APPENDIX A

TFL 41 Timber Supply Analysis Report

TFL 41 TIMBER SUPPLY ANALYSIS REPORT

Prepared for:

Skeena Sawmills Ltd., a wholly owned subsidiary of

West Fraser Mills Ltd.

Prepared by:

TECO Natural Resource Group Limited
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12 August, 2011

File: BC0210509

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June 13, 2011

Skeena Sawmills Ltd.
Terrace, BC

Attention: Sonny Jay, RPF

Re: TFL 41 Timber Supply Base Case

Dear Sonny;

Here is the final draft of the Timber Supply Analysis Report for your consideration.

Yours truly,

Jerry Miehm
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1 EXECUTIVE SUMMARY

The licensee Skeena Sawmills Ltd., a wholly owned subsidiary of West Fraser Mills Ltd., must complete a timber supply analysis for Tree Farm Licence (TFL) 41 in conjunction with the Management Planning process that is required by legislation. An Information Package describing the spatial data, yield forecasts and management assumption that would underpin the timber supply analysis was prepared and submitted to the Ministry of Forests, Lands and Natural Resource Operations. It was accepted by the Ministry on November 22, 2010 as an adequate basis upon which to prepare timber supply forecasts for the TFL.

The next step in the timber supply analysis process is the preparation of a base case. This has been done using Patchworks, a forest estate model that facilitates the preparation of data, application of management practices and other rules, and produces outputs describing the harvest flow and the future condition of the landbase with respect to timber and other resource values. The results are presented in this document.

The harvest levels found in the base case run are summarized in Table 1 and Figure 1.

Table 1: Base Case Harvest Flow

Period	Harvest Level (m^3/year)
2010 - 2054	123,000
2055 - 2064	133,000
2065 - 2074	145,000
2075 - 2084	157,000
2085 - 2094	169,000
2095 - 2104	181,000
2105 - 2114	193,000
2115 - 2124	205,000
2125 - 2134	217,000
2135 - 2259	222,000

The initial harvest level is set to the existing allowable annual cut (AAC) apportionment of approximately 123,000 cubic metres per year under which Skeena Sawmills Ltd. is operating within the landbase that will remain subsequent to area deletions that are set to occur in 2011. The deletions are to account for the AAC apportionments to other parties as a result of volume take-back under the Forest Revitalization Act (FRA) as well as pre-FRA BC Timber Sales volume. This harvest level is sustainable for 45 years. At that point, higher volume managed stands begin to reach minimum harvest criteria. The harvest level begins to climb at about 10% per decade until the long term sustainable harvest level of 222,000 cubic metres per year is achieved.

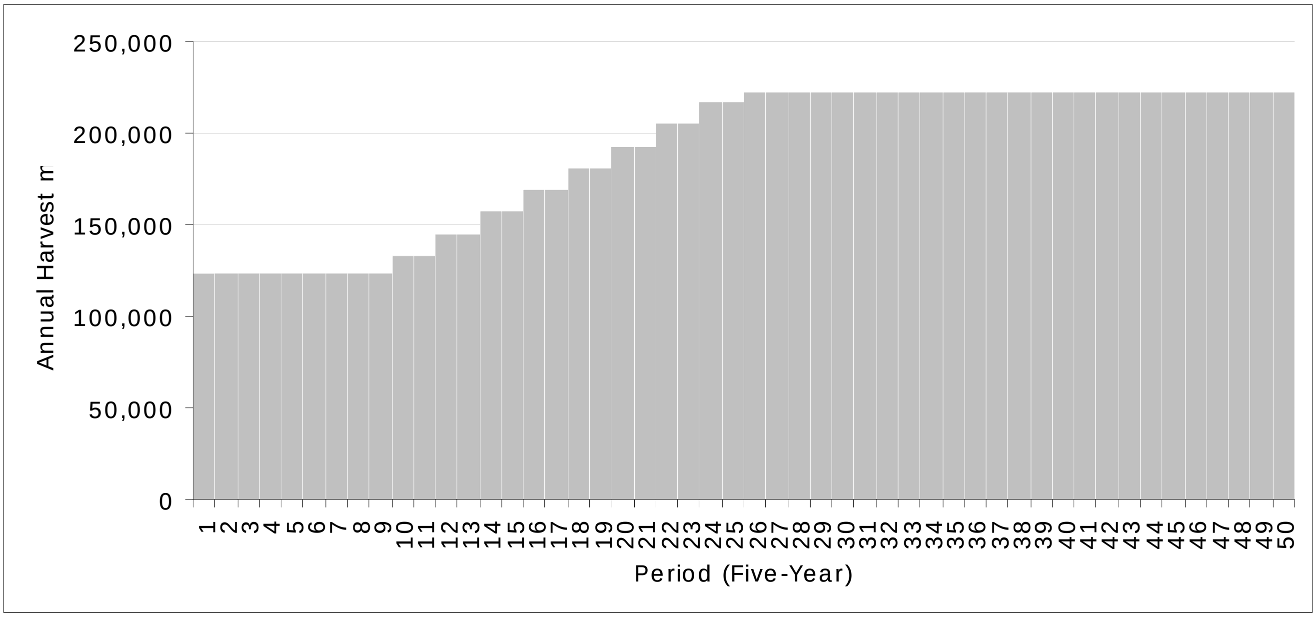

Figure 1: Base Case Harvest Flow – Cubic Metres per Year

2 INTRODUCTION

Timber supply is the quantity of timber available for harvest over time. It is dynamic, not only because trees naturally grow and die, but also because conditions that affect tree growth, and the social and economic environment that affect the availability of timber for harvest, change with time. Timber supply analysis is the process of assessing and predicting the current and future supply from a management unit. This information will be used by the Chief Forester of British Columbia in determining a permissible harvest level for Tree Farm Licence (TFL) 41.

This document presents the results of the timber supply analysis. It is based on the best available information and current management practices. The Base Case Results (Section 4) present the most likely outcome; potential sources of uncertainty are discussed under Sensitivity Analysis (Section 6). This information, and the management assumptions that underlie the forest estate modeling, were described in the Information Package that was submitted to the Ministry of Forests, Lands and Natural Resource Operations. It was accepted by the Ministry on November 22, 2010 as an adequate basis upon which to prepare timber supply forecasts for the TFL.

In accepting the Information Package, the Ministry attached several conditions including:

- clarification of adjacent and contained non-TFL areas being excluded from the analysis;
- further detail regarding the non-conventionally operable landbase;
- a rationale for the methods chosen to account for natural disturbance outside of the Timber Harvesting Landbase (THLB);
- confirmation that genetic gains were only incorporated into yield curves for future managed stands; and
- an explanation of the harvest queuing approach used in the forest estate model and its relationship to operational practice.

These matters have been addressed, either in this document or the updated version of the Information Package that is dated April 15, 2011.

3 DESCRIPTION OF THE TFL

TFL 41 is situated in north-western British Columbia, approximately 100 km inland from Prince Rupert, in the lee side of the Coast Mountains encompassing a portion of the Kitimat Ranges. The area encompasses the upper headwaters and major tributaries of Kitimat River, drainages adjacent to the west boundary of the District of Kitimat, and an area surrounding Clio Bay at the entrance to Kildala Arm. The total area of TFL 41 is approximately 202,000 hectares. The area of the TFL that is available for timber harvesting is 31,558 hectares. This was determined by removing portions of the land base that are not considered harvestable. The results are shown in Table 2 below.

Table 2: Timber Harvesting Landbase Determination

Classification	Total Area (ha)	Net Area Removed (ha)	Net Volume Removed (m³)
Gross Area Within TFL 41 Boundary	**201,939**		
Landbase Reductions:			
Non-TFL	104	104	1
Non Productive	93,046	93,046	412,174
Old Growth Management Areas	10,366	10,071	3,670,370
Avalanche - ESA1	1,380	1,295	274,393
Soils-ESA1	4,533	3,303	1,077,687
Soils-ESA2	7,594	1,087	372,313
Terrain Class V	5,542	3,799	1,607,409
Terrain Class IV	13,782	1,222	499,482
Recreation Sites and Trails	74	43	9,099
Inoperable Stands	156,841	47,883	13,721,395
Non-Merchantable Mature Stands	13,865	619	159,298
Non-Merchantable Immature Stands	99,440	618	82,518
Problem Forest Types[1]	4,882	1,215	569,039
Archaeological Sites	4	1	425
Wildlife Habitat – Tailed Frog	62	7	3,780
Wildlife Habitat – Goat	5,269	235	98,582
Riparian Reserve Zones - Spatial - S1	2,521	854	338,722
Riparian Reserve Zones - Spatial - Other Stream Classes	1,221	446	247,285
Riparian Reserve Zones - Unclassified Streams	148,994	2,107	475,044
Wildlife Tree Patch	154,707	103	19,518
Roads - Existing	19,050	991	15,887
Total Landbase Reductions	**169,058**		**23,654,423**
Current Timber Harvesting Landbase	**32,881**		**8,096,900**
Future Reductions			
Future Roads		1,324	
Long Term Timber Harvesting Landbase	**31,558**		

[1] includes 906 hectares of net area removed for isolated mature stands that won't be harvested.

