KINGCOME TIMBER SUPPLY AREA
TIMBER SUPPLY REVIEW 3 ANALYSIS REPORT

Prepared for:

Kingcome TSA Licensee- Group

Prepared by:

Timberline Natural Resource Group Ltd.

Victoria, B.C.

Project: 4061921

December 24, 2008

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This document was prepared to support an allowable annual cut determination by British Columbia's Chief Forester. To learn more about this process please visit the following website:

http://www.for.gov.bc.ca/hts/

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File number 4061921

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Attention: Ian Robertson, RPF
Program Coordinator

Reference: *Kingcome TSA TSR3 Analysis Report*

Attached please find the updated Analysis Report as part of the Kingcome TSA TSR3 process. This report summarizes the results of the analysis scenarios which evaluate the inputs and assumptions for the Pre-EBM and EBM as described in the *Kingcome TSA TSR3 Data Package.* All scenarios have been updated to include landscape unit – site series surrogate retention zones within the EBM land base as well as the stand retention adjustments for natural stands. In addition, revisions based on feedback from Ministry of Forests and Range staff have been made.

Thank you for your input and assistance during the preparation of the analysis.

Yours truly,
TIMBERLINE NATURAL RESOURCE GROUP LTD.

Erik Wang, RPF
Senior Resource Analyst

SAFE CERTIFIED

EXECUTIVE SUMMARY

A Timber Supply Review (TSR) process for the Kingcome Timber Supply Area (Kingcome TSA) began in spring 2006. This report describes the timber supply analysis prepared to inform and support the allowable annual cut (AAC) determination to be made by the Chief Forester shortly after accepting this analysis. This analysis was prepared by Timberline Natural Resource Group Ltd., on behalf of the Kingcome TSA Licensee Group. This is the third major TSR process initiated in the Kingcome TSA since 1996 and is identified as TSR3.

The Kingcome TSA Licensee Group is proposing that the TSR3 AAC be set at 1,175,500 m^3. This represents a 16% reduction in AAC due to ecosystem-based management (EBM) and land base withdrawals that have occurred as a result of the Central Coast Land-Use Decision (CCLUD). Table E.1 describes the events leading up to the current position in the Kingcome TSA.

Table E.1 History of Kingcome TSA AAC

Date	AAC (m^3/year)	Cumulative Reduction (%)[1]	Comments
1996	1,399,000	0	TSR 1 - 22% reduction from previous TSR.
July 2002	1,355,000	3	AAC Reduction under *Forest Act* Section 173 for the Central Coast Designated Area.
October 2002	1,284,000	8 (0)	TSR2 – AAC determination before *Forest Act* Section 173 for the Central Coast Designated Area.
November 2002	1,240,000	11 (3)	AAC Reduction under *Forest Act* Section 173 for the Central Coast Designated Area.
January 2006	1,284,000	8 (0)	Central Coast Designated Area *ceases* - AAC returns to October 2002 level.
September 2006	1,232,000	12 (4)	AAC Reduction under *Forest Act* Section 173 for the Central Coast Designated Area No 2.
TSR3 (Pre EBM)	1,398,700[2]	0	TSR3 Forecast that incorporates Central Coast land-use designations (conservancy areas and biodiversity areas).
TSR3 EBM Proposed AAC	1,175,500[2]	16 (8)	TSR3 Forecast that incorporates Coast Land Use Decision including (South Central Coast Legal Land-Use Objectives, conservancy areas, and biodiversity areas).

[1] Cumulative Reduction is based on the 1996 TSR1 AAC of 1,399,000 m^3 figures in brackets are cumulative reduction using TSR2 as the base.

[2] Figures shown are initial harvest level from TSR 3 timber supply forecasts and are not the AAC determined by the Chief Forester

The figures detailed above, and the associated sensitivity runs, are based on analyses reflecting the objectives described in the Legal Order for the South Central Coast[3] dated July 27, 2007 (as corrected in December 2007) and the land base removals associated with new Conservancy, Biodiversity, Mining & Tourism Areas. The inputs to these analysis scenarios are documented in the *Kingcome Timber Supply Area TSR3 Data Package* (Timberline 2008).

Although the land base has had several significant areas removed as a consequence of new parks and conservancies and EBM objectives, much of this is offset by the revised operability information used in this analysis. Additional operable area has been identified as economically contributing to timber supply and confirmed by several years of harvest performance data in parts of the land base previously identified in TSR2 as non-contributing. However, considerable good and medium site hemlock stands are still considered economically inoperable and do not contribute. Consequently the Base Case timber harvesting land base (THLB) is 186,914 hectares and the Pre-EBM THLB is 192,580 hectares. For comparison, the TSR2 Base Case THLB was 168,726 hectares. The Pre-EBM THLB does not include area in new parks, conservancies or biodiversity areas; had this area been included in a "pre Central Coast Land-Use Decision" analysis, it would have reflected an even larger THLB and increased harvest levels. Currently the impact of EBM specific land base removals and constraints on available harvest volume is 16%.

Figure E.1 presents the results of the Base Case analysis including the timber availability over the 250-year planning horizon. The TSR2 Base Case is included for comparison purposes.

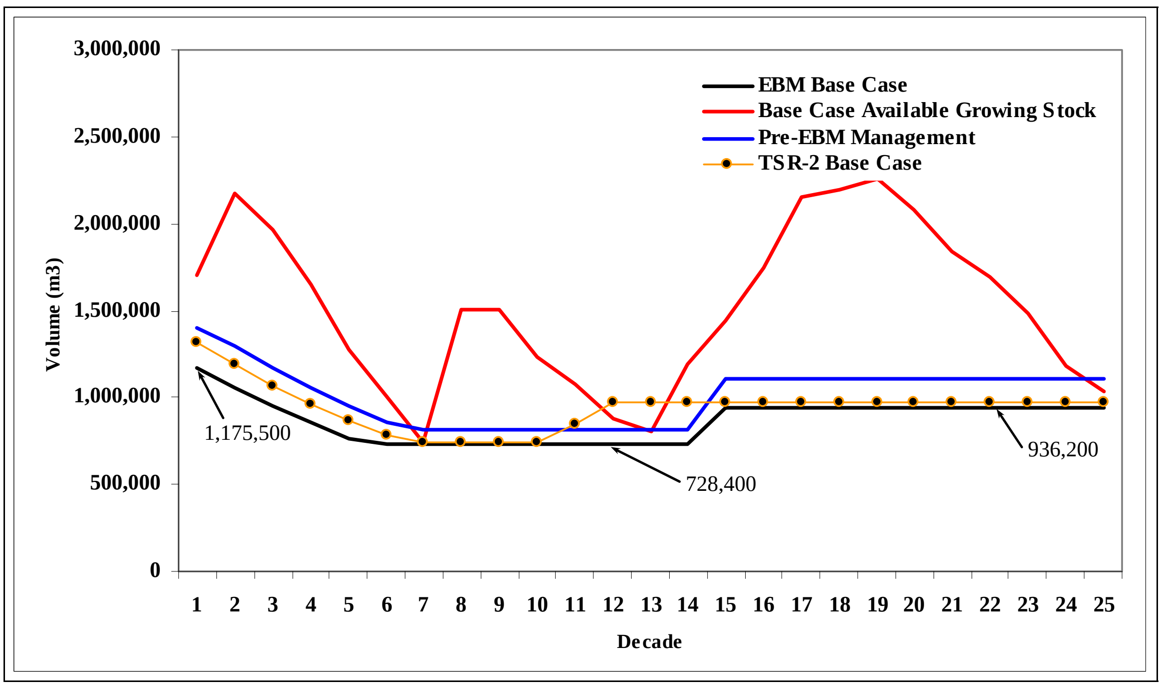

Figure E.1 – Kingcome TSA Base Case harvest and available growing stock

[3] This order only applies to the mainland portion of the TSA.

The initial harvest is 1,175,500 m^3/year, representing a 5% reduction from the most recent re-determination of the current AAC of 1,232,000 m^3/year, and an 8% reduction from the October 2002 TSR 2 AAC determination (1,284,000 m^3/year). During each of the next four decades there is a 10% drop in annual harvest, followed by a 5% drop in decade 6 to the mid-term level of 728,400 m^3/year. This mid-term level is 5.6% higher than the estimated natural stand long-run sustained yield[4] (LRSY) for the land base (1.6% lower than TSR2). Initial declines and the level of the mid term are dictated by the critical points at decades 7 and 13. At these periods the available volume is lowest and, based on the harvest flow objectives, limits the harvest level over the short (initial 50 years) and mid term (61 – 140 years).

This initial harvest level includes a second growth harvest component of 277,000 m^3/year, which then declines in sequence with the overall Base Case harvest flow. However, sensitivity analysis indicates that higher second growth harvest levels are possible.

Availability in the short term is influenced by the current age class structure, which is dominated by over mature (251+ years old) stands, with an additional component of young (less than 30 years old) stands. As the old stands are harvested or placed in reserve to accommodate non-timber objectives the supply is reduced, forcing the annual harvest to drop.

At year 130, low availability is the result of stands regenerated after harvest during years 61 to 140 not having reached minimum harvest age. There are also a number of older stands on poor quality sites that contribute low volume to the harvest during this time period. Beyond year 141 the supply increases and this allows the harvest to increase to the long-term level of 936,200 m^3/year. The inflection point for this transition to the long-term level is delayed several decades when compared to the TSR2 analysis because the EBM old seral representation targets require extended retention of old growth forest. This delays the realization gains associated with industrial forest management. In the long term, the overall growing stock becomes stable after a recovery period and has reached a level similar to the initial level.

In addition to the limits available growing stock imposes on timber supply, forest cover constraints related to old seral representation, visual quality, community watersheds, and to a lesser extent Special Management Zones, restrict the harvest at various times during the planning horizon.

Included in this report are results of several sensitivity analyses which provide interpretive context for the Base Case, which is being proposed as the AAC for the TSA. These additional runs were conducted to test their impact on timber supply and demonstrate which analysis inputs are most important in terms of both management decisions and additional information requirements for future analyses.

In many sensitivity analyses it was possible to increase the short-term harvest volume above 1,175,500 m^3/year. However, the short-term harvest has not been elevated for two reasons:

[4] Harvest level supported by the land base without gains from forest management such as species selection, density control, genetic gain and vegetation management.

- Increasing the harvest level excessively in the short term has negative consequences later, causing harvest levels to decline, possibly below the natural stand LRSY; and
- Increasing the mid-term supply was stated as a priority in harvest flow policy.

Accordingly sensitivity analysis has evaluated the impacts on mid and long-term harvest opportunity as a result of uncertainty. Table E.2 summarizes the sensitivity analysis results compared to the Base Case forecast.

Table E.2 – Kingcome TSA sensitivity analysis results

Scenario Description	Initial Harvest	Change from Base Case (%)	Mid-term Harvest	Change from Base Case (%)	Long-term Harvest	Change from Base Case (%)
Base Case Alternative Harvest Flow						
Base Case	1,175,500	100	728,400	100	936,200	100
Natural stand mid-term LRSY	1,194,000	102	689,500	95	962,200	103
Non-declining flow	799,500	68	799,500	110	910,500	97
Split non-declining and natural stand MT LRSY (MoFR)	1,149,500	98	744,500	102	928,200	99
Period 1 harvest 10% below Base Case initial (MoFR)	1,056,500	90	769,100	106	925,700	99
Base Case Sensitivity Analysis						
Pre-EBM management	1,398,700	119	815,200	112	1,107,500	118
Regulate harvest from EBM and non-EBM zones	1,075,600	92	763,500	105	966,400	103
Oldest first harvest rule	1,175,500	100	714,800	98	905,800	97
No limit on alder harvest	1,175,500	100	728,400	100	936,200	100
Limit alder harvest (10.5k/year - 12.5k/year)	1,170,500	100	728,400	100	933,700	100
Limit short-term 2nd growth harvest (150k/year)	1,115,500	95	763,400	105	936,200	100
No limit on short-term 2nd growth harvest	1,175,500	100	690,500	95	946,200	101
Increase THLB 10%	1,175,500	100	799,400	110	963,200	103
Reduce THLB 10%	1,035,500	88	623,850	86	751,550	80
$-20 economic threshold	1,175,500	100	880,400	121	1,003,200	107
$0 economic threshold	972,700	83	595,800	82	779,400	83
Exclude marginal stands & $0 economic threshold	908,500	77	537,000	74	762,800	81
Exclude marginal stands	1,119,000	95	601,900	83	936,200	100
Existing natural yields +10%	1,175,500	100	786,700	108	936,200	100
Existing natural yields -10%	1,099,500	94	712,400	98	936,200	100
Managed stand site index +2 metres	1,175,500	100	880,400	121	1,091,200	117
Managed stand site index -2 metres	991,500	84	689,500	95	748,200	80
Replace SIA with inventory site index	1,175,500	100	726,500	100	726,500	78
Apply 8% OAF-1 in TIPSY yields	1,175,500	100	788,100	108	992,200	106
Visual green-up +5 years	1,175,500	100	712,400	98	936,200	100
Visual green-up -5 years	1,175,500	100	764,600	105	943,200	101
All disturbance green-up +5 years	997,500	85	768,400	105	922,200	99
All disturbance green-up -5 years	1,175,500	100	764,600	105	936,200	100
Minimum harvest ages +10 years	1,128,500	96	720,400	99	943,200	101
Minimum harvest ages -10 years	1,175,500	100	774,100	106	921,200	98
High EBM stand-level retention rules	1,085,500	92	682,800	94	884,200	94
Low EBM stand-level retention rules	1,175,500	100	745,400	102	936,200	100

The results presented in this table confirm that the 1,175,500 m^3/year forecast is a reasonable target for the TSA for the following reasons:

1. The forecast does not fall below the long-term natural stand LRSY;
2. It incorporates and satisfies all land use objectives associated with EBM; and
3. It captures the productive capacity of the land base by utilizing available harvest volume by making the most of gains associated with forest management.

Many sensitivity runs report back with a long-term harvest level that is the same or higher, as much as 17% higher, than reported for the Base Case, while only those with significant land base implication or site productivity reductions return lower anticipated results.

Many of the sensitivity analyses affect the harvest level at various times during the planning horizon. However, it is important to note that the timing of the changes to the mid and long-term harvest levels does not change dramatically with the various sensitivity analyses. This indicates the availability of timber is dictated by the existing inventory structure and the timing of harvesting future stands.

Two additional baseline harvest flow alternatives have been included to address harvest flow dynamics requested by Ministry of Forests and Range regional staff. These two scenarios are included at the top of this table just below the Base Case. Both of these runs also indicate that 1,175,500 m^3/year is a reasonable forecast; by illustrating that substantial impacts today have marginal impact on the mid term and a negative impact on the long-term harvest potential.

Alternative harvest flow patterns do not provide significant benefit in the mid or long term, and in fact do not fully capture the productive capacity of the land base. EBM has introduced a number of new issues to address in terms of timber supply. It will be important to monitor how management decisions affect the targets for the issues, and to update resource inventory data to ensure that future timber supply analysis incorporates the best possible information.

Deciduous harvest in the Base Case is below the current harvest levels for this inventory group. However, given that hardwood tenures are exempt from EBM requirements, it is more realistic to determine the timber supply based on the Pre-EBM scenario, in which alder harvest is maintained at 25,000 m^3/year for the next 40 years and cottonwood maintains 5,000 m^3/year for the next 70 years. Consistent with the Coastal Forest Action Plan the analysis presented here included management of 6,211 hectares of alder and 653 hectares of cottonwood stands.

Presently in the Base Case harvest forecast operational adjustment factors (OAFs) are set at the provincial defaults and the economic operability threshold is set at $-10 profit. Both of these Base Case assumptions represent potential opportunities to significantly increase timber supply from the TSA. Reducing OAFs in sensitivity analysis permits the harvest to increase considerably. Research in other TSAs suggests that default OAFs are set too high. Combine this with the good and medium site hemlock presently excluded by the $-10 threshold and a there is a clear indication that the land base contributing to timber supply could be increased in future timber supply studies and improve the timber supply forecasts for the Kingcome TSA. It will therefore be important to continue gathering inventory data for these and other analysis inputs to improve the quality of timber supply estimates for the TSA.

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1.0 INTRODUCTION

Timberline Natural Resource Group Ltd. (Timberline), on behalf of the Kingcome Timber Supply Area (TSA) Licensee Group (the Group) is preparing timber supply information for the Provincial timber supply review. The Group is composed of forest companies and British Columbia Timber Sales (BCTS) with participation by First Nations and the Ministry of Forests and Range (MFR). It was originally formed under the Defined Forest Area Management (DFAM) concept, developed by the MFR as a policy framework to identify the obligations and opportunities for collaborative forest management within the province's TSAs. While the DFAM concept has since been terminated by the Chief Forester, the Group continues to exist and will assume collective responsibility for timber supply analysis within the TSA.

Timber supply reviews (TSRs) are usually conducted every five years to assist the B.C. Forest Service's Chief Forester in re-determining the allowable annual cut (AAC). For the Kingcome TSA, the Chief Forester will determine a new AAC following acceptance of this report by the MFR.

Timberline is completing the steps leading up to, and including the delivery of, timber supply analyses as follows:

- Collecting data and preparation of a Data Package which summarizes the data assumptions—land base, growth and yield, forest management practices, statement of management strategies, and analysis methods—that will be used, and the critical issues that will be examined in the timber supply analysis;
- Completing the timber supply analysis and report;
- Completing a socio-economic analysis; and
- Providing the necessary information for public and First Nations reviews at selected milestones during the process.

This *Kingcome Timber Supply Area TSR3 Data Package*, the initial document published in support of the current TSR process, was released in May 2008. This document and an addendum are included as Appendices IV and V to this report. It was submitted at that time to the MFR and was also made available for a public and First Nations review over a period of two months[5]. The Chief Forester will consider the Timber Supply Analysis Report and other sources of information in order to make a new AAC determination. This determination will be published in a report entitled '*Kingcome Timber Supply Area – Rationale for AAC Determination*'.

MFR staff plays a key role in reviewing and accepting both the *Data Package* and the subsequent timber supply analysis. They have provided technical support, facilitated resolution of issues, and validated technical information. Table 1.1 shows the general roles and responsibilities associated with the timber supply analysis leading to an AAC determination. Once the public and First Nations review of this report has been completed the Chief Forester will determine a new AAC for the TSA.

[5] Public review and comment of the data package was completed and accepted on July 11, 2008

Table 1.1 – Roles and responsibilities

Licensee-Agency Group Obligations	Government Obligations
Collect and prepare a Data Package based on the best available information	***Set standards for the Data Package*** ***Review and accept the Data Package***
Complete an analysis for the Kingcome TSA	***Set standards for the analysis*** ***Review and accept the analysis***
Provide information to the public and First Nations	***Consult with First Nations*** ***Determine the AAC for the Kingcome TSA***

For further information about the *Data Package* and *Timber Supply Analysis Report* for the Kingcome TSA, please contact:

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1.1 Background

The AAC for the Kingcome TSA was set in 1996 at 1,399,000 m³ (TSR1), which equated to a 22 percent reduction from the previous AAC. This 1996 determination predates any LRMP related adjustments to the land base or harvest levels. It was not until July 2002 the Chief Forester temporarily reduced the AAC under Section 173 in Part 13 of the *Forest Act*, to 1,355,000 m³. This reduction was done to account for the Central Coast Designated Area Regulation. Designated area regulation temporarily removes these areas from the contributing land base.

On October 1, 2002 the AAC was further reduced when the Chief Forester determined the AAC under Section 8 of the *Forest Act* to be 1,284,000 m³ (TSR2), a reduction of 8 percent from the previous AAC. This included a 20,340 m³ partition for deciduous-leading stands. The July 2002 temporary reduction of 44,000 m³ was re-established under new Section 173 order in November 2002 and applied to the October 2002 determination resulting in an AAC of 1,240,000 m³. This reduction remained in place until June 2004.

In September 2006, the Chief Forester made a new determination under Section 173 of the *Forest Act* that reduced the AAC by 52,000 m^3 to 1,232,000 m^3. This reduction did not affect the deciduous partition and remains in effect until the area referred to as the Central Coast Designated Area No. 2 ceases to be a designated area in May 23, 2010. It is expected that either the area will be re-established as a Designated Area or established as conservancy areas under the *Park Act* or as biodiversity, mining and tourism areas under the *Environment and Land-Use Act*.

On July 27, 2007, the Ministry of Agriculture and Lands issued a legally binding Ministerial Order (MO) called the South Central Coast Order. The legal order requires forest licensees to implement Ecosystem Based Management (EBM) in the southern portion of the Central Coast Land-Use Decision (CCLUD) area. The exception to this rule is the Deciduous tenures which have been granted an exemption from EBM under

Part 1 Section 4 of the MO for the South Central Coast. This includes only the mainland portion of the Kingcome TSA.

The analysis contained herein concludes that a first period harvest level of 1,175,500 m^3/year, adequately addresses recent changes in land use objectives, new park's and conservancies as well as social and economic objectives of the crown and industry. Table 1.2 summarizes the recent history of the AAC for the Kingcome TSA and highlights the initial forecast volume which forms the basis for all subsequent analysis.

Table 1.2 – History of Kingcome TSA AAC

Date	**AAC (m^3/year)**	**Cumulative Reduction (%)**[6]	**Comments**
1996	1,399,000	0	TSR 1 - 22% reduction from previous TSR.
July 2002	1,355,000	3	AAC Reduction under *Forest Act* Section 173 for the Central Coast Designated Area.
October 2002	1,284,000	8 (0)	TSR2 – AAC determination before *Forest Act* Section 173 for the Central Coast Designated Area.
November 2002	1,240,000	11 (3)	AAC Reduction under *Forest Act* Section 173 for the Central Coast Designated Area.
January 2006	1,284,000	8 (0)	Central Coast Designated Area *ceases* - AAC returns to October 2002 level.
September 2006	1,232,000	12 (5)	AAC Reduction under *Forest Act* Section 173 for the Central Coast Designated Area No 2.
TSR3 (Pre EBM)	1,398,700[7]	0	TSR3 Forecast that incorporates Central Coast land-use designations (conservancy areas and biodiversity areas).
TSR3 EBM Proposed AAC	1,175,500[7]	16 (8)	TSR3 Forecast that incorporates Coast Land Use Decision including (South Central Coast Legal Land-Use Objectives, conservancy areas, and biodiversity areas).

1.2 Central Coast Land-Use Decision Process

The July, 2007 South Central Coast Order[8] regarding the CCLUD defines land use objectives and other measures to implement ecosystem based management within the south and central coast portion of the CCLUD area. A copy of the order and a map outlining the areas where the objectives will be applied is available at:

http://www.mediaroom.gov.bc.ca/DisplayEventDetails.aspx?eventId=389

[6] Cumulative Reduction is based on the 1996 TSR1 AAC of 1,399,000 m^3 figures in brackets are cumulative reduction using TSR2 as the base.

[7] Figures shown are initial harvest level from TSR 3 timber supply forecasts and are not the AAC determined by the Chief Forester

[8] This order only applies to the mainland portion of the TSA.

There are two key components that will be recognized when addressing the CCLUD, specifically:

- Protection / exclusion of new Conservancy areas and Biodiversity areas; and
- Ecosystem-Based Management (EBM) objectives and targets.

2.0 Description of Kingcome TSA

The Kingcome TSA covers both the northern most portion of Vancouver Island and a portion of mainland coastal B.C. adjacent to Queen Charlotte Strait, extending to the northeast as far as Tweedsmuir Park. Most of the TSA land base is on the mainland. It falls within the North Island Central Coast Forest District, which also includes a number of Tree Farm Licences (TFLs) which are excluded from this analysis. Figure 2.1 shows the location of the Kingcome TSA.

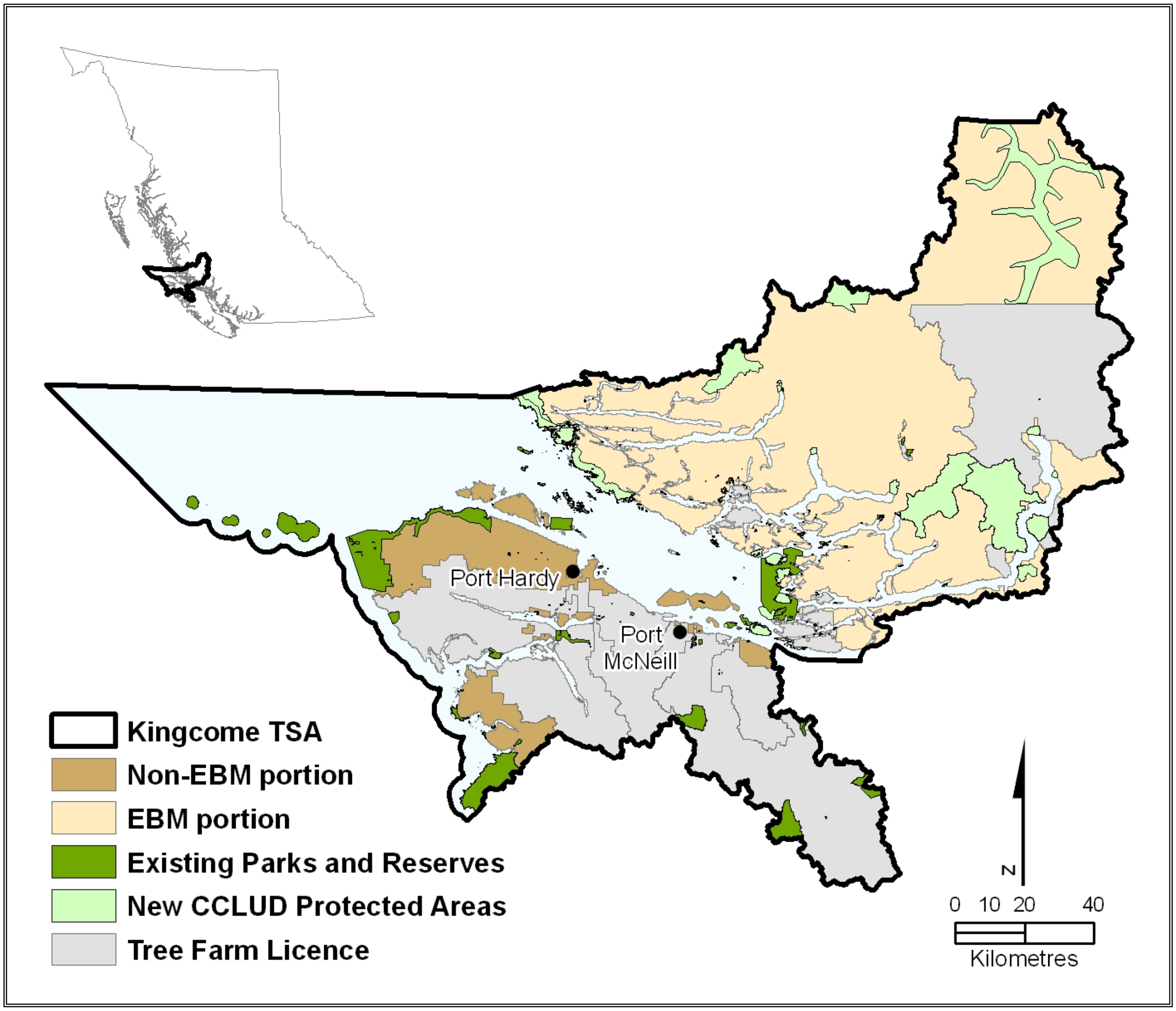

Figure 2.1 – Kingcome TSA overview

Timberline Natural Resource Group

A variety of terrain conditions are found on the TSA including poorly drained lowlands on northern Vancouver Island, the rugged Coast Mountains and some drier interior areas in the upper Klinaklini drainage. Major tree species include western hemlock, western redcedar, amabilis (true) fir, and minor components of Douglas-fir, yellow cedar, spruce and deciduous species.

Most of the productive land within the TSA is classified as Coastal Western Hemlock (CWH) biogeoclimatic (BEC) zone. CWH, characterized by wet, mild weather is found between sea level and 1,000 meters of elevation. Most of the timber harvesting land base (THLB) is located in this zone. Above 1,000 meters the other forested BEC zone present on the TSA is Mountain Hemlock (MH) noted for long, cold, wet winters, short cool, moist summers and the dominance of mountain hemlock, western hemlock and true firs. At high elevations is the Coastal Mountain-heather Alpine (CMA) BEC zone, which is characterized by cold, snowy winters and a landform covered with ice, snow, rock mixed with tundra and flowering meadows. Trees, where they exist in this zone are sparse and stunted.

3.0 TIMBER FLOW OBJECTIVES

The objective of the analysis is to determine the capacity of the land base to sustain a timber flow, and any risks to this flow resulting from uncertainty in assumptions. A number of different harvest flows will be explored, based on tradeoffs between short and mid-term harvest levels. The forest cover constraints and biological capacity of the THLB will dictate timber availability and harvest level options.

The overall strategy employed in the TSA is to gradually adjust harvest levels towards the best estimate of the long-term harvest level (LTHL) for the forest. In all timber supply scenarios, the choice(s) of harvest flow will reflect the following objectives:

- Achieve an acceptable short-term harvest level;
- Decrease the periodic harvest level in acceptable steps (<= 10%) when declines are required to meet all objectives associated with the various resources on the land base;
- Do not permit the mid-term harvest level to fall below a level reflecting the natural productive capacity of the TSA – 689,500 m^3/year in this case (based on VDYP natural stand yield estimates); and
- Achieve a stable long-term harvest level over a 250-year time horizon reflecting the productive capacity of the TSA under current forest management practices (based on TIPSY managed stand yield estimates).

In addition, a portion of the annual harvest will be directed to second growth stands to reflect current practice. This harvest target will incorporate an initial level of 277,000 m^3/year and will be in place for the first 70 years of simulation. Sensitivity analysis will explore the implications of much higher and lower second growth harvest rates.

3.1 Analysis Scenarios

Two initial scenarios have been modeled for the Kingcome TSR3 timber supply analysis:

- Pre-EBM; and
- EBM.

3.1.1 Pre-EBM

The Pre-EBM analysis is based on the TSR2 analysis completed in October 2002, the details of which are documented in TSR2 analysis report (MFR, 2001). However, current data sources and inventories (forest cover, operability, land base removals *etc*.) were used to develop the Pre-EBM data set as outlined in Section 4.2.2.

While this analysis does not address EBM as described in law, and articulated in the South Central Coast order of July 2007 the analysis does address land base removals occurring in the plan area as a consequence of new Conservancy, Biodiversity, Mining & Tourism Areas and Central Coast Designated Area No. 2 which were established as a result of the Central Coast Land Use Decision and preceding process.

3.1.2 EBM

The South Central Coast Ministerial Order (MO) is now legally established, formalizing into law the Land Use Objectives for the South Central Coast Area under the *Land Act.*

The order establishes 15 land use objectives for the following topics, among others: cultural heritage resources, freshwater ecosystem habitats, landscape and stand level biodiversity and grizzly bear habitat. These objectives provide direction for implementing ecosystem based management on the south coast in a manner that maintains ecosystem integrity and improves human well-being as supported by a viable forest industry. This analysis is based on the corrected version of the original order from July 27, 2007.

In November 2006, the Kingcome TSA Timber Supply Review stakeholders composed a letter to the Provincial Chief Forester seeking direction on the role that EBM should have in TSR. The TSR process is intended to model “current practice” on a management unit yet at that time the final EBM parameters had not yet been set by the MFR.

In his January 16, 2007 letter in response, the Chief Forester acknowledged that while the exact EBM framework had not yet been formalized, the development of the actual EBM components should be left to the discretion of the Kingcome TSA stakeholder group. On February 19, 2007, a sub-group of the Kingcome TSA stakeholders met to define the timber supply analysis framework for the Kingcome TSR and finalize the parameters proposed for modelling the key components of EBM. The sub-group included Ted Stevens and Gary Ardron representing First Nations interests, David Mackay, Gerry Sommers, and Warren Warttig of International Forest Products Ltd., Peter Kofoed of Western Forest Products Ltd., Jim Brown, Jennifer Barolet and Christina Mardell of the MFR, and Tara McCormick, Dave Coster, Laszlo Kardos, and Hamish Robertson of Timberline Natural Resource Group Ltd.

Data sources and assumptions needed to address Ecosystem-Based Management objectives were defined by the group. Since that time, these approaches have been refined as the specifics of each objective have been clarified. For each objective, the specific approach is documented in the appropriate section of the *Data Package*, depending upon whether it is a netdown factor (Section 5.2), a management zone (Sections 6.2, 9.2) a stand growth and yield adjustment (Section 8.5), or a timber flow consideration (Section 10.9).

These objectives will be modeled within the EBM zone (see Figure 2.1) of the TSA and include the land base removals associated with the CCLUD.

3.1.3 Harvest Flow Considerations

MFR has circulated a draft working paper: *Harvest Flow Considerations for the Timber Supply Review* (March 2004). This draft working paper provides guidance on developing base case harvest forecasts by describing the primary objectives of the Crown related to timber supply.

Key points highlighted on this document are:

1. The continued availability of good forest jobs and the long term stability of communities that rely on forest jobs (Direction provided by the Minister of Forests to the Chief Forester),
2. An initial harvest level as close to the current AAC as possible,
3. The need to have a smooth transition to second growth,
4. A mid-term harvest level that does not fall below the natural stand LRSY,
5. Short-term harvest rates are not increased at the expense of lowering the mid-term level.

The Base Case harvest forecast developed for this analysis meets all of these objectives. Points one and two above are linked to the social and economic objectives of the Crown. The base case described in this analysis reports on an initial harvest volume is 6 percent below that of TSR2 and 14 percent below that of TSR1. This reduction is necessary to accommodate land use and land management decisions arrived at during the land use planning process and captured in the Central Coast Land Use Decision (CCLUD).

Second growth harvest is also modeled in a manner consistent with operational practice requirements that substantiate and support the investment necessary in harvesting and processing equipment and facilities to provide a stable and orderly transition to a harvest profile that will be predominantly second growth in the near future.

The mid term harvest level objectives have been met by developing a forecast that does not fall below the natural stand long run sustainable yield. The natural stand productivity is evaluated as it represents the productive capacity of the land base without forest management intervention. Forest management practices (such as density control, use of select seed and fertilization) change the managed stand long run sustainable yield. If the long term harvest level was the primary objective a much more rapid conversion of unmanaged stands to managed stands (articulated by a very high short term harvest level) would be required to realize forest management benefits earlier in the harvest forecast. The dynamics and impacts of different initial harvest rates on future harvest levels are illustrated in this analysis in the scenarios modeled that vary the initial harvest level.

4.0 LAND BASE INFORMATION

This section describes factors that influence management of the Kingcome TSA land base and the methodology used to determine the way in which land contributes to timber supply. Some portions of the productive land base, while not contributing to harvest, may be available to meet other resource needs.

4.1 Data Sources

A complete description of the data sources and assumptions used as the basis for this analysis is contained in the *Kingcome TSA TSR3 Data Package*. This document is included as part of this analysis report in Appendix V. The following key data sources were employed in this analysis:

- VRI coverage for the entire TSA;
- VRI phase II attribute adjustments;
- Improved site productivity estimates for managed stands;
- Genetic gain estimates for tree improvement program;
- Updated spatially explicit road buffers;
- Updated spatially explicit stream buffers;
- Community watersheds;
- Updated cultural heritage and archaeological sites;
- Updated wildlife habitat information including grizzly bear and marbled murrelet;
- New economic operability assessment;
- New Conservancy Area
- New Biodiversity, Mining and Tourism Areas;
- EBM boundaries; and
- Allowance for disturbances in the non-timber harvesting land base.

All inventory data was assembled using spatially explicit methods and stored in a GIS database.

4.2 Land Base Classification

The *Data Package* includes a description of issues, information sources, assumptions, and criteria used to estimate the land base available for timber harvesting, including any relevant data processing or adjustments.

4.2.1 Revisions to Land Base Classification

Since the acceptance of the *Data Package*, a revision to the reductions for blue-listed plant communities has been made. The new methodology ensures that 70% of the productive forest within each blue-listed plant community is preserved. Originally a 70% reduction was assigned to each plant community regardless of how much had been excluded for other land base reductions (inoperable, riparian, wildlife habitat, *etc*.).

The new reductions were based on blue-listed plant communities within each landscape unit and BEC combination. An area target of 70% was determined for the productive forest within each LU-BEC combination. After all other land base netdowns were completed, the remaining net area within each LU-BEC was compared to the 70% target and reduced as required to achieve the target. Table 4.1 summarizes the updated netdowns for blue-listed plant communities.

Table 4.1 – EBM blue-listed plant community reductions

LU	BEC	Productive Area (ha)	EBM Target 70% of Productive (ha)	THLB Prior to Blue-listed Reduction (ha)	Blue-listed THLB Reduction (ha)	Blue-listed Reduction (%)
Ahnuhati-kwalate	CWH vm 1	24	17	6	0	0.0
Ahnuhati-kwalate	MH mm 1	0	0	0	0	0.0
Ahta	CWH vm 1	735	515	341	120	35.3
Ahta	MH mm 1	1	1	0	0	0.0
Belize	CWH vm 1	5,362	3,753	2,196	588	26.8
Belize	MH mm 1	5	3	0	0	0.0
Broughton	CWH vm 1	2,145	1,501	1,672	1,029	61.5
Charles	CWH vm 1	566	396	221	51	23.1
Charles	MH mm 1	1	1	0	0	0.0
Franklin	CWH dm	0.3	0.2	0.1	0.1	49.8
Fulmore	CWH vm 1	19	13	12	6	50.4
Gilford	CWH vm 1	3,077	2,154	1,953	1,030	52.7
Gilford	MH mm 1	1	1	0	0	0.0
Huaskin	CWH vm 1	4,177	2,924	2,207	954	43.2
Kakweiken	CWH vm 1	670	469	255	54	21.1
Kakweiken	MH mm 1	1	1	0	0	0.0
Knight East	CWH vm 1	1,275	892	632	249	39.5
Knight East	MH mm 1	4	3	0	0	0.0
Lower Kingcome	CWH vm 1	1,375	963	373	0	0.0
Lower Kingcome	MH mm 1	4	3	0	0	0.0
Lower Klinaklini	CWH vm 1	9	7	3	0	0.0
Lower Klinaklini	CWH ws 2	15	10	0	0	0.0
Lull-Sallie	CWH vm 1	1,155	809	511	164	32.2
Lull-Sallie	MH mm 1	2	2	0	0	0.0
Middle Klinaklini	CWH ds 2	1	0	0	0	0.0
Middle Klinaklini	CWH ws 2	266	186	0	0	0.0
Middle Klinaklini	MH mm 2	1	1	0	0	0.0
Miriam	CWH vm 1	2,327	1,629	1,179	479	40.8
Miriam	MH mm 1	2	1	0	0	0.0
Seymour	CWH vm 1	1,133	793	237	0	0.0
Seymour	MH mm 1	5	4	0	0	0.0
Sim	CWH vm 1	70	49	33	12	36.1
Smokehouse	CWH vm 1	4	3	1	0	3.7
Snowdrift	CWH vm 1	3,788	2,652	2,104	965	46.0
Snowdrift	MH mm 1	4	3	0	0	0.0
Upper Kingcome	CWH vm 1	1,091	764	232	0	0.0
Upper Kingcome	MH mm 1	4	3	0	0	0.0
Upper Klinaklini	CWH ws 2	122	85	0	0	0.0
Wakeman	CWH vm 1	2,162	1,514	840	191	22.7
Wakeman	MH mm 1	5	4	0	0	0.0
Total		**31,608**	**22,126**	**15,007**	**5,889**	

In addition, the grizzly bear habitat removal was applied before the blue-listed reductions noted above. This made a minor change to the grizzly withdrawal, which remained as a 100% exclusion. As a result of this change to the land base classification the net THLB increases by 7,128 ha for the EBM scenario, compared to the net THLB figures reported in the *Data Package*.

Subsequent to preparing the *Data Package* it was also discovered that several polygons were identified as having a harvest history based on change detection analysis when, in fact, they should not have been included in the THLB. While it was not possible to directly address this issue, the size of the THLB used in modelling has been reduced from what is reported in the land base definition as a result of removing sliver polygons from the modelling input files. This reduction more than offsets the additional land included and addresses any concerns about excessive area in the THLB. Furthermore, it is not expected that this area would have any short term implications since it is currently identified as logged and has no volume associated with it.

4.2.2 Land Base Classification

All of the land base classification steps performed during TSR2 remain in the current classification. However, the following additions or modifications have been made since TSR2:

- Existing road losses are now explicitly (spatially) identified and removed from the land base contributing to timber supply;
- Riparian reserve and management zones are now explicitly (spatially) identified and removed from the land base contributing to timber supply;
- Old growth management areas, established within some landscape units, are now identified and removed from the land base contributing to timber supply;
- Landscape units outside the South Central Coast Order plan area with no old growth management areas are now managed to retention levels set by the Order Establishing Provincial Non-spatial Old Growth Objectives (June 30, 2004);
- Wildlife habitat areas (WHAs) and Ungulate Winter Ranges (UWRs) are now identified and removed from the land base contributing to timber supply;
- Revised marginal site exclusion thresholds based on current and past performance;
- Existing forest inventory age and height values were adjusted, and the forest inventory has been updated for disturbance to 2004;
- New operability based on economic operability assessment for TSA completed in 2006 incorporated into analysis;
- Archaeological sites have been explicitly identified and the land base contributing to timber supply has been adjusted to account for these areas;
- Karst terrain features are now identified and removed from the THLB;
- Biodiversity Areas and Conservancy Areas either proposed or established as result of the CCLUD are now removed from the land base contributing to timber supply; and
- EBM objectives requiring areas to be removed from the THLB are incorporated into the netdown process.

Table 4.2 presents the updated results of the land base classification process to identify the timber harvesting land base. Individual areas may have several classification attributes. For example, stands within riparian reserve boundaries might also be classified as non-commercial. These areas would have been classified on the basis of this latter attribute, prior to the riparian classification. Therefore, in most cases the net reduction will be less than the total area in the classification. The order of the entries in Table 4.2 corresponds to the sequence of land base classification assignments.

Table 4.2 – Timber harvesting land base (THLB) determination

Land Classification	Land Base				
	Area (ha) [1]	% of Crown	Volume (000 m^3)	Productive Area (ha)	% Productive
Total TSA Area	1,172,428				
Exclusions from the total crown forest	21,274				
Total Crown Forest	1,151,154	100			
Non-forest	369,252	32.1	0	0	
Existing roads	4,457	0.4	0	0	
Non-productive	126,749	11.0	0	0	
Productive Forest	650,696	56.5	254,265		100
CCLUD Protected Areas	32,781	2.8	13,832	32,781	5.0
CCLUD Biodiversity, Mining & Tourism Areas	14,088	1.2	4,844	14,215	2.2
CCLUD Conservancy Areas	51,504	4.5	21,083	52,037	8.0
Inoperable	175,871	15.3	59,260	251,967	38.7
Operable Forest	376,452	32.7	155,246		
Sites with low growing potential	101,077	8.8	34,530	238,106	36.6
Non-merchantable	999	0.1	322	11,836	1.8
Environmentally sensitive – full netdown	5,146	0.4	2,548	35,026	5.4
Riparian	30,222	2.6	12,146	69,824	10.7
Approved Wildlife Habitat (wha + uwr)	3,095	0.3	1,951	14,725	2.3
Old Growth Management Areas	1,544	0.1	964	9,491	1.5
Archaeological Sites	1,476	0.1	648	4,099	0.6
Karst (aspatial partial netdown)	138	<0.1	42	3,768	0.6
Environmentally sensitive – partial netdown	13,778	1.2	7,391	96,979	14.9
Unstable terrain – partial netdown	10,802	0.9	4,964	156,323	24.0
Total Operable Reductions (Pre-EBM)	168,278	14.6	65,506	640,177	25.9
THLB subtotal (Pre-EBM)	208,175	18.1	89,740		32.0
EBM Exclusions					
Objective 3-5 - First Nations	1,072	0.1	481	4,099	0.2
Objective 9 - High Value Fish Habitat	7,052	0.6	3,052	38,374	1.1
Objective 10 - Not High Value Fish Habitat	1,462	0.1	856	30,711	0.2
Objective 11 - Forested Swamps	209	<0.1	100	1,998	0.0
Objective 15 - Red-listed Plant Communities	188	<0.1	134	2,247	0.0
Objective 17 - Grizzly bear habitat	3,124	0.3	1,083	14,511	0.5
Objective 15 - Blue-listed Plant Communities	5,889	0.5	3,854	48,601	0.9
Total Operable Reductions (EBM)	18,996	1.7	13,810		2.9
THLB subtotal (EBM)	189,179	16.4	75,066		29.1
Pre-EBM subtotal	208,175	18.1			32.0
Less WTPs (partial netdown)	12,479	1.1			1.9
Current THLB (Pre-EBM)	195,696	17.0			30.1
Less future roads	3,071	0.3			0.5
Future THLB (Pre-EBM)	192,625	16.7			29.6
EBM subtotal	189,179	16.4			29.1
Less WTPs (partial netdown)	2,265	0.2			0.4
Current THLB (EBM)	186,914	16.2			28.7
Less future roads	2,751	0.2			0.4
Future THLB (EBM)	184,163	16.0			28.3

[1] Note, all in Table 4.2 are from the GIS database and do not include removals for sliver polygons. After removing all slivers, the Current EBM THLB used in the CASH6 model is 183,868 hectares.

The final land base classification results in a Pre-EBM current THLB of 195,696 hectares and an EBM THLB of 186,914 hectares, compared to the TSR2 current timber harvesting land base (168,726 ha) documented in the Kingcome TSA TSR2 Analysis Report. While reductions to address new Central Coast biodiversity, conservancy and EBM objectives removed significant areas from timber production, these were offset by additions based on a new economic operability assessment, and revised low site criteria.

The total TSA area of 1,172,428 hectares represents the Kingcome TSA without any TFL or ocean area within the boundary of the TSA. Note that the WTP reductions were the final step of the netdown process but were different for the Pre-EBM and EBM land bases, so they are not listed with the other productive netdown steps.

Additional area in the THLB, as estimated by MFR due to satellite change detection errors, is approximately 2,450 hectares (1.3%) whereas the sliver polygons removed from the modelling inputs total 3,025 hectares (1.6%). Slivers were defined as any resultant polygon less than 0.1 ha in size. These polygons are excluded from the modelling process to improve efficiency and to allow more meaningful analysis results.

This resulted in a modelling THLB of 183,868 hectares. This figure remains conservative as a result of harvested area being excluded from the model. During marginal site performance measurements it was noted that 1,030 hectares of harvested blocks from recent harvest history data were excluded from the model. Many of these omissions are attributed to missing VRI attributes.

The THLB area includes 5,549 hectares of unreverted timber license areas which do not contribute to the TSA timber supply until after they are harvested and regenerated. Also, 12,937 hectares of not satisfactorily regenerated areas (NSR) are included in the THLB, and are scheduled to be regenerated successfully in the first planning period. Land classified as NSR includes areas confirmed as recent harvesting, but also includes areas with no stand attribute data (8,851 hectares) and areas with questionable VRI attribute data (277 hectares). Therefore actual NSR area is approximately 3,500 hectares. It is important to note that no land is classified as backlog NSR.

Some parks and protected areas not administered as part of the Kingcome TSA are included in the land base for analysis, as they contribute to non-timber objectives such as old-growth seral requirements to maintain landscape-level biodiversity.

Figure 4.1 shows the distribution of productive and non-productive land on the crown land base.

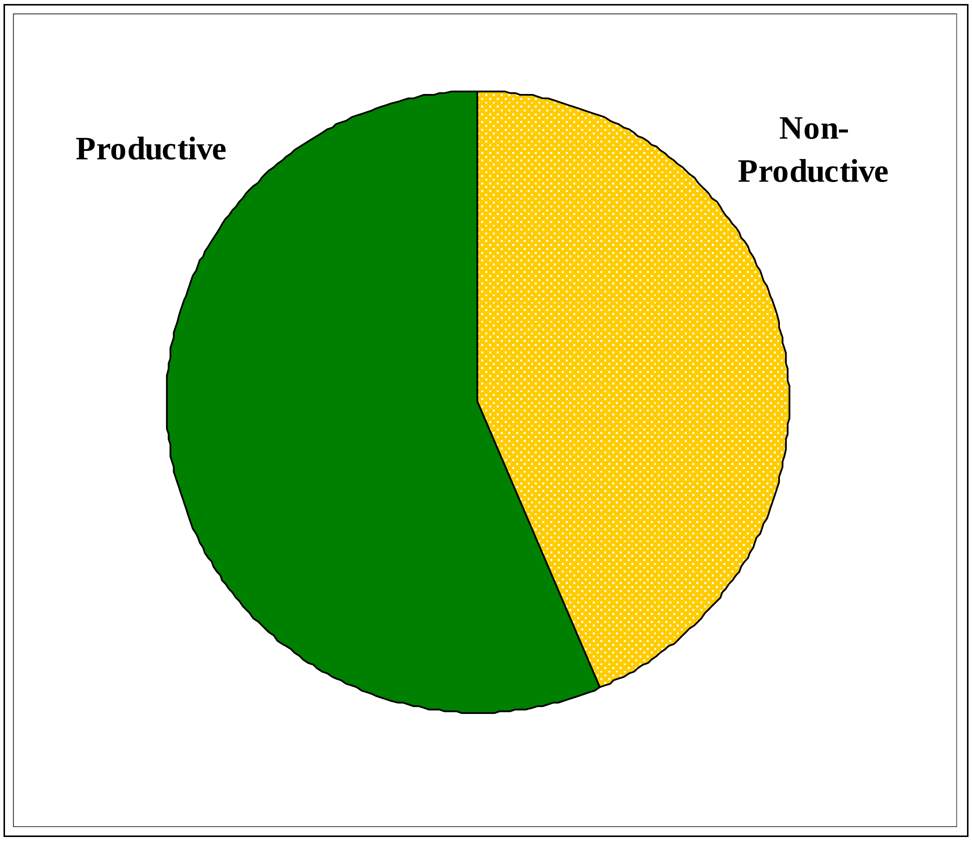

Figure 4.1 – Productive and non-productive land

Figure 4.2 shows the distribution of the productive land base for the Pre-EBM land base (top) and the EBM land base (bottom).

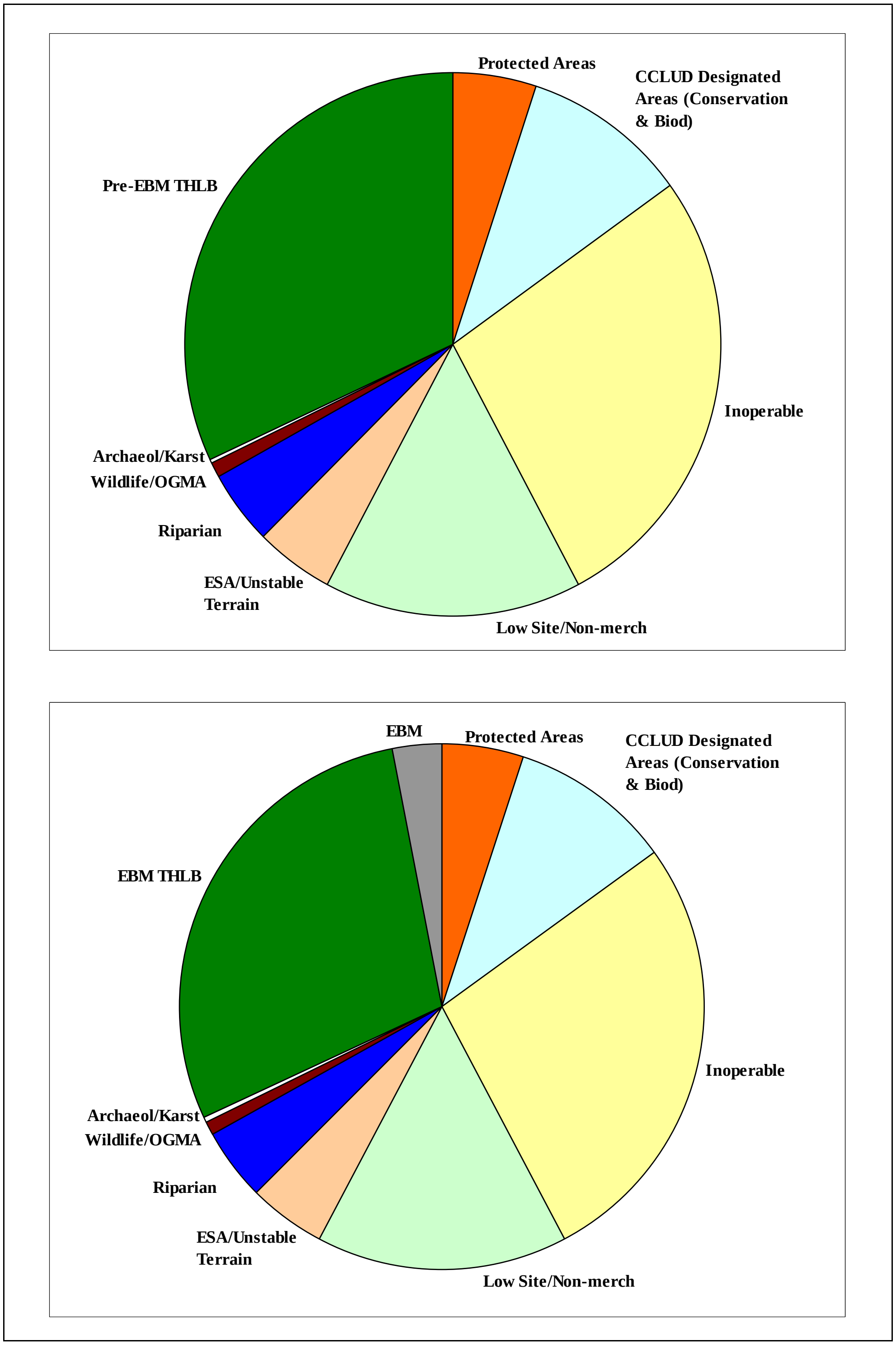

Figure 4.2 – Land base classification – Pre-EBM and EBM

The THLB consists of all productive land expected to be available for harvest over the long term. Most exclusions from productive land were spatially explicit polygons

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identified from the various inventories. However, some reductions were assigned to the land base as small percentage removals (netdowns) including unstable terrain, some ESAs, archaeological sites and karst features.

4.3 Ecosystem and Forest Inventories

The productive forested area of the Kingcome TSA is 650,696 ha. The following land categories are excluded from the productive land base:

- All salt and fresh water;
- Private and federal lands;
- Provincial crown land that is administered as part of the Kingcome TSA for timber supply; and
- Non-productive types.

Biogeoclimatic Ecosystem Classification mapping provides information on the range of ecological units that occur within the TSA. For a detailed description of the sites identified refer to Land Management Handbook 28, A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region (Ministry of Forests, June, 1994). The distribution of productive area by BEC unit is shown in Figure 4.3.

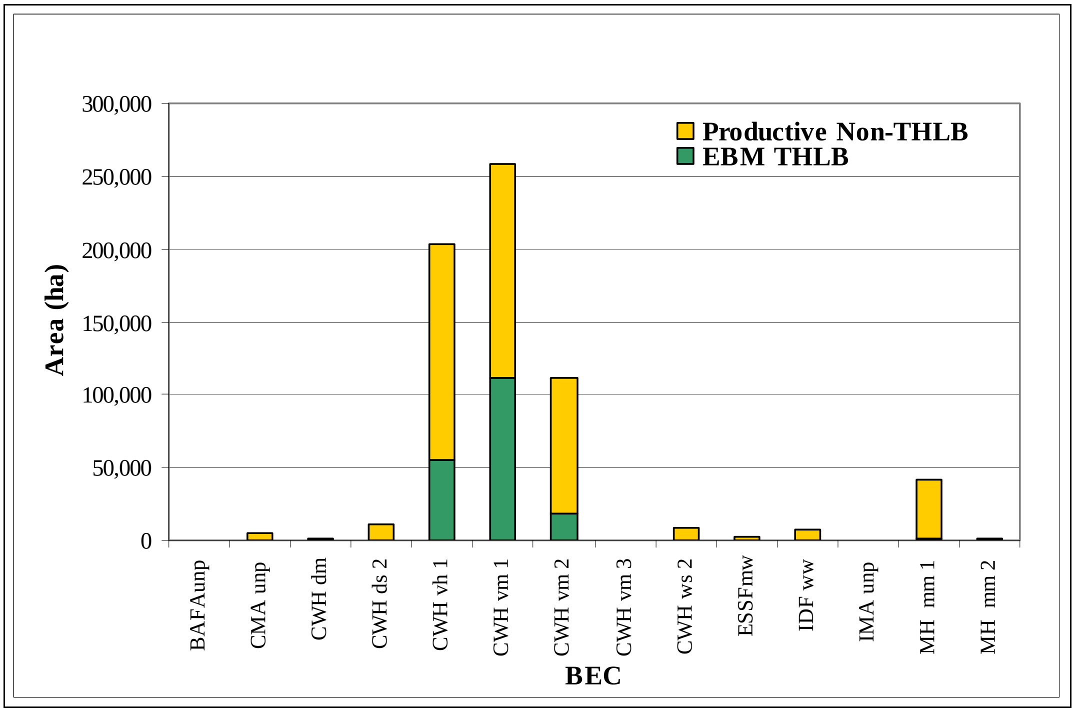

Figure 4.3 – Productive area by BEC sub zone and variant

Over 85% of the productive land (THLB and Non-THLB combined) is found in the CWH very wet maritime and hyper maritime sub zones. A small component, 6%, is classified as MH moist maritime sub zone, although the portion found in the THLB is less than 1% of the total THLB. The vast majority, 99%, of the THLB is classified as CWH very wet. All productive land is available to satisfy many of the non-timber resources modeled in the analysis including old growth, site series surrogates, wildlife habitat and riparian. Many of the forest cover requirements are assigned based on BEC classification; therefore both the THLB and non-THLB components are provided in Figure 4.3.

Forest stands are generally categorized by leading species. The distribution of the timber harvesting land base area by leading species and age class is shown in Figure 4.4. Age class definitions are as follows:

- Immature 0 – 25 years;
- Thrifty 26 – 140 years;
- Mature 141 – 250 years; and
- Old 251+ years.

Species composition is important for harvest planning purposes. In timber supply modelling, the species profile is monitored from the periodic harvest totals. The species profile on the non-THLB does not play as significant a role. Therefore only the THLB is presented in Figure 4.4.

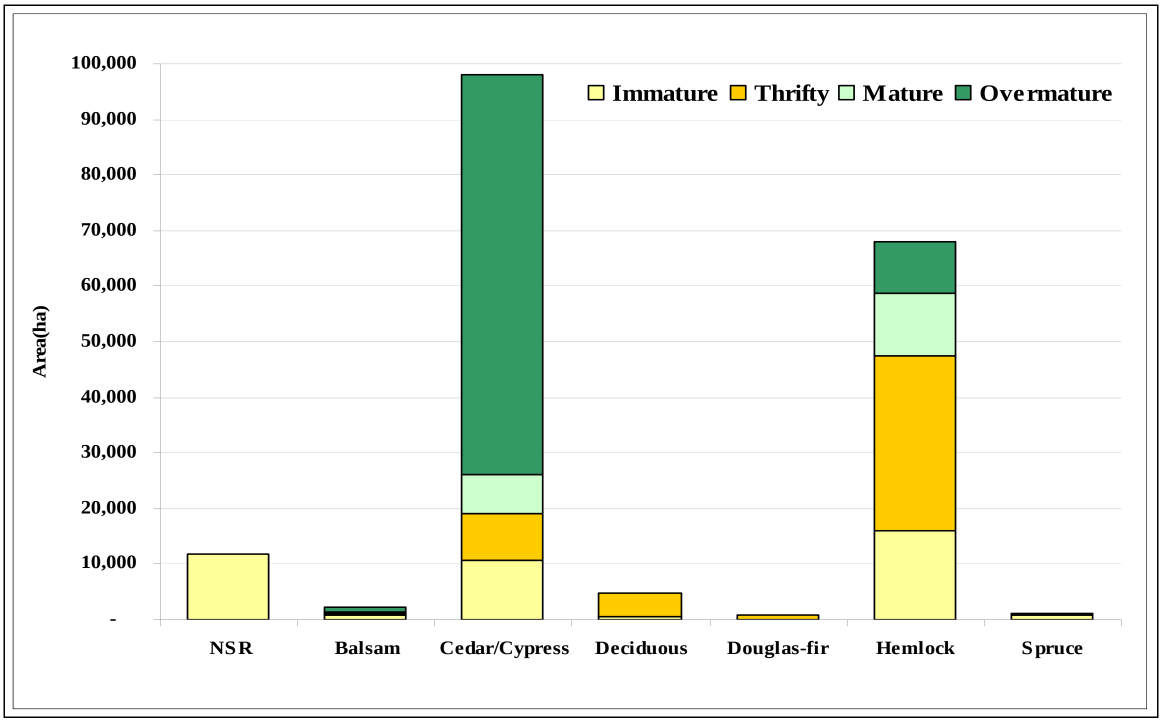

Figure 4.4 – THLB by leading species and age class

Approximately 90% of the forest within the Kingcome TSA THLB is occupied by cedar/cypress-leading (54%) and hemlock-leading (36%) stands. The largest single category is old cedar/cypress, representing 38% of the THLB. Although 45% of the land base is covered by stands currently in the immature and thrifty age classes, the actual age when these stands will become available for harvest will influence the timber supply in the next 50 to 70 years. Mature and old stands represent 54% of the THLB. However, while these stands may be old enough to harvest now, they must also contribute to non-timber resource objectives, which can limit their availability.

NSR is a combination of recent harvesting plus sites that were missing forest cover information or had questionable VRI attributes. The amount of area that is current NSR is approximately 3,500 hectares.

4.4 Inventory Aggregation

As part of the modelling process stands are aggregated for many purposes. They are grouped in order to represent areas designated for special management considerations and they are also aggregated to model stands with similar growth patterns.

4.4.1 Landscape Units

For planning purposes, the Kingcome TSA has been subdivided into 46 landscape units. For the CCLUD region of the TSA these are used to model landscape level biodiversity objectives described in the South Central Coast Order. Within a single landscape unit there are dozens of old seral forest targets that must be met to address the objective. For the Vancouver Island component of the TSA the non spatial old growth order targets are applied. The *Data Package* has a full list of all landscape unit-BEC and landscape unit-site series surrogates modeled in the analysis.

4.4.2 Resource Emphasis Areas

The productive land base was assigned to resource emphasis areas (REAs) to facilitate the modelling of management requirements. Each is described in the sections that follow. Additional information is also included in the *Kingcome Timber Supply Area TSR3 Data Package*, Section 6. Table 4.3 summarizes the area of the REA types modelled in the Kingcome TSR3 analysis.

Table 4.3 – Areas by REA Type

REA Type	Productive Area (ha)	THLB (ha)
Enhanced Forestry	32,724	12,406
Special Management	21,405	6,675
Visual Quality – Preservation (VAC Low)	23	0
Visual Quality – Preservation (VAC Mod)	3,563	692
Visual Quality – Preservation (VAC High)	907	39
Visual Quality – Retention (VAC Low)	817	380
Visual Quality – Retention (VAC Mod)	11,515	3,600
Visual Quality – Retention (VAC High)	1,418	209
Visual Quality – Partial Retention (VAC Low)	4,753	2,113
Visual Quality – Partial Retention (VAC Mod)	53,210	25,633
Visual Quality – Partial Retention (VAC High)	6,785	3,587
Visual Quality – Modification (VAC Mod)	4,108	2,068
Visual Quality – Modification (VAC High)	1,880	1,054
Community Watershed	3,994	731
IRM	528,995	135,132
Marbled Murrelet	150,953	66,955
EBM Objective 8 (fisheries, watersheds)	162,192	36,101
EBM Objective 12 (upland streams)	137,859	31,638

Note that marbled murrelet is shown for summary purposes only and no specific forest cover constraints for this species were assigned in the analysis.

4.4.2.1 Visual Quality and Integrated Resource Management

In the Kingcome TSA, polygonal-based visual quality objective (VQO) zones[9] are incorporated into the analysis as REAs. VQOs comprise 88,977 productive hectares, of which 39,376 ha fall within the THLB. Both THLB and productive non-contributing land contribute to the management requirements within the VQO polygon. For modelling purposes, visual polygons are assessed for both VQO and visual absorption capacity (VAC).

Twenty-five percent of the productive land base falls within VQO REAs. However, a large proportion of each REA is found in the non-THLB. This is relevant because the non-THLB can contribute to fulfilling the management requirements for each VQO REA, thereby reducing the pressure on the THLB.

Any area within the THLB that is not classified as visually sensitive was assigned to the integrated resource management (IRM) REA. These areas may be non-visible or visible but are not considered to be visually significant, and therefore have fewer restrictions on harvesting. For modelling purposes the IRM areas were aggregated within each landscape unit, resulting in 46 discreet units. Within this area a general 3-meter green-up requirement was applied to the mainland portion of the land base.

4.4.2.2 Vancouver Island Land Use Plan

The Vancouver Island Land Use Plan (VILUP) includes five Enhanced Forestry Zones (EFZ) and four special management zone designations in the Kingcome TSA. EFZ's are designed to increase the short term availability of timber by applying a 1.3-meter green-up constraint, down from 3 meters. Special Management Zones (SMZ) are designed to maintain mature and old forest conditions to zone specific targets. For green-up in SMZs the 3-meter green up constraint is applied.

4.4.2.3 Community Watersheds

REAs have also been defined for community watersheds Three community watersheds are present within the Kingcome TSA, although only one has any THLB, 760 ha, within its boundary. In community watersheds with a THLB component a maximum of 1% of the area is permitted to be below the green up height each year. To model this constraint a 5% per 5-year period is applied.

4.4.2.4 Marbled Murrelet Nesting Habitat

In order to evaluate how much suitable habitat remains in the non-contributing land base the TSR 3 analysis incorporates coarse scale mapping of potential suitable marbled murrelet nesting habitat. Habitat mapping data was based on application of the BC Coast Marbled Murrelet Suitability Model (Chatwin and Mather, 2007). The model was used in that study to estimate the distribution of existing habitat. It was considered a strategic level assessment, and was not supplemented with any photo mapping or low level reconnaissance. The mapping did not consider classes of habitat quality, and stand attributes such as canopy structure and site productivity were not considered. Further, the data used was only current to TSR 2, and therefore the results are somewhat dated.

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[9] VQO polygons used are those identified in the Visual Quality Objective Order issued by Charles van Hemmen, District Manager, North Island Central Coast Forest District – August 19, 2005

The March 2006 Notice under Section 7(2) of the FPPR for the North Island Central Coast Forest District requires that the total amount of currently suitable nesting habitat for marbled murrelet in the non-contributing land base (as of March 2006) be maintained. This amounts to 83,998 ha of productive non-THLB.

4.4.3 EBM Management Zones

In addition to the Pre-EBM management zones described in Section 4.4.2, the following management zones have been applied to address EBM Objectives:

- Objective 8 – important fisheries watersheds;
- Objective 12 – upland streams; and
- Objective 14 – landscape level biodiversity using landscape units and site series surrogates (a complete list is provided in Appendices I and IV).

These management constraints are in addition to the land base reductions and additional yield tables modeled to address EBM objectives.

4.4.4 Analysis Units

The inventory was aggregated into analysis units (AU) to capture biological and productivity similarities for modelling purposes. The definition of analysis units originated from the Kingcome TSA TSR2 analysis, with modifications after a series of TSA licensee and MFR regional and district reviews. Changes from TSR2 include:

- New aspen/cottonwood (Act) analysis unit, to incorporate all Act leading stands in the inventory.
- New Fdc planted zone, used to convert existing analysis units to a future regime planted to Fdc.
- New marginal cedar and hemlock analysis units added to separate low site conditions.
- Analysis units divided by EBM management zone, to provide for subsequent flexibility with different yield table generation parameters under EBM management scenarios.

(1)Fdc is being planted as a leading component in the southern most part of the TSA and on south facing slopes, warranting its inclusion as part of the analysis unit definition. Interfor spatially identified these areas on a map to define the Fdc planted zone. Modelling assumptions within this Fdc planted zone were subsequently clarified with MFR and Interfor, and it was agreed that all existing non-Fdc leading stands inside the Fdc planted zone would be directed to a future planted Fdc managed stand yield table (MSYT).

4.5 Growth and Yield

Forest growth and yield refers to the prediction of the growth and development of individual stands over time. Stand growth in terms of height, diameter, and volume is projected over time through the use of yield models. Yield tables were categorized as either natural stands or managed stands because of distinct management regimes and growth pattern differences between the two types of stands. Existing natural and managed stands were also differentiated based on stand age. The parameters used to define the yield table inputs were identified in the accepted Kingcome Timber Supply Analysis Data Package.

4.5.1 Natural Stands

Natural stand yield tables (NSYTs) were developed for those analysis units which were established naturally and have not been influenced by management (improved seedlings, stocking control, fertilization, *etc*.) since establishment. Inputs into the yield tables included inventory site index, species composition, stocking class, and crown closure. Phase 2 adjusted age and height attributes were used as inputs to the natural stand yield tables, and the volume adjustment factor (also included in the inventory) was used as a multiplier to all natural stand yield tables.

Individual NSYTs were generated for all existing natural stands by forest cover polygon, and then aggregated by analysis unit. For the Cottonwood leading (Act) analysis unit, VDYP version 7 for the NSYT was approved by the MFR. [10]

4.5.2 Managed Stands

Managed stand yield tables (MSYTs) were developed for existing and future managed stands as outlined in the Data Package. Inputs included species composition from the inventory (compiled by analysis unit), silviculture regimes by analysis unit, and adjusted site index estimates from the inventory. The yield tables were developed using the MFR BatchTIPSY (version 4.1c) program for managed stands.

4.5.3 Harvest System

Clearcutting with retention was assumed to be the predominant harvesting system. Reductions were applied to yield curves to account for trees left to meet wildlife tree requirements. Additional reductions were applied to both the land base and yield curves for those stands growing in the EBM areas to account for the higher retention levels that are required to meet various EBM objectives.

4.5.4 Minimum Harvest Age

A minimum harvest age (MHA) is developed for each analysis unit based on the criteria described below. An AU is first harvestable when it meets the greater of either of the following criteria:

- Minimum volume of 350 m^3/hectare for cedar-leading, 500 m^3/hectare for other coniferous-leading or 250 m^3/hectare for deciduous-leading; or
- 95% of culmination mean annual increment (CMAI).

In most cases the minimum volume threshold was the limiting factor in setting minimum harvest age.

4.5.5 Productivity

The rate at which a stand grows is determined by the underlying site productivity, and the chosen stand management regime. The productivity of a stand is measured based on site index. The inventory site index from the forest cover database was used to develop yield tables for all existing stands.

Figure 4.5 shows the distribution of inventory stand site index classes for the THLB by leading species group.

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[10] VDYP version 7 was used for the cottonwood (Act) analysis unit with the approval of J. Brown, MFR. This same NSYT was used for both current and future analysis units.

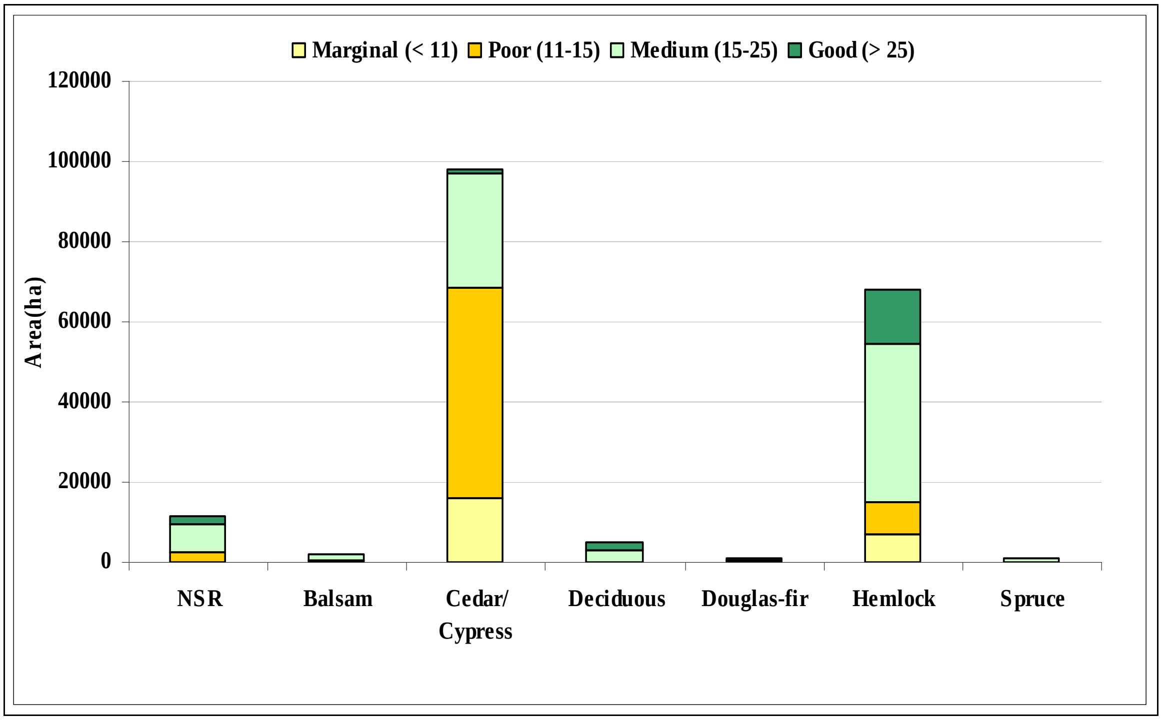


Figure 4.5 – Inventory site index distribution

Based on the inventory site index values, 43% of the THLB is classified as medium, 35% is poor and approximately 11% is in each of marginal and good. Many of the existing stands are old and site index values are likely underestimated. Using the inventory site index information to develop future managed stands leads to volume estimates well below what is achieved on the ground. For this reason, a site index adjustment project has been completed for the Kingcome TSA, which has a large component of old timber. Adjusted site indices were used to build yield curves for future managed stands.

