 cubic meters is approximately 5% 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.

6.2.3 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 option and varying only the assumption being evaluated.

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.

Sensitivity issues are summarized in Table 6.4. The timber supply impacts are illustrated in Sections 6.2.3.1 through 6.2.3.21.

Table 6.4. Current management sensitivity analyses – Alberni East and West

Issue	Sensitivity Levels to be Tested	Section
Landbase revisions	adjust timber harvesting landbase by +/- 5%	6.2.3.1
	exclude three first nations areas	6.2.3.1
	exclude marginally economic stands of mature timber	6.2.3.2
Growth and yield	adjust mature volumes by +/- 10%	6.2.3.3
	adjust second-growth stand yields by +/- 10%	6.2.3.4
	apply inventory site indices	6.2.3.5
Forest project	exclude forest project stewardship zones and variable retention	6.2.3.6
	apply higher levels of retention	6.2.3.7
Biodiversity	remove old seral constraint	6.2.3.8
	exclude forest ecosystem networks (FENs)	6.2.3.9
	exclude forest ecosystem networks (FENs) and remove old seral	6.2.3.10
Visual landscape	apply maximum disturbance in scenic area zone 1 (c.f. mid-point)	6.2.3.11
	apply alternative Visually Effective Green-up (VEG) heights	6.2.3.12
Adjacency	apply 3m green-up for adjacency in EFZs (c.f. 1.3m)	6.2.3.13
Minimum harvest ages	adjust for second-growth based on 400 m^3/ha (c.f. 350 m^3/ha)	6.2.3.14
	apply longer rotations in scenic area zone1, partial retention areas	6.2.3.15
Harvest flow	harvest the undercut during the first 10 years	6.2.3.16
	attempt to maintain the current AAC for 20 years	6.2.3.17
	apply higher harvest levels in the first 50 years	6.2.3.18
	establish a non-declining even flow (NDEF) harvest level	6.2.3.19
Summary	summary of sensitivity impacts	6.2.4

6.2.3.1 Adjust THLB

In order to assess the sensitivity of the timber supply to changes in the harvestable landbase, the THLB was adjusted by +/- 5% (+/- 8,329 ha). The intent was to model the effect of a change in the THLB, not a change in the overall productive area. In the –5% scenario, 5% of each harvestable type was reclassified as unharvestable. In this case, the harvest rate decreases at the same rate as the base option (50,000 m^3 per five year period) to a long-term harvest level of 1,475,000 m^3/year which is 5.1% less than the base.

In the +5% scenario, a proportion of each unharvestable type was reclassified as harvestable. The base option initial harvest may be maintained for 15 years before decreasing 45,000 m^3 to a long-term harvest level that is 4.8% higher than that for the base option.

In summary, a 5% increase or decrease in the THLB has a proportional effect on the long-term Base Case harvest levels and does not negatively impact initial harvest levels (Table 6.5, Figure 6.8).

Table 6.5. Net harvest levels – adjust timber harvesting landbase

Years	Annual Harvest Level (m^3 / year)		
	THLB (+5%)	Base Case	THLB (-5%)
1 - 5	1 675 000	1 675 000	1 675 000
6 - 10	1 675 000	1 625 000	1 625 000
11 - 15	1 675 000	1 575 000	1 575 000
16 - 20	1 630 000	1 555 000	1 525 000
21+	1 630 000	1 555 000	1 475 000

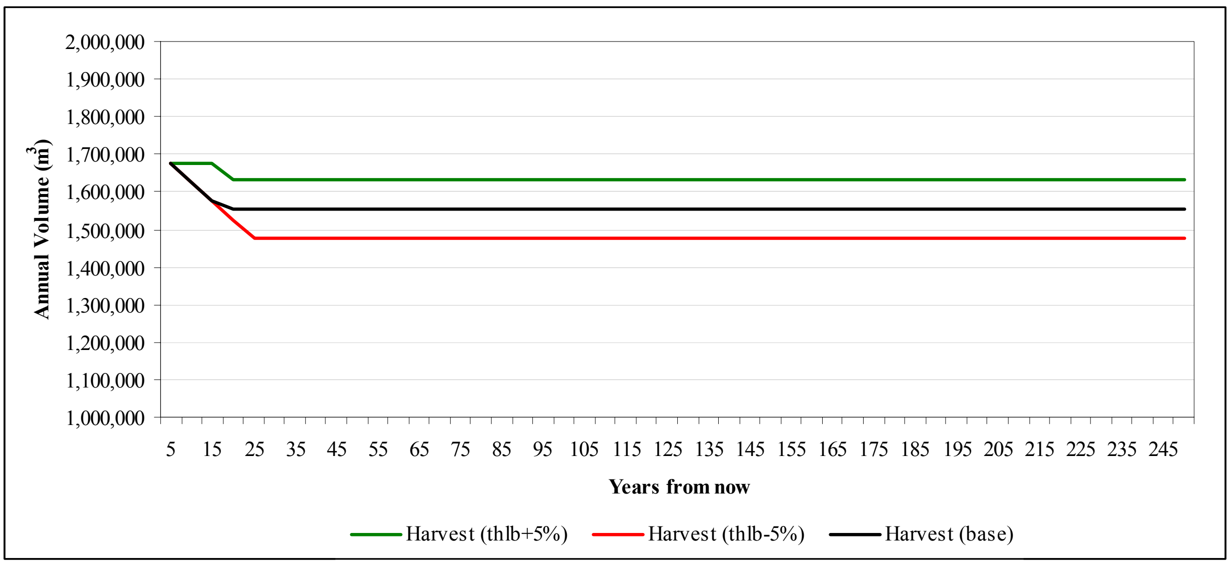

Figure 6.8. Net harvest levels – adjust timber harvesting landbase

Some issues discussed in the Information Package may be related to this sensitivity analysis:

The Information Package describes an option in which three First Nations interest areas are removed from the THLB. The larger of the three areas, the Tii'skin Pawaats (an area on the west side of Henderson Lake) has been identified as a 100% reserve Old-growth Stewardship Zone in the Base Option. The net difference from the base then is the other two areas, Thunder Mountain (just to the north of Great Central Lake) and the Devils Club area (near the head of the Alberni Inlet). The two areas are summarized Table 6.6. In total they contribute 1,036 ha (0.6%) of the THLB and a smaller proportion of the mature volume.

Table 6.6. Summary of two First Nations interest areas

	Thunder Mountain	Devils Club Area	Total
Total (ha)	1,341	14	1,355
Productive (ha)	1,253	11	1,264
THLB (ha)	1,029	7	1,036
Net mature volume (000m^3)	84	0	84

In Section 6.7 of the Information Package it was noted that upon review, the slope class netdowns for unstable terrain in the Nahmint Watershed were considered high. The soil specialists recommended lower netdowns that would reduce the terrain net-down by approximately 456 ha. The impact on the THLB would be somewhat less, i.e. a gain of less than 0.3%.

A small downward pressure on the THLB was identified in Section 6.11 on Wildlife Habitat Areas (WHAs) in the Information Package. It is estimated that the McLaughlin Ridge WHA would reduce the THLB by approximately 100 ha. This is a decrease of less than 0.1%."

Additional small gains are expected from using helicopters for single tree selection in sensitive areas such as unstable terrain. Weyerhaeuser continues to experiment and apply this approach on a small scale. Currently it is difficult to estimate the additional volumes that may be available from such techniques – they are expected to be relatively small. This factor will be reviewed prior to the next analysis.

6.2.3.2 Exclude Marginally Economic Stands

The base option includes mature stands that are classified as marginally economic, based on inventory attributes of volume per ha and proportion of pulp grades in cedar and cypress stands. Refer to section 6.6.2 in the Information Package. These "marginal" areas contribute almost 2.5 million m^3 and 6,174 ha to the base option THLB.

The harvest flow approach taken was to attempt to achieve the same harvest levels as the base option for the first three periods, reduce harvest in the medium-term to compensate for the existing standing volume in the marginal stands and finally reduce the LTHL to approximate the loss of growing sites.

The harvest schedule displayed in Table 6.7 and Figure 6.9 achieves these objectives. The harvest level is reduced by 25,000 m^3/year for 80 years from year 16 to 105. This total reduction in harvest opportunity of 2 million m^3 is similar to the volume currently in the marginal stands. The LTHL is 1,524,600 m^3/year or 30,400 m^3 (2%) less than that of the base option.

Table 6.7. Net harvest levels – exclude marginally economic stands

Years	Annual Harvest Level (m^3 / year)	
	Base Case	Exclude Marginal
1 - 5	1 675 000	1 675 000
6 - 10	1 625 000	1 625 000
11 - 15	1 575 000	1 575 000
16 - 105	1 555 000	1 530 000
105+	1 555 000	1 524 600

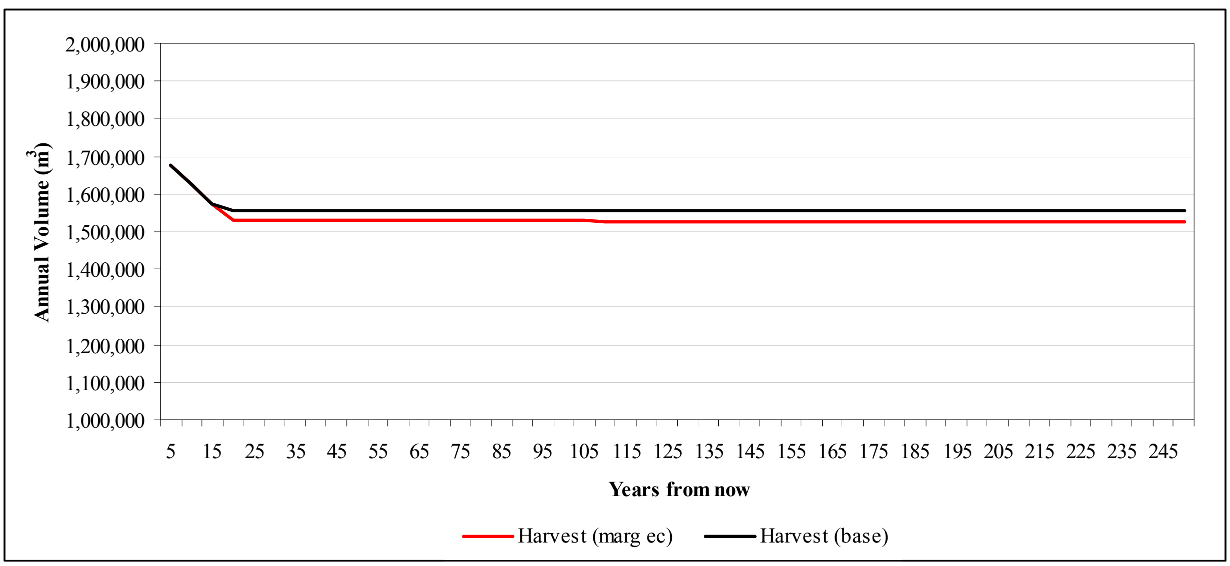

Figure 6.9. Net harvest levels – exclude marginally economic stands

6.2.3.3 Adjust Mature Volumes

The sensitivity of timber supply to mature volume estimates was tested by examining the impact of varying mature volumes by plus and minus 10%. Mature volume refers to volume in stands that are currently greater than 125 years of age. The volume estimates for "mature stands" are based on the compilation of samples from timber cruising. The approach taken was to increase or decrease harvest over the first 100 years to approximately match in total the 4 million m^3 change in mature volume.

The run with mature volumes increased by 10%, commenced with a harvest level of 1,704,500 m^3/year, decreased 100,000 m^3/year over the next 2 five-year periods and then continued higher than the base option for the remainder of the first 100 years before decreasing to the base LTHL (Table 6.8, Figure 6.10).

Table 6.8. Net harvest levels – adjust mature volumes

Years	Annual Harvest Level (m^3 / year) Mature (+10%)	Base Case	Mature (-10%)
1 - 5	1 704 500	1 675 000	1 675 000
6 - 10	1 654 500	1 625 000	1 625 000
11 - 15	1 604 500	1 575 000	1 575 000
16 - 20	1 604 300	1 555 000	1 525 000
21 - 100	1 604 300	1 555 000	1 496 200
101+	1 555 000	1 555 000	1 555 000

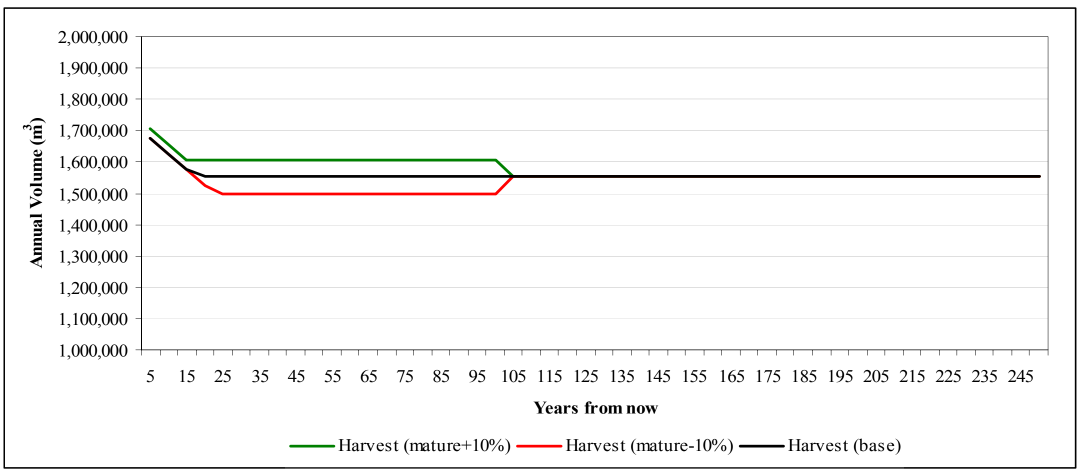

Figure 6.10. Net harvest levels – adjust mature volumes

The harvest schedule with mature volumes reduced by 10%, started at 1,675,000 m^3, then decreased by 50,000 m^3 per five-year period to a harvest level slightly over 50,000 m^3/year less than the base. After 100 years the harvest increased to the LTHL of the base option (Table 6.8, Figure 6.10). This result show that a 10% decrease in mature volumes need not impact initial or long-term harvest levels, but will have some impact on medium term harvest rates.

If the results of the inventory audits completed in TFL 44, were applied then the estimates of the total mature volume would be reduced by 0.5% (refer to Appendix I of the Information Package). This small change is only a small part of the 10% variation tested in this sensitivity.

6.2.3.4 Adjust Second-growth Volumes

In the base option 200,000 m^3/year is harvested from second-growth stands in the initial five-year period. This increases steadily over the ensuring period until the transition to second-growth is largely complete after 40 years.

Yield estimates for second-growth stands were developed using the yield model Y-XENO as described in Section 4.1. The sensitivity of timber supply to these yield table projections was tested by examining the impact of varying yield estimates by plus and minus 10%.

As seen in Table 6.9 and Figure 6.11, a flat line harvest rate of 1,713,000 m^3/year is possible with second-growth volumes increased by 10%. This is higher than the base option initial harvest rate of 1,675,000 m^3 and is 10.2% higher than the base option LTHL.

With second-growth volumes decreased by 10%, the harvest schedule can start at the same level as the base option and then decrease at a rate of 50,000 m^3 per five-year period (approximately 6% a decade) to a LTHL that is 11.2% below that of the base option.