The productive area of the TFL is 108,789 hectares. This is distributed across six landscape units, with three-quarters of the area falling within the Kitimat and Wedeene Landscape Units (LU) as shown in Figure 2 below.

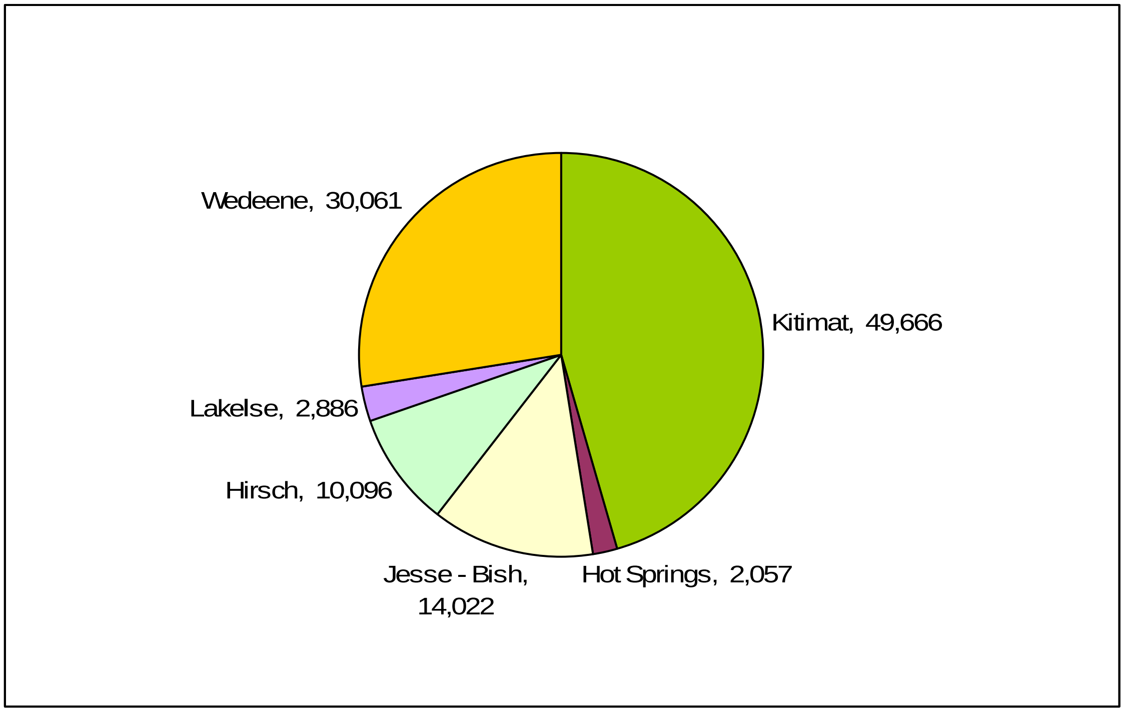

Figure 2: Productive Forest Area (ha) by Landscape Unit

Only a portion of the productive forest within each LU falls within the timber harvesting landbase (THLB).

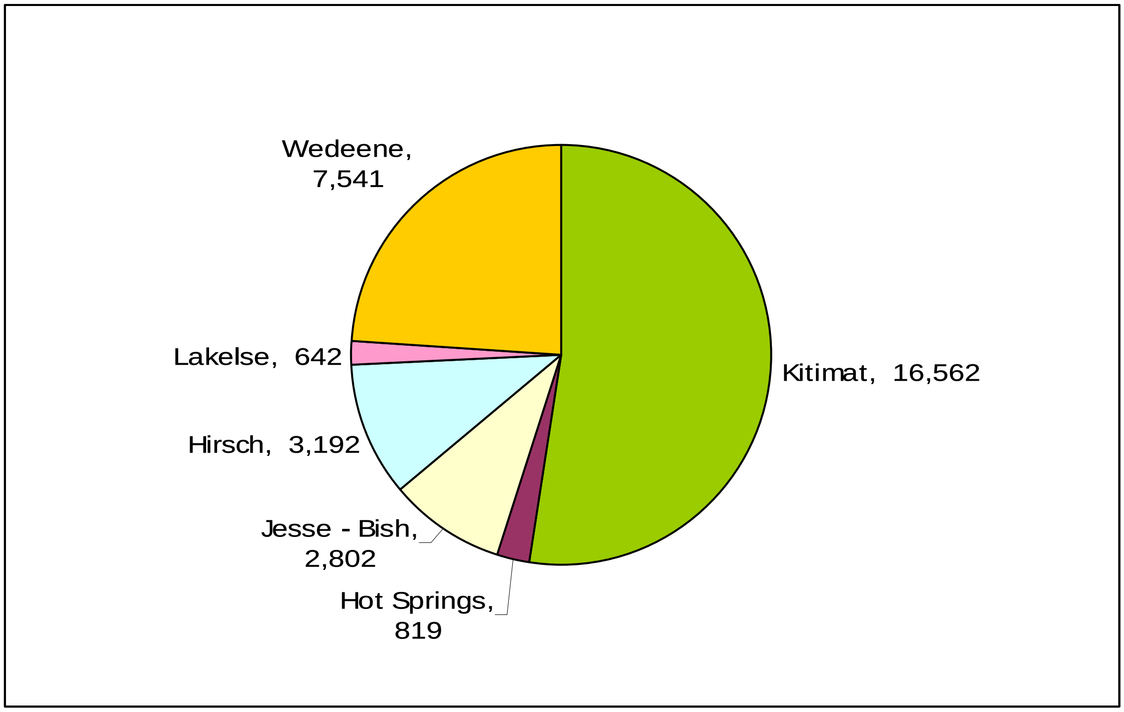

Figure 3: Timber Harvesting Landbase Area (ha) by Landscape Unit

In the Kitimat LU, one-third of the productive forest is available for timber harvesting. For the Wedeene LU the ratio is lower: one-quarter of the productive forest is classified as THLB. For the smaller landscape units the ratio ranges from 20% to 40%.

The forested areas of TFL 41 are predominantly within the wetter submaritime Coastal Western Hemlock (CWHws) biogeoclimatic subzone (BEC) to the north and the very wet maritime Coastal Western Hemlock (CWHvm) biogeoclimatic subzone to the south. Most of the productive land within TFL 41 – and virtually all of the THLB – falls within the Coastal Western Hemlock (CWH) biogeoclimatic zone. The CWH is bounded in the upper elevations by the Mountain Hemlock (MH) biogeoclimatic zone. Approximately 28% of the productive area falls within the Mountain Hemlock BEC zone. Figure 4 shows this distribution.

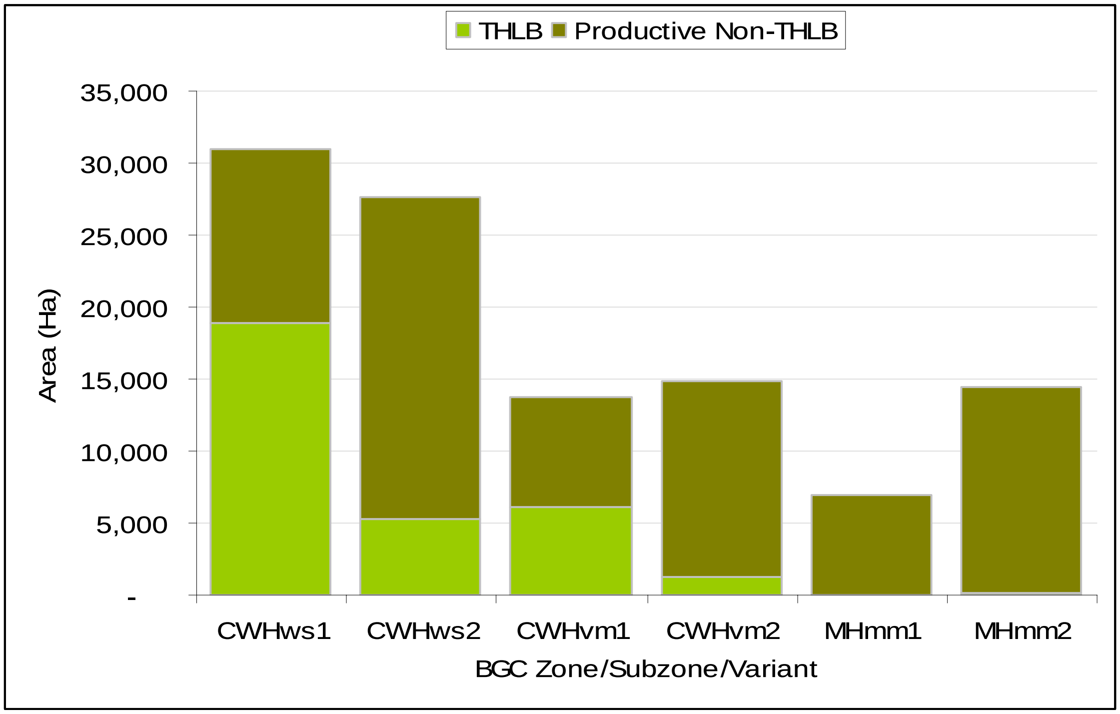

Figure 4: Productive and THLB Area by BEC Zone, Subzone and Variant

In the wetter subzones of the CWH Zone, western hemlock tends to be the climax and best-adapted tree species. Not surprisingly, much of the TFL (80% of the THLB) is occupied by hemlock-leading stands. Balsam-leading stands account for over half of the remaining area, with western redcedar, Sitka spruce, lodgepole pine and deciduous leading stands covering less than eight percent of the landbase. Figure 5 shows this distribution.