The derivation of adjusted site indices is described in the report *Site Index Adjustment of the Kingcome Timber Supply Area* (Timberline, 2007a). As explained in this report, and approved for use in TSRs by the MFR, a biophysical modelling approach is applied to better predict site index estimates in old growth stands. The steps in this modelling process are:

1) Develop a predictive site productivity model (i.e., the biophysical model) across the entire range of growing conditions on the TSA.
2) Attach predicted site productivity estimates to the model, using ground information and expert opinion on expected productivity trends within the TSA.
3) Complete ground sampling at random points within randomly selected second growth stands to measure the actual productivity.
4) Statistically adjust the preliminary site productivity estimates using the results of the plot data from the random points.
5) Apply the statistical adjustment results across the targeted area within the TSA.

The biophysical model predicts site productivity trends across the entire productivity range within the TSA and is the platform for applying the final results into the timber supply analysis. The ground sampling program was targeted to polygons that generally have a previous harvest history (20 to 80 years). While it could be argued that the ground estimates are derived from more productive areas, the risk is minimized if the biophysical model well predicts productivity across the range of growing conditions and that the relationships between the predicted and observed are consistent across the range of growing conditions. To support this, a series of comparisons were made to ensure that the area sampled well reflects the area to which the results will be applied.

It is also important to note that productivity has not changed as a result of management practices, simply that the Vegetation Resources Inventory (VRI) site index estimates do not reasonably state the expected productivity of these sites.

Figure 4.6 shows the distribution of adjusted stand site index classes for the THLB.

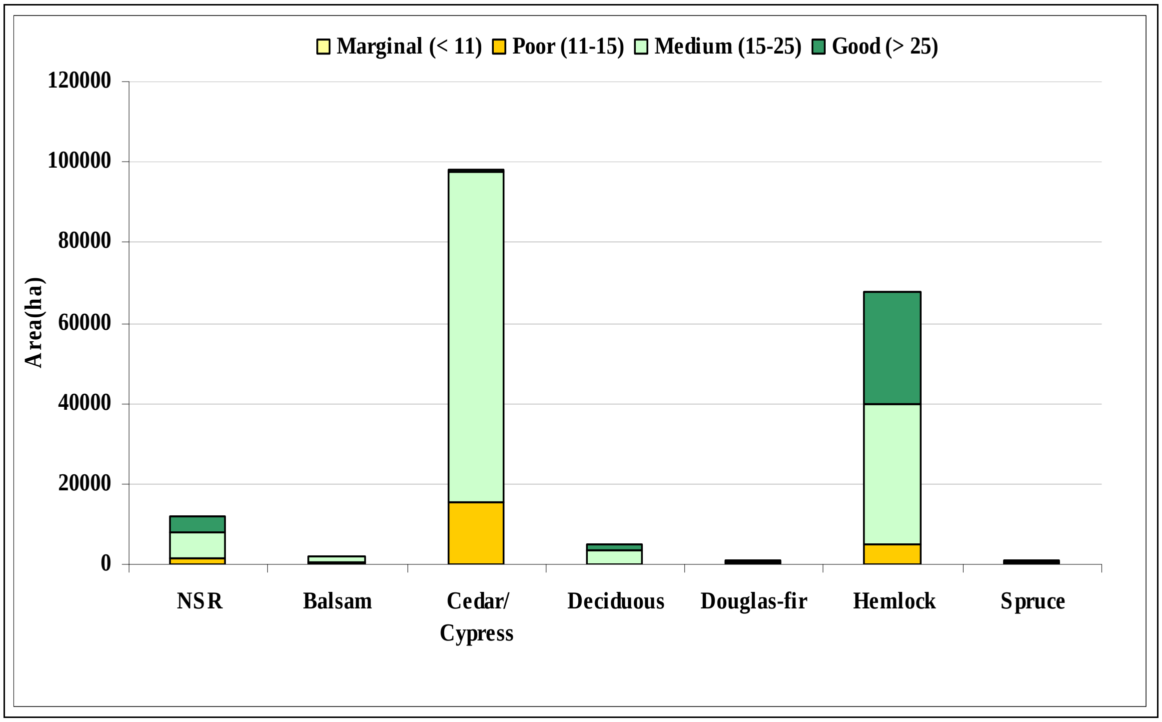


Figure 4.6 – Adjusted site index distribution

There is a considerable shift in site index with the adjusted values. There are virtually no marginal sites, and the medium class has increased to 70% of the land base, a large portion of which was previously classified as poor, which now represents 12% of the land base. Good sites have doubled to approximately 19% of the THLB. Using these adjusted site index values the managed stand yield estimates will more closely represent the actual site productivity and volumes will be significantly higher than managed stands estimated with the inventory site index. This is a critical issue with respect to estimating the long-term timber supply.

5.0 TIMBER SUPPLY ANALYSIS METHODS

Timberline's simulation model CASH6 (*Critical Analysis by Simulation of Harvesting*) has been used to develop harvest schedules integrating all resource management considerations. The model, which has been used for numerous timber supply reviews, Innovative Forest Practices Agreement, and land use planning analyses, has been accepted for use in timber supply by the MFR. The model uses a geographic approach to land base and inventory in order to adhere as closely as possible to the intent of forest cover constraints on harvesting. Maximum disturbance and minimum forest cover retention requirements are explicitly implemented.

A variable degree of spatial resolution is available including block-to-block adjacency, depending on inventory formulation and resource emphasis area definitions. Forest stands in refuges such as environmentally sensitive and inoperable areas that do not contribute to the periodic harvest are nonetheless included for their contribution to forest structure at both the stand and landscape levels.

In their current implementation, forest cover objectives require a control area over which to operate. The control area for a constraint set should correspond to a realistic element in the landscape. For example, the requirements associated with visual quality objectives are designed to operate on the scene visible from discrete sets of viewpoints. In aspatial mode, pseudo-geography may be employed to translate spatial constraints on harvesting into forest cover and static access constraints. The objective is to identify the "natural" constituency for forest cover constraints. Numerous levels of land aggregation are used to define both geographically separate areas and areas of similar management regime.

The use of forest cover objectives improves forest management modelling by ensuring that non-timber resources are given appropriate consideration. Cover constraints are applied at different levels of spatial resolution depending on the management zone, or resource emphasis area, in question.

Forest cover objectives place maximum and/or minimum limits on the amount of young, mature and/or old growth found in land base aggregates such as combinations of landscape units and ecosystem units or resource emphasis areas. CASH6 defines the following three classes of forest cover constraints for modelling management objectives within each land base aggregate.

1. Disturbance: the maximum area that can be younger than a specified age or shorter than a specified height. This is intended to model cutblock adjacency and green-up requirements.
2. Old-growth Retention: the minimum area that must be older than, or as old as, a specified age. This is intended to model both retention of cover and retention of old growth.
3. Mature Retention: the minimum proportion of area that must be retained over a lower retention age. This is intended to model thermal cover for wildlife or mature biodiversity requirements. Mature and old growth retention forest cover objectives may overlap and area that qualifies for both is counted in both.

6.0 BASE CASE TIMBER SUPPLY ANALYSIS RESULTS

This section summarizes the results of the base case timber supply analysis and the associated sensitivity runs.

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

The harvesting rule employed was ‘relative oldest first’. Alternative harvest rules are considered in the sensitivity analyses.

6.1 Base Case Alternative Harvest Flow

Table 6.1 summarizes the annual harvest for a number of alternative flows including two requested by MFR regional staff and the related flows used to draft these flow scenarios. Each of these were evaluated prior to establishing the base case and described in the sections which follow. The Pre-EBM scenario is included here in the table for reference and discussed in further detail in section 7.1. Note that all harvest levels are net of non-recoverable losses of 13,600 m^3/year and “harvest” (disturbance) in the inoperable forest.

Table 6.1 – Base Case alternative harvest flow scenarios

Period	Annual Harvest by Scenario (m^3/year)					
	Base Case	Natural Stand LRSY Midterm	Non-declining	**Split ND & Natural Stand Mid-Term LRSY	**Period 1 10% below Base Case	Pre EBM
1	1,175,500	1,194,000	799,500	1,149,500	1,056,500	1,398,700
2	1,056,500	1,073,200	799,500	1,033,100	949,400	1,293,300
3	949,400	964,400	799,500	928,300	852,900	1,167,100
4	852,900	866,400	799,500	834,000	769,100	1,051,600
5	766,100	778,400	799,500	749,200	769,100	947,800
6	728,400	699,100	799,500	744,500	769,100	853,600
7 - 14	728,400	689,500	799,500	744,500	769,100	815,200
15 - 25	936,200	962,200	910,500	928,200	925,700	1,107,500

**Scenario requested by Ministry Regional staff

The Base Case for this analysis begins with a harvest volume of 1,175,500 m^3/year. This initial harvest level realizes a 16% “EBM impact” measured against both TSR1 and the Pre-EBM scenario. In other words the harvest could be increased by 16% in the absence of EBM specific management constraints. Measured from the original TSR 2 determination (1,284,000 m^3/year) the reduction proposed is an incremental 6%. Over the next four periods declines are 10% per decade followed by a 5% drop in period 6 to the mid-term harvest of 728,400 m^3/year. Based on a review of possible harvest options this initial harvest rate and associated harvest schedule in subsequent periods represent a good balance between short, mid and long-term harvest objectives. Other scenarios will demonstrate that constraining the harvest can limit the productive capacity of the land base.

The base case forecast illustrates the incremental impact of incorporating all the elements of EBM since the 1996 determination of 1,399,000 m^3/year, representing a 16% impact overall. More conservative approaches carry with them substantial declines in short-term harvest levels while offering little gain in the mid term and result in poorer overall performance in the long term. The most notable distinction between these scenarios is that the Base Case, which represents a small incremental decrease from the current AAC of 1,232,000 m^3/year, continues to provide volume to meet harvesting requirements while simultaneously addressing the ecological objectives described in the Order.

The following sections summarize the results of the alternative harvest flow scenarios modeled using the base case assumptions.

6.1.1 Natural Stand Mid-Term LRSY

In this scenario the natural stand long-run sustained yield (LRSY) is used as the lower bound on the mid term harvest level. Setting the first decade harvest at the proposed AAC for the TSA the cut is held as high as possible while not breaking the lower bound at any point. It is possible to increase the decade one harvest level in this scenario, but in order to best evaluate the implications on the mid and long term this approach was not pursued. With this scenario it is necessary to harvest at the natural stand LRSY for seven decades, after which the harvest climbs to sustainable long-term level of 962,200 m^3/year. This scenario posts the highest long-term harvest rate because it is the most aggressive scenario over the short term, converting unmanaged stands to managed stands much faster in the first six decades. This in turn allows the full benefit of forest management on timber supply to be realized.

6.1.2 Non-Declining

The non-declining scenario establishes the maximum sustainable even flow harvest rate possible prior to increasing to the long-term level. In the short and mid term this harvest level is 799,500 m^3/year. During this time there is no additional volume elsewhere that can be harvested without resulting in a drop below this even flow harvest level at some other point in time. The long-term harvest rate achieved in decade 15 is 912,000 m^3/year, 3% lower than the Base Case long-term level. However, in this situation the harvest of unmanaged forest is constrained, and therefore the conversion to managed stands is significantly delayed reducing the full benefit of forest management on growth and yield.

6.1.3 Split Non-Declining (ND) & Natural Stand LRSY

To explore harvest flow dynamics this scenario was conducted to evaluate the impact of increasing the mid-term harvest level. In this case the mid-term lower bound was set at the midpoint between the natural stand LRSY and the non-declining level established in the scenario above. This results in a mid-term harvest level of 744,500 m^3/year which is 2.2% higher than the lowest harvest level in the Base Case. This 2.2% improvement is achieved at a cost. The short-term harvest must be decreased in all periods to accommodate this shift. The first period reduction required to accommodate this approach is 2.3%. In addition to this early decline, the long-term harvest level is also depressed because this scenario delays the harvest of slower growing unmanaged stands thus impeding the full realization of forest management on growth and yield.

6.1.4 Period 1, 10% Below Base Case

In this simulation the initial harvest level is reduced by 10% from the Base Case to evaluate the impact on the mid-term harvest level. During the first 40 years the harvest rate is 10% below that of the Base Case. After 40 years the mid-term level is 5.3% higher than noted in the Base Case for several decades. However, the long-term harvest level for the Base Case is 1% higher than in this scenario. Overall the total harvest volume is approximately 1% less than that achieved in the Base Case. Again this occurs because the initial reduced rate scenario delays the conversion of slow-growing unmanaged to more productive managed stands.

Figure 6.1 displays the alternative harvest flow patterns for the base case, including the TSR2 Base Case, in graphic form.

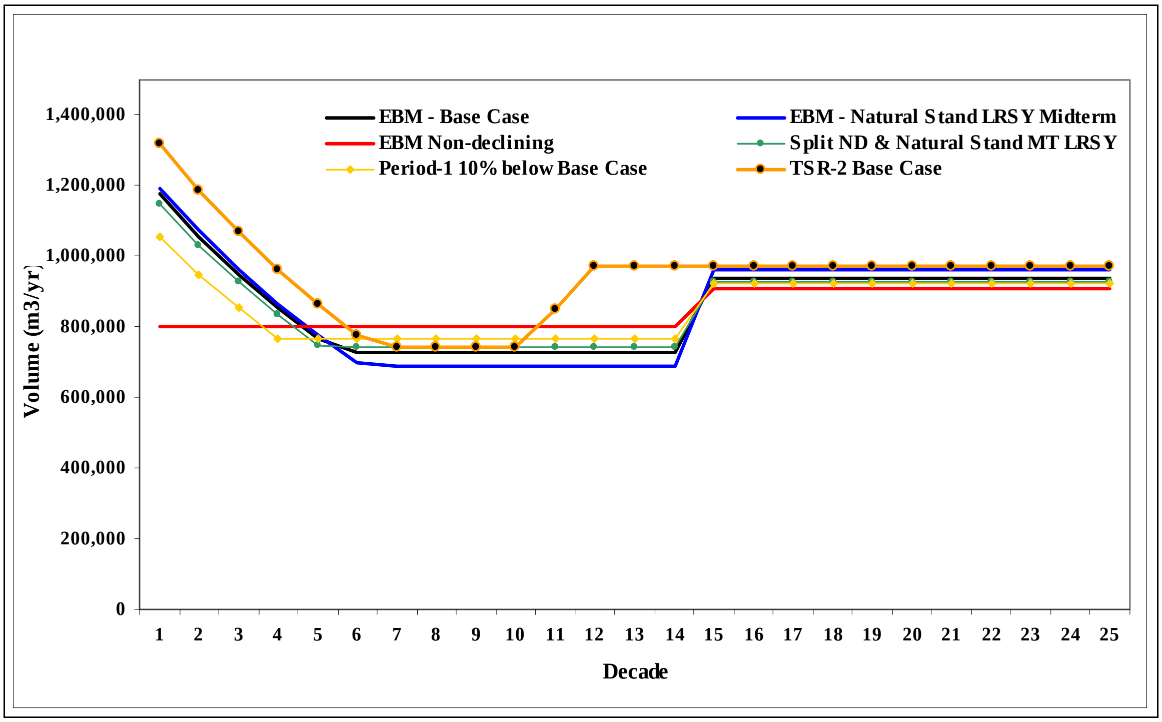


Figure 6.1 – Base Case alternative harvest flow

6.2 Harvest Characteristics

Figure 6.2 shows the growing stock for each 10-year period of the 250-year planning horizon.

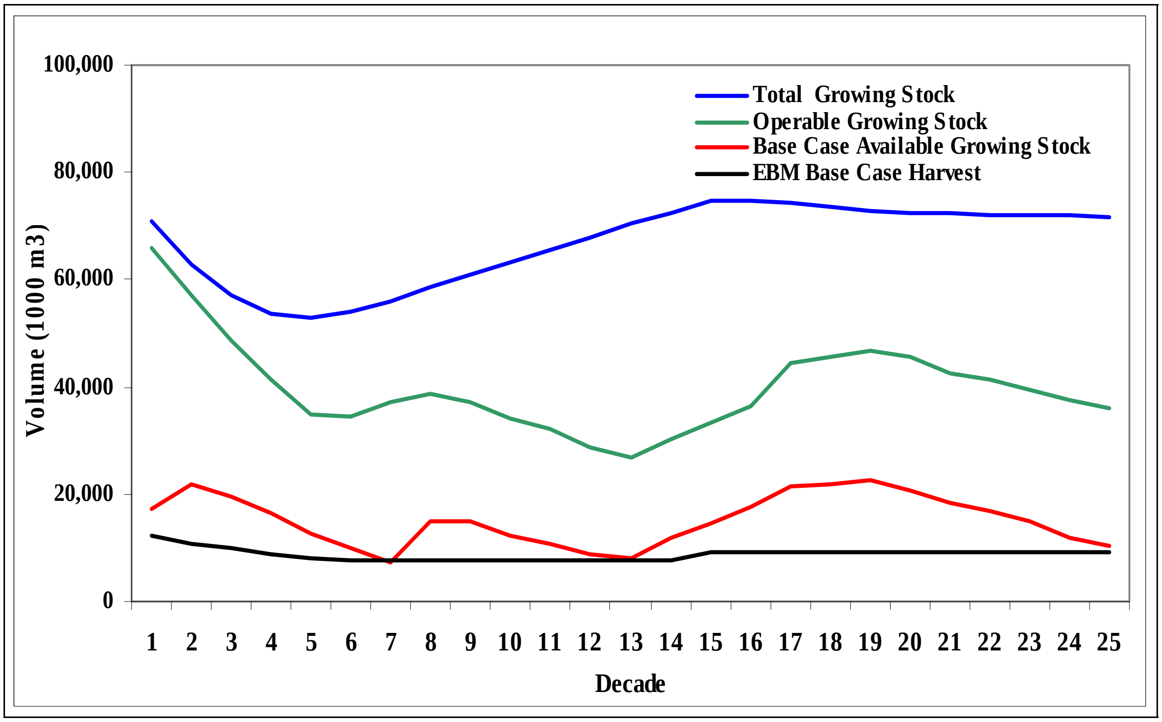


Figure 6.2 – Base Case growing stock

As shown in Figure 6.2, the total growing stock declines over the first 70 years as existing natural stands, which are typically older and have higher volumes per hectare, are harvested and replaced with managed stands. There is a gradual increase in total volume as these managed stands grow to maturity. Also, there is a significant amount of mature timber within the THLB being held in reserves to address non-timber resource values.

Operable growing stock, which includes stands that are older than minimum harvest age, declines for 60 years and then stabilizes with periodic fluctuations over the remainder of the planning horizon. This reflects the current age class distribution and the schedule of stands that are selected for harvest by the model over time.

Most important is the availability over time. There are critical minimum points in availability noted at years 70, 130 and 250 of the planning horizon, and these dictate the short, mid-term, and long-term harvest levels respectively.

The distribution of age classes (in 10s) at selected times during the planning horizon is presented in Figure 6.3.

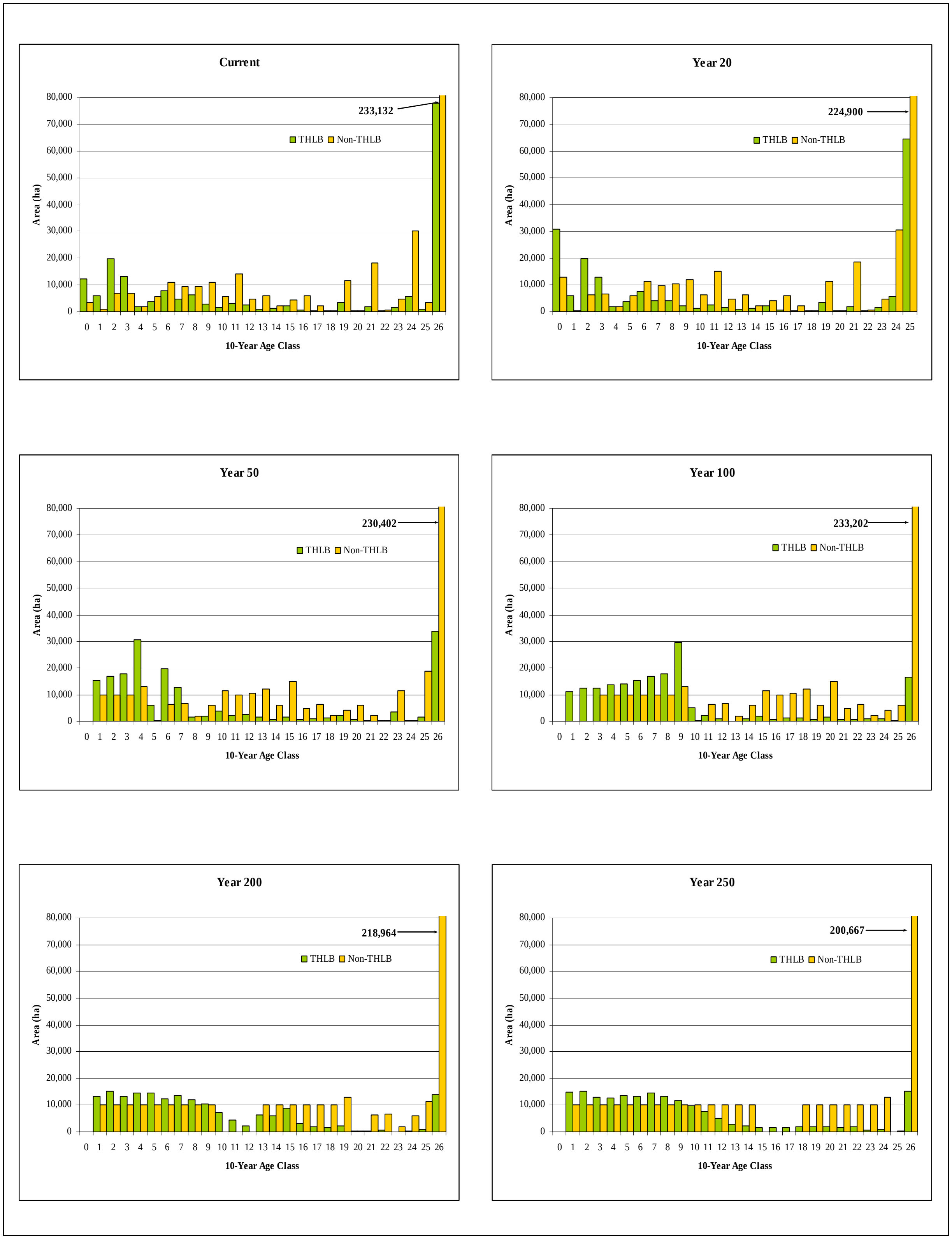


Figure 6.3 – Age class distribution at selected periods

Currently a large component, 43%, of the THLB is found mainly in over mature stands, with approximately 28% in stands younger than 31 years of age. The lack of stands in the thrifty and mature age categories, along with the demand for old forest to satisfy non-timber objectives, dictates the harvest rate over the first 70 years. After year 70 a large component of the managed forest reaches minimum harvest age and provides volume for the annual harvest.

At year 100 the forest age class structure becomes more evenly distributed as managed stands are harvested and regenerated on a shorter cycle. Beyond this time, as some area accumulates in the mature age classes, the harvest can be increased to the long-term level.

There is a persistent amount of over mature forest (greater than 250 years) in the THLB beyond year 100 of the simulation. This is the result of stands being placed in reserve to accommodate old forest requirements that cannot otherwise be met by the non-THLB. These stands are often on lower productivity sites and have very long rotation ages. Therefore they are given a lower priority for harvest based on the relative oldest first harvest rule.

Modelling included disturbance in the non-THLB. Therefore a continual progression of young stands is noted in this component of the inventory at each time period represented in Figure 6.3.

The following information summarizes the Base Case harvest by a variety of timber characteristics. Figure 6.4 presents the average volume of stands harvested in each period.

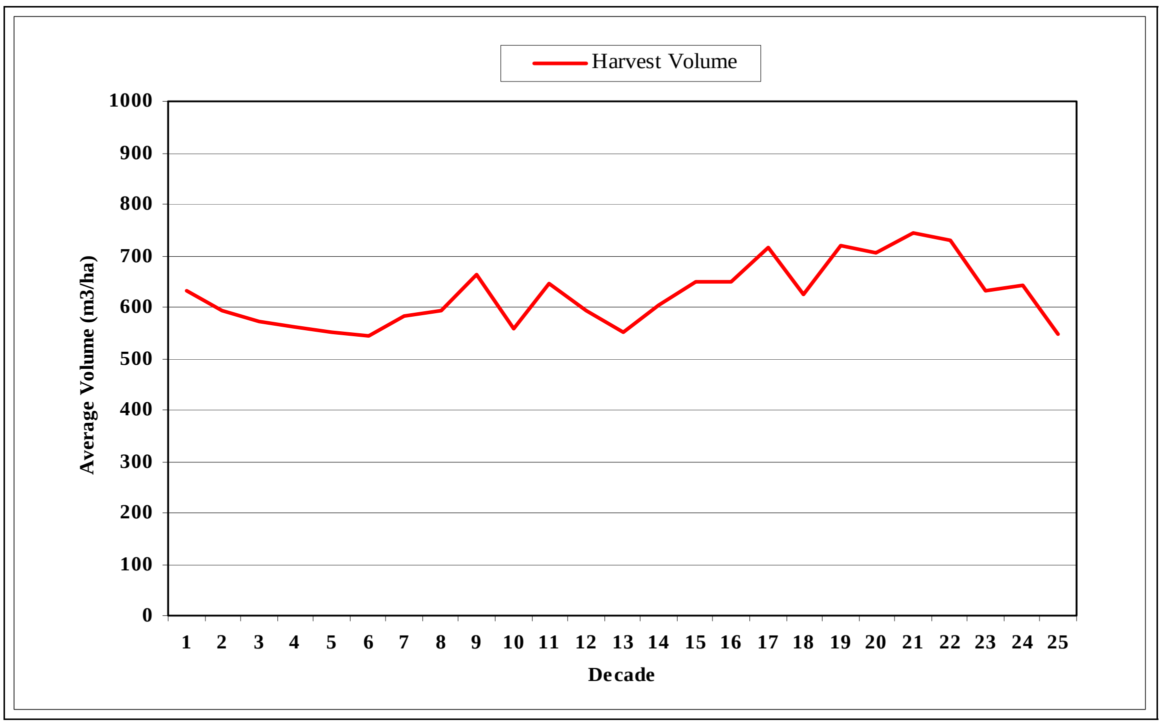


Figure 6.4 – Average harvest volume

Average harvest volume (cubic meters per hectare) shows only moderate fluctuation during the first 160 years. After that time there is a gradual increase as there is a brief contribution from old growth timber, which no longer needs to be reserved to meet non-timber objectives, as well as a slight increase in harvest on the most productive sites (see Figure 6.10). Existing natural stands provide high volume because they have been growing for at least 250 years, whereas the managed stands contribute high volumes in a much shorter time frame due to genetically improved seedlings and density control.

Figure 6.5 shows the area harvested during each period.

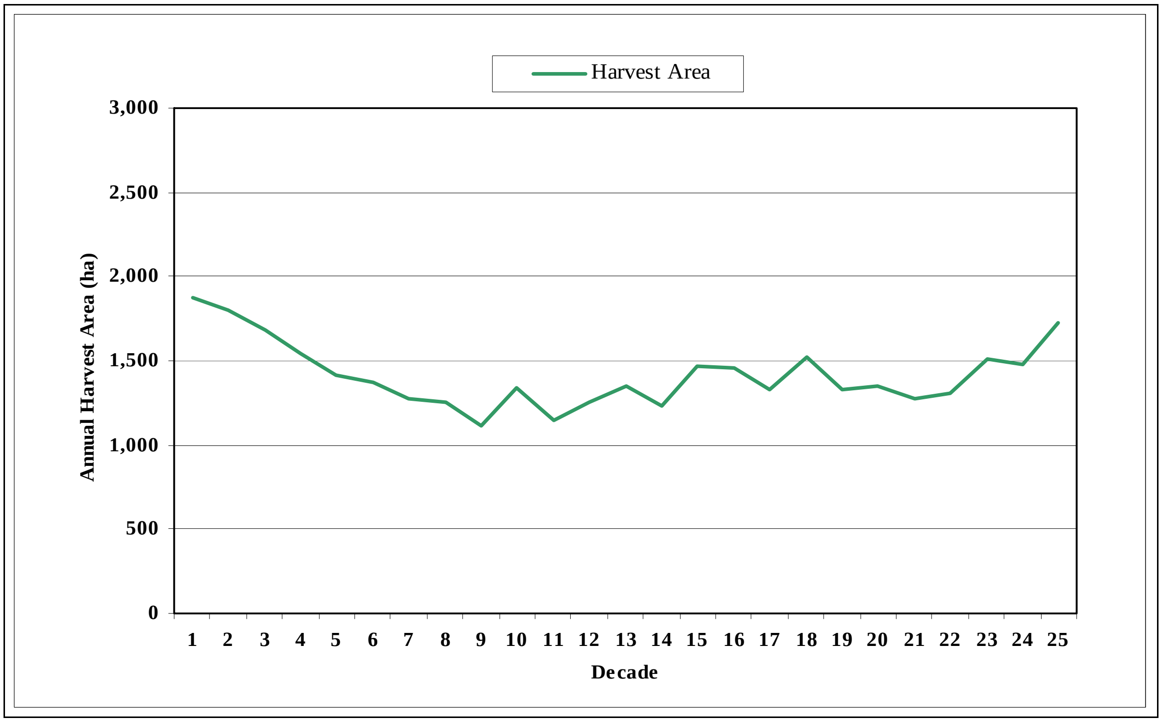


Figure 6.5 – Average harvest area

Area harvested declines during the first 70 years of the planning horizon as the annual harvest drops to the mid-term level. In the long term the area harvested is between approximately 1,275 hectares and 1,730 hectares, based on the volume contribution of each stand selected for harvest. In the final period there is a moderate upward spike in harvest area as the number of poor sites harvested increases with a corresponding decrease in good sites harvested.

Figure 6.6 displays the average age for stands harvested during each period.

Figure 6.6 – Average harvest age

There is a significant decline in average harvest age during the first 80 years of simulation as the number of old stands harvested declines with a corresponding increase in harvest of much younger second growth stands. During the mid and long term, the average harvest age ranges generally from 110 to 150 years. This is older than minimum harvest age of many stands indicating that existing natural (old) stands continue to support the annual harvest, and that many second growth stands are harvested at ages beyond the minimum harvest age.

Figure 6.7 presents the average diameter of stands harvested during each planning period.

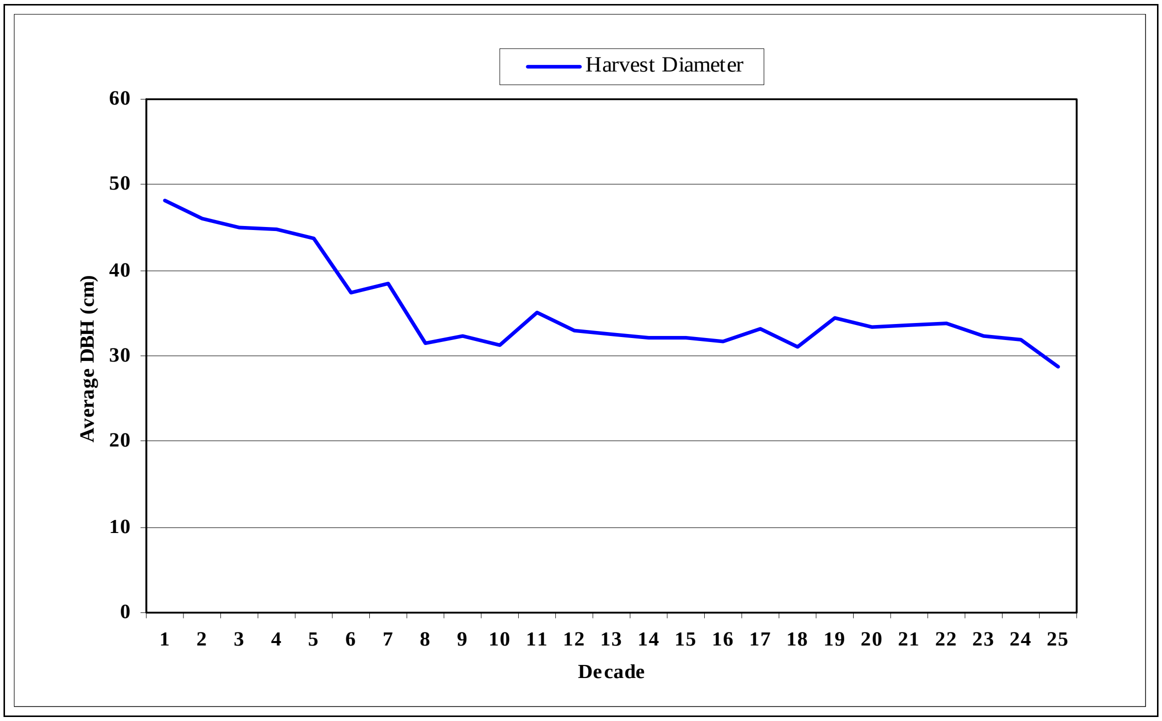


Figure 6.7 – Annual harvest diameter

Initially the average diameter of harvested stands is over 47 centimeters, declining to approximately 32 centimeters during the mid and long-term. Again this is reflective of the gradual decline of harvest in large diameter over mature stands with an increase in harvest of smaller second growth types.

Figure 6.8 displays the periodic harvest by stand type.

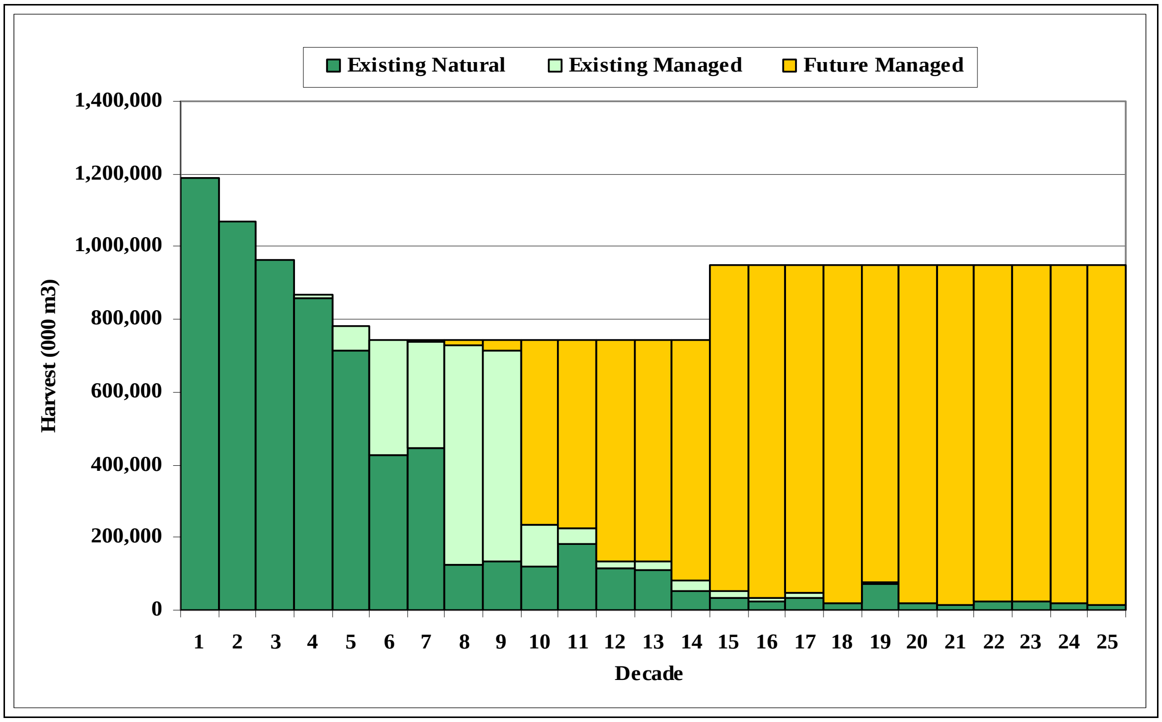


Figure 6.8 – Harvest by stand type

The low point in availability during decade seven (Figure 6.2) corresponds to the transition to harvesting managed stands shown in Figure 6.8. During this period there is insufficient existing managed timber (light green bars) to meet all of the supply requirements. In addition a portion of the existing mature timber (dark green bars) must be retained to satisfy non-timber requirements. In decade eight a large volume of managed timber reaches minimum harvest age and can therefore contribute to the harvest target. These factors, along with the lack of inventory currently 31 – 70 years of age, dictate the potential harvest from the Kingcome TSA during the short and mid term.

In the graphic above existing natural stands include second growth forests established prior to 1970. These stands are not considered managed stands and therefore do not include productivity gains from forest management such as those associated with density control and genetic gain. As a result managed second growth stands (those established after 1970) are not being harvested until the fourth decade. However, a portion of existing second growth stands contribute to the harvest in each decade and are included in the existing natural stand profile.

The minor contribution from existing natural stands (old growth) late in the planning horizon is possible because these stands are no longer needed to satisfy non-timber forest cover objectives.

Figure 6.9 on the following page shows the annual harvest by species over the 250-year planning horizon. The bottom figure represents the harvest volume by leading species from each harvested stand. If a stand is cedar-leading, then all volume from that stand contributes to the cedar volume, regardless of overall species composition. The top is species information based on the actual breakdown for each analysis unit modelled in the analysis. For example, if a species comprised 20% of a given analysis unit it would represent 20% of the harvest whenever that analysis unit is selected for harvest by the model.

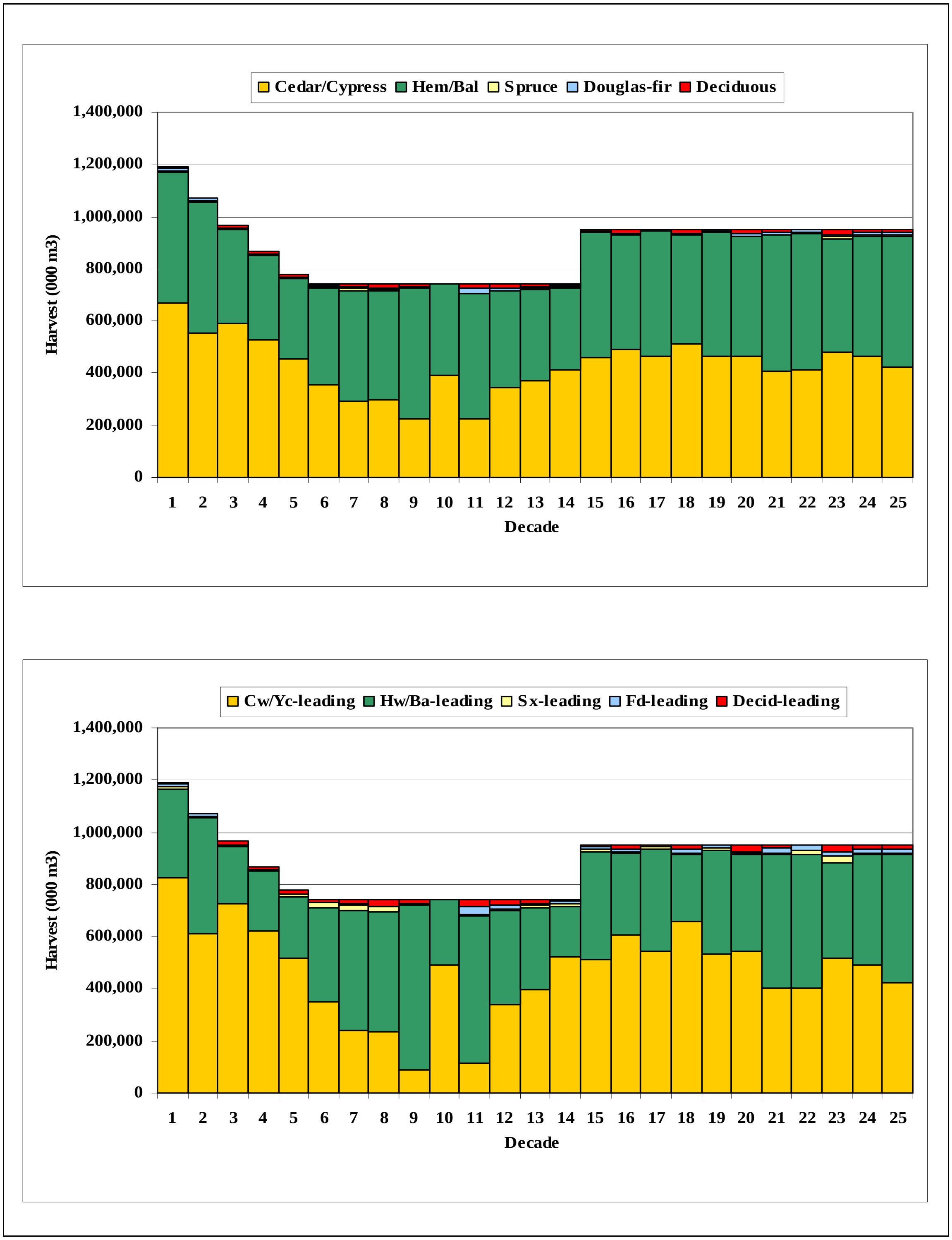


Figure 6.9 – Harvest by species composition and leading species

Given that cedar and hemlock account for approximately 90% of the THLB (see Figure 4.4), these species also dominate the harvest profile with periodic values ranging from 95% to 100% (combined for both species). On average these two species contribute equally to the harvest (47% from each) over the 250-year planning horizon. Deciduous and Douglas-fir each average approximately 1% of the harvest over the 250 years.

The deciduous species group includes alder and cottonwood. Alder accounts for the majority of the deciduous volume, averaging 97% over the planning horizon. Cottonwood contributes an average of 452 m^3/year, with a maximum contribution of 2,200 m^3/year in decade 11.

The alder harvest target of 25,000 m^3/year was provided by the Licensee group. It is important to note that the deciduous harvest is not subject to the EBM rules, and because it was not possible to isolate these areas for modelling, the results of the deciduous harvest estimates are likely underestimated by a considerable amount. Deciduous species are often located in riparian and other sites that are subject to land base withdrawals or limiting forest cover constraints under the new EBM rules. A more realistic estimate of the deciduous harvest can be determined from the Pre-EBM scenario (Section 7.1) because this scenario is based on the land base and management assumptions without EBM rules.

Figure 6.10 shows the annual harvest distribution by site index class.

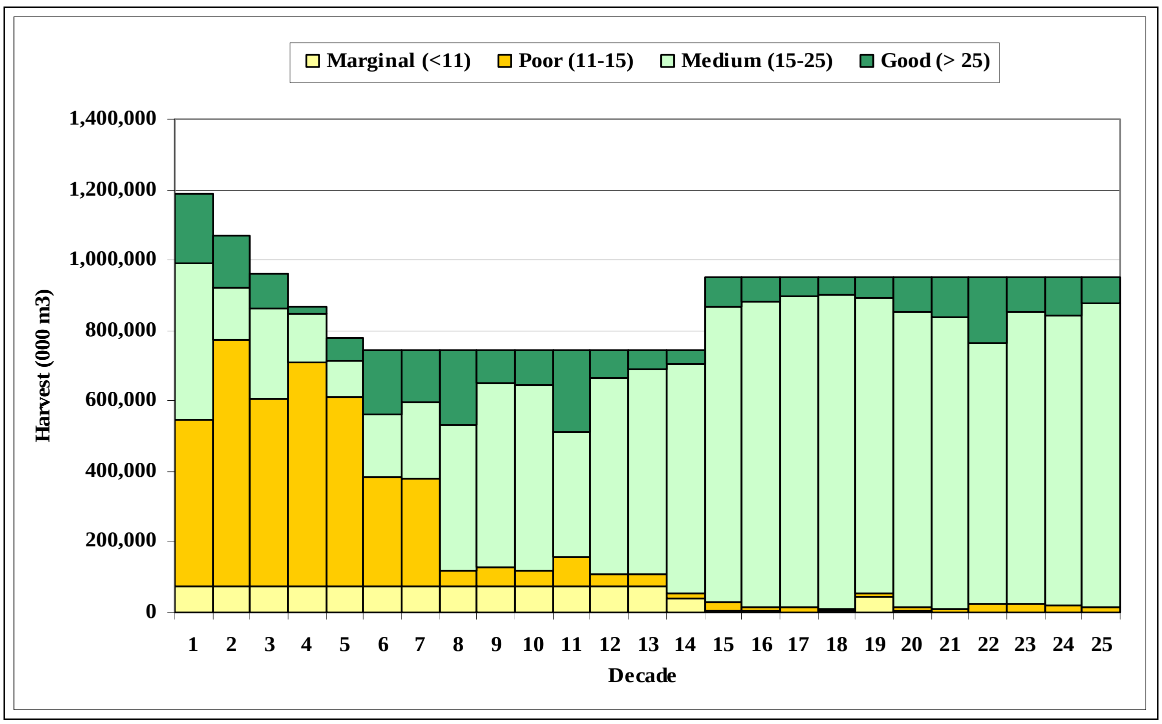


Figure 6.10 – Harvest by site class

The improved site productivity reflected in managed stands is clearly shown in Figure 6.10, as there is a marked increase in medium sites compared with the existing site distribution based on inventory site index (Figure 4.5). Initially, the harvest is provided by equal volumes from poor and medium sites, approximately 39% from each class, with 16% from good and the remaining 6% from marginal sites. Poor sites contribute a maximum of 70% in decades four and five, but decline after that time as stands are harvested and replaced with managed stands which reflect the site index adjustment. In the long-term an average of 90% of the annual harvest is taken from medium sites.

Figure 6.11 displays the annual harvest by specific harvest target groups.

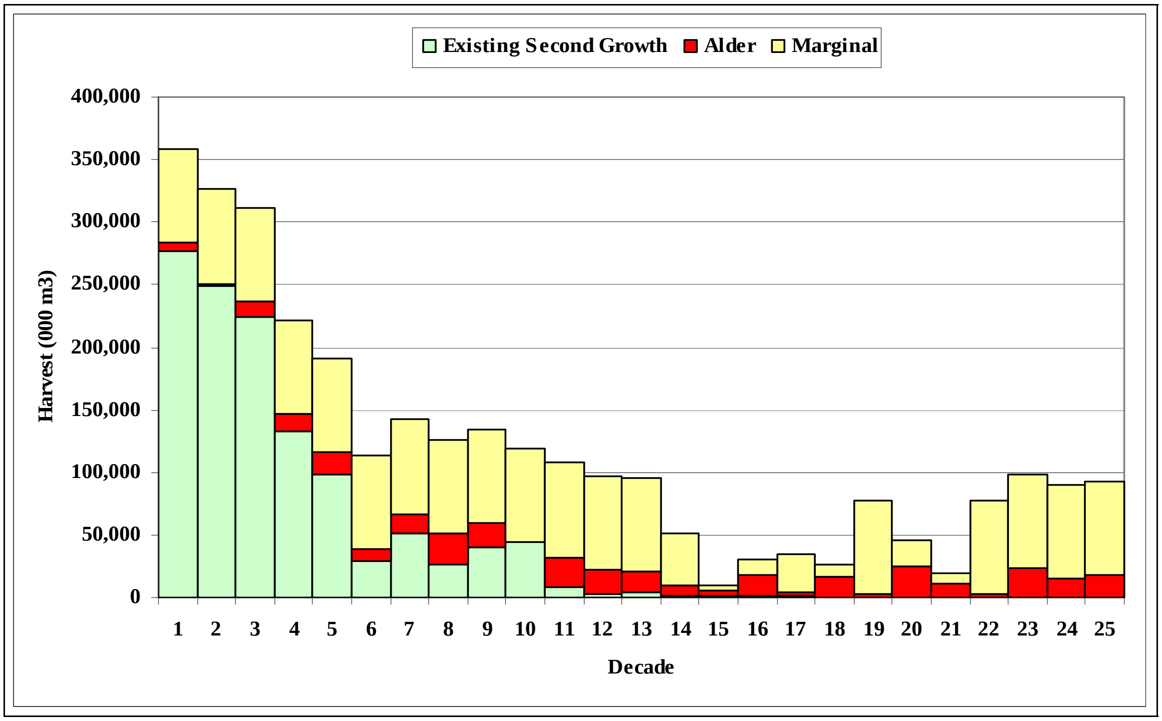


Figure 6.11 – Annual harvest by target groups

The contribution of second growth during the first 50 years follows a similar pattern to the overall harvest flow, with a proportionally declining contribution. Harvest rates now impact the orderliness of the transition to harvesting primarily second growth. If too much is taken early on there will be a shortage of this timber profile later in this 50-year period. In decade five existing managed stands become available for harvest and this supplements the second growth harvest (note, existing managed stands are shown in Figure 6.8).

There is a limit on the harvest from marginal stands, set at 75,000 m^3/year. These stands convert to more productive managed types and are not realistically marginal types in the future.

Alder is limited in availability because of the strict profile requirements of this species group. Beyond age 70, the stands were not considered merchantable and they are not regenerated to younger stands. In addition, the objectives of the Coast Action Plan and Coastal Hardwood Strategy were not included in the analysis. As previously noted, the hardwood tenures are not subject to EBM rules and therefore the alder harvest shown in Figure 6.11 is understated.

Figure 6.12 shows the annual harvest distribution between the EBM (mainland) and non-EBM (Vancouver Island) regions of the Kingcome TSA.

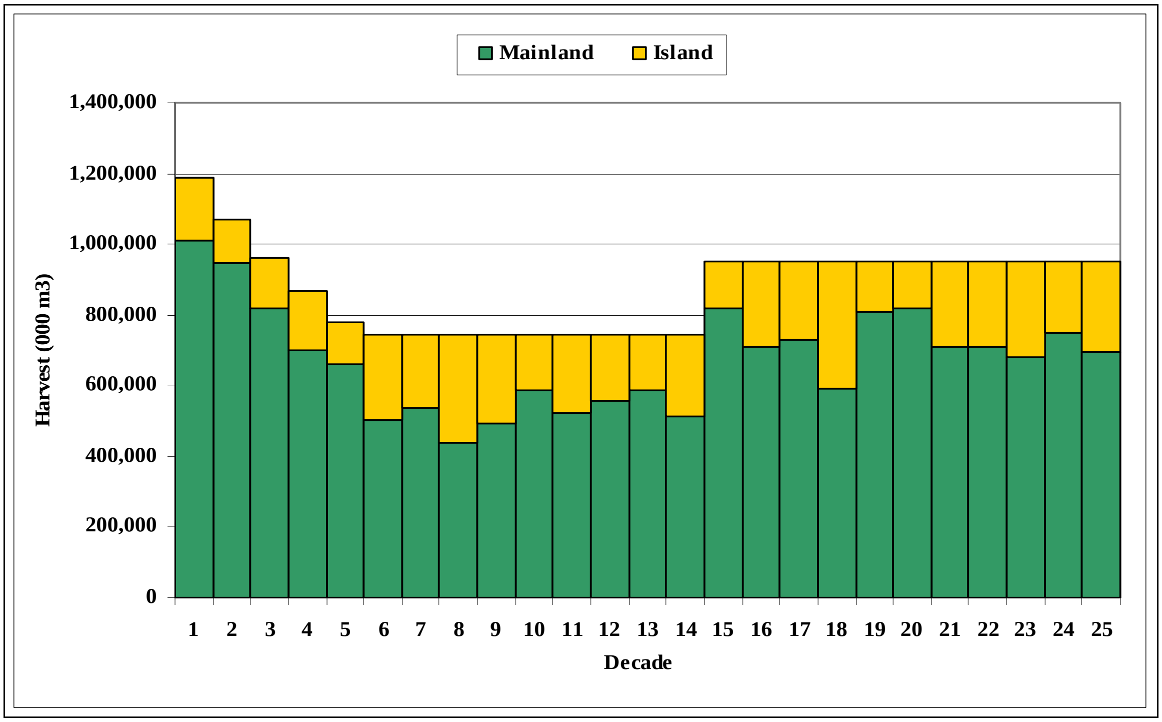


Figure 6.12 – Harvest by TSA region

During the 250-year simulation the mainland contributes 77% of the harvest volume, the remaining 23% provided by Vancouver Island. In the early decades as the harvest declines to the mid term, the mainland provides between 77% and 85% of the harvest. However, after that time there is more deviation away from the overall averages. During the critical phases at decade six and during the mid-term Vancouver Island provides up to 39% of the annual harvest. Similarly, there is higher than average contribution from the Island after the increase to the long-term harvest level. This ability to move the harvest to where timber is available is important to the timber supply, and might be an important factor in future planning for harvest.

6.3 Status of Non-Timber Resources

The following series of figures summarize the state of the forest with respect to non-timber resource objectives. These were addressed in the analysis by imposing forest cover constraints to either limit the total disturbance, or retain mature or old forest. In each figure the maximum disturbance or minimum mature/old forest requirement is provided along with the periodic status of the actual amount of disturbance or retention observed. Note that a number of individual zones within a given category (*eg*. IRM, community watersheds, *etc*.) that were modelled in the analysis have been aggregated for presentation to show the trends observed over time. The area values provided in the title of each figure reflect either productive forest or THLB of the zone that was assigned to the forest cover constraint.

Figure 6.13 presents the results of the cover constraints modelled for community watersheds.

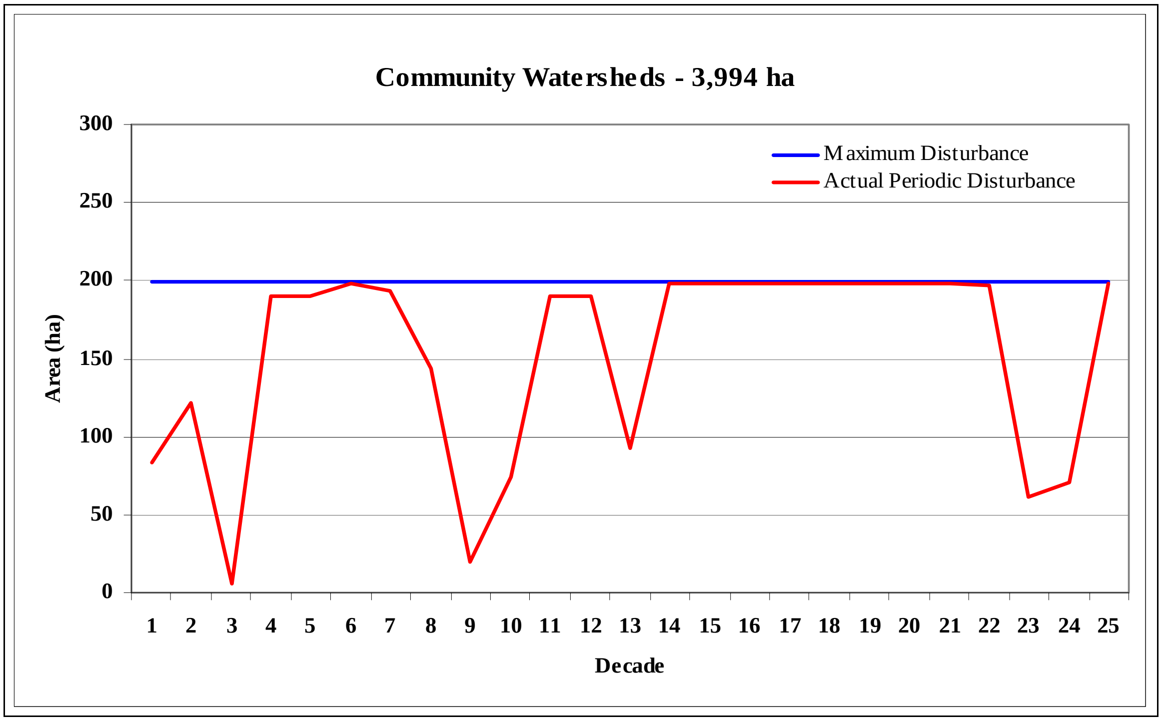


Figure 6.13 – Community watershed status

Only 200 hectares of the entire watershed zone is permitted to be younger than the green-up age at any time. There are a number of periods in which the maximum disturbance (red line) reaches the prescribed limit (blue line). During these periods, harvesting will be suspended until the zone recovers, in this case young stands achieve the required green-up age. This places limits on available timber, but given the small area of the watershed zone, it is not critical to the overall supply.

Figure 6.14 displays the outcome for forest cover constraints within the VILUP Enhanced Forestry zones and the IRM zones.

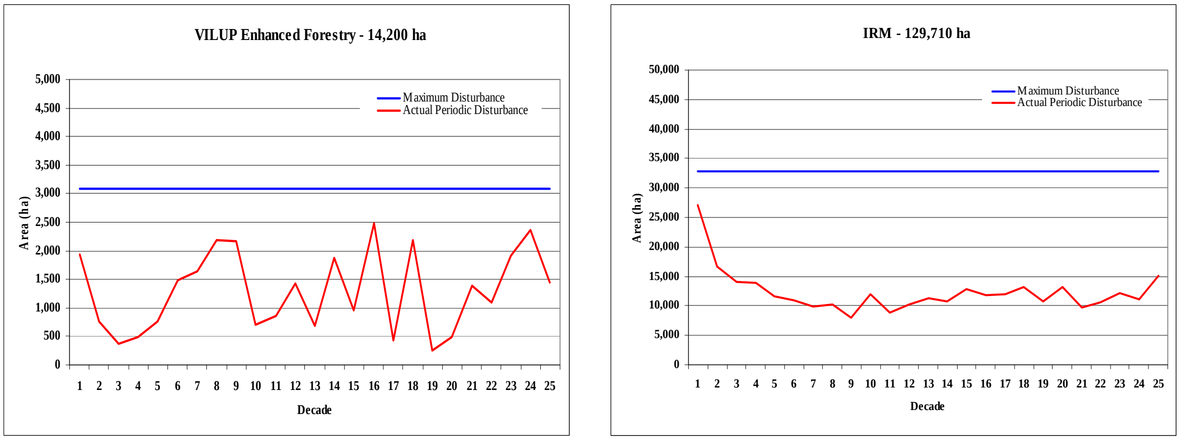
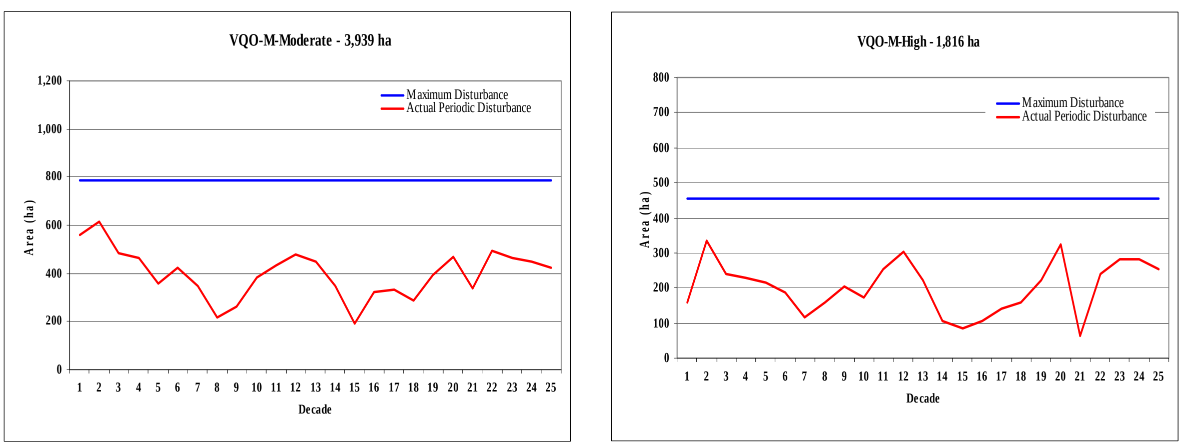
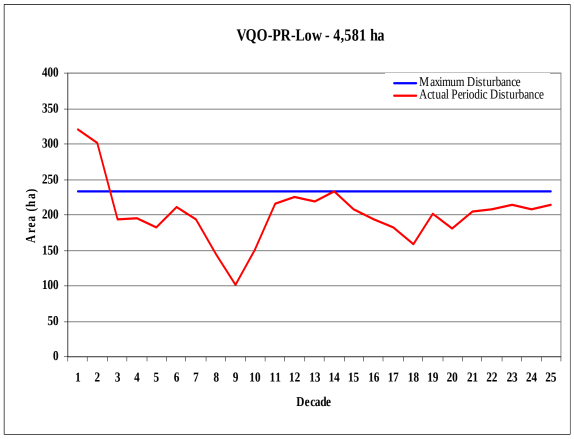


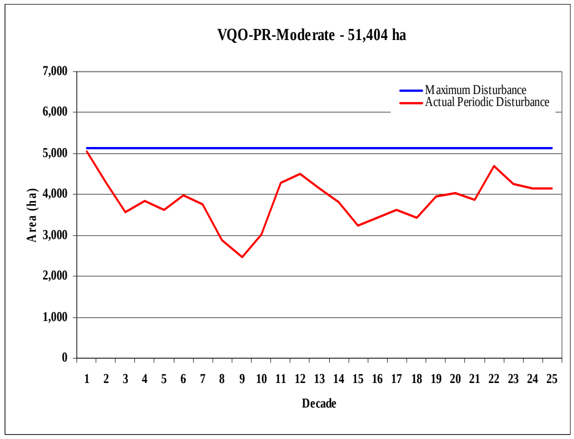
Figure 6.14 – Enhanced Forestry Zone and IRM status

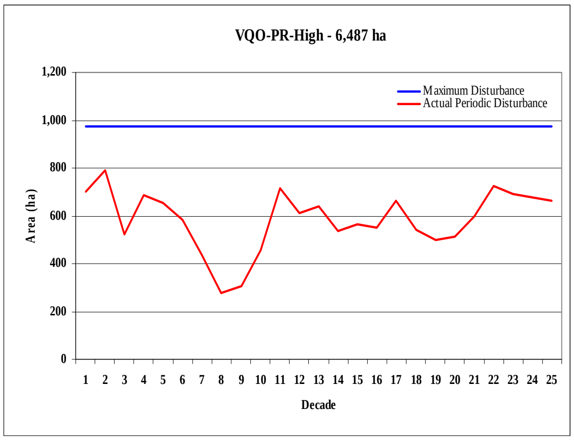
Neither of these zones reaches the maximum disturbance limit at any time during the planning horizon, as shown by the red line staying below the blue line at all times. This implies that these forest cover constraints are not limiting on timber supply.

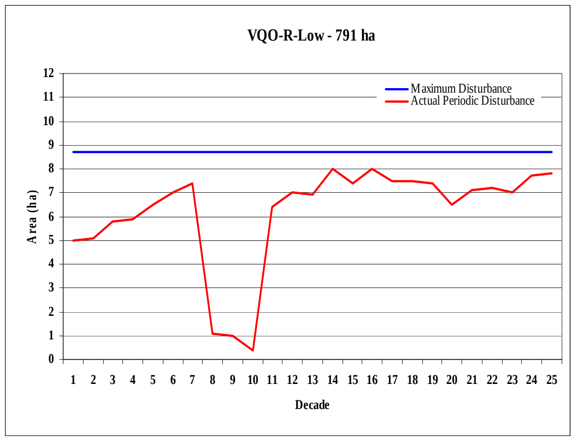
Figure 6.15 shows the results of the cover constraints modelled for the visually sensitive areas, summarized by VQO (visual quality objective) and VAC (visual absorption capacity). Note that the VQO-Preservation-Low VAC zone (22.5 ha total area) is not reported as no disturbance occurred in this area during the 250-year planning horizon.

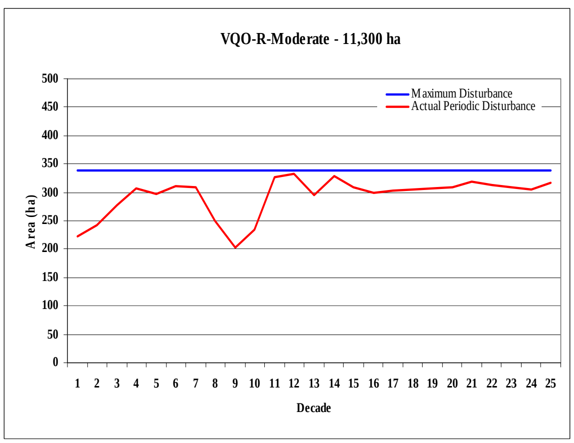


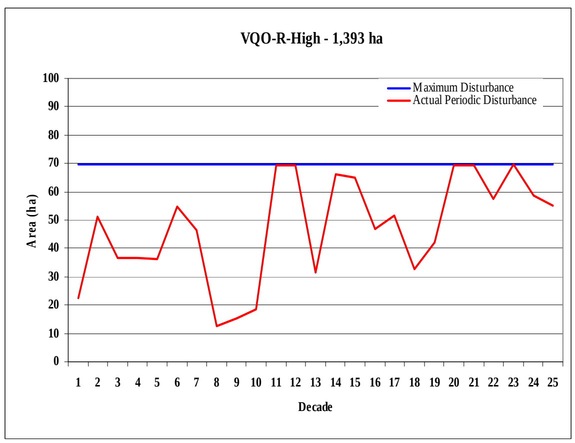

VQO-PR-Low - 4,581 ha
Maximum Disturbance
Actual Periodic Disturbance
Area (ha)
Decade


VQO-PR-Moderate - 51,404 ha
Maximum Disturbance
Actual Periodic Disturbance
Area (ha)
Decade


VQO-PR-High - 6,487 ha
Maximum Disturbance
Actual Periodic Disturbance
Area (ha)
Decade


VQO-R-Low - 791 ha
Maximum Disturbance
Actual Periodic Disturbance
Area (ha)
Decade


VQO-R-Moderate - 11,300 ha
Maximum Disturbance
Actual Periodic Disturbance
Area (ha)
Decade


VQO-R-High - 1,393 ha
Maximum Disturbance
Actual Periodic Disturbance
Area (ha)
Decade

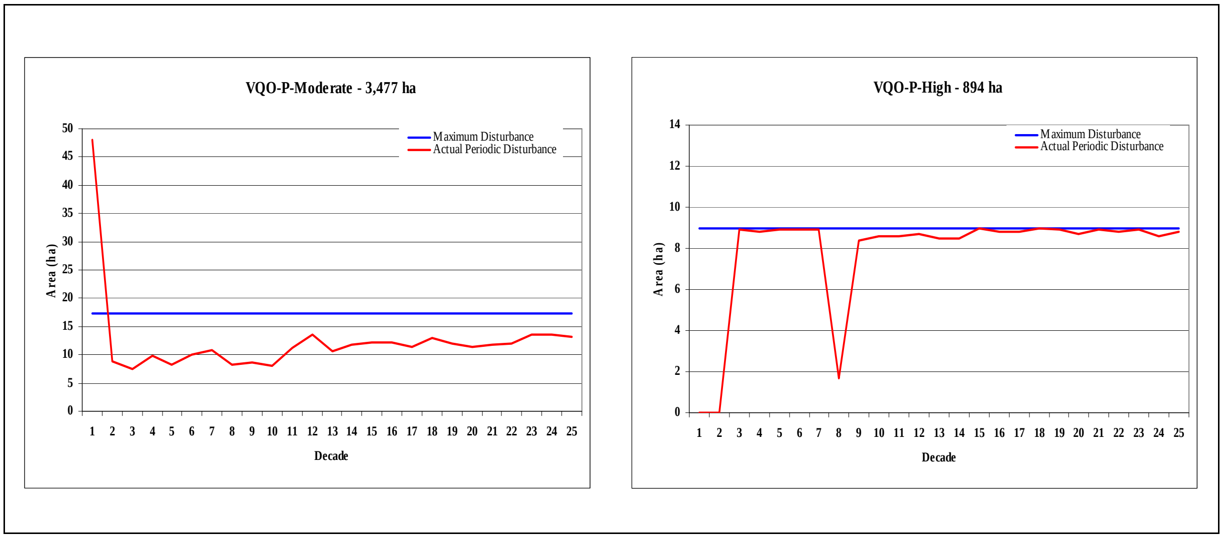


Figure 6.15 – Visually sensitive areas status

Initially, VQO-PR-Low and VQO-P-Moderate are in a state of disturbance violation (red line above the blue line). This is potentially the result of:

- Areas being reclassified as a more constraining VQO or VAC;
- New maximum disturbance percentage or green-up height constraints being assigned to an area; or
- Good visual landscape design permitting additional harvesting to occur in the zone.

For these areas there is a 20 to 30 year recovery period as stands reach the prescribed green-up height of five meters. In total, there is only a maximum of 120 hectares that exceeds the forest cover constraint.

In the other visually sensitive areas, the disturbance limits are met but never exceeded as the simulation progressed. This shows that harvesting is not permitted in these zones until sufficient green-up has been achieved. These summaries show the accumulated area of each VQO-VAC type and there were a number of individual zones throughout the planning horizon that reached the disturbance constraint limit and prevented further harvesting.

Figure 6.16 presents the results of the disturbance cover constraints modelled for EBM objectives 8 (fisheries watersheds) and objective 12 (upland streams).

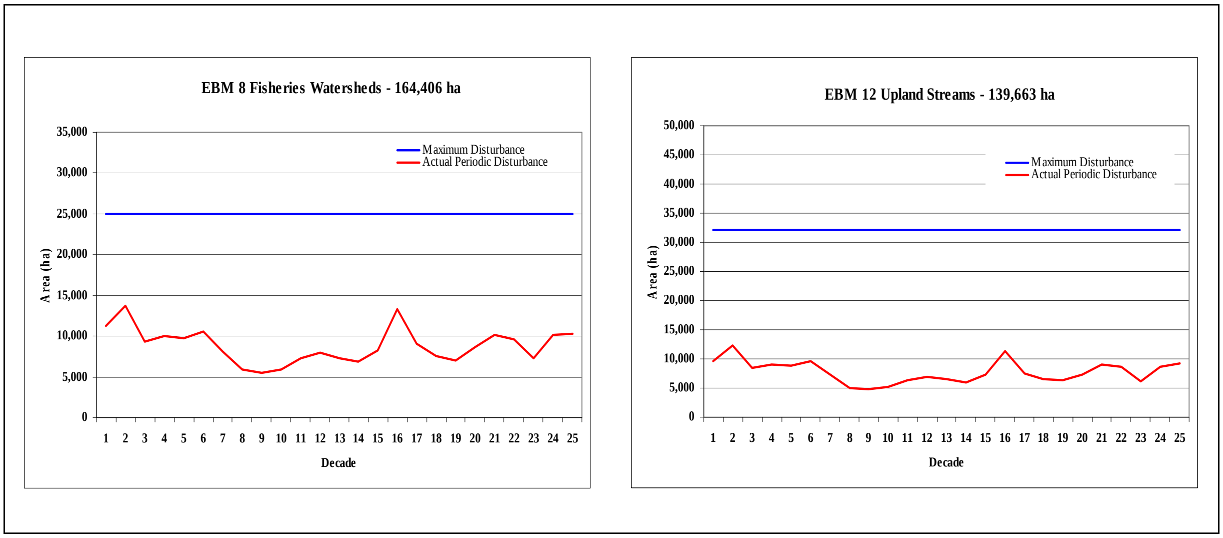


Figure 6.16 – EBM objectives 8 and 12 status

The results show that these EBM disturbance constraints do not place any limits on the harvest, because the periodic disturbance (red line) is always well below the maximum level (blue line). These zones include a significant amount of non-THLB productive land, approximately 80% of each zone, which contributes to the low levels of disturbance.

Figure 6.17 presents the results of the retention cover constraints modelled for VILUP Special RMZs. In this set of figures the minimum retention is shown by the blue line, and the observed periodic retention is red. The zone is in conformance with the constraint as long as the red line is above the blue line.