Table 6.9. Net harvest levels – adjust second-growth volumes

Years	Annual Harvest Level (m^3 / year)		
	Second-growth (+10%)	Base Case	Second-growth (-10%)
1 - 5	1 713 000	1 675 000	1 675 000
6 - 10	1 713 000	1 625 000	1 625 000
11 - 15	1 713 000	1 575 000	1 575 000
16 - 20	1 713 000	1 555 000	1 525 000
21 - 25	1 713 000	1 555 000	1 475 000
25 - 30	1 713 000	1 555 000	1 425 000
31 +	1 713 000	1 555 000	1 381 000

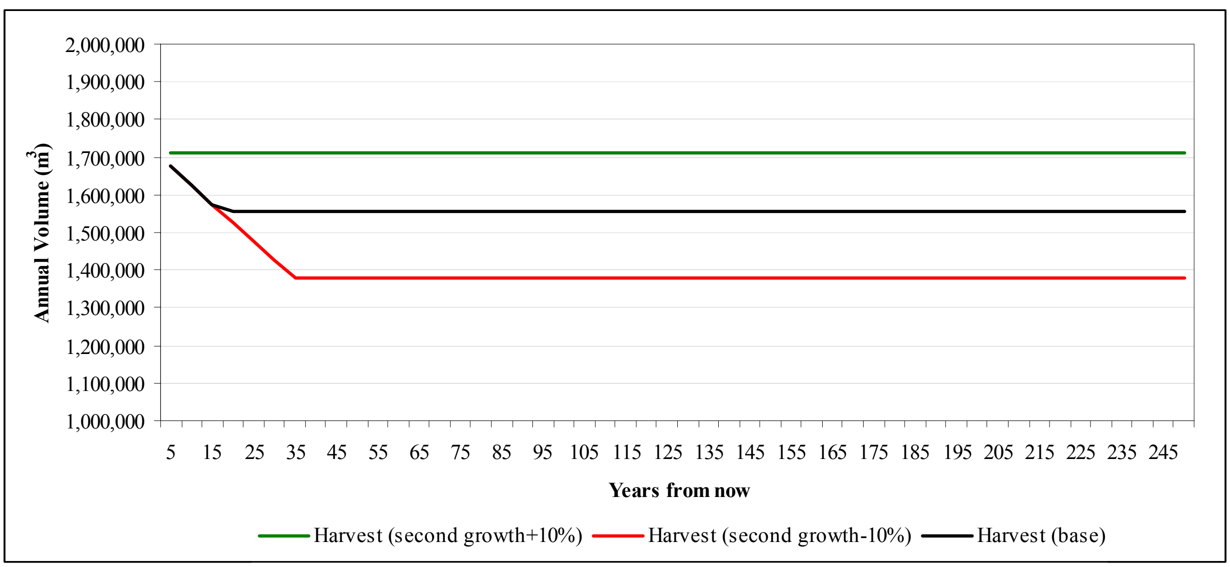

Figure 6.11. Net harvest levels – adjust second-growth volumes

6.2.3.5 Inventory Site Index

Site Index is a measure of productivity and is a major factor in projecting yields of second-growth. It does not effect mature stand (currently greater than 125 years of age) volumes as they are estimated from measured samples and it is assumed that in total these volumes are static over time.

This analysis uses the Weyerhaeuser BC Coastal Group Biophysical Site Index Model (BSIM) for estimating site index in mature (old-growth) stands and young second-growth stands. This same approach was used in the TFL 44 MP No.3 analysis. The BSIM approach was developed because of the recognition that site index estimates based on measurements of older forests (greater than 200 years of age) generally underestimate site index. This view is strongly supported by a comparison of sites indexes measured during timber cruising of second-growth and those estimated for the original stands. Refer to the discussion in Section 8.4.1 of the Information Package.

This option examines the timber supply impact of using the inventory site indexes rather than those estimated using BSIM (used in the base option). Average site indexes were re-calculated for the same analysis units used in the base option, but using the inventory site indexes instead of the BSIM site indexes. Table 6.10 compares the two sets of average site indexes.

Table 6.10. Inventory and BSIM site index comparison

Species Type	Site Index Class	Average BSIM Site Index	Average Inventory Site Index
Douglas-fir	High	35.5	30.6
	Good	28.5	25.5
	Medium	23.0	22.1
	Poor	17.0	16.7
Hemlock	High	33.5	29.1
	Good	28.5	24.0
	Medium	22.5	21.6
	Poor	17.0	16.4

A separate set of yield tables was developed using the average inventory site indexes listed above. In addition green-up ages for adjacency and Visually Effective Green-up (VEG) were increased by one year to reflect slower initial height growth with the lower site indexes.

As depicted in Table 6.11, the result is a LTHL of 1,218,000 m^3, 21.7% lower than the 1,555,000 m^3 in the base option. This difference is similar to the almost 20% estimated for the same comparison for the combined Alberni East and Alberni West working circles in the MP No.3 analysis.

Table 6.11. Net harvest levels – inventory site indexes

Years	Annual Harvest Level (m^3 / year)	
	Base Case	Inventory SI
1 - 5	1 675 000	1 675 000
6 - 10	1 625 000	1 574 500
11 - 15	1 575 000	1 480 000
16 - 20	1 555 000	1 391 200
21 - 25	1 555 000	1 307 800
26 - 30	1 555 000	1 229 300
31 - 150	1 555 000	1 155 500
151+	1 555 000	1 217 800

The inventory site index harvest schedule starts at the base option initial harvest rate, but then decreases by 6% per five-year period to 1,155,000 m^3/year in 30 years time and stays at this level for a further 120 years before increasing to the LTHL (Figure 6.12).

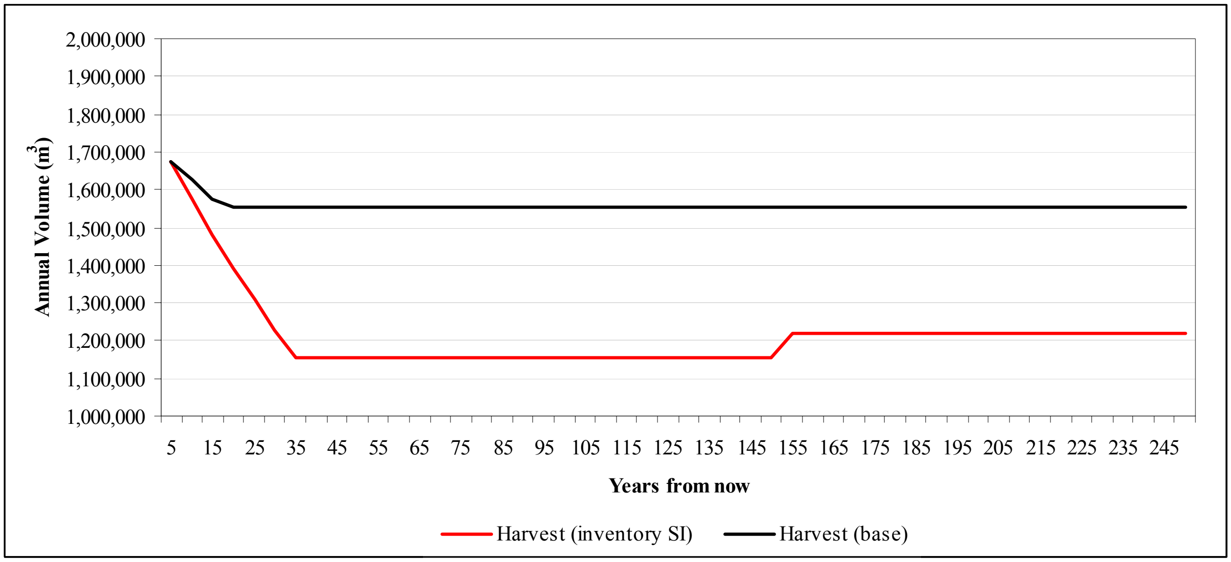

Figure 6.12. Net harvest levels – inventory site indexes

Recent comparisons show that measured site indexes in second-growth stands of 30 to 80 years of age compare closely on average to those estimated with BSIM (refer to Section 8.4.1 in the Information Package).

6.2.3.6 Exclude Stewardship Zone and Variable Retention Assumptions

The Weyerhaeuser BC Coastal Group is on schedule for phasing in variable retention. In addition management areas have been classified into three stewardship zones; timber, habitat and old-growth, with increasing levels of stand-level retention. This new forest management strategy, the "Forest Project" is an important change since MP No.3.

This option examines the timber supply impacts of excluding the stewardship zones and variable retention. That is the incremental net-downs of 5%, 7.5% and 30% and the regenerated stand yield reductions of 3%, 11% and 30% are removed. The initial harvest level is increased to 1,712,600 m^3/year and this rate is continued out as the LTHL, 10% higher than the LTHL for the base option (Table 6.12, Figure 6.13).

The 10% increase in LTHL is close to what might be estimated by considering the area weighted area net-down and regenerated stand yield impacts. From Table 6.1 of the Information Package it is estimated that excluding stewardship zones and variable retention would add 7.3% to the THLB. Similarly, from the net areas by stewardship zone in Table 6.21 of the Information Package it is estimated that the regenerated stand yield impacts would on average be an additional 4.8%. Combining 7.3% and 4.8% results in 12.5%, a little higher than the 10% achieved. Some of the difference is explained by the option harvest schedule being higher from the start, while the yield impacts apply to regenerated stands (future yields) and not to the current rotation. Also it is noted that the growing stock is growing slightly, indicating that a small increase in harvest level may be possible.

Table 6.12. Net harvest levels – exclude stewardship zone and variable retention assumptions

Years	Annual Harvest Level (m^3 / year)	
	Base Case	**No Stewardship Assumptions**
1 - 5	1 675 000	1 712 600
6 - 10	1 625 000	1 712 600
11 - 15	1 575 000	1 712 600
16 - 100	1 555 000	1 712 600
101 - 250	1 555 000	1 712 600

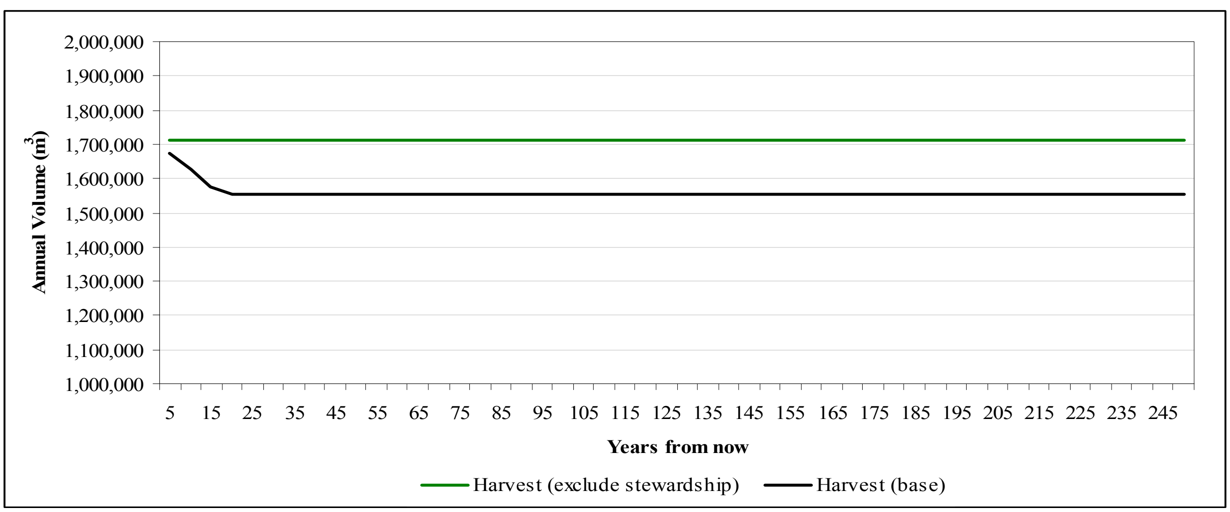

Figure 6.13. Net harvest levels – exclude stewardship zone and variable retention assumptions

The goal is to reserve two-thirds of the forest in old-growth zones and to achieve at least 10%, 15% and 20% retention in harvest areas in timber, habitat and old-growth zones respectively. These practices have been modelled in the base option by applying incremental net-downs of 5%, 7.5% and 70% in the timber, habitat and old-growth zones respectively. It is assumed that 50% of the minimum retention levels are provided by other net-downs for riparian areas, WTPs etc. Yield projections for regenerated stands have also been reduced to allow for the effects of increased crown competition from the higher levels of retention. Yield table adjustments (reductions) of 3% in the timber zone, 11% in the habitat zone and 30% in the old-growth zone have been applied in the base option. Potential benefits of variable retention include improved flexibility for managing visual landscapes and improved harvest access to adjoining areas. Such benefits have not been portrayed in this analysis.

6.2.3.7 Adjust Incremental Netdowns

Weyerhaeuser BC Coastal Group has been gaining experience with variable retention. Surveys have generally shown total harvest block retention to range between 15% and 25% on average. Much of this retention comes from riparian areas, WTPs and other net-downs. For example, refer to the discussion in Section 6.19.1 in the Information Package in which the average retention of 21.7% in a sample of blocks compares closely with the base option assumptions on spatial net-downs and incremental allowances for WTPs and variable retention.

This option considers the consequences of a 5% higher incremental net-down for variable retention in the timber and habitat stewardship zones, i.e. the net-downs increase from 5% to 10% in the timber zone and from 7.5% to 12.5% in the habitat zone. No changes were made to the yield assumptions for regenerated stands. It is perhaps not surprising that the resulting harvest schedule is very close to that for the option in which the THLB was decreased by 5%. The initial harvest is the same as the base option and then the schedule follows a regular decline of 50,000 m^3/five-year period for 25 years to a LTHL of 1,470,200 m^3, 5.4% below the LTHL of the base option (Table 6.13, Figure 6.14).

Table 6.13. Net harvest levels – increase incremental netdowns

Years	Annual Harvest Level (m^3 / year)	
	Base Case	Increase Incremental Netdown
1 - 5	1 675 000	1 675 000
6 - 10	1 625 000	1 625 000
11 - 15	1 575 000	1 575 000
16 - 20	1 555 000	1 525 000
21 - 25	1 555 000	1 475 000
26+	1 555 000	1 470 200

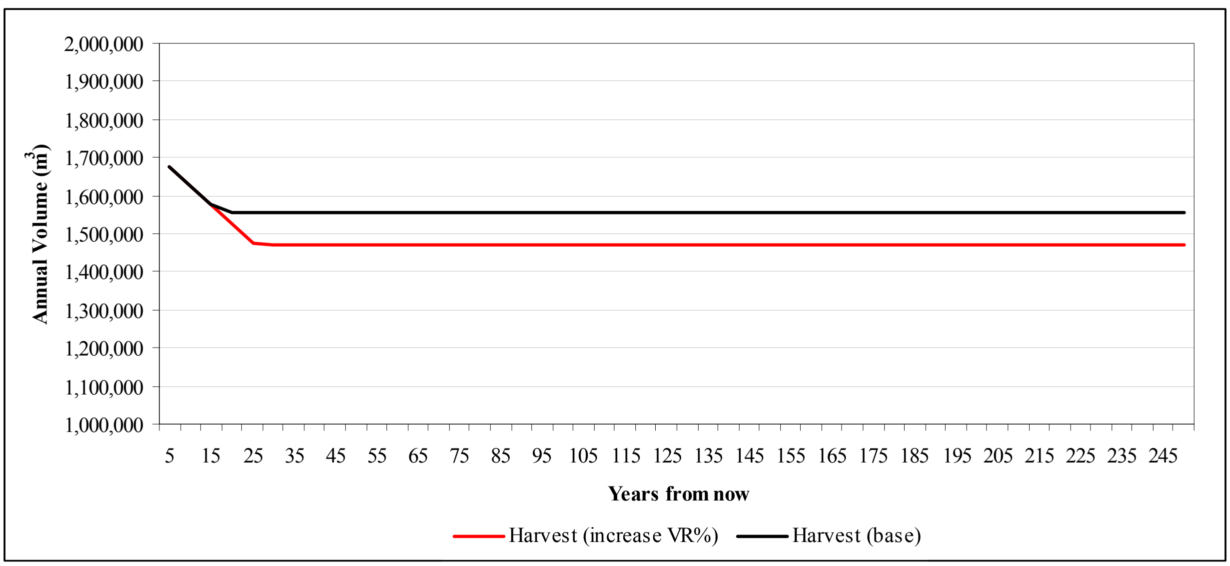

Figure 6.14. Net harvest levels – increase incremental netdowns

6.2.3.8 Remove Old Seral Requirements

Old seral constraints are applied in the base option in accordance with the Landscape Unit Planning Guide. The draft landscape units and biodiversity emphases and the BEC variant classification are the basis for applying the constraints. This includes the provision in low biodiversity emphasis areas for as little as one-third of the old seral requirement, increasing to the full amount by the end of three rotations (approximately 210 years). Refer to Section 10.2.2 in the Information Package.

The option harvest schedule continues with the initial period harvest rate of 1,675,000 m^3/year for three five-year periods before decreasing over three periods to the same LTHL as the base option (Table 6.14, Figure 6.15). An additional 1.2 million m^3 is harvested over the period from year 6 to year 25 compared to the base option. An alternative harvest flow would have been to spread the additional harvest out over a longer period. The forest growing stock is higher in this option than the base and increases a little over the longer term indicating that a small amount of additional volume is available for harvest.