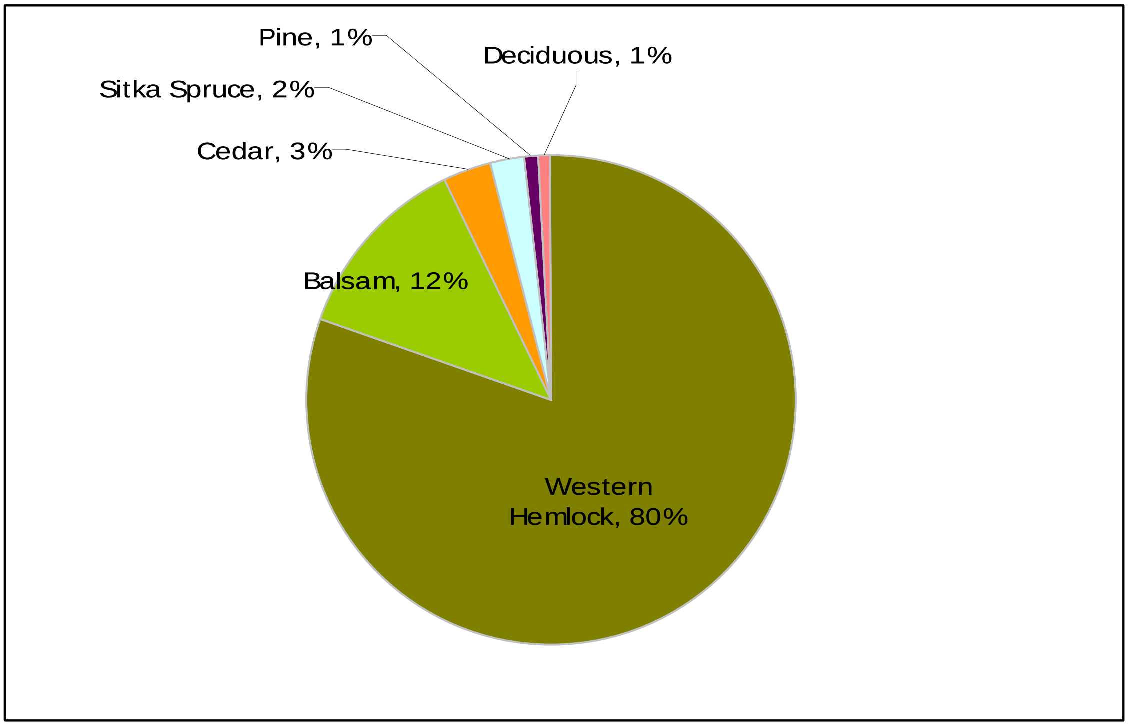

Figure 5: Leading Species Distribution of the Timber Harvesting Landbase

The productivity of the TFL is assessed by summarizing the site index for each stand in the THLB. The forest inventory site index was used for most stands. However, the SI for some hemlock stands was adjusted based on the results of a paired plot old-growth site index study that was completed in the Kalum Forest District[1]. This adjustment was applied to western-hemlock leading stands only with an inventory SI between 8 and 18 metres. The THLB area for which the site index was adjusted was 9415 hectares.

Figure 6 shows the distribution that results from summarizing the THLB area by five site productivity classes, for both the inventory SI and the adjusted SI that was used in the development of the yield curves. Just over three-quarters of the area has an adjusted site index of between 20 and 30 metres. Most of the remaining area is lower productivity, with SI between 10 and 20 metres. Less than two percent of the THLB has a site index greater than 30 metres.

[1] *Site index adjustment for old-growth coastal western hemlock stands in the Kalum Forest District*. 1997. Ministry of Forests (G.D. Nigh and B. Love)

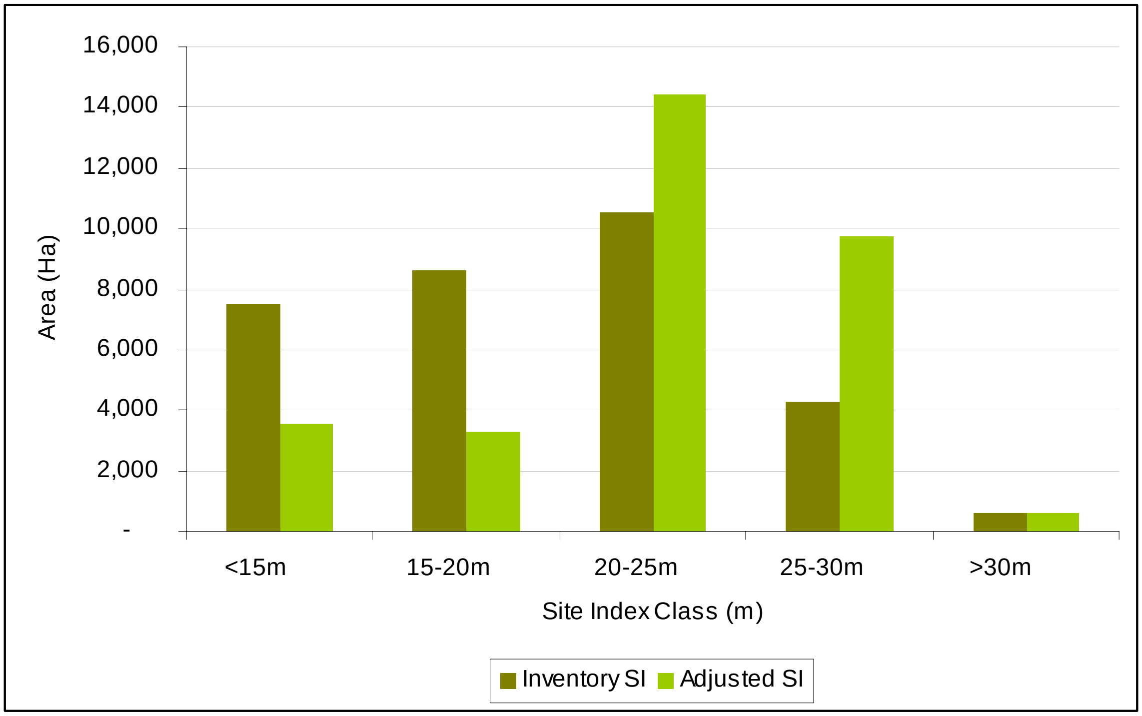

Figure 6: Site Index Distribution on the Timber Harvesting Landbase

The age class distribution of the THLB is shown in Figure 7.