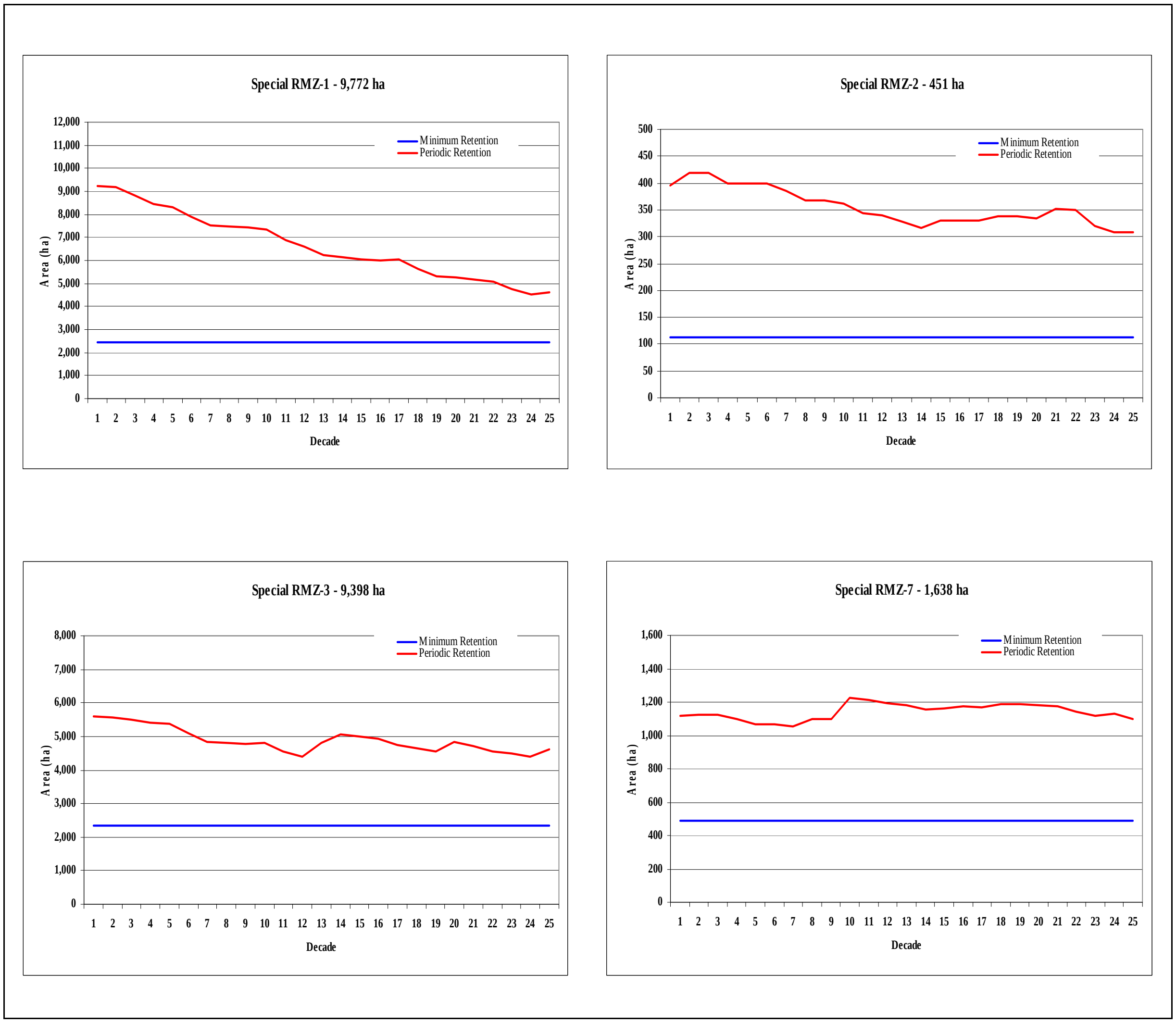


Figure 6.17 – VILUP Special RMZ retention status

All special RMZs meet the prescribed retention levels throughout the 250 years of simulation. This shows that these constraints are not limiting harvest within these particular zones.

No specific forest cover constraints were assigned to areas defined as marbled murrelet habitat (see Section 4.4.2.4). However, the harvest activity within defined murrelet areas was tracked during modelling. Figure 6.18 summarizes the harvesting in each period within marbled murrelet habitat.

Timberline Natural Resource Group

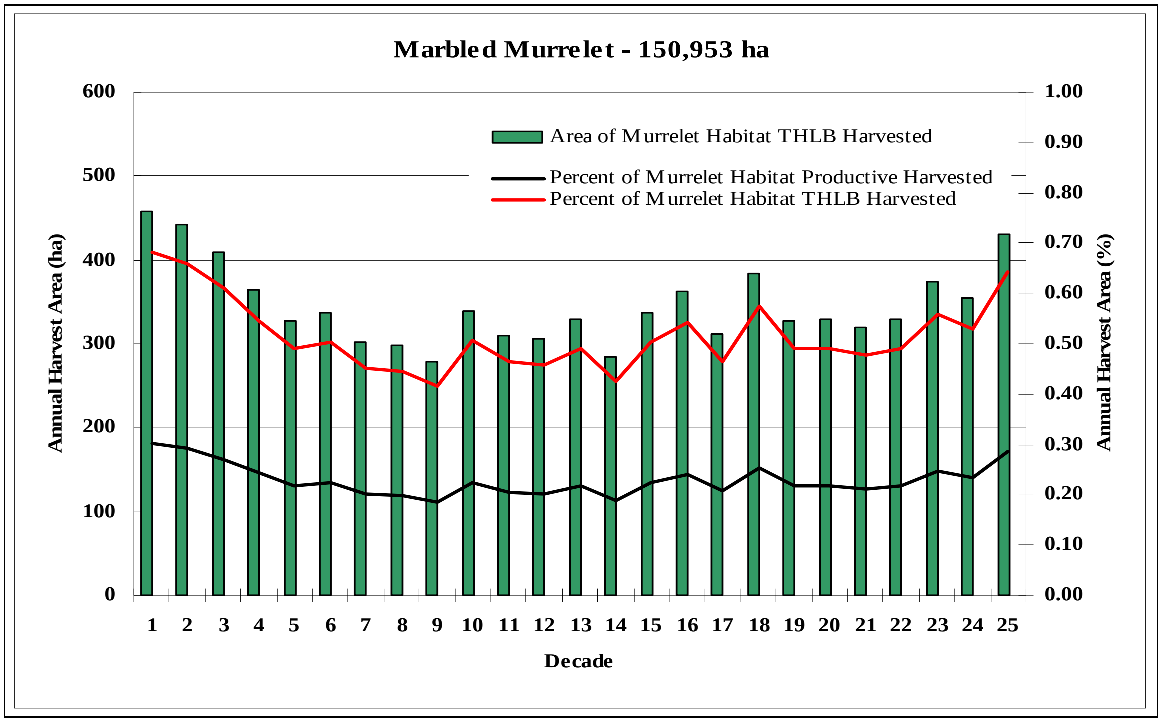


Figure 6.18 – Annual harvest within marbled murrelet habitat

Although no constraints were applied explicitly modelled for marbled murrelet in the analysis, other constraints overlap with the areas identified as habitat for the species. As a result there is never more than 457 hectares of this region harvested in one year, which is only 0.7% of the productive land base or 0.3% of the THLB defined as murrelet habitat. This represents an effective rotation age of over 330 years.

Old forest requirements to address landscape-level biodiversity were addressed differently for the Vancouver Island (under VILUP) and mainland (under EBM) portions of the Kingcome TSA. Vancouver Island used traditional old forest constraints based on the *Biodiversity Guidebook* for each LU-BEC area. Some of the landscape units have had old growth management areas designated and these have been included for reporting purposes only; no constraints for old forest were applied to these areas. Malcolm, Nahwitti, San Josef, Shushartie, and Tsulquate landscape units have had OGMAs assigned and are therefore assigned a 0% old growth target

OGMAs were originally assigned to the Holberg and Upper Nimpkish landscape units, but based on direction from MFR these OGMAs were not recognized and old growth retention was modelled using VILUP LU-BEC rules.

Under EBM, site series surrogates (SSS) were developed for the land base and old forest retention constraints were assigned to each unique landscape unit-surrogate.

Tables 6.2 and 6.3 summarize the old forest requirements at the landscape level. Note that landscape unit summaries are provided for the EBM areas. A full list of the status of each LU-SSS modelled in the analysis is provided in Appendix I.

Table 6.2 – VILUP LU-BEC old forest status

Analysis Identity and LU-BEC Retention Zone Name		FCC (% > Age)	Total Productive Area (ha)	Target Old Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
15	Bonanza-CWHvm1	19 > 250	2,207	419	571	590.3	1,011	970	829.9
16	Bonanza-CWHvm2	19 > 250	1,788	340	791	688.7	1,085	943.3	439.8
17	Bonanza-MHmm1	19 > 250	1,038	197	722	694.8	881.4	809.3	634.9
18	Brooks-CWHvh 1	13 > 250	5,862	762	3,846	3,597	5,261	5,415	3,536
36	Holberg-CWHvh1	13 > 250	1,085	141	661	631.9	671.4	628	271
37	Holberg-CWHvm1	13 > 250	3,076	400	229	235.6	272.7	299.8	1,261
47	Kashutl-CWHvm2	13 > 250	2	0	0	0	1.6	1.6	1.6
49	Keogh-CWHvm1	13 > 250	903	117	279	154.5	218.7	482	175.7
50	Klaskish-CWHvh1	19 > 250	14,702	2,793	3,296	3,752	8,681	8,695	6,736
51	Klaskish-CWHvm1	19 > 250	1,282	244	138	187.6	929.7	938.5	243.7
52	Klaskish-CWHvm2	19 > 250	748	142	178	231.4	619.8	560.2	247.1
53	Klaskish-MHmm1	28 > 250	7	2	3	3.3	6.6	6.6	6.6
75	Mahatta-CWHvh1	13 > 250	11,410	1,483	1,774	1,792	3,046	3,655	4,177
76	Mahatta-CWHvm1	13 > 250	2,663	346	151	160.2	376.6	458.5	681
77	Mahatta-CWHvm2	13 > 250	1,028	134	151	154.8	444.2	481.2	239.5
78	Mahatta-MHmm1	19 > 250	2	0	0	0	1.8	1.8	1.8
79	Malcolm-CWHvm1	0 > 250	5,650	0	861	687	410.8	590.2	1,660
90	Nahwitti-CWHvh1	0 > 250	23,443	0	17,971	16,555	15,653	14,609	5,985
91	Nahwitti-CWHvm1	0 > 250	1,787	0	664	561.8	414.5	585.1	261
92	Nasparti-CWHvh1	13 > 250	27	4	0	0.1	12.1	27	26.9
93	Nasparti-CWHvm2	13 > 250	1	0	0	0	1	1	1
96	Neroutsos-CWHvm1	13 > 250	11	2	0	0	0.3	0.3	0.3
97	Neroutsos-CWHvm2	13 > 250	10	1	1	0.8	8.3	8.3	7.5
98	Nigei-CWHvh1	13 > 250	6,896	897	3,981	4,088	4,385	4,224	3,392
99	San Josef-CWHvh1	0 > 250	24,366	0	16,124	12,654	9,939	10,402	6,242
100	San Josef-CWHvm1	0 > 250	1,067	0	82	43.1	50.1	41.4	335.9
101	San Josef-CWHvm2	0 > 250	139	0	16	6.7	6.7	12.7	50.6
107	Shushartie-CWHvh1	0 > 250	13,630	0	11,373	11,408	11,928	10,123	3,168

Analysis Identity and LU-BEC Retention Zone Name		FCC (% > Age)	Total Productive Area (ha)	Target Old Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
124	Tsulquate-CWHvh1	0 > 250	8,047	0	5,912	5,825	6,248	5,979	1,714
125	Tsulquate-CWHvm1	0 > 250	9,957	0	6,111	5,528	4,488	4,255	1,269
139	Upper Nimpkish-CWHvm1	19 > 250	701	133	643	639.2	408.4	147.3	148.6
140	Upper Nimpkish-CWHvm2	19 > 250	407	77	350	350	207.8	85.2	115.1
141	Upper Nimpkish-MHmm1	19 > 250	384	73	362	360.8	336.7	297.1	197.5

Table 6.3 – EBM site series surrogate old forest status by Landscape Unit

Landscape Unit Number and Name		FCC Age	Total Productive Area (ha)	Target Old Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
1	Ahnuhati_kwalate	180	9,595	2,362	5,335	5,365	6,350	7,367	5,831
2	Ahta	180	11,372	2,943	8,249	7,392	6,414	6,705	3,873
3	Allison	180	52,519	15,000	43,704	38,349	31,844	28,407	21,983
4	Belize	180	64,707	17,217	53,852	46,855	36,513	29,909	25,393
7	Broughton	180	20,316	5,410	11,153	9,812	7,085	7,531	8,068
8	Charles	180	9,333	2,252	6,233	5,353	4,396	4,509	3,966
9	Franklin	180	1,821	491	395	355	604	1,134	1,559
10	Fulmore	180	397	97	230	236	223	296	219
11	Gilford	180	42,572	10,858	16,250	13,433	10,482	13,388	14,030
13	Huaskin	180	37,501	10,209	23,791	16,923	11,199	9,998	13,809
14	Kakweiken	180	17,712	4,380	9,752	9,025	8,621	9,768	9,798
18	Knight_East	180	22,054	5,495	11,698	10,825	11,095	12,014	11,498
19	Lower_Kingcome	180	20,859	4,938	11,699	9,811	8,014	10,058	9,127
20	Lower_Klinaklini	180	1,547	402	377	377	485	442	850
22	Lull_Sallie	180	20,441	5,086	10,962	8,884	8,264	9,907	8,450
26	Miriam	180	16,659	4,380	12,708	10,779	8,378	7,952	5,832
33	Seymour	180	15,667	3,981	12,558	9,432	6,878	5,928	8,316
35	Sim	180	1,439	349	684	673	787	921	792

Landscape Unit Number and Name		FCC Age	Total Productive Area (ha)	Target Old Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
36	Smith_Sound	180	294	85	240	156	142	140	235
37	Smokehouse	180	136	38	129	129	126	120	78
38	Snowdrift	180	31,295	7,972	21,251	17,762	12,576	10,905	12,024
42	Upper_Kingcome	180	20,658	4,937	11,615	10,215	7,812	9,438	12,139
45	Wakeman	180	29,531	7,113	19,201	15,490	12,092	13,669	13,479
46	Walker	180	1,122	323	918	893	952	880	859

As shown in Table 6.2 only six old forest zones are in deficit at the beginning of the simulation. These zones represent less than five percent of the forested land base, 7,137 ha, which is modelled with old forest constraints at the LU-BEC level. By year 150 of the simulation all zones have achieved the old forest target.

Retention objectives in the site series surrogates are currently satisfied across most of the land base managed under EBM. Only 12 percent of the region is below the target retention level at the outset of the simulation. Based on the current age distribution of the stands in some of the areas in old forest deficit, it takes up to 150 years to achieve the target.

It is important to note that harvesting does not occur in any of the zones, either LU-BEC or SSS, that are currently in deficit until the old forest requirement has been satisfied.

7.0 SENSITIVITY ANALYSIS RESULTS

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 Kingcome TSR3 Base Case described in Section 6 and varying only the assumption being evaluated. All other assumptions remain unchanged. Based on the changes in availability, a new harvest level was sought, adhering to the flow policy used for the Base Case.

In adjusting the flow to reflect the alternate assumption for the sensitivity analyses which increase timber supply, mid-term harvest levels were altered first in an attempt to increase the harvest level during the trough experienced in the Base Case. This was followed by short-term and finally long-term levels.

In those scenarios which reduce the timber supply, the mid-term harvest was not reduced below the theoretical natural stand LRSY. Short-term levels were reduced based on this requirement to maintain the mid-term harvest at a specified level. Long-term harvest was decreased as needed to maintain a stable long-term timber supply. Sensitivity issues are summarized in Table 7.1. The timber supply impacts are illustrated in Sections 7.1 through 7.8.

Table 7.1 – Sensitivity analysis scenarios

Issue	*Tested Sensitivity Level*	Section
Pre-EBM Management	*No EBM land base reductions or forest cover objective*	7.1
Harvest flow	*Regulate the flow from EBM and non-EBM zones*	7.2
Harvest rule	*Oldest first harvest rule*	7.3.1
	Alternate alder harvest limits	7.3.2
	Alternative second growth harvest limits	7.3.3
Land base	*Increase/decrease timber harvesting land base by 10%*	7.4.1
	Alternative economic thresholds	7.4.2
	Exclude marginal stands & $0 economic threshold	7.4.3
	Exclude marginal stands	7.4.3
Growth and yield	*Increase/decrease existing yields by 10%*	7.5.1
	Increase/decrease managed yield site index by 2 meters.	7.5.2
	Replace SIA values with inventory SI for managed stands	7.5.3
	Apply 8% OAF1 in TIPSY yields	7.5.4
Green-up	*Increase/decrease visually sensitive green-up ages by 5 years*	7.6.1
	Increase/decrease all green-up ages by 5 years	7.6.2
Minimum harvest ages	*Increase/decrease minimum harvest ages by 10 years*	7.7
Variable retention	*Apply alternative (high and low) EBM stand-level retention rules*	7.8

Several sensitivities present an opportunity to increase the harvest level in the short term. With one exception, the Pre-EBM projection, short-term harvest levels were not increased. The initial Base Case harvest is within 5% of the current AAC and it was determined that opportunistic increases in short-term harvest rates beyond the initial rate suggested in this analysis would diminish the value of the outputs from the sensitivity runs. Further dialogue on this position is summarized in Section 8.0 Discussion.

7.1 Pre-EBM Management

In this sensitivity analysis none of the new rules or land base reductions associated with EBM were included. The key changes to the analysis data set for the Pre-EBM Management scenario were:

- THLB is increased to 208,175 hectares, approximately 19,000 hectares more than the Base Case;
- Yields are not reduced for EBM variable retention;
- No forest cover constraints for Objectives 8 (Important Fisheries Watersheds) and 12 (Upland Streams); and
- No forest cover constraints for old forest retention (site series surrogates).

Table 7.2 summarizes the results of the Pre-EBM Management sensitivity analysis.

Table 7.2 – Pre-EBM management annual harvest

Period	Annual Harvest by Scenario (m^3/year)			
	Base Case	% Decrease from Previous	Pre-EBM Management	% Decrease from Previous†
1	1,175,500	-	1,398,700	-
2	1,056,500	10.0	1,293,300	7.5
3	949,400	10.0	1,167,100	9.8
4	852,900	10.0	1,051,600	9.9
5	766,100	10.0	947,800	9.9
6	728,400	4.9	853,600	9.9
7 - 14	728,400	0	815,200	4.5
15 - 25	936,200	-	1,107,500	-

†Decrease from previous is the percent decline in harvest rate compared to the period immediately preceding the previous value.

There is a significant difference in the annual harvest throughout the 250-year planning horizon. The initial harvest increases to the TSR2 Base Case level, 16% higher than in the current Base Case. The mid term and long-term harvest levels are 12% and 18% greater, respectively, than those noted in the Base Case. These are the result of the combined effect of increased THLB, higher yields (due to lower retention levels at the stand level) and fewer forest cover constraints being assigned to the land base. This sensitivity analysis demonstrates the impact on the harvest of including the EBM objectives on the potential timber supply from Kingcome TSA.

The results described above for the Pre-EBM harvest level follows fundamental timber supply modelling rules such as those pertaining to growing stock, forest management constraints, *etc*. However, the dynamics of this harvest are not presented here. The objective of this scenario was to demonstrate that additional available volume could be distributed over the planning horizon, and thereby avoid exaggerating short and long-term differences. The mid term uses the natural stand LRSY as the lower bound while the Base Case does not. However, this scenario is not the Base Case and therefore has not been evaluated in that manner.

Figure 7.1 shows the annual harvest level from the Pre-EBM sensitivity analysis graphically.

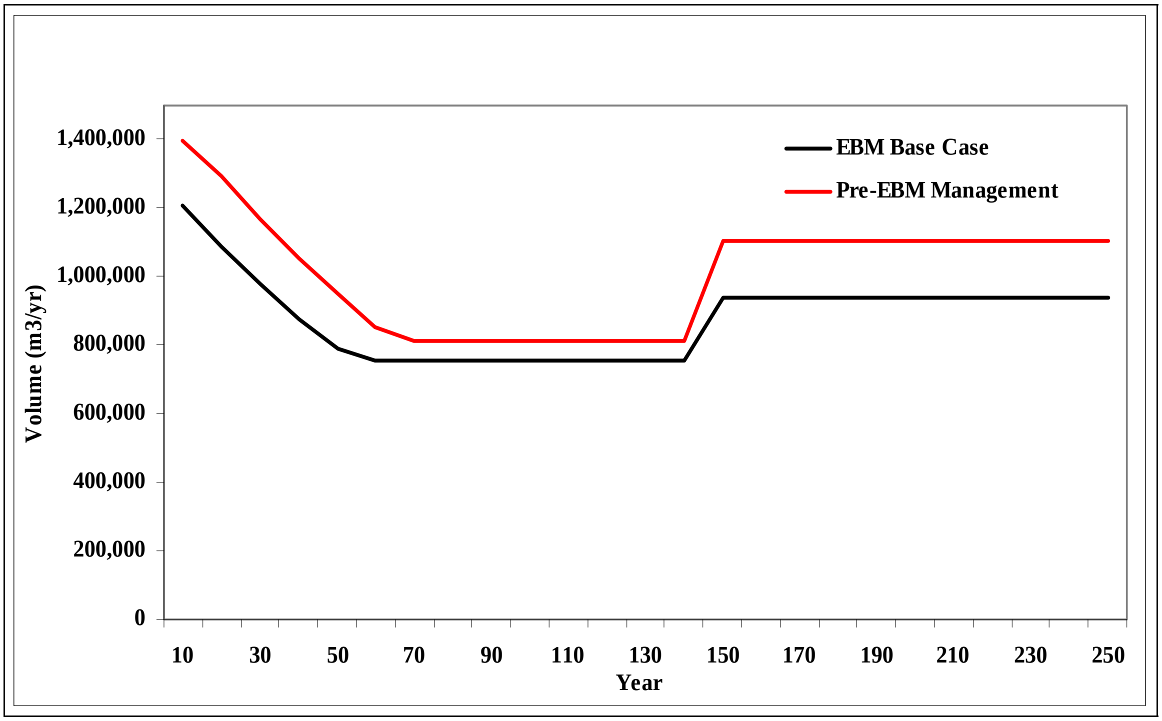


Figure 7.1 – Pre-EBM management annual harvest

7.2 Regulate Harvest from EBM and Non-EBM Areas

This sensitivity analysis separates the harvest from the two main regions of the Kingcome TSA:

- Vancouver Island; and
- Mainland (the portion to which EBM rules apply).

Unique management rules and zones apply to each area in addition to the physical separation of the two areas. Table 7.3 summarizes the harvest from each component of the TSA.

Table 7.3 – Regulate harvest from EBM and non-EBM zones annual harvest

Period	Annual Harvest by Scenario (m^3/year)			
	Base Case	Vancouver Island	Mainland	Combined
1	1,175,500	156,100	919,500	1,075,600
2	1,056,500	156,100	826,400	982,500
3	949,400	156,100	742,600	898,700
4	852,900	156,100	667,200	823,300
5	766,100	156,100	599,400	755,500
6	728,400	156,100	555,700	711,800
7	728,400	156,100	555,700	711,800
8 - 14	728,400	207,800	555,700	763,500
20 - 25	936,200	225,300	741,100	966,400

Modelling individual harvest targets on the two regions of the Kingcome TSA causes a 9% lower initial harvest and reduced levels during the short term. This is caused by the reduced flexibility in harvest location. In the Base Case it is possible to increase or decrease the harvest from either portion of the TSA as required to meet an overall target. Using similar harvest flow rules to that modelled in the Base Case removes this flexibility. Mid and long-term levels are 5% and 3% higher, respectively in this sensitivity analysis. Overall the harvest is changed by less than 1% over the 250-year planning horizon.

Figure 7.2 displays the results of the sensitivity analysis for regulating the harvest from the two regions of the Kingcome TSA in graphic form.

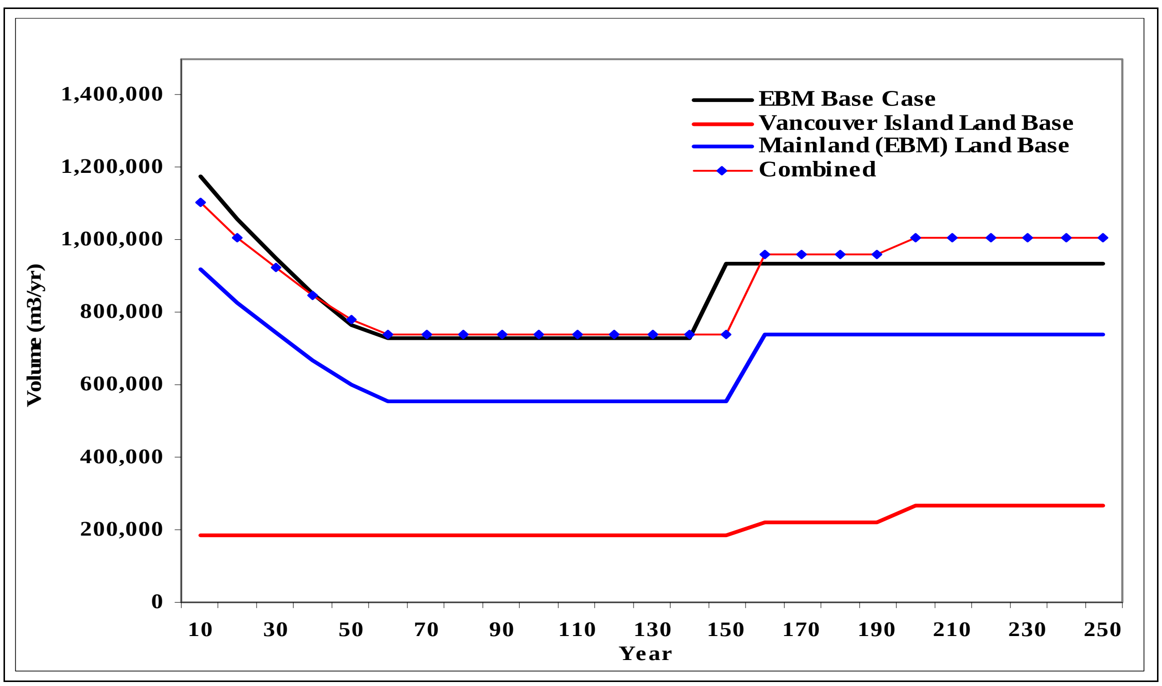


Figure 7.2 – Regulate harvest from EBM and non-EBM zones annual harvest

7.3 Harvest Rules

7.3.1 Oldest First Harvest Rule

In the Base Case "relative oldest first" was the harvest rule applied throughout the planning horizon. For this sensitivity analysis absolute oldest first was used. Results of this scenario, along with the Base Case harvest are provided in Table 7.4.

Table 7.4 – Oldest first harvest rule annual harvest

Period	Annual Harvest by Scenario (m^3/year)	
	Base Case	Oldest First Rule
1	1,175,500	1,175,500
2	1,056,500	1,056,500
3	949,400	949,400
4	852,900	852,900
5	766,100	766,100
6 - 14	728,400	714,800
15 - 25	936,200	905,800

There is no change to the short-term harvest using the oldest first harvest rule. During the mid term, a minor 1.9% decline in harvest. In the long term there is a reduction of 3.2%. This reduction is caused by lower volume stands contributing to the harvest in the last 100 years of the simulation. These stands are found on sites with lower productivity and although older, are not much older than minimum harvest age. In the Base Case, those stands that have grown beyond minimum harvest age by the largest amount are able to contribute more volume to the annual harvest.

Based on these results the harvest rule will only affect the long-term supply. Given the number of resource constraints in place on the Kingcome TSA, and the current age class structure of the inventory, availability of timber will not be significantly influenced by harvest rule during the short term.

Figure 7.3 displays the results of this sensitivity analysis graphically.

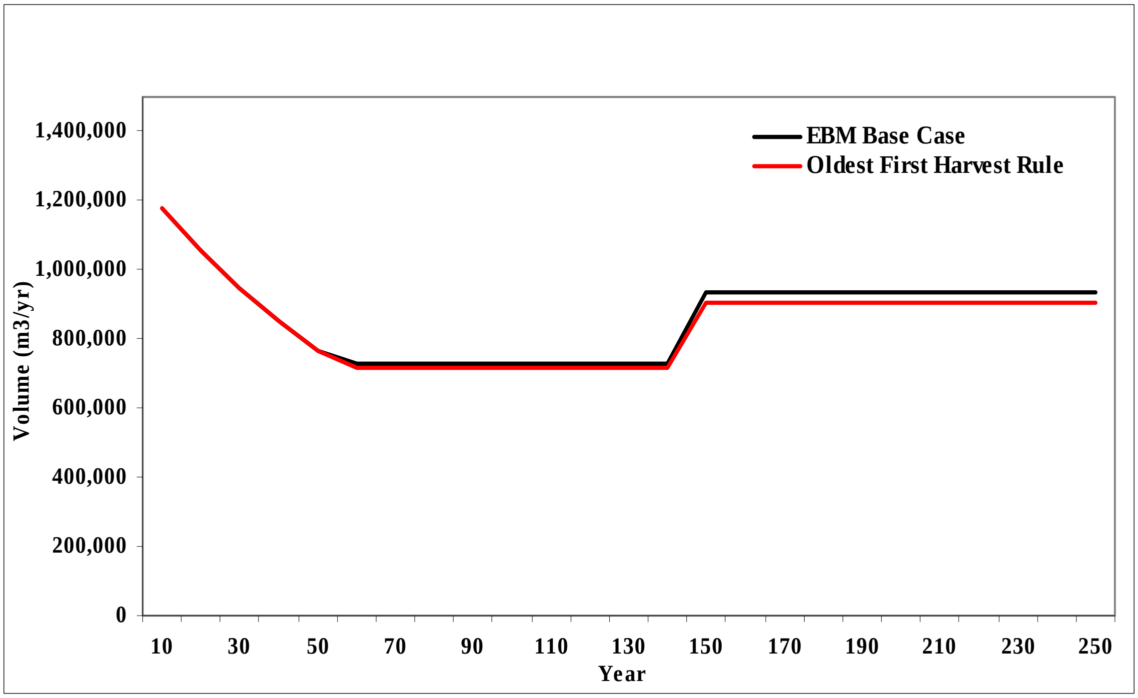


Figure 7.3 – Oldest first harvest rule annual harvest

7.3.2 Alternative Deciduous Harvest Limits

This group of sensitivity analyses evaluates the impact of modifying the contribution from alder-leading stands compared with the Base Case. The Pre-EBM harvest and deciduous contribution is also provided to shown the potential for these species on the TSA. Hardwood tenures are not subject to EBM and therefore the Pre-EBM scenario provides a better estimate of deciduous harvest.

Note that the harvest targets were assigned to stand groupings based on leading species (analysis units). The deciduous volumes are summarized by leading species, and do not include minor alder and cottonwood volumes from coniferous-leading stands. Results of these analysis runs are provided in Table 7.5.

In the Pre-EBM scenario there are 6,211 hectares in alder analysis units which are managed as alder leading stands throughout the planning horizon. In the EBM scenario this area is reduces to 4,726 hectares of alder leading analysis units. These areas represent area that is managed for deciduous and not converted to conifer after harvest.

Table 7.5 – Alternative deciduous harvest limits annual harvest

Period	Annual Harvest by Scenario and Species Partition (m^3/year)											
	Pre-EBM	Alder	Cottonwood	Base Case	Alder	Cottonwood	Limit on Alder	Alder	Cottonwood	No Limit on Alder	Alder	Cottonwood
1	1,398,700	25,000	5,000	1,175,500	6,403	0	1,170,500	6,403	0	1,175,500	6,403	0
2	1,293,300	25,000	5,000	1,056,500	2,051	0	1,052,000	2,051	0	1,056,500	2,051	0
3	1,167,100	25,000	5,000	949,400	12,247	11	945,300	10,500	11	949,400	12,247	11
4	1,051,600	25,000	5,000	852,900	12,720	0	849,300	10,500	0	852,900	12,720	0
5	947,800	18,039	5,000	766,100	17,809	0	763,000	10,500	0	766,100	17,809	0
6	853,600	2,580	5,000	728,400	9,934	298	728,400	10,500	216	728,400	9,934	298
7	815,200	20,183	5,000	728,400	16,045	1,148	728,400	10,558	1,204	728,400	16,045	1,148
8	815,200	0	0	728,400	25,000	0	728,400	10,500	0	728,400	34,549	0
9	815,200	0	0	728,400	18,178	0	728,400	10,500	0	728,400	8,284	0
10	815,200	0	0	728,400	494	0	728,400	10,500	0	728,400	494	0
11	815,200	25,000	5,000	728,400	23,325	2,197	728,400	14,939	2,221	728,400	23,325	2,197
12	815,200	25,000	5,000	728,400	19,906	1,780	728,400	12,744	1,760	728,400	19,906	1,780
13	815,200	21,881	5,000	728,400	16,856	0	728,400	12,531	0	728,400	21,151	0
14	815,200	1,399	5,000	728,400	9,031	0	728,400	12,503	0	728,400	6,582	0
15	1,107,500	1,295	5,000	936,200	4,223	0	933,700	12,500	0	936,200	2,409	0
16	1,107,500	1,037	2,949	936,200	16,917	1,082	933,700	12,134	1,093	936,200	16,883	1,082
17	1,107,500	25,000	3,369	936,200	2,703	0	933,700	1,189	0	936,200	2,701	0
18	1,107,500	25,000	3,417	936,200	15,818	1,332	933,700	11,891	1,318	936,200	15,818	1,332
19	1,107,500	1,673	0	936,200	1,577	192	933,700	831	192	936,200	1,577	192
20	1,107,500	25,000	4,140	936,200	23,967	0	933,700	12,477	0	936,200	29,244	0
21	1,107,500	7,020	0	936,200	10,891	0	933,700	12,526	0	936,200	5,655	0
22	1,107,500	1,966	5,000	936,200	1,915	0	933,700	12,502	0	936,200	3,140	0
23	1,107,500	903	5,000	936,200	23,439	1,537	933,700	13,375	1,605	936,200	22,262	1,537
24	1,107,500	25,000	5,000	936,200	14,706	1,390	933,700	12,577	1,449	936,200	14,690	1,390
25	1,107,500	25,000	5,000	936,200	17,043	164	933,700	11,407	0	936,200	21,289	164

As shown by the results in Table 7.5, in all but the Pre-EBM scenario there is limited supply of alder and cottonwood volume available and it is difficult to ensure an evenflow harvest of this species. Given the age requirements for merchantability (younger than 71 years) and the current EBM land base withdrawals and forest cover constraint requirements, there will be limited alder volume available in the next 20 years followed by improved supply of this species during the subsequent seven decades. There were no specific targets modeled for cottonwood in the EBM analysis as the majority of the area associated with this species had been removed from the THLB; only 93 ha of cottonwood-leading remains.

Limiting early harvest of alder does not improve the short-term availability of this species, but does provide a stable flow of volume throughout most of the planning horizon beyond year 20, although the annual levels are below the 25,000 m^3/year target for this species.

Removing any cap to the annual alder harvest leads to considerable fluctuation in annual harvest, including some periods with no alder harvest. Overall there is a modest gain of 1% in total alder harvested during the 250 years of simulation compared with the Base Case.

It is important to note that the deciduous harvest is not subject to the EBM rules, and because it was not possible to isolate these areas for modelling, the results of the alder and cottonwood harvest estimates are likely underestimated. Alder is typically located in riparian and other sites that are subject to limiting forest cover constraints, especially under the new EBM rules.

Figure 7.4 presents the annual harvest for the Limited Alder sensitivity.

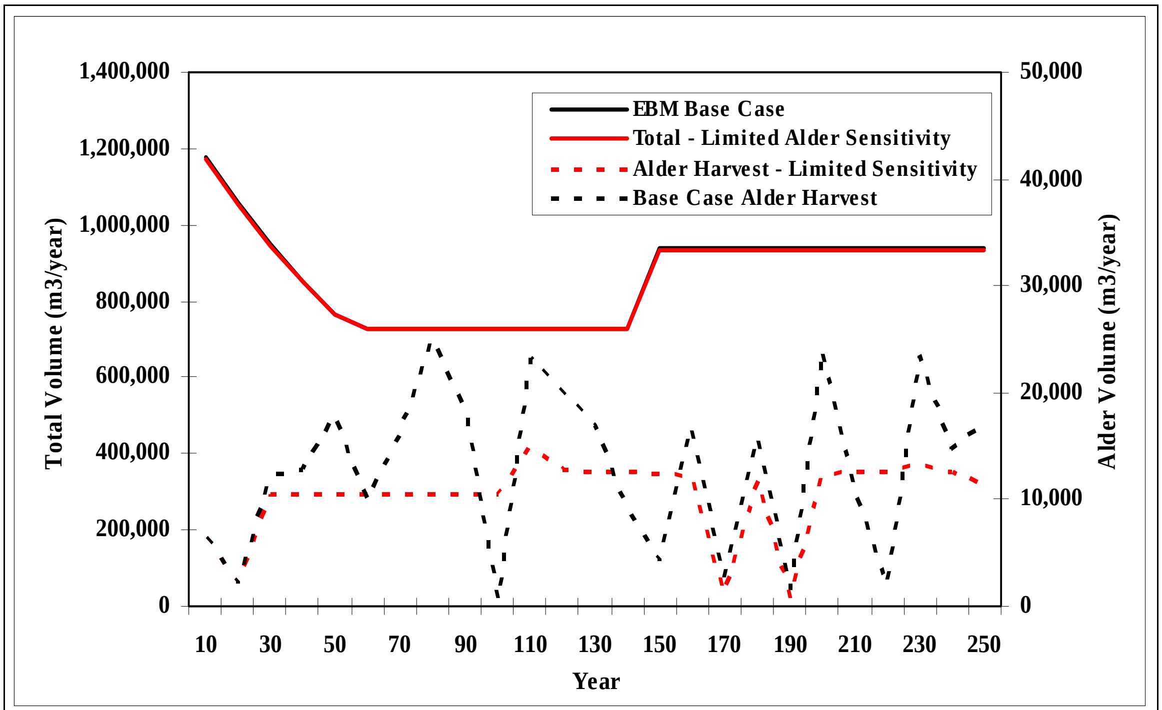


Figure 7.4 – Limited alder contribution annual harvest

Figure 7.5 presents the annual harvest for the No-Limit Alder sensitivity.

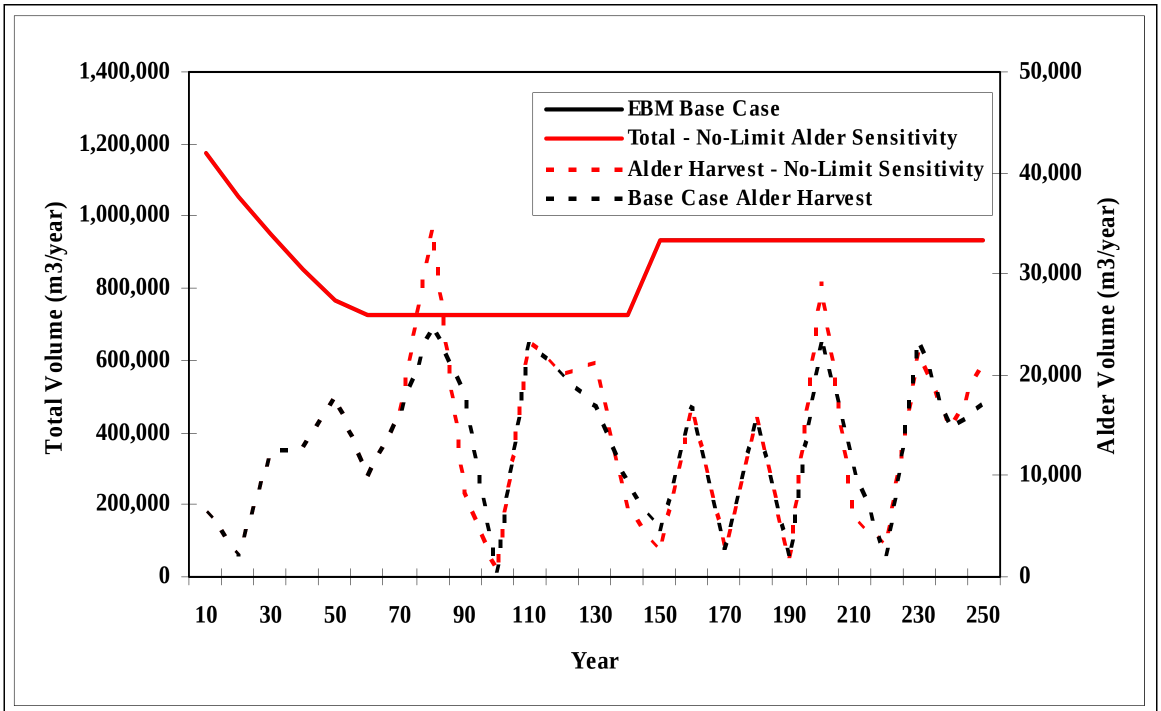


Figure 7.5 – No-limit alder contribution annual harvest

7.3.3 Alternative Second Growth Harvest Limits

This group of sensitivity analyses evaluates the impact of modifying the contribution from second growth stands compared with the Base Case. Presently second growth stands provide a vital contribution to the overall harvest on the TSA. For the purpose of this analysis second growth stands are defined as stands on the THLB with the following characteristics:

- All coniferous leading;
- Age 0 – 120 years; and
- Good, medium or poor sites (no low or marginal).

In the Base Case an initial limit of 277,000 m3/year of second growth was modelled in decade one, based on a review of the inventory of this forest type. Over the next 40 years the harvest of second growth was explicitly reduced by 10% per decade.

Results of these analysis runs are provided in Table 7.6.

Table 7.6 – Alternative second growth harvest limits annual harvest

Period	Annual Harvest by Scenario (m^3/year)					
	Base Case	2nd Growth Component	Limit on 2nd Growth Harvest	2nd Growth Component	No Limit on 2nd Growth Harvest	2nd Growth Component
1	1,175,500	277,000	1,115,500	150,000	1,175,500	384,228
2	1,056,500	249,000	1,002,500	150,000	1,056,500	182,580
3	949,400	223,999	900,800	150,000	949,400	183,530
4	852,900	134,456	809,300	150,000	852,900	112,944
5	766,100	154,012	712,900	150,000	766,100	156,725
6	728,400	340,000	712,900	340,000	690,500	617,428
7	728,400	339,999	712,900	339,999	690,500	619,628
8	728,400	643,013	763,400	678,012	690,500	605,113
9	728,400	649,835	763,400	684,964	690,500	473,741
10	728,400	667,519	763,400	702,493	690,500	202,176
11	728,400	546,058	763,400	696,900	690,500	507,815
12	728,400	609,210	763,400	563,965	690,500	589,043
13	728,400	617,292	763,400	638,557	690,500	574,229
14	728,400	669,744	763,400	699,584	690,500	610,790
15	936,200	915,000	936,200	914,632	946,200	910,313
16	936,200	899,902	936,200	914,929	946,200	915,111
17	936,200	885,173	936,200	886,006	946,200	888,318
18	936,200	907,902	936,200	891,131	946,200	927,812
19	936,200	844,878	936,200	844,092	946,200	850,071
20	936,200	894,095	936,200	893,275	946,200	926,477
21	936,200	916,314	936,200	908,339	946,200	911,060
22	936,200	850,328	936,200	849,222	946,200	847,726
23	936,200	828,176	936,200	851,765	946,200	834,956
24	936,200	839,777	936,200	831,307	946,200	856,851
25	936,200	843,290	936,200	841,358	946,200	850,528

Restricting second growth harvest to 150,000 m^3/year during the first 50 years reduces the total harvest level for the TSA. This demonstrates the importance of including this component of the inventory in the harvest early in the planning horizon. However, it is important to distribute the harvest of second growth appropriately during this time period to ensure this portion of the inventory is available to contribute over the next few decades. This is confirmed by the No-limit sensitivity, where the initial harvest of second growth is 39% higher than in the Base Case, but over the next four periods declines sporadically compared to the Base Case. However, this scenario also illustrates that there is a significant amount of second growth available in the first period, well beyond the limit applied in the Base Case.

In the mid term the harvest continues to drop below the Base Case in the No-limit sensitivity as a result of utilizing additional second growth in the first 90 years of simulation. In the other two scenarios, second growth is distributed more evenly throughout these early decades, thereby providing more volume during the critical phases encountered during the mid term.

In the long term, at which time the majority of the harvest is provided by second growth, the harvest level is the same in the Base Case and Limit second growth sensitivity analyses. In the No-Limit scenario the long-term harvest level is 1% higher than the Base Case. This is the result of a reduced harvest level in the mid term.

Figure 7.6 displays the annual harvest for the Limit Second Growth sensitivity, including the contribution from second growth stands. The Base Case second growth contribution is deliberately stepped down in each period in sequence with the overall reduction in annual harvest.

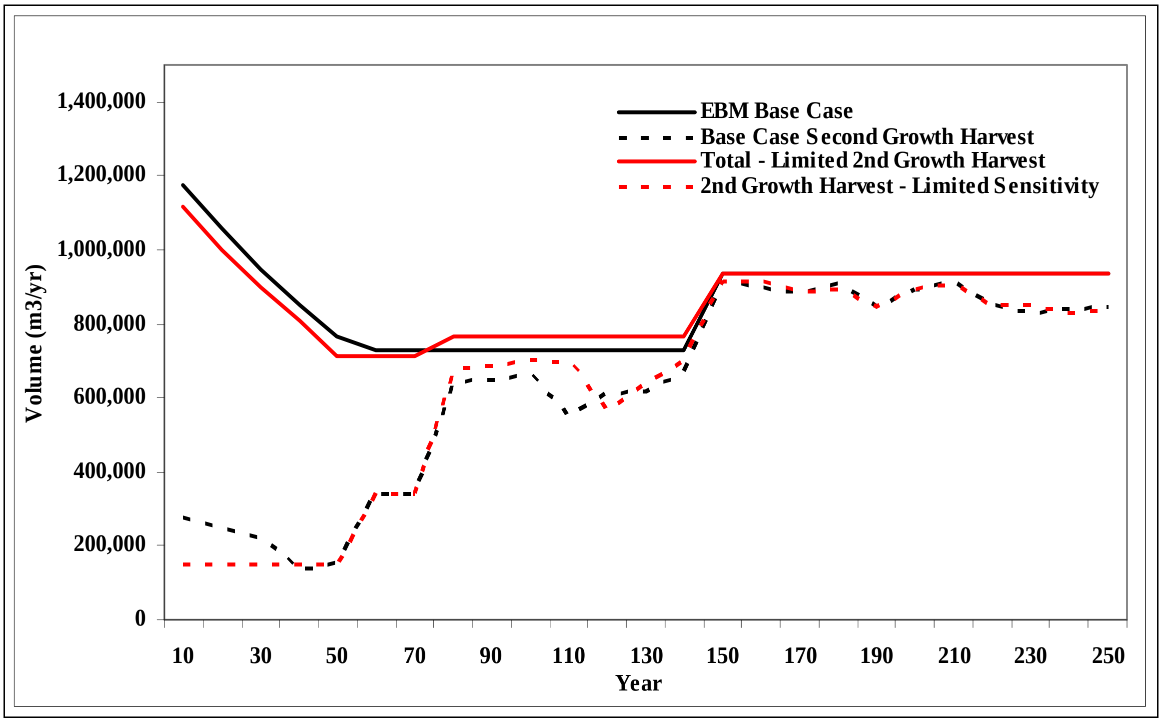


Figure 7.6 – Limit second growth harvest annual harvest

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Figure 7.7 displays the annual harvest for the No-limit Second Growth sensitivity, including the contribution from second growth stands.

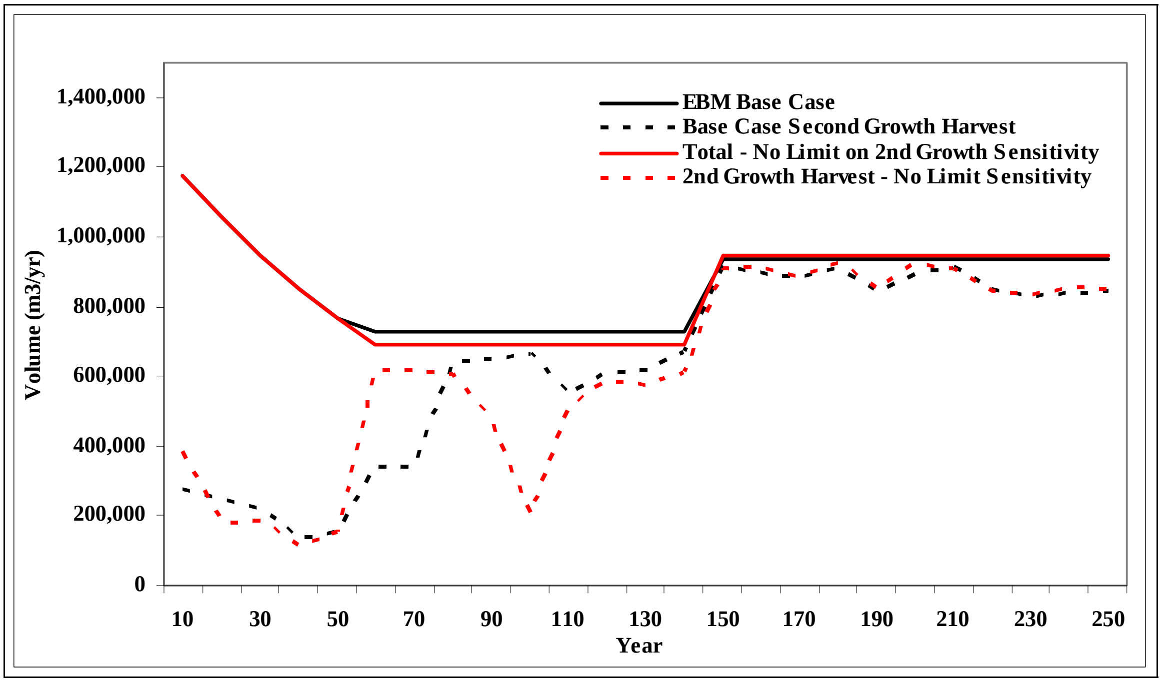

Figure 7.7 – No-limit second growth harvest annual harvest

7.4 Land Base

A number of sensitivity analyses were conducted to evaluate the impact of changing the size of the timber harvesting land base. Percentage additions and reductions were applied as well as others based on specific site characteristics, such as economic operability thresholds and marginal stands.

7.4.1 Increase and Decrease THLB by 10%

The THLB was increased and decreased by 10% in these analysis scenarios. Each stand within the THLB was increased by 10%. A corresponding reduction to each stand labeled as non-THLB area was also made to ensure the total productive forest land base did not change in size. Table 7.7 summarizes the results of these sensitivity analyses.

Table 7.7 – Increase and decrease THLB 10% annual harvest

Period	Annual Harvest by Scenario (m^3/year)		
	Base Case	Increase THLB 10%	Decrease THLB 10%
1	1,175,500	1,175,500	1,036,850
2	1,056,500	1,056,500	931,850
3	949,400	949,400	837,350
4	852,900	852,900	752,250
5	766,100	799,400	675,750
6 - 14	728,400	799,400	623,850
15 - 25	936,200	963,200	751,550

Increasing the size of the land base available for harvesting increases the mid and long-term harvest by approximately 10% and 3%, respectively, compared with the Base Case.

Reducing the THLB has a more significant impact on the harvest level across the entire 250-year planning horizon. The initial harvest rate must drop by 12% to meet the harvest flow requirements. Mid term and long-term harvest levels are 14% and 20% lower than the Base Case. Figure 7.8 displays the harvest for the THLB sensitivity analyses in graphic form.

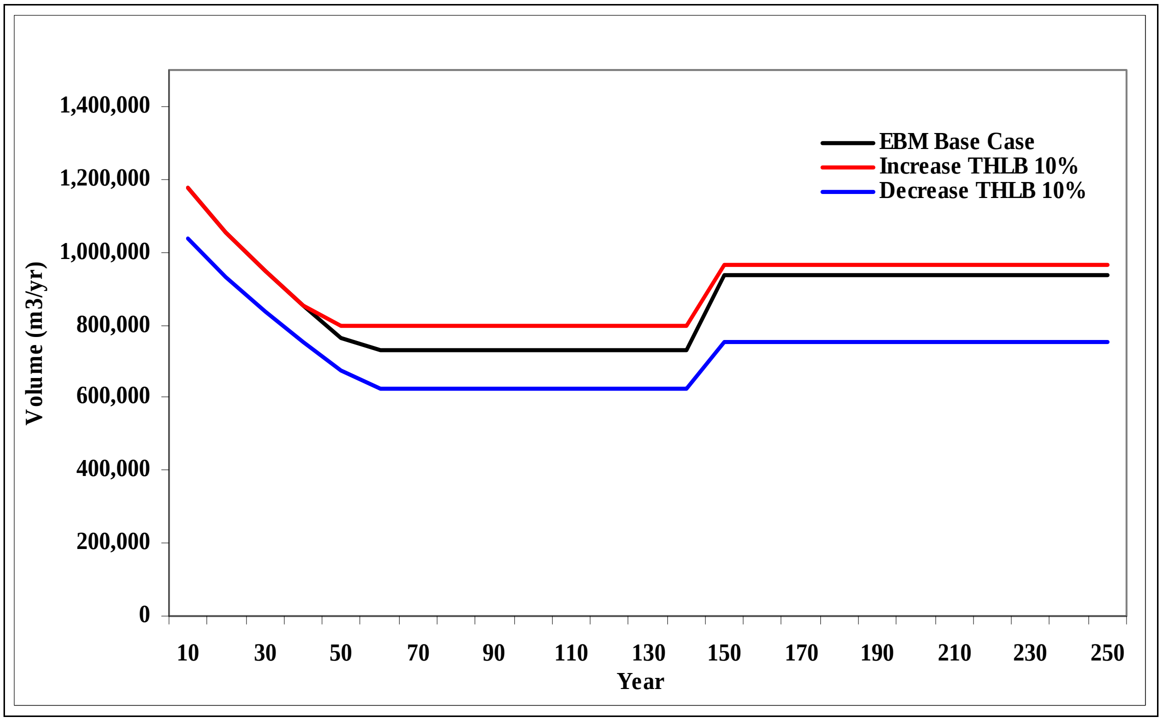

Figure 7.8 – Adjusted THLB annual harvest

7.4.2 Alternative Economic Operability Thresholds

A new economic operability was completed in 2006 and documented in *Kingcome TSA Economic Operability Assessment* (Timberline, 2006). The result was a model which applied a “value index”, *i.e.* the difference between timber value and delivered wood cost, to each stand. Inputs to this model were based on 2006 delivered wood costs, 10-year median log selling price table and representative log grade distributions. Based on a review of 56 cutting permits, 20 had a negative value index, and therefore it was concluded that stands with negative value index have still been harvested. A complete description of the economic operability used in the analysis is provided in the *Data Package*.

The Base Case economic operability assessment was based on $-10 profit margin or value index. These sensitivity analyses evaluate the impact of using profit margins of $0 and $-20.

Table 7.8 lists the annual harvest results of these two scenarios.

Table 7.8 – Alternative economic thresholds annual harvest

Period	Annual Harvest by Scenario (m^3/year)		
	Base Case ($-10 Value Index)	$0 Value Index	$-20 Value Index
1	1,175,500	972,700	1,175,500
2	1,056,500	874,200	1,056,500
3	949,400	785,500	949,400
4	852,900	705,700	880,400
5	766,100	633,900	880,400
6 - 14	728,400	595,800	880,400
15 - 25	936,200	799,400	1,003,200

Increasing the value index to $0 from $-10 reduces the THLB by 29,020 hectares, or 16% of the Base Case THLB. The initial harvest declines by 17%. Mid and long-term harvest are reduced by 18% and 15% respectively. The stands that are removed include a range of productivity levels. Based on the other factors included in the operability assessment – ease of access, distance to roads, *etc*. – they have been excluded for this sensitivity analysis.

Lowering the value index to $-20 results in an additional 16,786 hectares, or 9% of THLB. The majority of this area is in medium and good site hemlock stands of mature age which suggests that some of this area could be included in the THLB. Furthermore, the additional volume available from this timber is significant and allows the mid-term harvest to increase by 21%. As this volume is utilized and the sites are converted to the managed stands the increase, 7% more closely reflects the larger THLB.

Figure 7.9 displays the harvest for the THLB sensitivity analyses in graphic form.

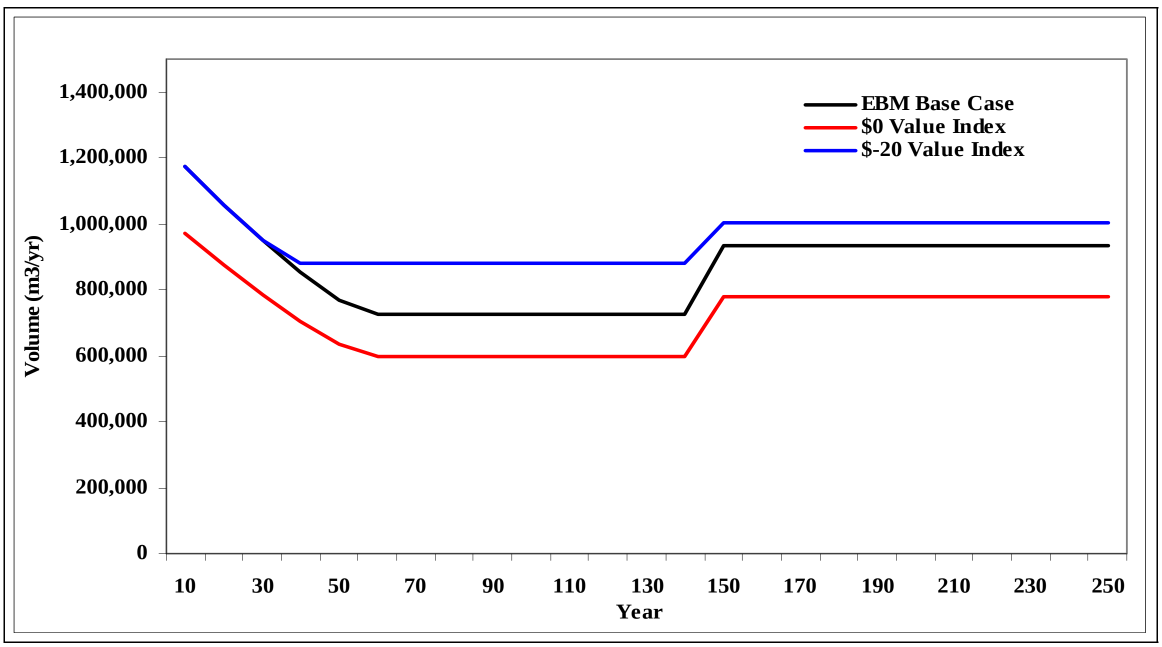

Figure 7.9 – Alternative economic thresholds annual harvest

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7.4.3 Exclude Marginal Stands & $0 Economic Threshold

Marginal stands in terms of productivity total 23,541 hectares (12.6%) of the THLB. This area represents a subset of the marginal productivity sites; overall roughly 101,077 hectares of similar sites and sites with lower productivity have been excluded under this heading. Some of the area identified as marginally operable was brought back into the contributing land base to address the considerable performance in these site types since the last TSR (Appendix II – "Operational Performance in the Inoperable Land Base"" provides additional detail regarding the inclusion of marginal stand types).

This sensitivity analysis assesses the impact of removing these areas from the THLB. To complete this sensitivity analysis marginal stand type analysis units are removed from the contributing land base. Once removed these stands do not contribute their existing inventory volume now or their managed stand productivity in the future.

Referring back to Figure 6.10 "Harvest by Site Class" it is evident that these stands do not disproportionately contribute to the annual harvest and more importantly express an increase in productivity under managed conditions.

An additional sensitivity analysis which excludes marginal stands described above and those stands with a value index less than $0 has also been modeled. This increases the total land base withdrawal from the THLB to 48,856 hectares or 26% of the THLB.

Table 7.9 summarizes the results of the sensitivity analysis.

Table 7.9 – Exclude marginal stands and $0 economic threshold annual harvest

Period	Annual Harvest by Scenario (m^3/year)		
	Base Case ($-10 Value Index)	Exclude Marginal Cw & Hw/Ba	Exclude Marginal Cw & Hw/Ba and $0 Value Index
1	1,175,500	1,119,000	908,500
2	1,056,500	1,005,900	816,550
3	949,400	903,600	733,800
4	852,900	811,800	659,300
5	766,100	729,100	592,250
6	728,400	654,800	533,000
7 - 14	728,400	601,900	533,000
15 - 25	936,200	936,200	762,800

Excluding marginal cedar and hemlock-balsam stands reduces the initial harvest by 5% compared to the Base Case. However, the difference between the annual harvest rates for the two scenarios expands over the next 60 years to a maximum of 17%. The long-term harvest is the same as the Base Case. These stands are of low productivity and therefore contribute less volume per unit area than the average for the remainder of the TSA. Therefore, the long-term harvest is not proportional to the area loss.

Additional reductions for stands with less than the $0 value index reduces the initial harvest by 23%. Losing a significant portion of the THLB affects the harvest during all phases of the planning horizon. Mid and long-term harvest levels drop by 26% and 19%, respectively for this analysis scenario.

Figure 7.10 displays the harvest for the THLB sensitivity analyses in graphic form.

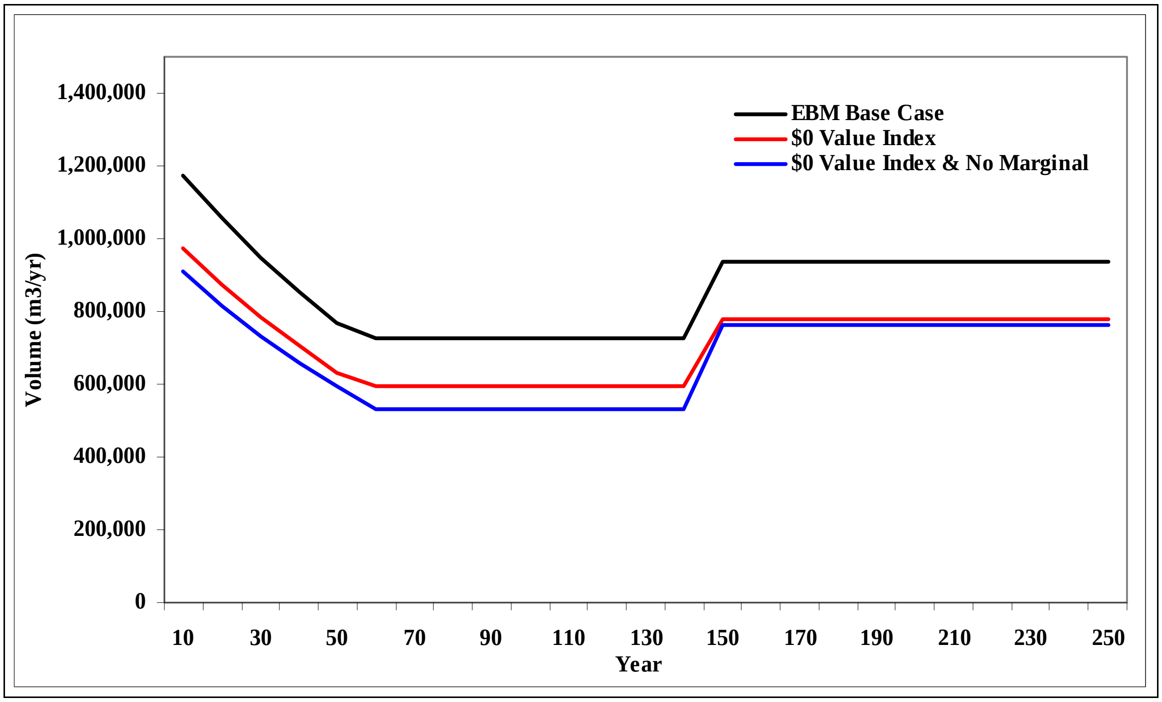

Figure 7.10 – Exclude marginal stands & $0 economic threshold annual harvest

7.5 Growth and Yield

Sensitivity analysis was conducted on the yields for both the existing natural and managed types included in the analysis.

7.5.1 Increase & Decrease Existing Natural Yields by 10%

Existing natural stand yield tables (NSYTs) were developed using VDYP as outlined in the *Data Package*. These yields were increased and decreased by 10% to test the impact on the harvest rate developed for the Base Case as summarized in Table 7.10.

Table 7.10 – Increase & decrease natural yields 10% annual harvest

Period	Annual Harvest by Scenario (m^3/year)		
	Base Case	Increase Natural Stand Yields 10%	Decrease Natural Stand Yields 10%
1	1,175,500	1,175,500	1,099,500
2	1,056,500	1,056,500	988,100
3	949,400	949,400	887,800
4	852,900	852,900	797,600
5	766,100	786,700	716,300
6	728,400	786,700	643,200
7	728,400	786,700	620,600
8 - 14	728,400	786,700	712,400
15 - 25	936,200	936,200	936,200

The changes to the annual harvest rate resulting from adjusted natural stand yields are realized in the short and mid term. It is possible to increase the mid-term harvest by 8% with improved yields. There is virtually no difference in the long-term harvest rate for this sensitivity because after the majority of stands have been converted to managed stands, unmanaged stand volume tables are no longer relevant.

Reducing natural stand yields by 10% results in an immediate 6% reduction in the annual harvest. The mid-term harvest is only 2% lower than that developed for the Base Case. However, this is after a drop of 15% in period 7. Figure 7.11 presents the harvest levels for the natural stand yield sensitivity analyses in graphic form.

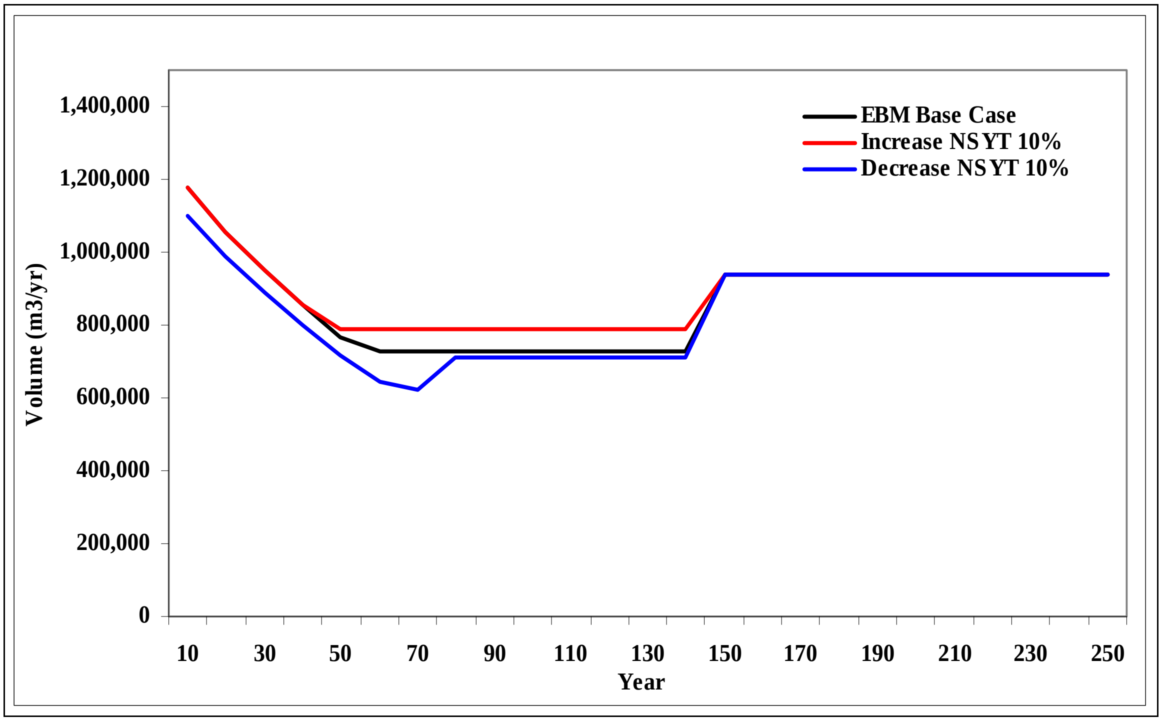

Figure 7.11 – Increase & decrease natural yields 10% annual harvest

7.5.2 Increase & decrease Managed Stand Site Index

Site index values for managed stands were based on the analysis provided for the licensee group and documented in the report *Site Index Adjustment of the Kingcome TSA* (Timberline, 2007a). In this group of sensitivity analyses the site index values were increased and decreased by 2.0 meters for each managed stand yield table.

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Results of the analysis scenarios are provided in Table 7.11.

Table 7.11 – Increase & decrease managed stand site index 2m annual harvest

Period	Annual Harvest by Scenario (m^3/year)		
	Base Case	Increase Managed Stand SI 2 meters	Decrease Managed Stand SI 2 meters
1	1,175,500	1,175,500	991,500
2	1,056,500	1,056,500	890,800
3	949,400	949,400	800,200
4	852,900	852,900	718,600
5	766,100	766,100	689,500
6	728,400	758,100	689,500
7	728,400	758,100	689,500
8 - 14	728,400	880,400	689,500
15 - 25	936,200	1,091,200	748,200

Increasing managed stand site index by two meters allows the mid and long-term harvest levels to increase by 21% and 17%, respectively. There is no change in the short-term until the sixth period when the harvest is 4% higher than in the Base Case. The mid-term level, which is achieved in year 81. Higher volume managed stands comprise the majority of the annual harvest at this time.

Reducing managed stand yields due to the two-meter drop in site index has an immediate impact on the harvest, dropping the initial rate by 16%. The reduced volume contribution from managed stands forces the mid-term harvest down to the natural stand LRSY estimate. In the long-term the harvest is only slightly higher than the natural stand LRSY, 20% lower than the long-term harvest developed for the Base Case.

Figure 7.12 displays in graphic form the harvest results for the managed stand site index sensitivity analyses.

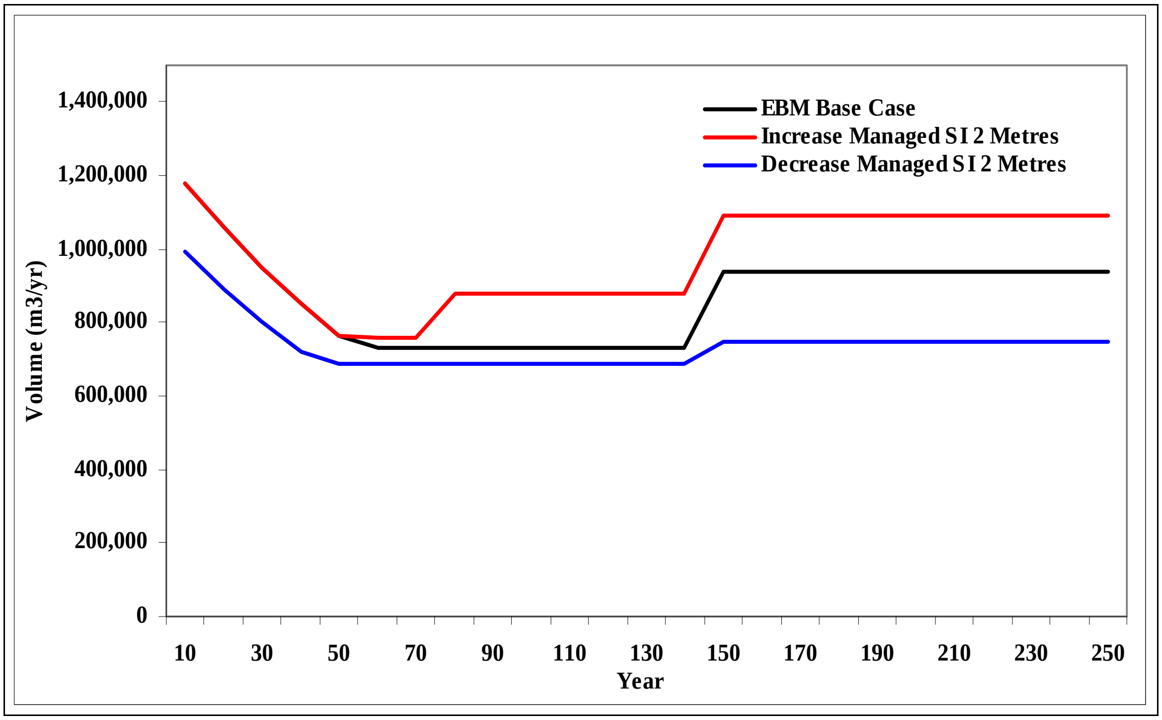

Figure 7.12 – Increase & decrease managed stand site index 2m annual harvest

7.5.3 Replace Managed Stand Adjusted Site Index with Inventory Site Index

In this scenario the adjusted site index (SIA) values used to develop the managed stand yield tables have been replaced with inventory site index. Generally the inventory site index is much lower than SIA on the poor and marginal sites, which comprise approximately 45% of the THLB. Table 7.12 summarizes the results of this sensitivity analysis.