Table 6.14. Net harvest levels – remove old seral requirements

Years	Annual Harvest Level (m^3 / year)	
	Base Case	No Old Seral
1 - 5	1 675 000	1 675 000
6 - 10	1 625 000	1 675 000
11 - 15	1 575 000	1 675 000
16 - 20	1 555 000	1 625 000
21 - 25	1 555 000	1 575 000
26+	1 555 000	1 555 000

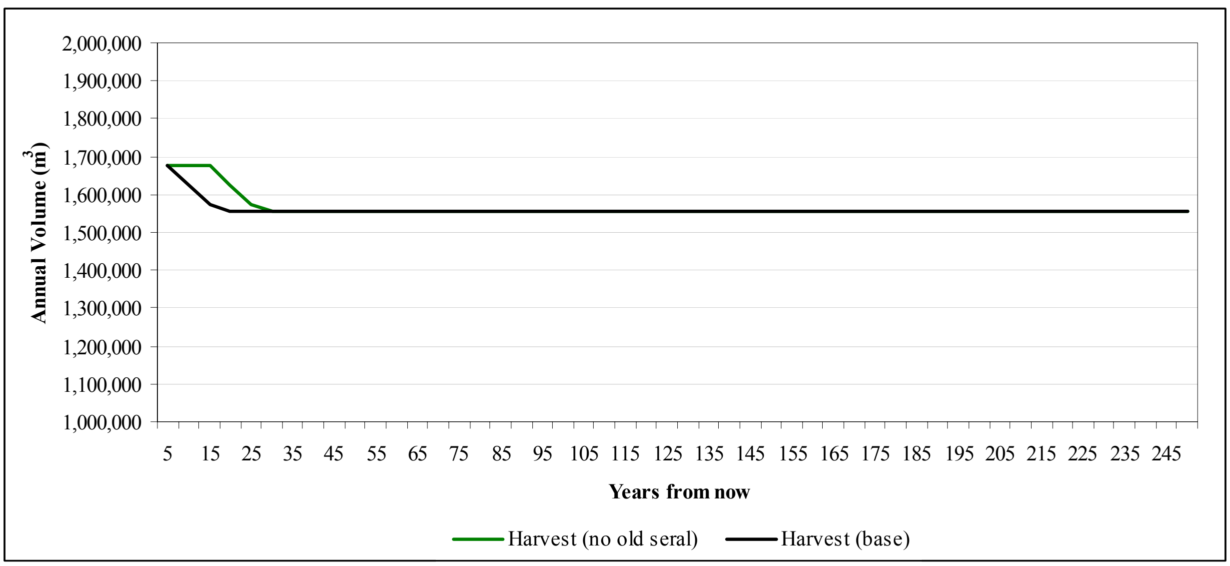

Figure 6.15. Net harvest levels – remove old seral requirements

There is insufficient old seral in reserves in some landscape unit and BEC Variant combinations to meet the old seral requirements. This occurs in particular in the Ash CWH xm2, Corrigan CWHvm1, Corrigan CWHxm2, and the Nitinat CWHvm1 landscape unit / variant combinations (Table 6.2). In total the harvest of more than 2,300 ha of mature forest (and additional areas of second-growth) in the THLB is delayed for up to 200 years by which time sufficient younger reserved areas have aged to 250 years plus. There is a small spike in harvest from old-growth at around period 190 to 230 years.

In the option without old seral constraints additional mature forest is available for harvest in the medium-term. Locally this will provide additional harvest flexibility and opportunities. Also earlier harvest of these areas will provide additional forest growth and hence some additional longer-term harvest opportunities.

The intention has been that the Forest Project (variable retention and old-growth stewardship zones) would provide an alternative way to achieve landscape biodiversity objectives. It is hoped that variable retention and recruitment strategies may contribute to the plan for meeting old seral targets in some landscape units and so alleviate impacts on medium-term timber supply. The base option did not include the incremental net-down from variable retention in the timber (5%) and habitat (7.5%) stewardship zones as contributing towards old seral targets.

If these percentages were applied against the remaining old seral in the THLB in landscape units which are short of the target, the impact would be small as generally there is little oldgrowth remaining in these areas. However, if combined with a recruitment strategy, as in the draft strategy at Weyerhaeuser's North Island Timberland's operation in the Campbell River District, the contribution may be significant.

6.2.3.9 Exclude Forest Ecosystem Networks

Forest Ecosystem Networks (FENs) were established in TFL 44 during the early 1990s. The purpose was to maintain natural connectivity in the area. FENs were recognized as netdowns in the MP No.3 analysis and are recognized in current operational plans.

The harvest schedule for the first periods follows the same pattern as in the base option, commencing at the same initial harvest rate and then decreasing at 50,000 m^3/five-year period. However the harvest level continues to decrease below the LTHL of the base option, reaching a LTHL of 1,391,000 m^3, 10.5% below the LTHL of the base option (Table 6.15, Figure 6.16).

Table 6.15. Net harvest levels – exclude forest ecosystem networks

Years	Annual Harvest Level (m^3 / year)	
	Base Case	Exclude FENs
1 - 5	1 675 000	1 675 000
6 - 10	1 625 000	1 625 000
11 - 15	1 575 000	1 575 000
16 - 20	1 555 000	1 525 000
21 - 25	1 555 000	1 475 000
26 - 30	1 555 000	1 425 000
31+	1 555 000	1 391 000

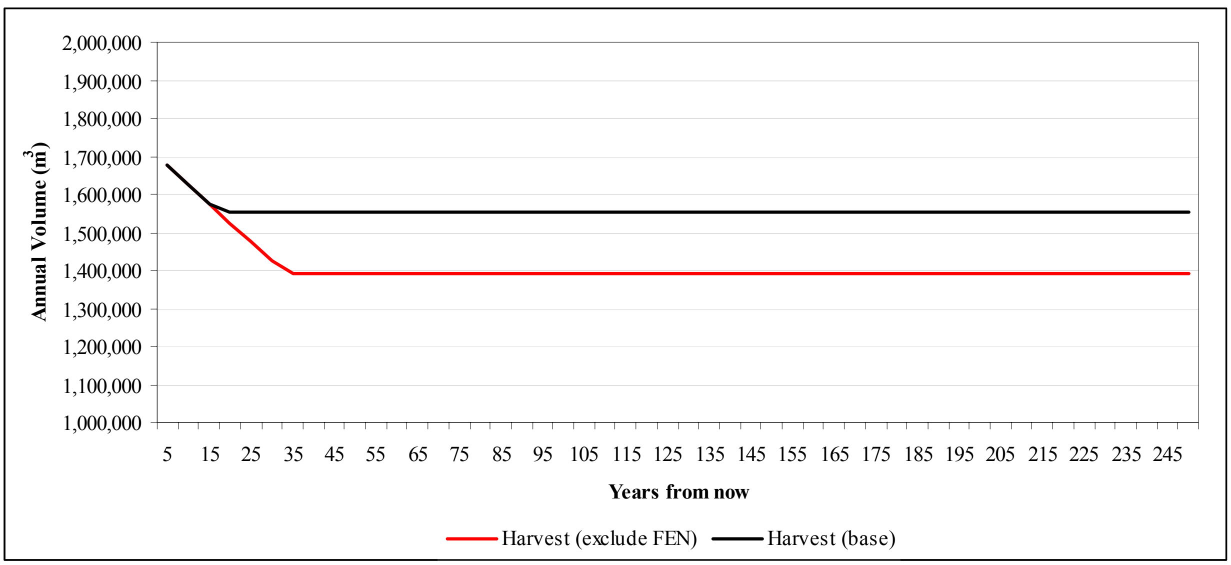

Figure 6.16. Net harvest levels – exclude forest ecosystem networks

FENs were intended to be a temporary measure until landscape planning was completed. They are scheduled to expire on June 15 2003 (refer to "forest ecosystem network" in definitions of Part I of the Operational Planning Regulation).

Other planning approaches are now available to achieve the habitat and biodiversity objectives that were originally sought from FENs.. These include landscape planning and the creation of Old-growth Management Areas (OGMAs). Also important is the Forest Project, which adds to the regulatory reserves by providing additional reserved areas in old-growth stewardship zones and in stand-level retention (habitat) distributed across the forest landscape. Increased flexibility to respond to local conditions and objectives (e.g. connectivity) is provided by varying silvicultural systems and amount and distribution of retention to meet such objectives.

Consequently, FENs were not recognized (not netted down) in the base option. As described in Section 4.2, the MP No.4 THLB is slightly less than that for MP No.3 because additional netdowns for the Forest Project (in old-growth stewardship zones and for variable retention), in riparian areas and for unstable soils exceed the area netted out for FENs in MP No.3. The spatial distribution of the reserve areas has changed.

This option investigates the timber supply impacts if the FENs are also removed from the THLB. The result is a THLB that is reduced by 17,260 ha (10%) to 149,319 ha.. Much of this difference is mature timber, resulting in a decrease in merchantable timber of 9.2 million m^3 (17.4%) at the start of the harvest schedule.

6.2.3.10 Exclude Forest Ecosystem Networks / Old Seral

This option netdowns the THLB for FENs and excludes the old seral requirements. The results are compared with the option that applied net-downs for FENs and also applied constraints for old seral requirements.

Table 6.16 and Figure 6.17 shows that the harvest flow approach used was to increase the long-term timber supply slightly compared to the option that netted down for FENs but applied the old seral constraint. The FENs do provide some additional old seral reserves in landscape unit / variant combinations such as the Nitnat CWHvm1 and the Corrigan CWH vm1. Hence the impact of removing the old seral constraint is less than the option above in which FENs were not recognized. The additional long-term timber supply derives from harvesting the 1500 ha of available old-growth at an earlier time and benefiting from the growth that results. An alternative harvest flow could have increased harvest slightly in the short to medium-term, in a similar manner (but lesser extent) to the option that did not net-down for FENs and excluded the old seral requirements.

Table 6.16. Net harvest levels – exclude forest ecosystem networks and old seral

Years	Annual Harvest Level (m^3 / year)		
	Base Case	Exclude FENs	Exclude FENs/Old
1 - 5	1 675 000	1 675 000	1 675 000
6 - 10	1 625 000	1 625 000	1 625 000
11 - 15	1 575 000	1 575 000	1 575 000
16 - 20	1 555 000	1 525 000	1 525 000
21 - 25	1 555 000	1 475 000	1 475 000
26 - 30	1 555 000	1 425 000	1 425 000
31+	1 555 000	1 391 000	1 405 800

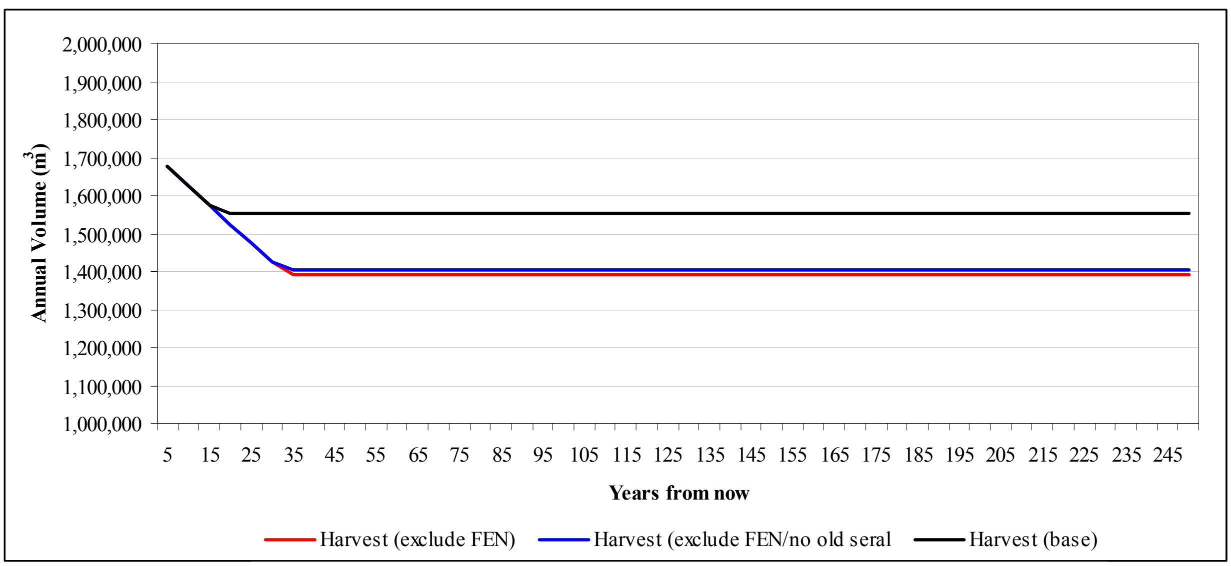

Figure 6.17. Net harvest levels – exclude forest ecosystem networks and old seral

6.2.3.11 Adjust VQO Maximum Disturbance

In the base option, Recommended Visual Quality Classes (RVQCs) in Scenic Area 1 and Scenic Area 2 are respectively modelled at the mid point and at the upper end of the range for disturbance (maximum percentage of the area below VEG).

In this option, the disturbance for RVQCs in Scenic Area 1 is also modelled at the upper end of the range. Table 6.17 summarizes the difference in constraint from the base option and the area that is affected.

Table 6.17. Comparison of disturbance requirements within scenic area 1

RVQC in Scenic Area 1	Area (ha)		Maximum Area Below VEG (%)	
	Productive	THLB	Base Option	Sensitivity
Retention	1,019	423	3	5
Partial Retention	25,274	15,170	10	15
Modification	4,168	1,993	20	25

The harvest schedule continues with the initial period harvest rate of 1,675,000 m3/year for three five-year periods before decreasing over three periods to a medium-term rate of 1,555,000 m^3 before increasing slightly to a LTHL of 1,579,000 m^3/year (1.5% higher than the base option LTHL).

An additional 1.2 million m^3 is harvested over the period from year 6 to year25 compared to the base option. An alternative harvest flow would have been to spread the additional harvest out over a longer period.

Table 6.18. Net harvest levels – adjust maximum VQO disturbance

Years	Annual Harvest Level (m^3 / year)	
	Base Case	Max Disturbance
1 - 5	1 675 000	1 675 000
6 - 10	1 625 000	1 675 000
11 - 15	1 575 000	1 675 000
16 - 20	1 555 000	1 625 000
21 - 25	1 555 000	1 575 000
26 - 100	1 555 000	1 555 000
101+	1 555 000	1 579 000

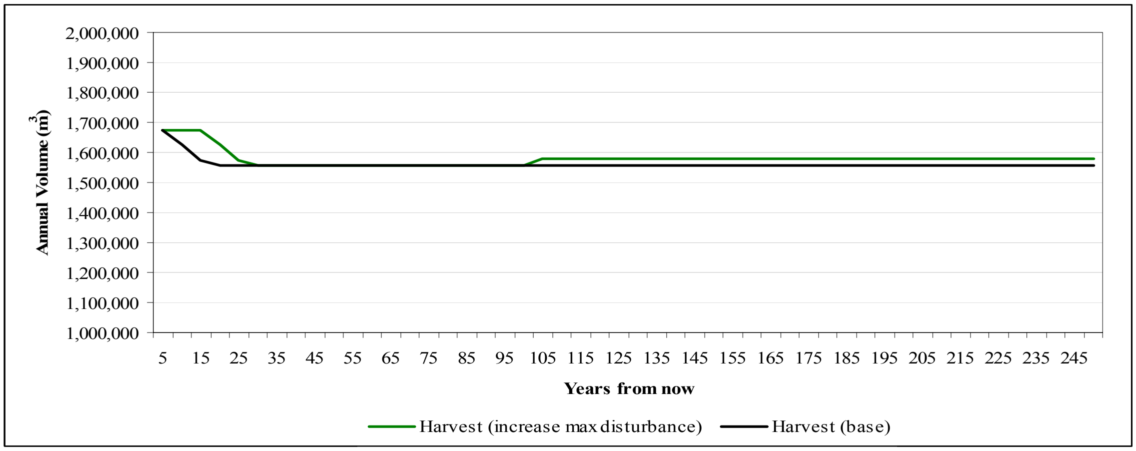

Figure 6.18. Net harvest levels – adjust maximum VQO disturbance

The change in constraint would have a significant impact on short-term and mid-term harvest flexibility in many Scenic Area 1 RVQCs, particularly those that are partial retention. In simple terms, the maximum area below VEG in these partial retention areas will increase from approximately 2,527 ha (10% of the productive forest area of 25,274 ha) to 3,791 ha (15% of 25,274 ha).

In the longer term this translates to a harvest rate that could be about 84 ha/year higher with the relaxed constraint. Only a small portion of this is additional long-term timber supply as theoretically average rotation ages decrease from 91 years to 80 years and therefore average MAIs in these areas will be affected only slightly. The change in maximum disturbance occurs on less than 10% of the total THLB.

6.2.3.12 Alternative Visually Effective Green-up Height

The base option assumes that Visually Effective Green-up (VEG) in visual landscape occurs on average at a height of 5m.

An alternative procedure for estimating the average VEG heights is outlined in the report, "Procedures for factoring Visual Resources into Timber Supply Analysis" (MoF, 1998). Average VEG heights estimated using this approach were generally in the 7m range. Table 6.19 compares average VEG heights and ages between the base option and this alternative approach.