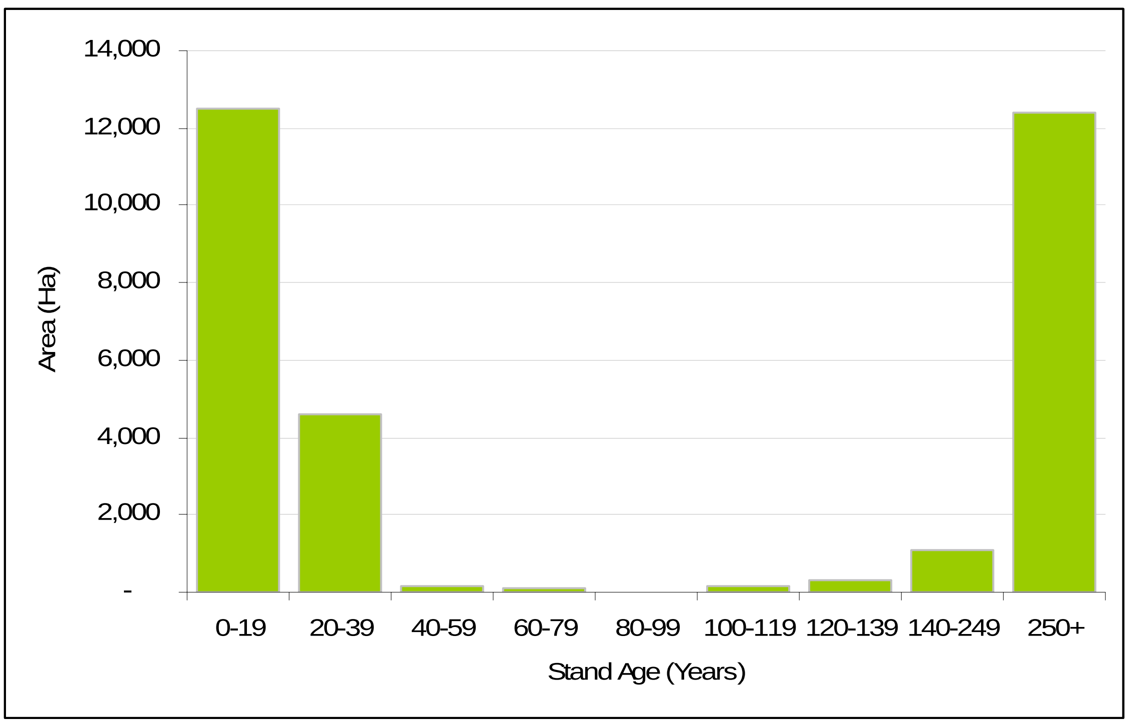

Figure 7: Age Class Distribution on the Timber Harvesting Landbase

This bimodal age class pattern is typical of Coastal forests that do not have a long history of harvesting. Since natural stand-regenerating events are uncommon and limited in area when they do occur, most stands reach very old ages. This is reflected in Figure 7, which shows that almost 40% of the THLB is in the 250+ age class. Stands that originate from harvesting – mostly within the last 30 years – fall within the first two age classes. The proportion of the area in the first two age classes is higher than would be expected because much of the area removed from the TFL over the years has been unharvested. The AAC has fallen accordingly, but the residual TFL landbase has retained a disproportionate share of the previously logged blocks.

Management objectives for TFL 41 recognize the importance of non-timber resources such as biodiversity, wildlife habitat and visual quality. In some areas, protection of these resources will have an impact on timber harvesting. Stands in the timber harvesting landbase are not unconditionally available to contribute to timber supply once they achieve minimum merchantability criteria. Within the forest estate model, constraints have been applied to address these objectives, which are listed in Table 3

Table 3: Management Objectives

Objective	Land Base Definition
Grizzly Bear Habitat	CFLB[2] within McKay-Davies grizzly bear identified watershed
Seral Stage Targets	CFLB within each LU-BEC
Visual Quality Objectives (VQO)	CFLB within each LU / VQO class
Identified Watersheds	CFLB within the identified BEC site series within the Jesse and Emsley watersheds
Patch Size Distribution / Integrated Resource Management (IRM)	THLB without VQO targets within each LU

Grizzly bear habitat, seral stage targets and identified watersheds management objectives are as specified in the Kalum Sustainable Resource Management Plan (SRMP) and defined in the TFL 41 Forest Stewardship Plan (FSP). The productive and net area of the TFL that are classified within the grizzly bear identified watershed is shown in Table 4.

Table 4: McKay-Davies Grizzly Bear Identified Watershed - Productive and THLB Area

	Productive Area (ha)	THLB Area (ha)
Grizzly Bear Identified Watershed	26,262	9,457

[2] Crown Forest Land Base – the productive forest area within the TFL

Seral stage requirements are established by the Kalum SRMP, and specific commitments are made in the TFL 41 FSP. These targets are modeled by landscape unit and BEC subzone / variant as shown in Table 5.

Table 5: THLB Area by Landscape Unit and BEC Subzone / Variant

	Biogeoclimatic Subzone / Variant						
Landscape Unit	CWHws1	CWHws2	CWHvm1	CWHvm2	MHmm1	MHmm2	Total
Hirsch	0	1,195	1,983	0	13		3,190
Hot Springs	729	89				0	819
Jesse – Bish			2,331	471	0		2,798
Kitimat	12,356	3,802	264	69	0	80	16,562
Lakelse	610	32				0	642
Wedeene	5,257	120	1,520	644	0	0	7,541
Total	18,945	5,238	6,098	1,184	13	80	31,558

Visual quality objectives are as defined in the TFL 41 FSP. These are modeled by landscape unit and VQO class (either ‘Modification’ or ‘Partial Retention’). The affected areas are shown in Table 6.

Table 6: THLB Area by Landscape Unit and Visual Quality Objective

	Visual Quality Objective		
Landscape Unit	M	PR	Total
Hirsch		117	117
Hot Springs	75	83	159
Jesse – Bish	0	428	428
Kitimat	938	862	1,799
Lakelse	201		201
Wedeene	401	145	545
Total	1,615	1,635	3,249

The Kalum SRMP specifies old seral stage forest targets by site series within identified watersheds. On TFL 41, the Jesse and Emsley watersheds are impacted by this objective. Seral targets are modeled by BEC subzone and variant within each watershed. Table 7 shows the areas that are impacted by these old seral targets.

Table 7: THLB Area by Identified Watershed, BEC Unit and Site Series

		Site Series						
Watershed	BEC Unit	1	3	5	6	8	14	Total
Emsley	CWHvm2	1	0	4	10	1		16
Jesse	CWHvm1	358	14	11	244	60	13	699
Jesse	CWHvm2	32	3	2	24	17		78
Total		391	17	17	278	78	13	793

The patch size distribution requirement is modelled using a proxy for cutblock adjacency. This is applied to the integrated resource management (IRM) area outside of special management zones, community watersheds and areas with VQO's. Unlike previously described constraints, the IRM constraint applies to the THLB only. Table 8 shows THLB area by landscape unit.

Table 8: THLB Area by Landscape Unit

Landscape Unit	THLB Area (ha)
Hirsch	3,192
Hot Springs	819
Jesse - Bish	2,802
Kitimat	16,562
Lakelse	642
Wedeene	7,541
Total	31,558

4 BASE CASE RESULTS

Timber supply analysis has been conducted using the Patchworks spatial optimization model. Patchworks is a spatially explicit harvest scheduling optimization model developed by Spatial Planning Systems in Ontario. It is capable of developing spatially explicit harvest allocations that explore trade-offs between a broad range of conflicting management and harvest goals.

For this analysis Patchworks has been formulated to schedule blocks for harvesting based on maximizing harvest volume over the long-term subject to meeting non-timber and other management objectives on the land base. The model has been run over planning horizon of 250 years (starting in 2010) using five year planning periods.

Patchworks uses a simulated annealing approach to harvest scheduling. Consequently, there are no harvest rules in the conventional sense (e.g. oldest-first or minimize growth loss). However, merchantability limits are set up such that no stands may be harvested before they have achieved a volume of 250m^3/hectare, a height of at least 19.5 metres and an average stand diameter of 25 centimetres. Growing stock constraints have been applied to the last 50 years of the planning horizon to ensure that the harvest forecast is sustainable. This was done by observing growing stock levels in the absence of any constraint and then interactively setting a lower limit that prevents any decline in growing stock over the last five decades. Without this constraint, the model would harvest excessively at the end of the planning horizon because harvest shortfalls beyond 250 years have no impact on the optimization algorithm.

The model has been set up to maintain the current harvest level (the existing AAC apportionment of approximately 123,000 m^3 that Skeena Sawmills will be operating under until the next AAC determination) for as long as possible. Long run sustained yield calculations demonstrate that, in the long term, a significantly higher harvest level is possible. The harvest level has been increased from the starting level to the long term level in steps that are 10% (or less) within each decade.

Table 9 shows the harvest flow that results from this model setup. Figure 8 shows this graphically. The following sections address the details of the short-, mid- and long-term harvest levels that were found.

Table 9: Base Case Harvest Flow

Period	Harvest Level (m^3/year)
2010 - 2054	123,000
2055 - 2064	133,000
2065 - 2074	145,000
2075 - 2084	157,000
2085 - 2094	169,000
2095 - 2104	181,000
2105 - 2114	193,000
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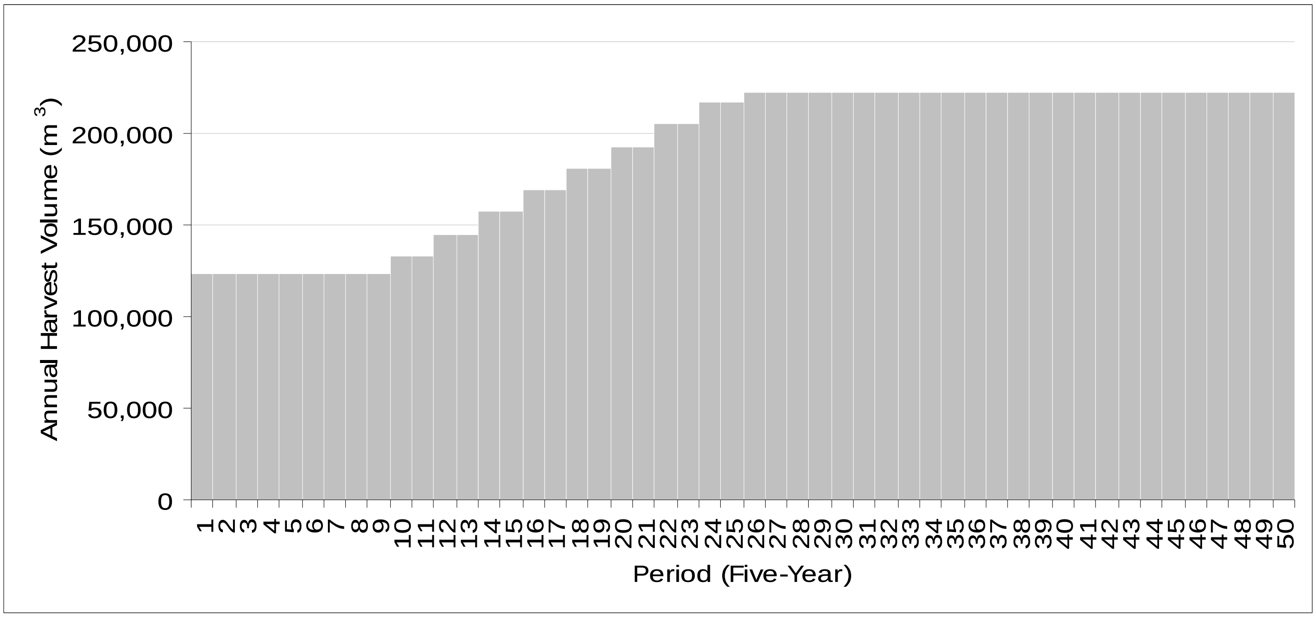