Table 7.12 – Replace managed stand SIA with inventory site index annual harvest

Period	Annual Harvest by Scenario (m^3/year)	
	Base Case	Replace SIA with Inventory Site Index
1	1,175,500	1,175,500
2	1,056,500	1,056,500
3	949,400	949,400
4	852,900	852,900
5	766,100	766,100
6 – 14	728,400	726,550
15 - 25	936,200	743,550

The initial and short-term harvest levels are the same as the Base Case and the mid-tem is only slightly lower than that developed for the Base Case. However, the long-term harvest rate is 22% lower than found in the Base Case. The land base is continually growing on yields similar to those developed for the natural forest, with no improvement from managed stand site indices. Figure 7.13 shows the harvest for the inventory site index sensitivity analysis.

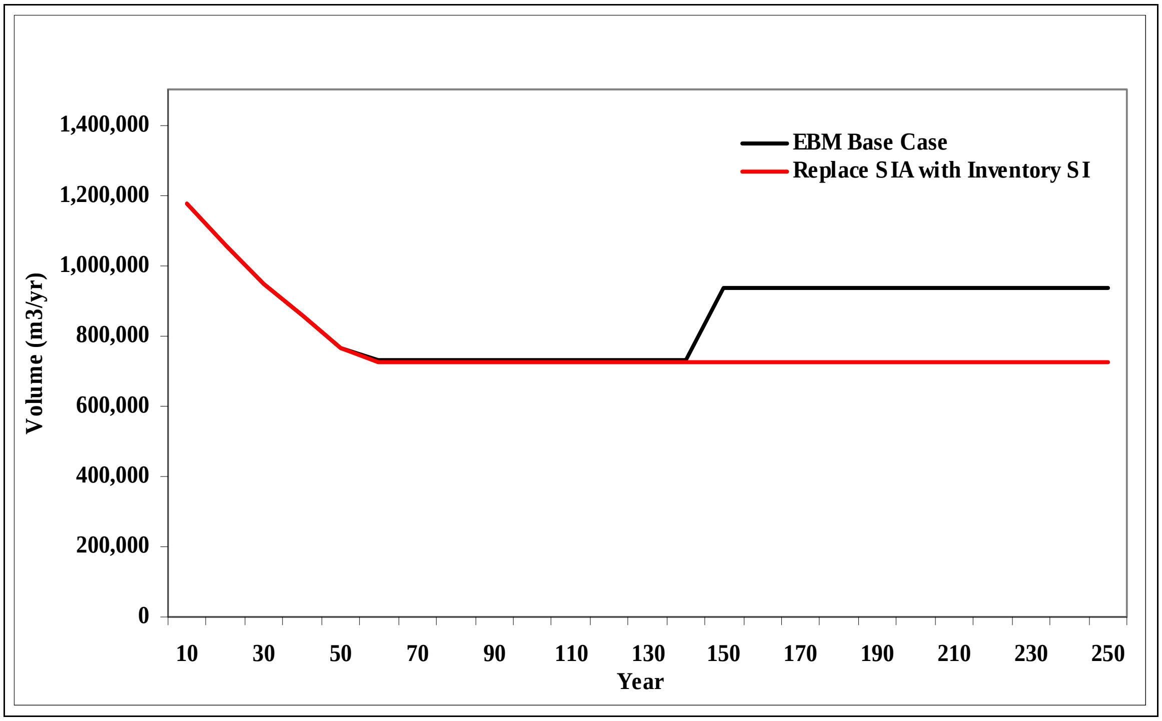

Figure 7.13 – Replace managed stand SIA with inventory site index annual harvest

7.5.4 Apply 8% OAF-1 in TIPSY Yields

Operational adjustment factors (OAFs) are applied to yield data to adjust managed stand yields generated by TIPSY to reflect such factors as gaps in stands and decay. OAF-1 is designed to address small areas of non-productive land (*eg*. rock outcrops, brush pockets, and wet areas) that are too small to be mapped in conventional inventories. OAF-2 was designed to capture decay waste and breakage in second growth stands and can also be used to account for pests if the losses can be quantified.

Traditional values are for 15% for OAF-1 and 5% for OAF2 at age 100, which were applied in the Base Case. Forest practices, particularly in EBM areas have changed significantly. Harvest areas are much smaller and there are also significant “in-block” reserves that frequently capture much of the area originally intended for the OAF-1 adjustment. Therefore, it is possible that traditional OAF values are overstated and reduce the actual productive capacity for the land base. The purpose of this sensitivity is to assess the impact of reducing the traditional OAF-1 value to 8%. Table 7.13 summarizes the results of the sensitivity analysis.

Table 7.13 – Apply 8% OAF-1 in TIPSY yields annual harvest

Period	Annual Harvest by Scenario (m^3/year)	
	Base Case	8% OAF-1 in TIPSY Yields
1	1,175,500	1,175,500
2	1,056,500	1,056,500
3	949,400	949,400
4	852,900	852,900
5	766,100	766,100
6	728,400	728,400
7	728,400	728,400
8 - 14	728,400	788,100
15 - 25	936,200	992,200

The harvest rate shows an improvement of 8% beginning in the eighth period and throughout the remainder of the mid term. In the long term the harvest is able to increase 6% over the Base Case level as the harvest is composed mainly of managed stands. This improvement to the harvest level demonstrates the importance of having reliable information for input to TIPSY for estimating managed stand yields. Figure 7.14 displays the harvest for the OAF-1 sensitivity analysis in graphic form.

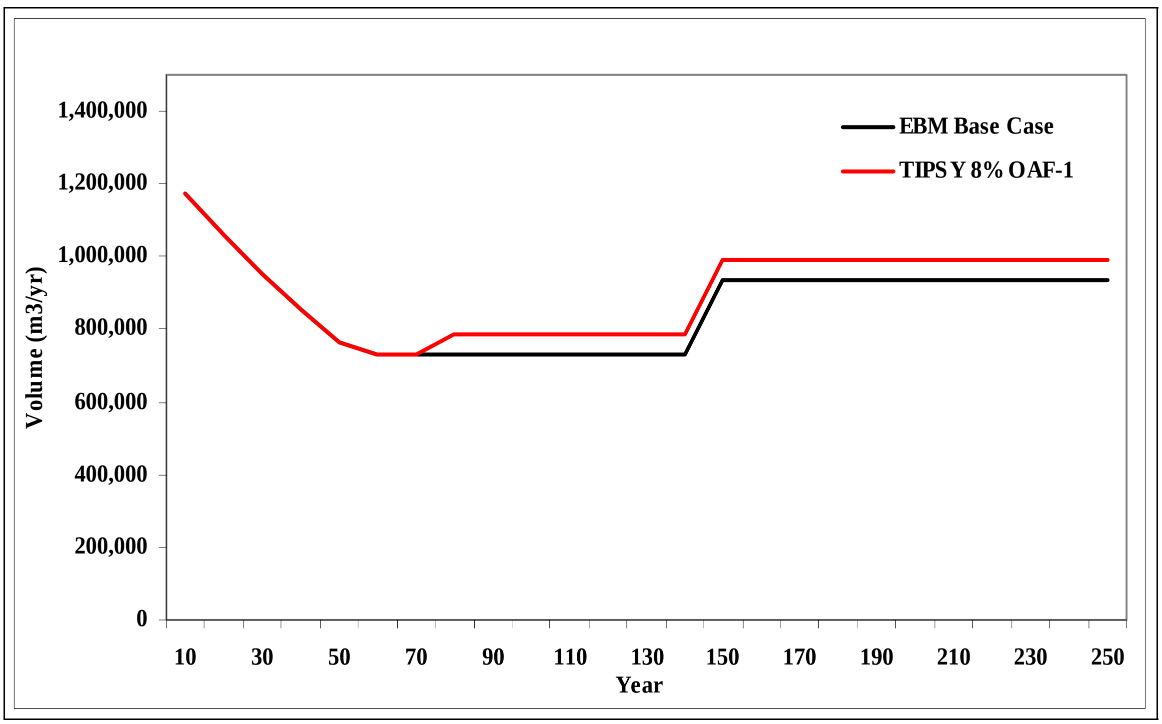

Figure 7.14 – Apply 8% OAF-1 in TIPSY yields annual harvest

7.6 Forest Cover Constraints

A number of sensitivity analyses were completed to evaluate the impact of forest cover constraints on the timber supply. Green-up in both visually sensitive areas and other disturbance zones were reviewed. In the analysis, green-up is modelled based on height for the majority of the zones. Therefore the height increase or decrease over a five-year period, based on average stand growth, was applied to the zones being evaluated in the sensitivity analysis.

7.6.1 Increase & decrease Green-up Ages in Visually Sensitive Areas

Green-up ages were adjusted five years from the Base Case assumptions for visually sensitive areas in these sensitivity analyses. Table 7.14 summarizes the harvest schedule results.

Table 7.14 – Increase & decrease green-up ages in visually sensitive areas annual harvest

Period	Annual Harvest by Scenario (m^3/year)		
	Base Case	Decrease Visual Green-up 5 Years	Increase Visual Green-up 5 Years
1	1,175,500	1,175,500	1,175,500
2	1,056,500	1,056,500	1,056,500
3	949,400	949,400	949,400
4	852,900	852,900	852,900
5	766,100	764,600	766,100
6 - 14	728,400	764,600	712,400
15 - 25	936,200	943,200	936,200

Results show that there is no change in the short-term annual harvest with sensitivity analyses for green-up in visually sensitive areas. The short-term harvest is the same as that developed for the Base Case. Reducing green-up by five years allows the mid-term harvest to increase by approximately 5%, with a minor 1% increase in the long term. Increasing green-up by five years reduces the mid-term harvest by less than approximately 2%, with no change in the long-term level

It is important to note that at various times throughout the planning horizon, a number of visually sensitive areas reach the disturbance limit and restrict harvesting. The five-year adjustment does not show a significant impact because many of the managed stands are achieving rapid height increment and these stands are reaching minimum green-up height within the same modelling period as the Base Case. In addition, visually sensitive areas represent only about 21% of the THLB.

Figure 7.15 presents the results of adjusting the green-up ages in visually sensitive areas in graphic form.

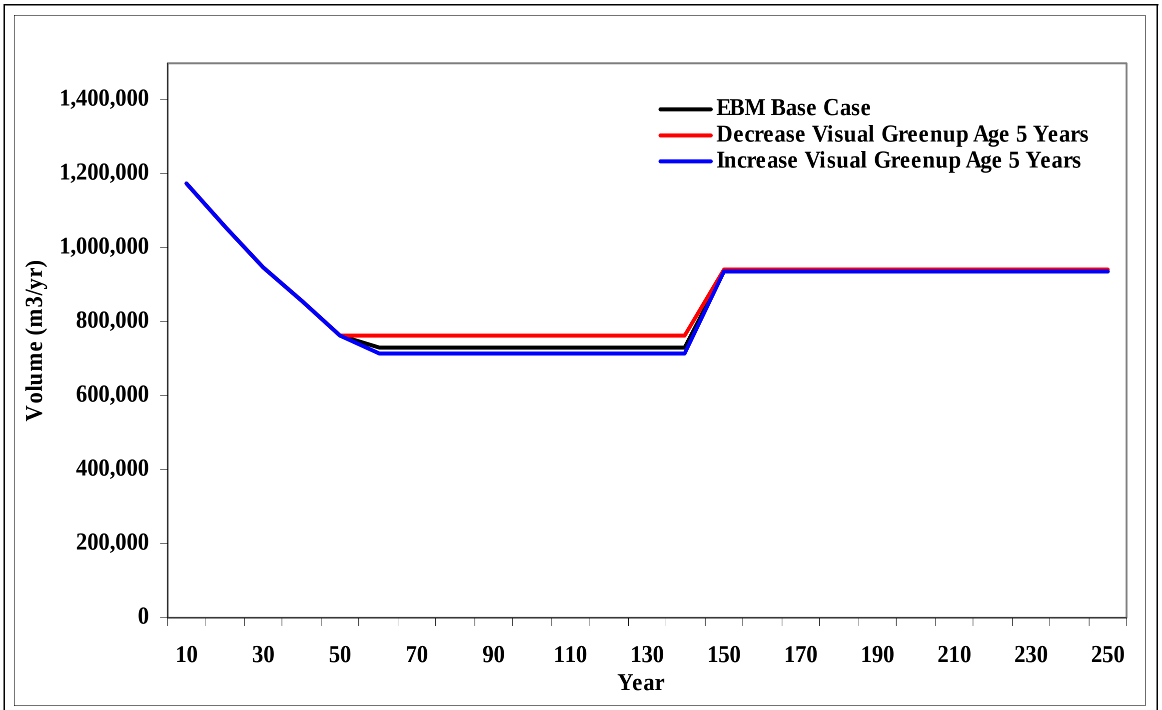

Figure 7.15– Increase & decrease green-up ages in visually sensitive areas annual harvest

7.6.2 Increase & Decrease All Green-up Ages

In this pair of sensitivity analyses green-up ages in all management zones, including visually sensitive areas, were increased and decreased by five years. Table 7.15 presents the results of adjusting green-up ages in all zones.

Table 7.15 – Increase & decrease green-up ages in all management zones annual harvest

Period	Annual Harvest by Scenario (m^3/year)		
	Base Case	Decrease All Green-up 5 Years	Increase All Green-up 5 Years
1	1,175,500	1,175,500	997,500
2	1,056,500	1,056,500	896,300
3	949,400	949,400	805,200
4	852,900	852,900	768,400
5	766,100	764,600	768,400
6 - 14	728,400	764,600	768,400
15 - 25	936,200	936,200	922,200

Increasing the area affected by the green-up age adjustment results in more significant changes to the annual harvest potential on the land base. Reducing green-up by five years allows the mid-term harvest to increase by 5%. No change to the long-term harvest was observed. Having all areas achieve green-up faster than in the Base Case provides additional flexibility in locating the harvest. Given that the land base is highly constrained, this flexibility enables an increase in the harvest. In the long term, most of the land base is supporting managed stands, which reach green-up height at a much quicker pace, so the five year adjustment is not as significant.

Increasing the green-up age has an immediate and substantial effect on the annual harvest. The initial harvest drops by approximately 15%. The mid-term harvest, which is 5% higher than in the Base Case level, is reached 10 years earlier in this sensitivity analysis, as the result of slowing the harvest in the previous decades and allowing stands to accumulate more volume per area. A minor 1% decline in long-term harvest was required with this change to the green-up assumptions. Figure 7.16 shows the results of these sensitivity analyses.

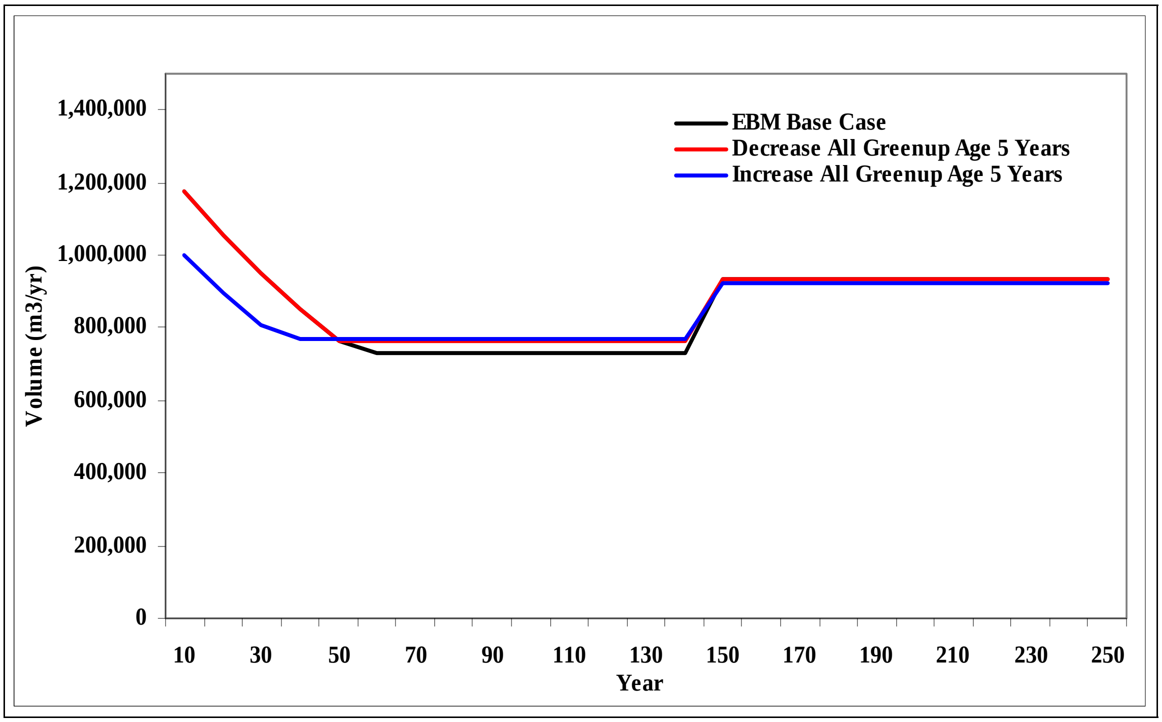

Figure 7.16– Increase & decrease green-up ages in all management zones annual harvest

7.7 Management Assumptions

7.7.1 Increase & Decrease Minimum Harvest Age

Minimum harvest ages (MHA) for all stands were increased and reduced by 10 years in these sensitivity analyses.

Table 7.16 shows the results for these analysis scenarios.

Table 7.16 – Increase & decrease minimum harvest ages annual harvest

Period	Annual Harvest by Scenario (m^3/year)		
	Base Case	Minimum Harvest Age -10 Years	Minimum Harvest Age +10 Years
1	1,175,500	1,175,500	1,128,500
2	1,056,500	1,056,500	1,014,200
3	949,400	949,400	911,300
4	852,900	852,900	818,700
5	766,100	774,100	735,400
6	728,400	774,100	689,500
7	728,400	774,100	689,500
8 - 14	728,400	774,100	720,400
15 - 25	936,200	910,200	946,600

Reducing minimum harvest ages by 10 years allows the mid-term harvest to increase by 6% and to be reached 10 years sooner. This is the result of gaining access to existing and future second growth stands earlier during the critical phase when the harvest is making the transition from existing old forest to those second growth stands. In addition, there is a larger pool of existing second growth that is available for harvest during the first 50 years. However, in the long term the harvest declines 2% below the Base Case level because, although the second growth stands are available sooner, they provide less volume per hectare and the harvest becomes restricted by disturbance limits in the various management zones.

Increasing minimum harvest age results in a 4% reduction in the short-term harvest compared to the Base Case. Most of the stands that contribute to the early harvest are older than minimum harvest age so the 10-year change is not significant for them. However, the critical phase when the harvest is converting to second growth is amplified and this requires a reduction in the short-term to keep within the harvest flow policy of 10% declines per decade. In addition, the harvest drops to the natural stand LRSY level during periods 6 and 7, which is 5% below the Base Case harvest at that time. This increase in MHA forces the mid-term harvest down by only 1%. Any restrictions to harvesting second growth during the critical phase 60 to 70 years into the future are likely to reduce the short-term harvest. In the long term the harvest level is slightly higher than the Base Case level. This indicates that stands are being harvested beyond MHA in the Base Case (Figure 6.6) due to other constraints.

Figure 7.17 displays the results of the MHA sensitivity analyses in graphic form.

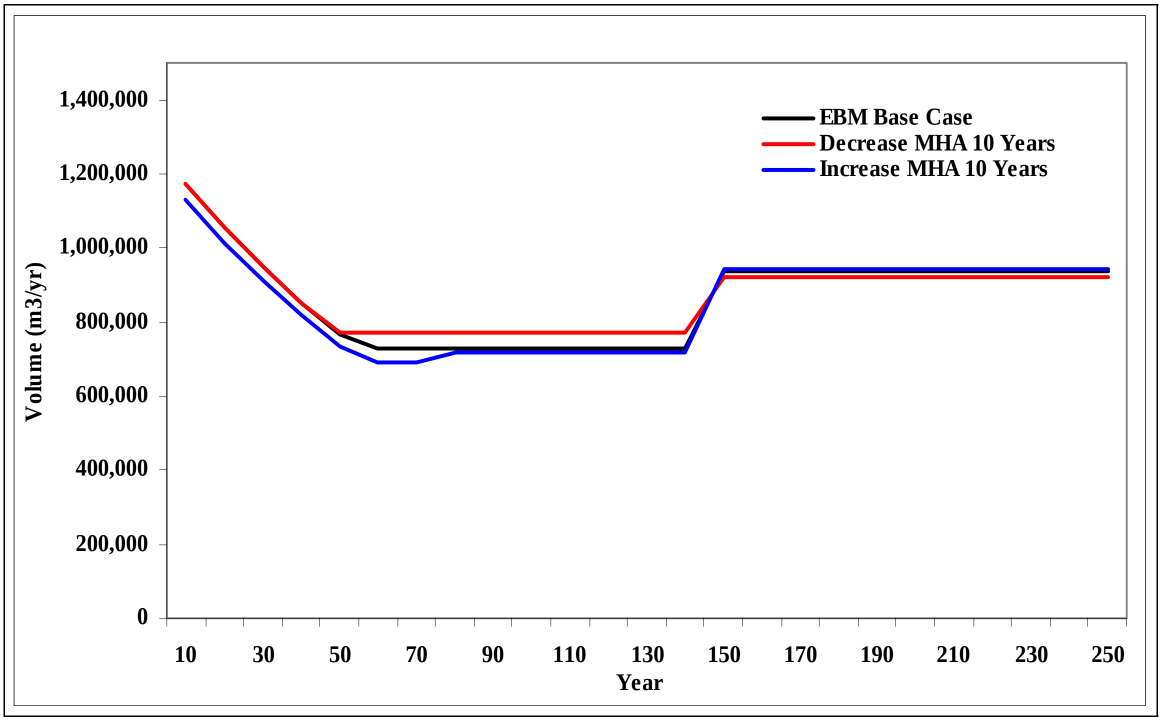

Figure 7.17– Increase & decrease minimum harvest ages annual harvest

7.8 Apply Alternative EBM Stand-Level Retention

As part of the EBM rules, stand-level retention requirements were included in the TIPSY managed stand yields. Depending on the location of the stand (general or high-retention) different stand retention levels were applied. Details of the methodology are provided in the *Data Package*. In this pair of sensitivity analyses, the stand-level retention requirements are increased (high) and decreased (low) to evaluate the impact on timber supply. Table 7.17 summarizes the results of these analysis scenarios.

Table 7.17 – Apply alternative EBM stand-level retention annual harvest

Period	Annual Harvest by Scenario (m^3/year)		
	Base Case	High Stand-Level Retention	Low Stand-Level Retention
1	1,175,500	1,085,500	1,175,500
2	1,056,500	975,400	1,056,500
3	949,400	876,300	949,400
4	852,900	787,100	852,900
5	766,100	706,800	766,100
6 - 14	728,400	682,800	745,400
15 - 25	936,200	884,200	936,200

Increasing the stand-level retention requirements affects the harvest rate throughout the simulation. Initially the harvest is reduced by 8% followed by 6% declines in both the mid and long term. This is simply the result of lower volumes being recovered from some all stands on the EBM portion of the land base, which in turn requires more disturbance to take place to achieve a given harvest target and amplifies the forest cover constraint condition.

Reducing the level of retention within stands allows a minor 2% improvement in the mid-term harvest rate, with no change to the long-term level. The change in volume is much not as significant compared to the High Stand-Level retention scenario, resulting in relatively smaller changes to the annual harvest.

Figure 7.18 displays the results of these sensitivity analyses.

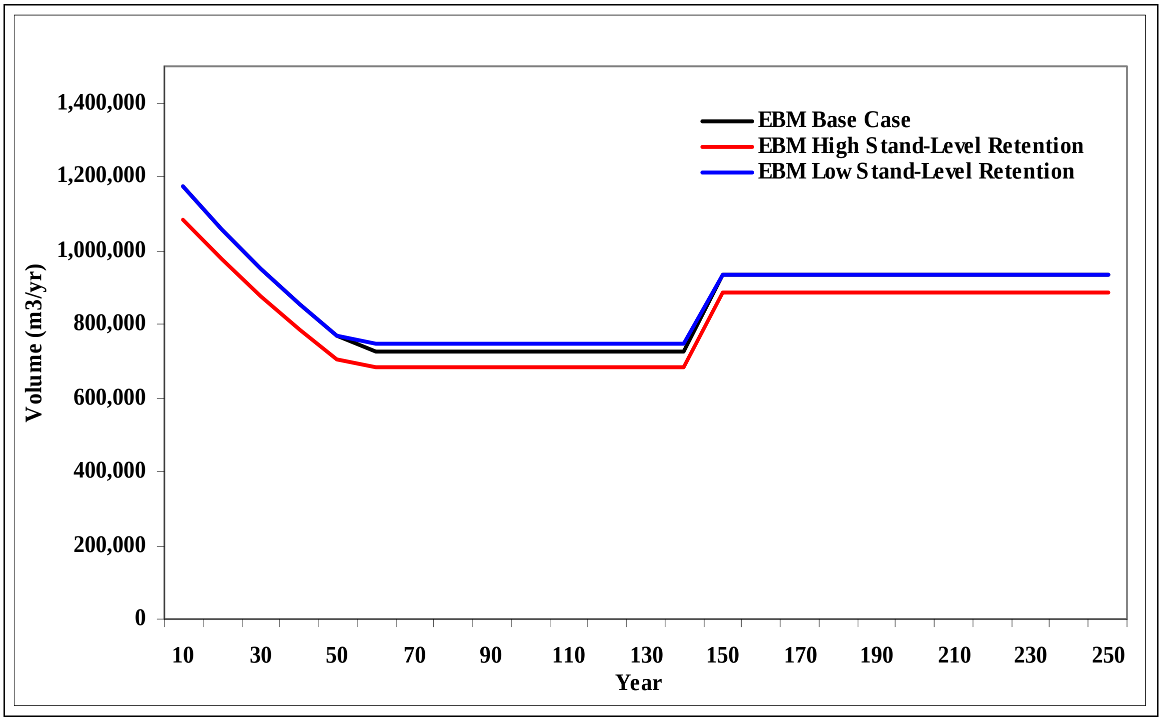

Figure 7.18– Apply alternative EBM stand-level retention annual harvest

Timberline Natural Resource Group

8.0 DISCUSSION

The initial harvest developed for the Base Case is within 5% of the current AAC. Earlier in this document it was noted that several opportunities to increase the short-term harvest rate in sensitivity analysis were not exercised. The discussion that follows highlights several areas where there are likely downward pressures on both short and longer-term harvest rates. Once these issues have been explored in more detail increased harvest opportunity should be evaluated.

8.1 Proposed AAC

Results of the timber supply analysis for the Kingcome TSA indicate that a harvest level of 1,175,500 m^3/year can be maintained over the next 10 years. Included in the annual harvest is some contribution of volume from second growth stands (277,000 m^3/year), deciduous stands (6,400 m^3/year)[11], and marginal forest types (75,000 m^3/year). Additional deciduous volume is present in the TSA, however, much of this volume is unavailable due to EBM specific constraints (land base withdrawal, and forest cover constraints). Beyond 10 years, there are declines of approximately 10% per decade until the mid-term harvest of 728,400 m^3/year is reached at year 61 of the planning horizon. The long-term harvest level of 936,200 m^3/year begins in the 15th decade after the majority of natural forest have been converted into managed stands and is maintained for the remainder of the 250-years modelled in the analysis.

Relative to TSR2 the AAC proposed in this analysis suggests that EBM, the land base removals associated with EBM and the land base removals for new parks, conservancies, and biodiversity areas have reduced the initial harvest by 6%. Conversely, the Pre-EBM forecast included in this report, which incorporates the revised operability, suggests that the impact from EBM specific management objectives is 16%. The impact since TSR1, which predates the LRMP and EBM is the same, 16%. Preliminary analysis of the productive land base now unavailable for harvesting[12] suggests that the cumulative impact of EBM and the land base removals likely exceeds the 16% reported here.

Collectively most sensitivities indicate that 1,175,500 m^3/year is an acceptable harvest rate for the first decade. Sensitivities that reduce the land base or roll back yield expectations realize obvious and expected results; harvest levels decline. However, since the last TSR considerable effort has been invested in collecting new data sets to increase the level of confidence in modelling inputs and analysis results. Since the last TSR considerable operational data has also been collected which supports the assumptions modelled in the analysis.

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[11] A deciduous volume of 6,400 m^3/yr (primarily alder) is supported by the "EBM" contributing land base. Additional deciduous volume is estimated in the Pre-EBM scenario. The pre-EBM scenario should be used to , evaluate deciduous harvest volumes based on exceptions for deciduous licenses.

[12] Table 4.2 identifies 99,033 hectares of productive forest in parks, conservancies and biodiversity areas. Remaining land base statistics suggest that approximately 40% of this area is THLB which, based on a managed forest MAI of 5.3 m^3/yr would support and additional 210,000 m^3/yr harvest. This volume is not measured or reported on in this analysis.

8.2 Economic Operability

A specific example of where base information has been greatly improved upon is the economic operability data overlay. Presently in the Base Case the economic operability profit threshold is set at $-10. While this may seem counter intuitive it is in fact conservative; permit blending, reduced logging costs and incidental development of stands make the single stand economic model difficult to intuitively calibrate. In future a THLB classification system that does not report on dollars may resolve this idiosyncrasy. Even at this threshold many good and medium site hemlock sands are still excluded. This is a market/species specific pressure and should be monitored between now and the next TSR to ensure that the size of the contributing land base and associated harvest level has not been underestimated. The exclusion of good and medium sites suggests that there may in fact be an underestimation.

8.3 Second Growth Volumes

The Base Case harvest forecast for this analysis includes a conservative harvest rate of second growth timber harvest, a harvest rate which is based on minimum harvest rates and an upper limit which steps down in conjunction with the total harvest. Unconstrained sensitivity runs indicate that the volume of second growth that meets the minimum harvest age criterion in the first decade far exceeds that which is harvested. In period one the harvest is constrained to 277,000 m^3/year, unconstrained this increases to 384,228 m^3/year. As expected this unconstrained harvest does have consequences in other periods. However, the sensitivity analysis demonstrates that additional harvest opportunities in second growth exist and may provide important volume over the next few decades. In addition, the long-term harvest level is improved slightly by an increase in second growth harvest in the short term.

When second growth harvesting is constrained to 150,000 m^3/year the cut during decades one through five is negatively impacted and the long term is unaffected. This confirms that second growth is a critical part of the short-term harvest and requires thorough evaluation. Both economics of scale with respect to operational capacity and Ministerial direction indicate that the volume of second growth available now should be significant. Modelling suggests that in as little as 60 years second growth will dominate the harvest profile in the TSA.

8.4 Deciduous Volume

Deciduous harvest in the Base Case is well below the current harvest levels for this inventory group. However, given that hardwood tenures are exempt from EBM rules, it is more realistic to estimate the timber supply from the Pre-EBM scenario, in which alder harvest is maintained at 25,000 m^3/year for the next 40 years and cottonwood maintains 5,000 m^3/year for the next 70 years. Consistent with the Coastal Forest Action Plan the analysis presented here included management of 6,211 hectares of alder and 653 hectares of cottonwood stands.

8.5 Operational Adjustment Factors (OAFs)

Sensitivities run on OAF-1 conclude the obvious; reducing OAF-1 increases managed stand yields, and subsequently increases the harvest over the entire planning horizon, especially in the mid and long term.

There are two types of OAFs used in TIPSY. Historically the values used have been 15% for OAF-1 and 5% for OAF-2. OAF-1 is intended to address stocking gaps that traditionally have been unmappable such as rock outcrops, non commercial cover, and other small non-productive areas. OAF-2 is meant to address decay, waste and breakage, losses due to forest health and random risk factors.

The combination is a net down of 20% on managed stand yields. The actual reduction necessary to approximate the yield of the averaged managed stand is not measured and current defaults are conservative in order to account for unknowns that are difficult to quantify. The Morice & Lakes Innovative Forest Practices Agreement (IFPA) OAF1 analysis (McCulloch and Bance, 2003[13]) showed that none of the site series surveyed exceeded an OAF1 of 14% and that in most cases OAF-1 was less than 5%. Therefore, the recommendations of the study suggested 5% value for OAF-1. Where the OAF-1 values were above 5%, the site series associated with these trends were the wetter poorer sites at the bottom of the edatopic grid. In the Kingcome TSA these sites are associated with red listed ecosystems that are now removed from the timber harvesting land base due to the South Central Coast Ministerial Order.

Consequently, it is possible that traditional OAF values are excessive and therefore represent a downward pressure on the potential harvest volume. Additional research in the TSA is required to confirm this hypothesis and this issue should be investigated prior to the next TSR. Reducing OAF-1 from 15% to 8% results in a long-term harvest increase of 6%.

8.6 Terrestrial Ecosystem Mapping (TEM)

Full implementation of EBM requires specific inventories to accurately and meaningfully manage ecosystems. TEM is a cornerstone inventory required for full implementation of EBM. Until such time as TEM is available, management and analysis is limited to using Site Series Surrogates (SSS) that were developed during the LRMP to quantify the land base. These surrogates are productivity class based and do not mimic ecosystems mapping well. Furthermore, these surrogates create administrative rarity based on abundance of the species site class groupings in the Plan area. Consequently, it is likely that the old seral requirements based on SSS are overstated and result in a depressed timber supply.

TEM mapping will also greatly improve management of red and blue listed ecosystems; however, the CDC Blue List will also have to be updated to accurately address rare ecosystems listed in the intent of the South Central Coast Order. Presently there are Blue Listed ecosystems in the CDC list that are actually abundant on the coast.

A concerted effort is immediately required to marshal energy and resources towards acquiring this pivotal management data set. This effort should be implemented prior to any additional analysis on the land base to aid in establishing baselines, objectives and thresholds related to EBM.

8.7 Operational Issues

Road width assumptions used in this analysis are based on a uniform 14-meter disturbance and, consequently form a non-contributing land base netdown for future

[13] Operational adjustment factor (1) analysis for the Bulkley, Morice and Lakes Timber Supply Areas / Larry McCulloch and Bryan Bance. (http://www.for.gov.bc.ca/hfd/library/FIA/2003/FIA-03-04-0121.pdf)

stands. There is concern from operational practitioners that the road widths utilized in the analysis may be too high. Thus the assumptions regarding existing and future roads could possibly overstate the impact on the productive land base placing downward pressure on harvest rates. It is recommended by the licensee group that this topic be thoroughly researched prior to the next TSR.

Additional concerns have been raised from operational staff regarding riparian management area (RMA) netdowns. Since RMA management is prescriptive in nature and no current data exists to assess impacts of RMA activities, netdown estimates were used. In this analysis there was the added advantage of additional spatial data for streams. As a result, it was possible to identify riparian management zones with greater certainly. However, concern has been raised over the assumptions used in the analysis. Consequently, this reduction may not be accurate and should be investigated to determine if that is the case.

8.8 Conclusions

The discussion above highlights several areas where improvement in measurement and inventories is required to continue improving the reliability of the timber supply prediction for the TSA. A number of uncertainties related to inventory and managed stand productivity have been addressed through additional studies since the completion of TSR2. These increase confidence in the results and confirm the results of sensitivity analysis in conducted in previous analyses.

The analysis data set excluded a number of sliver polygons, reducing the THLB by 3,025 hectares (1.6%). This indicates that the harvest estimates provided in this report may be conservative. It also demonstrates the importance of developing reliable inventories and data sets for use in timber supply analysis. The uncertainty around harvested lands and missing information in the VRI point to examples of areas where information can be improved for future analyses on the Kingcome TSA.

The analysis has recognized the current implementation of EBM for the TSA, and has accounted for the non-timber objectives associated with this initiative. Based on the results of the Base Case and sensitivity analyses conducted, the results of the analysis support a harvest of 1,175,500 m^3/year for the next five years on the Kingcome TSA.

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GLOSSARY

Allowable annual cut (AAC)	The rate of timber harvest permitted each year from a specified area of land, usually expressed as cubic meters of wood per year.
Analysis unit	A grouping of types of forest — for example, by species, site productivity, silvicultural treatment, age, and or location — done to simplify analysis and generation of timber yield tables.
Base case harvest forecast	The timber supply forecast which illustrates the effect of current forest management practices on the timber supply using the best available information, and which forms the reference point for sensitivity analysis.
Basic sector	Sectors of the economy, such as forestry, tourism and mining, which create flows of income into the region and are assumed to be drivers of the local economy. Non-basic sectors, such as retail outlets, are supported by basic sectors.
Biodiversity (biological diversity)	The diversity of plants, animals and other living organisms in all their forms and levels of organization, including the diversity of genes, species and ecosystems, as well as the evolutionary and functional processes that link them.
Biogeoclimatic (BEC) variant	A subdivision of a biogeoclimatic subzone. Variants reflect further differences in regional climate and are generally recognized for areas slightly drier, wetter, snowier, warmer or colder than other areas in the subzone.
Biogeoclimatic zones	A large geographic area with broadly homogeneous climate and similar dominant tree species.
Coniferous	Coniferous trees have needles or scale-like leaves and are usually 'evergreen'.
Cutblock	A specific area, with defined boundaries, authorized for harvest.
Cutblock adjacency	The desired spatial relationship among cutblocks. Most adjacency restrictions require that recently harvested areas must achieve a desired condition (green-up) before nearby or adjacent areas can be harvested. Specifications for the maximum allowable proportion of a forested landscape that does not meet green-up requirements are used to approximate the timber supply impacts of adjacency restrictions.

Deciduous	Deciduous trees shed their leaves annually and commonly have broad-leaves.
Ecosystem Based Management (EBM)	An adaptive approach to managing human activities that seeks to ensure the coexistence of healthy, fully functioning ecosystems and human communities. The intent is to maintain those spatial and temporal characteristics of ecosystems such that component species and ecological processes can be sustained, and human wellbeing supported and improved.
Employment coefficient	The number of person-years of employment supported by every 1,000 cubic meters of timber harvested; for example, a coefficient of 1.0 indicates that every 1,000 cubic meters harvested supports one person-year, or 500,000 cubic meters supports 500 person-years.
Employment multiplier	An estimate of the total employment supported by each direct job, for example a multiplier of 2.0 means that one direct job supports one additional indirect and induced job.
Environmentally sensitive areas (ESA)	Areas with significant non-timber values, fragile or unstable soils, impediments to establishing a new tree crop, or high risk of avalanches.
Forest cover objectives	Specify desired distributions of areas by age or size class groupings. These objectives can be used to reflect desired conditions for wildlife, watershed protection, visual quality and other integrated resource management objectives. General adjacency and green-up guidelines are also specified using forest cover objectives (see **Cutblock adjacency and Green–up**).
Forest inventory	An assessment of British Columbia's timber resources. It includes computerized maps, a database describing the location and nature of forest cover, including size, age, timber volume, and species composition, and a description of other forest values such as recreation and visual quality.
Forest Practices Code	Legislation, standards and guidebooks that govern forest practices and planning, with a focus on ensuring management for all forest values.
Forest type	The classification or label given to a forest stand, usually based on its tree species composition. Pure spruce stands and spruce-balsam mixed stands are two examples.

Free-growing	An established seedling of an acceptable commercial species that is free from growth-inhibiting brush, weed and excessive tree competition.
Green-up	The time needed after harvesting for a stand of trees to reach a desired condition (usually a specific height) — to ensure maintenance of water quality, wildlife habitat, soil stability or aesthetics — before harvesting is permitted in adjacent areas.
Growing stock	The volume estimate for all standing timber at a particular time.
Harvest forecast	The flow of potential timber harvests over time. A harvest forecast is usually a measure of the maximum timber supply that can be realized over time for a specified land base and set of management practices. It is a result of forest planning models and is affected by the size and productivity of the land base, the current growing stock, and management objectives, constraints and assumptions.
Higher level plans	Higher level plans establish the broader, strategic context for operational plans, providing objectives that determine the mix of forest resources to be managed in a given area.
Indirect and induced jobs	Indirect jobs are supported by direct business purchases of goods and services. Induced jobs are supported by employee purchases of goods and services; for example, at retail outlets.
Inoperable areas	Areas defined as unavailable for harvest for terrain-related or economic reasons. Operability can change over time as a function of changing harvesting technology and economics.
Integrated resource management (IRM)	The identification and consideration of all resource values, including social, economic and environmental needs, in resource planning and decision-making.
Landscape-level biodiversity	The *Landscape Unit Planning Guide* provides objectives for maintaining biodiversity at both the landscape level and the stand level. At the landscape level, guidelines are provided for the maintenance of seral stage distribution, patch size distribution and landscape connectivity.

Landscape unit	A planning area based on topographic or geographic features, that is appropriately sized (up to 100 000 hectares), and designed for application of landscape-level biodiversity objectives.
Long-term harvest level	A harvest level that can be maintained indefinitely given a particular forest management regime (which defines the timber harvesting land base, and objectives and guidelines for non-timber values) and estimates of timber growth and yield.
Mature seral	Forest stands with trees between 80 and 120 years old, depending on species, site conditions and biogeoclimatic zone.
Management assumptions	Approximations of management objectives, priorities, constraints and other conditions needed to represent forest management actions in a forest planning model. These include, for example, the criteria for determining the timber harvesting land base, the specification of minimum harvestable ages, utilization levels, integrated resource guidelines and silviculture and pest management programs.
Mean annual increment (MAI)	Stand volume divided by stand age. The age at which average stand growth, or MAI, reaches its maximum is called the culmination age (CMAI). Harvesting all stands at this age results in a maximum average harvest over the long term.
Minimum harvestable age (MHA)	The age at which a stand of trees is expected to achieve a merchantable condition. The minimum harvestable age could be defined based on maximize average productivity (culmination of mean annual increment), minimum stand volume, or product objectives (usually related to average tree diameter).
Model	An abstraction and simplification of reality constructed to help understand an actual system or problem. Forest managers and planners have made extensive use of models, such as maps, classification systems and yield projections, to help direct management activities.
Natural disturbance type (NDT)	An area that is characterized by a natural disturbance regime, such as wildfires, which affects the natural distribution of seral stages. For example areas subject to less frequent stand-initiating disturbances usually have more older forests.

Not satisfactorily restocked (NSR)
An area not covered by a sufficient number of well-spaced trees of desirable species. Stocking standards are set by the B.C. Forest Service. Areas harvested prior to October 1987 and not yet sufficiently stocked according to standards are classified as backlog NSR. Areas harvested or otherwise disturbed since October 1987 are classified as current NSR.

Operational Adjustment Factor (OAF)
OAF1 and OAF2 are TIPSY input parameters that reduce predicted yield to account for factors such as non-productive areas within stands, disease and insects, non-commercial cover, stocking gaps, decay, waste, and breakage.

Operability
Classification of an area considered available for timber harvesting. Operability is determined using the terrain characteristics of the area as well as the quality and quantity of timber on the area.

Person-year(s)
One person working the equivalent of one full year, defined as at least 180 days of work. Someone working full-time for 90 days accounts for 0.5 person-years.

Protected area
A designation for areas of land and water set aside to protect natural heritage, cultural heritage or recreational values (may include national park, provincial park, or ecological reserve designations).

Riparian area
Areas of land adjacent to wetlands or bodies of water such as swamps, streams, rivers or lakes.

Scenic area
Any visually sensitive area or scenic landscape identified through a visual landscape inventory or planning process carried out or approved by a district manager.

Sensitivity analysis
A process used to examine how uncertainties about data and management practices could affect timber supply. Inputs to an analysis are changed, and the results are compared to a baseline or base case.

Seral stages
Sequential stages in the development of plant communities that successively occupy a site and replace each other over time.

Site index	A measure of site productivity. The indices are reported as the average height, in meters, that the tallest trees in a stand are expected to achieve at 50 years (age is measured at 1.3 meters above the ground). Site index curves have been developed for British Columbia's major commercial tree species.
Stand-level biodiversity	A stand is a relatively localized and homogeneous land unit that can be managed using a single set of treatments. In stands, objectives for biodiversity are met by maintaining specified stand structure (wildlife trees or patches), vegetation species composition and coarse woody debris levels.
Stocking	The proportion of an area occupied by trees, measured by the degree to which the crowns of adjacent trees touch, and the number of trees per hectare.
Table Interpolation Program for Stand Yields (TIPSY)	A B.C. Forest Service computer program used to generate yield projections for managed stands based on interpolating from yield tables of a model (TASS) that simulates the growth of individual trees based on internal growth processes, crown competition, environmental factors and silvicultural practices.
Timber harvesting land base	Crown forest land within the timber supply area where timber harvesting is considered both acceptable and economically feasible, given objectives for all relevant forest values, existing timber quality, market values and applicable technology.
Timber supply	The amount of timber that is forecast to be available for harvesting over a specified time period, under a particular management regime.
Timber supply area (TSA)	An integrated resource management unit established in accordance with *Section 7* of the *Forest Act*.
Tree farm license (TFL)	Provides rights to harvest timber, and outlines responsibilities for forest management, in a particular area.
Ungulate	A hoofed herbivore, such as deer.
Unsalvaged losses	The volume of timber killed or damaged annually by natural causes (e.g., fire, wind, insects and disease) that is not harvested.

Variable Density Yield Prediction Model (VDYP)	An empirical yield prediction system supported by the Ministry of Sustainable Resource Management, designed to predict average yields and provide forest inventory updates over large areas (i.e., Timber Supply Areas). It is intended for use in unmanaged natural stands of pure or mixed species composition.
Vegetation Resources Inventory (VRI)	An assessment of British Columbia's vegetation resources. It includes computerized maps, a database describing the location and nature of forest information, including timber size, stand age, timber volume, tree species composition, and shrub, herb, and bryoid information. It replaces the older forest inventory.
Visual quality objective (VQO)	Defines a level of acceptable landscape alteration resulting from timber harvesting and other activities. A number of visual quality classes have been defined on the basis of the maximum amount of alteration permitted.
Volume estimates	Estimates of yields from forest stands over time. Yield projections can be developed for stand volume, stand diameter or specific products, and for empirical (average stocking), normal (optimal stocking) or managed stands.
Yield projections	See volume estimates
Watershed	An area drained by a stream or river. A large watershed may contain several smaller watersheds.
Wildlife tree	A standing live or dead tree with special characteristics that provide valuable habitat for conservation or enhancement of wildlife.
Woodlot licence	An agreement entered into under the *Forest Act*. It allows for small-scale forestry to be practised in a described area (Crown and private) on a sustained yield basis.

ACRONYMS

AAC	Allowable Annual Cut
Analysis	Timber Supply Analysis
AU	Analysis Unit
BCTS	British Columbia Timber Sales
BEC	Biogeoclimatic Ecosystem Classification
BEO	Biodiversity Emphasis Option
BGB	Biodiversity Guidebook
CF	Chief Forester
CASH6	Critical Analysis by Simulation of Harvesting (version 6)
CWAP	Coastal Watershed Assessment Procedure
DFO	Department of Fisheries and Oceans
DM	District Manager
EBM	Ecosystem-Based Management
ESA	Environmentally Sensitive Area
FES	Forest Ecosystem Specialist
FIZ	Forest Inventory Zone
FPC	Forest Practices Code
FPPR	Forest Planning and Practices Regulation
FSP	Forest Stewardship Plan
FSSIM	Forest Service Simulation Model
GIS	Geographic Information System
HLP	Higher Level Plan
ILMB	Integrated Land Management Bureau (Ministry of Agriculture and Lands)
IP	Information Package
IRM	Integrated Resource Management
LRMP	Local Resource Management Plan
LU	Landscape Unit
MHA	Minimum Harvestable Age
MFR	Ministry of Forests and Range
MO	Ministerial Order
MSYT	Managed Stand Yield Table

NCC	Non-Commercial Cover
NDT	Natural Disturbance Type
NRL	Non-Recoverable Losses
NSR	Not Satisfactorily Restocked
NSYT	Natural Stand Yield Table
OAF	Operational Adjustment Factor
OGMA	Old Growth Management Area
PSP	Permanent Sample Plot
PSYU	Public Sustained Yield Unit
QMD	Quadratic Mean Diameter
RFI	Recreation Features Inventory
RMZ	Riparian Management Zone
ROS	Recreation Opportunity Spectrum
RRZ	Riparian Reserve Zone
RVQC	Recommended Visual Quality Class
SI	Site Index
SRMZ	Special Resource Management Zone
TFL	Tree Farm License
THLB	Timber harvesting land base
WHA	Wildlife habitat area
UWR	Ungulate winter range

Appendix I
Kingcome Timber Supply Area TSR3
Base Case EBM
Landscape Unit-Site Series Surrogate
Old Forest Retention Status

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
151	Ahnuhati_kwalate-CWHvm1-AU1	21 > 180	2.1	0.4	0	0	0	2	2
152	Ahnuhati_kwalate-CWHvm1-AU3	21 > 180	197.7	41.5	33.5	34	104	191	42
153	Ahnuhati_kwalate-CWHvm1-AU12	12 > 180	12.3	1.5	2.1	2	2	5	8
154	Ahnuhati_kwalate-CWHvm2-AU11	59 > 180	4.5	2.6	2.9	3	3	4	4
155	Ahnuhati_kwalate-MHmm1-AU7	59 > 180	4.3	2.5	0	0	0	0	4
156	Ahnuhati_kwalate-CWHvm2-AU2	49 > 180	15.1	7.4	13.7	14	14	14	15
157	Ahnuhati_kwalate-CWHvm2-AU3	49 > 180	3.1	1.5	0	0	0	3	3
158	Ahnuhati_kwalate-CWHvm1-AU2	21 > 180	169.8	35.7	62	62	83	132	36
159	Ahnuhati_kwalate-CWHvm1-AU5	28 > 180	329.3	92.2	302.7	303	288	159	158
160	Ahnuhati_kwalate-CWHvm1-AU6	28 > 180	295	82.6	206.5	207	250	177	83
161	Ahnuhati_kwalate-CWHvm1-AU7	25 > 180	519.5	129.9	137.7	138	155	209	213
162	Ahnuhati_kwalate-CWHvm1-AU8	25 > 180	2253.9	563.5	1436	1,466	1,860	1,910	564
163	Ahnuhati_kwalate-CWHvm1-AU9	25 > 180	424	106	115.4	129	225	299	122
164	Ahnuhati_kwalate-CWHvm1-AU10	25 > 180	199.2	49.8	108.1	108	114	145	50
165	Ahnuhati_kwalate-CWHvm1-AU11	25 > 180	272.7	68.2	149	149	207	247	68
166	Ahnuhati_kwalate-CWHvm2-AU5	28 > 180	67.7	19	67.1	67	67	59	19
167	Ahnuhati_kwalate-CWHvm2-AU6	28 > 180	302.4	84.7	258.6	251	250	248	213
168	Ahnuhati_kwalate-CWHvm2-AU7	25 > 180	77.6	19.4	7.4	7	7	7	78
169	Ahnuhati_kwalate-CWHvm2-AU8	25 > 180	1499.1	374.8	1221.7	1,222	1,352	1,419	1,339
170	Ahnuhati_kwalate-CWHvm2-AU9	25 > 180	1353.1	338.3	607.7	608	672	1,042	1,286
171	Ahnuhati_kwalate-MHmm1-AU6	28 > 180	31.7	8.9	17	17	17	16	23
172	Ahnuhati_kwalate-MHmm1-AU8	25 > 180	206.9	51.7	185.2	185	195	189	196
173	Ahnuhati_kwalate-MHmm1-AU9	25 > 180	1117.6	279.4	394.8	395	484	883	1,089
176	Ahnuhati_kwalate-CWHvm1-AU13	0 > 180	236.8	0	0	0	0	7	218
177	Ahta-CWHvm1-AU3	21 > 180	9.4	2	0	0	0	3	3
178	Ahta-MHmm1-AU5	65 > 180	15.3	9.9	15.3	15	15	15	11
179	Ahta-CWHvm1-AU4	25 > 180	16.6	4.2	0	0	0	0	9
180	Ahta-CWHvm1-AU5	28 > 180	527.3	147.6	141.7	142	143	148	147
181	Ahta-CWHvm1-AU6	28 > 180	3119	873.3	2859.8	2,236	1,299	1,065	873

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
182	Ahta-CWHvm1-AU7	25 > 180	884.4	221.1	0	0	9	442	367
183	Ahta-CWHvm1-AU8	25 > 180	1567.2	391.8	945.1	943	998	912	392
184	Ahta-CWHvm1-AU9	25 > 180	155.8	39	104.3	104	138	150	39
185	Ahta-CWHvm1-AU11	25 > 180	16.6	4.2	14.8	15	15	15	4
186	Ahta-CWHvm2-AU5	28 > 180	57.5	16.1	9.6	10	10	10	19
187	Ahta-CWHvm2-AU6	28 > 180	1856.7	519.9	1802.8	1,611	1,356	1,287	520
188	Ahta-CWHvm2-AU7	25 > 180	2.5	0.6	0	0	0	0	3
189	Ahta-CWHvm2-AU8	25 > 180	747.8	186.9	650.1	620	628	617	242
190	Ahta-CWHvm2-AU9	25 > 180	818.2	204.5	580.4	580	690	774	437
191	Ahta-MHmm1-AU6	28 > 180	451.4	126.4	437	437	388	399	126
192	Ahta-MHmm1-AU8	25 > 180	114.8	28.7	114.8	111	104	103	36
193	Ahta-MHmm1-AU9	25 > 180	665.4	166.3	568.6	569	612	621	513
196	Ahta-CWHvm1-AU13	0 > 180	313	0	0	0	10	143	99
197	Ahta-CWHvm2-AU13	0 > 180	32.8	0	0	0	0	2	32
198	Allison-CWHvh1-AU4	27 > 180	1806.9	487.9	0	0	0	2	671
199	Allison-CWHvh1-AU7	25 > 180	934.2	233.5	0	0	0	58	479
200	Allison-CWHvh1-AU8	29 > 180	911.9	264.5	240.8	249	261	281	349
201	Allison-CWHvh1-AU12	25 > 180	925.9	231.5	922.7	921	860	863	687
202	Allison-CWHvh1-AU9	29 > 180	799.4	231.8	766	745	733	753	733
203	Allison-CWHvh1-AU5	29 > 180	2602.7	754.8	157.3	157	157	203	888
204	Allison-CWHvh1-AU6	29 > 180	44124.9	12796.2	41617.4	36,278	29,833	26,179	17,867
205	Allison-CWHvh1-AU13	0 > 180	412.8	0	0	0	0	68	308
206	Belize-CWHvh1-AU7	25 > 180	11.1	2.8	0	0	0	0	8
207	Belize-CWHvh1-AU8	29 > 180	440	127.6	168.4	128	128	122	161
208	Belize-CWHvh1-AU12	25 > 180	441.1	110.3	438.5	439	439	433	305
209	Belize-CWHvm1-AU12	12 > 180	487	58.4	376	381	431	298	147
210	Belize-CWHvh1-AU9	29 > 180	190.2	55.2	172.2	165	159	159	158
211	Belize-CWHvm2-AU4	59 > 180	2.2	1.3	0	0	0	0	1
212	Belize-CWHvm2-AU11	59 > 180	25.7	15.2	25.1	17	15	16	16
213	Belize-CWHvm2-AU12	29 > 180	463.8	134.5	319	363	365	450	310

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
214	Belize-MHmm1-AU5	65 > 180	14	9.1	9.7	10	10	10	14
215	Belize-MHmm1-AU7	59 > 180	2	1.2	0	0	0	0	2
216	Belize-CWHvh1-AU5	29 > 180	892.1	258.7	45.7	46	52	197	310
217	Belize-CWHvh1-AU6	29 > 180	11583.7	3359.3	11206.4	9,346	7,461	6,500	4,415
218	Belize-CWHvm1-AU4	25 > 180	160.6	40.2	0	0	0	0	68
219	Belize-CWHvm1-AU5	28 > 180	1952	546.6	647.6	528	547	558	547
220	Belize-CWHvm1-AU6	28 > 180	17016.3	4764.6	16229.5	14,381	8,927	4,745	4,765
221	Belize-CWHvm1-AU7	25 > 180	1522.9	380.7	17.6	18	18	73	808
222	Belize-CWHvm1-AU8	25 > 180	3542.8	885.7	1453.6	1,032	886	925	1,253
223	Belize-CWHvm1-AU9	25 > 180	815.9	204	699.3	548	422	270	437
224	Belize-CWHvm1-AU10	25 > 180	49.6	12.4	48.6	49	49	49	12
225	Belize-CWHvm1-AU11	25 > 180	40.7	10.2	36.4	27	27	31	10
226	Belize-CWHvm2-AU5	28 > 180	283	79.2	184.1	147	123	132	80
227	Belize-CWHvm2-AU6	28 > 180	13733.2	3845.3	13376.9	12,240	10,684	9,329	4,500
228	Belize-CWHvm2-AU7	25 > 180	127.1	31.8	30.5	31	31	31	57
229	Belize-CWHvm2-AU8	25 > 180	1309.6	327.4	1107.1	884	671	511	645
230	Belize-CWHvm2-AU9	25 > 180	3216.3	804.1	2982.9	2,543	1,791	1,575	1,840
231	Belize-MHmm1-AU6	28 > 180	2792.4	781.9	2582.9	2,470	2,426	2,498	2,069
232	Belize-MHmm1-AU8	25 > 180	132.8	33.2	85.2	63	56	34	108
233	Belize-MHmm1-AU9	25 > 180	1344.5	336.1	1126.1	1,002	792	665	943
237	Belize-CWHvh1-AU13	0 > 180	483.7	0	0	0	0	96	393
238	Belize-CWHvm1-AU13	0 > 180	1546.2	0	0	0	3	197	938
239	Belize-CWHvm2-AU13	0 > 180	84.3	0	0	0	4	6	76
240	Broughton-CWHvm1-AU3	21 > 180	38.5	8.1	38.5	39	39	39	8
241	Broughton-CWHvm1-AU12	12 > 180	12.1	1.5	4.9	5	6	12	2
242	Broughton-CWHvm1-AU4	25 > 180	563.2	140.8	0	0	0	19	266
243	Broughton-CWHvm1-AU5	28 > 180	3345.2	936.6	1616.7	1,127	937	975	937
244	Broughton-CWHvm1-AU6	28 > 180	8525	2387	8276.2	7,461	4,667	3,436	3,299
245	Broughton-CWHvm1-AU7	25 > 180	4125.8	1031.4	0	0	76	1,220	2,585
246	Broughton-CWHvm1-AU8	25 > 180	3292.8	823.2	930.7	910	1,075	1,542	823

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
247	Broughton-CWHvm1-AU9	25 > 180	325.5	81.4	286	270	287	287	81
248	Broughton-CWHvm1-AU13	0 > 180	88.1	0	0	0	0	2	66
249	Charles-CWHvm1-AU3	21 > 180	11.5	2.4	0	0	6	12	5
250	Charles-MHmm1-AU5	65 > 180	1.2	0.8	0.5	1	1	1	1
251	Charles-CWHvm1-AU2	21 > 180	21.5	4.5	0	0	21	12	12
252	Charles-CWHvm1-AU4	25 > 180	21.2	5.3	0	0	14	8	10
253	Charles-CWHvm1-AU5	28 > 180	317.7	89	255.7	110	89	89	89
254	Charles-CWHvm1-AU6	28 > 180	1936.3	542.2	1750.4	1,279	615	538	542
255	Charles-CWHvm1-AU7	25 > 180	599	149.7	0	0	17	72	379
256	Charles-CWHvm1-AU8	25 > 180	1025.4	256.4	454.5	441	477	282	256
257	Charles-CWHvm1-AU9	25 > 180	332.3	83.1	239.7	233	238	290	83
258	Charles-CWHvm2-AU5	28 > 180	66.5	18.6	66.4	37	19	9	32
259	Charles-CWHvm2-AU6	28 > 180	1597	447.2	1532.2	1,363	1,078	1,056	447
260	Charles-CWHvm2-AU7	25 > 180	5.7	1.4	0	0	0	0	6
261	Charles-CWHvm2-AU8	25 > 180	415.9	104	348.6	341	274	255	168
262	Charles-CWHvm2-AU9	25 > 180	918.8	229.7	662.7	663	671	839	553
263	Charles-MHmm1-AU6	28 > 180	399.5	111.9	356.4	342	339	379	143
264	Charles-MHmm1-AU8	25 > 180	89.6	22.4	84.2	84	76	76	69
265	Charles-MHmm1-AU9	25 > 180	732.9	183.2	459.4	459	461	539	627
269	Charles-CWHvm1-AU13	0 > 180	769.8	0	0	0	0	53	475
270	Charles-CWHvm2-AU13	0 > 180	71.3	0	0	0	0	0	70
271	Franklin-CWHdm-AU1	23 > 180	298.2	68.6	0	0	0	62	298
272	Franklin-CWHdm-AU2	17 > 180	94.4	16.1	20.4	20	37	19	19
273	Franklin-CWHdm-AU3	18 > 180	51.4	9.3	0	0	0	23	51
274	Franklin-CWHdm-AU5	23 > 180	15.7	3.6	15.7	12	5	5	5
275	Franklin-CWHdm-AU8	23 > 180	34.6	8	3.6	4	8	16	27
276	Franklin-CWHvm2-AU12	29 > 180	17.5	5.1	0	0	0	18	18
277	Franklin-MHmm1-AU5	65 > 180	12.3	8	12.3	12	12	12	12
278	Franklin-MHmm1-AU7	59 > 180	6.1	3.6	0	0	0	2	6
279	Franklin-CWHvm2-AU1	49 > 180	101.7	49.8	0	0	0	59	102

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
280	Franklin-CWHvm2-AU2	49 > 180	30.1	14.8	18.9	19	15	18	15
281	Franklin-CWHvm2-AU3	49 > 180	49.1	24.1	0	0	10	47	49
282	Franklin-MHmm1-AU3	49 > 180	12.3	6	0	0	6	12	12
283	Franklin-CWHdm-AU7	23 > 180	61.3	14.1	0	0	0	0	61
284	Franklin-CWHvm2-AU5	28 > 180	25.3	7.1	25.3	24	24	24	8
285	Franklin-CWHvm2-AU6	28 > 180	12.3	3.4	0	0	12	12	12
286	Franklin-CWHvm2-AU7	25 > 180	62.5	15.6	0	0	0	2	63
287	Franklin-CWHvm2-AU8	25 > 180	379.1	94.8	133	133	213	299	255
288	Franklin-CWHvm2-AU9	25 > 180	99	24.7	26.8	27	29	96	99
289	Franklin-MHmm1-AU6	28 > 180	17.4	4.9	12	12	17	17	17
290	Franklin-MHmm1-AU8	25 > 180	268.5	67.1	54.5	55	174	260	259
291	Franklin-MHmm1-AU9	25 > 180	170.3	42.6	37.4	37	44	130	170
294	Franklin-CWHdm-AU13	0 > 180	2.3	0	0	0	0	0	0
295	Fulmore-CWHvm1-AU3	21 > 180	5.2	1.1	0	0	0	5	3
296	Fulmore-CWHvm1-AU12	12 > 180	6.2	0.7	0	0	6	6	4
297	Fulmore-CWHvm1-AU4	25 > 180	6.2	1.6	0	0	0	5	5
298	Fulmore-CWHvm1-AU5	28 > 180	3	0.8	0	0	0	0	2
299	Fulmore-CWHvm1-AU6	28 > 180	36.1	10.1	23.2	14	11	12	10
300	Fulmore-CWHvm1-AU7	25 > 180	81.5	20.4	0	0	0	62	28
301	Fulmore-CWHvm1-AU8	25 > 180	25.8	6.4	14.8	15	13	13	11
302	Fulmore-CWHvm1-AU9	25 > 180	0.3	0.1	0.3	0.3	0.3	0.3	0.1
303	Fulmore-CWHvm2-AU6	28 > 180	55.4	15.5	54.6	51	46	46	19
304	Fulmore-CWHvm2-AU8	25 > 180	13.2	3.3	12.8	13	13	12	4
305	Fulmore-CWHvm2-AU9	25 > 180	65.9	16.5	56.7	66	66	66	61
306	Fulmore-MHmm1-AU6	28 > 180	47.7	13.3	47.7	48	39	39	39
307	Fulmore-MHmm1-AU8	25 > 180	1.9	0.5	1.9	2	2	2	1
308	Fulmore-MHmm1-AU9	25 > 180	26.6	6.7	17.6	27	27	27	27
309	Fulmore-CWHvm1-AU13	0 > 180	14.4	0	0	0	0	0	5
310	Fulmore-CWHvm2-AU13	0 > 180	7.5	0	0	0	0	0	1
311	Gilford-CWHvm1-AU1	21 > 180	90.5	19	0	0	0	0	36

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
312	Gilford-CWHvm1-AU3	21 > 180	74.8	15.7	42.2	42	53	56	16
313	Gilford-CWHvm1-AU12	12 > 180	50.3	6	0	0	10	16	33
314	Gilford-CWHvm2-AU4	59 > 180	87.1	51.4	0	0	0	0	82
315	Gilford-MHmm1-AU5	65 > 180	8.6	5.6	0	0	0	0	8
316	Gilford-MHmm1-AU7	59 > 180	22.2	13.1	0	0	0	0	16
317	Gilford-CWHvm2-AU1	49 > 180	8.2	4	0	0	0	0	7
318	Gilford-CWHvm2-AU2	49 > 180	1.9	0.9	0	0	0	0	1
319	Gilford-CWHvm1-AU2	21 > 180	84.5	17.8	4.3	4	10	10	26
320	Gilford-CWHvm1-AU4	25 > 180	1191.5	297.9	0	0	0	0	414
321	Gilford-CWHvm1-AU5	28 > 180	3884	1087.5	548.6	552	586	617	1,086
322	Gilford-CWHvm1-AU6	28 > 180	7498.2	2099.5	6306.6	4,848	2,100	2,100	2,046
323	Gilford-CWHvm1-AU7	25 > 180	10002.6	2500.7	11.1	11	176	3,134	4,219
324	Gilford-CWHvm1-AU8	25 > 180	9392.9	2348.2	1860.1	1,863	2,554	2,653	2,348
325	Gilford-CWHvm1-AU9	25 > 180	903.9	226	599	608	712	762	226
326	Gilford-CWHvm1-AU10	25 > 180	21.3	5.3	0	0	0	8	8
327	Gilford-CWHvm2-AU5	28 > 180	387.4	108.5	117.9	109	109	109	108
328	Gilford-CWHvm2-AU6	28 > 180	3531.3	988.8	3508.4	2,323	1,193	984	989
329	Gilford-CWHvm2-AU7	25 > 180	237	59.2	0	0	0	0	104
330	Gilford-CWHvm2-AU8	25 > 180	1546.1	386.5	1135.8	1,114	1,147	933	510
331	Gilford-CWHvm2-AU9	25 > 180	835	208.7	670.9	680	705	709	521
332	Gilford-MHmm1-AU6	28 > 180	1018.3	285.1	1015.5	876	719	664	285
333	Gilford-MHmm1-AU8	25 > 180	126.8	31.7	122.2	109	109	102	60
334	Gilford-MHmm1-AU9	25 > 180	347.4	86.9	295.9	296	296	345	319
335	Gilford-MHmm1-AU2	49 > 180	8.2	4	0	0	0	0	8
338	Gilford-CWHvm1-AU13	0 > 180	1157.8	0	0	0	4	184	512
339	Gilford-CWHvm2-AU13	0 > 180	53.8	0	0	0	0	3	43
340	Huaskin-CWHvh1-AU4	27 > 180	921.4	248.8	0	0	0	0	365
341	Huaskin-CWHvh1-AU7	25 > 180	2780.8	695.2	0	0	0	625	1,522
342	Huaskin-CWHvh1-AU8	29 > 180	1947.1	564.6	266.8	306	335	535	861
343	Huaskin-CWHvh1-AU12	25 > 180	17.4	4.4	17.4	17	17	17	17

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
344	Huaskin-CWHvm1-AU12	12 > 180	9.5	1.1	9.5	10	10	1	8
345	Huaskin-CWHvh1-AU9	29 > 180	189.6	55	94.6	95	105	137	169
346	Huaskin-CWHvh1-AU11	25 > 180	10.2	2.6	0	0	0	0	10
347	Huaskin-CWHvm2-AU4	59 > 180	0.1	0.1	0	0.0	0.0	0.0	0.1
348	Huaskin-CWHvm2-AU12	29 > 180	15.2	4.4	15.2	15	15	15	5
349	Huaskin-CWHvh1-AU2	63 > 180	1.8	1.1	0	0	0	2	2
350	Huaskin-CWHvh1-AU5	29 > 180	1907.6	553.2	77.9	82	82	165	690
351	Huaskin-CWHvh1-AU6	29 > 180	12482.9	3620	11193.6	7,692	5,164	3,620	4,288
352	Huaskin-CWHvm1-AU4	25 > 180	339.7	84.9	0	0	0	1	123
353	Huaskin-CWHvm1-AU5	28 > 180	1307	366	488.1	366	366	372	357
354	Huaskin-CWHvm1-AU6	28 > 180	8991.2	2517.5	8281.7	5,814	3,042	2,516	2,517
355	Huaskin-CWHvm1-AU7	25 > 180	1622.2	405.6	50.5	59	59	398	835
356	Huaskin-CWHvm1-AU8	25 > 180	1306.8	326.7	624.8	416	303	327	392
357	Huaskin-CWHvm1-AU9	25 > 180	335.1	83.8	247.5	175	166	134	166
358	Huaskin-CWHvm1-AU11	25 > 180	23.9	6	23.9	24	24	24	6
359	Huaskin-CWHvm2-AU5	28 > 180	6.7	1.9	6.7	0	0	0	6
360	Huaskin-CWHvm2-AU6	28 > 180	2089.5	585.1	2086.3	1,609	1,301	956	705
361	Huaskin-CWHvm2-AU7	25 > 180	2	0.5	0	0	0	0	1
362	Huaskin-CWHvm2-AU8	25 > 180	107.4	26.9	107.4	74	55	38	27
363	Huaskin-CWHvm2-AU9	25 > 180	120.9	30.2	120.7	90	76	43	65
364	Huaskin-MHmm1-AU6	28 > 180	65	18.2	59.4	59	59	20	44
365	Huaskin-MHmm1-AU8	25 > 180	0.4	0.1	0.4	0.4	0.4	0.3	0.2
366	Huaskin-MHmm1-AU9	25 > 180	18.5	4.6	18.5	19	19	5	13
367	Huaskin-CWHvh1-AU13	0 > 180	545.3	0	0	0	0	32	363
368	Huaskin-CWHvm1-AU13	0 > 180	329.2	0	0	0	0	14	246
369	Huaskin-CWHvm2-AU13	0 > 180	6.7	0	0	0	0	0	6
370	Kakweiken-CWHvm1-AU12	12 > 180	2.5	0.3	0	0	0	3	0
371	Kakweiken-MHmm1-AU5	65 > 180	1.4	0.9	1	1	1	1	1
372	Kakweiken-CWHvm1-AU4	25 > 180	7.1	1.8	0	0	0	0	2
373	Kakweiken-CWHvm1-AU5	28 > 180	640.9	179.5	365.4	339	255	191	180

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
374	Kakweiken-CWHvm1-AU6	28 > 180	1477.9	413.8	1291	980	619	447	440
375	Kakweiken-CWHvm1-AU7	25 > 180	1549.2	387.3	63.3	63	66	196	719
376	Kakweiken-CWHvm1-AU8	25 > 180	2528.8	632.2	1667.3	1,668	1,719	1,595	632
377	Kakweiken-CWHvm1-AU9	25 > 180	481	120.2	220.3	220	246	306	159
378	Kakweiken-CWHvm1-AU10	25 > 180	242.8	60.7	173.3	173	173	191	61
379	Kakweiken-CWHvm1-AU11	25 > 180	19.6	4.9	14.6	15	16	20	5
380	Kakweiken-CWHvm2-AU5	28 > 180	102	28.6	71.7	72	60	48	46
381	Kakweiken-CWHvm2-AU6	28 > 180	2253.7	631	1889.4	1,658	1,226	1,116	908
382	Kakweiken-CWHvm2-AU7	25 > 180	128.9	32.2	0	0	0	0	89
383	Kakweiken-CWHvm2-AU8	25 > 180	2412.8	603.2	1582	1,575	1,664	1,829	1,628
384	Kakweiken-CWHvm2-AU9	25 > 180	2554	638.5	1087.4	1,087	1,296	1,869	2,216
385	Kakweiken-MHmm1-AU6	28 > 180	484.3	135.6	398.6	380	380	378	320
386	Kakweiken-MHmm1-AU8	25 > 180	237.4	59.3	164	164	169	183	201
387	Kakweiken-MHmm1-AU9	25 > 180	1799.4	449.9	630.1	630	732	1,282	1,696
391	Kakweiken-CWHvm1-AU13	0 > 180	761.6	0	0	0	0	114	468
392	Kakweiken-CWHvm2-AU13	0 > 180	26.8	0	0	0	0	0	27
393	Knight_East-CWHdm-AU2	17 > 180	11.3	1.9	0	0	0	3	3
394	Knight_East-CWHdm-AU3	18 > 180	18.3	3.3	0	0	4	18	18
395	Knight_East-CWHdm-AU8	23 > 180	20.5	4.7	0	0	0	15	17
396	Knight_East-CWHvm1-AU3	21 > 180	215	45.2	57.2	68	129	208	45
397	Knight_East-CWHvm1-AU12	12 > 180	23.6	2.8	0	0	2	24	3
398	Knight_East-CWHvm2-AU4	59 > 180	30	17.7	0	0	0	0	23
399	Knight_East-MHmm1-AU5	65 > 180	7.8	5.1	7.8	7	5	5	5
400	Knight_East-CWHvm2-AU2	49 > 180	3.8	1.9	0	0	0	0	4
401	Knight_East-CWHvm2-AU3	49 > 180	84.1	41.2	9.5	10	24	84	84
402	Knight_East-MHmm1-AU3	49 > 180	14.5	7.1	0	0	0	15	15
403	Knight_East-CWHdm-AU7	23 > 180	36.3	8.3	0	0	0	0	25
404	Knight_East-CWHvm1-AU2	21 > 180	122.7	25.8	0	0	9	100	40
405	Knight_East-CWHvm1-AU4	25 > 180	207.7	51.9	0	0	0	14	97
406	Knight_East-CWHvm1-AU5	28 > 180	744.5	208.5	269.8	209	209	234	209