Table 6.19. Comparison of VEG heights and ages

Scenic Area Zone	RVQC	Base Option		Alternative Approach	
		VEG Height (m)	VEG Age (yrs)	VEG Height (m)	VEG Age (yrs)
1	R	5	16	6.1	18
	PR	5	14	7.0	18
	M	5	13	7.1	17
2	R	5	12	7.7	16
	PR	5	14	7.1	17
	M	5	14	7.1	17

Increased green-up heights result in less area being available for harvest since the time to reach green-up is prolonged. The approach was to target the base option harvest flow in the short term and medium term. The results in Table 6.19 and Figure 6.19 show that this approach was successful with harvest volume impacts delayed to a 2% reduction in the LTHL after the first 100 years. This analysis does not examine the economic impacts of reduced harvest flexibility in the short term.

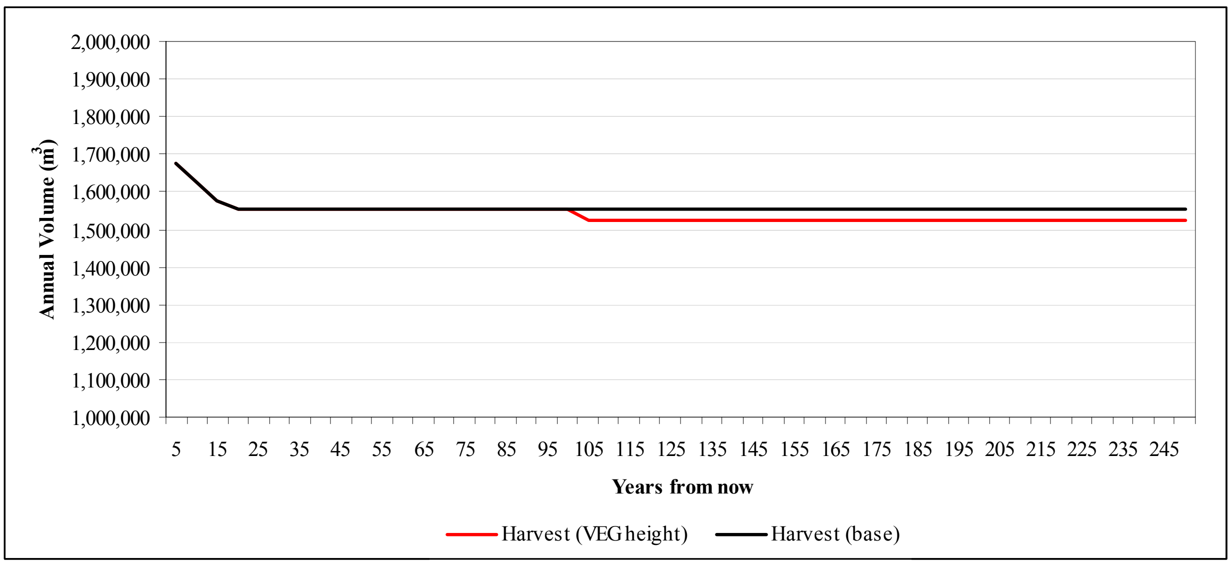

Figure 6.19. Net harvest levels – include VEG height

Table 6.20. Net harvest levels – include VEG height

Years	Annual Harvest Level (m^3 / year)	
	Base Case	Include VEG Height
1 - 5	1 675 000	1 675 000
6 - 10	1 625 000	1 625 000
11 - 15	1 575 000	1 575 000
16 - 100	1 555 000	1 555 000
101+	1 555 000	1 524 600

6.2.3.13 Adjust Enhanced Forestry Zone Green-up

The Vancouver Island Land Use Plan Higher Level Plan Order allows for a reduced requirement for adjacency (1.3m green-up) in Enhanced Forestry Zones (EFZs). This is portrayed in the base option by assuming a green-up age of five years in EFZs compared to 10 years elsewhere.

In this option the green-up age for adjacency in EFZs is increased to 3m (10 years). As depicted in Table 6.21 and Figure 6.20, there is no apparent impact on harvest levels. Aspatial approaches (as used in this analysis) can not effectively portray the impacts of spatial constraints such as adjacency. In specific circumstances a reduced adjacency requirement may have a significant economic benefit by providing more harvest flexibility including reduced cash flow for development costs and earlier access to adjacent areas for harvest.

Table 6.21. Net harvest levels – adjust enhanced management zone green-up

Years	Annual Harvest Level (m^3 / year)	
	Base Case	EFZ Green-up
1 - 5	1 675 000	no change
6 - 10	1 625 000	
11 - 15	1 575 000	
16+	1 555 000	

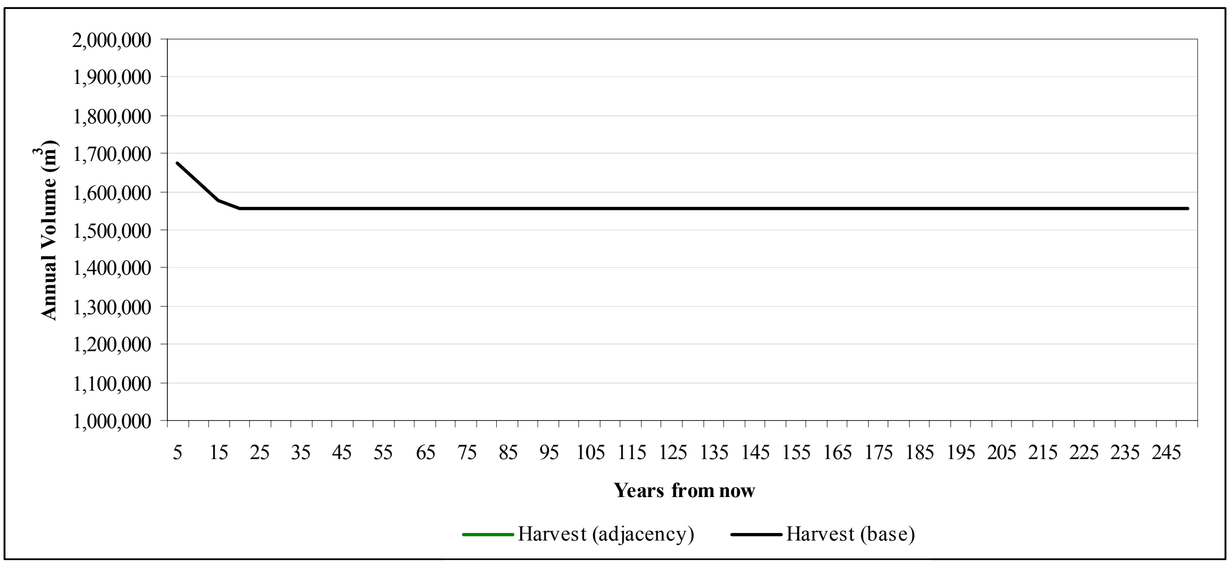

Figure 6.20. Net harvest levels – adjust enhanced forestry zone green-up

6.2.3.14 Adjust Minimum Harvest Age

In general, minimum harvest ages for second-growth in the base option are defined by the age at which a volume of 350 m^3/ha is achieved (refer to Section 10.5.2 of the Information Package).

A sensitivity analysis was run in which the minimum harvest age volume requirement was increased to 400 m^3/ha. This change has no effect on the harvest schedule (Table 6.22, Figure 6.21) and minimal impact on the forest growing stock. The harvest schedules include very little volume, primarily poor site areas that are harvested at volumes per ha near the minimum levels.

Table 6.22. Net harvest levels – adjust minimum harvest age

Years	Annual Harvest Level (m^3 / year)	
	Base Case	Adjust MHA
1 - 5	1 675 000	no change
6 - 10	1 625 000	
11 - 15	1 575 000	
16+	1 555 000	

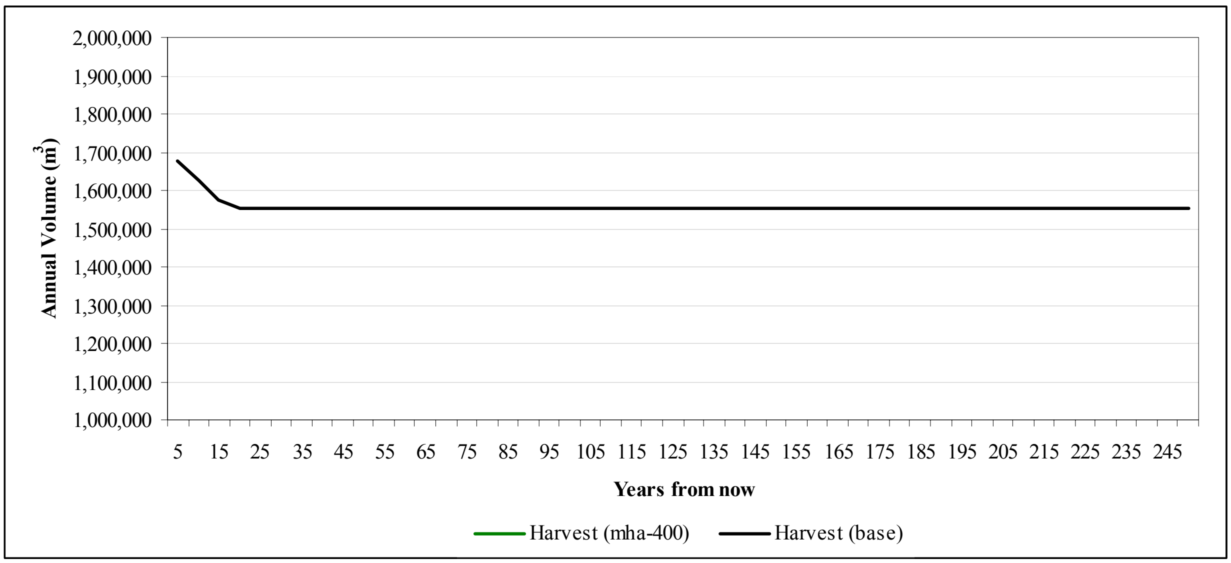

Figure 6.21. Net harvest levels – adjust minimum harvest age

6.2.3.15 Apply Longer Rotation

During the public review of the draft management plan, some interest was expressed in a portion of the THLB been managed on longer rotations. The approach taken in this option to increase rotation lengths on areas that already constrained to minimize the impact on overall timber supply. The maximum percent denudation for the 15,000 ha (9%) of THLB in Scenic Area Zone 1, partial retention RVQC areas, was decreased from 10% to 5%. In theory this will increase the average rotation ages in these areas to approximately 180 years (using calculations based on a maximum area of 5% under 14 years of age and the THLB averaging 60% of the productive forest).

It was possible to follow the same harvest volumes as the base option for the first 15 years and then decrease to harvest level 2% lower through to year 150 and 5% below the base LTHL (Table 6.23, Figure 6.22).

Table 6.23. Net harvest levels – apply longer rotation

Years	Annual Harvest Level (m^3 / year)	
	Base Case	Longer Rotation
1 - 5	1 675 000	1 675 000
6 - 10	1 625 000	1 625 000
11 - 15	1 575 000	1 575 000
16 - 20	1 555 000	1 525 000
21 - 150	1 555 000	1 524 800
151+	1 555 000	1 480 000

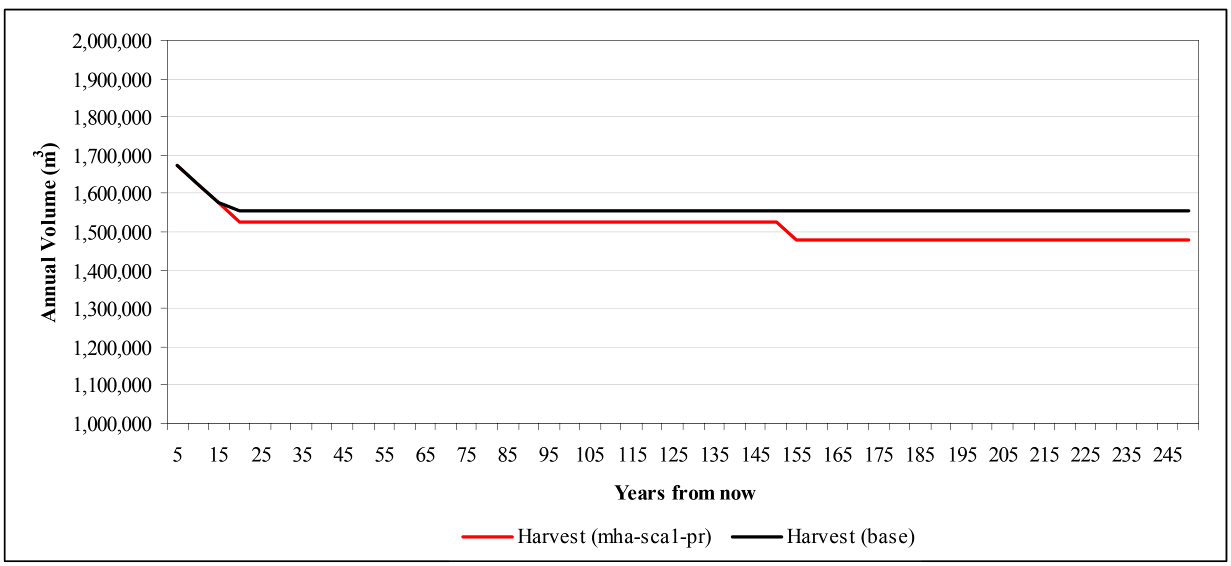

Figure 6.22. Net harvest levels – apply longer rotation

6.2.3.16 Harvest Undercut

An undercut of 893,000 m^3 occurred in TFL 44 during the 1995 to 1999 cut control period. Of this, 97,000 occurred in the Ucluelet Working Circle and the balance of 796,000 is associated with the Alberni East and Alberni West Working Circles. This volume is available for allocation by the MoF as timber sales etc. No allowance for this undercut volume was made in the base option.

This option examines the impact of allocating the 796,000 m^3 undercut volume over the first ten years (2 periods) of the harvest schedule. Hence harvest levels are increased by 79,600 m^3/year (approximately 5%) for the first 10 years. The results show that it is possible to then follow the base option harvest schedule in the medium term (period 3 to beyond 100 years) with a small reduction (0.7%) in the LTHL (Table 6.24, Figure 6.23). An alternative harvest flow might be to reduce harvest levels in the medium term (year 11 to 100) by somewhat less than 10,000 m^3/year.

Table 6.24. Net harvest levels – apply undercut

Years	Annual Harvest Level (m^3 / year)	
	Base Case	Undercut
1 - 5	1 675 000	1 754 600
6 - 10	1 625 000	1 704 600
11 - 15	1 575 000	1 575 000
16 - 175	1 555 000	1 555 000
175+	1 555 000	1 544 000

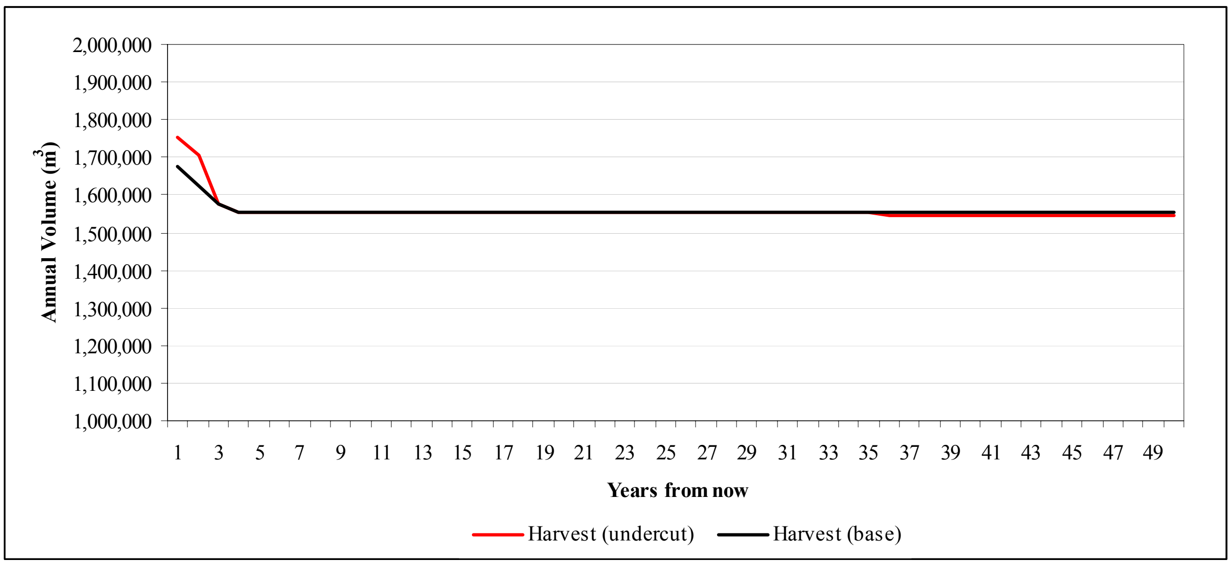

Figure 6.23. Net harvest levels – apply undercut

6.2.3.17 Maintain Initial Harvest Level – 20 Years

The base option portrays a strategy of gradually adjusting harvest levels towards the estimated LTHL. The contribution of the Alberni East and Alberni West Working Circles to the MP No.3 AAC is estimated at 1,724,000 m^3. The base option initial harvest level of 1,675,000 m^3 is below the MP No.3 contribution and allows a relatively gradual decrease of 50,000 m^3/five-year period to the estimated LTHL of 1,555,000 m^3.