Figure 8: Base Case Harvest Flow – Cubic Metres per Year

Timber supply dynamics on the TFL are primarily influenced by the transition from harvesting in old growth stands to harvesting in younger stands. This pattern is shown in Figure 9 which shows the decrease in the proportion of old growth harvested as more and more second growth stands reach minimum harvest age.

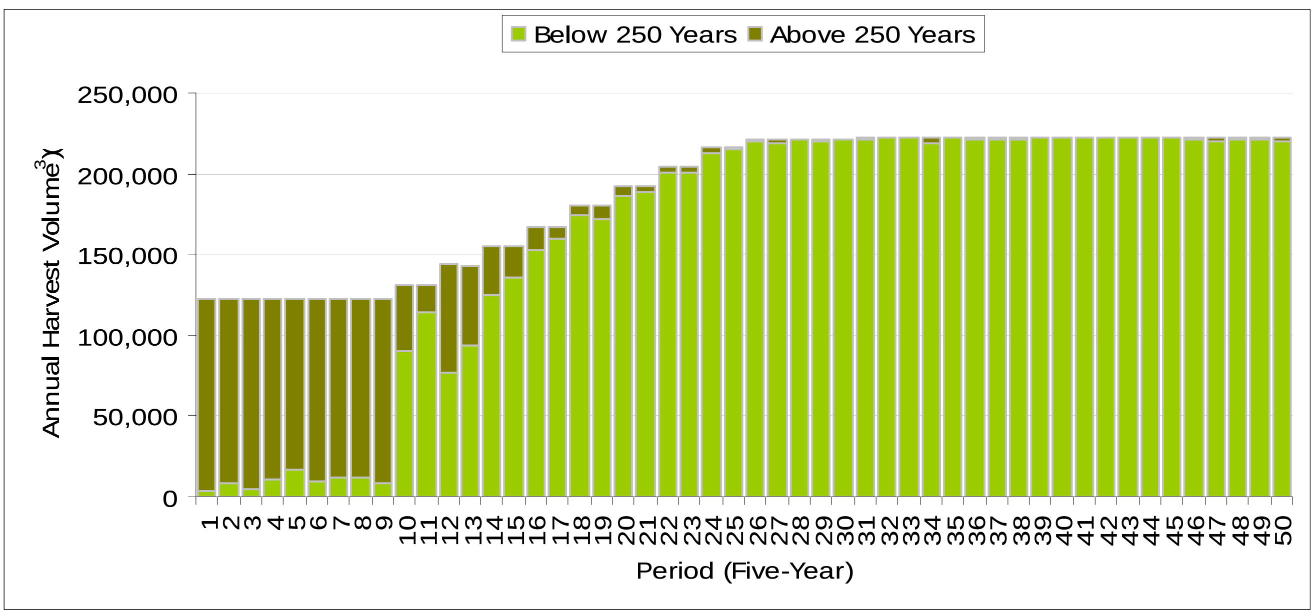

Figure 9: Harvest Volume from Stands Above and Below 250 Years of Age

In this chart, old growth is defined as stands older than 250 years. These stands make up the majority of the harvest volume for the first 45 years. After this point, there is a fairly sharp transition to second growth harvesting. For the first nine five-year periods, over 96% of the harvest volume is from stands older than 140 years of age; and most of this volume is from stands older than 250 years.

4.1 Short Term Harvest Level

The short term harvest level has been set at the current AAC of 123,000 cubic metres annually. This level is achievable for 45 years. Preliminary versions of the base case harvest schedule were reviewed by Skeena Sawmills staff. This review identified some mature stands within the THLB that, although mapped originally as operable, are likely inoperable as they appear to have been isolated at the time the surrounding areas were harvested. A description of these areas is provided in the Information Package document under Section 3.9 (Problem Forest Types). On subsequent model runs, these stands were deleted from the timber harvesting landbase. The land base netdown has been updated accordingly (see Table 2). Although it is reasonable to assume there is likely additional area that would fall under this category, the areas cannot yet be identified as isolated where they are within large contiguous patches of mature timber that have not had extensive harvesting incursions. The impact on THLB for currently identified isolated mature timber is 903 ha. A portion of this area has accounted for wildlife tree patch (WTP) requirements, however, 103 ha of additional netdown is required for WTP. The operable landbase that remains under larger contiguous patches of mature timber is significantly less than half of the THLB, and where areas do become isolated and potentially inoperable, these areas would also be available to potentially offset a portion of the remaining netdown required for WTP requirements. For the foregoing reasons, the impact of additional area for future isolated mature timber would likely be less than that currently identified.

4.2 Mid-Term Harvest Level

The mid-term is a period of increasing harvest levels. This is possible because higher-volume managed stands become harvestable and begin to contribute to timber supply. Attempts were made to start increasing harvest levels earlier in the planning horizon, but these failed. Period 10 (beginning at year 46) was the earliest point at which increase harvesting could be sustained. Subsequent increases in harvest level were limited to a maximum of ten percent in each decade. The long-term harvest level is reached after nine harvest level increases spread over eighty years.

4.3 Long-Term Harvest Level

The long-term harvest level is determined by the productive capacity of the landbase. If timber were the only resource value being managed, the timber supply model would find a long-term harvest level very close to the theoretical long-run sustained yield (LRSY). The LRSY value for TFL 41, based on managed stand yield tables that incorporate genetic gain estimates, is approximately 260,000 cubic metres annually. The long term harvest level achieved by Patchworks is 222,000 m^3/year – short of the LRSY level. This is due primarily to the fact that harvest rates are limited for management of grizzly habitat and viewscapes, and to meet biodiversity objectives.

The long term harvest level is higher than the level that is sustainable in the short term as managed stands become harvestable and begin to contribute to timber supply. In part, a higher harvest level is attained as the managed stands, where allowed to develop beyond the minimum harvest age, contribute higher volume per unit area than current old growth stands. More significantly, the current land base subject to this analysis had been part of a larger TFL area whereby the current residual portion had been subject to a much higher rate of harvest than the current AAC. This occurred in particular during the second decade of TFL harvesting history. Therefore, the full productive capacity of the land-base is not realized until the age class structure has normalized and is not skewed towards a higher proportion of immature age classes. It is therefore likely that a further small increase in harvest level would be possible in the very long term (beyond 250 years) and that the gap to the theoretical LRSY would be reduced.

4.4 Harvest Statistics

A closer examination of the harvest flow produced by the base case model run provides some confidence that the model setup is realistic and that the results concur with operational experience in the short term and common sense in the long term. Three summaries are particularly useful and commonly produced and examined: average annual harvest area, average volume per hectare harvested, and average harvest age. Changes in these parameters over the entire planning horizon are presented in the following three charts.

Average annual harvest area averages 246 hectares for the first 50 years. After that, there is a brief spike to 363 hectares when the pinch point in the timber supply is reached and the transition to second growth logging begins in earnest. From that point if falls briefly to 250 hectares, then climbs slightly to a reasonably stable level at around 325 hectares per year. Figure 10 shows these trends.