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
407	Knight_East-CWHvm1-AU6	28 > 180	3200.7	896.2	2695.1	2,206	1,428	914	1,110
408	Knight_East-CWHvm1-AU7	25 > 180	1727.1	431.8	0	0	18	706	701
409	Knight_East-CWHvm1-AU8	25 > 180	3490.8	872.7	1270.6	1,271	1,598	1,452	873
410	Knight_East-CWHvm1-AU9	25 > 180	496.3	124.1	211.9	212	313	346	124
411	Knight_East-CWHvm2-AU5	28 > 180	110.4	30.9	96.5	81	56	61	31
412	Knight_East-CWHvm2-AU6	28 > 180	1893.5	530.2	1779.5	1,542	1,258	1,098	691
413	Knight_East-CWHvm2-AU7	25 > 180	141	35.2	0	0	0	6	109
414	Knight_East-CWHvm2-AU8	25 > 180	2742.1	685.5	1885.4	1,890	2,185	1,951	1,648
415	Knight_East-CWHvm2-AU9	25 > 180	1939.5	484.9	1029.2	1,061	1,270	1,455	1,724
416	Knight_East-MHmm1-AU6	28 > 180	748.2	209.5	743.1	724	693	679	589
417	Knight_East-MHmm1-AU8	25 > 180	719.6	179.9	487.4	493	605	659	646
418	Knight_East-MHmm1-AU9	25 > 180	2354.4	588.6	1042.5	1,049	1,288	1,692	2,342
422	Knight_East-CWHdm-AU13	0 > 180	0.2	0	0	0.0	0.0	0.0	0.0
423	Knight_East-CWHvm1-AU13	0 > 180	786.5	0	2.2	2	3	274	211
424	Knight_East-CWHvm2-AU13	0 > 180	164	0	0	0	0	3	113
425	Lower_Kingcome-CWHvm1-AU1	21 > 180	10.4	2.2	0	0	0	0	8
426	Lower_Kingcome-CWHvm1-AU3	21 > 180	37.2	7.8	0	0	0	0	11
427	Lower_Kingcome-CWHvm1-AU12	12 > 180	194.8	23.4	67.4	63	51	176	24
428	Lower_Kingcome-CWHvm2-AU11	59 > 180	2.7	1.6	2.7	2	2	2	2
429	Lower_Kingcome-CWHvm2-AU12	29 > 180	1.6	0.5	0.1	0	0	2	2
430	Lower_Kingcome-MHmm1-AU5	65 > 180	4.2	2.8	4.2	4	4	4	4
431	Lower_Kingcome-CWHvm2-AU2	49 > 180	0.5	0.2	0	0.0	0.0	0.0	0.5
432	Lower_Kingcome-CWHvm2-AU3	49 > 180	1.8	0.9	1.8	1	1	1	1
433	Lower_Kingcome-CWHvm1-AU2	21 > 180	186.7	39.2	58.3	37	37	37	44
434	Lower_Kingcome-CWHvm1-AU4	25 > 180	225.7	56.4	0	0	0	0	96
435	Lower_Kingcome-CWHvm1-AU5	28 > 180	720.4	201.7	526.6	202	202	203	202
436	Lower_Kingcome-CWHvm1-AU6	28 > 180	1586.7	444.3	1455	986	517	442	437
437	Lower_Kingcome-CWHvm1-AU7	25 > 180	1660.7	415.2	0	0	3	220	705
438	Lower_Kingcome-CWHvm1-AU8	25 > 180	3198.7	799.7	1733.4	1,381	986	921	977
439	Lower_Kingcome-CWHvm1-AU9	25 > 180	676.8	169.2	510.2	505	496	504	169

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
440	Lower_Kingcome-CWHvm1-AU10	25 > 180	191	47.8	100.6	101	155	163	48
441	Lower_Kingcome-CWHvm1-AU11	25 > 180	90.2	22.6	45.4	53	51	49	23
442	Lower_Kingcome-CWHvm2-AU5	28 > 180	204	57.1	175.4	127	62	53	74
443	Lower_Kingcome-CWHvm2-AU6	28 > 180	2339.4	655	1980.8	1,589	1,163	1,088	717
444	Lower_Kingcome-CWHvm2-AU7	25 > 180	164.1	41	0	0	0	0	87
445	Lower_Kingcome-CWHvm2-AU8	25 > 180	2243.1	560.8	1923.4	1,796	1,336	1,221	1,190
446	Lower_Kingcome-CWHvm2-AU9	25 > 180	2472.2	618.1	1419.7	1,408	1,336	1,956	1,471
447	Lower_Kingcome-MHmm1-AU6	28 > 180	711	199.1	635.4	615	543	557	321
448	Lower_Kingcome-MHmm1-AU8	25 > 180	212.9	53.2	143.2	141	145	125	111
449	Lower_Kingcome-MHmm1-AU9	25 > 180	2073.8	518.5	783.8	784	846	1,680	1,621
450	Lower_Kingcome-CMAunp-AU6	0 > 180	18.4	0	81	18	7	0	7
453	Lower_Kingcome-CWHvm1-AU13	0 > 180	1555	0	0	0	71	653	701
454	Lower_Kingcome-CWHvm2-AU13	0 > 180	74.9	0	0	0	0	1	74
455	Lower_Klinaklini-CWHvm1-AU1	21 > 180	11	2.3	0	0	0	4	10
456	Lower_Klinaklini-CWHvm1-AU3	21 > 180	12.3	2.6	0	0	0	12	8
457	Lower_Klinaklini-CWHvm2-AU1	49 > 180	8.3	4	0	0	0	0	8
458	Lower_Klinaklini-CWHvm2-AU3	49 > 180	1.4	0.7	0	0	0	1	1
459	Lower_Klinaklini-CWHvm1-AU2	21 > 180	58.4	12.3	14.8	15	13	13	12
460	Lower_Klinaklini-CWHvm1-AU6	28 > 180	591.1	165.5	0	0	0	0	389
461	Lower_Klinaklini-CWHvm1-AU7	25 > 180	53.7	13.4	0	0	0	20	18
462	Lower_Klinaklini-CWHvm1-AU8	25 > 180	275.6	68.9	82.5	83	170	24	81
463	Lower_Klinaklini-CWHvm1-AU9	25 > 180	75.3	18.8	6.8	7	16	65	22
464	Lower_Klinaklini-CWHvm2-AU7	25 > 180	5.2	1.3	0	0	0	2	2
465	Lower_Klinaklini-CWHvm2-AU8	25 > 180	221.3	55.3	135.7	136	150	78	67
466	Lower_Klinaklini-CWHvm2-AU9	25 > 180	82.8	20.7	32.2	32	32	83	83
467	Lower_Klinaklini-MHmm1-AU8	25 > 180	26.1	6.5	26.1	26	26	25	24
468	Lower_Klinaklini-MHmm1-AU9	25 > 180	116.6	29.2	78.7	79	79	115	117
469	Lower_Klinaklini-CWHvm1-AU13	0 > 180	7.9	0	0	0	0	0	7
470	Lull_Sallie-CWHvm1-AU1	21 > 180	49.3	10.3	0	0	0	14	18
471	Lull_Sallie-CWHvm1-AU3	21 > 180	277.1	58.2	39.2	39	56	142	85

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
472	Lull_Sallie-CWHvm1-AU12	12 > 180	33.7	4	0	0	0	34	5
473	Lull_Sallie-CWHvm2-AU4	59 > 180	12.3	7.2	0	0	0	0	12
474	Lull_Sallie-MHmm1-AU7	59 > 180	1.3	0.8	0	0	0	0	1
475	Lull_Sallie-CWHvm2-AU2	49 > 180	1.6	0.8	0	0	0	2	2
476	Lull_Sallie-CWHvm1-AU2	21 > 180	338	71	22.1	22	58	154	83
477	Lull_Sallie-CWHvm1-AU4	25 > 180	315.5	78.9	0	0	0	0	122
478	Lull_Sallie-CWHvm1-AU5	28 > 180	913.2	255.7	394.6	259	256	263	254
479	Lull_Sallie-CWHvm1-AU6	28 > 180	2431	680.7	2200.6	1,346	860	681	662
480	Lull_Sallie-CWHvm1-AU7	25 > 180	2622.1	655.5	26.4	26	143	973	1,007
481	Lull_Sallie-CWHvm1-AU8	25 > 180	3655.2	913.8	1539.3	1,556	1,732	1,771	914
482	Lull_Sallie-CWHvm1-AU9	25 > 180	466.5	116.6	293.9	294	334	373	117
483	Lull_Sallie-CWHvm1-AU10	25 > 180	6.9	1.7	0	0	7	3	3
484	Lull_Sallie-CWHvm1-AU11	25 > 180	14.1	3.5	3	3	3	13	4
485	Lull_Sallie-CWHvm2-AU5	28 > 180	96.4	27	42.8	27	25	25	27
486	Lull_Sallie-CWHvm2-AU6	28 > 180	2512.5	703.5	2309.5	1,599	1,101	979	964
487	Lull_Sallie-CWHvm2-AU7	25 > 180	143.4	35.8	0	0	0	4	46
488	Lull_Sallie-CWHvm2-AU8	25 > 180	1375.7	343.9	1081.9	1,048	1,077	1,027	740
489	Lull_Sallie-CWHvm2-AU9	25 > 180	1668	417	1046.6	1,047	1,066	1,295	1,131
490	Lull_Sallie-MHmm1-AU6	28 > 180	802.1	224.6	753.2	495	338	310	497
491	Lull_Sallie-MHmm1-AU8	25 > 180	348.2	87.1	258.8	258	268	261	212
492	Lull_Sallie-MHmm1-AU9	25 > 180	1553.8	388.4	855.1	864	942	1,245	1,275
493	Lull_Sallie-CMAunp-AU6	0 > 180	0.4	0	16.5	0.4	0.4	0.0	0.0
496	Lull_Sallie-CWHvm1-AU13	0 > 180	782.9	0	0	0	0	339	253
497	Lull_Sallie-CWHvm2-AU13	0 > 180	19.6	0	0	0	0	2	20
499	Miriam-CWHvm1-AU3	21 > 180	13.4	2.8	0	0	6	13	3
500	Miriam-CWHvm1-AU12	12 > 180	9.8	1.2	9.8	10	10	10	1
501	Miriam-CWHvm2-AU4	59 > 180	3.1	1.8	0	0	0	0	3
502	Miriam-MHmm1-AU5	65 > 180	10.4	6.8	10.4	10	7	7	8
503	Miriam-CWHvm1-AU4	25 > 180	289.5	72.4	0	0	0	6	109
504	Miriam-CWHvm1-AU5	28 > 180	635.8	178	409.9	307	178	178	177

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
505	Miriam-CWHvm1-AU6	28 > 180	6196	1734.9	5998.2	4,575	2,494	1,696	1,901
506	Miriam-CWHvm1-AU7	25 > 180	1344.3	336.1	0	0	14	542	800
507	Miriam-CWHvm1-AU8	25 > 180	1635.6	408.9	505.5	509	787	680	409
508	Miriam-CWHvm1-AU9	25 > 180	459.5	114.9	356.9	357	397	447	115
509	Miriam-CWHvm2-AU5	28 > 180	109.6	30.7	106.5	79	31	31	50
510	Miriam-CWHvm2-AU6	28 > 180	2971.4	832	2944	2,632	2,201	1,961	832
511	Miriam-CWHvm2-AU7	25 > 180	13.9	3.5	0	0	0	0	9
512	Miriam-CWHvm2-AU8	25 > 180	339	84.7	302.7	303	300	288	95
513	Miriam-CWHvm2-AU9	25 > 180	264.3	66.1	243.5	244	259	264	166
514	Miriam-MHmm1-AU6	28 > 180	1284.5	359.7	1284.3	1,225	1,130	1,130	360
515	Miriam-MHmm1-AU8	25 > 180	72.7	18.2	72.7	73	73	73	46
516	Miriam-MHmm1-AU9	25 > 180	507.1	126.8	455.6	456	491	506	457
518	Miriam-CWHvm1-AU13	0 > 180	484.8	0	0	0	2	119	280
519	Miriam-CWHvm2-AU13	0 > 180	13.8	0	0	0	0	3	13
520	Neechanz-MHmm1-AU6	28 > 180	0.4	0.1	0.4	0.4	0.4	0.4	0.2
521	Seymour-CWHvm1-AU12	12 > 180	12.2	1.5	12.2	12	2	2	11
522	Seymour-CWHvm2-AU12	29 > 180	45.7	13.3	45.7	46	46	46	14
523	Seymour-CWHvm1-AU5	28 > 180	246.2	68.9	82.2	76	81	68	69
524	Seymour-CWHvm1-AU6	28 > 180	2245.8	628.8	2157	1,863	1,386	862	657
525	Seymour-CWHvm1-AU7	25 > 180	346.9	86.7	19.2	19	19	19	186
526	Seymour-CWHvm1-AU8	25 > 180	2066.4	516.6	800.5	517	517	513	575
527	Seymour-CWHvm1-AU9	25 > 180	1079.1	269.8	996	539	279	286	748
528	Seymour-CWHvm1-AU10	25 > 180	12.6	3.2	3.5	3	3	3	9
529	Seymour-CWHvm1-AU11	25 > 180	10.2	2.5	0	0	0	0	8
530	Seymour-CWHvm2-AU6	28 > 180	2742.5	767.9	2607	2,241	1,789	1,595	1,003
531	Seymour-CWHvm2-AU7	25 > 180	3	0.7	0	0	0	0	3
532	Seymour-CWHvm2-AU8	25 > 180	773.6	193.4	700.4	550	345	205	513
533	Seymour-CWHvm2-AU9	25 > 180	2675.4	668.8	2450.2	1,653	978	832	2,024
534	Seymour-MHmm1-AU6	28 > 180	1331.6	372.8	1324.9	1,252	1,022	954	977
535	Seymour-MHmm1-AU8	25 > 180	134.1	33.5	52.3	52	52	44	50

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
536	Seymour-MHmm1-AU9	25 > 180	1408.7	352.2	1102.6	610	360	446	1,103
537	Seymour-CMAunp-AU6	0 > 180	1.2	0	168.3	0	0	0	0
538	Seymour-CMAunp-AU9	0 > 180	1.4	0	36.3	0	0	0	0
539	Seymour-CWHvm1-AU13	0 > 180	524.5	0	0	0	0	52	362
540	Seymour-CWHvm2-AU13	0 > 180	5.9	0	0	0	0	2	6
541	Sim-CWHvm1-AU3	21 > 180	98.8	20.7	0	0	3	96	31
542	Sim-CWHvm1-AU12	12 > 180	8.5	1	0	0	0	9	2
543	Sim-CWHvm2-AU2	49 > 180	4.9	2.4	4.9	5	5	1	4
544	Sim-CWHvm2-AU3	49 > 180	1.7	0.8	0	0	0	2	2
545	Sim-CWHvm1-AU2	21 > 180	140.8	29.6	14.5	14	57	58	31
546	Sim-CWHvm1-AU5	28 > 180	47.5	13.3	47.5	48	13	7	13
547	Sim-CWHvm1-AU7	25 > 180	69.3	17.3	0	0	0	26	47
548	Sim-CWHvm1-AU8	25 > 180	355.1	88.8	238.2	238	215	157	89
549	Sim-CWHvm1-AU9	25 > 180	25.1	6.3	0	0	7	25	7
550	Sim-CWHvm2-AU5	28 > 180	5.7	1.6	5.7	2	2	2	2
551	Sim-CWHvm2-AU6	28 > 180	6.9	1.9	6.9	0	0	0	6
552	Sim-CWHvm2-AU8	25 > 180	277.4	69.4	181.9	182	216	242	183
553	Sim-CWHvm2-AU9	25 > 180	136.8	34.2	47.9	48	80	92	120
554	Sim-MHmm1-AU8	25 > 180	105.2	26.3	67.9	68	102	105	102
555	Sim-MHmm1-AU9	25 > 180	141.8	35.4	68.1	68	87	98	141
557	Sim-CWHvm1-AU13	0 > 180	13.9	0	0	0	0	0	14
558	Smith_Sound-CWHvh1-AU4	27 > 180	2.8	0.8	0	0	0	0	1
559	Smith_Sound-CWHvh1-AU7	25 > 180	0.6	0.2	0	0.0	0.0	0.0	0.5
560	Smith_Sound-CWHvh1-AU8	29 > 180	2	0.6	2	2	2	2	2
561	Smith_Sound-CWHvh1-AU12	25 > 180	0.7	0.2	0.7	0.7	0.7	0.7	0.7
562	Smith_Sound-CWHvh1-AU9	29 > 180	8.6	2.5	8.6	9	9	9	5
563	Smith_Sound-CWHvh1-AU5	29 > 180	44.8	13	0	0	0	0	22
564	Smith_Sound-CWHvh1-AU6	29 > 180	234.1	67.9	228.5	144	130	129	203
565	Smokehouse-CWHvh1-AU5	29 > 180	0.3	0.1	0	0.0	0.0	0.0	0.3
566	Smokehouse-CWHvh1-AU6	29 > 180	1	0.3	0.4	0	0	0	1

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
567	Smokehouse-CWHvm1-AU5	28 > 180	0.1	0	0	0.0	0.0	0.0	0.1
568	Smokehouse-CWHvm1-AU6	28 > 180	38	10.6	36.9	37	36	32	12
569	Smokehouse-CWHvm2-AU6	28 > 180	87.5	24.5	85.5	86	85	84	57
570	Smokehouse-CWHvm2-AU9	25 > 180	3.6	0.9	3.6	4	1	1	3
571	Smokehouse-MHmm1-AU6	28 > 180	2.2	0.6	2.2	2	2	2	2
572	Smokehouse-MHmm1-AU8	25 > 180	2.9	0.7	0	0	0	0	3
573	Smokehouse-MHmm1-AU9	25 > 180	0.3	0.1	0.3	0.3	0.3	0.3	0.3
574	Smokehouse-CWHvh1-AU13	0 > 180	0.2	0	0	0.0	0.0	0.0	0.2
575	Snowdrift-CWHvm1-AU1	21 > 180	11	2.3	0	0	0	0	9
576	Snowdrift-CWHvm1-AU3	21 > 180	8	1.7	0	0	0	8	2
577	Snowdrift-CWHvm1-AU12	12 > 180	35.7	4.3	25.3	25	24	30	4
578	Snowdrift-CWHvm2-AU4	59 > 180	24.6	14.5	0	0	0	0	19
579	Snowdrift-CWHvm2-AU11	59 > 180	14.7	8.7	13.3	10	10	10	9
580	Snowdrift-CWHvm2-AU12	29 > 180	10.5	3	10.5	11	11	11	3
581	Snowdrift-MHmm1-AU5	65 > 180	26.6	17.3	26.6	27	17	17	20
582	Snowdrift-MHmm1-AU7	59 > 180	2.2	1.3	0	0	0	0	2
583	Snowdrift-CWHvm1-AU2	21 > 180	3.3	0.7	0	0	3	1	1
584	Snowdrift-CWHvm1-AU4	25 > 180	537.3	134.3	0	0	9	16	178
585	Snowdrift-CWHvm1-AU5	28 > 180	3093.5	866.2	1348.5	1,132	832	838	856
586	Snowdrift-CWHvm1-AU6	28 > 180	7840.9	2195.5	7476	5,812	2,726	2,191	2,196
587	Snowdrift-CWHvm1-AU7	25 > 180	2584.8	646.2	9.4	13	32	443	1,381
588	Snowdrift-CWHvm1-AU8	25 > 180	3550	887.5	1996.7	1,799	1,594	943	888
589	Snowdrift-CWHvm1-AU9	25 > 180	653.6	163.4	591.1	514	386	348	279
590	Snowdrift-CWHvm1-AU10	25 > 180	0.8	0.2	0	0.0	0.0	0.0	0.3
591	Snowdrift-CWHvm2-AU5	28 > 180	263.4	73.8	200.4	137	85	81	74
592	Snowdrift-CWHvm2-AU6	28 > 180	5215.7	1460.4	4905.4	4,063	3,027	2,280	1,772
593	Snowdrift-CWHvm2-AU7	25 > 180	109.8	27.5	0	0	0	0	42
594	Snowdrift-CWHvm2-AU8	25 > 180	1812.9	453.2	1469.1	1,299	1,012	727	705
595	Snowdrift-CWHvm2-AU9	25 > 180	1531.2	382.8	1162.2	1,109	1,112	1,146	1,024
596	Snowdrift-MHmm1-AU6	28 > 180	1607.9	450.2	1433.9	1,388	1,352	1,339	946

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
597	Snowdrift-MHmm1-AU8	25 > 180	155.9	39	113.7	111	76	58	121
598	Snowdrift-MHmm1-AU9	25 > 180	553.7	138.4	316.3	314	270	344	467
602	Snowdrift-CWHvm1-AU13	0 > 180	1442.4	0	0	0	0	76	824
603	Snowdrift-CWHvm2-AU13	0 > 180	204.9	0	0	0	0	0	202
604	Stafford-MHmm1-AU9	25 > 180	0.2	0.1	0.2	0.2	0.2	0.2	0.2
605	Upper_Kingcome-CWHvm1-AU3	21 > 180	30.2	6.3	14.7	6	6	6	10
606	Upper_Kingcome-CWHvm1-AU12	12 > 180	42.5	5.1	25.3	25	36	35	7
607	Upper_Kingcome-CWHvm2-AU4	59 > 180	1.8	1.1	0	0	0	0	2
608	Upper_Kingcome-MHmm1-AU5	65 > 180	9.1	5.9	9.1	9	9	6	7
609	Upper_Kingcome-CWHvm2-AU3	49 > 180	4	1.9	4	4	2	2	2
610	Upper_Kingcome-CWHvm1-AU2	21 > 180	76.1	16	8.2	8	8	8	68
611	Upper_Kingcome-CWHvm1-AU4	25 > 180	151.6	37.9	0	0	0	34	100
612	Upper_Kingcome-CWHvm1-AU5	28 > 180	887.2	248.4	460.6	248	236	236	248
613	Upper_Kingcome-CWHvm1-AU6	28 > 180	588.2	164.7	122.4	122	128	149	339
614	Upper_Kingcome-CWHvm1-AU7	25 > 180	674.7	168.7	16.3	16	30	117	319
615	Upper_Kingcome-CWHvm1-AU8	25 > 180	4849.2	1212.3	3494.3	2,670	1,212	1,298	2,126
616	Upper_Kingcome-CWHvm1-AU9	25 > 180	616.7	154.2	239.8	230	292	382	182
617	Upper_Kingcome-CWHvm1-AU10	25 > 180	140.4	35.1	132.8	119	35	35	103
618	Upper_Kingcome-CWHvm1-AU11	25 > 180	49.6	12.4	48.4	48	25	23	23
619	Upper_Kingcome-CWHvm2-AU5	28 > 180	82.9	23.2	70.4	62	29	24	37
620	Upper_Kingcome-CWHvm2-AU6	28 > 180	488	136.6	353.4	324	210	151	304
621	Upper_Kingcome-CWHvm2-AU7	25 > 180	63.4	15.8	0	0	0	4	20
622	Upper_Kingcome-CWHvm2-AU8	25 > 180	3761	940.2	3249.3	3,092	2,483	2,250	2,162
623	Upper_Kingcome-CWHvm2-AU9	25 > 180	2373.4	593.4	1261.1	1,255	1,134	1,563	1,778
624	Upper_Kingcome-MHmm1-AU6	28 > 180	265.1	74.2	236.6	237	147	137	142
625	Upper_Kingcome-MHmm1-AU8	25 > 180	1107.6	276.9	680.8	681	657	639	740
626	Upper_Kingcome-MHmm1-AU9	25 > 180	3226.5	806.6	1055.5	1,055	1,114	2,006	2,760
627	Upper_Kingcome-CMAunp-AU6	0 > 180	42.1	0	59	4	0	0	0
629	Upper_Kingcome-CMAunp-AU9	0 > 180	1.6	0	59.3	0	0	1	0
630	Upper_Kingcome-CWHvm1-AU13	0 > 180	1120.2	0	0	0	19	333	656

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
631	Upper_Kingcome-CWHvm2-AU13	0 > 180	5.1	0	0	0	0	0	5
633	Wakeman-CWHvm1-AU1	21 > 180	13.5	2.8	0	0	0	0	4
634	Wakeman-CWHvm1-AU12	12 > 180	49.6	6	4.2	4	46	45	6
635	Wakeman-CWHvm2-AU4	59 > 180	15.1	8.9	0	0	0	0	15
636	Wakeman-MHmm1-AU5	65 > 180	15.2	9.9	10.8	10	10	10	10
637	Wakeman-CWHvm2-AU1	49 > 180	0.6	0.3	0	0.0	0.0	0.0	0.6
638	Wakeman-CWHvm1-AU2	21 > 180	24	5	0	0	0	0	8
639	Wakeman-CWHvm1-AU4	25 > 180	79.4	19.8	0	0	0	0	26
640	Wakeman-CWHvm1-AU5	28 > 180	1800.7	504.2	1343.4	556	501	502	504
641	Wakeman-CWHvm1-AU6	28 > 180	2966.8	830.7	2757.6	2,000	1,161	824	830
642	Wakeman-CWHvm1-AU7	25 > 180	1906.4	476.6	47.1	47	55	115	748
643	Wakeman-CWHvm1-AU8	25 > 180	4378.9	1094.7	3232.6	2,201	1,095	1,095	1,573
644	Wakeman-CWHvm1-AU9	25 > 180	600.4	150.1	426.6	397	242	307	272
645	Wakeman-CWHvm1-AU10	25 > 180	111	27.8	24.5	25	26	71	44
646	Wakeman-CWHvm1-AU11	25 > 180	135.7	33.9	135.7	130	85	85	45
647	Wakeman-CWHvm2-AU5	28 > 180	300	84	259.4	138	84	89	84
648	Wakeman-CWHvm2-AU6	28 > 180	2354.8	659.4	1988	1,708	1,480	1,276	1,045
649	Wakeman-CWHvm2-AU7	25 > 180	62.4	15.6	0	0	0	4	28
650	Wakeman-CWHvm2-AU8	25 > 180	4102.6	1025.6	3790.8	3,275	2,414	1,823	1,786
651	Wakeman-CWHvm2-AU9	25 > 180	3422.3	855.6	2206.9	2,202	2,107	2,780	1,783
652	Wakeman-MHmm1-AU6	28 > 180	486	136.1	443.8	418	395	361	305
653	Wakeman-MHmm1-AU8	25 > 180	736.8	184.2	696.7	670	525	413	405
654	Wakeman-MHmm1-AU9	25 > 180	3926.9	981.7	1710.8	1,711	1,779	2,916	3,134
655	Wakeman-CMAunp-AU6	0 > 180	0.9	0	39.5	0.1	0.1	0.0	0.0
658	Wakeman-CWHvm1-AU13	0 > 180	2031.3	0	0	0	88	952	815
659	Wakeman-CWHvm2-AU13	0 > 180	9.3	0	0	0	0	2	9
660	Walker-CWHvh1-AU7	25 > 180	12	3	0	0	0	0	12
661	Walker-CWHvh1-AU8	29 > 180	286.4	83.1	154.8	155	203	131	136
662	Walker-CWHvh1-AU12	25 > 180	41.1	10.3	35	35	37	41	41
663	Walker-CWHvh1-AU9	29 > 180	71.1	20.6	55.1	30	46	46	71

Analysis Identity and Landscape Unit-Site Series Surrogate Name		FCC % > Age	Productive Area (ha)	Target Area (ha)	Old Area at Specified Years of Simulation (ha)				
					Current	20	50	100	250
664	Walker-CWHvh1-AU5	29 > 180	14.6	4.2	7.4	7	7	7	12
665	Walker-CWHvh1-AU6	29 > 180	696.4	202	665.8	666	660	655	588

APPENDIX II
KINGCOME TIMBER SUPPLY AREA TSR3
OPERATIONAL PERFORMANCE IN THE INOPERABLE LAND BASE

In timber supply analysis at the TSA scale the non-contributing forested land base is a broad grouping of forested area where crop trees are not expected to supply harvest volume. Accordingly, this area in the timber supply model does not contribute to timber supply. The inoperable land base is one, frequently large, component of the non-contributing. Another frequently large component of the non-contributing element is low site (often referred to as marginal area). Depending on the definition used for inoperable this area includes segments of forested land that are either physically not harvestable, constrained by economic viability or a combination of both.

The non-contributing land base is also referred to as the NCLB; these terms are used interchangeably. However, in this analysis the land base is divided up into several contributing and non-contributing sub components. Table 4.2 and Figure 4.2 in this analysis report show how the land base is classified in the TSR3 base case forecast. Figure A1, *Distribution of Marginal Analysis Units* illustrates the distribution of these site types.

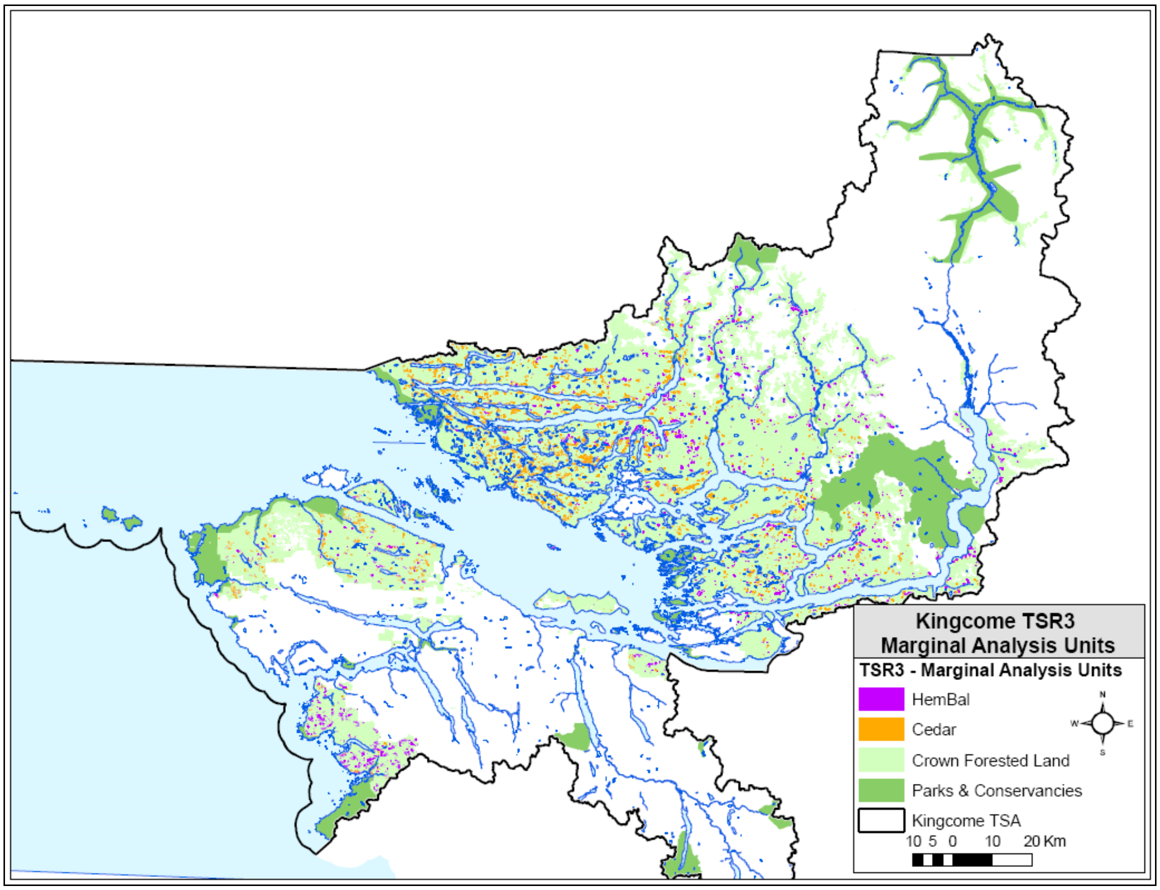

Figure A1: Distribution of Marginal Analysis Units

In order to ensure that current practice is captured in timber supply analysis, recent harvest activity was compared to the contributing land base determination both in the present analysis (Table 4.2 of the analysis report) and in TSR2 using the analysis from 2002.

Analyzing TSR2 data and comparing it to Kingcome harvest activity since that analysis indicates that significant harvest is occurring in the TSR2 non-contributing land base. Harvest activity data supplied by Interfor for the 2002 to 2007 period suggests that 29 (2004 & 2007) to 49% (2005) of their harvest was coming from the TSR2 non-contributing area. All combined Kingcome licensee harvest data for the same period ranged from 17 to 33% of harvest area taking place in the TSR2 non-contributing land base. This suggests that the land base definition used in the TSR2 determination process significantly underestimates harvest opportunity. To address this an economic operability project was initiated and harvest activity in the non-contributing land base was examined. Additional area representing performance in low sites was drawn in to the contributing land base by adjusting exclusion criteria (see Section 5.1.8. Low Growing Potential in the Data Package).

Figure A2 illustrates Interfor's harvest performance on site type for the period 2002 to 2007. The year 2007 has been included here, because the data point is consistent with the trends. However, this year was impacted by a protracted labour dispute which significantly curtailed operations.

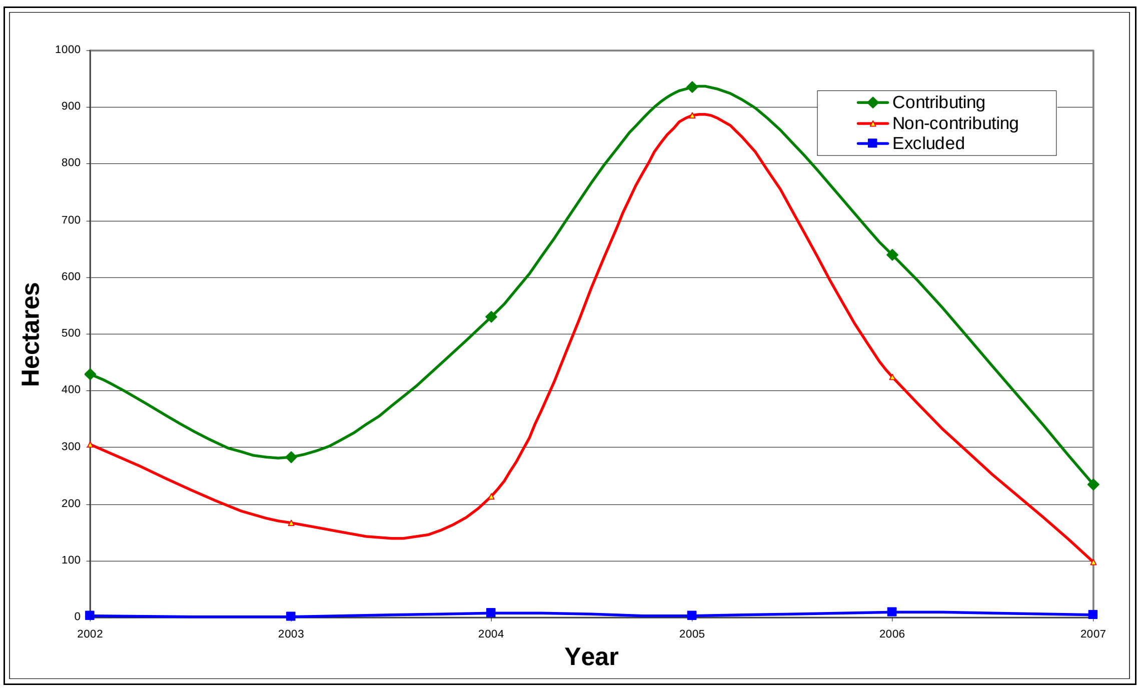

Figure A2: Interfor blocks harvested by TSR2 contribution class

Figure A3, which illustrates the same data for all licensees should be viewed the same way.

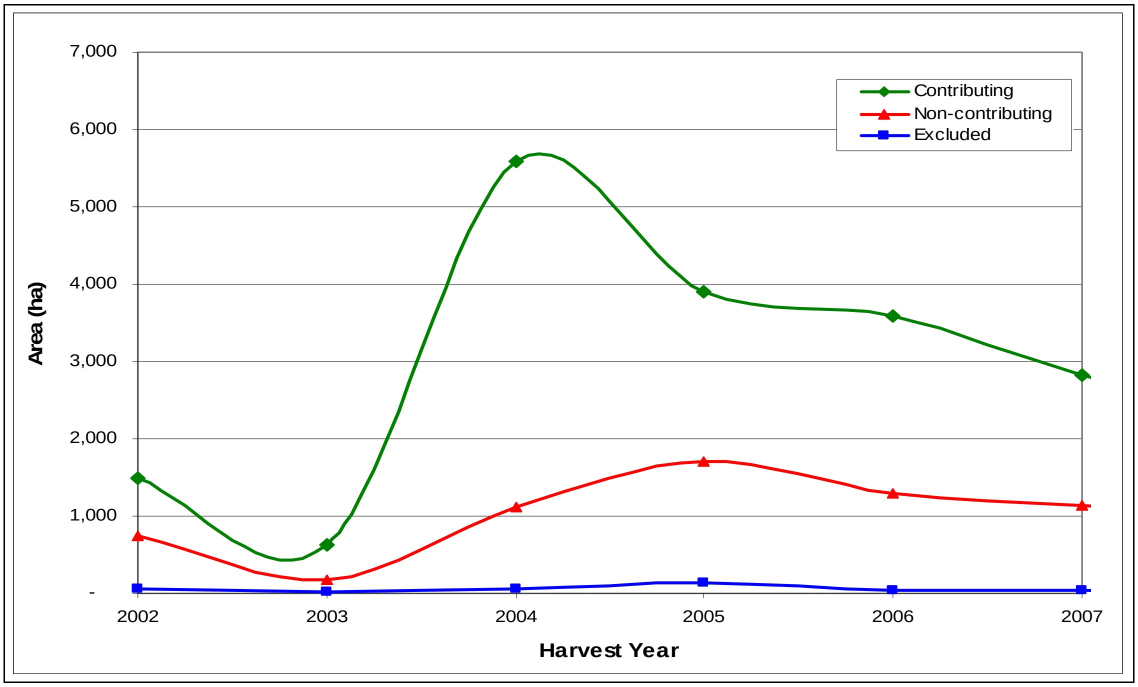

Figure A3: Blocks harvested for all licensees by TSR2 contribution class

Both of these figures illustrate significant performance occurring in the forested non-contributing land base which indicates that the available land base was either underestimated, incorrectly defined, or both. Accordingly it was necessary to revisit the land base definition assumptions.

Completing a similar analysis using the TSR3 data set created for the model used to prepare all of the simulation runs presented in this document provides results which allow comparison of assumptions and operational performance. Table 1. *Operational Performance on TSR3 Land Base* characterizes how well the modeled land base coincides with harvest activity in the 2002 to 2007 period. In this table “Rollup” is the grouping of attributes used to describe the land base into buckets which are either contributing to timber supply or not. Area identified as “Harv” is timber harvesting land base.

Table A1. Operational Performance on TSR3 Land Base

Licensee	All

	HARVEST YEAR							
	Hectares Harvested						Total	
"ROLLUP"	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**		**%Total**
Harv	1,612	611	4,866	4,188	3,198	3,389	17,865	73%
Riparian	138	70	609	471	381	368	2,037	8%
Inoperable	71	0	452	558	676	332	2,088	9%
Excluded / Road	194	69	477	235	126	217	1,318	5%
Marginal	130	29	141	219	245	276	1,040	4%
Total	**2,146**	**780**	**6,545**	**5,671**	**4,625**	**4,583**	**24,349**	**100%**

Harvest % in "THLB"	75.1%	78.4%	74.3%	73.9%	69.2%	74.0%
Harvest % in "Marginal"	6.1%	3.7%	2.1%	3.9%	5.3%	6.0%
Harvest % in "Inoperable"	3.3%	0.0%	6.9%	9.8%	14.6%	7.2%

On average there is a 73% correlation, ranging between 69 and 78%. This is a much stronger correlation between modeled data and actual harvest activity than was observed with the TSR2 land base.

However, the correlation is not perfect and significant harvest still occurs in the inoperable, as much as 14.6%. This is confirmation that the land base has not been over estimated and is in fact still conservative in its estimates of contribution. Inoperable is area that does not contribute to timber supply in any of the forecasts. Similarly, the "excluded / road" area includes roughly 30% harvest area in blocks which should have contributed to timber supply in the timber supply analysis but did not due to data assembly assumptions that excluded it. Harvest occurring in "riparian" is harvest area in riparian management zones.

"Marginal" represents those site types with an inventory site index between 10.5 and 11.5 (cedar) and 12.5 and 13.5 meters (hemlock/balsam) included in the model and contributing to timber supply. It is important to realize that in the model this area is constrained to 75,000 m^3/yr contribution and once harvested the stands in this area "leave" the marginal group and are given a managed stand site index consistent with the site index adjustment process described in section 4.5.5 "Productivity" in the analysis report.

The result of revisiting low site threshold values is the inclusion of addition forested area in the timber harvesting land base. All of these stands have lower site productivity and some are considered marginal. The marginal definition is applied to monitor the contribution of these stands in the harvest forecast to ensure (via the 75,000 cubic meter annual harvest constraint) that the forecast in any one period is not overly dependant on marginal stands making up a significant portion of the total annual Kingcome harvest volume.

Using these new land base definitions, harvest activity for all licensees was analyzed. Figure A4 shows that 73% of harvested blocks for the 2002-2007 period fell within the operable land base with a further 4% in the marginal sites.

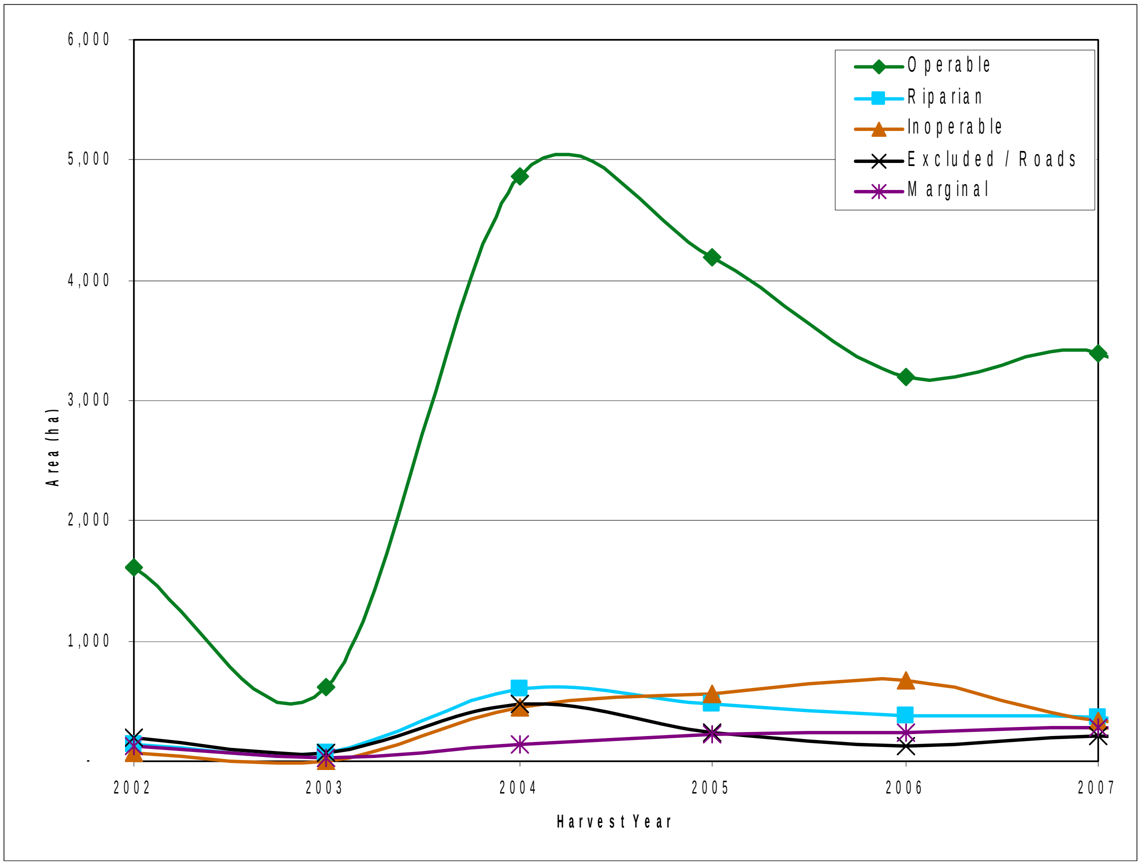

Figure A4: Harvested area for all licensees by TSR3 operability class

The analysis here indicates that the land base used in the timber supply model to generate the forecasts in the base case and associated sensitivities has the following characteristics that confirm its validity:

1. Harvest in any one period is not overly dependant on marginal cedar and hemlock types now included in the contributing land base.
2. Operational performance is coincident with the modeled land base.
3. The land base is conservative as operational performance still extends into site types that are not expected to contribute to timber supply.

APPENDIX III
KINGCOME TIMBER SUPPLY AREA TSR3
SOCIO-ECONOMIC ANALYSIS

KINGCOME TIMBER SUPPLY AREA
TSR 3 SOCIO-ECONOMIC ASSESSMENT

Prepared for:

Kingcome TSA Licensee-Agency Group

Prepared by:

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September 2008

Robinson Consulting and Associates Ltd.

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1.0 INTRODUCTION

The impact of timber supply adjustments on local communities and the provincial economy is an important consideration in the Chief Forester's allowable annual cut (AAC) determination. This socio-economic assessment identifies the employment and economic activity presently supported by the Kingcome Timber Supply Area (TSA) harvest, which provides the basis for projecting future levels of economic activity given the base case timber supply forecast.

This report includes:

- An overview of the Kingcome TSAs demographic and social characteristics, a description of its main communities and its primary economic drivers;
- A survey of the forest industry active in the Kingcome TSA forest industry, recent trends, and the contribution of the TSA's timber supply to local and provincial economies; and
- An analysis of the socio-economic implications of the base case timber supply forecast. TSA Profile

1.1 Overview

The Kingcome TSA covers an area of about 1.14 million hectares, mostly on the mainland from Knight Inlet in the south, northwest to Cape Caution and northeast to Tweedsmuir Park. Smaller portions of the TSA are on northern Vancouver Island. The TSA is also bounded, or close to tree farm licenses (TFLs) 6, 37, 39, 45 and 47. The TSA is within the North Island-Central Coast Forest District, with its main office located in Port McNeill and a field office in Hagensborg (Bella Coola Valley)[1] (Figure 2.1 in the *Analysis Report*).

The topography of the TSA is diverse, ranging from the coastal lowlands to the rugged Coast Range Mountains. Five biogeoclimatic zones cover the area, reflecting this diversity. Productive forest land is primarily found in two zones, the Coastal Western Hemlock (CWH) and the Mountain Hemlock (MH) zones. The former zone occurs from sea level to 1000 meters elevation. It experiences high precipitation, and is characterized by cool summers and mild winters. Western hemlock is the dominate tree species, with other species such as amabilis fir, Douglas-fir, western redcedar, Sitka spruce, maple and alder occurring depending on local conditions. The MH zone is above the CWH zone. It has a sub-alpine climate, with short cool summers and long, cool, wet winters. The deep snow pack is slow to disappear, resulting in a short growing season. Mountain hemlock is the most prevalent tree species, with amabilis fir and yellow cedar also common. While timber harvesting has a long history in the TSA, most of it has occurred in the past thirty years. (MoF, 2001).

In addition to supporting industrial timber harvesting activities, the TSA land base provides tourism and recreation opportunities, community water supply, habitats for wildlife and fish. Most of the recreation is marine oriented (*e.g*. boating, fishing, whale watching, kayaking) and is growing in popularity. The management of the various uses of the TSA's land base is addressed by the two strategic land use plans. The Vancouver Island Land Use Plan pertains to the Island portion of the TSA, and the recently announced Central Coast LRMP provides direction for the

[1] In 2003 the Port McNeill and Mid-Coast forest districts were combined to become the North Island-Central Coast Forest District. Where the information is available, it is reported at the Port McNeill District boundaries this more closely corresponds to the TSA geography.

mainland portion and the islands between Vancouver Island and the mainland. These strategic land use plans affect timber supply by the creation of protected areas over land that had been available for harvest, and by modifying timber management to address non-timber objectives.

The productive forest land base covers about 650,696 ha, or about 57 percent of the TSA's total land base when parks, protected areas and inoperable area is included. However, much less land is available for harvest. Removing, parks protected areas and the inoperable the productive land base is reduced to 376,452 ha or about 33% of the TSA's total land base. The operable forest is further reduced by 101,077 ha to address sites with low growing potential which are not considered economically operable. The remaining productive forest area is then reduced by an additional 67,201 ha to address forest management objectives and 18,996 ha to address EBM specific objectives which require land base removals.

The TSA is sparsely settled. The larger communities are Port Hardy, Port McNeill and Port Alice are on Vancouver Island. Smaller communities include Alert Bay and Sointula. There are 15 First Nations bands that have traditional territories in the TSA. The traditional territories are on Vancouver Island and the mainland, but most of the First Nations people reside on Vancouver Island due to historic relocations. The larger settlements include Fort Rupert, Tsulquate reserve, Quatsino, and Namgis.

In the following section, various statistics are used to profile the plan area social and economic trends and conditions. This includes trends in population and various social statistics relating to measures of crime, health, education. This provides the context for understanding the role the forest industry presently plays in the TSA's communities, and a basis for considering the implications of future timber supply scenarios.

1.2 Population

1.2.1 Historical Population

In 2007, the total population of the Mount Waddington Regional District was approximately 12,300 persons.[2] The population in the regional district peaked at approximately 16,000 in 1984 and has trended downward since 1993, when it stabilized at 14,350. Population recovered slightly in the mid-1990's but has once again slipped into a period of negative growth (Table 1.1). Port Alice and Port Hardy were particularly hard hit. A contributing factor to this decline is the out-migration of persons seeking better economic prospects. The economic challenges in the region will be discussed in the economic profile that follows.

[2] The Mount Waddington Regional District is used here as proxy for the Kingcome TSA. The geographical boundaries are similar. Census data is readily available for regional districts but not for the TSA geography.

Table 1.1 – Population trends in the Kingcome TSA, 1986 to 2007

Community	1986	1996	2001	2005	2006	2007	% Change 1986/2007
Alert Bay	701	637	608	607	586	584	-17%
Port Alice	1,436	1,384	1,175	1,128	880	893	-38%
Port Hardy	5,627	5,501	4,774	4,597	4,064	4,011	-29%
Port McNeill	2,652	3,046	2,944	2,928	2,771	2,740	+3%
Unincorporated Areas	5,092	4,626	4,182	4,424	4,040	4,060	-20%
Mount Waddington RD	**15,508**	**15,194**	**13,683**	**13,684**	**12,341**	**12,288**	**-21%**
British Columbia	3,004,105	3,874,276	4,078,447	4,260,246	4,320,255	4,380,256	+46%

Source: BC Stats.

1.2.2 Population Characteristics

In 2006, males made up 51.9 percent of the population, as compared to 49.0 percent in the total provincial population. The median age of the population in the Kingcome TSA is 40.0 years as compared to 40.8 years for the total province. However, as illustrated in Table 1.2, the Kingcome TSA has a significantly smaller percentage of population in the over 65 year age category than is generally observed in the province. This may reflect the tendency for older persons to move closer to urban centres that offer easier access to specialized services. The younger age profile also supports the conclusion that this community is on dependant on resource industry employment.

Table 1.2 - Age Characteristics, 2006.

Age Category	Kingcome TSA	British Columbia
0 to 29 years	37.9%	35.6%
29 to 64 years	53.6%	49.8%
65 years and older	8.5%	14.6%

Source: Statistics Canada. 2006 Census.

1.2.3 Population Forecast

The latest available population forecast for the Mount Waddington Regional District is a continuing decline from the current level. The region's population growth is expected to lag behind the province rate and that of neighbouring regions to the south (Table 1.3). It is noted that the forecast is based primarily on age of the current population, fertility rates and assumptions regarding migration. In small populations, such as this TSA, the forecast can be quite sensitive to small changes in the assumptions, particularly shifts in economic conditions that trigger migration rates exceeding those assumed in the forecast.

1.2.4 First Nation Communities

First Nation population makes up almost 25 percent of the total population in the TSA.[3] Among the First Nations, approximately half of the members live on reserve, while the remaining population lives off reserve. The total registered members of on and off reserve are approximately 5,230. Of this total the three First Nations of 'Namgis, Gwa'Sala-Nakwaxda'xw, and Kwakiutl make up approximately 58 percent of the total registered members.

Table 1.3 - Forecast and comparison of the Mt. Waddington Regional District population

Year	Persons	Avg. Change For Period		Persons
	2007	2007/17	2017/27	2027
Mount Waddington RD	12,288	-8%	-5%	10,780
Campbell River RD	108,795	+12%	+11%	134,750
British Columbia	4,380,256	+13%	+10%	5,424,730

Source: BC Stats, PEOPLE 32.

1.3 Socio-Economic Indicators

BC Stats compiles statistics related to various social conditions. The statistics relate to measures of economic hardship, crime, health, education, youth, and children at risk. BC Stats also compiles a “Hardship Index” based on a weighting of the social indicators, summing them up to obtain a relative ordering. The index numbers range from 1, the regional district that is worst-off, to 26 the regional district that is best-off. The overall rank for the Mount Waddington Regional District is 1, less than the median value for all of the social statistics, suggesting relatively difficult economic and social conditions for its residents (Table 1.4).

Table 1.4 - Index of Social Conditions, 2006

Regional District	Overall Rank	Economic Hardship	Crime	Health	Education	Children	Youth
Weighting		0.30	0.20	0.20	0.20	0.05	0.05
Mount Waddington	**1**	3	6	1	2	1	8
Comox-Strathcona	**14**	13	15	20	11	12	14

Source: BC Stats: Socio-Economic Indices
Note: Comparative Regional District. Rankings out 26, median value is 13.

The index does not tell us why a region is doing well or poorly, but rather is an indicator that identifies areas where social stress may be high.

[3] Statistics Canada. 2006 Census for the Mount Waddington Regional District.

1.4 Economic Profile

The economic profile begins by considering the size, change and make up of the local labour force. This is followed by the sources of income earned by local residents. It then proceeds to identify the basic industries that underpin the TSA economy, the relative importance of the sectors, and the trend in the sector's contribution in recent years.

1.4.1 Labour Force

Table 1.5 summarizes labour force by industry for the last two census periods for the TSA's main communities and the Mount Waddington Regional District. The table also compares the change in the Regional District labour force to that of British Columbia.

The labour force in the Mount Waddington Regional District declined by 12 percent between 2001 and 2006, losing 935 persons to 6,610 persons at the last census. Over the same period, the labour force in the province grew by eight percent.

This decline was particularly evident in the TSA's goods producing sector, which was down net 22 percent over the five year period. Again, over the same period, the provincial goods producing labour force increased by 11 percent. The forestry sector's labour force is mostly found in the primary industries (i.e. logging, reported in NASICS #11) and manufacturing (e.g. sawmilling and pulp and paper in NASICS #31-33) industry classifications. The labour forces in both industry classifications were down sharply in 2006 from their respective 2001 levels. The reduction in the primary industry work force (i.e. fishing and logging) was most evident in Port McNeill while the decline in manufacturing labour force was concentrated in Port Alice and Port Hardy likely reflecting the closure of the pulp mill in Port Alice.

There were bright spots in the region's economy over the period with Port McNeill seeing its service related labour force increase by 11 percent. Since the Census, Neucel has reopened the sulphite pulp mill in Port Alice (March 2006), renewing the operation's substantial economic contribution to the community and the North Island. It employs close to 400 workers. Currently the second growth pulp content of the TSA is directed to Neucel which is a very positive synergy providing low cost fiber.

Table 1.5 – Mount Waddington labour force and change in labour force compared to British Columbia, 2001 and 2006

NASICS	Labour Force	Port Hardy		Port McNeill		Port Alice		MWRD		MWRD	BC
		2001	2006	2001	2006	2001	2006	2001	2006	(% Change 2001 to 2006)	
11	Agr., Forestry Fishing & Hunting[1]	410	380	550	430	90	40	1,760	1,375	-%22	-3%
21	Mining and Oil and Gas Extraction	10	20	0	0	0	0	15	25	+67%	+43%
22	Utilities	20	0	10	0	0	10	40	20	-50%	-3%
23	Construction	65	95	45	35	10	30	210	300	+43%	+40%
31-33	Manufacturing	345	205	180	160	340	165	1,045	690	-34%	-3%
	Total Goods producing Sector	**850**	**700**	**785**	**625**	**440**	**245**	**3,070**	**2,410**	**-22%**	**+11%**
41	Wholesale Trade	40	85	15	60	0	30	70	190	+171%	+12%
44-45	Retail Trade	350	270	180	160	30	10	705	640	-9%	+7%
48-49	Transportation and Warehousing	215	140	110	95	10	20	455	405	-11%	+1%
51	Information and Cultural industries	30	25	0	10	10	0	55	45	-18%	-5%
52	Finance and Insurance	65	55	10	0	15	10	110	100	-9%	+5%
53	Real Estate and Rental and Leasing	40	35	20	20	15	10	75	70	-7%	+22%
54	Prof., Scientific & Technology	60	95	10	115	20	0	175	295	+69%	+19%
55	Management of Comp. & Enterpr.	0	0	0	0	0	0	0	0	0%	+126%
56	Admin. & Support, Waste Mang.	55	70	25	20	15	20	130	180	+38%	+20%
61	Education Services	250	170	80	90	30	0	495	390	-21%	+9%
62	Health care and social assistance	175	150	130	125	30	15	515	445	-14%	+7%
71	Arts, Entertainment and Recreation	30	40	10	35	15	10	125	150	+20%	+11%
72	Accommodation & Food Services	265	175	200	115	40	25	675	470	-30%	+8%
81	Other Services	95	85	45	65	15	20	235	215	-9%	+12%
91	Public Administration	150	95	90	115	15	30	540	445	-18%	-2%
	Total Service Producing Sector	**1,820**	**1,490**	**925**	**1,025**	**265**	**200**	**4,360**	**4,040**	**-7%**	**+8%**
	Industry not applicable	45	50	25	15	0	5	120	130		
	Total Labour Force	**2,715**	**2,240**	**1,735**	**1,665**	**700**	**450**	**7,545**	**6,610**	**-12%**	**+8%**

Source: Statistics Canada 2001 and 2006 Census
Notes:
1. Logging aggregated with other primary activities for confidentiality.

1.4.2 Employment Income

In 2006, the latest year data is available, employment income accounted for almost 80 percent of all income earned in the Mount Waddington Regional District, as noted in Table 1.6. The TSA relies to a greater extent on employment income than is the case for the province as a whole. That is, contribution of non-employment income sources, such as government income support payment, pension income, investment income, foreign income and the like make a smaller contribution.

Table 1.6 - Share of employment income and median employment income, 2006

Regional District	Employment Income	Median Employment Income		
	Percentage of Total	Male	Female	Total
Mount Waddington	79.4%	$37,520	$19,905	$27,215
British Columbia	71.7%	$34,935	$22,420	$27,860

Source: Canada Revenue Agency.

In the TSA, several industries dominate. The average employment income in 2000 for these important industries in the Kingcome TSA is summarized in Table 1.7.

Table 1.7 - Average income by basic industry in North Island Forest District, 2000

Industry	Average Annual Income
Logging	$45,328
Pulp and Paper	$52,735
Other Wood Manufacturing	$31,658
Fishing	$19,741
Agriculture	$26,327
Tourism	$16,422
Public Sector	$27,445
Construction	$28,830
Non-Basic	$17,770

Source: MoF Economic Dependency (Table 8)

More recent data on wage rates for the Kingcome TSA specifically is not available. At the provincial level it is known how wages in specific industries have changed between 2000 and 2007. Table 1.8 outlines the percentage change in wages for specific basic sectors and the non-basic sector between 2000 and 2007 in British Columbia.

Table 1.8 - Average change wage rates in B.C. by key sectors between 2000 and 2007

Industry	Percentage Change 2000 to 2007	Revised Sector Incomes
Logging	3.2%	$46,778
Pulp and Paper	9.3%	$57,639
Other Wood Manufacturing	3.5%	$32,766
Fishing	N/A	NA
Agriculture	27.2%	$33,487
Tourism (based on food and accommodation)	16.5%	$19,131
Public Sector	17.9%	$32,357
Construction	18.3%	$34,105
Non-Basic	17.4%	$20,861

Source: Statistics Canada, CANSIM 281-0027.

The derivation of average incomes used to estimate the income impacts of future timber supplies is summarized in Appendix A, Table A1.

1.5 Economic Dependency and Trends

There is considerable inter-dependency among industries in an economy, with businesses supplying goods and services to other industries, and the spending of their employees on consumer goods and services. Analysis by BC Stats highlights this interdependency by identifying the "basic" sectors and "dependent" sectors. A basic sector sells its output (goods or services) to customers outside the TSA, therefore bringing new revenue into the local economy where it re-circulates creating addition income and employment (termed dependent employment).

The analysis by BC Stats adds the dependent incomes to the respective basic sector income to provide a more accurate representation of the area's key economic drivers. Table 1.9 summarizes the important basic sectors in the Alert Bay and Port Hardy areas and their respective share of total area income. For example, in 2001 the forest industry accounted for 8% of total incomes in the Alert Bay area, down from 18% in 1996. The public sector and government transfers account for large proportion of total in come in this area. In the Port Hardy area, the forest sector (includes logging and manufacturing) account for about half of the local area's income (in 2001). The trend since 2001 is also estimated using the more recent 2006 Census experienced labour force data and 2005 tax filer data.

Table 1.9 - Trend in economic dependency by basic sectors (% of total area's income)

	Forest	Mining	Fishing & Trapping	Agriculture	Tourism	Public	Other Basic Industry	Government Transfers	Other Non-employment
Alert Bay Area									
Trend to 2006	Decline	Flat	Flat	Flat	Decline	Increase	Flat	Increase	Increase
2001	8	0	15	1	8	32	5	24	6
1996	18	0	19	0	3	31	9	7	3
1991	11	0	17	0	5	27	14	11	9
Port Hardy Area									
Trend to 2006	Decline	Increase	Flat	Flat	Decline	Increase	Increase	Increase	Flat
2001	49	1	4	2	8	19	2	10	5
1996	51	5	5	1	7	16	5	7	3
1991	37	13	5	1	6	15	3	11	9

Source: BC Stats, Local Area Dependencies and Taxation Statistics 2005 and 2001.
Note: Alert Bay local area consists of Alert Bay, Mount Waddington Electoral Area A and surrounding First Nation reserves.
Port Hardy local area consists of Port McNeill, Port Alice, Port Hardy, Mount Waddington Electoral Areas B,C,D and surrounding First Nation reserves.

One can also characterize the dependence in terms of employment. That is, how many other jobs are supported in the local area for say 100 jobs in the forest sector? The employment relationships are summarized in Table 1.10 in terms of the number of "spin-off" jobs supported per 100 jobs in the respective basic industry. In the Alert Bay area, 100 jobs in forestry support another 18 jobs in various supply and consumer oriented industries. In the Port Hardy area, given its larger service base, 27 jobs are supported per 100 jobs in forestry.

Table 1.10 – Indirect and induced employment per 100 direct basic industry jobs

	Logging	Pulp & Paper	Wood Mfg.	Mining	Tourism	Public	Hi Tech	Agriculture	Construction
Alert Bay Area	18	0	25	0	7	15	7	15	25
Port Hardy Area	27	76	36	60	10	18	3	18	32

Source: BC Stats, Local Area Dependencies

2.0 FOREST INDUSTRY PROFILE

The last socio-economic profile of the Kingcome TSA examined the industry's performance over the period 1997 to 2000[4]. During that period, it was estimated that the TSA harvest created 313 direct full time positions in the North Island Central Coast Forest District (in the woods and mills) and 1,364 total direct jobs in BC. Aggregate industry performance is profiled in this chapter since the time the current AAC took effect in 2002.

2.1 Kingcome TSA Allowable Annual Cut and Harvest History

The Kingcome TSA was created in 1980, and its first timber supply review set the allowable annual cut at 1.7 million cubic metres per year. At various intervals the AAC was adjusted to account for various boundary adjustments that occurred. In 1996, the AAC was set at 1.399 million cubic metres per year, a 22 percent reduction from the previous AAC. The most recent AAC determination took effect in October 2002, setting the AAC at 1.284 million cubic metres per year. This has been temporarily reduced to provide for designated area identified in the Central Coast LRMP planning process. The current order reduces the AAC by 52,000 cubic metres, or an AAC of 1.232 million cubic metres per year.

Over the most recent eight years the TSA's total harvest has averaged 80 percent of the AAC (Figure 2.1). Constrained market conditions (e.g. weak hemlock market, soft-wood dispute, stronger Canadian dollar, high energy costs) have contributed to this circumstance as well as company specific issues.

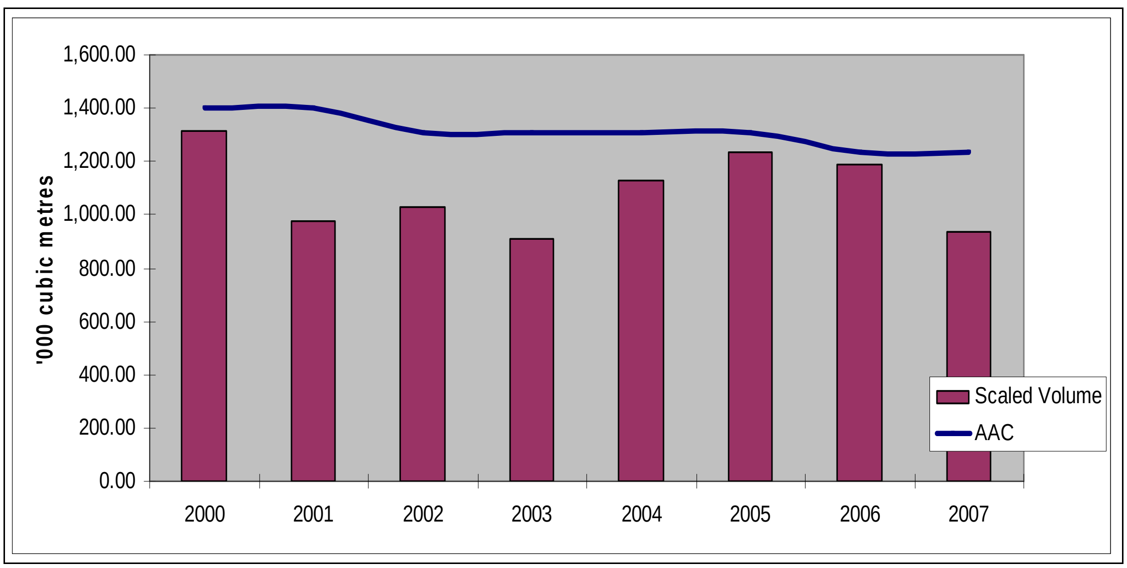

Figure 2.1 – Harvest billing history

The AAC is apportioned to various license/use categories, and then committed to specific companies. The AAC sets the maximum harvest volume of both coniferous and deciduous leading standings. Table 2.1 summarizes the apportionment of the AAC.

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4 . Ministry of Forests, 2000. *Kingcome Timber Supply Area Analysis Report*, *Socio Economic Analysis*. Chap. 8, Socio-Economic Analysis

Table 2.1 - Kingcome TSA apportionment table[1]

	Total (m^3)	**Conventional**	**Deciduous-leading**
Allowable Annual Cut (2006-09-28)	1,232,000	1,211,660	20,340
Apportionment (2005-12-19)			
Forest Licences Replaceable	772,246	772,246	
Forest Licences Non-Replaceable	94,796	75,592	19,204
Non-Replaceable Forest Licence	47,646	47,646	
BCTS Timber Sale License Non-Replaceable	28,460	28,460	
BCTS Timber Sale License	253,968	253,968	
Woodlots	18,136	18,136	
Forest Service Reserve	16,748	15,612	1,136
Total	**1,232,000**	**1,211,660**	**20,340**

Source: Ministry of Forests, Apportionment System, effect 2008-06-20
Notes:
1. includes reduction of 52,000 cubic metres for designated area, order dated September 28, 2006.

BC Timber Sales (BCTS) is an independent organization within the MoFR. BCTS makes available its apportionment through a number of timber sales that are sold at auction to registered operators. The operators are independent logging operators, who may operate a mill or other value added facility. The apportionment to forest licences (replaceable and non-replaceable) shown in Table 2.1 is committed as individual licenses.

The licensed volume is the maximum annual average harvest over the term of the cut control period. The last full cut control period was 2003-07. The actual harvest volume may diverge from the AAC as license holders have some latitude for meeting the cut-control requirements. As shown in Figure 2.1, the actual aggregate harvest has been below the maximum allowable level since 2001. A more detailed breakdown of billed harvest volume by general apportionment categories is shown in Table 2.2.

Table 2.2 – Volume harvested by type of license (m^3/year)

Licence Type	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**8-Year Average**
SBFEP/BCTS	266,259	161,105	150,549	253,348	248,930	105,486	222,482	403,702	226,483
Forest license	1,025,582	770,051	816,612	549,344	758,378	1,074,695	882,157	451,710	791,066
Other[1]	24,000	8,881	59,605	105,708	119,248	55,037	81,763	83,355	67,200
Total Kingcome volume	**1,317,841**	**942,037**	**1,028,769**	**910,403**	**1,128,560**	**1,237,223**	**1,188,408**	**940,774**	**1,086,752**

Source: Ministry of Forests Harvest Billing Records volumes scaled
Notes
1. Includes woodlots, private land and federal land

Table 2.3 illustrates how the total volume and harvest by license type fluctuates annually. This fluctuation illustrates the range of variability in harvest as a result of all mitigating factors in the sector such as labor disputes, lumber prices and extraction costs. However, this table does not reflect licensee specific performance. Forest licensee performance relative to apportionment of harvest volume is also highly variable with some meeting or exceeding harvest allotment targets and some underperforming.

In 2005 (the most recent year the mill survey was completed by MoFR) several mills were reported operating in the North Island-Central Coast Forest District. Several mills utilize harvest from the Kingcome TSA, as well as wood from the other nearby management units (TFLs and TSAs). Both of Interfor's sawmills, Hammond and Acron, are economically dependant on volume received from the Kingcome TSA. The name and locations of the mill are summarized in Table 2.4.

Table 2.3 – Timber processing facilities in North Island-Central Coast Forest District

Type of Mill	Company Name	Location of Mill	Estimated Annual Capacity
Lumber Mills			(millions of bd ft)
	Edgegrain	Campbell River	1.0
	G. W. Milling Ltd.	Malcolm Island	1.4
	Greg Williams	Sointula	1.0
	John Salo	Sointula	0.2
	Mill & Timber Products Ltd.	Port Hardy	2.4[1]
	Port Hardy Merchandising Ltd.	Port Hardy	4.8
	Rocky Mountain Salvage	Port Hardy	1.0
Pulp Mills			(000s of tonnes)
	Port Alice Pulp Mill	Port Alice	162
Shake & Shingle Mills			('000s of squares)
	Port McNeill Shake & Shingles Ltd.	Port McNeill	24
	Taylor Contracting	Zeballos	15
	Titan Ridge	Port McNeill	96
	Vancouver Island Shake and Shingle	Port McNeill	12
Shake & Shingle Stock	John Salo	Sointula	-
Utility Pole Mills			('000s of pieces)
	Sierra Cascade Resources II LLC	Port McNeill	6

Source: B. C. Ministry of Forests. 2005. Major Primary Timber Processing Facilities in British Columbia, 2004.
Notes:
1. mill temporarily closed in late 2007

2.2 Kingcome TSA Major Licensees

An informal survey of TSA licensee was completed for this assessment, which included web search and telephone interviews where persons were available. The survey findings are summarized below.