This option tests the consequences of maintaining the initial harvest level of 1,675,000 m^3/year for 20 years instead of the 5 years in the base option. The impact is relatively minor as the harvest schedule declines by the standard 50,000 m^3/five-year period after the first 20 years and then compensates for the higher short-term harvest by harvesting at 1,530,000 m^3/year (instead of 1,555,000 m^3/year in the base option) from year 31 to 100. Under this harvest flow scenario the LTHL is the same as for the base option (Table 6.25, Figure 6.24).

Table 6.25. Net harvest levels – maintain initial harvest levels, 20 years

Years	Annual Harvest Level (m^3 / year)	
	Base Case	AAC 20
1 - 5	1 675 000	1 675 000
6 - 10	1 625 000	1 675 000
11 - 15	1 575 000	1 675 000
16 - 20	1 555 000	1 675 000
21 - 25	1 555 000	1 625 000
26 30	1 555 000	1 575 000
21 - 100	1 555 000	1 530 000
101+	1 555 000	1 555 000

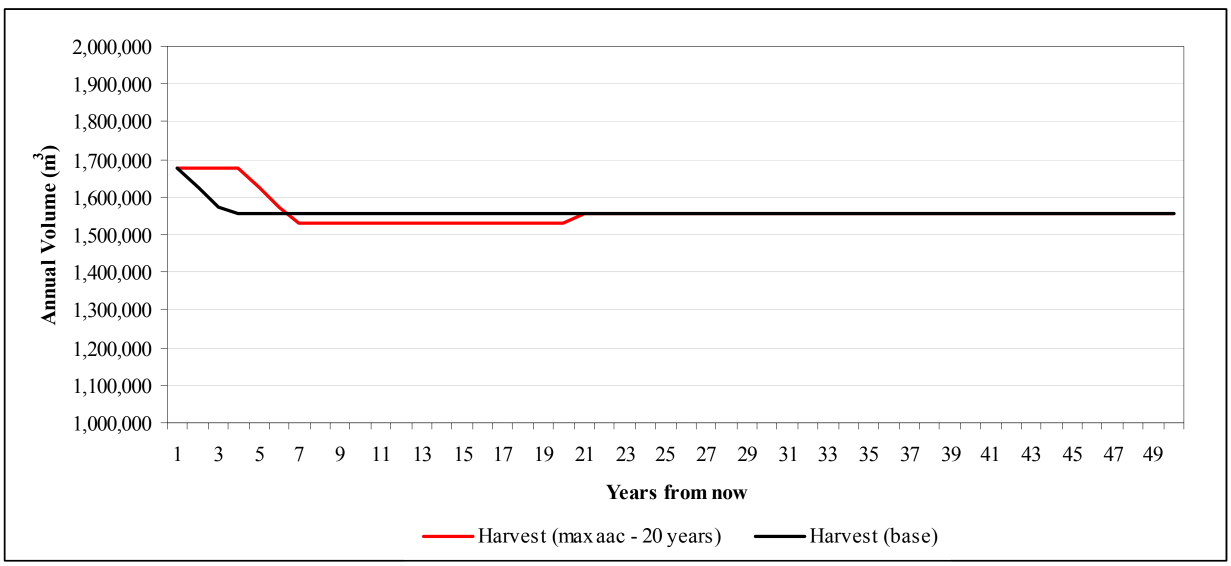

Figure 6.24. Net harvest levels – maintain initial harvest levels, 20 years

6.2.3.18 Maintain Initial Harvest Level – 50 Years

The initial harvest level of 1,675,000 m^3/year is maintained for 50 years, as opposed to 5 years in the base option. Harvest rates then follow the transition of decreasing by 50,000 m^3/five-year period to a LTHL that is almost 3% lower than the LTHL for the base option. In effect, the increased harvest levels in the first 50 years have drawn down the forest growing stock somewhat, resulting in shorter rotation ages and slightly lower average MAIs in the longer-term (Table 6.26, Figure 6.25).

Table 6.26. Net harvest levels – maintain initial harvest levels, 50 years

Years	Annual Harvest Level (m^3 / year)	
	Base Case	AAC 50
1 - 5	1 675 000	1 675 000
6 - 10	1 625 000	1 675 000
11 - 15	1 575 000	1 675 000
16 - 20	1 555 000	1 675 000
21 - 25	1 555 000	1 675 000
26 - 50	1 555 000	1 675 000
51 - 55	1 555 000	1 625 000
56 - 60	1 555 000	1 575 000
61 - 65	1 555 000	1 525 000
66 - 250	1 555 000	1 509 700

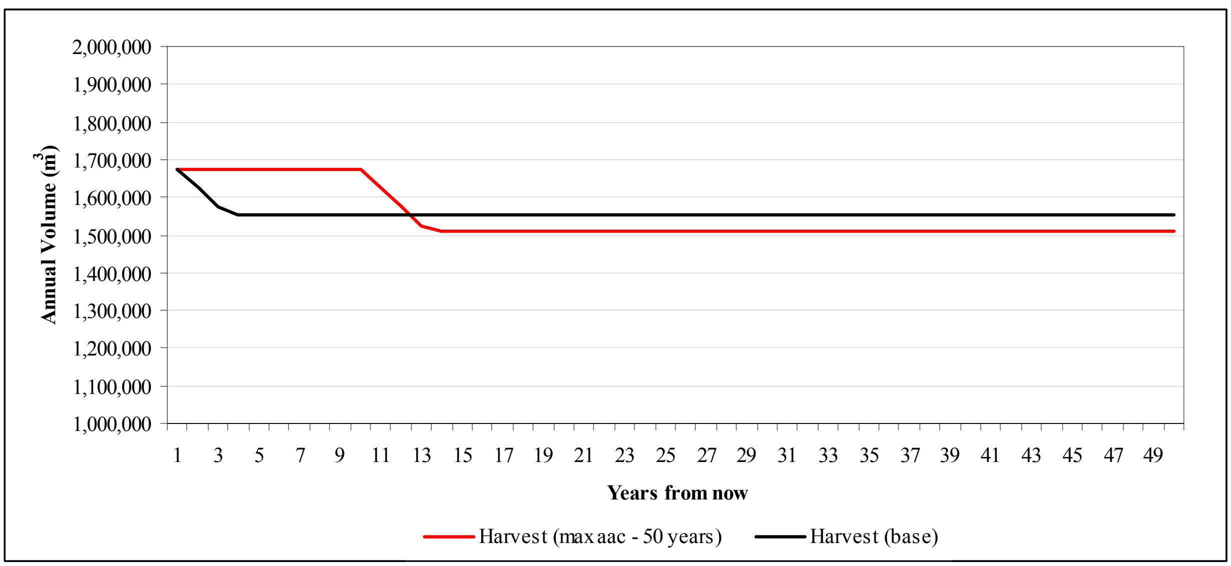

Figure 6.25. Net harvest levels – maintain initial harvest levels, 50 years

6.2.3.19 Establish a Non Declining Even Flow (NDEF) Harvest Level

The base option portrays a harvest flow strategy of gradually adjusting to the LTHL. This option examines a different strategy. Of interest is the highest harvest level that achieves a non-declining even flow.

As seen in Table 6.27, and Figure 6.26, the resulting even-flow harvest level of 1,558,200 m^3/year is only marginally higher than the base option LTHL of 1,555,000 m^3/year but results in a 117,000 m^3/year decrease in the first period and smaller decreases in the subsequent 2 five-year periods. As in all options in this analysis, the long-term harvest level is constrained to ensure sustainability of timber flows as shown by stability in long-term growing stock levels (i.e. harvest equals growth).

Table 6.27. Net harvest levels – establish NDEF harvest level

Years	Annual Harvest Level (m^3 / year)	
	Base Case	NDEF
1 - 5	1 675 000	1 558 200
6 - 10	1 625 000	1 558 200
11 - 15	1 575 000	1 558 200
16 - 20	1 555 000	1 558 200
21 - 100	1 555 000	1 558 200
101+	1 555 000	1 558 200

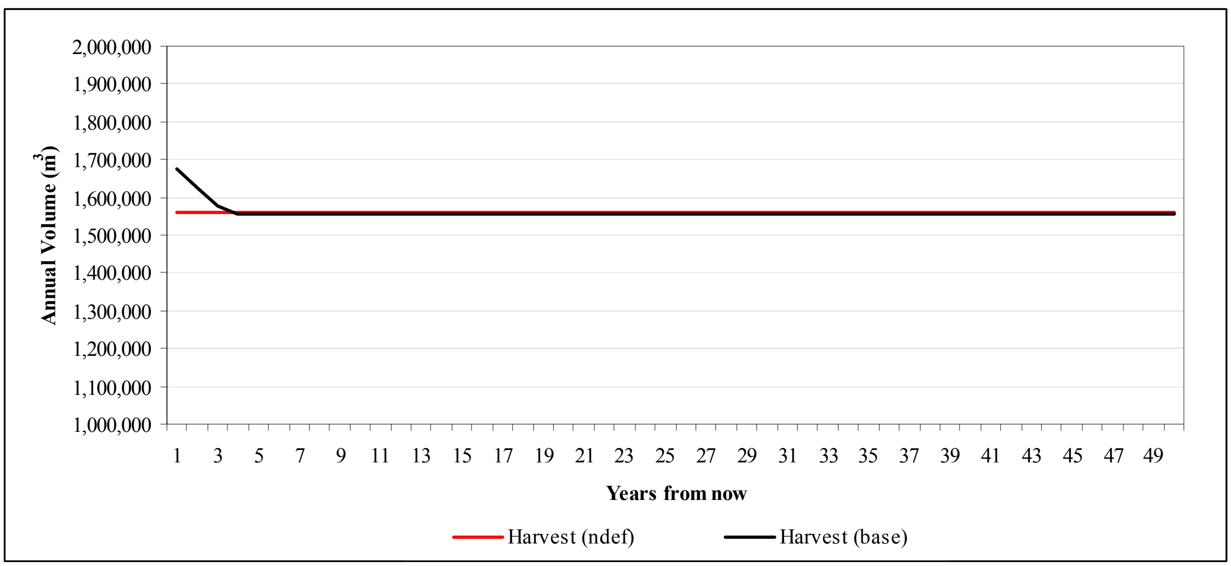

Figure 6.26. Net harvest levels – establish NDEF harvest level

6.2.4 Summary of Sensitivity Issues – Alberni East and West

Table 6.28 provides a summary of the impacts of the sensitivity issues explored in the Alberni East and Alberni West Working Circles. 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 6.28. Sensitivity analyses – summary of percentage impacts

		Harvest Interval (years)		
		1-20	**21-100**	**101-250**
Base Case Net Harvest (Alberni) (total cubic meters) =		32,150,000	124,400,000	233,250,000
Issue Tested	**Sensitivity**	**Percentage Impact**		
adjust timber harvesting landbase	+5%	+3.5	+5	+5
adjust timber harvesting landbase	-5%	-0.5	-5	-5
exclude marginal stands	operability	-0.5	-2	-2
adjust mature volumes	+10%	+2	+3	0
adjust mature volumes	-10%	-0.5	-4	0
adjust second-growth stand yields	+10%	+7	+10	+10
adjust second-growth stand yields	-10%	-0.5	-11	-11
apply inventory site indices	site index	-5	-25	-23
exclude stewardship zones (vr)	forest project	+6	+10	+10
apply higher levels of retention	forest project	-0.5	-5	-5
remove old seral constraint	seral	+3	0	0
exclude FENs	connectivity	-0.5	-10	-11
exclude FENs / remove old seral	connectivity/seral	-0.5	-9	-10
adjust VQO disturbance levels	max disturbance	+3	0	+1.5
apply alternative VEG heights	green-up	0	0	-2
apply 3m green-up in EMZs	adjacency	0	0	0
adjust MHA based on 400 m^3/ha	mha	0	0	0
apply longer rotations	mha	-0.5	-2	-4
maintain initial harvest level, 20 years	max aac	+4	-1	0
maintain initial harvest level, 50 years	max aac	+4	+2	-3
apply undercut	cut control	+2	0	-0.5
establish a NDEF harvest level	ndef	-3	0	0

In most cases, the sensitivity analyses support the initial harvest levels of the base case. The use of Inventory Site Indices had the greatest impact on the short-term harvest levels of all the sensitivity analysis; and it was still possible to maintain the recommended AAC and meet subsequent constraints on permissible rates of change in the harvest. The only sensitivity analysis that was not consistent with the recommended AAC, was the imposition of a NDEF harvest level. As the recommended AAC is higher than the maximum LTHL, the imposition of a NDEF must result in a lower initial harvest. Neither of these sensitivity analyses represents likely options.

6.2.5 Twenty-Year Plan Option – Alberni East and Alberni West

As laid out in the MoF guidelines for the preparation of the Twenty-Year Plan, the spatial plan sets out a hypothetical sequence of harvesting over a period of at least 20 years. The Twenty-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 44 Twenty-Year Plan 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 (Twenty-Year Plan Report, June 2002) detailing this analysis for the Alberni East and Alberni West Working Circles will be submitted to the Manager of the South Island Forest District under separate cover.

6.3 Ucluelet – Timber Supply Analysis

The base option harvest schedule for MP No.4 and MP No.3 are presented in Table 6.29. The MP No.3 harvest schedule has been adjusted to fit the five-year periods, commencing with 2001-2005.

Table 6.29. Net harvest levels – Ucluelet

	Annual Harvest Level (m^3 / year)	
Years	**MP No. 3**	**MP No. 4**
1 - 5	33, 600	60,400
6 - 10	29,800	60,400
11 - 20	29,000	60,400
21 - 25	29,000	69,300
26 - 30	33,800	69,300
31 - 35	43,000	69,300
36 - 40	50,600	69,300
41 - 45	56,000	69,300
46 - 100	57,000	69,300
101 - 250	55,000	69,300

The initial harvest level is 60,400 cubic meters per year, and maintained for 20 years. In year 21 the harvest is increased by 15% to the net long-term steady level of 69,300 cubic meters. This is approximately 3% below the theoretical long-term LRSY (71,347 cubic meters) based on maximizing MAI.

The harvest levels indicated in MP No. 4 are higher than those indicated in MP No. 3, throughout the planning horizon. This is a reflection of changes in the timing of available volume and expectations of second-growth yields.

Higher short-term harvest levels can be maintained because more volume is expected to be available. There are several reasons why more volume is available. There were lower than expected harvest rates between 1996 and 2000. The FENs that reduced the available volume in MP No. 3 are not in the current base case. An updated visual landscape inventory resulted in the reclassification of a very large retention-VQO. In MP No.3 it severely restricted access to 170,000 cubic meters of mature volume and 600 hectares of THLB.

Higher medium and long-term harvest levels can be maintained because of a higher THLB and increased yield expectations. Updates to resource inventories have resulted in an increase in the THLB by 8% over that used in MP No. 3. The updated visual landscape inventory has also resulted in less restrictive harvest rate constraints. There are higher expectations for yields from the second-growth. This is particularly true on Douglas-fir sites, where part of the expected gain is from tree improvement.

Figure 6.27 displays the 250-year growing stock (inventory) profile associated with this harvest profile. Operable and merchantable inventory within the harvestable land base remains relatively stable over the planning horizon. ***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 periods 4, 22, and 40. The harvest flow is largely controlled by these minimum's. Further increases prior to period 4 could result in the medium-term harvest falling below the long-term steady level, which is contrary to the harvest flow policy adopted in these analyses.