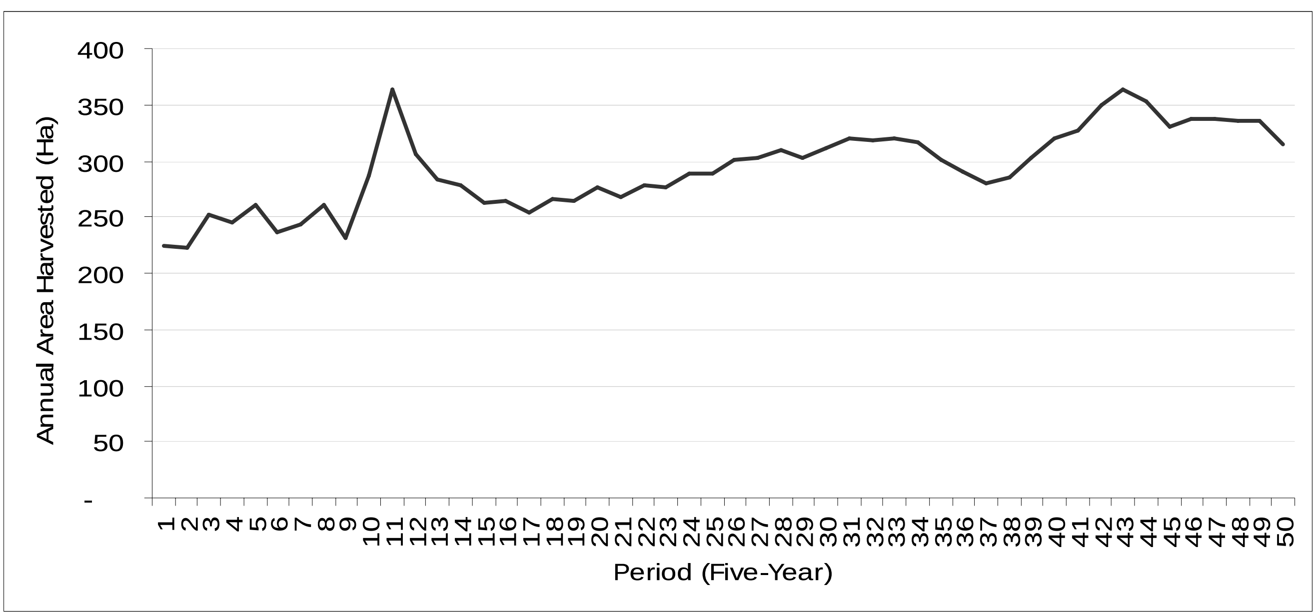

Figure 10: Average Annual Area Harvested

The trend in average annual volume per hectare harvested is shown in Figure 11. In broad terms, it is approximately 500 m^3/hectare in the short term (up to 50 years). After that, it falls as harvesting moves into second growth. The first of these stands harvested are younger and near the minimum merchantability limits. Following this minimum, it climbs to between 600 and 800 cubic metres per year the long term.

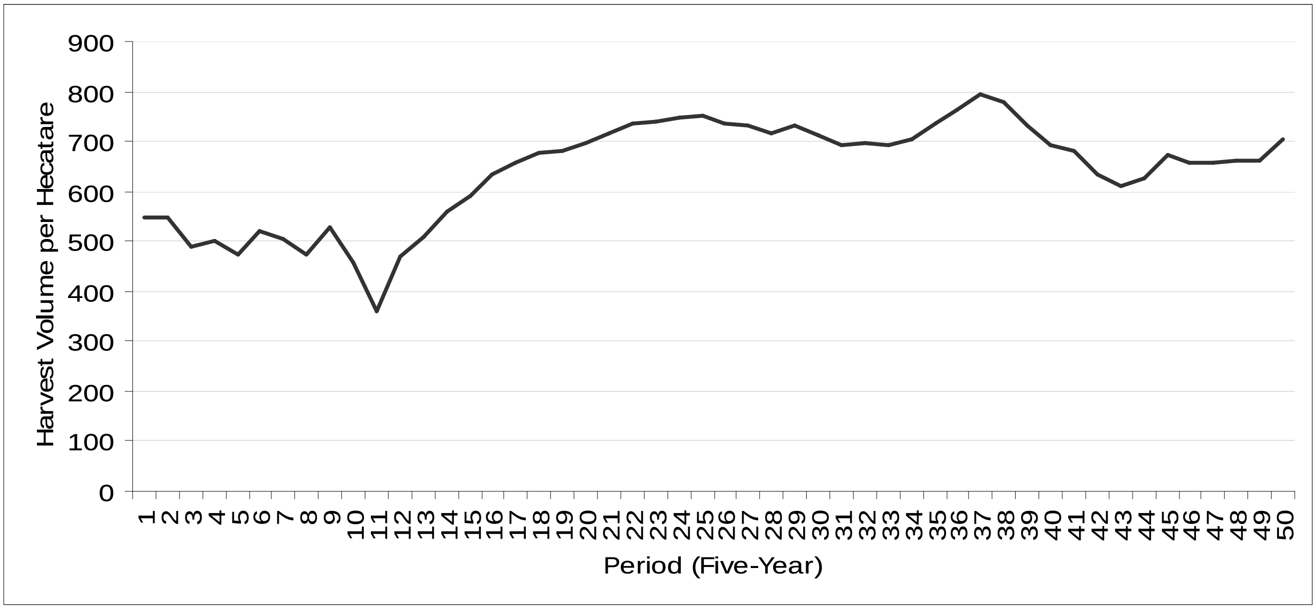

Figure 11: Average Volume per Hectare Harvested

Figure 12 shows the trend in average harvest age. It is high initially as remaining old growth stands on the timber harvesting landbase are logged. It averages 345 years over the first 45 years, at which point it falls significantly. It reaches a minimum of 102 during the early transition to second growth harvesting, and then rebounds as old growth that was previously constrained becomes available. The main constraint that limits timber supply during this transition period is the requirement that, within the McKay-Davies grizzly bear identified watershed unit, no more than 30% of the forested land base be between 25 and 100 years old. This identified habitat includes almost 9,500 hectares of THLB, and the area in the target age class is at or near the limit from period 9 to period 17. A few other constraints also approach their limits during the transition period, but their impact on timber supply is lower because they cover less THLB. These include: IRM in the Jesse-Bish LU, old seral in the Hirsch LU CWHvm1 and the Lakelse LU CWHws1 and VQO (PR) in the Kitimat LU. Harvest age increases slightly until these constraints become less limiting, and averages 105 years over the latter 30 periods of the planning horizon.

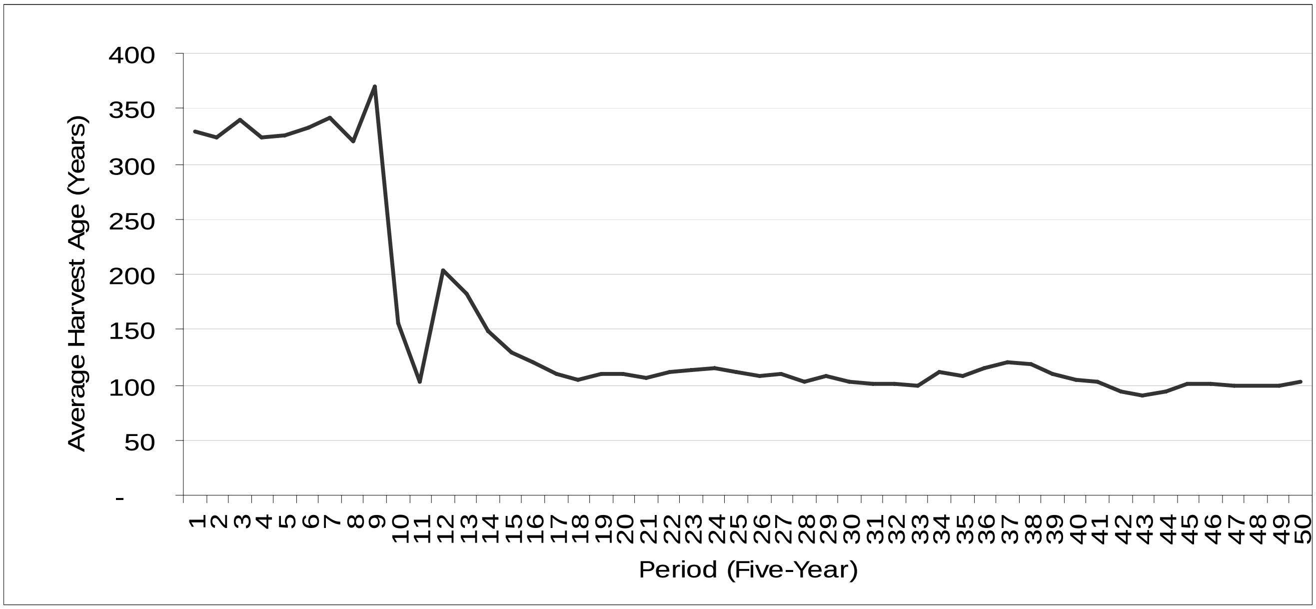

Figure 12: Average Harvest Age

4.5 Future Forest Inventory

With the base case harvest schedule established, the condition of the future forest can be predicted by simulating growth and harvesting, and summarizing the results by period. Future growing stock levels are shown in Figure 13. Total growing stock is the sum of the stand volumes for all productive forest within the TFL. The THLB volume includes only those stands that are available for harvesting. Of these, only some are above MHA at a given point in the planning horizon: this is indicated by the third and lowest line on the graph. This line confirms the pinch point in timber supply at approximately 45 years in the future.