International Forest Products is the single largest holder of Crown quota in the TSA. It holds three replaceable forest licences in the TSA, totaling 642,000 cubic metres/yr, and 17 replaceable forest licenses in the province. The company also has three TFLs. The company's total Crown quota from the 20 tenures is 3,598,591 cubic metres. [5] The management units are located on the coast and the interior. The quota from the Kingcome TSA accounts for about 31 percent of coastal crown quota being directed to the Hammond and Acorn mills and roughly 18 percent of its total Crown quota. Over the most recent 5 years, the actual aggregate harvest has been about 97% of the total quota volume (pers.comm. H. Kalmakoff) which includes 2007 data which was impacted due to the IWA strike that year. The most recent cut control data for Interfor licenses is as follows:

- FLA19238 – 101%;
- FLA77806 – 98%; and
- FLA77087 – 105%.

About 75 percent of the company's harvest from the Kingcome TSA is processed in one of its two coastal mills in the lower mainland. The Hammond Mill, in Maple Ridge, takes cedar logs and produces siding, paneling, facia, trim, decking, and cedar timbers. The products are mostly sold in North America, or to third parties for custom cutting. The company's Acorn Mill in Delta takes hemlock and Douglas-fir logs and produces lumber in sizes and grades for use in Japanese traditional housing. Some output is also sold to China (pers.comm. G. Sommers).

Mill & Timber Products Ltd. holds two forest licenses in the TSA. A replaceable forest licence for 49,817 cubic metres and a non-replaceable forest license for 76,191 cubic metres. The latter targets low sites, and is due to expire. The company also manages the Gwa'nak Resources non-replaceable license for the First Nation. The operating areas of these licenses are in the Seymour Inlet area.

The cedar harvested from the licenses account for about 30 percent of the company's mill requirements. The company operates three mills in the Lower Mainland. The company had operated a shingle mill, saw mill, pole mill and dry land sort in Port Hardy. The saw mill closed in January 2008 and the company is examining the potential for re-opening it with First Nations involvement. The dry land sort operates intermittently on a contract basis. The pole and shingle mills are closed.

Table 2.4 - Mill & Timber Products Ltd harvest and direct employment statistics

Allowable Annual Cut (2 FL's)	126,008 cubic meters
2002-07 average harvest	109,845 cubic metres
Direct Employment (jobs)	
Harvesting	81 jobs
Processing (3 mills)	195 jobs
Average Total log input	383,900 cubic metres

Source: Licensee response

Richmond Plywood Ltd holds one replaceable license in Kingcome TSA and one in the Soo TSA. The Kingcome licence is located on northern Vancouver Island, with a total volume of 47,428 cubic metres. Most of the licence harvest volume is cedar, which the company trades for

[5] Company's aggregate licence volume from MoFR Apportionment System "Linkages and Licences Report" dated 200-06-20. Accessed at: http://www.for.gov.bc.ca/hth/apportionment/Documents/Aptr041.pdf.

logs suitable for its plywood plant located in Richmond. Total log input to the mill is some 450,000 cubic metres. The company purchases the balance of its log input requirements on the open market.

Over the past five years the company's harvest has averaged about 90 percent of its license volume. It contracts about 25 persons out of Port Hardy/Port McNeill area for its woods operations (pers. comm.. T. Cole). It employs about 450 people at its plywood plant.

Western Forest Products Inc. holds one replaceable forest licence in the TSA for 24,278 cubic metres. The license quota is reduced from 63,000 cubic metres in 2002 largely because of the government's revitalization program. The company holds six forest licenses (two are jointly held) and six TFLs on the coast, with a total AAC of 7,120,981 cubic metres. WFP operates eight sawmills and four remanufacturing plants located on southern Vancouver Island[6].

Over the past five years the company has fully harvested its licence volume in the TSA. The volume has been harvested by company contractors and the fibre is processed in a company mill, or traded/sold on the open market.

Kruger Forest Products Ltd holds one non-replaceable forest licence in the Kingcome TSA to harvest deciduous stands. It also holds TFL 43 with an AAC of 39,900 cubic metres. The latter consists of three blocks. The Kingcome block is on the Kingcome River and is surrounded by the Kingcome TSA. The Homathco block is on the Homathco River, and the third block is in the Fraser Valley. The company targets cottonwood which is processed in the company's pulp mill in New Westminster, producing a wide range of tissue and paper products.

The TSA licence is nearing the end of its term. Over its term, about 85 percent of the allowable volume was harvested. Poor market conditions and the high cost of accessing the remote sites have precluded the company from harvesting the remaining volume. Kruger intends to apply for a similar licence volume, with the view that the attainment of EBM objectives on the land base can be suitably specified.

Harvesting is done by contractors on an intermittent basis. The company's logging contractor for the Kingcome area has typically come from the Campbell River area.

Weyerhaeuser Company Limited holds a non-replaceable forest license for 13,605 cubic metres targeting deciduous stands. The volume is utilized by a company subsidiary, Northwest Hardwoods. The latter operates a plant in Delta. It primary output is furniture stock. At two shifts the mill employs about 250 persons/contractors and consumes about 250,000 cubic metres of input logs. The balance of log requirements not met from its licenses is purchased. In mid-2008 the mill was reportedly not operating.

BC Timber Sales in the Kingcome TSA is managed from Port McNeill, being part of its Seaward-Tlasta Business Area. Since the BCTS volume is sold at auction, the proportion of sales won by TSA resident contractors, and the disposition of the harvest volume to TSA and non-TSA mills, will vary. Based on recent sales, 30% of the awards are won by local residents. In addition, local contractors are typically used by the timber sale licence holder to harvest and transport the sale. Over the most recent 5 years, actual harvest has averaged 246,790 cubic metres per year, or slightly below the apportionment volume. Most of the volume is processed outside the local area.

[6] See company website http://www.westernforest.com/domans/download/WFP%20Overview.pdf

Based on the survey information, the industry's recent economic contribution is summarized relative to that reported in TSR 2 (Table 2.5). Relative to the earlier analysis, the direct employment coefficients appeared to be similar to those found in TSR 2, and were adopted in this current analysis. The stumpage and income values have changed materially and update values were used. Broadly, the TSA's contribution in terms of employment and incomes has remained relatively constant since the late 1990's. Although it is noted that this is does not appear to be supported by the trends in local labour force (Table 1.5). Stumpage revenue to the Crown has fallen significantly, indicating the market pricing system's (MPS) greater sensitivity to market conditions and the low prices during the period.

Table 2.5 - Comparison of forest sector contributions

	1999[1]	**2005/07[2]**
AAC (m^3)	1,399,000	1,232,000
Average Harvest (m^3)	1,117,728	1,122,135
TSA direct employment (person-years)	313	314
Total BC direct employment (person-years)	1,364	1,369
TSA direct employment income	$14.7 million	$16.35 million
Total BC direct employment income	$64.3 million	$65.73 million
Average stumpage	$27.73 $/m^3	$13.05 $/m^3
Average stumpage revenue	$31 million	$14.65 million

Notes:
1. **Table20, page 78, Kingcome Timber Supply Area Analysis Report**
2. **See Appendix A for coefficient values**

3.0 SOCIO-ECONOMIC IMPLICATIONS OF THE BASE CASE TIMBER SUPPLY FORECAST

This section presents the implications of the Base Case timber supply forecasts in terms of employment, incomes, government revenue and community implications. These implications take into consideration the industry's current conditions as discussed in the last section and an outlook given the Base Case timber supply forecast.

The analysis focuses on the level and change in economic aggregates for the first two decades of the timber supply forecast. The method uses average forest industry values observed in recent periods. The coefficients are applied to the forecast of timber supply to derive a forecast of economic activity at both the TSA and provincial levels. It is recognized that the relationship between timber harvesting and the forest industry's economic contribution to the TSA and provincial economy is more complex than represented by this simple relationship. The industry is greatly influenced by external factors as it strives to be competitive in world markets. This will lead to changes over time, as the industry adopts new technologies and methods, changes products lines and mill locations for example. These changes would be reflected in changes in labour productivity (hence employment level and income) and likely average government revenues relative to the values adopted here. Given this, our findings should be interpreted as indicating the direction and magnitude of the trend in economic indicators given the indicated changes to future timber supply, rather than an absolute forecast of future industry conditions.

The findings are summarized in Table 3.1. The coefficient values and assumptions for estimating the economic impacts are in Appendix 1.

3.1 Employment and Income Implications in the Kingcome TSA

The Kingcome TSA employment and income impacts describe those workers that reside in the North Island–Central Coast forest district and whose jobs are supported by the TSA's harvest. Persons who reside elsewhere, but come to the TSA to work are included in the provincial level impact.

Given the average harvest level in the most recent three years, it is estimated that the Kingcome TSA supports about 191 person-years employment in the woods (logging and silviculture) and 123 person-years employment in milling, or a total of 314 jobs (line 4, Table 3.1). This is essentially unchanged from the late 1990's. Business expenditures for operations support additional local employment (termed indirect impact) as does the spending by employees on consumer goods and services (termed induced employment). These effects support some 124 person-years of employment (line 5). That is, total employment in the TSA attributed to recent harvest volume is about 440 person–years of employment.

Future increases in second growth harvesting are likely to decrease the person years of employment associated with harvest operations due to efficiencies associated with mechanized harvest systems.

The timber supply forecast indicates an average harvest volume over the first decade of slightly below the current AAC, a decline of 22,300 cubic meters, or 2 percent. In the second decade, the timber supply is expected to decline by some 128,000 cubic metres per year, or 10 percent compared to the current AAC. If that volume on average were fully taken, the employment level would be about eight positions less than the current level. Incomes follow a similar pattern.

Table 3.1 - Socio-economic impacts of the base case harvest forecast

	Current AAC	Decade 1	Decade 2
	Timber Supply (m^3/year)		
AAC	1,232,000	1,209,700	1,104,400
Cumulative Change	0	-22,300	-127,600
Kingcome TSA			
Employment (person years)			
Direct	345	339	309
Indirect/Induced	222	218	199
Total	567	556	508
Cumulative Change in total person years	0	-10	-59
Employment Income (before tax, millions)			
Direct	$17.9	$17.6	$16.1
Indirect/Induced	$6.7	$6.6	$6.0
Total	$24.6	$24.2	$22.1
Cumulative Change	$0.0	-$0.4	-$2.6
Province (includes Kingcome TSA)			
Employment (person years)			
Direct	1,503	1,476	1,347
Indirect/Induced	1,823	1,790	1,635
Total	3,326	3,266	2,982
Cumulative Change in total person years	0	-60	-345
Employment Income (before tax, millions)			
Direct	$72.2	$70.9	$64.7
Indirect/Induced	$55.1	$54.1	$49.4
Total	$127.3	$125.0	$114.1
Cumulative Change	$0.0	-$2.3	-$13.2
Provincial Government Revenues			
Provincial income tax	$36.9	$36.2	$33.1
Stumpage and Rent	$16.1	$15.8	$14.4
Other B.C. revenues	$25.7	$25.3	$23.1
Total Revenue	$78.7	$77.3	$70.6
Cumulative Change in total revenue	$0.0	-$1.4	-$8.2

Note: Columns may not add due to rounding

For comparison, the socio-economic impacts of the Pre-EBM analysis are presented in Table 3.2. The Pre-EBM AAC is estimated to be 1,398,000 cubic metres per year developed for this scenario.

Table 3.2 - Socio-economic impacts of the base case harvest forecast compared to Pre-EBM

	Pre EBM AAC	Proposed AAC in decade 1
Timber Supply (m^3/year)		
AAC	1,398,700	1,209,700
Kingcome TSA		
Direct	392	339
Indirect/Induced	252	218
Total	643	556
Cumulative Change in total person years		-87
Direct	$20.4	$17.6
Indirect/Induced	$7.6	$6.6
Total	$28.0	$24.2
Province (includes Kingcome TSA)		
Employment (person-years)		
Direct	1,706	1,476
Indirect/Induced	2,070	1,790
Total	3,776	3,266
Employment Income (before tax, millions)		
Direct	$81.9	$70.9
Indirect/Induced	$62.6	$54.1
Total	$144.5	$125.0
Provincial Government Revenues		
Provincial income tax	$41.9	$36.2
Stumpage and Rent	$18.3	$15.8
Other B.C. revenues	$29.2	$25.3
Total Revenue	$89.4	$77.3

Note: Columns may not add due to rounding

Based on the results of the Pre-EBM scenario, employment, income and provincial revenues would be about 15% higher than the current AAC (and the current harvest conditions). The reductions for the EBM Base Case are therefore more significant in comparison.

3.2 Provincial Employment and Income Implications

A large proportion of the economic impacts associated with the Kingcome TSA harvest occur outside the immediate area, either because persons living outside the North Island travel to work in the TSA (in the remote camps) and because most of the wood is manufactured in plants located on the South Island (*e.g*. Nanaimo, Ladysmith, Chemanius) or the Lower Mainland. For instance, direct employment in the TSA as noted above is around 314 person-years, or 22 percent of the total provincial direct employment of 1,369 person years (line 12, Table 3.1). Also, the relatively small local economy, and remote location of operations imply that a relatively large share of the indirect and induced economic activity occurs away from the TSA. For instance, the TSA's share of the indirect and induced employment is only about 7.5 percent of total impact .

It is estimated that the average harvest from the Kingcome TSA in recent years has supported a total of some 3,000 person-years of employment (line14) and generate an annual wage bill of some $116 million provincially (line 18).

In the first decade, if the full timber supply is harvested on average, provincial employment attributed to the TSA could increase from its current level of 3,030 person-years to 3,266, or a gain of 236 person-years of employment. In the second decade, if the available timber supply is harvested on average, the reduced volume would support total employment of about 344 jobs less than the current AAC, and 48 person-years less than the Current Conditions.

3.3 Government Revenue Implications

Government revenue is derived from all levels of economic activity stimulated by harvesting activity. Direct revenue to government includes income taxes paid by those directly and indirectly employed by the TSA harvest, stumpage paid on the harvest volume and other miscellaneous taxes (*e.g*. sales tax, corporate taxes, rental/lease and royalties).

At the average harvest volume experienced over the past three years, total government revenues associated with the TSA harvest is roughly $72 million per year. A major uncertainty in this projection is future market prices, hence the average stumpage rate. Stronger market conditions would probably support an average stumpage rate greater than the $13.05 per cubic metre assumed here. In that case government stumpage revenues might be higher than recent experience even if the harvest level is less; however, overall revenue would decline due to reduced employment.

3.4 Community Implications

The timber supply forecasts indicate the Kingcome TSA has the potential to continue contributing to the North Island economy at a level at least as great recent experience. Whether in fact that is the case will depend on the availability of skilled labour in the local labour force and company decisions with respect to its hiring of contractors and the disposition of logs. Presently a relatively large proportion of the TSA's economic impacts accrue outside of the North Island. If the communities on the North Island were able to attract a greater proportion of the associated employment (direct, indirect, or induced), then the TSA's local contribution could increase even with a reduction in total timber supply. However, workers elsewhere would be displaced if this occurred. Whereas a reduction in harvest rates is certain to exacerbate decline in the immediate areas such as Mt Waddington RD and other areas already experiencing decline as the harvest rates fall.

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APPENDIX 1

The following table presents the values and assumptions used in the report to estimate current, and future economic impacts associated with the Kingcome TSA harvest volume.

Table A.1 - Derivation of coefficient values and assumptions

Item	TSA	BC	Comments/discussion
Direct Employment			From Table 13, MoF (2000). The harvest level is similar, the same licensees and new labour saving investments not substantial in the interval, so earlier values likely remain reasonably reliable.
Harvesting (PY's/000m^3)	0.15	0.45	
Silviculture (PY's/000m^3)	0.02	0.05	
Processing (PY's/000m^3)	0.36	0.72	
Indirect/induced (woods)	.36	1.21	Person years per one direct job. From Table 8, 2001 Economic Dependency Tables for Forest Districts, and TSR2 for provincial level
Indirect/induced (mills)	.45		
Total Employment	1.33	2.21	In multiplier form (total employment/direct employment)
Employment Income			
Harvesting and silviculture	$60,000		Average weekly earning in 2006 reported by BC Stats is $1,089 for forestry, fishing, and mining. Assumed a person year to be 44 weeks this is an annual salary of $47,921. However, data reported by industry indicated an average payroll cost of $ 62,196 in the past two years. This magnitude was considered more reflective of industry conditions, so an annual value of $60,000 was used here.
Primary Breakdown mills	$39,695		Provincial manufacturing average weekly salary reported to be $827 in 2006. A 48 week person year is assumed. In comparison, industry data for 1 mill indicated an average payroll cost of $ 36,994.
Indirect/induced	$30,221		Indirect includes trucking, suppliers, professionals, while induced would be retail and consumer services. Took the average weekly service industry wage of $698 and retail/wholesale weekly wage of $ 561, the average of the two being about $629 and a 48 week work year.
Government revenues			
Provincial/Federal average personal income tax	29%		From Price Waterhouse Coopers (2005) , industry average personal tax rate
Stumpage ($/m3)	$13.05		Simple average of average stumpage rate for years 2004-06, as shown in table B2
Other B.C. revenues ($/m3)	$20.89		From Price Waterhouse Coopers (2005), averaged over the years 2002 to '04.

Table A.2 – Harvest and stump revenue by year

	2000	2001	2002	2003	2004	2005	2006	2007
Harvest (000 m^3)	1,315.84	972.79	1,026.77	908.40	1,126.56	1,235.22	1,186.40	938.77
Stumpage ($ million)	$31.69	$25.30	$37.14	$34.57	$28.40	$10.87	$10.99	$22.01
Average Rate ($/$m^3$)	$24.08	$26.01	$36.17	$38.06	$25.21	$8.80	$9.27	$23.44

Source: Harvest Billing System, Ministry of Forests and Range, Revenue Branch.

APPENDIX IV

KINGCOME TIMBER SUPPLY AREA TSR3

DATA PACKAGE ADDENDUM

KINGCOME TIMBER SUPPLY AREA
TSR 3 DATA PACKAGE

ADDENDUM

Prepared for:

Kingcome TSA Licensee-Agency Group

Prepared by:

Timberline Natural Resource Group Ltd.

Victoria, B.C.

Project: 4061921

November 2008

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1.0 INTRODUCTION

This summary is an addendum to the report *Kingcome Timber Supply Area TSR3 Data Package* (*Data Package*) submitted by Timberline Natural Resource Group Ltd. (Timberline), on behalf of the Kingcome Timber Supply Area (TSA) Licensee-Agency Group (the Group) on September 26, 2008. Some information provided in that document has been updated based on revised assumptions for the analysis, or information that was not initially provided.

The primary change to the analysis assumptions was a revised land base netdown for blue-listed species needed to meet the requirements for Ecosystem-Based Management (EBM). Although the final timber harvesting land base (THLB) defined for the EBM scenario has changed, only a subset of the summary tables provided in the original *Data Package* are included in this addendum.

Throughout this addendum, original section and table references are used to aide with direct comparison to the original *Data Package*.

5.0 LAND BASE DESCRIPTION (PAGE 13)

The final classification results in a current THLB of 208,175 hectares (Pre-EBM) and 186,914 hectares (EBM), compared to the TSR 2 current timber harvesting land base (168,726 ha) documented in the previous timber supply review analysis report. While reductions to address new Central Coast biodiversity, conservancy and EBM objectives removed significant areas from timber production, these were more than offset by additions based on a new economic operability assessment, and revised low site criteria. The THLB area includes 5,549 hectares of unreverted timber licence areas which do not contribute to the TSA timber supply until after they are harvested and regenerated.

The netdown results are summarized in Table 3.

Table 3 – Timber harvesting land base (THLB) determination

Land Classification	Land Base				
	Area (ha) [1]	% of Crown	Volume (000 m^3)	Productive Area (ha)	% Productive
Total TSA Area	1,172,428				
Exclusions from the total crown forest	21,274				
Total Crown Forest	1,151,154	100			
Non-forest	369,252	32.1	0	0	
Existing roads	4,457	0.4	0	0	
Non-productive	126,749	11.0	0	0	
Productive Forest	650,696	56.5	254,265		100
CCLUD Protected Areas	32,781	2.8	13,832	32,781	5.0
CCLUD Biodiversity, Mining & Tourism Areas	14,088	1.2	4,844	14,215	2.2
CCLUD Conservancy Areas	51,504	4.5	21,083	52,037	8.0
Inoperable	175,871	15.3	59,260	251,967	38.7
Operable Forest	376,452	32.7	155,246		
Sites with low growing potential	101,077	8.8	34,530	238,106	36.6
Non-merchantable	999	0.1	322	11,836	1.8
Environmentally sensitive – full netdown	5,146	0.4	2,548	35,026	5.4
Riparian	30,222	2.6	12,146	69,824	10.7
Approved Wildlife Habitat (wha + uwr)	3,095	0.3	1,951	14,725	2.3
Old Growth Management Areas	1,544	0.1	964	9,491	1.5
Archaeological Sites	1,476	0.1	648	4,099	0.6
Karst (aspatial partial netdown)	138	<0.1	42	3,768	0.6
Environmentally sensitive – partial netdown	13,778	1.2	7,391	96,979	14.9
Unstable terrain – partial netdown	10,802	0.9	4,964	156,323	24.0
Total Operable Reductions (Pre-EBM)	168,278	14.6	65,506	640,177	25.9
THLB subtotal (Pre-EBM)	208,175	18.1	89,740		32.0
EBM Exclusions					
Objective 3-5 - First Nations	1,072	0.1	481	4,099	0.2
Objective 9 - High Value Fish Habitat	7,052	0.6	3,052	38,374	1.1
Objective 10 - Not High Value Fish Habitat	1,462	0.1	856	30,711	0.2
Objective 11 - Forested Swamps	209	<0.1	100	1,998	0.0
Objective 15 - Red-listed Plant Communities	188	<0.1	134	2,247	0.0
Objective 17 - Grizzly bear habitat	3,124	0.3	1,083	14,511	0.5
Objective 15 - Blue-listed Plant Communities	5,889	0.5	3,854	48,601	0.9
Total Operable Reductions (EBM)	18,996	1.7	13,810		2.9
THLB subtotal (EBM)	189,179	16.4	75,066		29.1
Pre-EBM subtotal	208,175	18.1			32.0
Less WTPs (partial netdown)	12,479	1.1			1.9
Current THLB (Pre-EBM)	195,696	17.0			30.1
Less future roads	3,071	0.3			0.5
Future THLB (Pre-EBM)	192,625	16.7			29.6
EBM subtotal	189,179	16.4			29.1
Less WTPs (partial netdown)	2,265	0.2			0.4
Current THLB (EBM)	186,914	16.2			28.7
Less future roads	2,751	0.2			0.4
Future THLB (EBM)	184,163	16.0			28.3

[1] Note, all in Table 4.2 are from the GIS database and do not include removals for sliver polygons. After removaing all slivers, the Current EBM THLB use in the CASH6 model is 183,868 hectares.

The final land base classification results in a Pre-EBM current THLB of 195,696 hectares and an EBM THLB of 186,914 hectares, compared to the TSR2 current timber harvesting land base (168,726 ha) documented in the Kingcome TSA TSR2 Analysis Report. While reductions to address new Central Coast biodiversity, conservancy and EBM objectives removed significant areas from timber production, these were offset by additions based on a new economic operability assessment, and revised low site criteria.

The total TSA area of 1,172,428 hectares represents the Kingcome TSA without any TFL or ocean area within the boundary of the TSA. Note that the WTP reductions were the final step of the netdown process but were different for the Pre-EBM and EBM land bases, so they are not listed with the other productive netdown steps.

Subsequent to preparing the *Data Package* it was also discovered that several polygons were identified as having a harvest history based on change detection analysis when, in fact, they should not have been included in the THLB. While it was not possible to directly address this issue, the size of the THLB used in modelling has been reduced from what is reported in the land base definition as a result of removing sliver polygons from the modelling input files. Slivers were defined as any resultant polygon less than 0.1 ha in size. These polygons are excluded from the modelling process to improve efficiency and to allow more meaningful analysis results.

Additional area in the THLB, as estimated by MoFR, is approximately 2,450 hectares (1.3%) whereas the sliver polygons removed from the modeling inputs total 3,025 hectares (1.6%). This reduction more than offsets the additional land included and addresses any concerns about excessive area in the THLB. Furthermore, it is not expected that this area would have any short term implications since it is currently identified as logged and has no volume associated with it.

5.2 EBM THLB Determination (page 30)

The Pre-EBM analysis will be based on the THLB determined to this point. A number of the objectives associated with the Ministerial Order require additional removals from the THLB. These will serve to further reduce the THLB on which the EBM analysis will be based, and are outlined in the following sections.

5.2.6 Objective 15. Red-listed and blue-listed plant communities (page 34)

Land Base Definition

Since the acceptance of the *Data Package*, a revision to the reductions for blue-listed plant communities has been made. The new methodology ensures that 70% of the productive forest within each blue-listed plant community is preserved. Originally a 70% reduction was assigned to each plant community regardless of how much had been excluded for other land base reductions (inoperable, riparian, wildlife habitat, *etc*.).

The new reductions were based on blue-listed plant communities within each landscape unit and BEC combination. An area target of 70% was determined for the productive forest older than 180 years within each LU-BEC combination. After all other land base netdowns were completed, the remaining net area within each LU-BEC was compared to the 70% target and reduced as required to achieve the target. Table 31 summarizes the updated netdowns for blue-listed plant communities.

Table 31 – Land base reductions for EBM Objective 15

LU	BEC	Productive Area (ha)	EBM Target 70% of Productive (ha)	THLB Prior to Blue-listed Reduction (ha)	Blue-listed THLB Reduction (ha)	Blue-listed Reduction (%)
Ahnuhati-kwalate	CWH vm 1	24	17	6	0	0.0
Ahnuhati-kwalate	MH mm 1	0	0	0	0	0.0
Ahta	CWH vm 1	735	515	341	120	35.3
Ahta	MH mm 1	1	1	0	0	0.0
Belize	CWH vm 1	5,362	3,753	2,196	588	26.8
Belize	MH mm 1	5	3	0	0	0.0
Broughton	CWH vm 1	2,145	1,501	1,672	1,029	61.5
Charles	CWH vm 1	566	396	221	51	23.1
Charles	MH mm 1	1	1	0	0	0.0
Franklin	CWH dm	0.3	0.2	0.1	0.1	49.8
Fulmore	CWH vm 1	19	13	12	6	50.4
Gilford	CWH vm 1	3,077	2,154	1,953	1,030	52.7
Gilford	MH mm 1	1	1	0	0	0.0
Huaskin	CWH vm 1	4,177	2,924	2,207	954	43.2
Kakweiken	CWH vm 1	670	469	255	54	21.1
Kakweiken	MH mm 1	1	1	0	0	0.0
Knight East	CWH vm 1	1,275	892	632	249	39.5
Knight East	MH mm 1	4	3	0	0	0.0
Lower Kingcome	CWH vm 1	1,375	963	373	0	0.0
Lower Kingcome	MH mm 1	4	3	0	0	0.0
Lower Klinaklini	CWH vm 1	9	7	3	0	0.0
Lower Klinaklini	CWH ws 2	15	10	0	0	0.0
Lull-Sallie	CWH vm 1	1,155	809	511	164	32.2
Lull-Sallie	MH mm 1	2	2	0	0	0.0
Middle Klinaklini	CWH ds 2	1	0	0	0	0.0
Middle Klinaklini	CWH ws 2	266	186	0	0	0.0
Middle Klinaklini	MH mm 2	1	1	0	0	0.0
Miriam	CWH vm 1	2,327	1,629	1,179	479	40.8
Miriam	MH mm 1	2	1	0	0	0.0
Seymour	CWH vm 1	1,133	793	237	0	0.0
Seymour	MH mm 1	5	4	0	0	0.0
Sim	CWH vm 1	70	49	33	12	36.1
Smokehouse	CWH vm 1	4	3	1	0	3.7
Snowdrift	CWH vm 1	3,788	2,652	2,104	965	46.0
Snowdrift	MH mm 1	4	3	0	0	0.0
Upper Kingcome	CWH vm 1	1,091	764	232	0	0.0
Upper Kingcome	MH mm 1	4	3	0	0	0.0
Upper Klinaklini	CWH ws 2	122	85	0	0	0.0
Wakeman	CWH vm 1	2,162	1,514	840	191	22.7
Wakeman	MH mm 1	5	4	0	0	0.0
Total Blue-Listed		**31,608**	**22,126**	**15,007**	**5,889**	
Total Red-Listed		**2,247**	**n/a**	**n/a**	**188**	**100**

In addition to the modified blue-listed reductions, the grizzly bear habitat removal was applied before the blue-listed reductions noted above. This made a minor change to the grizzly withdrawal, which remained as a 100% exclusion. As a result of this change to the land base classification the net THLB increases by 7,128 ha for the EBM scenario, compared to the net THLB figures reported in the *Data Package*.

5.2.7 Objective 17. Sensitive grizzly bear habitat (page 35)

1. *"Maintain sensitive grizzly bear habitat will not cause a material adverse impact to the stability of the sensitive grizzly bear habitat;*
2. *Before altering or harvesting sensitive grizzly bear habitat:*
    a) *Obtain from a registered professional biologist confirmation that the disturbance.*
    b) *To the extent practical, develop and implement an adaptive management plan and monitor the ecological impacts of the proposed forestry development; and*
    c) *Engage in information-sharing or consultation with the applicable First Nation".*

Land Base Definition

A 100% netdown was applied to all areas within the most recently defined grizzly habitat zone (Table 32).

Table 32 – Land base reductions for EBM Objective 17

Description	Productive Area (ha)	Area Removed (ha)
Grizzly bear habitat	**14,511**	**3,124**

6.0 INVENTORY AGGREGATION

6.2 Landscape Units (page 36)

Landscape-level biodiversity is managed by ensuring that old-growth targets are maintained across the landscape. To ensure that retained old growth is spatially distributed and represents the full range of natural ecological conditions, these targets are established by landscape unit and biogeoclimatic sub zone and variant. The distribution of TSA land by LU/BEC is shown in Table 33.

Table 33 – Area by landscape unit and BEC

Landscape Unit		BEC	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
No.	Name					
1	Ahnuhati-kwalate	CMA unp	5,489	48	0	0
1	Ahnuhati-kwalate	CWH vm 1	5,721	5,020	376	314
1	Ahnuhati-kwalate	CWH vm 2	5,569	3,353	52	52
1	Ahnuhati-kwalate	MH mm 1	6,906	1,366	11	11
2	Ahta	CMA unp	761	10	0	0
2	Ahta	CWH vm 1	7,172	6,886	2,620	2,291
2	Ahta	CWH vm 2	4,645	3,589	528	508
2	Ahta	MH mm 1	3,798	1,266	19	19
3	Allison	CWH vh 1	59,044	54,263	17,184	16,329
4	Belize	CMA unp	4,286	502	0	0
4	Belize	CWH vh 1	15,469	14,369	5,739	5,564
4	Belize	CWH vm 1	29,408	28,403	12,939	11,695
4	Belize	CWH vm 2	23,020	19,716	2,271	2,207
4	Belize	MH mm 1	9,793	4,415	48	47
5	Bonanza	CWH vm 1	2,514	2,225	1,168	1,098
5	Bonanza	CWH vm 2	1,983	1,801	673	633
5	Bonanza	MH mm 1	1,408	1,045	160	151
6	Brooks	CWH vh 1	7,220	5,868	0	0
7	Broughton	CWH vm 1	22,384	21,194	9,915	8,484
8	Charles	CMA unp	2,617	80	0	0
8	Charles	CWH vm 1	5,575	5,280	2,488	2,260
8	Charles	CWH vm 2	4,134	3,157	276	272
8	Charles	MH mm 1	3,761	1,234	2	2
9	Franklin	CMA unp	1,153	151	0	0
9	Franklin	CWH dm	610	609	141	139
9	Franklin	CWH vm 1	0	0	0	0
9	Franklin	CWH vm 2	856	794	112	111
9	Franklin	MH mm 1	707	489	9	9
10	Fulmore	CWH vm 1	209	188	107	96
10	Fulmore	CWH vm 2	150	147	13	13
10	Fulmore	MH mm 1	93	77	8	7
11	Gilford	CMA unp	92	12	0	0

Landscape Unit		BEC	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
No.	Name					
11	Gilford	CWH vm 1	38,530	36,314	23,816	21,606
11	Gilford	CWH vm 2	7,097	6,925	3,546	3,398
11	Gilford	MH mm 1	1,717	1,555	264	257
12	Holberg	CWH vh 1	1,326	1,095	354	333
12	Holberg	CWH vm 1	4,094	3,090	1,744	1,640
13	Huaskin	CWH vh 1	22,223	21,627	11,498	11,100
13	Huaskin	CWH vm 1	15,615	15,053	8,320	7,023
13	Huaskin	CWH vm 2	2,649	2,410	517	505
13	Huaskin	MH mm 1	144	85	1	1
14	Kakweiken	CMA unp	5,964	200	0	0
14	Kakweiken	CWH vm 1	9,084	8,272	3,156	2,568
14	Kakweiken	CWH vm 2	10,916	7,701	1,012	947
14	Kakweiken	MH mm 1	10,632	2,561	63	61
15	Kashutl	CWH vm 1	0	0	0	0
15	Kashutl	CWH vm 2	9	2	0	0
15	Kashutl	MH mm 1	5	0	0	0
16	Keogh	CWH vm 1	5,222	908	95	90
17	Klaskish	CWH vh 1	15,589	14,817	4,347	4,087
17	Klaskish	CWH vm 1	1,455	1,297	250	235
17	Klaskish	CWH vm 2	919	752	121	114
17	Klaskish	MH mm 1	11	7	0	0
18	Knight East	CMA unp	7,913	466	0	0
18	Knight East	CWH dm	109	94	44	43
18	Knight East	CWH vm 1	12,825	11,582	5,984	5,306
18	Knight East	CWH vm 2	8,975	7,321	1,337	1,244
18	Knight East	MH mm 1	7,944	3,866	94	93
19	Lower Kingcome	CMA unp	12,684	1,027	19	19
19	Lower Kingcome	CWH vm 1	13,651	11,056	5,008	3,995
19	Lower Kingcome	CWH vm 2	11,745	7,757	1,383	1,249
19	Lower Kingcome	MH mm 1	10,303	3,043	149	148
20	Lower Klinaklini	CWH vm 1	3,182	1,105	639	589
20	Lower Klinaklini	CWH vm 2	386	334	81	81
20	Lower Klinaklini	CWH ws 2	613	155	0	0
20	Lower Klinaklini	MH mm 1	208	145	1	1
20	Lower Klinaklini	MH mm 2	1,392	145	0	0
21	Lower Nimpkish	CMA unp	2	0	0	0
21	Lower Nimpkish	CWH vm 1	670	78	5	5
21	Lower Nimpkish	CWH vm 2	8	0	0	0
22	Lull-Sallie	CMA unp	1,107	142	0	0
22	Lull-Sallie	CWH vm 1	12,935	12,519	6,580	5,927
22	Lull-Sallie	CWH vm 2	7,000	5,993	1,390	1,345
22	Lull-Sallie	MH mm 1	5,501	2,732	234	228
23	Mahatta	CWH vh 1	12,437	11,482	6,202	5,830
23	Mahatta	CWH vm 1	2,941	2,684	1,667	1,567
23	Mahatta	CWH vm 2	1,118	1,039	476	447

Landscape Unit		BEC	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
No.	Name					
23	Mahatta	MH mm 1	2	2	0	0
24	Malcolm	CWH vm 1	8,664	6,115	3,776	3,399
25	Middle Klinaklini	CMA unp	42,273	14	0	0
25	Middle Klinaklini	CWH ds 2	12,555	7,440	0	0
25	Middle Klinaklini	CWH ws 2	13,530	6,319	0	0
25	Middle Klinaklini	ESSFmw	5,343	534	0	0
25	Middle Klinaklini	IDF ww	659	377	0	0
25	Middle Klinaklini	MH mm 2	16,617	1,177	0	0
26	Miriam	CMA unp	66	8	0	0
26	Miriam	CWH vm 1	11,765	11,579	5,749	5,035
26	Miriam	CWH vm 2	4,416	3,818	434	422
26	Miriam	MH mm 1	3,413	1,895	1	1
27	Nahwitti	CWH vh 1	33,595	24,026	4,016	3,775
27	Nahwitti	CWH vm 1	2,037	1,868	633	595
28	Nasparti	CWH vh 1	45	29	1	1
28	Nasparti	CWH vm 2	5	2	0	0
29	Neechanz	CWH vm 3	22	17	0	0
29	Neechanz	MH mm 1	1	0	0	0
30	Neroutsos	CWH vm 1	520	11	8	8
30	Neroutsos	CWH vm 2	221	11	1	1
31	Nigei	CWH vh 1	11,307	6,932	1,647	1,551
32	San Josef	CWH vh 1	29,062	24,960	3,733	3,509
32	San Josef	CWH vm 1	2,054	1,184	730	657
32	San Josef	CWH vm 2	180	155	81	73
33	Seymour	CMA unp	12,952	234	3	3
33	Seymour	CWH vm 1	7,919	7,001	2,187	1,856
33	Seymour	CWH vm 2	10,007	6,423	492	364
33	Seymour	CWH vm 3	165	125	0	0
33	Seymour	MH mm 1	11,656	2,897	83	82
34	Shushartie	CWH vh 1	15,527	13,808	1,603	1,587
35	Sim	CMA unp	140	5	0	0
35	Sim	CWH vm 1	887	785	321	293
35	Sim	CWH vm 2	487	446	84	82
35	Sim	MH mm 1	460	249	3	3
36	Smith Sound	CWH vh 1	342	302	45	44
37	Smokehouse	CWH vh 1	2	2	0	0
37	Smokehouse	CWH vm 1	40	40	8	8
37	Smokehouse	CWH vm 2	103	93	0	0
37	Smokehouse	MH mm 1	38	6	0	0
38	Snowdrift	CMA unp	1,572	203	0	0
38	Snowdrift	CWH vm 1	21,836	20,957	12,656	10,903
38	Snowdrift	CWH vm 2	11,304	9,489	2,642	2,526
38	Snowdrift	MH mm 1	5,328	2,403	87	75
39	Stafford	CMA unp	18	0	0	0

Landscape Unit		BEC	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
No.	Name					
39	Stafford	MH mm 1	4	0	0	0
40	Tahsish	CWH vm 1	26	0	0	0
41	Tsulquate	CWH vh 1	8,817	8,152	1,278	1,252
41	Tsulquate	CWH vm 1	12,058	10,237	3,239	3,110
42	Upper Kingcome	CMA unp	39,692	1,395	44	44
42	Upper Kingcome	CWH vm 1	12,544	10,006	4,309	2,773
42	Upper Kingcome	CWH vm 2	12,963	6,992	534	413
42	Upper Kingcome	MH mm 1	18,648	4,642	182	166
43	Upper Klinaklini	BAFAunp	11,043	13	0	0
43	Upper Klinaklini	CMA unp	33,201	0	0	0
43	Upper Klinaklini	CWH ds 2	6,472	3,735	0	0
43	Upper Klinaklini	CWH ws 2	6,634	2,040	0	0
43	Upper Klinaklini	ESSFmw	14,785	1,702	0	0
43	Upper Klinaklini	IDF ww	10,434	6,651	0	0
43	Upper Klinaklini	IMA unp	14,560	8	0	0
43	Upper Klinaklini	MH mm 2	8,456	166	0	0
44	Upper Nimpkish	CMA unp	273	96	0	0
44	Upper Nimpkish	CWH vm 1	713	701	8	8
44	Upper Nimpkish	CWH vm 2	436	407	15	13
44	Upper Nimpkish	MH mm 1	501	384	4	4
45	Wakeman	CMA unp	20,842	382	1	1
45	Wakeman	CWH vm 1	17,777	15,105	8,369	6,127
45	Wakeman	CWH vm 2	17,388	10,606	1,725	1,576
45	Wakeman	MH mm 1	20,144	5,206	89	88
46	Walker	CWH vh 1	1,215	1,136	101	100

6.2.2 *Visually Sensitive Areas (page 40)*

Visual quality objectives are achieved by limiting the rate of harvest in areas that are identified as visually sensitive in a Visual Landscape Inventory. Each polygon is assigned a VQO. In the Kingcome TSA, VQOs are applied at the VQO polygon level within the defined Known Scenic Area. Areas outside of these polygons, and outside the VILUP Enhanced Zones were assigned to an Integrated Resource Management (IRM) objective, where only a general maximum disturbance objective was assigned to mimic cutblock adjacency. Table 35 provides a summary of these areas. Note that overlaps are possible between some of the zones, therefore a total has is not included because it would overstate the area of the land base.

Table 35 – Visually sensitive areas

Resource Emphasis Area	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
Visual Quality – Preservation	4,976	4,493	788	731
Visual Quality – Retention	14,446	13,749	4,512	4,189
Visual Quality – Partial Retention	68,798	64,747	34,147	31,333
Visual Quality – Modification	6,590	5,988	3,533	3,123
VILUP – Enhanced Zones	39,524	32,724	14,200	14,200
Integrated Resource Management	1,038,094	528,995	150,995	135,132

6.2.3 Community Watersheds (page 41)

The Forest Planning and Practices Regulation places limits on harvesting in identified Community Watersheds. There are three such areas within the Kingcome TSA (Table 36), although only one watershed incorporates a significant THLB.

Table 36 – Community watersheds

Community Watershed	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
Calbick (900.001)	6	6	0	0
Quaee (900.002)	377	175	0	0
Tsulquate (920.069)	4,205	3,813	760	731
Total	**4,588**	**3,994**	**760**	**731**

6.2.4 Marbled Murrelet Nesting Habitat (page 41)

The March 2006 Notice under Section 7(2) of the FPPR for the North Island Central Coast Forest District requires that the total amount of currently suitable nesting habitat for Marbled Murrelet in the non-contributing land base (as of March 2006) be maintained.

In order to evaluate how much suitable habitat remains in the non-contributing land base the TSR 3 analysis will incorporate coarse scale mapping of potential suitable Marbled Murrelet nesting habitat. Habitat mapping data was based on application of the BC Coast Marbled Murrelet Suitability Model (Chatwin and Mather, 2007). The model was used in that study to estimate the distribution of existing habitat. It was considered a strategic level assessment, and was not supplemented with any photo mapping or low level reconnaissance. The mapping did not consider classes of habitat quality, and stand attributes such as canopy structure and site productivity were not considered. Further, the data used was only current to TSR 2, and therefore the results are somewhat dated.

Portions of these areas are included in the Kingcome TSA, as shown in Table 37. In the analysis, no restrictions will be placed on harvesting within these areas. However, the levels of harvesting within the nesting habitat will be tracked and reported on.

Table 37 – Marbled murrelet nesting habitat

Description	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
Nesting habitat	161,271	150,953	75,945	66,955

6.3 EBM Management Zones (page 42)

In addition to the Pre-EBM management zones described in Section 6.1, the following management zones have been applied to address EBM Objectives 8, 12 and 14.

6.3.1 Objective 8. Important fisheries watersheds (page 42)

1. *"Maintain equivalent clearcut area < 20% in important fisheries watersheds.*
2. Despite subsection (1), an equivalent clearcut area of more than 20% may be maintained after:
    a) *information-sharing or consultation with the applicable First Nation;*
    b) *A coastal watershed assessment or similar assessment of watershed sensitivity to forest development disturbance is completed to relevant professional standards;*
    c) *Maintaining an amount, type and distribution of forest cover that is sufficient to sustain natural hydrological and fluvial processes, based on the assessment of subsection (2) (b); and*
    d) *To the extent practical, an adaptive management plan is developed and implemented to monitor environmental impacts during any primary forest activity."*

Important fisheries watersheds were identified based on Schedule 2 of the MO. The productive and THLB areas are reported in Table 38.

Table 38 – Important fisheries watersheds area summary – Objective 8

Description	Prod. Area (ha)	THLB (ha) EBM
Important fisheries watersheds	164,406	36,101

6.3.2 Objective 12. Upland streams (page 42)

1. *"For watersheds in Schedule 2 of the MO, maintain 70% or more of the forest, in the portion of the watershed occupied by upland streams, as functional riparian forest.*
2. *For the purposes of subsection (1), allocate retention to include upland stream reaches with unique microclimate or other rare ecological or geomorphological characteristics.*
3. Despite subsection (1), an equivalent clearcut area of more than 20% may be maintained after:
    a) *information-sharing or consultation with the applicable First Nation;*
    b) *A coastal watershed assessment or similar assessment of watershed sensitivity to forest development disturbance is completed to relevant professional standards;*
    c) *Maintaining an amount, type and distribution of forest cover that is sufficient to sustain natural hydrological and fluvial processes, based on the assessment of subsection (3) (b); and*

d) *To the extent practical, an adaptive management plan is developed and implemented to monitor environmental impacts during any primary forest activity.*

Land Base Definition

Upland streams are defined in the MO as "streams with slope greater than 5% that are classified as S4 and S6 streams in Section 47 of the Forest Planning and Practices Regulation". For this analysis, these zones were defined as areas within important fisheries zones (Objective 8) which fall above the floodplain, are outside of existing riparian zones. However, for modelling purposes, a 10% slope break was used as it was felt that the resolution of the slope gradient data was too coarse to reliably define a 5% gradient. Within the forested area of the zone, a 30% disturbance constraint will be applied. The zone area is summarized in Table 39.

Table 39 – Upland streams – Objective 12

Description	Prod. Area (ha)	THLB (ha) EBM
Upland streams	**139,663**	**31,638**

6.3.3 Objective 14. Landscape-level biodiversity (page 43)

1. *"For landscape units in Schedule 1, retain an amount of old forest equal to or greater than that specified for each site surrogate listed in Schedule 3, except where alteration or removal is required for road access, other infrastructure, or to address a safety concern.*
2. *Where there is less than the old forest in a landscape unit required in subsection (1), to the extent possible recruit forest to meet the representation requirements within 180 years".*
3. *Where the requirement of (2) applies harvesting of old forest is not permitted except where:*
    a. *Alteration or removal is required for road access, other infrastructure, or to address safety concerns; or*
    b. *Information sharing or consultation with First Nations determines there is no practical alternative.*
4. *Maintain, in each landscape unit, less than 50% of each site series surrogate listed in Schedule 3 in mid-seral forest age classes, to the extent practical.*
5. *Where there is more than 50% of any site series surrogate listed in Schedule 3 in mid-seral forest age classes in any landscape unit, then reduce the mid-seral forest age classes in that site series surrogate in that landscape unit to less than 50% within 80 years, to the extent practical.*
6. *To the extent practical, include within old forest retention areas, habitat elements important for species at risk, ungulate winter range, regionally important wildlife, including:*
    c. *Mountain goats;*
    d. *Grizzly bears;*
    e. *Northern goshawks;*
    f. *Tailed frogs, and*
    g. *Marbled murrelets.*

Land Base Definition

The provincial BEC coverage was overlaid with the Kingcome TSA VRI coverage (with adjusted site indices) to assign site series surrogates (SSS) (unique BEC/AU combinations) to the land base;

These site series surrogates (BEC/AU) will then be used to apply old growth representation targets as defined in the MO. In this case, AU definitions differ from those used in this analysis to model stand growth. The definitions are included in Table 40.

Table 40 – AU definitions for site series surrogate (SSS) definitions – Objective 12

AU	Description	Criteria
1	Fir - Good	ITG 1-8, SI >27
2	Fir - Medium	ITG 1-8, SI 21-27
3	Fir - Poor	ITG 1-8, SI <=20
4	Cedar - Good	ITG 9-11, SI >23
5	Cedar - Medium	ITG 9-11, SI 16-23
6	Cedar - Poor	ITG 9-11, SI <=15
7	HemBal - Good	ITG 12-20, SI >22
8	HemBal - Medium	ITG 12-20, SI 12.6-22
9	HemBal - Poor	ITG 12-20, SI <=12.5
10	Spruce - Good	ITG 21-26, SI >22
11	Spruce - Medium	ITG 21-26, SI 16-22
12	Spruce/Pine - Poor	SI <= 15, Pine ITG 21-34, All SI
13	Deciduous - All	ITG 35-42, SI all

The following is an updated list of land base aggregates that will be used to address Objective 14 of EBM. Table 40.A provides a complete list of the LU-SSS aggregates that will be modelled in the EBM analysis scenarios.

Table 40.A – Area by EBM landscape unit-site series surrogate

Analysis Identity and EBM Landscape Unit-Site Series Surrogate Name		Analysis FCC (% > Age)	Area (ha)	
			Productive	THLB
151	Ahnuhati_kwalate-CWHvm1-AU1	21 > 180	2.1	0
152	Ahnuhati_kwalate-CWHvm1-AU3	21 > 180	197.7	4.9
153	Ahnuhati_kwalate-CWHvm1-AU12	12 > 180	12.3	0
154	Ahnuhati_kwalate-CWHvm2-AU11	59 > 180	4.5	0.1
155	Ahnuhati_kwalate-MHmm1-AU7	59 > 180	4.3	0
156	Ahnuhati_kwalate-CWHvm2-AU2	49 > 180	15.1	0
157	Ahnuhati_kwalate-CWHvm2-AU3	49 > 180	3.1	0
158	Ahnuhati_kwalate-CWHvm1-AU2	21 > 180	169.8	10.3
159	Ahnuhati_kwalate-CWHvm1-AU5	28 > 180	329.3	9
160	Ahnuhati_kwalate-CWHvm1-AU6	28 > 180	295	24.9
161	Ahnuhati_kwalate-CWHvm1-AU7	25 > 180	519.5	85.7
162	Ahnuhati_kwalate-CWHvm1-AU8	25 > 180	2253.9	122.5
163	Ahnuhati_kwalate-CWHvm1-AU9	25 > 180	424	0
164	Ahnuhati_kwalate-CWHvm1-AU10	25 > 180	199.2	1

Analysis Identity and EBM Landscape Unit-Site Series Surrogate Name		Analysis FCC (% > Age)	Area (ha)	
			Productive	THLB
165	Ahnuhati_kwalate-CWHvm1-AU11	25 > 180	272.7	28.2
166	Ahnuhati_kwalate-CWHvm2-AU5	28 > 180	67.7	0.4
167	Ahnuhati_kwalate-CWHvm2-AU6	28 > 180	302.4	17.5
168	Ahnuhati_kwalate-CWHvm2-AU7	25 > 180	77.6	0
169	Ahnuhati_kwalate-CWHvm2-AU8	25 > 180	1499.1	32.3
170	Ahnuhati_kwalate-CWHvm2-AU9	25 > 180	1353.1	0
171	Ahnuhati_kwalate-MHmm1-AU6	28 > 180	31.7	1.9
172	Ahnuhati_kwalate-MHmm1-AU8	25 > 180	206.9	9.1
173	Ahnuhati_kwalate-MHmm1-AU9	25 > 180	1117.6	0
176	Ahnuhati_kwalate-CWHvm1-AU13	0 > 180	236.8	22.7
177	Ahta-CWHvm1-AU3	21 > 180	9.4	8.6
178	Ahta-MHmm1-AU5	65 > 180	15.3	0
179	Ahta-CWHvm1-AU4	25 > 180	16.6	12.8
180	Ahta-CWHvm1-AU5	28 > 180	527.3	338
181	Ahta-CWHvm1-AU6	28 > 180	3119	974.3
182	Ahta-CWHvm1-AU7	25 > 180	884.4	395.7
183	Ahta-CWHvm1-AU8	25 > 180	1567.2	444.9
184	Ahta-CWHvm1-AU9	25 > 180	155.8	3.2
185	Ahta-CWHvm1-AU11	25 > 180	16.6	1.2
186	Ahta-CWHvm2-AU5	28 > 180	57.5	33.9
187	Ahta-CWHvm2-AU6	28 > 180	1856.7	341.7
188	Ahta-CWHvm2-AU7	25 > 180	2.5	0
189	Ahta-CWHvm2-AU8	25 > 180	747.8	121.1
190	Ahta-CWHvm2-AU9	25 > 180	818.2	2.9
191	Ahta-MHmm1-AU6	28 > 180	451.4	5.7
192	Ahta-MHmm1-AU8	25 > 180	114.8	12.6
193	Ahta-MHmm1-AU9	25 > 180	665.4	0
196	Ahta-CWHvm1-AU13	0 > 180	313	63.8
197	Ahta-CWHvm2-AU13	0 > 180	32.8	0.6
198	Allison-CWHvh1-AU4	27 > 180	1806.9	1500
199	Allison-CWHvh1-AU7	25 > 180	934.2	652.7
200	Allison-CWHvh1-AU8	29 > 180	911.9	546.7
201	Allison-CWHvh1-AU12	25 > 180	925.9	1.4
202	Allison-CWHvh1-AU9	29 > 180	799.4	9.4
203	Allison-CWHvh1-AU5	29 > 180	2602.7	2101.3
204	Allison-CWHvh1-AU6	29 > 180	44124.9	10971.5
205	Allison-CWHvh1-AU13	0 > 180	412.8	202.9
206	Belize-CWHvh1-AU7	25 > 180	11.1	8.5
207	Belize-CWHvh1-AU8	29 > 180	440	251.5
208	Belize-CWHvh1-AU12	25 > 180	441.1	5.8
209	Belize-CWHvm1-AU12	12 > 180	487	26.3
210	Belize-CWHvh1-AU9	29 > 180	190.2	6.5
211	Belize-CWHvm2-AU4	59 > 180	2.2	2
212	Belize-CWHvm2-AU11	59 > 180	25.7	7.5
213	Belize-CWHvm2-AU12	29 > 180	463.8	3.6
214	Belize-MHmm1-AU5	65 > 180	14	0.4
215	Belize-MHmm1-AU7	59 > 180	2	0

Analysis Identity and EBM Landscape Unit-Site Series Surrogate Name		Analysis FCC (% > Age)	Area (ha)	
			Productive	THLB
216	Belize-CWHvh1-AU5	29 > 180	892.1	691.8
217	Belize-CWHvh1-AU6	29 > 180	11583.7	4309.2
218	Belize-CWHvm1-AU4	25 > 180	160.6	126.5
219	Belize-CWHvm1-AU5	28 > 180	1952	1407.8
220	Belize-CWHvm1-AU6	28 > 180	17016.3	7187.1
221	Belize-CWHvm1-AU7	25 > 180	1522.9	875
222	Belize-CWHvm1-AU8	25 > 180	3542.8	1300.6
223	Belize-CWHvm1-AU9	25 > 180	815.9	90.7
224	Belize-CWHvm1-AU10	25 > 180	49.6	0
225	Belize-CWHvm1-AU11	25 > 180	40.7	3
226	Belize-CWHvm2-AU5	28 > 180	283	92.3
227	Belize-CWHvm2-AU6	28 > 180	13733.2	1748.7
228	Belize-CWHvm2-AU7	25 > 180	127.1	42
229	Belize-CWHvm2-AU8	25 > 180	1309.6	232.3
230	Belize-CWHvm2-AU9	25 > 180	3216.3	13.9
231	Belize-MHmm1-AU6	28 > 180	2792.4	40.9
232	Belize-MHmm1-AU8	25 > 180	132.8	1.5
233	Belize-MHmm1-AU9	25 > 180	1344.5	2.8
237	Belize-CWHvh1-AU13	0 > 180	483.7	205.4
238	Belize-CWHvm1-AU13	0 > 180	1546.2	420.3
239	Belize-CWHvm2-AU13	0 > 180	84.3	10.5
240	Broughton-CWHvm1-AU3	21 > 180	38.5	0
241	Broughton-CWHvm1-AU12	12 > 180	12.1	0
242	Broughton-CWHvm1-AU4	25 > 180	563.2	326.3
243	Broughton-CWHvm1-AU5	28 > 180	3345.2	1815.9
244	Broughton-CWHvm1-AU6	28 > 180	8525	3573.2
245	Broughton-CWHvm1-AU7	25 > 180	4125.8	1241.7
246	Broughton-CWHvm1-AU8	25 > 180	3292.8	1226.3
247	Broughton-CWHvm1-AU9	25 > 180	325.5	24.2
248	Broughton-CWHvm1-AU13	0 > 180	88.1	24.7
249	Charles-CWHvm1-AU3	21 > 180	11.5	0
250	Charles-MHmm1-AU5	65 > 180	1.2	0.1
251	Charles-CWHvm1-AU2	21 > 180	21.5	14.4
252	Charles-CWHvm1-AU4	25 > 180	21.2	17
253	Charles-CWHvm1-AU5	28 > 180	317.7	240.5
254	Charles-CWHvm1-AU6	28 > 180	1936.3	912.2
255	Charles-CWHvm1-AU7	25 > 180	599	284.6
256	Charles-CWHvm1-AU8	25 > 180	1025.4	460.6
257	Charles-CWHvm1-AU9	25 > 180	332.3	6.9
258	Charles-CWHvm2-AU5	28 > 180	66.5	32
259	Charles-CWHvm2-AU6	28 > 180	1597	185
260	Charles-CWHvm2-AU7	25 > 180	5.7	0
261	Charles-CWHvm2-AU8	25 > 180	415.9	46.2
262	Charles-CWHvm2-AU9	25 > 180	918.8	0
263	Charles-MHmm1-AU6	28 > 180	399.5	1.4
264	Charles-MHmm1-AU8	25 > 180	89.6	0
265	Charles-MHmm1-AU9	25 > 180	732.9	0

Analysis Identity and EBM Landscape Unit-Site Series Surrogate Name		Analysis FCC (% > Age)	Area (ha)	
			Productive	THLB
269	Charles-CWHvm1-AU13	0 > 180	769.8	275.4
270	Charles-CWHvm2-AU13	0 > 180	71.3	1.1
271	Franklin-CWHdm-AU1	23 > 180	298.2	14.5
272	Franklin-CWHdm-AU2	17 > 180	94.4	80.3
273	Franklin-CWHdm-AU3	18 > 180	51.4	0
274	Franklin-CWHdm-AU5	23 > 180	15.7	13
275	Franklin-CWHdm-AU8	23 > 180	34.6	13
276	Franklin-CWHvm2-AU12	29 > 180	17.5	0
277	Franklin-MHmm1-AU5	65 > 180	12.3	0
278	Franklin-MHmm1-AU7	59 > 180	6.1	0
279	Franklin-CWHvm2-AU1	49 > 180	101.7	0
280	Franklin-CWHvm2-AU2	49 > 180	30.1	18.5
281	Franklin-CWHvm2-AU3	49 > 180	49.1	0
282	Franklin-MHmm1-AU3	49 > 180	12.3	0
283	Franklin-CWHdm-AU7	23 > 180	61.3	14
284	Franklin-CWHvm2-AU5	28 > 180	25.3	1.3
285	Franklin-CWHvm2-AU6	28 > 180	12.3	0
286	Franklin-CWHvm2-AU7	25 > 180	62.5	0
287	Franklin-CWHvm2-AU8	25 > 180	379.1	89.3
288	Franklin-CWHvm2-AU9	25 > 180	99	0
289	Franklin-MHmm1-AU6	28 > 180	17.4	0
290	Franklin-MHmm1-AU8	25 > 180	268.5	8.8
291	Franklin-MHmm1-AU9	25 > 180	170.3	0
294	Franklin-CWHdm-AU13	0 > 180	2.3	2.3
295	Fulmore-CWHvm1-AU3	21 > 180	5.2	0
296	Fulmore-CWHvm1-AU12	12 > 180	6.2	0
297	Fulmore-CWHvm1-AU4	25 > 180	6.2	5.6
298	Fulmore-CWHvm1-AU5	28 > 180	3	2.4
299	Fulmore-CWHvm1-AU6	28 > 180	36.1	17.3
300	Fulmore-CWHvm1-AU7	25 > 180	81.5	40.1
301	Fulmore-CWHvm1-AU8	25 > 180	25.8	15.9
302	Fulmore-CWHvm1-AU9	25 > 180	0.3	0
303	Fulmore-CWHvm2-AU6	28 > 180	55.4	5.2
304	Fulmore-CWHvm2-AU8	25 > 180	13.2	0.4
305	Fulmore-CWHvm2-AU9	25 > 180	65.9	0
306	Fulmore-MHmm1-AU6	28 > 180	47.7	7.4
307	Fulmore-MHmm1-AU8	25 > 180	1.9	0
308	Fulmore-MHmm1-AU9	25 > 180	26.6	0
309	Fulmore-CWHvm1-AU13	0 > 180	14.4	9.9
310	Fulmore-CWHvm2-AU13	0 > 180	7.5	6.7
311	Gilford-CWHvm1-AU1	21 > 180	90.5	71.3
312	Gilford-CWHvm1-AU3	21 > 180	74.8	12.8
313	Gilford-CWHvm1-AU12	12 > 180	50.3	2
314	Gilford-CWHvm2-AU4	59 > 180	87.1	75.1
315	Gilford-MHmm1-AU5	65 > 180	8.6	6.9
316	Gilford-MHmm1-AU7	59 > 180	22.2	18.6
317	Gilford-CWHvm2-AU1	49 > 180	8.2	6.2

Analysis Identity and EBM Landscape Unit-Site Series Surrogate Name		Analysis FCC (% > Age)	Area (ha)	
			Productive	THLB
318	Gilford-CWHvm2-AU2	49 > 180	1.9	1.6
319	Gilford-CWHvm1-AU2	21 > 180	84.5	71
320	Gilford-CWHvm1-AU4	25 > 180	1191.5	993.6
321	Gilford-CWHvm1-AU5	28 > 180	3884	3104.4
322	Gilford-CWHvm1-AU6	28 > 180	7498.2	4328.1
323	Gilford-CWHvm1-AU7	25 > 180	10002.6	6022.9
324	Gilford-CWHvm1-AU8	25 > 180	9392.9	5760.7
325	Gilford-CWHvm1-AU9	25 > 180	903.9	40.3
326	Gilford-CWHvm1-AU10	25 > 180	21.3	10.7
327	Gilford-CWHvm2-AU5	28 > 180	387.4	320.8
328	Gilford-CWHvm2-AU6	28 > 180	3531.3	1987
329	Gilford-CWHvm2-AU7	25 > 180	237	177.1
330	Gilford-CWHvm2-AU8	25 > 180	1546.1	676.9
331	Gilford-CWHvm2-AU9	25 > 180	835	74.9
332	Gilford-MHmm1-AU6	28 > 180	1018.3	201.8
333	Gilford-MHmm1-AU8	25 > 180	126.8	19.8
334	Gilford-MHmm1-AU9	25 > 180	347.4	2.1
335	Gilford-MHmm1-AU2	49 > 180	8.2	5.6
338	Gilford-CWHvm1-AU13	0 > 180	1157.8	581
339	Gilford-CWHvm2-AU13	0 > 180	53.8	11
340	Huaskin-CWHvh1-AU4	27 > 180	921.4	749.1
341	Huaskin-CWHvh1-AU7	25 > 180	2780.8	1588.8
342	Huaskin-CWHvh1-AU8	29 > 180	1947.1	1132.8
343	Huaskin-CWHvh1-AU12	25 > 180	17.4	0
344	Huaskin-CWHvm1-AU12	12 > 180	9.5	0
345	Huaskin-CWHvh1-AU9	29 > 180	189.6	5.4
346	Huaskin-CWHvh1-AU11	25 > 180	10.2	0
347	Huaskin-CWHvm2-AU4	59 > 180	0.1	0.1
348	Huaskin-CWHvm2-AU12	29 > 180	15.2	0
349	Huaskin-CWHvh1-AU2	63 > 180	1.8	0
350	Huaskin-CWHvh1-AU5	29 > 180	1907.6	1536.9
351	Huaskin-CWHvh1-AU6	29 > 180	12482.9	5585.9
352	Huaskin-CWHvm1-AU4	25 > 180	339.7	263.9
353	Huaskin-CWHvm1-AU5	28 > 180	1307	880.1
354	Huaskin-CWHvm1-AU6	28 > 180	8991.2	4177.6
355	Huaskin-CWHvm1-AU7	25 > 180	1622.2	758.1
356	Huaskin-CWHvm1-AU8	25 > 180	1306.8	608.8
357	Huaskin-CWHvm1-AU9	25 > 180	335.1	54.3
358	Huaskin-CWHvm1-AU11	25 > 180	23.9	0
359	Huaskin-CWHvm2-AU5	28 > 180	6.7	3.1
360	Huaskin-CWHvm2-AU6	28 > 180	2089.5	441.3
361	Huaskin-CWHvm2-AU7	25 > 180	2	1.8
362	Huaskin-CWHvm2-AU8	25 > 180	107.4	30.2
363	Huaskin-CWHvm2-AU9	25 > 180	120.9	16.4
364	Huaskin-MHmm1-AU6	28 > 180	65	0.5
365	Huaskin-MHmm1-AU8	25 > 180	0.4	0
366	Huaskin-MHmm1-AU9	25 > 180	18.5	0

Analysis Identity and EBM Landscape Unit-Site Series Surrogate Name		Analysis FCC (% > Age)	Area (ha)	
			Productive	THLB
367	Huaskin-CWHvh1-AU13	0 > 180	545.3	263.2
368	Huaskin-CWHvm1-AU13	0 > 180	329.2	69.4
369	Huaskin-CWHvm2-AU13	0 > 180	6.7	0.6
370	Kakweiken-CWHvm1-AU12	12 > 180	2.5	0
371	Kakweiken-MHmm1-AU5	65 > 180	1.4	0
372	Kakweiken-CWHvm1-AU4	25 > 180	7.1	6.5
373	Kakweiken-CWHvm1-AU5	28 > 180	640.9	262.4
374	Kakweiken-CWHvm1-AU6	28 > 180	1477.9	493.7
375	Kakweiken-CWHvm1-AU7	25 > 180	1549.2	849.2
376	Kakweiken-CWHvm1-AU8	25 > 180	2528.8	680.8
377	Kakweiken-CWHvm1-AU9	25 > 180	481	15.8
378	Kakweiken-CWHvm1-AU10	25 > 180	242.8	9.8
379	Kakweiken-CWHvm1-AU11	25 > 180	19.6	0
380	Kakweiken-CWHvm2-AU5	28 > 180	102	18.5
381	Kakweiken-CWHvm2-AU6	28 > 180	2253.7	516.9
382	Kakweiken-CWHvm2-AU7	25 > 180	128.9	59.4
383	Kakweiken-CWHvm2-AU8	25 > 180	2412.8	329.1
384	Kakweiken-CWHvm2-AU9	25 > 180	2554	2.2
385	Kakweiken-MHmm1-AU6	28 > 180	484.3	46
386	Kakweiken-MHmm1-AU8	25 > 180	237.4	11.4
387	Kakweiken-MHmm1-AU9	25 > 180	1799.4	2.1
391	Kakweiken-CWHvm1-AU13	0 > 180	761.6	177.8
392	Kakweiken-CWHvm2-AU13	0 > 180	26.8	0
393	Knight_East-CWHdm-AU2	17 > 180	11.3	9.2
394	Knight_East-CWHdm-AU3	18 > 180	18.3	1
395	Knight_East-CWHdm-AU8	23 > 180	20.5	11.7
396	Knight_East-CWHvm1-AU3	21 > 180	215	1.3
397	Knight_East-CWHvm1-AU12	12 > 180	23.6	0
398	Knight_East-CWHvm2-AU4	59 > 180	30	19.4
399	Knight_East-MHmm1-AU5	65 > 180	7.8	2.5
400	Knight_East-CWHvm2-AU2	49 > 180	3.8	0
401	Knight_East-CWHvm2-AU3	49 > 180	84.1	7.1
402	Knight_East-MHmm1-AU3	49 > 180	14.5	0
403	Knight_East-CWHdm-AU7	23 > 180	36.3	20.8
404	Knight_East-CWHvm1-AU2	21 > 180	122.7	7.6
405	Knight_East-CWHvm1-AU4	25 > 180	207.7	119.9
406	Knight_East-CWHvm1-AU5	28 > 180	744.5	384.2
407	Knight_East-CWHvm1-AU6	28 > 180	3200.7	1496.2
408	Knight_East-CWHvm1-AU7	25 > 180	1727.1	999.6
409	Knight_East-CWHvm1-AU8	25 > 180	3490.8	1725.7
410	Knight_East-CWHvm1-AU9	25 > 180	496.3	63.2
411	Knight_East-CWHvm2-AU5	28 > 180	110.4	40
412	Knight_East-CWHvm2-AU6	28 > 180	1893.5	378.8
413	Knight_East-CWHvm2-AU7	25 > 180	141	53.7
414	Knight_East-CWHvm2-AU8	25 > 180	2742.1	647.1
415	Knight_East-CWHvm2-AU9	25 > 180	1939.5	15.6
416	Knight_East-MHmm1-AU6	28 > 180	748.2	25.4

Analysis Identity and EBM Landscape Unit-Site Series Surrogate Name		Analysis FCC (% > Age)	Area (ha)	
			Productive	THLB
417	Knight_East-MHmm1-AU8	25 > 180	719.6	63.3
418	Knight_East-MHmm1-AU9	25 > 180	2354.4	0
422	Knight_East-CWHdm-AU13	0 > 180	0.2	0.2
423	Knight_East-CWHvm1-AU13	0 > 180	786.5	371
424	Knight_East-CWHvm2-AU13	0 > 180	164	50.8
425	Lower_Kingcome-CWHvm1-AU1	21 > 180	10.4	5.7
426	Lower_Kingcome-CWHvm1-AU3	21 > 180	37.2	32.5
427	Lower_Kingcome-CWHvm1-AU12	12 > 180	194.8	0.8
428	Lower_Kingcome-CWHvm2-AU11	59 > 180	2.7	2.3
429	Lower_Kingcome-CWHvm2-AU12	29 > 180	1.6	0
430	Lower_Kingcome-MHmm1-AU5	65 > 180	4.2	0
431	Lower_Kingcome-CWHvm2-AU2	49 > 180	0.5	0
432	Lower_Kingcome-CWHvm2-AU3	49 > 180	1.8	1.6
433	Lower_Kingcome-CWHvm1-AU2	21 > 180	186.7	105.7
434	Lower_Kingcome-CWHvm1-AU4	25 > 180	225.7	154.3
435	Lower_Kingcome-CWHvm1-AU5	28 > 180	720.4	461.7
436	Lower_Kingcome-CWHvm1-AU6	28 > 180	1586.7	610
437	Lower_Kingcome-CWHvm1-AU7	25 > 180	1660.7	1073.4
438	Lower_Kingcome-CWHvm1-AU8	25 > 180	3198.7	1215.2
439	Lower_Kingcome-CWHvm1-AU9	25 > 180	676.8	19.8
440	Lower_Kingcome-CWHvm1-AU10	25 > 180	191	8.8
441	Lower_Kingcome-CWHvm1-AU11	25 > 180	90.2	35.8
442	Lower_Kingcome-CWHvm2-AU5	28 > 180	204	69.5
443	Lower_Kingcome-CWHvm2-AU6	28 > 180	2339.4	662
444	Lower_Kingcome-CWHvm2-AU7	25 > 180	164.1	97.3
445	Lower_Kingcome-CWHvm2-AU8	25 > 180	2243.1	275.9
446	Lower_Kingcome-CWHvm2-AU9	25 > 180	2472.2	108.4
447	Lower_Kingcome-MHmm1-AU6	28 > 180	711	57.8
448	Lower_Kingcome-MHmm1-AU8	25 > 180	212.9	40.5
449	Lower_Kingcome-MHmm1-AU9	25 > 180	2073.8	47.4
450	Lower_Kingcome-CMAunp-AU6	0 > 180	18.4	18.4
453	Lower_Kingcome-CWHvm1-AU13	0 > 180	1555	177.7
454	Lower_Kingcome-CWHvm2-AU13	0 > 180	74.9	1.2
455	Lower_Klinaklini-CWHvm1-AU1	21 > 180	11	4.4
456	Lower_Klinaklini-CWHvm1-AU3	21 > 180	12.3	0
457	Lower_Klinaklini-CWHvm2-AU1	49 > 180	8.3	0
458	Lower_Klinaklini-CWHvm2-AU3	49 > 180	1.4	0
459	Lower_Klinaklini-CWHvm1-AU2	21 > 180	58.4	45.3
460	Lower_Klinaklini-CWHvm1-AU6	28 > 180	591.1	363.7
461	Lower_Klinaklini-CWHvm1-AU7	25 > 180	53.7	44.5
462	Lower_Klinaklini-CWHvm1-AU8	25 > 180	275.6	124.8
463	Lower_Klinaklini-CWHvm1-AU9	25 > 180	75.3	0
464	Lower_Klinaklini-CWHvm2-AU7	25 > 180	5.2	3.9
465	Lower_Klinaklini-CWHvm2-AU8	25 > 180	221.3	73.8
466	Lower_Klinaklini-CWHvm2-AU9	25 > 180	82.8	0
467	Lower_Klinaklini-MHmm1-AU8	25 > 180	26.1	0.8
468	Lower_Klinaklini-MHmm1-AU9	25 > 180	116.6	0