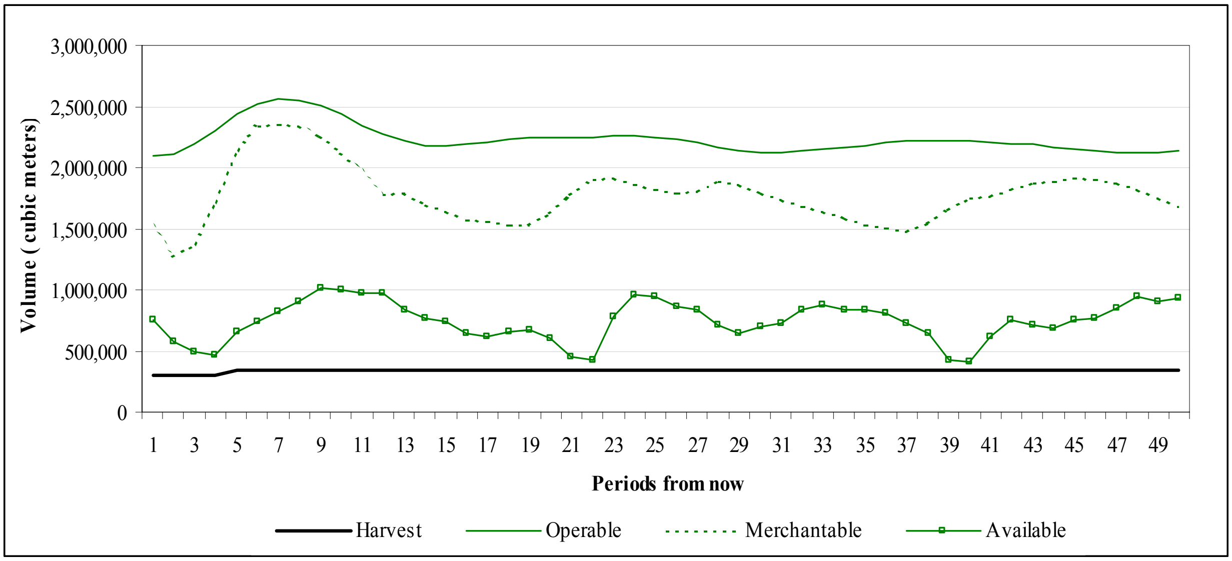

Figure 6.27. Growing stock profile – Ucluelet

Figure 6.28 shows the sources of timber for the harvest over the entire 250-year time horizon. For the first 20 years most of the harvest comes from the mature forest (> 125 years). This reflects the management strategy, which is to maximize harvest by capturing volume in the oldest age classes first. At year 30, the harvest from the current existing mature harvesting land base begins to shift to the younger second-growth (currently less than 39 years) forest. Harvest is predominately from the future managed forest after 75 years.

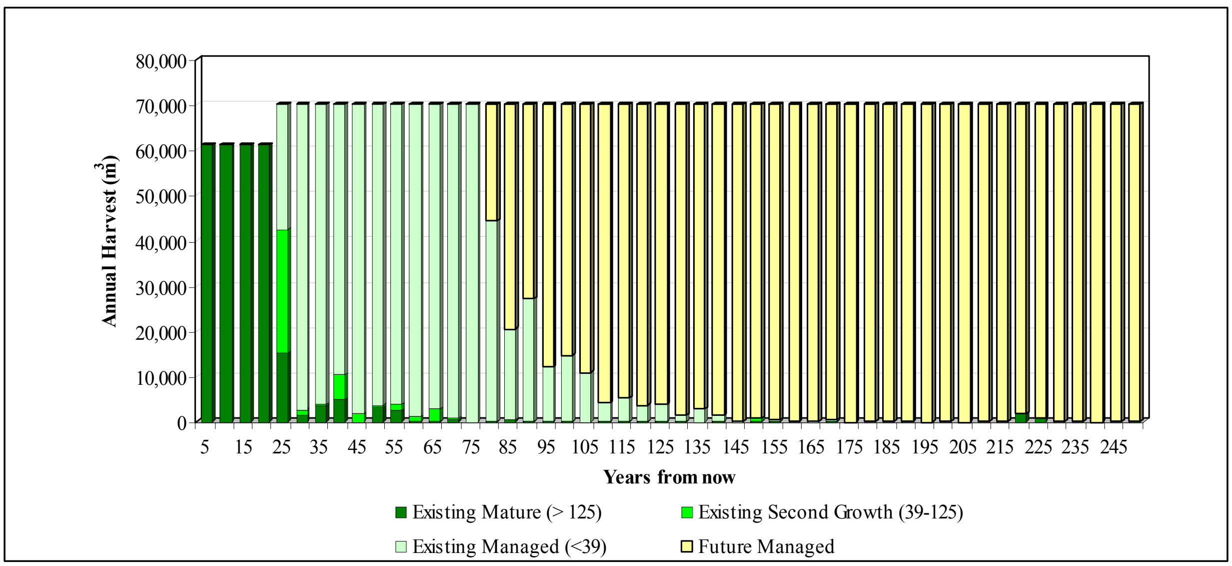

Figure 6.28. Timber supply sources – Ucluelet

Figures 6.30 through 6.32 show average harvested age, volume per hectare and area harvested per year. The average harvest age declines sharply as harvesting shifts from mature to second-growth types.

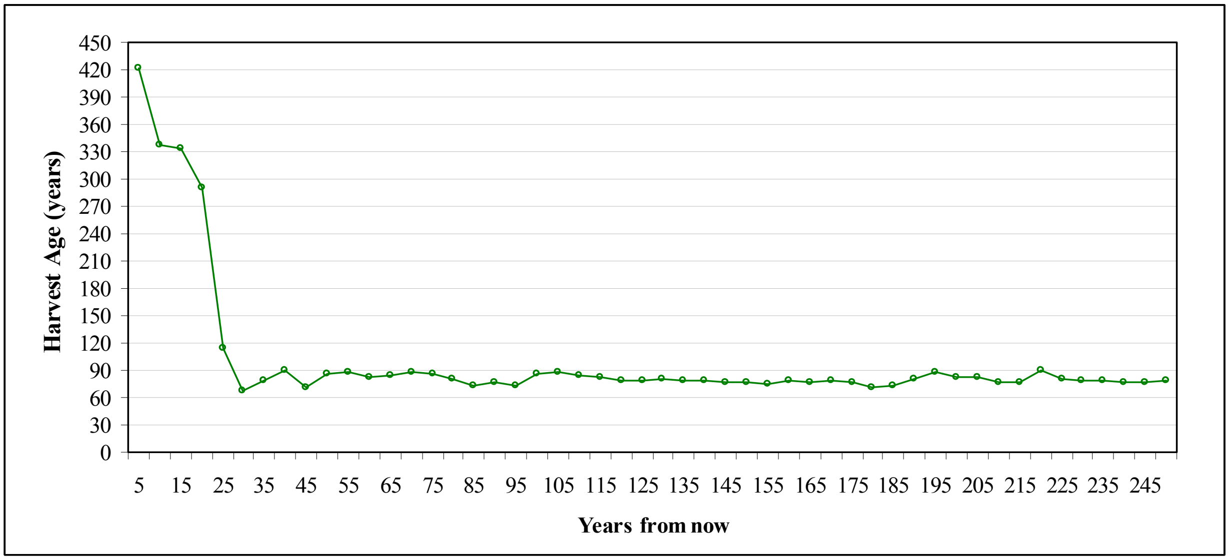

Figure 6.29. Average harvested age – Ucluelet

As seen in Figure 6.30, 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 6.30. Average harvested volume per hectare – Ucluelet

The average area harvested fluctuates over the planning horizon. Overall, when the average harvested volume per hectare decreases the amount of area harvested increases in order to meet harvest schedule requirements (Figure 6.31).

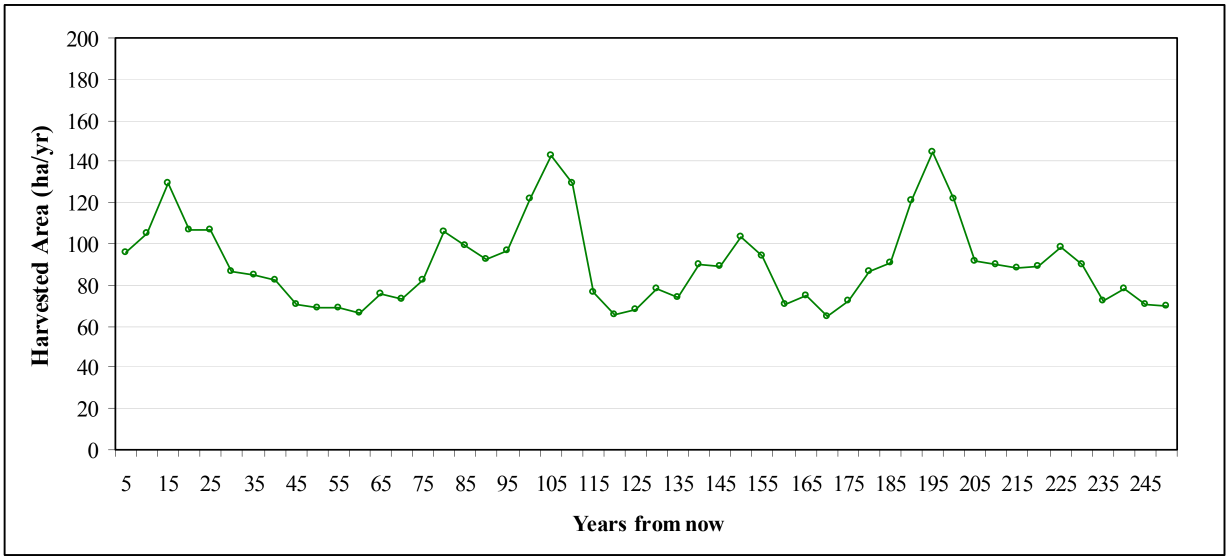

Figure 6.31. Average area harvested – Ucluelet

6.3.1 Ageclass distribution

Figure 6.32 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.

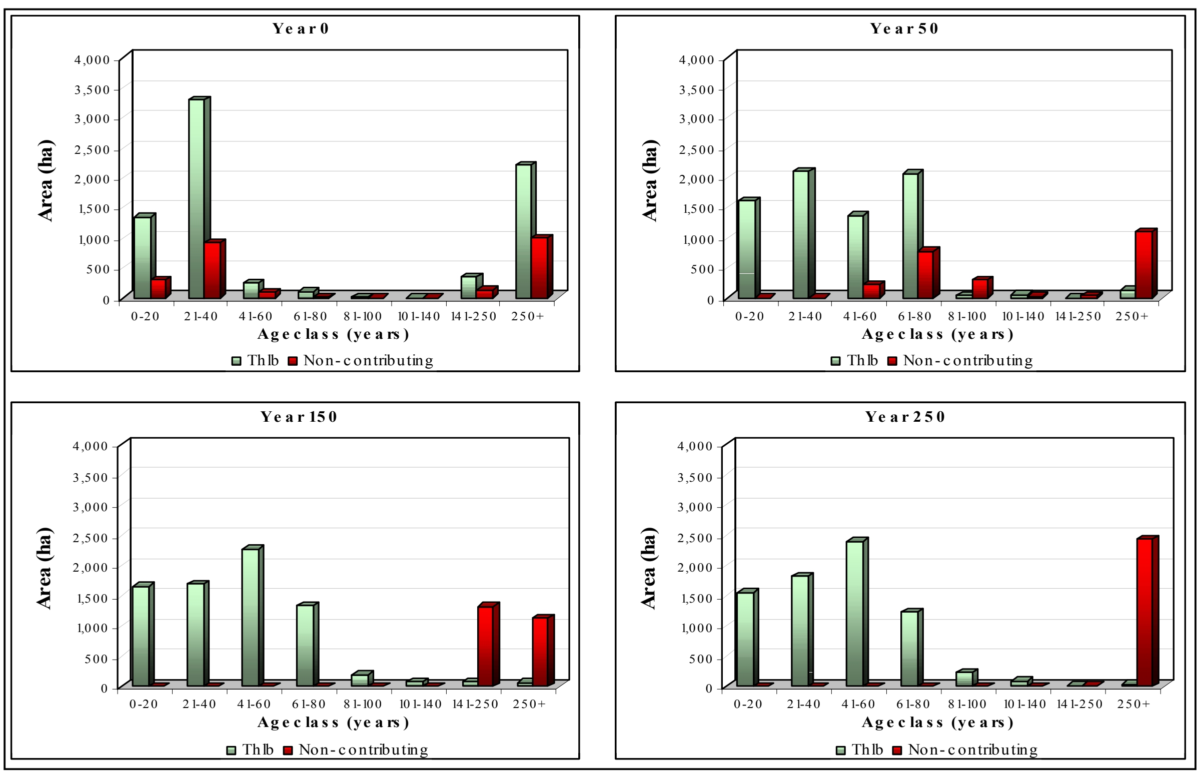

Figure 6.32. Age class distribution over time – Ucluelet

The total area of old-growth (age 250 years plus) decreases to 1,226 hectares (12% of the productive forest area) in the first 50 years as harvest occurs in the THLB. It then increases over time as recruitment occurs in reserved (non-contributing) areas, amounting to 2,477 hectares (25% of the productive forest area) in 250 years time.

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 (36 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 LU / BEC variant level, and forest cover objectives are modelled at the REA or LU / REA level. In the case of IRM disturbance constraints (Figure 6.33), a maximum of 25% of the THLB can be below green-up (5 years) at any point in time. Timber availability is impacted if the disturbed area reaches this maximum at the same point in time. The Maggie landscape unit is portrayed in the example. The figure depicts how the disturbance area over time varies, however, at no time does it violate the green-up requirement, i.e. no more than 25% of the forest can be less than 5 years of age at any one point in time.

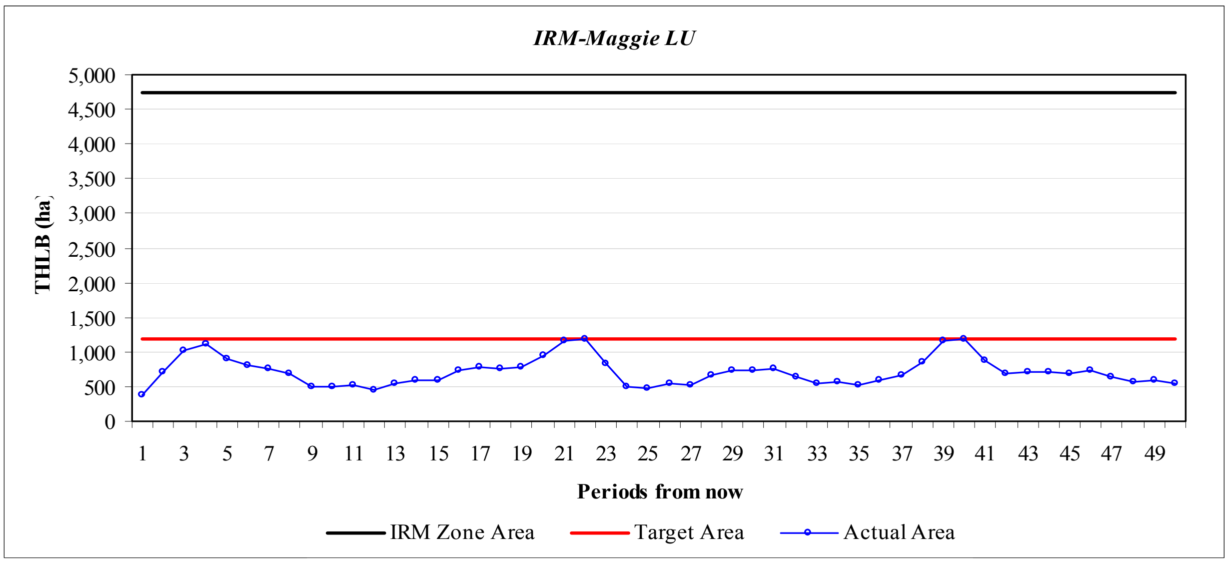

Figure 6.33. IRM post-harvest disturbance constraint status – Maggie Landscape Unit

Old-growth seral constraints represent minimum retention levels of the productive forest which must be maintained above age 250. As seen in Table 6.30, old-growth levels in all cases meet or exceed the minimum thresholds.

Table 6.30. Periodic old-growth compliance

Landscape Unit	BEC Variant	BEO	NDT	Base Area (ha)	Old -growth (% > years)	Target (ha)	Status at Year of Simulation 0	50	100	150	200	250
Kennedy Flats	CWH vh 1	High	1	21	19.0 > 250	4	10	6	6	6	7	7
Kennedy Flats	CWH vm 1	High	1	162	19.0 > 250	31	48	31	31	31	31	31
Kennedy Flats	CWH vm 2	High	1	31	19.0 > 250	6	7	6	6	6	6	8
Maggie	CWH vh 1	Low(1)	1	3,353	4.35 > 250	146	1,550	521	526	524	552	792
Maggie	CWH vm 1	Low(1)	1	5,668	4.35 > 250	247	987	463	445	445	452	1,143
Maggie	CWH vm 2	Low(1)	1	289	4.35 > 250	13	13	13	13	13	13	49
AT	AT	High	5	1	85.0 > 250	0.9	1	1	1	1	1	1

(1) In low biodiversity emphasis units the requirement is to achieve at least one third of the target percentage now and to meet the full target by the end of the third rotation, target levels depicted reflect first rotation requirement.