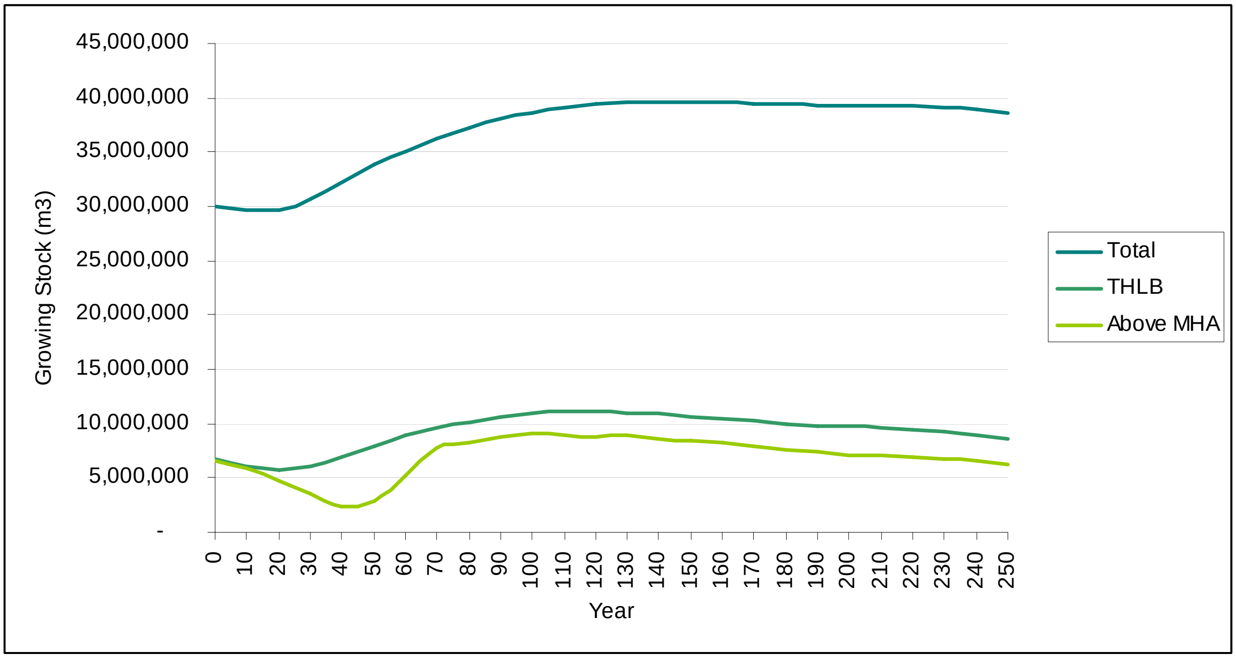

Figure 13: Future Growing Stock Levels

The impact of the proposed base case harvest level on the landbase can be further evaluated by observing how the age class distribution of the timber harvesting landbase changes over time. Harvesting at fixed rate (the long-term harvest level) should serve to normalize the age class distribution over time. Setting a harvest target at or near LRSY (subject to retention requirements to meet other resource objectives) should limit the number of stands carried past classical rotation age. Figure 14 shows both of these patterns occurring on TFL 41. By the end of the planning horizon, 80 percent the THLB area is well distributed among the first four twenty-year age classes. The remaining 20 percent is carried for a longer rotation to meet biodiversity requirements.

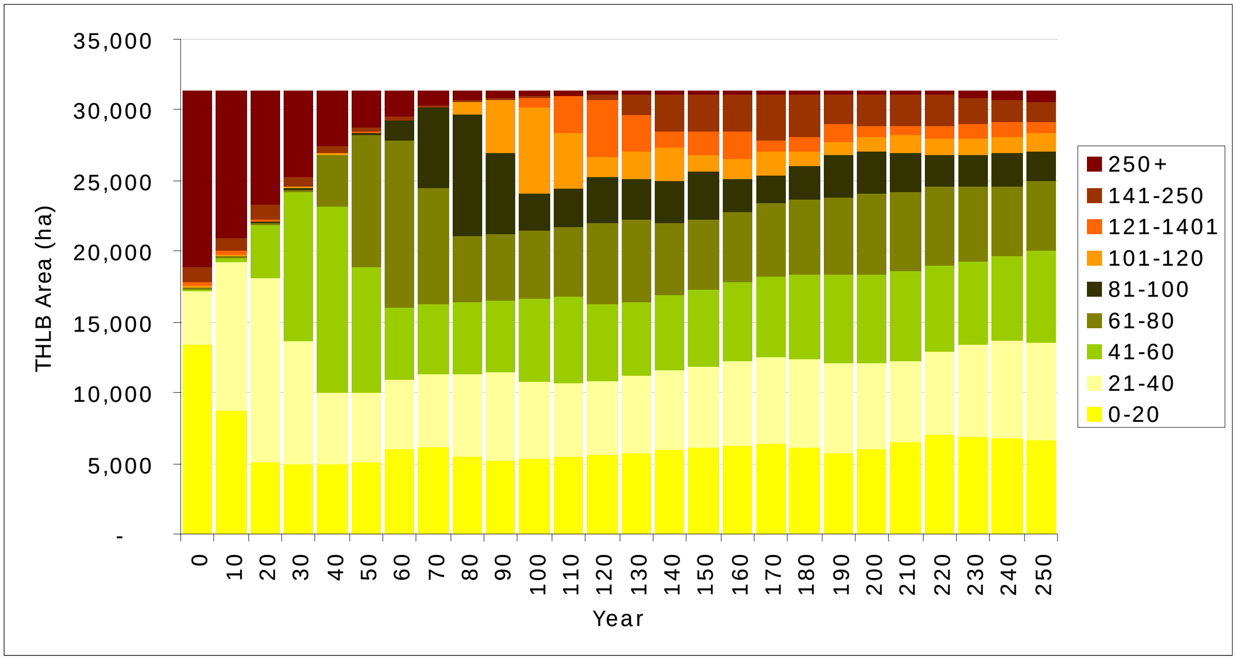

Figure 14: Current and Future Age Class Distribution of the Timber Harvesting Land Base

4.6 Non Timber Resources

Rate-of-cut constraints have been applied during forest estate modelling to ensure that management objectives for non-timber resources such as biodiversity, wildlife habitat and visual quality are met. These objectives are listed in Table 3 on page 10.

Grizzly Bear Habitat in the McKay-Davies identified watershed is managed by requiring that no more than 30% of the productive forest area be between 25 and 100 years old. This appears to be constraining timber supply between period 9 and period 17. Timber supply is most limited in this timeframe, and since almost one-third of the THLB falls within the grizzly-constrained area, it has an impact on the timing of the step up to the long term timber supply. It is the main reason that available old growth timber is deferred from harvest in periods 10 and 11 until later periods (see Figure 9), forcing harvesting into younger second growth stands (Figure 12).

Seral stage objectives are established by the Kalum SRMP, and are described in Section 4.9.1 of the Information Package. Seral stage requirements for early and mature-plus-old are applied on the productive forest land base, by landscape unit and biogeoclimatic subzone, in the forest estate model. For the early seral requirements, a deviation from target is allowed.

For the mature-plus-old targets, only the lower-elevation subzones (CWHvm1 or CWHws1) tend to be an issue from a timber supply stand point. These targets are limiting on timber supply in period 9 and 10 in the Hirsch, Wedeene and Lakelse landscape units. In the Hirsch LU this constraint is the most acute; it persists from period 8 to period 12, and it remains limiting in the long term. The higher-elevation subzones have sufficient productive land outside of the THLB to satisfy old seral requirements, so timber supply impacts are negligible.

The impact of early seral constraint is also felt mainly in the low elevation subzones. It is applied in the Hirsch, Wedeene and Lakelse landscape units (unlike the mature-plus-old objective, which is applied everywhere). Generally speaking it is not limiting on timber supply in the long-term and is not an issue during the period in which the harvest is stepped up to the long term level. However, in some cases it is exceeded in the short term, as is permitted by the transitional provisions specified in the Kalum SRMP and summarized in Table 27 of the Information Package. The Lakelse CWHws1 and the Wedeene CWHvm1 meet the early seral objective by period 4, and the Wedeene CWHws1 meets the objective by period 5.

Visual Quality Objectives (VQO) are applied by landscape unit and VQO class (either ‘Modification’ or ‘Partial Retention’). The limitations for ‘Modification’ are less severe and do not impact timber harvesting (in a strategic sense). The ‘Partial Retention’ zones do affect harvest scheduling periodically, but areas involved are small relative to the size of the THLB, so timber supply impacts are minimal. Only the Kitimat LU is noteworthy because the PR objective appears to be restrictive from periods 10 to 15 when harvesting alternative are most limited.

The ‘old seral’ requirements (by site series) in Identified Watersheds are high on a proportional basis, but the objectives are easily met by productive forest stands outside of the THLB. In addition, only a small amount of THLB falls within these watersheds. This constraint has no impact on strategic timber supply.