Analysis Identity and EBM Landscape Unit-Site Series Surrogate Name		Analysis FCC (% > Age)	Area (ha)	
			Productive	THLB
469	Lower_Klinaklini-CWHvm1-AU13	0 > 180	7.9	1.3
470	Lull_Sallie-CWHvm1-AU1	21 > 180	49.3	35.1
471	Lull_Sallie-CWHvm1-AU3	21 > 180	277.1	69.9
472	Lull_Sallie-CWHvm1-AU12	12 > 180	33.7	0
473	Lull_Sallie-CWHvm2-AU4	59 > 180	12.3	8.4
474	Lull_Sallie-MHmm1-AU7	59 > 180	1.3	0
475	Lull_Sallie-CWHvm2-AU2	49 > 180	1.6	0.2
476	Lull_Sallie-CWHvm1-AU2	21 > 180	338	215.7
477	Lull_Sallie-CWHvm1-AU4	25 > 180	315.5	255.9
478	Lull_Sallie-CWHvm1-AU5	28 > 180	913.2	682.9
479	Lull_Sallie-CWHvm1-AU6	28 > 180	2431	1349.5
480	Lull_Sallie-CWHvm1-AU7	25 > 180	2622.1	1631.7
481	Lull_Sallie-CWHvm1-AU8	25 > 180	3655.2	1276.8
482	Lull_Sallie-CWHvm1-AU9	25 > 180	466.5	10.2
483	Lull_Sallie-CWHvm1-AU10	25 > 180	6.9	5.7
484	Lull_Sallie-CWHvm1-AU11	25 > 180	14.1	0.7
485	Lull_Sallie-CWHvm2-AU5	28 > 180	96.4	69.7
486	Lull_Sallie-CWHvm2-AU6	28 > 180	2512.5	878.3
487	Lull_Sallie-CWHvm2-AU7	25 > 180	143.4	110.2
488	Lull_Sallie-CWHvm2-AU8	25 > 180	1375.7	245
489	Lull_Sallie-CWHvm2-AU9	25 > 180	1668	2.9
490	Lull_Sallie-MHmm1-AU6	28 > 180	802.1	178.6
491	Lull_Sallie-MHmm1-AU8	25 > 180	348.2	48.1
492	Lull_Sallie-MHmm1-AU9	25 > 180	1553.8	0
493	Lull_Sallie-CMAunp-AU6	0 > 180	0.4	0.4
496	Lull_Sallie-CWHvm1-AU13	0 > 180	782.9	254.5
497	Lull_Sallie-CWHvm2-AU13	0 > 180	19.6	0.9
499	Miriam-CWHvm1-AU3	21 > 180	13.4	0
500	Miriam-CWHvm1-AU12	12 > 180	9.8	0
501	Miriam-CWHvm2-AU4	59 > 180	3.1	2.2
502	Miriam-MHmm1-AU5	65 > 180	10.4	0
503	Miriam-CWHvm1-AU4	25 > 180	289.5	191.1
504	Miriam-CWHvm1-AU5	28 > 180	635.8	406.5
505	Miriam-CWHvm1-AU6	28 > 180	6196	2980.2
506	Miriam-CWHvm1-AU7	25 > 180	1344.3	392.5
507	Miriam-CWHvm1-AU8	25 > 180	1635.6	829.3
508	Miriam-CWHvm1-AU9	25 > 180	459.5	0.2
509	Miriam-CWHvm2-AU5	28 > 180	109.6	12.9
510	Miriam-CWHvm2-AU6	28 > 180	2971.4	361.4
511	Miriam-CWHvm2-AU7	25 > 180	13.9	9
512	Miriam-CWHvm2-AU8	25 > 180	339	24.7
513	Miriam-CWHvm2-AU9	25 > 180	264.3	0
514	Miriam-MHmm1-AU6	28 > 180	1284.5	0.5
515	Miriam-MHmm1-AU8	25 > 180	72.7	0.1
516	Miriam-MHmm1-AU9	25 > 180	507.1	0
518	Miriam-CWHvm1-AU13	0 > 180	484.8	88.3
519	Miriam-CWHvm2-AU13	0 > 180	13.8	0.6

Analysis Identity and EBM Landscape Unit-Site Series Surrogate Name		Analysis FCC (% > Age)	Area (ha)	
			Productive	THLB
520	Neechanz-MHmm1-AU6	28 > 180	0.4	0
521	Seymour-CWHvm1-AU12	12 > 180	12.2	0
522	Seymour-CWHvm2-AU12	29 > 180	45.7	0
523	Seymour-CWHvm1-AU5	28 > 180	246.2	114.1
524	Seymour-CWHvm1-AU6	28 > 180	2245.8	696.3
525	Seymour-CWHvm1-AU7	25 > 180	346.9	175.5
526	Seymour-CWHvm1-AU8	25 > 180	2066.4	721.8
527	Seymour-CWHvm1-AU9	25 > 180	1079.1	23.7
528	Seymour-CWHvm1-AU10	25 > 180	12.6	0
529	Seymour-CWHvm1-AU11	25 > 180	10.2	2.9
530	Seymour-CWHvm2-AU6	28 > 180	2742.5	253.9
531	Seymour-CWHvm2-AU7	25 > 180	3	0
532	Seymour-CWHvm2-AU8	25 > 180	773.6	66
533	Seymour-CWHvm2-AU9	25 > 180	2675.4	32.2
534	Seymour-MHmm1-AU6	28 > 180	1331.6	4.1
535	Seymour-MHmm1-AU8	25 > 180	134.1	46.2
536	Seymour-MHmm1-AU9	25 > 180	1408.7	31.3
537	Seymour-CMAunp-AU6	0 > 180	1.2	1.2
538	Seymour-CMAunp-AU9	0 > 180	1.4	1.4
539	Seymour-CWHvm1-AU13	0 > 180	524.5	81.8
540	Seymour-CWHvm2-AU13	0 > 180	5.9	1.4
541	Sim-CWHvm1-AU3	21 > 180	98.8	8.1
542	Sim-CWHvm1-AU12	12 > 180	8.5	0
543	Sim-CWHvm2-AU2	49 > 180	4.9	2.5
544	Sim-CWHvm2-AU3	49 > 180	1.7	0
545	Sim-CWHvm1-AU2	21 > 180	140.8	63.5
546	Sim-CWHvm1-AU5	28 > 180	47.5	34
547	Sim-CWHvm1-AU7	25 > 180	69.3	31.7
548	Sim-CWHvm1-AU8	25 > 180	355.1	149.5
549	Sim-CWHvm1-AU9	25 > 180	25.1	0
550	Sim-CWHvm2-AU5	28 > 180	5.7	0.6
551	Sim-CWHvm2-AU6	28 > 180	6.9	3.2
552	Sim-CWHvm2-AU8	25 > 180	277.4	57.7
553	Sim-CWHvm2-AU9	25 > 180	136.8	16.5
554	Sim-MHmm1-AU8	25 > 180	105.2	1.5
555	Sim-MHmm1-AU9	25 > 180	141.8	0.9
557	Sim-CWHvm1-AU13	0 > 180	13.9	0
558	Smith_Sound-CWHvh1-AU4	27 > 180	2.8	2.3
559	Smith_Sound-CWHvh1-AU7	25 > 180	0.6	0.6
560	Smith_Sound-CWHvh1-AU8	29 > 180	2	1.8
561	Smith_Sound-CWHvh1-AU12	25 > 180	0.7	0
562	Smith_Sound-CWHvh1-AU9	29 > 180	8.6	0
563	Smith_Sound-CWHvh1-AU5	29 > 180	44.8	33.4
564	Smith_Sound-CWHvh1-AU6	29 > 180	234.1	4.4
565	Smokehouse-CWHvh1-AU5	29 > 180	0.3	0
566	Smokehouse-CWHvh1-AU6	29 > 180	1	0
567	Smokehouse-CWHvm1-AU5	28 > 180	0.1	0.1

Analysis Identity and EBM Landscape Unit-Site Series Surrogate Name		Analysis FCC (% > Age)	Area (ha)	
			Productive	THLB
568	Smokehouse-CWHvm1-AU6	28 > 180	38	7.2
569	Smokehouse-CWHvm2-AU6	28 > 180	87.5	0.2
570	Smokehouse-CWHvm2-AU9	25 > 180	3.6	0
571	Smokehouse-MHmm1-AU6	28 > 180	2.2	0
572	Smokehouse-MHmm1-AU8	25 > 180	2.9	0
573	Smokehouse-MHmm1-AU9	25 > 180	0.3	0
574	Smokehouse-CWHvh1-AU13	0 > 180	0.2	0
575	Snowdrift-CWHvm1-AU1	21 > 180	11	8.2
576	Snowdrift-CWHvm1-AU3	21 > 180	8	0
577	Snowdrift-CWHvm1-AU12	12 > 180	35.7	2.7
578	Snowdrift-CWHvm2-AU4	59 > 180	24.6	19.9
579	Snowdrift-CWHvm2-AU11	59 > 180	14.7	6.8
580	Snowdrift-CWHvm2-AU12	29 > 180	10.5	0
581	Snowdrift-MHmm1-AU5	65 > 180	26.6	2.6
582	Snowdrift-MHmm1-AU7	59 > 180	2.2	0
583	Snowdrift-CWHvm1-AU2	21 > 180	3.3	3.2
584	Snowdrift-CWHvm1-AU4	25 > 180	537.3	397.4
585	Snowdrift-CWHvm1-AU5	28 > 180	3093.5	2139.1
586	Snowdrift-CWHvm1-AU6	28 > 180	7840.9	4266.3
587	Snowdrift-CWHvm1-AU7	25 > 180	2584.8	1349.3
588	Snowdrift-CWHvm1-AU8	25 > 180	3550	1852.5
589	Snowdrift-CWHvm1-AU9	25 > 180	653.6	45.8
590	Snowdrift-CWHvm1-AU10	25 > 180	0.8	0
591	Snowdrift-CWHvm2-AU5	28 > 180	263.4	108.5
592	Snowdrift-CWHvm2-AU6	28 > 180	5215.7	1650.4
593	Snowdrift-CWHvm2-AU7	25 > 180	109.8	54.5
594	Snowdrift-CWHvm2-AU8	25 > 180	1812.9	596.9
595	Snowdrift-CWHvm2-AU9	25 > 180	1531.2	25.6
596	Snowdrift-MHmm1-AU6	28 > 180	1607.9	62.1
597	Snowdrift-MHmm1-AU8	25 > 180	155.9	9.2
598	Snowdrift-MHmm1-AU9	25 > 180	553.7	0.2
602	Snowdrift-CWHvm1-AU13	0 > 180	1442.4	522.7
603	Snowdrift-CWHvm2-AU13	0 > 180	204.9	3.1
604	Stafford-MHmm1-AU9	25 > 180	0.2	0
605	Upper_Kingcome-CWHvm1-AU3	21 > 180	30.2	13.3
606	Upper_Kingcome-CWHvm1-AU12	12 > 180	42.5	0.7
607	Upper_Kingcome-CWHvm2-AU4	59 > 180	1.8	0.3
608	Upper_Kingcome-MHmm1-AU5	65 > 180	9.1	0
609	Upper_Kingcome-CWHvm2-AU3	49 > 180	4	0
610	Upper_Kingcome-CWHvm1-AU2	21 > 180	76.1	6.8
611	Upper_Kingcome-CWHvm1-AU4	25 > 180	151.6	79.2
612	Upper_Kingcome-CWHvm1-AU5	28 > 180	887.2	503.6
613	Upper_Kingcome-CWHvm1-AU6	28 > 180	588.2	143.2
614	Upper_Kingcome-CWHvm1-AU7	25 > 180	674.7	352.3
615	Upper_Kingcome-CWHvm1-AU8	25 > 180	4849.2	1439.4
616	Upper_Kingcome-CWHvm1-AU9	25 > 180	616.7	45.8
617	Upper_Kingcome-CWHvm1-AU10	25 > 180	140.4	0.9

Analysis Identity and EBM Landscape Unit-Site Series Surrogate Name		Analysis FCC (% > Age)	Area (ha)	
			Productive	THLB
618	Upper_Kingcome-CWHvm1-AU11	25 > 180	49.6	3.3
619	Upper_Kingcome-CWHvm2-AU5	28 > 180	82.9	13.7
620	Upper_Kingcome-CWHvm2-AU6	28 > 180	488	86.7
621	Upper_Kingcome-CWHvm2-AU7	25 > 180	63.4	52.4
622	Upper_Kingcome-CWHvm2-AU8	25 > 180	3761	206.4
623	Upper_Kingcome-CWHvm2-AU9	25 > 180	2373.4	38.7
624	Upper_Kingcome-MHmm1-AU6	28 > 180	265.1	49.4
625	Upper_Kingcome-MHmm1-AU8	25 > 180	1107.6	68.1
626	Upper_Kingcome-MHmm1-AU9	25 > 180	3226.5	47.3
627	Upper_Kingcome-CMAunp-AU6	0 > 180	42.1	42.1
629	Upper_Kingcome-CMAunp-AU9	0 > 180	1.6	1.6
630	Upper_Kingcome-CWHvm1-AU13	0 > 180	1120.2	118.1
631	Upper_Kingcome-CWHvm2-AU13	0 > 180	5.1	0
633	Wakeman-CWHvm1-AU1	21 > 180	13.5	11.8
634	Wakeman-CWHvm1-AU12	12 > 180	49.6	1.3
635	Wakeman-CWHvm2-AU4	59 > 180	15.1	13.8
636	Wakeman-MHmm1-AU5	65 > 180	15.2	5.3
637	Wakeman-CWHvm2-AU1	49 > 180	0.6	0.5
638	Wakeman-CWHvm1-AU2	21 > 180	24	20.5
639	Wakeman-CWHvm1-AU4	25 > 180	79.4	63.3
640	Wakeman-CWHvm1-AU5	28 > 180	1800.7	1178
641	Wakeman-CWHvm1-AU6	28 > 180	2966.8	1356.3
642	Wakeman-CWHvm1-AU7	25 > 180	1906.4	1300.8
643	Wakeman-CWHvm1-AU8	25 > 180	4378.9	1849.1
644	Wakeman-CWHvm1-AU9	25 > 180	600.4	13.5
645	Wakeman-CWHvm1-AU10	25 > 180	111	0.4
646	Wakeman-CWHvm1-AU11	25 > 180	135.7	5
647	Wakeman-CWHvm2-AU5	28 > 180	300	128.1
648	Wakeman-CWHvm2-AU6	28 > 180	2354.8	584
649	Wakeman-CWHvm2-AU7	25 > 180	62.4	36.1
650	Wakeman-CWHvm2-AU8	25 > 180	4102.6	745.7
651	Wakeman-CWHvm2-AU9	25 > 180	3422.3	29.3
652	Wakeman-MHmm1-AU6	28 > 180	486	43.9
653	Wakeman-MHmm1-AU8	25 > 180	736.8	35.5
654	Wakeman-MHmm1-AU9	25 > 180	3926.9	1.7
655	Wakeman-CMAunp-AU6	0 > 180	0.9	0.9
658	Wakeman-CWHvm1-AU13	0 > 180	2031.3	200.3
659	Wakeman-CWHvm2-AU13	0 > 180	9.3	0
660	Walker-CWHvh1-AU7	25 > 180	12	0
661	Walker-CWHvh1-AU8	29 > 180	286.4	88.8
662	Walker-CWHvh1-AU12	25 > 180	41.1	0
663	Walker-CWHvh1-AU9	29 > 180	71.1	0
664	Walker-CWHvh1-AU5	29 > 180	14.6	0
665	Walker-CWHvh1-AU6	29 > 180	696.4	9.9

APPENDIX V
KINGCOME TIMBER SUPPLY AREA TSR3
DATA PACKAGE

Kingcome Timber Supply Area
TSR 3 Data Package

Prepared for:
Kingcome TSA Licensee-Agency Group

Prepared by:
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Victoria, B.C.

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Project: 4061921
September 2008

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Ministry of Forests – Port McNeill Forest District	Phil Spencer
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June 9, 2008

File number 4061921

Kingcome TSA Licensee-Agency Group
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#213 – 1720 14th Ave.
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V9W 8B9

Attention: Ian Robertson, RPF
Program Coordinator

Reference: *Kingcome TSA TSR 3 Data Package*

Attached please find the Data Package report as part of the Kingcome TSA TSR 3 process. This report outlines the inputs and assumptions that will be used in the timber supply analysis for the TSA. Revisions have been made based on feedback from members of the Licensee Group and MoFR.

Thank you for your input and assistance during the preparation of the Data Package.

Yours truly,
TIMBERLINE NATURAL RESOURCE GROUP LTD.

Erik Wang, RPF
Senior Resource Analyst

EXECUTIVE SUMMARY

A timber supply review process has been initiated for the Kingcome Timber Supply Area (TSA). These reviews are conducted every five years and assist the B.C. Forest Service's Chief Forester in re-determining allowable annual cuts (AACs). For the Kingcome Timber Supply Area the Chief Forester will determine a new AAC by August 2008. Timberline Natural Resource Group Ltd., on behalf of the Kingcome TSA Licensee-Agency Group, is preparing timber supply information for the analysis.

The allowable annual cut (AAC) for the Kingcome TSA was set in 1996 at 1,399,000 m^3, which equated to a 22 percent reduction from the previous AAC. In July 2002, the Chief Forester temporarily reduced the AAC under section 173 in Part 13 of the *Forest Act*, to 1,355,000 m^3. This reduction was done to account for the Central Coast Designated Area. On October 1, 2002, the Chief Forester determined the AAC under section 8 of the *Forest Act* to be 1,284,000 m^3, a reduction of 8 percent from the previous AAC. This included a 20,340 m^3 partition for deciduous-leading stands. The July 2002 temporary reduction of 44 000 m^3, also applied to the October 2002 determination and remained in place until June 2004. In September 2006, the Chief Forester made a new determination under Section 173 of the *Forest Act* that reduced the AAC by 52,000 m^3 to 1,232,000 m^3. This reduction did not affect the deciduous partition and remains in effect until the area referred to as the Central Coast Designated Area No. 2 ceases to be a designated area in May 23, 2010. It is expected that either the area will be re-established as a Designated Area or it will have achieved full provincial park status by that date.

On July 27, 2007, the Ministry of Agriculture and Lands issued a legally binding Ministerial Order (MO) called the South Central Coast Order. The legal order requires forest licensees to implement Ecosystem Based Management (EBM) in the southern portion of the Central Coast Land and Resource Management Plan (CCLRMP) area.

This *Kingcome TSA Data Package* is provided to the public and First Nations for review prior to initiation of the analysis to support allowable cut determination for Timber Supply Review (TSR) 3. Although it is a technical document for a technical audience, every effort has been made to ensure that it is self-explanatory.

The Data Package allows the reader to consider the inputs and assumptions that will be used in the timber supply analysis. These include:

- Documentation of inventory data and sources;
- Classification of the land base according to each hectare's contribution to management (harvest, resource management for wildlife, *etc).*;
- Land productivity estimates and prediction of stand growth and timber yield;
- Silviculture and harvesting regimes;
- Action taken to model multi-resource requirements;
- Modelling structures to address the Central Coast Land and Resource Management Plan (CCLRMP); and
- Timber supply scenarios and sensitivities to be investigated.

The TSR process is designed to capture "current practice" on a management unit. However, during the period in which EBM parameters are being established and implemented, current practice is in fact in a stage of transition. To capture this dynamic, two scenarios will be explored.

- Pre-EBM - This scenario will capture current Forest and Range Practices Act (FRPA) management practices and assumptions.
- EBM Ministerial Order – This will capture the objectives as defined in the final South Central Coast Order, which has now been legally established.

The public and First Nations review processes have been completed, and this document has been finalized. It will be published as an appendix to the Timber Supply Analysis Report. There will be another public review opportunity at that time.

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1.0 INTRODUCTION

Timberline Natural Resource Group Ltd. (Timberline), on behalf of the Kingcome Timber Supply Area (TSA) Licensee-Agency Group (the Group) is preparing timber supply information for the Provincial timber supply review. The Group is composed of forest companies and British Columbia Timber Sales (BCTS) with some participation by First Nations and the Ministry of Forests and Range (MoFR). It was originally formed under the Defined Forest Area Management (DFAM) concept, developed by the MoFR as a policy framework to identify the obligations and opportunities for collaborative forest management within the province's TSAs. While the DFAM concept has since been terminated by the Chief Forester, the Group continues to exist and will assume collective responsibility for timber supply analysis within the TSA.

Timber supply reviews are conducted every five years to assist the B.C. Forest Service's Chief Forester in re-determining the allowable annual cut (AAC). For the Kingcome Timber Supply Area (TSA), the Chief Forester will determine a new AAC by August 2008.

Timberline will complete the steps leading up to, and including the delivery of, timber supply analyses as follows:

- Collecting data and preparation of a Data Package which summarizes the data assumptions—land base, growth and yield, forest management practices, statement of management strategies, and analysis methods—that will be used, and the critical issues that will be examined in the timber supply analysis;
- Completing the timber supply analysis and report; and
- Providing the necessary information for public and First Nations reviews.

Upon acceptance by the British Columbia MoFR Forest Analysis and Inventory Branch, the assumptions and methodology provided in the Data Package will be used by the Group to prepare and submit a timber supply analysis to the MoFR. These results will be presented in a Timber Supply Analysis Report. First Nations and the public will have an opportunity to review and comment on the timber supply analysis report that has been accepted by the Chief Forester. Finally, the Chief Forester will consider the Timber Supply Analysis Report and other sources of information in order to make a new AAC determination. All results will be presented to the Chief Forester of British Columbia for the determination. This determination will be published in a report entitled '*Kingcome Timber Supply Area – Rationale for AAC Determination*'.

1.1 Purpose

The purpose of the Data Package is to provide information on the forest resource inventory and the practices within the timber supply area (TSA) that will be compiled for the purposes of conducting a timber supply analysis. It includes descriptions of information sources, assumptions, issues, and any relevant data processing or adjustments related to the land base, growth and yield, and management objectives and practices.

The following principles and standards will apply to the data sources and Data Package (MoFR, 2003a):

- The Data Package must describe, and where appropriate summarize, all data and information to be used in the timber supply analysis;
- The Data Package must contain descriptions of how current forest management, or reasonable extrapolations of current management will be modelled;

- The most current and best available data must be used;
- More detailed discussion should be provided in the package for data for which there is a high degree of uncertainty;
- The Data Package must contain a summary of plans for examining the potential impacts of important uncertainties in information (*i.e.*, planned sensitivity analysis);
- The evidentiary basis for information used in analyses must be available on request, and to the extent possible be included in the Data Package. Evidence could include the following:
    - A description of data sources;
    - A description of sampling and data analysis methods or standards;
    - Digital or analog maps of the land base (*e.g.*, forest cover, ownership, habitat areas);
    - Results of any reviews or audits of source information or inventories; and
    - Any acceptances by appropriate professionals (*e.g.*, terrain stability mapping).
- When collecting or analyzing data to include in the Data Package, existing standards should be followed, unless justification is provided for diverging from standards. Such justification should demonstrate that although standards were not followed, the information is the best available that could be obtained for the timber supply review;
- Where possible, the implications to the timber supply analysis (*e.g.*, increased uncertainty) of diverging from the standards should be examined and reported; and
- The choice of a particular timber supply model is at the discretion of MoFR.

1.2 Background

The AAC for the Kingcome TSA was set in 1996 at 1,399,000 m³, which equated to a 22 percent reduction from the previous AAC. In July 2002 the Chief Forester temporarily reduced the AAC under Section 173 in Part 13 of the *Forest Act*, to 1,355,000 m³. This reduction was done to account for the Central Coast Designated Area. On October 1, 2002, the Chief Forester determined the AAC under section 8 of the *Forest Act* to be 1,284,000 m³, a reduction of 8 percent from the previous AAC. This included a 20,340 m³ partition for deciduous-leading stands. The July 2002 temporary reduction of 44,000 m³, also applied to the October 2002 determination and remained in place until June 2004. In September 2006, the Chief Forester made a new determination under Section 173 of the *Forest Act* that reduced the AAC by 52,000 m³ to 1,232,000 m³. This reduction did not affect the deciduous partition and remains in effect until the area referred to as the Central Coast Designated Area No. 2 ceases to be a designated area in May 23, 2010. It is expected that either the area will be re-established as a Designated Area or it will have achieved full provincial park status by that date.

On July 27, 2007, the Ministry of Agriculture and Lands issued a legally binding Ministerial Order (MO) called the South Central Coast Order (Ministry of Agriculture and Lands, 2007). This legally established order requires forest licensees to implement Ecosystem Based Management (EBM) in the southern portion of the Central Coast Land and Resource Management Plan (CCLRMP) area. This includes the mainland portion of the Kingcome TSA.

1.3 Processes, Roles and Responsibilities

This Kingcome TSA Data Package fits within a continuum of processes progressing towards the determination of the AAC for the Kingcome TSA. The Data Package outlines the steps to be followed from collection of existing information through to completion of the Timber Supply Analysis Reports.

MoFR staff plays a key role in reviewing and accepting both the Data Package and the subsequent timber supply analysis. They have provided technical support, facilitated resolution of issues, and validated technical information. The following summary shows the general roles and responsibilities associated with the timber supply analysis leading to an AAC determination.

Licensee-Agency Group Obligations	Government Obligations
Collect and prepare a Data Package based on the best available information	Set standards for the Data Package Review and accept the Data Package
Complete an analysis for the Kingcome TSA	Set standards for the analysis Review and accept the analysis
Provide information to the public and First Nations	Consult with First Nations Determine the AAC for the Kingcome TSA

When completed, this document will be published as an appendix to the Timber Supply Analysis Report. For further information about the Data Package and timber supply analysis for the Kingcome TSA, please contact:

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1.4 Timber Supply Review

The preparation of the Data Package is the first step in the TSR process. The Data Package must go through two revision processes before it is accepted for use. MoFR must review and accept the first draft of the Data Package. It must also be made available for a public and First Nations review. Feedback from this review process must be documented along with records of how comments were incorporated into the revision of the Data Package. After the first revision, the Data Package is then submitted for a second review by the MoFR, public and First Nations. After this review and accompanying revision, the Data Package can be accepted for use in the TSR.

Once the Data Package has achieved approval for use, the timber supply analyses can be performed following all of the criteria outlined in the Data Package. The results of these analyses are documented in the analysis report. This report is then submitted to the Chief Forester for consideration as part of the TSR process. The timber supply analysis report will also be made available for review and comment by First Nations and the public.

To facilitate the Data Package review process, a web site dedicated to the TSR 3 analyses was established at <http://www.timberline.ca/kingcome/index.html>. The draft Data Package and background documents will be placed on this site. This provides individuals with the opportunity to download these materials for review.

1.5 Forest and Range Practices Act

The Forest Practices Code (FPC) was introduced in 1995. The Forest and Range Practices) came into force January 31, 2004 and for the most part, replaced the FPC by December 31, 2005. This move from the FPC to the FRPA represents a transition from a primarily plan and process-based regime under FPC to a results-based regime under FRPA. Prior to December 31, 2005 there was a transition period where licensees worked under either a Forest Development Plan (as per FPC) or a Forest Stewardship Plan (as per FRPA).

Under FRPA, FPC guidelines will no longer be within the legal framework but will move to the non-legal realm. To meet the objectives set by government either through land use, regulation, or enabled by regulation, greater emphasis will be placed upon professional reliance in the preparation of operational plans to ensure such objectives will be met. The licensee may propose results and strategies in their operational plan (i.e., Forest Stewardship Plan) or in some cases may select default results and strategies identified in the Forest Planning and Practices Regulation (FPPR).

1.6 Central Coast Land and Resource Management Plan Process

The July, 2007 South Central Coast Order regarding the CCLRMP defines land use objectives and other measures to implement ecosystem based management within the South and Central Coast area. A copy of the order and a map outlining the areas where the objectives will be applied is available at:

http://www.mediaroom.gov.bc.ca/DisplayEventDetails.aspx?eventId=389

There are two key components that will be recognized when addressing the CCLRMP, specifically:

- Protection of new Conservancy areas and Biodiversity areas; and
- Ecosystem-Based Management (EBM) objectives and targets.

1.7 Timber Supply Scenarios

The TSR process is designed to capture “current practice” on a management unit. However, during the period in which EBM parameters are being established and implemented, current practice is in fact in a stage of transition. To capture this dynamic, two scenarios will be explored.

Pre-EBM - This scenario will capture current Forest and Range Practices Act (FRPA) management practices and assumptions.

EBM Ministerial Order – This scenario will capture the objectives as defined in the now legally established South Central Order.

2.0 Inventory and Generate Data

2.1 Data Sources

The sources of data compiled for input into the TSR 3 timber supply analyses are documented in Table 1. The use of these data sources is noted in the following sections describing land base and management assumptions. Details about the data source are available from the data source contacts. Further information specific to each inventory category will be made available with the final Data Package included with the Timber Supply Analysis Report. The use of each data component in also indicated in Table 1. The table also indicates whether the data was employed only in the **Pre** EBM scenario or as an additional component in the **EBM** scenario.

There are three major new or updated sources of data that were not included in the previous timber supply review. These data are the recently completed Vegetation Resource Inventory (VRI), CCLRMP land use zones and EBM boundaries.

Table 1 – Data sources

Inventory Category	Coverage Name	Source Agency[2]	Date of Compilation or Update	Analysis Use[1]		
				Net	Res	Zone
TSA Boundary	Tsa_bnd	ILMB	2006	Pre		
Protected Areas	Prot_areas	ILMB	2006	Pre		
Ownership TSR 2	Own	MoFR	2000	Pre		
Vegetation Res Inventory	VRI	MoFR	2004	Pre	Pre	
Addition Forest Cover	For_t0405	MoFR	2006	Pre	Pre	
Old Growth Management Area	Ogma	ILMB	2006	Pre		
Woodlots	Woodlots	MoFR	2006	Pre		
Karst Potential LRDW	Karstpot	ILMB	2002	Pre		
Timber Licences	Tls	MoFR	2006	Pre	Pre	
Operability	Oper_rw8	TNRG Vancouver	2006	Pre		
Recreation	Rec_ften/rec	ILMB	2006	Pre	Pre	
Riparian Management Area	Rma	TRIM/TFIC	2006	Pre		
Road Buffer	Road_20mbuf	TRIM/TFIC	2006	Pre		
Wildife Habitat Area	Wha	ILMB	2006	Pre		
Archaeology	Arch_buf	TNRG Vic	2006	Pre		
ESA 1	Esa_1	MoFR	1978	Pre	Pre	
ESA 2	Esa_2	MoFR	1978	Pre	Pre	
Ungulate Winter Range	Uwr	MOE	2006		Pre	Pre
Protection and Biodiversity	tg2g_14	ILMB	2007	Pre	Pre	
Logged Blocks	Tsa33_log	MoFR	2007	Pre	Pre	
BEC	Bec	MoFR	2006		Pre	Pre
Community Watersheds	Com_watsh	ILMB	2006		Pre	Pre
Visual Landscape Inventory	Dmpvli	MoFR	2006		Pre	Pre
Landscape Units	Lu	ILMB	2006		Pre	Pre
Scenic Areas	Sa_dec05	MoFR	2006		Pre	Pre
Inventory Ageclass	Ageclass	TNRG Vic.	2006		Pre	
Planted Douglas Fir	Fd_plant	Interfor	2007		Pre	
Watersheds	Cc_swshd	ILMB	2006		Pre	

Inventory Category	Coverage Name	Source Agency[2]	Date of Compilation or Update	Analysis Use[1]		
				Net	Res	Zone
Marbled Murrelet	Mm_hab2006	MOE	2007		Pre	
Slope Coverage	Mslp	MoFR	2006		Pre	
Openings	Openings	MoFR	2006		Pre	
Floodplain	Cc_flood	MoFR	2002	EBM	EBM	
Grizzly Bear Habitat	Tgbh	ILMB	2005	EBM	EBM	
EBM Boundary	EBM_bnd	TNRG / TSA Boundary	2007		EBM	EBM
Estuaries	Estuaries	Pac. Coast Est. Prog	2004		EBM	
Estuary buffers TT	Est_ebm	TNRG/ Estuaries, VRI	2007	EBM	EBM	
Estuary buffers MO	Est_mo	TNRG/ Estuaries, VRI	2007	EBM	EBM	
Archaeological features	Req154north_point	Interfor – Mike Landers	2007	EBM		
	Req866king_point	Interfor – Mike Landers	2007	EBM		
	Req317	Interfor – Douglas Sauer	2007	EBM		
High Value Fish Habitat	Hvfs	MOE/ILMB	2005	EBM	EBM	
Known Fish Presence	Lfish_buf	ILMB	2006	EBM	EBM	
Predicted Landscape Elements	Ple_eco	JST/TNRG	2007	EBM	EBM	
Buffered Swamps	Swamp	TRIM/TNRG	2007	EBM	EBM	
Wild Zones	Wildzone	ILMB	2005		EBM	EBM

(1) Net = netdown; Zone = management zone mapping; Res = resultant

(2) ILMB=Integrated Land Management Bureau, MoFR=Ministry of Forests and Range, MOE=Ministry of Environment, TNRG=Timberline Natural Resource Group, TRIM=Terrain Resource Information Management

2.2 Current Forest Cover Inventory

The present vegetation resource inventory (VRI) for the Kingcome TSA was last updated to July 2004 to account for changes in denudation through harvesting, based on imagery and district data. Supplementary logged area mapping was incorporated into the data base to capture additional disturbances. The forest cover VRI was projected to January 2006.

The VRI was found to lack attributes in harvested polygons which became obvious in the first review of the timber harvesting land base (THLB). These gaps in the data were identified as harvested blocks and a composite harvested or logged block layer was provided to Timberline by MoFR. These logged blocks were assumed to represent productive/ potentially harvestable areas, and were used to override non-productive, inoperable, low site, and non-merchantable classifications. Where possible, forest cover attributes were assigned to these harvested areas by using history information from the MoFR Results Database.

It was found that some of the harvested or logged blocks did have appropriate VRI information and that about half of the remaining blocks were identified in the Results history information. The remaining polygons identified as logged blocks were assigned labels for growth and yield modelling purposes. Section 7.1 lists the assumptions made to assign labels.

The forest cover inventory data has been prepared using a geographic information system (GIS). Use of GIS ensures that spatial relationships between inventory attributes are maintained throughout the analysis process.

2.3 Forest Cover Inventory – Statistical Adjustment

The phase 2 VRI statistical attribute adjustment study for the Kingcome TSA was completed by J.S. Thrower & Associates in May 2005 (J.S. Thrower, 2005) for the Kingcome TSA licensees. The attribute adjustment is the process of correcting aerial photo-based inventory data from the estimation phase using ground sample observations. The purpose of the adjustments is to obtain unbiased overall averages and totals for the TSA by major species groups and to adjust the existing estimation data to obtain individual stand values (MoFR, March 2004). This analysis indicated that the volume in the timber harvesting land base was underestimated by approximately 9% with a sampling error (at the 95% probability level) of 12.3%.

Seventy-five (75) Phase II ground samples were installed by crews from Kerley & Associates Ltd. in the 2003 field season and 79 net volume adjustment factor (NVAF) trees were destructively sampled by crews from McColl Forestry during the 2004 field season. The target population for the statistical adjustment included polygons in the operable land base with a stand age of at least 30 years that were likely to be included in the timber harvesting land base (THLB) in TSR 3. The target population covered 251,188 ha. Approximately 26% of the area was located in Immature stands (less tha121 years), 32% was located in Low Land cedar stands (stands leading in western red cedar in the CHWvh1 biogeoclimatic zone), and 42% in Mature stands (120 years and older).

NVAF trees were selected across the Kingcome TSA and Tree Farm Licence (TFL) 45. The objective was to estimate NVAF adjustment ratios that would apply to both management units. Results showed that taper equations and net factoring rules under-estimated the true net merchantable volume for dead potential, live immature, and mature cedar trees by 2-3%. For mature hemlock and other mature trees, taper equations and net factoring rules over-estimated true volume by 1% and 3%, respectively.

The following steps were employed to adjust the inventory attributes:

1. Perform analysis on VRI ground sample inventory data and develop inventory file adjustment factors for age and height;
2. Using the factors derived in step 1, adjust height and age in the inventory database files;
3. Based on the adjusted inventory file height and age, use Variable Density Yield Predictor (VDYP Version 6.6d) to compute an "attribute-adjusted" inventory volume;
4. Develop inventory file adjustment factors for volume (using ground sample inventory volume and "attribute-adjusted" inventory volume); and
5. Using the volume adjustment factors derived in step 4; adjust the "attribute-adjusted" inventory volume derived in step 3. The adjusted volumes are based on net factoring with the NVAF applied. This volume is referred to as the final adjusted inventory volume.

Results are presented in Table 2. Following adjustment, both the overall average live net merchantable volume (17.5 cm+) and the average mature volume increased 9% to 503 m^3/ha and 627 m^3/ha, respectively. The overall average increases were +14%, -1% and +12% for the immature, low land, and mature stands, respectively. The increases were similar for all leading species groups within a maturity group.

Inventory site index decreased on average by 10%. The average decrease was slightly more important in the immature (12%) and low land stands (13%) than in the mature ones (6%).

Table 2 – Inventory statistical adjustment results

Stratum	Area		Net Merchantable Volume (17.5 cm+)			Site Index (m)		
	(ha)	(%)	Phase I (m^3/ha)	Adjusted (m^3/ha)	Difference (%)	Phase I (m^3/ha)	Adjusted (m^3/ha)	Difference (%)
Immature	67,739	26%	337.3	386.1	14%	24.9	22.0	-12%
Low Land	79,896	32%	447.6	442.7	-1%	12.1	10.6	-13%
Mature	103,552	42%	558.2	626.6	12%	14.0	13.2	-6%
Total	**251,188**	**100%**	**463.4**	**503.2**	**9%**	**16.3**	**14.7**	**-10%**

One of the project objectives was to estimate average net merchantable volume in the population of interest to within 15% (at the 95% confidence level). This objective has been met since the 95% sampling error for the adjusted net merchantable volume was 12.3%. Based on the coefficient of variation observed in the sample, another 52 plots would be required to decrease the 95% sampling error to 10%.

These site index and volume estimates were utilized only in the natural unmanaged stand yield tables. Section 7.4 Site Index, provides an explanation of the process used to estimate site index for managed stand yields.

The report identified several potential sources of uncertainty in this analysis.

NVAF factors were obtained from two management units. There was concern that these adjustments might differ and therefore applying them to the Kingcome could create bias. No obvious biases were detected.

There was also some concern that inclusion of several outlier sample points in the deciduous-leading immature stratum could have introduced bias in to the results. A larger sample size would be necessary to resolve this.

It was necessary to complete the sampling before the final THLB was established. It is possible that some areas that will be included in the final version of the THLB were not included in the target population from which the Phase II samples were selected, introducing a risk of bias.

There is no approved method for adjusting species composition, although preliminary analysis indicated that the ratio adjustments are not the same for all species in a stratum.

The stratification used for adjustment was based on broad age classes (Immature and Mature). There were concerns that adjustment ratios might be correlated with age, which would cause bias if the ratios are not computed and applied by age class. This was investigated, and only net merchantable volume in the immature stratum showed a slight positive correlation trend.

These results are presented here only to provide a general understanding of the process, and potential uncertainties inherent in a sampling process such as this. The study report should be referred to for a complete description and explanation.

3.0 TIMBER SUPPLY ANALYSIS FORECASTS

The British Columbia Timber Supply Review process utilizes forest estate modelling techniques to forecast timber supply characteristics of major management units. Such models require that the land base be stratified and characterized by management objectives.

Management objectives are described by two methods within the forest estate modelling framework. The first method is by considering that the management objective results in exclusion of area for the purposes of timber harvesting. This is often referred to as defining the timber harvesting land base or the netdown process. The second method is through the use of forest cover or adjacency constraints. An example of a forest cover constraint is requiring a specific percentage of a specified management zone to be above a certain age.

Section 4.0 provides a description of Timberline's proprietary spatial timber supply model CASH6 (Critical Analysis of Schedules for Harvesting) that is used in the analysis.

Details about the individual factors determining the timber harvesting land base and management zones for the Pre-EBM and EBM scenarios are found in Sections 5 and 6. Details about regeneration and growth and yield assumptions and the attendant silviculture prescriptions are discussed in Sections 7 and 8. Section 9 provides a summary of the Integrated Resource Management objectives that will be modelled. Section 10 provides a summary of modelling rules to be employed in the analysis.

Finally, Section 11 summarizes the analyses that will be performed to test the sensitivity of the forecasted results to changes in one or more assumptions.

The TSR 3 analysis used the 'best available information'. In this case the best available information includes the information collected by the Kingcome TSA Licensee-Agency Group.

3.1 Pre-EBM

The Pre-EBM analysis is built from the TSR 2 analysis completed in October 2002, the details of which are documented in TSR 2 analysis report (MoFR, 2001). The Pre-EBM analysis also takes direction from the comments made by the Chief Forester in the 2002 AAC Rationale for the Kingcome TSA (MoFR, 2002). Information updates and improvements completed since TSR 2 are listed below:

- VRI coverage for the entire TSA;
- VRI phase II attribute adjustments;
- Improved site productivity estimates for managed stands;
- Use of tree improvement program seed;
- Updated spatially explicit road buffers;
- Updated spatially explicit stream buffers;
- Updated cultural heritage sites;
- Updated wildlife habitat information;
- New economic operability assessment;
- New Conservancy and Biodiversity Areas; and
- Allowance for disturbances in the non-timber harvesting land base.

3.2 EBM

In November 2006, the Kingcome TSA Timber Supply Review stakeholders composed a letter to the Provincial Chief Forester seeking direction on the role that Ecosystem-Based Management (EBM) should have in TSR. The TSR process is intended to model "current practice" on a management unit yet at that time the final EBM parameters had not yet been set by the Ministry of Forests and Range. Currently, for those who have committed to the process, each Kingcome TSA licensee is at a different stage in their implementation process.

In his January 16, 2007 letter in response, the Chief Forester acknowledged that while the exact EBM framework had not yet been formalized, the development of the actual EBM components should be left to the discretion of the Kingcome TSA stakeholder group. On February 19, 2007, a sub-group of the Kingcome TSA stakeholders met to define the timber supply analysis framework for the Kingcome TSR and finalize the parameters proposed for modelling the key components of EBM. The sub-group included Ted Stevens and Gary Ardron representing First Nations interests, Dave McKay, Gerry Sommers, and Warren Wartig of International Forest Products Ltd., Peter Koefed of Western Forest Products Ltd., Jim Brown, Jennifer Barolet and Christina Mardell of the MoFR, and Tara McCormick, Dave Coster, Laszlo Kardos, and Hamish Robertson of Timberline Natural Resource Group Ltd.

Modelling data sources and assumptions needed to address Ecosystem-Based Management objectives were defined by the group. Since that time, these approaches have been refined as the specifics of each objective have been clarified. For each objective, the specific approach is documented in the appropriate section of this report, depending upon whether it is a netdown factor (Section 5.2), a management zone (Sections 6.2, 9.2) a stand growth and yield adjustment (Section 8.5), or a timber flow consideration (Section 10.9).

The South Central Coast Ministerial Order is now legally established, formalizing the Land Use Objectives for the South Central Coast Area. These objectives address protection of the following resources. In each case, the section reference is listed to refer the reader to the appropriate section of this Data Package. The complete MO text describing the objective is included in the referenced section:

First Nations

- Objective 3: First Nations' traditional forest resources (5.2.1);
- Objective 4: First Nations' traditional heritage features (5.2.1);
- Objective 5: Culturally modified trees (5.2.1);
- Objective 6: Monumental cedar (10.9.1);
- Objective 7: Stand-level retention of Western red and Yellow Cedar (10.9.2);

Aquatic Habitats

- Objective 8: Important fisheries watersheds (6.2.1);
- Objective 9: High value fish habitat (5,2,2);
- Objective 10: Aquatic habitat that is not high value fish habitat (5.2.3);
- Objective 11: Forested swamps (5.2.4);
- Objective 12: Upland streams (6.2.2);
- Objective 13: Active fluvial units (5.2.5);

Biodiversity

- Objective 14: Landscape-level biodiversity (6.2.3);
- Objective 15: Red-listed and blue-listed plant communities (5.2.6);
- Objective 16: Stand-level retention (8.5.1); and
- Objective 17: Sensitive grizzly bear habitat (5.2.7).

These objectives will be modelled within the EBM zone, essentially the mainland portion of the TSA.

4.0 FOREST ESTATE MODEL

4.1 Model Description

Timberline's simulation model CASH6 (*Critical Analysis by Simulation of Harvesting*) will be used to develop harvest schedules integrating all resource management considerations. The model, which has been used for numerous timber supply reviews, Innovative Forest Practices Agreement, and land use planning analyses, has been accepted for use in timber supply by the MoFR. The model uses a geographic approach to land base and inventory in order to adhere as closely as possible to the intent of forest cover constraints on harvesting. Maximum disturbance and minimum forest cover retention requirements are explicitly implemented.

A variable degree of spatial resolution is available including block-to-block adjacency, depending on inventory formulation and resource emphasis area definitions. Forest stands in refuges such as environmentally sensitive and inoperable areas that do not contribute to the periodic harvest are nonetheless included for their contribution to forest structure at both the stand and landscape levels.

In their current implementation, forest cover objectives require a control area over which to operate. The control area for a constraint set should correspond to a realistic element in the landscape. For example, the requirements associated with visual quality objectives are designed to operate on the scene visible from discrete sets of viewpoints. In aspatial mode, pseudo-geography may be employed to translate spatial constraints on harvesting into forest cover and static access constraints. The objective is to identify the "natural" constituency for forest cover constraints. Numerous levels of land aggregation are used to define both geographically separate areas and areas of similar management regime.

The use of forest cover objectives improves forest management modelling by ensuring that non-timber resources are given appropriate consideration. Cover constraints are applied at different levels of spatial resolution depending on the management zone, or resource emphasis area, in question.

Forest cover objectives place maximum and/or minimum limits on the amount of young, mature and/or old growth found in land base aggregates such as combinations of landscape units and ecosystem units or resource emphasis areas. CASH6 defines the following three classes of forest cover constraints for modelling management objectives within each land base aggregate.

1. Disturbance: the maximum area that can be younger than a specified age or shorter than a specified height. This is intended to model cutblock adjacency and green-up requirements.
2. Old-growth Retention: the minimum area that must be older than, or as old as, a specified age. This is intended to model both retention of cover and retention of old growth.
3. Mature Retention: the minimum proportion of area that must be retained over a lower retention age. This is intended to model thermal cover for wildlife or mature biodiversity requirements. Mature and old growth retention forest cover objectives may overlap and area that qualifies for both is counted in both.

5.0 LAND BASE DESCRIPTION

This section describes factors that influence management of the Kingcome TSA land base and the methodology used to determine the way in which land contributes to timber supply. Some portions of the productive land base, while not contributing to harvest, may be available to meet other resource needs.

The section presents the determination of the timber harvesting land base for the Kingcome TSA. Each factor in the table is described in the sections which follow. The order in which these factors are applied to remove areas from the timber harvesting land base is important, as many of the netdown features overlap spatially. In the tables which accompany each of the following sections, productive area represents the total productive area within the feature. Area removed represents the area removal at that step in the netdown process, net of any area overlapping other features previously removed. The classification of land base for contribution to analysis described in this section is based on the procedure outlined in the *Supplemental Guide for Preparing Timber Supply Analysis Data Packages* (MoFR, 2003c).

All of the land base classification steps performed during TSR 2 remain in the current classification. However, the following additions or modifications have been made since TSR 2:

- Existing road losses are now explicitly (spatially) identified and removed from the land base contributing to timber supply;
- Riparian reserve and management zones are now explicitly (spatially) identified and removed from the land base contributing to timber supply;
- Old growth management areas, established within some landscape units, are now identified and removed from the land base contributing to timber supply;
- Landscape units with no old growth management areas are now managed to retention levels set by the Order Establishing Provincial Non-spatial Old Growth Objectives (June 30, 2004);
- Wildlife habitat areas (WHAs) and Ungulate Winter Ranges (UWRs) are now identified and removed from the land base contributing to timber supply;
- Existing forest inventory age and height values were adjusted, and the forest inventory has been updated for disturbance to 2004;
- Archaeological sites have been explicitly identified and the land base contributing to timber supply has been adjusted to account for these areas;
- Karst terrain features are now identified and removed from the THLB;
- Biodiversity Areas and Conservancy Areas either proposed or established as result of the CCLRMP are now removed from the land base contributing to timber supply; and
- EBM objectives requiring areas to be removed from the THLB are incorporated into the netdown process.

The final classification results in a current THLB of 208,175 hectares (Pre-EBM) and 182,052 hectares (EBM), compared to the TSR 2 current timber harvesting land base (168,726 ha) documented in the previous timber supply review analysis report. While reductions to address new Central Coast biodiversity, conservancy and EBM objectives removed significant areas from timber production, these were more than offset by additions based on a new economic operability assessment, and revised low site criteria. The THLB area includes 5,549 hectares of unreverted timber licence areas which do not contribute to the TSA timber supply until after they are harvested and regenerated. Also, 12,937 hectares of recently disturbed areas are included in the timber harvesting land base. For the purpose of the analysis, these areas area classified as not satisfactorily restocked (NSR) that will successfully regenerate in the first simulation period.

Some parks and protected areas not managed by the BC Forest Service are included in the land base for analysis, as they contribute to non-timber objectives such as old-growth seral requirements to maintain landscape-level biodiversity.

The netdown results are summarized in Table 3. The productive area values in this table represent the total productive area of the feature, regardless of area removed previously. Pre-EBM netdowns are listed in Section 5.1 and additional EBM netdowns in Section 5.2.

Table 3 – Timber harvesting land base (THLB) determination

Land Classification	Refer to Section	Land Base			Productive Area (ha)
		Area (ha)	% of Crown	Volume (000 m^3)	
Total Area		1,172,428			
Exclusions from the total crown forest	5.1.1	21,274			0
Total Crown Forest		1,151,154	100		
Non-forest	5.1.2	369,252	32.1	0	0
Existing roads	5.1.3.1	4,457	0.4	0	0
Non-productive	5.1.4	126,749	11.0	0	0
Productive Forest		650,696	56.5	254,265	
Protected	5.1.5	32,781	2.8	13,832	32,781
G2G Biodiversity	5.1.6	14,088	1.2	4,844	14,215
G2G Conservancy	5.1.6	51,504	4.5	21,083	52,037
Inoperable	5.1.7	175,871	15.3	59,260	251,967
Operable Forest		376,452	32.7	155,246	
Sites with low growing potential	5.1.8	101,077	8.8	34,530	238,106
Non-merchantable	5.1.9	999	0.1	322	11,836
Environmentally sensitive – full netdown	5.1.11	5,146	0.4	2,548	35,026
Riparian	5.1.13	30,222	2.6	12,146	69,824
Wildlife Habitat (wha + uwr)	5.1.14	3,095	0.3	1,951	14,725
Old Growth Management Areas	5.1.15	1,544	0.1	964	9,491
Archaeological Sites	5.1.16	1,476	0.1	648	4,099
Karst	5.1.17	138	<0.1	42	3,768
Environmentally sensitive – partial netdown	5.1.10	13,778	1.2	7,391	96,979
Unstable terrain – partial netdown	5.1.12	10,802	0.9	4,964	156,323
Total Operable Reductions (Pre-EBM)		168,278	14.6	65,506	
Current THLB (Pre-EBM)		208,175	18.1	89,740	
EBM Exclusions					
Objective 3-5 – First Nations	5.2.1	1,072	0.1	481	4,099
Objective 9 - High Value Fish Habitat	5.2.2	7,052	0.6	3,052	38,374
Objective 10 - Not High Value Fish Habitat	5.2.3	1,462	0.1	856	30,711
Objective 11 – Forested Swamps	5.2.4	209	<0.1	100	1,998
Objective 15 - Red-listed Plant Communities	5.2.6	188	<0.1	134	2,247
Objective 15 – Blue-listed Plant Communities	5.2.6	13,095	1.1	8,378	48,601

Land Classification	Refer to Section	Land Base			Productive Area (ha)
		Area (ha)	% of Crown	Volume (000 m^3)	
Objective 17 – Grizzly	5.2.7	3,046	0.3	809	14,511
Total Operable Reductions (EBM)		26,123	2.3	13,810	
Current THLB (EBM)		182,052	15.8	75,930	
Less future roads (pre-EBM)	5.1.3.2	3,071	0.3		
Less future roads (EBM)	5.1.3.2	2,647	0.2		
Future THLB (Pre-EBM)		205,104	17.8		
Future THLB (EBM)		179,405	15.6		

5.1 Pre-EBM THLB Determination

5.1.1 Exclusions from the Total Crown Forest

The total area of the Kingcome TSA is 1,172,428 hectares. For timber supply purposes, private land, and crown land that is either managed by agencies other than the MoFR or administered by the MoFR but not a part of TSR 3 (*i.e.* woodlot licences) are generally excluded.

Although a revised ownership definition within the Kingcome TSA is underway, it has not been included in the analysis as it was not determined by the cut-off date for inclusion. A sensitivity analysis will be completed however, if the definition is established during the timber supply review.

Table 4 shows the area excluded from the timber harvesting land base. Ownership codes are generally used to identify whether land can be considered to contribute to timber supply. Ownership Codes which do not signify crown land in a forest management unit or timber licence land (see Section 5.1.19) are generally removed. These codes are those currently defined in the ownership layer. In the case of woodlots, these attributes are overridden by information contained in a separate woodlot GIS layer provided by MoFR.

Table 4 – Land base reductions for land not administered by MoFR

Land classification	Ownership Code	Area Removed (ha)
Private - Crown Grant	40N	11,518
Federal Reserve	50N	803
Indian Reserve	52N	6,197
Woodlots (ownership code overridden by designation in woodlot coverage)		2,756
Total		**21,274**

5.1.2 Non-forest

Non-forest land includes areas that are either not vegetated, such as lakes, rocks and shrubs that occupy less than 5% of the land, etc., or are unreported. Non-forest land also includes vegetated areas where less than 10% of the area is occupied by trees. With the exception of areas classified as bare ground or little tree cover but recently logged, all these non-forest areas are considered non-contributing to timber supply and are excluded from the Kingcome TSA (Table 5).

Table 5 – Land base reductions for non-forest

Classification	Area Removed (ha)
Non-Forested	369,252
Total	**373,709**

5.1.3 Roads, Trails and Landings

Forest operations create roads, trails, and landings that can reduce the productivity of growing sites, and reduce the area available for growing trees. Many existing roads and trails are identified as line features in the digital inventory. For input to modelling, areas and volumes associated with existing roads, trails, and landings must be estimated and removed from the timber harvesting land base. In addition, there are changes in available growing area and productivity for future stands due to road building disturbance.

5.1.3.1 Existing Roads, Trails and Landings

Existing roads for the Kingcome TSA are described as line features from the following sources:

- Consolidated road coverage used for the *Kingcome TSA Economic Operability Assessment* (Timberline 2006); and
- Licensee road classification by chart area (May 2006).

As the sources and detail of this information are varied, it is not possible to provide a meaningful summary by road classification. Existing roads have been spatially netted out of the land base using a 14 meter buffer width. This buffer width reflects an overall average site loss associated with road and cutblock development, and is based on the following assumptions:

- Average side slope: 50%
- Width of cut and running surface for 50% average side slope: 10 meters
- Average side cast: 6.5 meters
- Percent of side cast considered to be productive: 50%
- Allowance for quarries, landings and turnouts: 0.5 meters
- Total road allowance = 10 + (6.5 x .5) + 0.5 = 13.75 (rounded to 14 meters).

Existing road exclusions are shown in Table 6.

Table 6 – Land base reductions for existing roads

Classification	Area Removed (ha)
Existing roads	4,457
Total	**373,709**

5.1.3.2 Future Roads, Trails and Landings

Upon harvesting, a component of each stand is placed into a category that will remain in a disturbed state in perpetuity. If the area harvested is included in an area associated with forest cover constraints relating to integrated resource management, the road area will become part of the disturbance area permanently.

Generally these stands will provide harvest volume on the first entry but not on further entries. The area contributing to the long-term sustainable harvest is net of this amount. In CASH6, a percentage reduction will be applied to reduce the area of each newly-roaded forest class the first time it is harvested. In these cases, area reductions are made in the timber supply analysis after the volume is credited to the harvest.

The area that will be removed from the THLB for future reading was determined by applying a 14 meter buffer to the future roads developed for the Kingcome Economic Operability Study, and overlaying these areas on the existing THLB to determine the net area which will be removed. A summary by age class is provided in Table 7. However, the operability study also indicated that the proposed road network underestimated the actual roading requirements by approximately 16% (*Kingcome TSA Economic Operability Assessment,* Timberline, 2006). Therefore, these areas were increased by 16% to account for this bias. The majority of these removals fall in stands above age 40. The THLB area in these age classes totals 155,807 hectares, and the estimated future roaded area (3,071 hectares) represents 1.97% of this amount. Therefore, to model the correct area in future roads, a 2 % future road reduction will be applied to all stands currently greater than age 40 on the first entry.

Table 7 – Land base reductions for future roads, trails and landings

Age Class	THLB Area (ha)	THLB + 16% (ha)
0	144	167
1-20	97	113
21-40	66	77
41-60	204	237
61-80	287	333
81-100	142	165
101-120	109	126
121-140	42	49
141-250	253	294
251+	1,302	1,510
Total	**2,647**	**3,071**

5.1.4 Non-productive

Non-productive and non-commercial lands (Table 8) were removed based on age or site productivity:

- Mature stands with Crown closure < 10% (< 30% for Hemlock); or
- Stands with no assigned species or a site index < 5.0.

Table 8 – Land base reductions for non-productive

Criteria	Area Removed (ha)
Crown closure-based	88,579
Productivity-based	38,170
Total	**126,749**

5.1.5 Protected Areas

While protected areas are not managed for timber supply, the forested areas within them contribute to non-timber objectives, and they therefore are included in the land base for analysis. These areas were either identified based on ownership, or by a separate protected area (PA) coverage. Areas are summarized in Table 9.

Table 9 – Land base reductions for protected areas

Criteria	Name	Productive Area (ha)	Area Removed (ha)
Ownership layer	Crown Reserves	3,143	3,142
PA coverage	Beresford Island Ecological Reserve	2	2
	Brooks Peninsula Park	6,995	6,995
	Broughton Archipelago Marine Park	1,899	1,899
	Cape Scott Park	16,022	16,022
	Cormorant Channel Marine Park	238	238
	Duke of Edinburgh Ecological Reserve	57	57
	Echo Bay Marine Park	0	0
	God's Pocket Marine Park	538	538
	Kingcome River / Atlatzi River Ecological	385	385
	Klaskish River Ecological Reserve	126	126
	Lanz and Cox Islands Park	1,340	1,340
	Lawn Point Park	499	499
	Schoen Lake Park	1,537	1,537
Subtotal from PA coverage		29,639	29,639
TSA Total		32,781	32,781

5.1.6 G2G Biodiversity and Protected

The April 2006 orders-in-council established Central Coast Designated Area No. 2 for protection from harvesting under Part 13 of the Forest Act. Two categories of protected areas were identified, Conservancy Areas and Biodiversity Areas. More than half of the proposed Conservancy Areas have been legally designated and work is ongoing to designate the remaining Conservancies and the Biodiversity Areas.

Under Section 170 (2) of the Forest Act the Minister of Forests and Range, by written order, has suspended plans, prescriptions, cutting permits, timber sale licences and road permits within the Central Coast Designated Area No.2 (with some specified exemptions) and has directed that any person authorized to issue a permit, licence or plan not to do so if any part of the permit, licence or plan is in the designated area, unless exempted in the Minister's Order. Therefore, the Central Coast Designated Area is assumed to be reserved from logging in the timber supply analysis, and the areas removed from the THLB. Table 10 lists the areas removed from the THLB. A map showing the locations of all protected areas will be posted on the Kingcome TSR 3 website.

Table 10 – Land base reductions for Central Coast Designated Area No. 2

Theme	Name	Productive Area (ha)	Area Removed (ha)
Conservancy	Boat Bay	9	4
	Broughton	4,077	4,008
	Burdwood Group	117	1
	Catto Creek	847	847
	Dzawadi/Klinaklini Estuary	2	2
	Hunwadi / Ahnuhati – Bald	9,167	9,167
	Hunwadi/Ahnuhati-Bald	10,787	10,787
	Kingcome Estuary	28	28
	Mahpahkum-Ahkwuna	881	699
	Oogwewa'/Cape Caution	4,527	4,402
	Polkinghorn Islands	149	119
	Tsa-Latl/Smokehouse	179	179
	Upper Klinaklini River	20,733	20,733
	Wahkash Point	174	174
	Wakeman Estuary	132	132
	Waw Wat'l/Seymour Estuary	229	224
Subtotal		**52,037**	**51,504**
Biodiversity	Adeane Point-mining	1,300	1,300
	Hanson Island-head_lease	21	3
	Inland Cape Caution-mining	1,965	1,965
	Shelter Bay-mining	5,755	5,646
	Waump-mining	5,174	5,174
Subtotal		**14,215**	**14,088**
Total		**66,252**	**65,592**

5.1.7 Economically Inoperable

In TSR 2, it was apparent that the existing operability assessment significantly understated the economic availability of timber on the TSA. To address this, The Kingcome TSA Economic Operability Study was completed in 2006 (*Kingcome TSA Economic Operability Assessment* Timberline, 2006). This model was applied to all commercial species including cottonwood and alder, and was based on a Value Index, *i.e.* the difference between timber values and delivered wood costs for each stand of timber. The model was based on 2006 delivered wood costs, 10 year median log price selling price table and representative log grade distributions. It was necessary to establish a Value Index threshold to determine profitability. Upon first consideration, it would seem logical to use the breakeven point (no profit or loss when the stand is harvested). However, the following assessment supports the use a negative profit margin when determining which stands are economically operable.

Of the 56 cutting permits (CPs) reviewed for this project, 20 had a negative value index. Twelve of those were below $-10.00, and six were below $-20.00. In fact, the average volume-weighted Value Index for the helicopter CPs examined was $-9.94. Market variability and business cycles result in changes in economic thresholds for harvesting. The economic operability analysis is designed to avoid "spot market" conditions and assess availability over the long-term time horizon of the analysis. There is always a core component of the land base that will be available under most economic conditions. In addition, other more marginal components move in and out of economic availability, and harvest planning allows these stands to be accessed under the right market conditions.

These results support the conclusion that licensees on the coast have been able to harvest blocks that would appear to be unprofitable according to a strict application of the CVP system. In support of this harvesting, Interfor points out that:

1. Higher value stands harvested by licensees will frequently subsidize the development of marginal stands making them economically viable; and
2. Licensees with post-processing facilities may also harvest at a loss to maintain their customer base and to prevent substitution to other materials.

For these reasons, a stand was deemed inoperable if the net value (timber value minus delivered wood costs) was less than a $-10 profit margin. Scenarios using $-20 and $0 profit margins will be explored as sensitivities.

The preliminary results of this study were reviewed by licensees and staff of the North Island-Central Coast Forest District staff, and their comments were taken into consideration in developing the final economic operability definition.

Reductions to the timber harvesting land base due to inoperability are shown in Table 11. It should be noted that the area considered to be inoperable includes the entire Klinaklini supply block.

Table 11 – Land base reductions for inoperable areas

Inventory Description	Code	Total Area (ha)	Productive Area (ha)	Area Removed (ha)
Inoperable	**I**	**760,547**	**251,967**	**175,871**

5.1.8 Low Growing Potential

These stands do not currently have high enough timber volumes to make harvesting feasible and are not likely to achieve a harvestable volume over a reasonable time horizon. Stands may fall into this category in two ways:

1. The site is either not fully occupied by commercial tree species; or
2. The productivity of the site limits timber growth.

In the TSR 2 AAC determination rationale document, with reference to the low site criteria used, the Chief Forester stated that "*…the minimum volume requirements appear to be high in comparison to those used in the timber supply analyses for other coastal units. I also noted that the criteria used to exclude low productivity stands from the timber harvesting land base resulted in the exclusion of some very old stands that met the minimum volume criteria but were below the minimum site index value*." Licensees at that time were also concerned that the approach resulted in exclusions from the THLB in conditions where operational performance could be demonstrated. Consequently, in the *Implementation* section of the *Rationale*, the Chief Forester directed staff to "*…continue to review and refine the criteria used to identify low productivity stands in preparation for the next determination.*".

During a meeting with most licensees in attendance it was agreed that the TSR 2 thresholds for cedar and hemlock/balsam should be reviewed. The basis for this review was an assessment of demonstrated performance and future harvesting opportunities in the low site stands. Two harvest history and planning data sources were reviewed to assess the productivity spectrum in which licensees are presently operating.

To address the concerns noted above by the Chief Forester in his TSR 2 Determination, analysis of MoFR Results data and Interfor harvest block data were used to investigate performance in the inoperable. Results of this analysis indicated a significant level of performance in stands with site indices (SI) below the original low site thresholds used in TSR 2 (site index thresholds generated in VDYP6 based on the volume thresholds used). Specifically, a significant level of harvesting has been and is occurring in the SI range of 10-11 metres for cedar/cypress, and 12-13 metres for hemlock/balsam. Below these levels, while some harvesting is occurring, the performance clearly falls off. Consequently, conservative thresholds were selected. Minimum site index thresholds of 10.5 metres for cedar, and 12.5 metres for hemlock/balsam were selected to reasonably reflect past performance and future opportunities. Both data sources supported this conclusion. Although the data indicated that at least 5% of the harvesting occurs below these levels, this is probably offset by the fact that there will be some areas above the thresholds that would be excluded for productivity reasons as well.

Notwithstanding the above, MoFR staff remain concerned that the cedar/cypress and hemlock/balsam thresholds are lower than warranted. To address this issue, all parties agree that the lower site conditions in question (site index values between 10.5-11.0 metres for cedar/cypress and 12.5-13.5 metres for hemlock/balsam) should be grouped and monitored by analysis unit as a separate component, in order that their contribution to timber supply can be evaluated and regulated, if deemed necessary to prevent unrealistic reliance on these stands in a particular simulation period.

TSR 2 low site thresholds for Douglas fir (Fdc) and spruce were unchanged. No thresholds were applied to other species. The revised criteria for exclusion are listed in Table 12, along with the areas removed.

Table 12 – Land base reductions for sites with low growing potential

Leading Species	Site Index (m)	Total Area (ha)	Productive Area (ha)	Area Removed (ha)
Cedar/cypress	< 10.5	174,711	141,257	77,624
Douglas Fir	< 20.2	8,394	6,819	265
Hemlock/Balsam	< 12.5	196,533	89,118	23,092
Spruce	< 10.8	1,046	912	96
Total		**380,684**	**238,106**	**101,077**

It should be noted that application of the logging history information as described in Section 2.2, can result in the inclusion of areas which fall below either the economic operability or low site thresholds. The rationale is that these stands have been logged previously, and therefore represent reasonable future logging opportunities.

5.1.9 Non-merchantable

Non-merchantable forest types are currently not utilized in the Kingcome TSA. The areas are physically operable and exceed low site criteria but because of the inherent low economic opportunity they are not currently utilized. The criteria are listed in Table 13.

Table 13 – Land base reductions for non-merchantable forest types

Species	Total Area (ha)	Productive Area (ha)	Area Removed (ha)
Pine	**20,272**	**11,836**	**999**

5.1.10 Deciduous Species

Alder and aspen/cottonwood leading types were not excluded from the THLB, unless they were removed for factors other than species (eg. inoperable, riparian). Instead they have been assigned separate analysis units, and can be incorporated into the analysis in whole or in part depending upon the scenario. However, deciduous volumes have been excluded from yield curves for coniferous-leading types.

In total, 6,394 hectares of alder leading types and 648 hectares of cottonwood leading types are included in the Pre-EBM THLB.

The alder area compares to approximately 1,080 hectares included in TSR 2 (no cottonwood leading types were included in TSR 2). This is primarily due to the revised economic operability criteria, which based the inclusion of alder on a timber value of $\$70.28/m^3$. As well, there was no explicit low site threshold applied to alder, as the site index values were not deemed to be sufficiently reliable to permit this. Notwithstanding this, it is recognized that while the availability of alder may have been understated in TSR 2, not all of the currently included area may ultimately be economically accessible. In particular, 2,347 hectares of this alder component is currently over age 70, approaching the maximum age when alder is considered to be merchantable.

Currently, the Coast Region FRPA Implementation Team (CRIT) Silviculture Committee is developing a hardwood management strategy for the Coast Region. A draft discussion paper "*Hardwood Management in the Coast Forest Region*" has been prepared. This report suggests an interim target "*to actively manage for and grow up to 1,200 hectares/year of hardwood species for sawlog production*" (CRIT Unpublished draft report, 2008). The target for the North Island Central Coast Forest District is 200 hectares per year. It also suggests optimum rotations of 25-35 years to produce a minimum alder sawlog. This would require a very aggressive silviculture regime, with high initial densities, live crown management and density control. The VDYP/TIPSY yield curves employed in this analysis are based on more conventional regeneration strategies, and therefore the attendant yields and minimum harvest ages are considered to be very conservative.

In the base case timber supply analysis the harvest of deciduous species will be capped at approximately 25,000 cubic metres. This will create a requirement for approximately 70-80 hectares of hardwood silviculture per year, which appears to fall well within the silviculture targets suggested in the discussion paper. Alternative scenarios may also be explored to determine the implications of different harvest flows on the sustainability of the hardwood resource and the attendant silviculture requirements. These scenarios will include exclusion of the alder component currently greater than age 70.

5.1.11 Environmentally Sensitive Areas

ESA mapping for the Kingcome TSA was completed in 1978 for a variety of non-timber values. For soils, avalanche and regeneration problem categories, this mapping remains the "best available information" on a particular resource value or feature and was used in this timber supply analysis. It is however, recognized that this information is dated, and its reliability is questionable.

For recreation and wildlife habitat features, additional information has been acquired and was used in place of ESA mapping. Wildlife netdowns are summarized in Section 5.1.14.

Assessment of the current recreation inventory (REC) obtained from the ILMB concluded that the map is inaccurate (especially for class H/VH and H/H polygons) and incomplete (Southeast of Knight Inlet)[1], and that a review and adjustment was required to fix major issues in the recreation features inventory. Independent of the inventory there exists data (FTEN) for recreation tenures and reserve in layers in the ILMB.

The recreation inventory map (REC) was reviewed, along with the polygons, lines and points in the FTEN layers and recommendations made for appropriate criteria to remove areas from the THLB.

It was concluded that the two data sources, if used together, constitute the best available data on recreation management in the TSA. In this arrangement recreation features polygons were removed from the THLB as indicated in Table 14. In addition, features in FTEN layers were removed.

Table 14 – Supplementary recreation netdown sources

Coverage	Sensitivity	Significance	Removal (% criteria)
FTEN	-	-	100%
REC	H	VH, H	100%
	H	M	50%
	M	VH, H	50%

For the purposes of timber supply analysis, percent area reductions were used to remove areas from the THLB. The amounts of reduction applied for a particular ESA category are outlined in Table 15.

[1] C.J. Cornfield , Recreation Officer, Ministry of Tourism, Sport and the Arts, Discovery Coast Recreation District

Table 15 – Land base reductions for ESAs

ESA category	Criteria	Reduction (%)	Total Area (ha)	Productive Area (ha)	Area Removed (ha)
Avalanche	Ea1	100	3,994	3,359	371
Recreation	FTEN	100	2,826	2,786	383
Recreation	RECINV	100	988	908	215
Regeneration	Ep1, Ep2	100	30,858	23,350	4,177
Subtotal – full netdowns			**43,350**	**35,026**	**5,146**
Soils	Es1	80		44,578	9,812
Recreation	RECINV	50		52,401	3,966
Subtotal – partial netdowns				**96,979**	**13,778**
TSA Total				**132,005**	**18,924**

5.1.12 Unstable Terrain

The 1978 ESA mapping for areas of sensitive terrain is known to have some limitations. In particular, no areas of moderately sensitive terrain (Es2) have been mapped. In the last timber supply review, forest district staff conducted a study of detailed terrain stability to attempt to quantify the potential mapping problem. That study indicated that while there appeared to be only a slight underestimation of Class V areas (Es1), a large area of potential Class IV (Es2) area is not been identified.

While the 80 percent partial netdown for ESA = Es1 is considered to be a reasonable allowance for terrain class V areas, the Es2 classification does not accurately reflect terrain class IV. As was the case in TSR 2, slope-based factors have been applied to predict the area of operable land base in moderately unstable terrain (which is assumed to be equivalent to Es2). A reduction of 20 percent was then applied to these categories. Table 16 provides a summary of areas removed for this condition.

Table 16 – Land base reductions for unstable terrain

Slope Class	Predicted Percent of Class IV Terrain	Reduction (%)	Total Area (1) (ha)	Productive Area(1) (ha)	Area Removed (ha)
0-20%	3.5	20	9,744	6,233	369
21-40%	15.8	20	39,100	25,730	2,142
41-60%	38.9	20	101,396	51,391	4,065
61-80%	50.6	20	92,158	44,343	2,978
81-100%	43.1	20	28,324	13,596	855
101+%	32.7	20	39,819	15,030	393
TSA Total			**310,541**	**156,323**	**10,802**

(1) Area in slope class x predicted percent

5.1.13 Riparian Reserves and Management Zones

Riparian zones along waterways are required by the *Forest Range and Practices Act* to protect aquatic and terrestrial habitat. In TSR 2, riparian reserve zones were accounted for aspatially with a 4.2% reduction in the land base contributing to timber supply being applied. For this analysis, an explicit (spatial) stream buffering approach was employed. Riparian management areas were generated as buffer polygons around these features based on their classifications. The water features for the Kingcome TSA are currently compiled from two sources:

- Terrain Resource Inventory Mapping (TRIM); and
- Stream classification by licensee chart area.