6.3.2 Summary – Ucluelet

This analysis provides for an initial harvest level of 60,400 cubic meters. A long-term level of 69,300 cubic meters, an increase of 15%, is achieved 21 years from now.

Short and medium-term harvest levels are largely dictated by the availability of harvestable regenerating stands. Any changes to inventory information, growth and yield expectations, silviculture treatment scenarios or forest cover requirements that affect the timber availability 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 Ucluelet base case are shown in Table 6.31.

Table 6.31. Managed forest LRSYs - Ucluelet

Description	Managed
THLB (including NSR) (ha)	7,538
- future roads (ha)	184
= net long-term land base (ha)	7,354
* average MAI (m^3/ha) at culmination age	9.8
= theoretical GROSS long-term (m^3)	**72,068**
- non-recoverable losses (NRLs) (m^3)	721
= theoretical NET long-term (m^3)	**71,347**

In the Ucluelet base case, the theoretical long-term harvest level of 71,347 cubic meters (net of NRL volumes) could be attained if all stands were harvested at MAI culmination age. The realized long-term net level of 69,300 cubic meters is approximately 3% lower, as stands cannot always be harvested at this age due to harvest scheduling requirements conflicting with forest cover objectives.

6.3.3 Sensitivity Analysis

Weyerhaeuser and the MoF are presently discussing the removal of this area from TFL 44. It is expected that the process will be completed shortly. As a result, no sensitivities will be conducted for the Ucluelet Working Circle.

6.3.4 Twenty-Year Plan Option – Ucluelet

As laid out in the MoF guidelines for the preparation of the Twenty-Year Plan, the spatial plan sets out a hypothetical sequence of harvesting over a period of at least 20 years. The Twenty-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 44 Twenty-Year Plan 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 (Twenty-Year Plan Report, June 2002) detailing this analysis for the Ucluelet Working Circle will be submitted to the Manager of the South Island Forest District under separate cover.

6.4 Clayoquot – Timber Supply Analysis

The base case harvest schedule for the Clayoquot Working Circle is presented in Table 6.32. The timber supply analysis of this area recognized additional management requirements defined in the report by the Clayoquot Sound Scientific Panel (1995).

Table 6.32. Net harvest levels – Clayoquot

Years	Annual Harvest Level (m^3 / year) MP No. 4
1 - 250	28,700

The initial harvest level of 28,700 cubic meters per year is maintained for the entire planning horizon. The non-declining even flow (NDEF) harvest level is approximately 8% below the theoretical long-term LRSY (30,902 cubic meters) based on maximizing MAI.

This even-flow harvest of 28,700 m^3 is significantly greater than the AAC of 6,200 m^3 currently attributed to the Clayoquot Working Circle. The main reasons for this change are procedural.

The harvest levels in the Clayoquot Working Circle for MP N0. 3 were a simple calculation based on the conditions of the time. An allowance was made for requirements of maintaining forest 140 years of age and older. A "1% rate of harvest" was calculated from the THLB and then reduced for any harvest that had occurred in the previous 10-years.

The harvest levels in this analysis are based on a 250-year simulation from CASH6. The objective was a NDEF while meeting rate of cut constraints by watershed basin, using total watershed area, and a minimum requirement for forest of 140 years of age and older. No adjustment was necessary for recent harvest as there has been no harvest in the last 5-years.

Figure 6.34 displays the 250-year growing stock (inventory) profile associated with this harvest profile. Operable inventory within the harvestable land base declines for 25 years. Beyond this point, growth and harvest rates equalize, and inventory remains relatively stable to the end of the simulation period. Merchantable inventory stabilizes at decade 10. Available growing stock is relatively stable over the planning horizon.

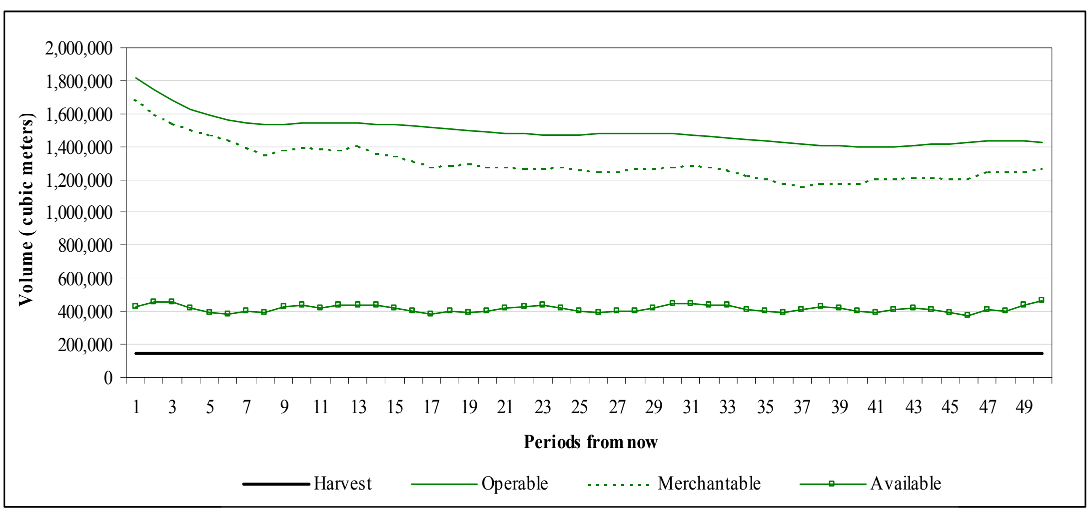

Figure 6.34. Growing stock profile – Clayoquot

Figure 6.35 shows the sources of timber for the harvest over the entire 250-year time horizon. For the first 45 years all of the harvest comes from the mature types (stand age > 125 years). This reflects the management strategy, which is to maximize harvest by capturing volume in the older age classes first. At year 50, the harvest from the current existing mature harvesting land base begins to shift to the younger second-growth (currently less than 39 years of age). Harvest is predominately from the future managed forest in 120 years from now.

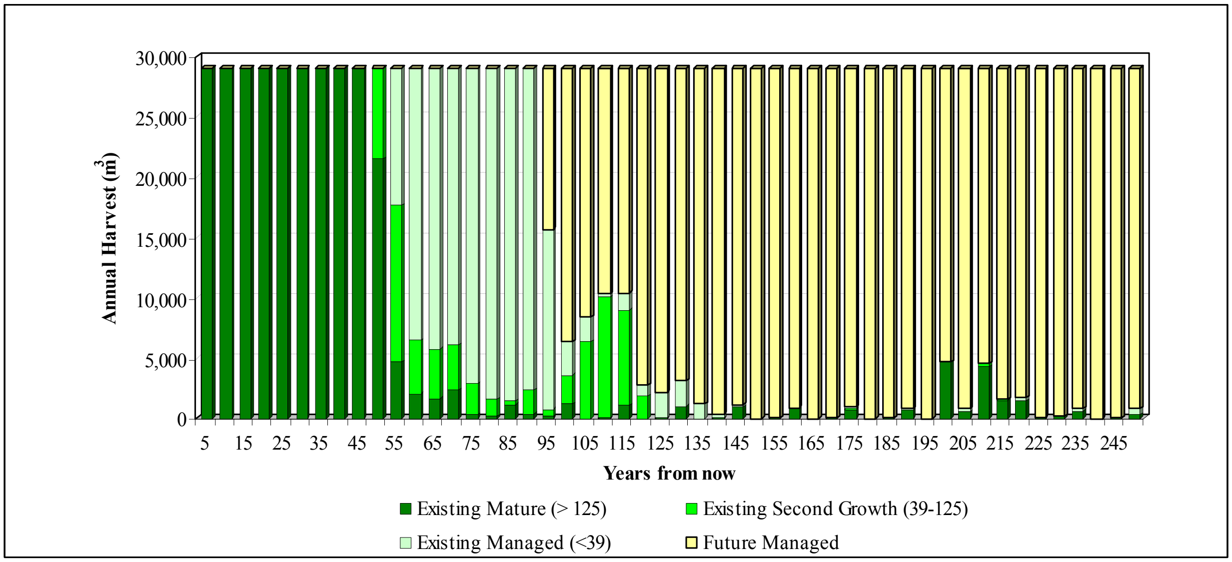

Figure 6.35. Timber supply sources – Clayoquot

Figures 6.42 through 6.44 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.

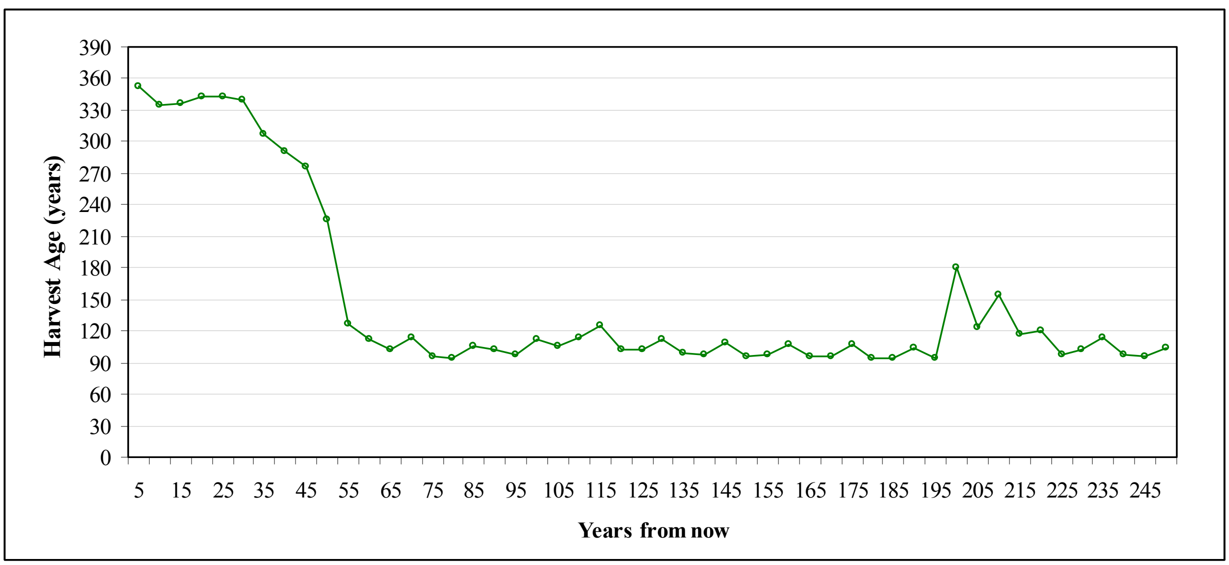

Figure 6.36. Average harvested age – Clayoquot

As seen in Figure 6.37, 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.

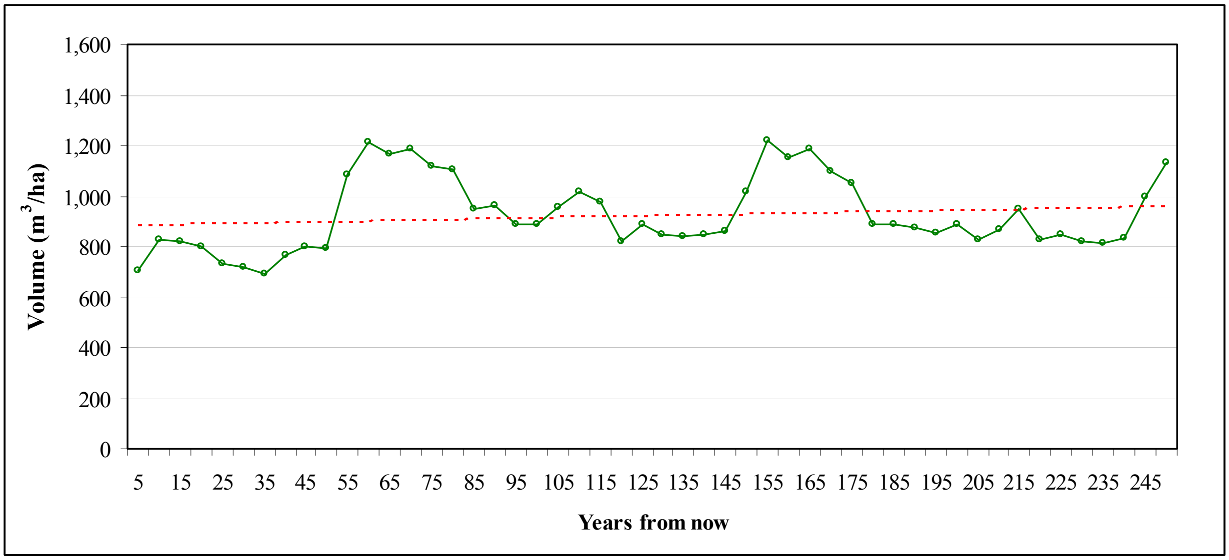

Figure 6.37. Average harvested volume per hectare – Clayoquot

The average area harvested remains relatively constant over the planning horizon at approximately 35 hectares per year (Figure 6.38).

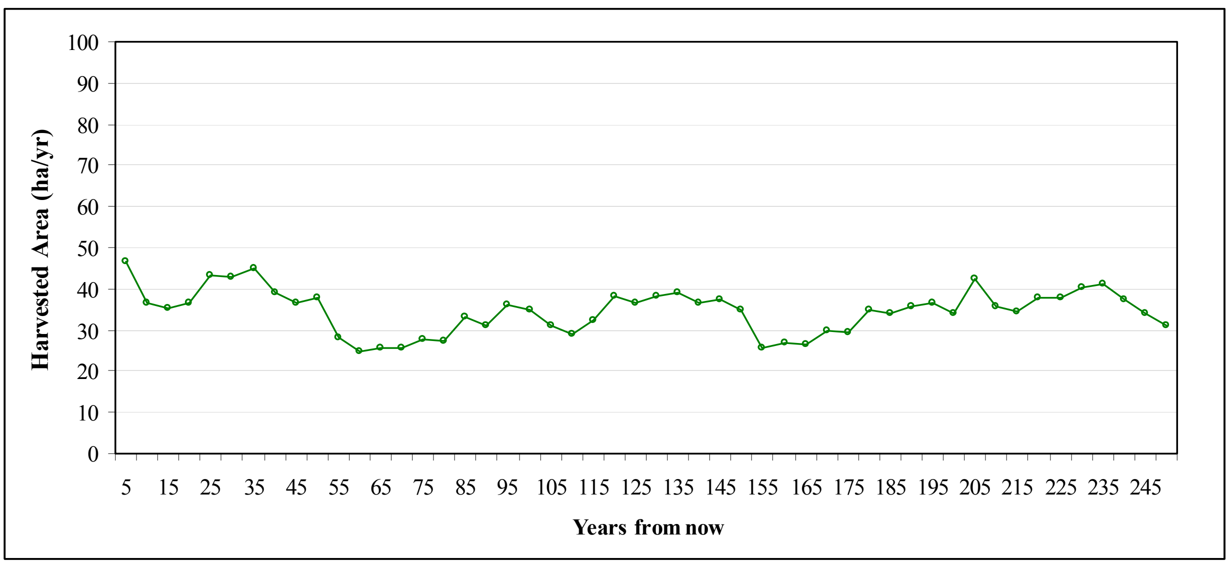

Figure 6.38. Average area harvested – Clayoquot

6.4.1 Ageclass Distribution

Figure 6.39 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.