As a proxy for directly modeling cutblock size and adjacency constraints, an integrated resource management (IRM) constraint has been applied at the landscape unit level. No more than 35% of the THLB that is not being managed for visual quality can be less than 3 metres in height. This does not impact harvest level in any landscape unit.

5 DISCUSSION

The base case harvest forecast presents a very clear picture of the timber supply dynamics on TFL 41. The existing old growth growing stock must last until second growth stands that have originated from past logging reach minimum merchantability criteria. Figure 7: Age Class Distribution on the Timber Harvesting Landbase) and Figure 9: Harvest Volume from Stands Above and Below 250 Years of Age) demonstrate the reliance on old growth timber to support harvesting in the short and medium term.

The base case harvest flow presented in this document has been selected, in part, to emphasize the fundamental importance of managed, second growth stands to reaching the long-term productive capacity of the landbase. Conversely, the short term harvest level is limited by the requirement that the existing old growth timber last until the second growth timber is harvestable. Repeated forest estate model runs were made to find the earliest point at which the step-up from the initial harvest level to the long-term harvest level could begin. This established that the existing old growth timber must be made to last at least 45 years. After this, second growth stands begin to make up a significant component of the harvest volume and harvest levels can be increased.

In fact, an argument could be made for delaying the increase in harvest levels for a further five or ten years. The harvest statistics graphs (Figure 10 to Figure 12) show that increasing the harvest level beginning after 45 years is aggressive. Increasing the harvest at this point causes a spike in area harvested, and troughs in volume per hectare and average harvest age – all at period 11. This could be mitigated by delaying any increase in harvest level for a few more years. However, this harvest flow pattern has been selected and presented as the base case precisely because of the clarity that it provides regarding the underlying timber supply dynamics.

The initial harvest level of 123,000 cubic metres per year being proposed in the base case is prudent and defensible. The existing stock of homogeneous old growth timber provides considerable operating flexibility over the next ten years – the period for which the upcoming AAC determination will be in effect.

6 SENSITIVITY ANALYSIS

It is usual, when presenting timber supply analysis results, to show alternative potential harvest flow patterns and to conduct sensitivity analyses in order to gauge the impact of uncertainties in the input data and assumptions. The magnitude of the increase and decrease in the sensitivity variable reflects the degree of uncertainty surrounding the assumption associated with that specific variable. In the Information Package upon which this analysis has been based, several potential sensitivity analyses were proposed. After reviewing the base case results, it is felt that these additional analyses would not provide any additional, useful information for the AAC determination process.

Alternative harvest flows were considered. However, it is obvious from the base case results that no increase in initial harvest level is possible without suffering a mid-term harvest level reduction until second growth stands become available for harvesting. Conversely, nothing can be gained by lowering the initial harvest level. All non-timber resource values can be met if the current AAC is continued, and lowering the initial harvest level can do nothing to accelerate the development of the second growth stands upon which the increased long-term harvest level will rely.

In the Information Package, a sensitivity analysis to gauge the impact of basing managed stand yield tables on SIBEC site index estimates[3] (as opposed to OGSI-adjusted inventory SI) was proposed. However, this additional work could only impact long term harvest levels. It would have no affect on the current harvest level and would only change the timing of the step-up in harvest level only slightly – if at all. This, coupled with the fact that the underlying PEM has not met accuracy assessment standards for timber supply analysis, suggests that this sensitivity analysis would provide little useful information to the AAC determination process.

In the past on the original larger TFL landbase, the contribution of non-conventional operable stands (helicopter or skyline) to harvest levels, particularly in the short term, has been a concern as 7.6 % of the THLB was classified in the non-conventional category. However, within the current TFL boundaries, and after accounting for other netdowns to the landbase, less that one percent of the THLB area (only 289 hectares) falls into this category. The forest estate model would be unlikely to show significant harvest level changes with this small change to the landbase should the non-conventional portion of the THLB be excluded.

Sensitivity analyses related to minimum harvest age would undoubtedly have an impact on the timing of the increases to future higher harvest levels. However, the MHA's used for the base case are operationally realistic and no obvious reason for adjusting them up or down exists. Given the simplicity of the underlying age class distribution, the impact on short term harvest levels could be readily estimated without the considerable effort needed to complete additional forest estate model runs. In fact, since the harvest volume for the first nine periods is comprised almost entirely of old growth (i.e. stands well above MHA), there is no reason to believe that adjusting MHA either upwards or downwards would have any impact on the short-term harvest level.

Finally, sensitivity runs related to green-up ages in visually sensitive area were considered in the Information Package. These green-up ages are based on the expect height growth of individual managed stands as predicted by TIPSY. No better green-up information is readily

[3] For technical details, see http://www.for.gov.bc.ca/hre/sibec/

available. In addition, only 10% of the THLB falls in visually constrained areas; half of this is classified as 'Modification' VQO, which is not constraining in any landscape unit at any point in the planning horizon. To the extent that a sensitivity analyses around green-up ages would show any impact, it would be at most a very small harvest level reduction.

The Information Package indicated that sensitivities related to an earlier commencement of second growth harvesting would be considered. However, upon review of the base case results (and inventory summaries) it became clear that conclusions about second growth harvesting could be drawn without running separate sensitivity analyses. Figure 15 confirms that, in the base case, the transition to second growth harvesting is abrupt at 45 years. Until that time only a small proportion of the harvest come from (naturally regenerated stands less than 140 years of age.

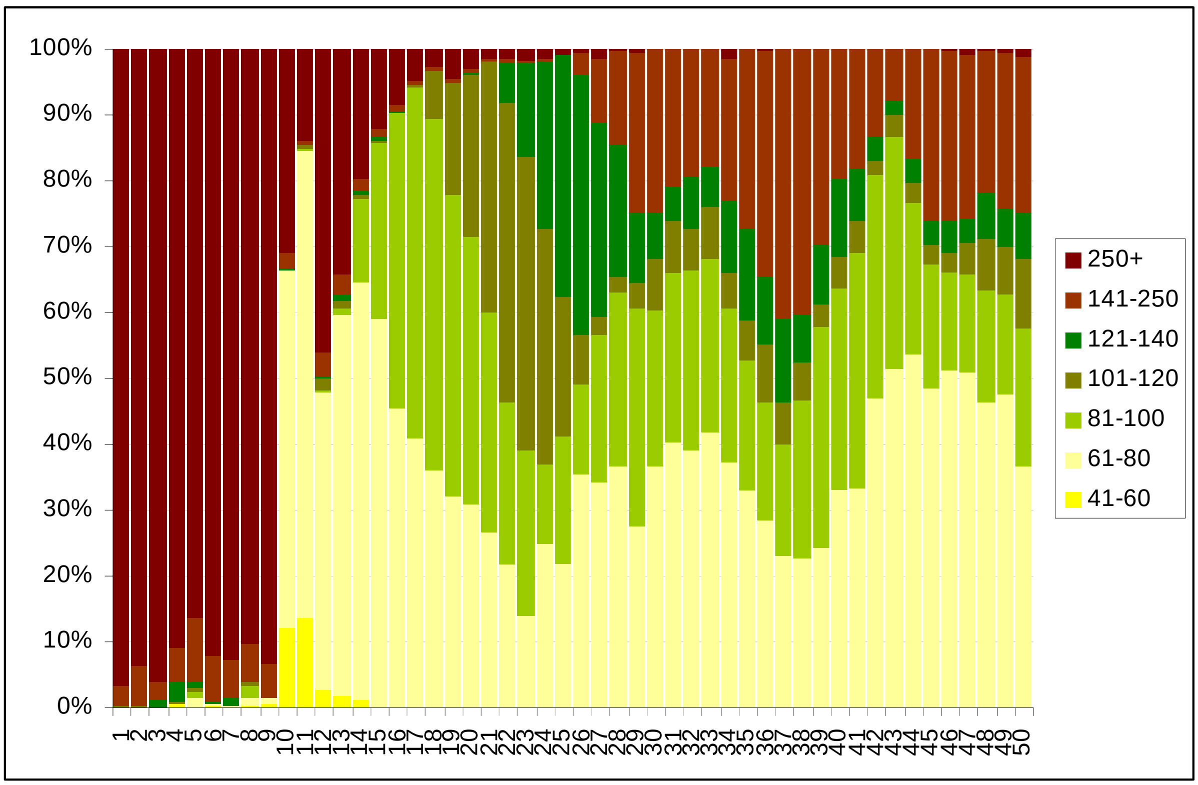

Figure 15: Age Class Distribution of the Base Case Harvest Volume

Just over 17,000 hectares of the THLB is currently below minimum harvest age. Only an additional 332 hectares reaches MHA within the first 40 years of the planning horizon. Between 40 and 50 years in the future, 4,500 hectares of second growth reaches MHA. This clearly demonstrates that an earlier transition to second growth harvesting than was found in the base case is not possible given the age class distribution of the THLB and rules applied to set MHA.