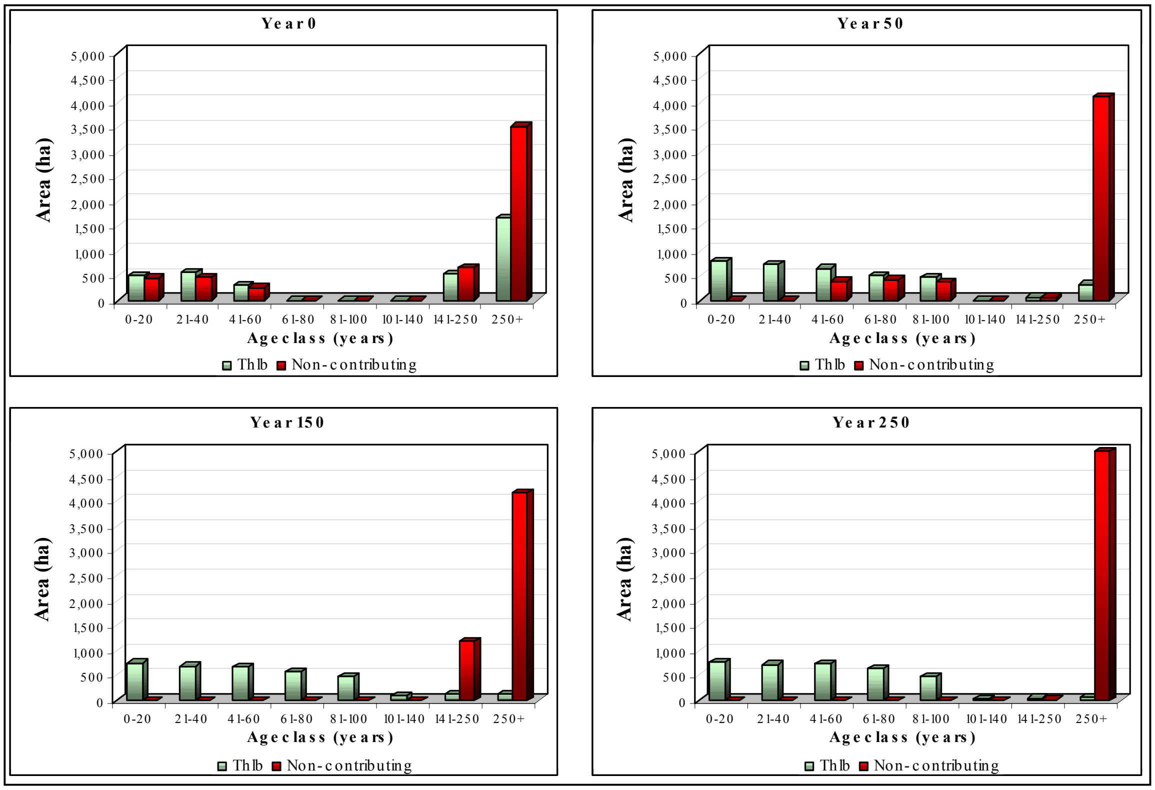

Figure 6.39. Age class distribution over time – Clayoquot

The total area of old-growth (age 250 years plus) decreases to 4,434 hectares (50% of the productive forest area) in the first 50 years as harvest occurs in the THLB. It then increases over time as recruitment occurs in reserved (non-contributing) areas, amounting to 5,399 hectares (60% of the productive forest area) in 250 years time. This has very positive implications with respect to retention objectives on the TFL.

Seral stage objectives are modeled at the LU/BEC variant level, and forest cover objectives are modelled at the REA or LU/REA level. Figure 6.40 illustrates the approach used to model these requirements. The Upper Kennedy Landscape Unit RM disturbance constraint is portrayed in the example. The figure shows how the disturbance area (THLB below the green up age of 10 years) varies over time, but at no time rises above the maximum set at 25% of the THLB.

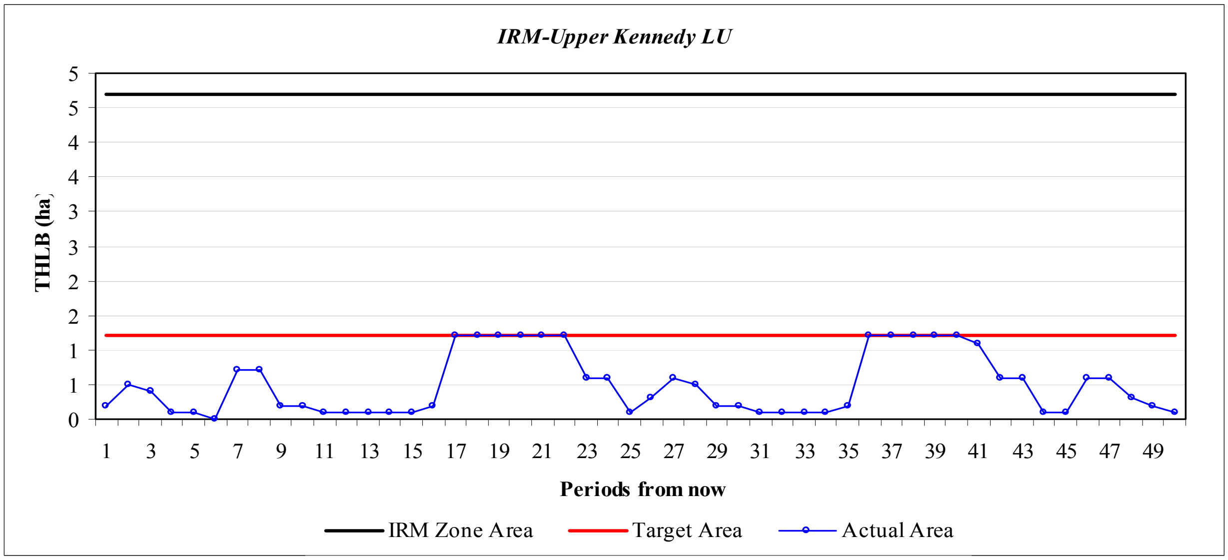

Figure 6.40. IRM post-harvest disturbance constraint status – Upper Kennedy Landscape Unit

Old-growth seral constraints represent minimum retention levels of the productive forest which must be maintained above age 250. As seen in Table 6.33, old-growth levels substantially exceed the minimum thresholds in nearly all cases. Although the old seral requirements within the Kennedy Flats CWH vh1 and CWH vm1 BEC variants are not met at the beginning of the simulation they are, in all cases, achieved within 250 years.

Table 6.33. Periodic old-growth compliance - Clayoquot

Landscape Unit	BEC Variant	BEO	NDT	Base Area (ha)	Old -growth (% > years)	Target (ha)	Status at Year of Simulation					
							0	50	100	150	200	250
Kennedy Flats	CWH vh1	High	1	1,309	19.0 > 250	249	240	240	249	249	249	594
Kennedy Flats	CWH vm1	High	1	24	19.0 > 250	5	0	0	0	0	3	11
Kennedy Flats	CWH vm2	High	2	3	51.0 > 250	1	1	1	1	1	1	1
Upper Kennedy	CWH mm1	High	1	1	19.0 > 250	0	1	1	1	1	1	1
Upper Kennedy	CWH vm1	High	1	4,130	19.0 > 250	785	2,080	1,836	1,796	1,783	1,767	2,278
Upper Kennedy	CWH vm2	High	2	2,710	51.0 > 250	1,382	2,125	1,760	1,746	1,740	1,740	1,828
Upper Kennedy	MH mm1	High	1	279	28.0 > 250	78	269	230	230	230	230	230

6.4.2 Summary – Clayoquot

This analysis provides for a non-declining even flow (NDEF) harvest level of 28,700 cubic meters. The 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 Clayoquot base case are shown in Table 6.34.

Table 6.34. Managed forest LRSYs - Clayoquot

Description	Managed
THLB (including NSR) (ha)	3,572
- future roads (ha)	216
= net long-term land base (ha)	3,356
* average MAI (m^3/ha) at culmination age	9.30
= ***theoretical GROSS long-term (m^3)***	**31,214**
- non-recoverable losses (NRLs) (m^3)	312
= ***theoretical NET long-term (m^3)***	**30,902**

In the Clayoquot base case, the theoretical long-term harvest level of 31,000 cubic meters (net of NRL volumes) could be attained if all stands were harvested at MAI culmination age. The realized long-term net level of 28,700 cubic meters is approximately 8% 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.

6.4.3 Sensitivity Analysis

A reduced set of sensitivities has been run. As overall retention levels and harvest rate constraints go well beyond landscape-unit planning and the Forest project, in general sensitivities are not useful. Also most of the harvest for the first 50 years is from mature hence changes in mature volume will mainly effect harvest during this period and changes in second-growth will affect longer term harvest levels. THLB reductions will tend to have a proportional impact on harvest (everything else being equal).

Sensitivity issues are summarized in Table 6.35. The timber supply impacts are illustrated in Sections 6.4.3.1 through 6.4.3.2.

Table 6.35. Current management sensitivity analyses – Clayoquot

Issue	Sensitivity Levels to be Tested	Section
Harvest flow	maximize annual harvest for 50 years	6.4.3.1
	apply watershed constraints based on operable landbase	6.4.3.2

6.4.3.1 Maximize Harvest – 50 Years

As an alternative to a non-declining even flow harvest profile this assumption will examine the impact of maximizing the harvest over the first 50 years. As depicted in Table 6.36 and Figure 6.41, an initial harvest level of 33,700 m^3/year is maintained for 50 years. Beyond this point, subsequent step-downs of 6% for the next two-five year periods are necessary to achieve a long-term harvest level of 28,700 cubic meters 61 years from now.

Table 6.36. Net harvest levels – maximize harvest for 50 years

Years	Annual Harvest Level (m^3 / year)	
	Base Case	Maximize Harvest
1 - 50	28,700	33,700
51 - 55	28,700	31,700
56 - 60	28,700	29,700
61 - 250	28,700	28,700

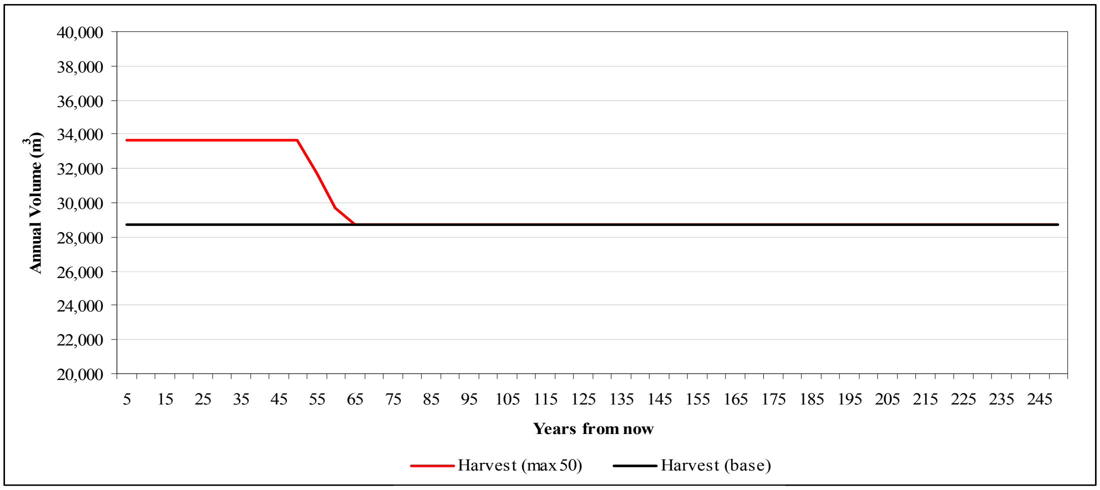

Figure 6.41. Net harvest levels – maximize volumes for 50 years

6.4.3.2 Regulate Harvest Based on Operable Landbase

Under the base case option the CSSP recommended that harvest rates within the Clayoquot were to be regulated at the basic watershed basin level. A forest cover class constraint that allows no more than 5% of the "total" forest area to be harvested in a five-year period was applied to each of the 26 watershed basins.

This option will test the sensitivity of the base case when applying a forest cover class constraint that allows no more than 5% of the "net operable" forest area to be harvested in a five year period. Predictably, regulating the harvest based on the net operable area within each watershed had a significant impact on timber supply. In fact, harvest levels in the short, mid, and long-term were reduced by an average of 39% across the planning horizon.

Table 6.37. Net harvest levels – regulate harvest based on THLB

Years	Annual Harvest Level (m^3 / year)	
	Base Case	Regulate Harvest
1 - 100	28,700	19,300
101 - 105	28,700	18,300
106 - 110	28,700	17,320
111 - 250	28,700	16,340

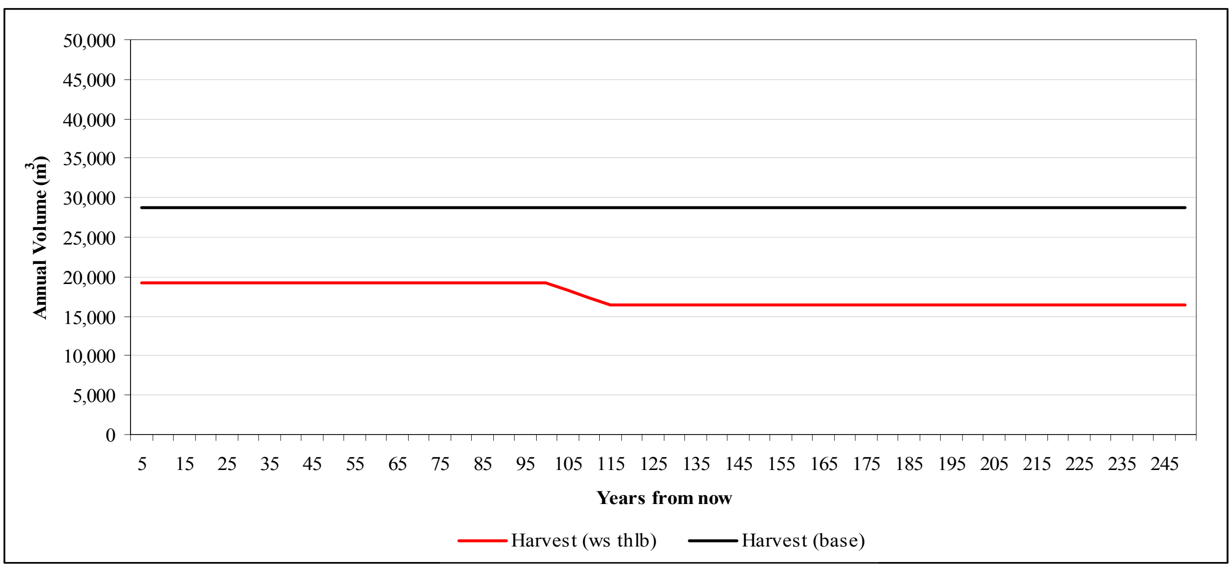

Figure 6.42. Net harvest levels – regulate harvest based on THLB

6.4.4 Summary of Sensitivity Issues – Clayoquot

The sensitivity analyses indicate that the initial harvest rates could be significantly increased for the short and medium-term without affecting the long-term harvest level. They also indicate that the harvest level is sensitive to what landbase is used for the "1% harvest rule" of the CSSP. The recommended AAC is a middle ground.

6.4.5 Twenty-Year Plan Option – Clayoquot

No spatially explicit harvest schedule will be submitted for the Clayoquot Working Circle, watershed basin rates of harvest will be used to meet the Twenty-Year Plan requirement.

A report (Twenty-Year Plan Report, June 2002) detailing this analysis for the Clayoquot Working Circle will be submitted to the Manager of the South Island Forest District under separate cover.

7.0 Recommendations

ALBERNI EAST AND WEST WORKING CIRCLES

Based on the outcome of these analyses, it is proposed that the AAC for the Alberni East and West Working Circles be 1,675,000 cubic meters per year for the period 2003 to 2007. This harvest is maintainable for a period of 5 years. It is then reduced by 7% over the following 10 years to achieve a long-term harvest level of 1,555,000 cubic meters.

The sensitivity analyses, done as part of this report, support the initial harvest levels of the base cases. The use of Inventory Site Indices had the greatest impact on the short-term harvest levels of all the sensitivity analysis; and it was still possible to maintain the recommended AAC and meet subsequent constraints on permissible rates of change in the harvest. The only sensitivity analysis that was not consistent with the recommended AAC, was the imposition of a NDEF harvest level. As the recommended AAC is higher than the maximum LTHL, the imposition of a NDEF must result in a lower initial harvest. Neither of these sensitivity analyses represent likely options.

This proposed AAC is consistent with the existing MP No. 3 AAC and Timber Supply Analysis Report.

UCLUELET WORKING CIRCLE

Based on the outcome of these analyses, it is proposed that the AAC for the Ucluelet Working Circle be 60,000 cubic meters per year for the period 2003 to 2007. This harvest is maintainable for a period of 20 years. It is then increased to a long-term harvest level of 69,300 cubic meters per year.

No sensitivity analysis is included, as it is anticipated that this area will be removed from TFL44.

This proposed AAC is significantly higher then the existing MP No. 3 AAC. This is a reflection of updated resource inventories, exclusion of FENs from the current analysis and lower than expected harvest rates between the years 1996 and 2000.

CLAYOQUOT WORKING CIRCLE

Based on the outcome of these analyses, it is proposed that the AAC for the Clayoquot Working Circle be 28,000 cubic meters per year for the period 2003 to 2007. This harvest is maintainable for a period of 250 years.

The sensitivity analyses indicate that the initial harvest rates could be significantly increased for the short and medium-term without affecting the long-term harvest level. They also indicate that the harvest level is sensitive to what landbase is used for the "1% harvest rule" of the CSSP. The recommended AAC is a middle ground.

This proposed AAC is significantly higher than the existing Clayoquot Working Circle partition. The main reasons for this change are procedural.

The AAC for the Clayoquot Sound portion of TFL 44 is interpreted as the maximum average level of harvest activity. This is consistent with the Chief Forester's statements in the AAC Rationale for MP #3. It recognizes that actual harvest in Clayoquot Sound is defined through local planning and forest practices as recommended by the Clayoquot Sound Scientific Panel.