Water features which have been categorized by the licensees are assumed to be the best information available. These areas are buffered according to the recommendations outlined in the *Riparian Management Area Guidebook* (Mover, 1995).

Water features outside of those provided by the licensees are based on TRIM and are classified as follows:

- Double line rivers are assumed to be S1;
- Single line rivers are classified using the slope of the stream reach and the distinction between definite/indefinite and intermittent streams (Table 17); and
- Lakes are categorized L1 to L4 based on area and BEC zone as outlined in the *Riparian Management Area Guidebook*. Marshes are categorised W1 to W4 using the same process. Wetland complexes (W5) were identified by producing 60 and 80 metre buffers around appropriately size wetlands and determining which of those wetlands and their buffers formed a "complex".

These are also buffered based on the recommendation outlined in the *Riparian Management Area Guidebook*. Categories of streams are summarized in Table 17.

Table 17 – Stream categories

Stream Class	Single Line Water Type	Slope Class
S2/S3	Definite & Indefinite	<20%
S4	Intermittent	<20%
S5	Definite & Indefinite	>= 20%
S6[1]	N/A	N/A

[1] – N/A for TRIM base, licensee

5.1.13.1 Streams and Rivers

Where available, stream classification was based on information submitted with Forest Development Plans. This inventory is updated as operational inventories are completed for planned harvest blocks. Stream reaches that are currently not inventoried are classified according to local knowledge and by relating to inventoried stream reaches. The number of mapped smaller streams has increased with the application of enhanced TRIM map data. The netdowns for riparian management areas follow the direction defined in the *Riparian Management Area Guidebook*. The classifications and associated stream buffer widths are summarized in Table 18.

Table 18 – Land base reductions for streams

Stream Class	Reserve Zone (RRZ) (m)	Management Zone (RMZ) (m)	RMZ Basal Area Retention (%)	Combined Riparian Zone Width[1] (m)	Area Removed (ha)
S1	50	20	50	60	1,637
S2-S3	30	20	50	40	21,901
S4	0	30	25	8	357
S5	0	30	25	8	4,632
S6	0	20	5	0	5
TSA Total					**28,532**

(1) Combined riparian zone width = reserve zone + (management zone * (basal area retention / 100))

5.1.13.2 Lakes and Wetlands

Buffers and management area netdowns are consistent with the *Riparian Management Area Guidebook* for wetlands and smaller lakes. Buffers have been created adjacent to mapped lakes and wetlands and netdowns applied as described in Table 19.

Table 19 – Land base reductions for lakes and wetlands

Lake/Wetland Class	Reserve Zone (RRZ) (m)	Management Zone (RMZ) (m)	RMZ Basal Area Retention (%)	Combined Riparian Zone Width[1] (m)	Area Removed (ha)
Unclassified					33
L1	10	0	25	10	730
L2	10	20	25	15	3
L3	0	30	25	8	88
L4	0	30	25	8	2
Subtotal					***856***
Unclassified					96
W1	10	40	25	20	277
W2	10	20	25	15	0
W3	0	30	25	8	246
W4	0	30	25	8	0
W5	10	40	25	20	215
Subtotal					***834***
TSA Total					**1,690**

(1) Combined riparian zone width = reserve zone + (management zone * (basal area retention / 100))

Table 20 summarizes the riparian management area reductions to the THLB in the Kingcome TSA.

Table 20 – Land base reductions for riparian management areas

Description	Total Area (ha)	Productive Area (ha)	Area Removed (ha)
Streams, lakes and wetlands	**106,314**	**69,824**	**30,222**

5.1.14 Identified Wildlife Habitat

Under the Forest and Range Practices Act, the Minister of Environment has identified two categories of species: Species at Risk and Regionally Important Wildlife which together are referred to as Identified Wildlife. An Identified Wildlife Management Strategy (IWMS) provides direction, policy, procedures and guidelines for managing Identified Wildlife. These include the establishment of wildlife habitat areas (WHAs) and the implementation of general wildlife measures (GWMs) and wildlife habitat area objectives, or through other management practices specified in strategic or landscape level plans.

Wildlife habitat areas (WHAs) are areas managed for selected species and plant communities that have been designated under the Forest Practices Code as Identified Wildlife. Since TSR 2 many WHAs have come into force. In areas where harvesting is prohibited in a WHA, that area was removed from the THLB (Table 19).

The Kingcome Ungulate Winter Range (UWR) areas were officially established on June 9, 2006. Legal boundaries of these areas have been incorporated into the database for this analysis, and the areas removed from the THLB. (Table 21).

Table 21 – Land base reductions for wildlife habitat areas

Description	Total Area (ha)	Productive Area (ha)	Area Removed (ha)
Wildlife habitat	2,312	2,286	1,127
Ungulate Winter Range	24,264	12,439	1,968
Total	**26,576**	**14,725**	**3,095**

5.1.15 Old Growth Management Areas

Old growth management areas were defined within a number of landscape unit/biogeoclimatic ecosystem classification variant combinations by selecting those areas as prescribed in the *Landscape Unit Planning Guide* (LUPG) (MoF, 1999). In order to meet these landscape level objectives two broad categories were characterized:

- Objectives specific to the LUPG; and
- Objectives specific to the current operational planning requirements.

Under the first objective, the LUPG requires that OGMAs be representative of the various ecosystems, where each ecosystem has a representative percentage of productive area that must be retained in older age classes. Under the second objective, the selection process was designed to reflect the operational commitments currently in place on the TSA.

OGMAs have been identified for five landscape units in the Kingcome TSA (Table 22). For the Pre-EBM analysis these areas are assumed to satisfy all seral biodiversity requirements and are unavailable for timber supply. These areas and the reductions to the timber harvesting land base are listed in Table 21. Old growth requirements will be met for the balance of the landscape units by applying old growth seral constraints at the Landscape Unit (LU)/BEC level (Section 9.2.2).

Table 22 – Land base reductions for old growth management areas

OGMA (Landscape Unit)	Total Area (ha)	Productive Area (ha)	Area Removed (ha)
Malcolm	814	808	535
Nahwitti	1,851	1,805	253
San Josef	2,867	2,581	231
Shushartie	1,557	1,480	283
Tsulquate	2,880	2,817	242
TSA Total	**9,969**	**9,491**	**1,544**

5.1.16 Archaeological Sites

Mapped archaeological sites (buffered point locations and mapped sensitive areas) were used to develop an appropriate netdown factor for timber supply analysis purposes. A 50-metre protection buffer was placed around all point locations. As this spatial information is not available for general distribution, and will not be included in the final archived spatial resultant data set, it was only used as background to develop aspatial netdown factors for timber supply analysis purposes. To accomplish this, the buffered areas were overlaid on the existing THLB. This information was then reviewed by licensee and First Nations representatives, and an aspatial netdown factor determined. This factor (0.63%) was applied to all harvestable polygons. (Table 23).

Table 23 – Land base reductions for archaeological sites

Description	Total Area (ha)	Productive Area (ha)	Area Removed (ha)
Archaeological Sites	**7,252**	**4,099**	**1,476**

5.1.17 Karst Features

In order to protect natural karst terrain systems and processes in the Kingcome TSA, mapped Karst features have been reviewed to determine an appropriate netdown to allow for protection of karst areas. Mapping of the high Karst Potential Areas was reviewed by licensees, and an appropriate netdown factor established. It was estimated that 8% of the mapped area falling within the THLB should be reserved from harvesting, and an 8% aspatial netdown factor was therefore applied to these mapped polygons (Table 24).

Table 24 – Land base reductions for Karst

Description	Total Area (ha)	Productive Area (ha)	Area Removed (ha)
Karst	**4,321**	**3,768**	**138**

5.1.18 Wildlife Tree Patches

Biodiversity planning is a requirement under the Forest Range and Practices Act and is done in accordance with the *Landscape Unit Planning Guide* (MoFR, 1999), and the definition of "priority biodiversity" planning described within. This priority biodiversity planning is the current focus of landscape unit planning and consists of two objectives: "*retention of old growth forest; and stand structure through wildlife tree retention (WTR)*".

The practice of leaving wildlife tree patches (WTPs) will be modelled in the timber supply analysis. WTPs will be modelled by reducing the area harvested, to account for trees that must be left standing in harvested areas. Existing Landscape Unit Plans (LUPs) contain specific WTP recommendations (Table 25). For all other landscape units, and BEC variants not specifically addressed within these plans, a 6% WTP allowance will be applied. Licensees (J. Leblanc, Interfor) have indicated that this is a reasonable reflection of current practice. It should be noted that this allowance will be employed in the Pre-EBM scenario, and outside the EBM zone in the EBM analysis. However, in the EBM analysis, an explicit WTP allowance will not be applied within the EBM zone, as the EBM objectives are deemed to adequately account for this factor.

Table 25 – WTP allowances in existing LUPs

Landscape Unit	BEC Variant	Pre-EBM THLB (ha)	WTP allowance (%)
Malcolm	CWHvm	3,776	10
Lower Nimpkish	CWHxm	0	11
	CWHvm	0	9
	MHmm	0	1
San Josef	CWHvh	3,733	6
	CWHvm	811	10
	MHmm1	0	1
Sushartie	CWHvh (in SMZ)	989	1
	CWHvh (Outside SMZ)	614	0
Upper Nimpkish	CWHxm	0	13
	CWHmm	0	14
	CWHvm	23	9
	MHmm	4	3
Tsulquate (draft)	CWHvh1	1,278	2
	CWHvm1	3,239	4
Subtotal		**14,467**	**5.9%**
Balance of area with no LUP		**193,708**	**6.0%**
Total		**208,175**	

5.1.19 Timber Licences Reversions

Timber licences and timber agreements are old forms of tenure where the licensee was granted rights to harvest merchantable timber within a specific licence area. These are not currently part of the normal TSA lands managed by the MoFR. However, once these lands have been harvested, reforested, and are designated as free growing they revert back to the TSA. They are included in the THLB, but do not contribute to timber supply until they are harvested and regenerated. In the context of the Kingcome TSA, any stands identified by licensees as expired, as well as any remaining timber licence areas younger than 50 years are assumed to have already reverted to the TSA. All remaining timber licences will be modelled to return to the TSA according to the reversion period. This is a general assumption, as it is recognized that expiry dates do not necessarily correspond to reversion dates. However, for the purposes of this analysis, this approach is deemed to provide a reasonable approximation. Table 26 provides a summary of all Timber Licence areas identified in the TSA, as well as those yet to be reverted. This information was provided to Timberline by Interfor (G. Sommers).

Table 26 – Timber licence reversion schedule and new contributions to the THLB

Expiry Year	Expired	Unexpired	Unexpired > Age 49[1]	Reversion Period
2006 or unknown	940			
2007	4,679	694	591	2007-2011
2008		5,532	2,918	2007-2011
2009		220	220	2007-2011
2010		2,653	1,042	2007-2011
2012		535	15	2012-2016
2013		342	104	2012-2016
2015		572	199	2012-2016
2016		310	93	2012-2016
2030		442	218	2027-2031
2031		350	149	2027-2031
TSA Total	**5,619**	**11,650**	**5,549**	

(1) These areas are assumed to be unreverted and will contribute to the THLB starting in the corresponding reversion period.

5.2 EBM THLB Determination

The Pre-EBM analysis will be based on the THLB determined to this point. A number of the objectives associated with the Ministerial Order require additional removals from the THLB. These will serve to further reduce the THLB on which the EBM analysis will be based, and are outlined in the following sections.

5.2.1 First Nations Objectives 3-5

These objectives are designed to protect First Nations values.

5.2.1.1 Objective 3: Traditional forest resources

1. *"Maintain traditional forest resources in a manner that supports First Nations' food, social and ceremonial use of the forest".*

5.2.1.2 Objective 4: Traditional heritage features

1. *"Protect traditional heritage features, other than culturally modified trees, and include a management zone of sufficient size to protect the integrity of the traditional heritage feature.*

2. *Despite subsection (1), a traditional heritage feature, other than a culturally modified tree, may be altered or removed after information-sharing or consultation with the applicable First Nation determines whether:*
   a) *the alteration or removal will cause a material adverse impact to the traditional heritage feature that is of continuing importance to the First Nation;*
   b) *the alteration or removal is required for road access, other infrastructure, or to address a safety concern; and*
   c) *there is any practical alternative to the alteration or removal".*

5.2.1.3 Objective 5: Culturally modified trees

1. *"Protect culturally modified trees, and include a management zone of sufficient size to protect the integrity of the culturally modified tree.*
2. *Despite subsection (1), a culturally modified tree may be altered or harvested after information-sharing or consultation with the applicable First Nation determines whether:*
   a) *the alteration or removal will cause a material adverse impact to the traditional heritage feature that is of continuing importance to the First Nation;*
   b) *the alteration or removal is required for road access, other infrastructure, or to address a safety concern;*
   c) *protection of all of the culturally modified trees in the cutblock would make harvesting the cutblock unviable; and*
   d) *there is any practical alternative to the alteration or removal".*
3. *Reserve culturally modified tree areas, at the landscape level and stand level, where practical, after information-sharing or consultation with the applicable First Nation."*

Land Base Definition

It was concluded based on discussions with licensees and First Nations representatives that the areas removed to account for archaeological sites in the pre-EBM scenario would need to be further expanded to address these objectives. To capture this impact, and again respecting the confidential nature of the mapped archaeological information, a further 0.63% aspatial land base reduction was applied to the pre-EBM THLB (Table 27).

Table 27 – Land base reductions for EBM Objectives 3 - 5

Description	Productive Area (ha)	Area Removed (ha)
Objectives 3-5	**4,099**	**1,072**

5.2.2 Objective 9. High value fish habitat

1. *"Adjacent to high value fish habitat, maintain a reserve zone with a width, on average, of 1.5 times the height of the dominant trees, and do not alter or harvest the forest in the reserve zones unless there is no practical alternative.*
2. *For the purposes of subsection (1), the width of the reserve zone in any one location may be increased or decreased by up to 0.5 tree heights to address site-specific values, including reserving critical habitat for species at risk.*
3. *Where some or all of the forest within the reserve zone required under subsection (1) has been previously altered or harvested, recruit functional riparian forest in that reserve zone, to the extent possible."*

Land Base Definition

High value fish habitat is defined in the MO as "*critical spawning and rearing areas for anadromous and nonanadromous fish*", and includes estuaries, floodplains and marine interface areas. A number of data sources Table 28) were employed which were determined to be the best sources of information to define probable high value fish habitat areas. However, a two-treelength buffer was used (vs. 1.5 as specified in subsection (1)), in order to account for smaller-sized, meandering streams and side channels. Within the buffered areas, a 100% netdown was applied. Areas removed included active low and medium bench active floodplains.

Table 28 – Land base reductions for EBM Objective 9

Description	Productive Area (ha)	Area Removed (ha)
Floodplains	8,100	1,695
HVFH	16,138	3,131
Lfish	13,651	2,148
Estu	113	0
Est_mo	372	77
Total	**overlapping conditions**	**7,052**

5.2.3 Objective 10. Aquatic habitat that is not high value fish habitat

1. *"Adjacent to the following aquatic habitat:*
   a) *S1-S3 streams;*
   b) *Lakes greater than 0.25 hectares; and*
   c) *marshes and fen wetlands greater than 0.25 hectare;*

   retain 90% of the functional riparian forest in a management zone with a width, on average, of 1.5 times the height of the dominant trees".
2. *The width of the management zone in subsection (1) may be increased or decreased by 0.5 tree lengths in any one location, to address site-specific values, including reserving critical habitat for species at risk.*
3. *Despite subsections (1) and (2), a forest stewardship plan may comply with the provisions for the managements of riparian management areas in accordance with the Forest and Range Practices Act and the regulations made there under, including section 8 of the Forest Planning and Practices Regulation for S1 to S3 streams and for lakes, and marsh and fen wetlands greater than 0.25 hectares.*
4. *Before altering or harvesting the forest described in subsection (3);*
   a) *Ascertain and retain the amount of functional riparian forest sufficient to retain stream bank stability and stream channel integrity;*
   b) *To the extent practical, develop and implement an adaptive management plan and monitor environmental impacts during any primary forestry activity; and*
   c) *Engage in information-sharing or consultation with the applicable First Nation.*
5. *Where some or all of the forest required in subsection (1) has been previously altered or harvested, to the extent practical, recruit functional riparian forest in that management zone or area."*

Land Base Definition

Buffers were defined as specified in subsection (1) from TRIM features. A buffer width of 1.35 times tree height was used (0.9 x 1.5). A 100% netdown was applied within these defined riparian buffers (Table 29).

Table 29 – Land base reductions for EBM Objective 10

Description	Productive Area (ha)	Area Removed (ha)
Not High Value Fish Habitat	30,711	1,462

5.2.4 Objective 11. Forested swamps

1. *"Adjacent to forested swamps greater than 0.25 hectares, retain 70% of the functional riparian forest in a management zone with a width, on average, equal to 1.5 times the height of the dominant trees.*
2. *For the purposes of subsection (1), the width of the management zone in any one location may be increased or decreased by 0.5 tree lengths, to address site-specific values, including reserving critical habitat for species at risk.*
3. *Despite subsection (1), an additional 10% of the forest in the management zone adjacent to the forested swamp may be altered or harvested where:*
   a) *alteration or removal is required for road access, other infrastructure, or to address a safety concern; or*
   b) *where 70% retention would make harvesting the cutblocks economically unviable.*
4. *Before altering or harvesting the forest pursuant to subsection (3);*
   a) *Ascertain and retain the amount of functional riparian forest sufficient to retain the integrity of the forested swamp;*
   b) *To the extent practical, develop and implement an adaptive management plan and monitor environmental impacts during any primary forestry activity; and*
   c) *Engage in information-sharing or consultation with the applicable First Nation.*
5. *Where some or all of the forest required in subsection (1) has been previously altered or harvested, to the extent practical, recruit functional riparian forest in that management zone or area."*

Land Base Definition

A forested swamp as defined in the MO means " a forested mineral wetland or a forested peatland with standing or gently flowing nutrient rich water in pools or channels, and the water table is usually at or near the surface…". Forested swamp buffers were determined from TRIM features as described in the MO. A 100% netdown within these areas within the defined buffer was applied to account for unmapped forest swamps. Potential forested swamp features were restricted to those falling within CWHvm1, CWHws2 and CWHds2 BEC subzones. Swamp features in other subzones were not considered to meet the nutrient rich definition of forested swamps. (Interfor, personal communications). The area removed is listed in Table 30.

Table 30 – Land base reductions for EBM Objective 11

Description	Productive Area (ha)	Area Removed (ha)
Forested Swamps	**1,998**	**209**

5.2.5 Objective 13. Active fluvial units

1. *"Retain 90% of the functional riparian forest on active fluvial units.*
2. *Despite subsection (1), up to an additional 10% of the forest on an active fluvial unit may be harvested in accordance with subsection (3).*
3. *Before altering or harvesting the functional riparian forest pursuant to subsection (2);*
    a) *Ascertain and retain the amount of functional riparian forest sufficient to retain bank stability and channel integrity on the active fluvial unit;;*
    b) *To the extent practical, develop and implement an adaptive management plan and monitor environmental impacts during any primary forestry activity; and*
    c) *Engage in information-sharing or consultation with the applicable First Nation".*

Land Base Definition

An active fluvial unit is defined in the MO as "an active floodplain, where water flows over land in a normal flood event, and includes low and medium benches, and the hydro-geomorphic zone of an active fan". Given this definition, it was concluded that these areas have already been captured within active floodplains (Objective 9).

5.2.6 Objective 15. Red-listed and blue-listed plant communities

1. *"Protect each occurrence of a red-listed plant community during a primary forest activity.*
2. *Despite subsection (1), up to 5% of each occurrence of a red-listed plant community may be disturbed if there is no practical alternative for road access, other infrastructure, or to address a safety concern."*
3. *"Protect at least 70% of each occurrence of a blue-listed plant community in Schedule 5 during a primary forest activity, or protect at least 70% of each type of blue-listed plant community that occurs in a landscape unit".*

Land Base Definition

Red-listed plant communities are defined in the MO as "plant communities that are rare, threatened or extirpated in British Columbia". Blue-listed plant communities are defined as "plant communities that are of special concern in British Columbia". The corresponding site series which define these conditions are set out in Schedules 4 and 5 of the MO. As full coverage Terrain Ecosystem Mapping (TEM) is not available for the Kingcome TSA, red and blue-listed plant communities were identified using an approach based on the biophysical model used to predict site index across the TSA. The methodology is documented in the report: "Methods Used to Model Ecosystem Based Management in the Kingcome TSA for Timber Supply Review 3" (Timberline, 2007b), prepared for the Kingcome TSA Stakeholders.

The analysis model predicted the spatial location of site series, which in turn permitted the identification of red and blue-listed plant communities based on Schedules 4 and 5. The site series predictions were compared to existing TEM information where a moderate spatial correlation was evident in areas where TEM mapping was available. Consequently, the approach was deemed to be a reliable surrogate for modelling purposes in the absence of TEM. However, Interfor noted that the land base deletion figure of 13,095 ha for blue-listed species appears to be high, considering that this reduction is the second to last exclusion in a long set of incremental land base netdowns. In addition, operational experience suggests that the correlation in the field is not high.

For the EBM analysis, 100% of the red-listed areas were netted out of the THLB. In addition, a 70% partial netdown was applied to all blue-listed series (Table 31). Red and blue-listed areas include only those stands at least 180 years of age.

Table 31 – Land base reductions for EBM Objective 15

Description	Productive Area (ha)	Area Removed (ha)
Red listed species	2,247	188
Blue listed species	48,601	13,095
Total	**50,848**	**13,283**

5.2.7 *Objective 17. Sensitive grizzly bear habitat*

1. *"Maintain sensitive grizzly bear habitat will not cause a material adverse impact to the stability of the sensitive grizzly bear habitat;*
2. *Before altering or harvesting sensitive grizzly bear habitat:*
    - a) *Obtain from a registered professional biologist confirmation that the disturbance.*
    - b) *To the extent practical, develop and implement an adaptive management plan and monitor the ecological impacts of the proposed forestry development; and*
    - c) *Engage in information-sharing or consultation with the applicable First Nation".*

Land Base Definition

A 100% netdown was applied to all areas within the most recently defined grizzly habitat zone (Table 32).

Table 32 – Land base reductions for EBM Objective 17

Description	Productive Area (ha)	Area Removed (ha)
Grizzly bear habitat	**14,665**	**3,046**

6.0 INVENTORY AGGREGATION

For the purposes of timber supply analysis the land base is aggregated into management zones and analysis units (AUs). A number of management zones were established previous to the order. These zones are common to both the Pre-EBM and EBM analyses, and therefore THLB area figures for both scenarios are included in the tabular summaries Section 6.1). In addition, several of the EBM objectives require the establishment of management zones to control the rate of harvest and/or retain existing forest cover conditions. These are described in Section 6.2.

6.1 Pre-EBM Management Zones

Management zones define geographical units within which specific management guidelines are applied. In the Kingcome TSA, management zones are established to address the following objectives:

- Landscape level biodiversity;
- Vancouver Island Land Use Plan (VILUP) Objectives;
- Visual quality objectives;
- Community watersheds (CWS); and
- Marbled Murrelet nesting habitat.

6.2 Landscape Units

Landscape-level biodiversity is managed by ensuring that old-growth targets are maintained across the landscape. To ensure that retained old growth is spatially distributed and represents the full range of natural ecological conditions, these targets are established by landscape unit and biogeoclimatic sub zone and variant. The distribution of TSA land by LU/BEC is shown in Table 33.

Table 33 – Area by landscape unit and BEC

Landscape Unit		BEC	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
No.	Name					
1	Ahnuhati-kwalate	CMA unp	5,489	48	0	0
1	Ahnuhati-kwalate	CWH vm 1	5,721	5,020	376	309
1	Ahnuhati-kwalate	CWH vm 2	5,569	3,353	52	44
1	Ahnuhati-kwalate	MH mm 1	6,906	1,366	11	11
2	Ahta	CMA unp	761	10	0	0
2	Ahta	CWH vm 1	7,172	6,886	2,620	2,173
2	Ahta	CWH vm 2	4,645	3,589	528	473
2	Ahta	MH mm 1	3,798	1,266	19	19
3	Allison	CWH vh 1	59,044	54,263	17,184	15,764
4	Belize	CMA unp	4,286	502	0	0
4	Belize	CWH vh 1	15,469	14,369	5,739	5,351
4	Belize	CWH vm 1	29,408	28,403	12,939	10,745
4	Belize	CWH vm 2	23,020	19,716	2,271	1,972
4	Belize	MH mm 1	9,793	4,415	48	46

Landscape Unit		BEC	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
No.	Name					
5	Bonanza	CWH vm 1	2,514	2,225	1,168	1,168
5	Bonanza	CWH vm 2	1,983	1,801	673	673
5	Bonanza	MH mm 1	1,408	1,045	160	160
6	Brooks	CWH vh 1	7,220	5,868	0	0
7	Broughton	CWH vm 1	22,384	21,194	9,915	8,342
8	Charles	CMA unp	2,617	80	0	0
8	Charles	CWH vm 1	5,575	5,280	2,488	2,157
8	Charles	CWH vm 2	4,134	3,157	276	251
8	Charles	MH mm 1	3,761	1,234	2	2
9	Franklin	CMA unp	1,153	151	0	0
9	Franklin	CWH dm	610	609	141	138
9	Franklin	CWH vm 1	0	0	0	0
9	Franklin	CWH vm 2	856	794	112	105
9	Franklin	MH mm 1	707	489	9	9
10	Fulmore	CWH vm 1	209	188	107	93
10	Fulmore	CWH vm 2	150	147	13	12
10	Fulmore	MH mm 1	93	77	8	7
11	Gilford	CMA unp	92	12	0	0
11	Gilford	CWH vm 1	38,530	36,314	23,816	21,269
11	Gilford	CWH vm 2	7,097	6,925	3,546	3,156
11	Gilford	MH mm 1	1,717	1,555	264	257
12	Holberg	CWH vh 1	1,326	1,095	354	354
12	Holberg	CWH vm 1	4,094	3,090	1,744	1,744
13	Huaskin	CWH vh 1	22,223	21,627	11,498	10,759
13	Huaskin	CWH vm 1	15,615	15,053	8,320	6,432
13	Huaskin	CWH vm 2	2,649	2,410	517	450
13	Huaskin	MH mm 1	144	85	1	1
14	Kakweiken	CMA unp	5,964	200	0	0
14	Kakweiken	CWH vm 1	9,084	8,272	3,156	2,445
14	Kakweiken	CWH vm 2	10,916	7,701	1,012	879
14	Kakweiken	MH mm 1	10,632	2,561	63	61
15	Kashutl	CWH vm 1	0	0	0	0
15	Kashutl	CWH vm 2	9	2	0	0
15	Kashutl	MH mm 1	5	0	0	0
16	Keogh	CWH vm 1	5,222	908	95	95
17	Klaskish	CWH vh 1	15,589	14,817	4,347	4,347
17	Klaskish	CWH vm 1	1,455	1,297	250	250
17	Klaskish	CWH vm 2	919	752	121	121
17	Klaskish	MH mm 1	11	7	0	0
18	Knight East	CMA unp	7,913	466	0	0
18	Knight East	CWH dm	109	94	44	43
18	Knight East	CWH vm 1	12,825	11,582	5,984	5,113
18	Knight East	CWH vm 2	8,975	7,321	1,337	1,136
18	Knight East	MH mm 1	7,944	3,866	94	92

Landscape Unit		BEC	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
No.	Name					
19	Lower Kingcome	CMA unp	12,684	1,027	19	19
19	Lower Kingcome	CWH vm 1	13,651	11,056	5,008	3,742
19	Lower Kingcome	CWH vm 2	11,745	7,757	1,383	1,152
19	Lower Kingcome	MH mm 1	10,303	3,043	149	147
20	Lower Klinaklini	CWH vm 1	3,182	1,105	639	587
20	Lower Klinaklini	CWH vm 2	386	334	81	74
20	Lower Klinaklini	CWH ws 2	613	155	0	0
20	Lower Klinaklini	MH mm 1	208	145	1	1
20	Lower Klinaklini	MH mm 2	1,392	145	0	0
21	Lower Nimpkish	CMA unp	2	0	0	5
21	Lower Nimpkish	CWH vm 1	670	78	5	0
21	Lower Nimpkish	CWH vm 2	8	0	0	0
22	Lull-Sallie	CMA unp	1,107	142	0	0
22	Lull-Sallie	CWH vm 1	12,935	12,519	6,580	5,734
22	Lull-Sallie	CWH vm 2	7,000	5,993	1,390	1,253
22	Lull-Sallie	MH mm 1	5,501	2,732	234	227
23	Mahatta	CWH vh 1	12,437	11,482	6,202	6,202
23	Mahatta	CWH vm 1	2,941	2,684	1,667	1,667
23	Mahatta	CWH vm 2	1,118	1,039	476	476
23	Mahatta	MH mm 1	2	2	0	0
24	Malcolm	CWH vm 1	8,664	6,115	3,776	3,776
25	Middle Klinaklini	CMA unp	42,273	14	0	0
25	Middle Klinaklini	CWH ds 2	12,555	7,440	0	0
25	Middle Klinaklini	CWH ws 2	13,530	6,319	0	0
25	Middle Klinaklini	ESSFmw	5,343	534	0	0
25	Middle Klinaklini	IDF ww	659	377	0	0
25	Middle Klinaklini	MH mm 2	16,617	1,177	0	0
26	Miriam	CMA unp	66	8	0	0
26	Miriam	CWH vm 1	11,765	11,579	5,749	4,690
26	Miriam	CWH vm 2	4,416	3,818	434	377
26	Miriam	MH mm 1	3,413	1,895	1	1
27	Nahwitti	CWH vh 1	33,595	24,026	4,016	4,016
27	Nahwitti	CWH vm 1	2,037	1,868	633	633
28	Nasparti	CWH vh 1	45	29	1	1
28	Nasparti	CWH vm 2	5	2	0	0
29	Neechanz	CWH vm 3	22	17	0	0
29	Neechanz	MH mm 1	1	0	0	0
30	Neroutsos	CWH vm 1	520	11	8	8
30	Neroutsos	CWH vm 2	221	11	1	1
31	Nigei	CWH vh 1	11,307	6,932	1,647	1,646
32	San Josef	CWH vh 1	29,062	24,960	3,733	3,733
32	San Josef	CWH vm 1	2,054	1,184	730	730
32	San Josef	CWH vm 2	180	155	81	81
33	Seymour	CMA unp	12,952	234	3	3

Landscape Unit No.	Landscape Unit Name	BEC	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
33	Seymour	CWH vm 1	7,919	7,001	2,187	1,698
33	Seymour	CWH vm 2	10,007	6,423	492	333
33	Seymour	CWH vm 3	165	125	0	0
33	Seymour	MH mm 1	11,656	2,897	83	82
34	Shushartie	CWH vh 1	15,527	13,808	1,603	1,603
35	Sim	CMA unp	140	5	0	0
35	Sim	CWH vm 1	887	785	321	282
35	Sim	CWH vm 2	487	446	84	80
35	Sim	MH mm 1	460	249	3	3
36	Smith Sound	CWH vh 1	342	302	45	44
37	Smokehouse	CWH vh 1	2	2	0	0
37	Smokehouse	CWH vm 1	40	40	8	7
37	Smokehouse	CWH vm 2	103	93	0	0
37	Smokehouse	MH mm 1	38	6	0	0
38	Snowdrift	CMA unp	1,572	203	0	0
38	Snowdrift	CWH vm 1	21,836	20,957	12,656	10,397
38	Snowdrift	CWH vm 2	11,304	9,489	2,642	2,299
38	Snowdrift	MH mm 1	5,328	2,403	87	75
39	Stafford	CMA unp	18	0	0	0
39	Stafford	MH mm 1	4	0	0	0
40	Tahsish	CWH vm 1	26	0	0	0
41	Tsulquate	CWH vh 1	8,817	8,152	1,278	1,278
41	Tsulquate	CWH vm 1	12,058	10,237	3,239	3,239
42	Upper Kingcome	CMA unp	39,692	1,395	44	44
42	Upper Kingcome	CWH vm 1	12,544	10,006	4,309	2,620
42	Upper Kingcome	CWH vm 2	12,963	6,992	534	382
42	Upper Kingcome	MH mm 1	18,648	4,642	182	166
43	Upper Klinaklini	BAFAunp	11,043	13	0	0
43	Upper Klinaklini	CMA unp	33,201	0	0	0
43	Upper Klinaklini	CWH ds 2	6,472	3,735	0	0
43	Upper Klinaklini	CWH ws 2	6,634	2,040	0	0
43	Upper Klinaklini	ESSFmw	14,785	1,702	0	0
43	Upper Klinaklini	IDF ww	10,434	6,651	0	0
43	Upper Klinaklini	IMA unp	14,560	8	0	0
43	Upper Klinaklini	MH mm 2	8,456	166	0	0
44	Upper Nimpkish	CMA unp	273	96	0	0
44	Upper Nimpkish	CWH vm 1	713	701	8	8
44	Upper Nimpkish	CWH vm 2	436	407	15	15
44	Upper Nimpkish	MH mm 1	501	384	4	4
45	Wakeman	CMA unp	20,842	382	1	1
45	Wakeman	CWH vm 1	17,777	15,105	8,369	5,740
45	Wakeman	CWH vm 2	17,388	10,606	1,725	1,453
45	Wakeman	MH mm 1	20,144	5,206	89	88
46	Walker	CWH vh 1	1,215	1,136	101	99

6.2.1 Vancouver Island Land Use Planning Zones

In the year 2000, the Vancouver Island Land Use Plan (VILUP) Higher Level Plan Order was established. This set management objectives for a number of Special Management Zones (SMZ) and Enhanced Forestry Zones (EFZ) on Vancouver Island. SMZ management objectives are designed to sustain forest ecosystem structure and function, requiring the retention of specified forest structural components. EFZ management objectives are designed to increase short-term availability of timber. A number of these zones are found within the Kingcome TSA (Table 34). Minimum forest cover retention objectives (for SMZs) and maximum disturbance objectives (for EFZs) will be applied within these areas.

Table 34 – VILUP Enhanced and Special Management Zones

Type	Name	No.	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
Enhanced	San Josef-Koprino	4	16,233	13,419	4,483	4,483
	Holberg	5	4,983	4,043	2,032	2,032
	Keogh-Cluxewe	6	1,777	833	92	92
	Mahatta-Neuroutsos	8	12,382	11,010	6,318	6,318
	Bonanza	11	4,149	3,419	1,275	1,275
Subtotal			39,524	32,724	14,200	14,200
Special	Goletas Channel	1	10,619	9,826	2,030	2,030
	W Coast Nawhitti Lowlands	2	695	456	57	57
	Brooks Bay	3	9,896	9,473	4,212	4,212
	Johnstone Strait	7	1,748	1,650	726	726
Subtotal			**22,958**	**21,405**	**7,025**	**7,025**
Total			**62,482**	**54,129**	**21,225**	**21,225**

6.2.2 Visually Sensitive Areas

Visual quality objectives are achieved by limiting the rate of harvest in areas that are identified as visually sensitive in a Visual Landscape Inventory. Each polygon is assigned a VQO. In the Kingcome TSA, VQOs are applied at the VQO polygon level within the defined Known Scenic Area. Areas outside of these polygons, and outside the VILUP Enhanced Zones were assigned to an Integrated Resource Management (IRM) objective, where only a general maximum disturbance objective was assigned to mimic cutblock adjacency. Table 35 provides a summary of these areas.

Table 35 – Visually sensitive areas

Resource Emphasis Area	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
Visual Quality – Preservation	4,976	4,493	788	734
Visual Quality – Retention	14,446	13,749	4,512	4,243
Visual Quality – Partial Retention	68,798	64,747	34,147	30,825
Visual Quality – Modification	6,590	5,988	3,533	3,074
VILUP – Enhanced Zones	39,524	32,724	14,200	14,200
Integrated Resource Management	1,038,094	528,995	150,995	129,710
Total	**1,172,428**	**650,696**	**208,175**	**182,052**

6.2.3 Community Watersheds

The Forest Planning and Practices Regulation places limits on harvesting in identified Community Watersheds. There are three such areas within the Kingcome TSA (Table 36), although only one watershed incorporates a significant THLB.

Table 36 – Community watersheds

Community Watershed	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
Calbick (900.001)	6	6	0	0
Quaee (900.002)	377	175	0	0
Tsulquate (920.069)	4,205	3,813	760	760
Total	**4,588**	**3,994**	**760**	**760**

6.2.4 Marbled Murrelet Nesting Habitat

The March 2006 Notice under Section 7(2) of the FPPR for the North Island Central Coast Forest District requires that the total amount of currently suitable nesting habitat for Marbled Murrelet in the non-contributing land base (as of March 2006) be maintained.

In order to evaluate how much suitable habitat remains in the non-contributing land base the TSR 3 analysis will incorporate coarse scale mapping of potential suitable Marbled Murrelet nesting habitat. Habitat mapping data was based on application of the BC Coast Marbled Murrelet Suitability Model (Chatwin and Mather, 2007). The model was used in that study to estimate the distribution of existing habitat. It was considered a strategic level assessment, and was not supplemented with any photo mapping or low level reconnaissance. The mapping did not consider classes of habitat quality, and stand attributes such as canopy structure and site productivity were not considered. Further, the data used was only current to TSR 2, and therefore the results are somewhat dated.

Portions of these areas are included in the Kingcome TSA, as shown in Table 37. In the analysis, no restrictions will be placed on harvesting within these areas. However, the levels of harvesting within the nesting habitat will be tracked and reported on.

Table 37 – Marbled murrelet nesting habitat

Description	Total Area (ha)	Prod. Area (ha)	THLB (ha) Pre-EBM	THLB (ha) EBM
Nesting habitat	**161,271**	**150,953**	**75,945**	**63,160**

6.3 EBM Management Zones

In addition to the Pre-EBM management zones described in Section 6.1, the following management zones have been applied to address EBM Objectives 8, 12 and 14.

6.3.1 Objective 8. Important fisheries watersheds

1. *"Maintain equivalent clearcut area < 20% in important fisheries watersheds.*
2. Despite subsection (1), an equivalent clearcut area of more than 20% may be maintained after:
    a) *information-sharing or consultation with the applicable First Nation;*
    b) *A coastal watershed assessment or similar assessment of watershed sensitivity to forest development disturbance is completed to relevant professional standards;*
    c) *Maintaining an amount, type and distribution of forest cover that is sufficient to sustain natural hydrological and fluvial processes, based on the assessment of subsection (2) (b); and*
    d) *To the extent practical, an adaptive management plan is developed and implemented to monitor environmental impacts during any primary forest activity."*

Important fisheries watersheds were identified based on Schedule 2 of the MO. The productive and THLB areas are reported in Table 38.

Table 38 – Important fisheries watersheds area summary – Objective 8

Description	Prod. Area (ha)	THLB (ha) EBM
Important fisheries watersheds	**164,406**	**34,121**

6.3.2 Objective 12. Upland streams

1. *"For watersheds in Schedule 2 of the MO, maintain 70% or more of the forest, in the portion of the watershed occupied by upland streams, as functional riparian forest.*
2. *For the purposes of subsection (1), allocate retention to include upland stream reaches with unique microclimate or other rare ecological or geomorphological characteristics.*
3. Despite subsection (1), an equivalent clearcut area of more than 20% may be maintained after:
    a) *information-sharing or consultation with the applicable First Nation;*
    b) *A coastal watershed assessment or similar assessment of watershed sensitivity to forest development disturbance is completed to relevant professional standards;*
    c) *Maintaining an amount, type and distribution of forest cover that is sufficient to sustain natural hydrological and fluvial processes, based on the assessment of subsection (3) (b); and*

d) *To the extent practical, an adaptive management plan is developed and implemented to monitor environmental impacts during any primary forest activity.*

Land Base Definition

Upland streams are defined in the MO as "streams with slope greater than 5% that are classified as S4 and S6 streams in Section 47 of the Forest Planning and Practices Regulation". For this analysis, these zones were defined as areas within important fisheries zones (Objective 8) which fall above the floodplain, are outside of existing riparian zones. However, for modelling purposes, a 10% slope break was used as it was felt that the resolution of the slope gradient data was too coarse to reliably define a 5% gradient. Within the forested area of the zone, a 30% disturbance constraint will be applied. The zone area is summarized in Table 39.

Table 39 – Upland streams – Objective 12

Description	Prod. Area (ha)	THLB (ha) EBM
Upland streams	**139,663**	**29,756**

6.3.3 Objective 14. Landscape-level biodiversity

1. *"For landscape units in Schedule 1, retain an amount of old forest equal to or greater than that specified for each site surrogate listed in Schedule 3, except where alteration or removal is required for road access, other infrastructure, or to address a safety concern.*
2. *Where there is less than the old forest in a landscape unit required in subsection (1), to the extent possible recruit forest to meet the representation requirements within 180 years".*
3. *Where the requirement of (2) applies harvesting of old forest is not permitted except where:*
    a. *Alteration or removal is required for road access, other infrastructure, or to address safety concerns; or*
    b. *Information sharing or consultation with First Nations determines there is no practical alternative.*

4. *Maintain, in each landscape unit, less than 50% of each site series surrogate listed in Schedule 3 in mid-seral forest age classes, to the extent practical.*
5. *Where there is more than 50% of any site series surrogate listed in Schedule 3 in mid-seral forest age classes in any landscape unit, then reduce the mid-seral forest age classes in that site series surrogate in that landscape unit to less than 50% within 80 years, to the extent practical.*
6. *To the extent practical, include within old forest retention areas, habitat elements important for species at risk, ungulate winter range, regionally important wildlife, including:*
    c. *Mountain goats;*
    d. *Grizzly bears;*
    e. *Northern goshawks;*
    f. *Tailed frogs, and*
    g. *Marbled murrelets.*

Land Base Definition

The provincial BEC coverage was overlaid with the Kingcome TSA VRI coverage (with adjusted site indices) to assign site series surrogates (SSS) (unique BEC/AU combinations) to the land base;

These site series surrogates (BEC/AU) will then be used to apply old growth representation targets as defined in the MO. In this case, AU definitions differ from those used in this analysis to model stand growth. The definitions are included in Table 40.

Table 40 – AU definitions for site series surrogate (SSS) definitions – Objective 12

AU	Description	Criteria
1	Fir - Good	ITG 1-8, SI >27
2	Fir - Medium	ITG 1-8, SI 21-27
3	Fir - Poor	ITG 1-8, SI <=20
4	Cedar - Good	ITG 9-11, SI >23
5	Cedar - Medium	ITG 9-11, SI 16-23
6	Cedar - Poor	ITG 9-11, SI <=15
7	HemBal - Good	ITG 12-20, SI >22
8	HemBal - Medium	ITG 12-20, SI 12.6-22
9	HemBal - Poor	ITG 12-20, SI <=12.5
10	Spruce - Good	ITG 21-26, SI >22
11	Spruce - Medium	ITG 21-26, SI 16-22
12	Spruce/Pine - Poor	SI <= 15, Pine ITG 21-34, All SI
13	Deciduous - All	ITG 35-42, SI all

6.4 Analysis Unit Definitions

To reduce the complexity and volume of information used and generated in timber supply models, individual stands may be aggregated into fewer, larger and more or less homogeneous analysis units. Analysis units are usually comprised of combinations of stands with similar tree species, timber growing capability (site index), silvicultural management regimes, and in some cases management objectives.

Yield tables representing the growth of trees on each polygon within the analysis unit are combined to represent average growth of stands on the unit. Yield tables for current and future stands are developed using this approach. Analysis units are formed in order to track growth characteristics of similar stands.

The definition of analysis units originated from the Kingcome TSA TSR 2 analysis, with modifications after a series of TSA licensee and MOFR regional and district reviews. Changes from TSR 2 include:

- New aspen/cottonwood (Act) analysis unit, to incorporate all Act leading stands in the inventory.
- New Fdc planted zone(1), used to convert existing analysis units to a future regime planted to Fdc.
- New marginal cedar and hemlock analysis units added to separate low site conditions.

- Analysis units divided by EBM management zone, to provide for subsequent flexibility with different yield table generation parameters under EBM management scenarios.

(1)Fdc is being planted as a leading component in the southern most part of the TSA and on south facing slopes, warranting its inclusion as part of the analysis unit definition. Interfor spatially identified these areas on a map, which was used to define the Fdc planted zone. Modelling assumptions within this Fdc planted zone were subsequently clarified with MoFR and Interfor, and it was agreed that all existing non-Fdc leading stands inside the Fdc planted zone would be directed to a future planted Fdc managed stand yield table (MSYT).

The same analysis unit designations and numbering conventions were employed in both the pre-EBM and EBM runs. However, for the EBM scenario, an additional high stand retention EBM zone was defined based on VQO preservation and retention designations. Analysis units within this area were split out and assigned separate designations.

Analysis unit definitions are summarized in Table 41. EBM high retention analysis units include “VQO” in the AU description.

Table 41 – Analysis unit definitions for existing and regenerated stands

Current AU	Future AU	THLB (ha) Pre-EBM	THLB (ha) EBM	AU Description	Leading Species	Inv SI Range	EBM Zone	Fdc Plant Zone	Era
1	201	224	224	CW-GOOD	Cw,Yc	>=20	Out	Out	Exist Natural
2	202	690	690	CW-MED	Cw,Yc	15-19.9	Out	Out	Exist Natural
3	203	6,410	6,410	CW-POOR	Cw,Yc	11.6-14.9	Out	Out	Exist Natural
4	204	1,927	1,927	HW/BA-GOOD	Hwc,Hm,Ba	>=25	Out	Out	Exist Natural
5	205	1,406	1,406	HW/BA-MED	Hwc,Hm,Ba	20-24.9	Out	Out	Exist Natural
6	206	4,739	4,739	HW/BA-POOR	Hwc,Hm,Ba	13.6-19.9	Out	Out	Exist Natural
7	207	270	270	SS	Ss	All	Out	Out	Exist Natural
8	208	385	385	DR	Dr,Mb	All	Out	Out	Exist Natural
10	210	107	107	FDC	Fdc	All	Out	In	Exist Natural
11	211	1,760	1,613	CW-GOOD-EBM	Cw,Yc	>=20	In	Out	Exist Natural
12	212	16,726	12,929	CW-MED-EBM	Cw,Yc	15-19.9	In	Out	Exist Natural
13	213	50,930	40,701	CW-POOR-EBM	Cw,Yc	11.6-14.9	In	Out	Exist Natural
14	214	8,825	7,454	HW/BA-GOOD-EBM	Hwc,Hm,Ba	>=25	In	Out	Exist Natural
15	215	8,896	7,579	HW/BA-MED-EBM	Hwc,Hm,Ba	20-24.9	In	Out	Exist Natural
16	216	16,585	12,282	HW/BA-POOR-EBM	Hwc,Hm,Ba	13.6-19.9	In	Out	Exist Natural
17	217	572	125	SS-EBM	Ss	All	In	Out	Exist Natural
18	218	4,680	3,227	DR-EBM	Dr,Mb	All	In	Out	Exist Natural
19	219	603	93	ACT-EBM	Act	All	In	Out	Exist Natural
20	220	801	416	FDC-EBM	Fdc	All	In	In	Exist Natural
21	221		37	CW-GOOD-EBM-VQO	Cw,Yc	>=20	In	Out	Exist Natural
22	222		512	CW-MED-EBM-VQO	Cw,Yc	15-19.9	In	Out	Exist Natural
23	223		1,136	CW-POOR-EBM-VQO	Cw,Yc	11.6-14.9	In	Out	Exist Natural
24	224		470	HW/BA-GOOD-EBM-VQO	Hwc,Hm,Ba	>=25	In	Out	Exist Natural
25	225		503	HW/BA-MED-EBM-VQO	Hwc,Hm,Ba	20-24.9	In	Out	Exist Natural
26	226		1,333	HW/BA-POOR-EBM-VQO	Hwc,Hm,Ba	13.6-19.9	In	Out	Exist Natural
27	227		16	SS-EBM-VQO	Ss	All	In	Out	Exist Natural

Current AU	Future AU	THLB (ha) Pre-EBM	THLB (ha) EBM	AU Description	Leading Species	Inv SI Range	EBM Zone	Fdc Plant Zone	Era
28	228		113	DR-EBM-VQO	Dr,Mb	All	In	Out	Exist Natural
30	230		338	FDC-EBM-VQO	Fdc	All	In	In	Exist Natural
32	232	67	67	CW-MED-TOFDC	Cw,Yc	15-19.9	Out	In	Exist Natural
33	233	104	104	CW-POOR-TOFDC	Cw,Yc	11.6-14.9	Out	In	Exist Natural
34	234	22	22	HW/BA-GOOD-TOFDC	Hwc,Hm,Ba	>=25	Out	In	Exist Natural
35	235	133	133	HW/BA-MED-TOFDC	Hwc,Hm,Ba	20-24.9	Out	In	Exist Natural
36	236	631	631	HW/BA-POOR-TOFDC	Hwc,Hm,Ba	13.6-19.9	Out	In	Exist Natural
38	238	7	7	DR-TOFDC	Dr,Mb	All	Out	In	Exist Natural
42	242	294	229	CW-MED-TOFDC-EBM	Cw,Yc	15-19.9	In	In	Exist Natural
43	243	778	614	CW-POOR-TOFDC-EBM	Cw,Yc	11.6-14.9	In	In	Exist Natural
44	244	282	264	HW/BA-GOOD-TOFDC-EBM	Hwc,Hm,Ba	>=25	In	In	Exist Natural
45	245	387	290	HW/BA-MED-TOFDC-EBM	Hwc,Hm,Ba	20-24.9	In	In	Exist Natural
46	246	941	585	HW/BA-POOR-TOFDC-EBM	Hwc,Hm,Ba	13.6-19.9	In	In	Exist Natural
47	247	36	7	SS-TOFDC-EBM	Ss	All	In	In	Exist Natural
48	248	146	95	DR-TOFDC-EBM	Dr,Mb	All	In	In	Exist Natural
49	249	5	0	ACT-TOFDC-EBM	Act	All	In	In	Exist Natural
52	252		4	CW-MED-TOFDC-EBM-VQO	Cw,Yc	15-19.9	In	In	Exist Natural
53	253		31	CW-POOR-TOFDC-EBM-VQO	Cw,Yc	11.6-14.9	In	In	Exist Natural
55	255		78	HW/BA-MED-TOFDC-EBM-VQO	Hwc,Hm,Ba	>=25	In	In	Exist Natural
56	256		231	HW/BA-POOR-TOFDC-EBM-VQO	Hwc,Hm,Ba	20-24.9	In	In	Exist Natural
57	257		15	SS-TOFDC-EBM-VQO	Hwc,Hm,Ba	13.6-19.9	In	In	Exist Natural
58	258		1	DR-TOFDC-EBM-VQO	Ss	All	In	In	Exist Natural
61	261	2,495	2,495	CW-MARG	Cw,Yc	<=11.5	Out	Out	Exist Natural
62	262	2,298	2,298	HW/BA-MARG	Hwc,Hm,Ba	<=13.5	Out	Out	Exist Natural
63	263	14,252	11,889	CW-MARG-EBM	Cw,Yc	<=11.5	In	Out	Exist Natural
64	264	5,740	4,148	HW/BA-MARG-EBM	Hwc,Hm,Ba	<=13.5	In	Out	Exist Natural
65	265		185	CW-MARG-EBM-VQO	Cw,Yc	<=11.5	In	Out	Exist Natural
66	266		333	HW/BA-MARG-EBM-VQO	Hwc,Hm,Ba	<=13.5	In	Out	Exist Natural

Current AU	Future AU	THLB (ha) Pre-EBM	THLB (ha) EBM	AU Description	Leading Species	Inv SI Range	EBM Zone	Fdc Plant Zone	Era
67	267	65	65	CW-MARG-TOFDC	Cw,Yc	<=11.5	Out	In	Exist Natural
68	268	139	139	HW/BA-MARG-TOFDC	Hwc,Hm,Ba	<=13.5	Out	In	Exist Natural
69	269	143	124	CW-MARG-TOFDC-EBM	Cw,Yc	<=11.5	In	In	Exist Natural
70	270	236	157	HW/BA-MARG-TOFDC-EBM	Hwc,Hm,Ba	<=13.5	In	In	Exist Natural
72	272		41	HW/BA-MARG-TOFDC-EBM-VQO	Hwc,Hm,Ba	<=13.5	In	In	Exist Natural
101	301	2,894	2,894	CW-GOOD	Cw,Yc	>=20	Out	Out	Exist Managed
102	302	322	322	CW-MED	Cw,Yc	15-19.9	Out	Out	Exist Managed
103	303	6	6	CW-POOR	Cw,Yc	11.6-14.9	Out	Out	Exist Managed
104	304	1,345	1,345	HW/BA-GOOD	Hwc,Hm,Ba	>=25	Out	Out	Exist Managed
105	305	7,263	7,263	HW/BA-MED	Hwc,Hm,Ba	20-24.9	Out	Out	Exist Managed
106	306	119	119	HW/BA-POOR	Hwc,Hm,Ba	13.6-19.9	Out	Out	Exist Managed
107	307	813	813	SS	Ss	All	Out	Out	Exist Managed
108	308	161	161	DR	Dr,Mb	All	Out	Out	Exist Managed
111	311	7,647	7,161	CW-GOOD-EBM	Cw,Yc	>=20	In	Out	Exist Managed
112	312	1,708	1,637	CW-MED-EBM	Cw,Yc	15-19.9	In	Out	Exist Managed
113	313	366	358	CW-POOR-EBM	Cw,Yc	11.6-14.9	In	Out	Exist Managed
114	314	2,471	2,239	HW/BA-GOOD-EBM	Hwc,Hm,Ba	>=25	In	Out	Exist Managed
115	315	11,080	10,217	HW/BA-MED-EBM	Hwc,Hm,Ba	20-24.9	In	Out	Exist Managed
116	316	799	759	HW/BA-POOR-EBM	Hwc,Hm,Ba	13.6-19.9	In	Out	Exist Managed
117	317	10	8	SS-EBM	Ss	All	In	Out	Exist Managed
118	318	992	838	DR-EBM	Dr,Mb	All	In	Out	Exist Managed
119	319	31	0	ACT-EBM	Act	All	In	Out	Exist Managed
120	320	109	68	FDC-EBM	Fdc	All	In	In	Exist Managed
121	321		62	CW-GOOD-EBM-VQO	Cw,Yc	>=20	In	Out	Exist Managed
122	322		1	CW-MED-EBM-VQO	Cw,Yc	15-19.9	In	Out	Exist Managed
124	324		9	HW/BA-GOOD-EBM-VQO	Hwc,Hm,Ba	>=25	In	Out	Exist Managed
125	325		75	HW/BA-MED-EBM-VQO	Hwc,Hm,Ba	20-24.9	In	Out	Exist Managed
128	328		2	DR-EBM-VQO	Dr,Mb	All	In	Out	Exist Managed

Current AU	Future AU	THLB (ha) Pre-EBM	THLB (ha) EBM	AU Description	Leading Species	Inv SI Range	EBM Zone	Fdc Plant Zone	Era
131	331	66	66	CW-GOOD-TOFDC	Cw,Yc	>=20	Out	In	Exist Managed
132	332	36	36	CW-MED-TOFDC	Cw,Yc	15-19.9	Out	In	Exist Managed
135	335	105	105	HW/BA-MED-TOFDC	Hwc,Hm,Ba	20-24.9	Out	In	Exist Managed
141	341	243	224	CW-GOOD-TOFDC-EBM	Cw,Yc	=20	In	In	Exist Managed
144	344	159	136	HW/BA-GOOD-TOFDC-EBM	Hwc,Hm,Ba	>=25	In	In	Exist Managed
145	345	509	457	HW/BA-MED-TOFDC-EBM	Hwc,Hm,Ba	20-24.9	In	In	Exist Managed
146	346	1	1	HW/BA-POOR-TOFDC-EBM	Hwc,Hm,Ba	13.6-19.9	In	In	Exist Managed
147	347	21	1	SS-TOFDC-EBM	Ss	All	In	In	Exist Managed
148	348	23	2	DR-TOFDC-EBM	Dr,Mb	All	In	In	Exist Managed
151	351		4	CW-GOOD-TOFDC-EBM-VQO	Cw,Yc	=20	In	In	Exist Managed
154	354		15	HW/BA-GOOD-TOFDCEBM-VQO	Hwc,Hm,Ba	>=25	In	In	Exist Managed
155	355		17	HW/BA-MED-TOFDC-EBM-VQO	Hwc,Hm,Ba	20-24.9	In	In	Exist Managed
158	358		18	DR-TOFDC-EBM-VQO	Dr,Mb	All	In	In	Exist Managed
162	362	45	45	HW/BA-MARG	Cw,Yc	<=13.5	Out	Out	Exist Managed
163	363	95	94	CW-MARG-EBM	Hwc,Hm,Ba	<=11.5	In	Out	Exist Managed
164	364	38	33	HW/BA-MARG-EBM	Cw,Yc	<=13.5	In	Out	Exist Managed
167	367	26	26	CW-MARG-TOFDC	Hwc,Hm,Ba	<=11.5	Out	In	Exist Managed
401	601	10	10	CW-GOOD	Cw,Yc	>=20	Out	Out	NSR
402	602	296	296	CW-MED	Cw,Yc	15-19.9	Out	Out	NSR
403	603	2,056	2,056	CW-POOR	Cw,Yc	11.6-14.9	Out	Out	NSR
404	604	147	147	HW/BA-GOOD	Hwc,Hm,Ba	>=25	Out	Out	NSR
405	605	93	93	HW/BA-MED	Hwc,Hm,Ba	20-24.9	Out	Out	NSR
406	606	3	3	HW/BA-POOR	Hwc,Hm,Ba	13.6-19.9	Out	Out	NSR
410	610	28	28	FDC	Fdc	All	Out	In	NSR
411	611	274	241	CW-GOOD-EBM	Cw,Yc	>=20	In	Out	NSR
412	612	860	816	CW-MED-EBM	Cw,Yc	15-19.9	In	Out	NSR
413	613	7,699	7,008	CW-POOR-EBM	Cw,Yc	11.6-14.9	In	Out	NSR
414	614	539	500	HW/BA-GOOD-EBM	Hwc,Hm,Ba	>=25	In	Out	NSR

Current AU	Future AU	THLB (ha) Pre-EBM	THLB (ha) EBM	AU Description	Leading Species	Inv SI Range	EBM Zone	Fdc Plant Zone	Era
415	615	273	263	HW/BA-MED-EBM	Hwc,Hm,Ba	20-24.9	In	Out	NSR
416	616	171	157	HW/BA-POOR-EBM	Hwc,Hm,Ba	13.6-19.9	In	Out	NSR
419	619	14	0	ACT-EBM	Act	All	In	Out	NSR
420	620	198	185	FDC-EBM	Fdc	All	In	In	NSR
421	621		18	CW-GOOD-EBM-VQO	Cw,Yc	>=20	In	Out	NSR
422	622		20	CW-MED-EBM-VQO	Cw,Yc	15-19.9	In	Out	NSR
423	623		28	CW-POOR-EBM-VQO	Cw,Yc	11.6-14.9	In	Out	NSR
424	624		4	HW/BA-GOOD-EBM-VQO	Hwc,Hm,Ba	>=25	In	Out	NSR
461	661	2	2	CW-MARG	Cw,Yc	<=11.5	Out	Out	NSR
462	662	6	6	HW/BA-MARG	Hwc,Hm,Ba	<=13.5	Out	Out	NSR
463	663	57	42	CW-MARG-EBM	Cw,Yc	<=11.5	In	Out	NSR
464	664	211	177	HW/BA-MARG-EBM	Hwc,Hm,Ba	<=13.5	In	Out	NSR
Total		**208,175**	**182,052**						

6.5 Age Class Distributions

Area and volume summaries by age class are summarized in Tables 42 and 43.

Table 42 – Area by age class

Age Range	Area (ha)			
	Total	Productive	THLB Pre-EBM	THLB EBM
0	363,605	16,110	12,634	11,848
1-20	34,284	31,538	23,305	22,493
21-40(1)	29,157	26,302	16,429	15,369
41-60	36,022	31,840	13,683	12,453
61-80	38,104	33,250	12,805	11,854
81-100	28,161	23,429	5,640	4,731
101-120	35,195	26,656	6,767	5,870
121-140	16,785	11,799	2,887	2,496
141-250	179,715	109,443	21,500	18,484
251+	411,400	340,329	92,525	76,454
Total	**1,172,428**	**650,696**	**208,175**	**182,052**

Table 43 – Coniferous volume by age class

Age Range	Volume (1000 m^3)			
	Total	Productive	THLB Pre-EBM	THLB EBM
0	0	1	1	1
1-20	31	28	15	15
21-40	767	643	396	360
41-60	6,788	6,376	3,624	3,392
61-80	11,730	11,164	5,557	5,194
81-100	8,128	7,580	2,939	2,624
101-120	10,092	9,607	4,183	3,858
121-140	5,024	4,748	1,789	1,624
141-250	56,693	53,120	13,719	11,826
251+	171,366	160,998	57,517	47,036
Total	**270,619**	**254,265**	**89,740**	**75,930**

7.0 GROWTH AND YIELD

This section describes the issues, information sources, assumptions, methods, and any relevant processing or adjustments related to growth and yield estimates for existing and future stands.

7.1 Inventory

The Forest cover inventory was received from the MoFR January 1, 2006, with age and height attributes projected to this date. Both age and height attributes included in this inventory originate from the VRI Phase 2 adjustment process.[2]

In assigning analysis units based on inventory attributes, the following assumptions were made:

- Leading species (as opposed to inventory type group) was used to define analysis units, due to the inventory coverage data discrepancy between ITG and leading species labels.
- If previous stand attribute data were available, the previous stand attributes were used to assign analysis units using a combination of leading species, age, height and stocking classes to assign broad good, medium, and poor site classes. (assigned to NSR)
- If no previous stand attribute data was available, the dominant analysis unit in a given BEC subzone was used to assign an equivalent analysis unit to each stand occurring in the same BEC subzone. (assigned to NSR)
- In some cases, the combination of age, height, and inventory site index from the current VRI was considered questionable (*ie*., height 1.3m, age 250yrs). For these stands, the current inventory attributes were ignored, and the stands were assumed to be NSR. No change was made to the analysis unit assignment.

7.2 Natural Stand Yield Tables.

Natural stand yield tables (NSYT) were developed using the MoFR program Variable Density Yield Prediction Model (VDYP Batch version 6.6D). Phase 2 adjusted age and height attributes were used as inputs to the natural stand yield tables, and the volume adjustment factor (also included in the inventory) was used as a multiplier to all natural stand yield tables.

Individual NSYTs were generated for all existing natural stands by forest cover polygon, and then aggregated by analysis unit. For the Cottonwood leading (Act) analysis unit, VDYP version 7 for the NSYT was approved by the MOFR.[3]

7.3 Managed Stand Yield Tables

Managed stand yield tables used the MoFR Table Interpolation Program for Stand Yields (TIPSY Batch version 4.1) growth model. Individual MSYTs were generated for all existing and future managed stands by forest cover polygon, and then aggregated by analysis unit.

The managed yield curves for alder reported in this Data Package have been developed using TIPSY. However, Northwest Hardwoods staff has expressed concern that these yields appear

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[2] Confirmed via email from T.Salkeld, MoFR, June 20, 2007.

[3] VDYP version 7 was used for the Act analysis unit with the approval of J. Brown, MoFR. This same NSYT was used for both current and future analysis units.

very conservative when compared to data from the Pacific Northwest Hardwood Cooperative, and yield curves developed with TASS. This issue will be explored further prior to finalizing yield curve tables for alder analysis units.

7.4 Site Index

Site Index is a measure of productivity used during yield analysis. SI is an estimate of potential height growth on a site over a fixed period of time, normally 50 years breast height age. The productivity of a site largely determines how quickly trees grow and when rotation age and minimum harvest age (MHA) are reached. The inventory site index from the forest inventory coverage is used to develop yield tables for existing natural stands.

Adjusted site index has been used to develop yield tables for future managed stands. The derivation of these site indices is described in the report *Site Index Adjustment of the Kingcome Timber Supply Area*. (Timberline, 2007a).

The Kingcome SIA project was completed in three major steps:

1. Preliminary potential site index (PSI) was estimated for western red cedar (Cw) and western hemlock (Hw) using the TNRG biophysical model.
2. Field sampling was completed to estimate PSI of Cw and Hw from height and age measurements of site trees in randomly located points, in suitable second-growth stands.
3. The preliminary PSI estimates were statistically adjusted using the sample data to remove potential bias from the predicted PSI estimates.

Both Cw and Hw predicted PSI were adjusted using the ratio of means method. The Cw preliminary PSI estimates showed almost no bias (less than 1%), while the Hw bias was approximately 2.4%. The relationship between preliminary PSI and ground site index was relatively strong. The coefficient of determination (R^2) was 20-30%, while the 95% sampling error was relatively low (1.2 m) for Cw, and slightly higher than the targeted ±1.5 m (1.7 m) for Hw.

The adjusted PSI estimates were higher than current inventory site index estimates in areas where Cw and Hw are currently the leading species. The differences were approximately 4.2 m (or 30%) for Cw and 3.2 m (or 15%) for Hw. This site index increase should increase mean annual increment estimates on the TSA by 60% for Cw stands and 30% for Hw stands in timber supply analysis.

The following rules were used to assign adjusted site index to each record for existing managed and future managed stands:

- For Cw and Hw analysis units, adjusted site indices were used where available.[4] Where adjusted site indices were not generated, inventory site index was used.
- For Cw and Hw analysis units that converted to future Fdc analysis units, MoFR site index conversion equations were used to convert from either Cw or Hw to Fdc site index.
- For all other analysis units, inventory site index was used.

For the Act analysis unit, a single average site index was computed from all stands, using a minimum SI of 25m.[5] Table 44 lists the weighted average site index assigned to all existing and future analysis units.

[4] The site index adjusted area included all operable schedule C vegetated lands in the CWH, as defined in the site index adjustment report.

Table 44 – Site index values for present and future stands

Current AU	Current AU Description	Future AU	Pre-EBM		EBM	
			Present SI	Future SI	Present SI	Future SI
1	CW-GOOD	201	24.3	17.6	24.3	17.6
2	CW-MED	202	16.7	20.1	16.7	20.1
3	CW-POOR	203	12.7	20.6	12.7	20.6
4	HW/BA-GOOD	204	27.4	24.0	27.4	24.0
5	HW/BA-MED	205	22.4	22.4	22.4	22.4
6	HW/BA-POOR	206	15.6	21.5	15.6	21.5
7	SS	207	18.6	20.7	18.6	20.7
8	DR	208	23.2	22.5	23.2	22.5
10	FDC	210	31.5	31.5	31.5	31.5
11	CW-GOOD-EBM	211	22.8	19.5	22.8	19.5
12	CW-MED-EBM	212	16.5	18.5	16.5	18.6
13	CW-POOR-EBM	213	13.0	19.0	13.0	19.0
14	HW/BA-GOOD-EBM	214	27.7	25.3	27.7	25.2
15	HW/BA-MED-EBM	215	22.6	22.7	22.6	22.8
16	HW/BA-POOR-EBM	216	16.3	20.6	16.3	20.8
17	SS-EBM	217	20.1	21.4	17.9	19.6
18	DR-EBM	218	24.5	23.6	23.6	22.8
19	ACT-EBM	219	28.7	29.5	23.9	27.1
20	FDC-EBM	220	24.9	24.9	25.5	25.5
21	CW-GOOD-EBM-VQO	221			24.9	20.2
22	CW-MED-EBM-VQO	222			16.3	17.2
23	CW-POOR-EBM-VQO	223			13.1	17.9
24	HW/BA-GOOD-EBM-VQO	224			28.0	26.0
25	HW/BA-MED-EBM-VQO	225			22.6	21.6
26	HW/BA-POOR-EBM-VQO	226			17.0	18.5
27	SS-EBM-VQO	227			18.8	18.8
28	DR-EBM-VQO	228			26.3	24.5
30	FDC-EBM-VQO	230			24.2	24.2
32	CW-MED-TOFDC	232	15.8	15.8	15.8	15.8
33	CW-POOR-TOFDC	233	11.9	11.9	11.9	11.9
34	HW/BA-GOOD-TOFDC	234	26.5	26.5	26.5	26.5
35	HW/BA-MED-TOFDC	235	23.4	23.4	23.4	23.4
36	HW/BA-POOR-TOFDC	236	15.0	15.0	15.0	15.0
38	DR-TOFDC	238	20.9	20.9	20.9	20.9
42	CW-MED-TOFDC-EBM	242	16.7	16.7	16.8	16.8
43	CW-POOR-TOFDC-EBM	243	13.0	13.0	13.0	13.0
44	HW/BA-GOOD-TOFDC-EBM	244	28.8	28.8	28.8	28.8

[5] Based on recommendations from P.O'Connor , Kruger Forest Products, that site index of cottonwood leading stands almost never drop below 25m site index.

Current AU	Current AU Description	Future AU	Pre-EBM		EBM	
			Present SI	Future SI	Present SI	Future SI
45	HW/BA-MED-TOFDC-EBM	245	23.0	23.0	23.6	23.6
46	HW/BA-POOR-TOFDC-EBM	246	15.7	15.7	15.7	15.7
47	SS-TOFDC-EBM	247	21.9	21.9	23.0	23.0
48	DR-TOFDC-EBM	248	24.5	24.5	24.5	24.5
49	ACT-TOFDC-EBM	249	29.6	29.6		
52	CW-MED-TOFDC-EBM-VQO	252			15.4	15.4
53	CW-POOR-TOFDC-EBM-VQO	253			13.0	13.0
55	HW/BA-MED-TOFDC-EBM-VQO	255			21.1	21.1
56	HW/BA-POOR-TOFDC-EBM-VQO	256			15.8	15.8
57	SS-TOFDC-EBM-VQO	257			18.7	18.7
58	DR-TOFDC-EBM-VQO	258			26.5	26.5
61	CW-MARG	261	10.8	20.8	10.8	20.8
62	HW/BA-MARG	262	12.8	20.4	12.8	20.4
63	CW-MARG-EBM	263	10.9	19.0	10.9	19.1
64	HW/BA-MARG-EBM	264	12.6	17.8	12.7	18.2
65	CW-MARG-EBM-VQO	265			11.0	16.4
66	HW/BA-MARG-EBM-VQO	266			13.0	14.2
67	CW-MARG-TOFDC	267	10.9	10.9	10.9	10.9
68	HW/BA-MARG-TOFDC	268	12.8	12.8	12.8	12.8
69	CW-MARG-TOFDC-EBM	269	10.9	10.9	10.9	10.9
70	HW/BA-MARG-TOFDC-EBM	270	12.9	12.9	12.9	12.9
72	HW/BA-MARG-TOFDC-EBM-VQO				12.8	12.8
101	CW-GOOD	301	19.9	19.9	19.9	19.9
102	CW-MED	302	22.6	22.6	22.6	22.6
103	CW-POOR	303	13.0	13.0	13.0	13.0
104	HW/BA-GOOD	304	25.6	25.6	25.6	25.6
105	HW/BA-MED	305	23.0	23.0	23.0	23.0
106	HW/BA-POOR	306	21.4	21.4	21.4	21.4
107	SS	307	25.4	25.4	25.4	25.4
108	DR	308	22.0	22.0	22.0	22.0
111	CW-GOOD-EBM	311	18.9	18.9	18.8	18.8
112	CW-MED-EBM	312	18.4	18.4	18.4	18.4
113	CW-POOR-EBM	313	21.0	21.0	21.0	21.0
114	HW/BA-GOOD-EBM	314	25.0	25.0	25.0	25.0
115	HW/BA-MED-EBM	315	22.9	22.9	22.9	22.9
116	HW/BA-POOR-EBM	316	21.3	21.3	21.3	21.3
117	SS-EBM	317	24.3	24.3	24.4	24.4
118	DR-EBM	318	22.1	22.1	22.1	22.1
119	ACT-EBM	319	26.8	26.8		
120	FDC-EBM	320	22.9	22.9	23.3	23.3
121	CW-GOOD-EBM-VQO	321			16.8	16.8

Current AU	Current AU Description	Future AU	Pre-EBM		EBM	
			Present SI	Future SI	Present SI	Future SI
122	CW-MED-EBM-VQO	322			16.6	16.6
124	HW/BA-GOOD-EBM-VQO	324			26.6	26.6
125	HW/BA-MED-EBM-VQO	325			22.1	22.1
128	DR-EBM-VQO	328			21.0	21.0
131	CW-GOOD-TOFDC	331	27.0	27.0	27.0	27.0
132	CW-MED-TOFDC	332	15.0	15.0	15.0	15.0
135	HW/BA-MED-TOFDC	335	21.3	21.3	21.3	21.3
141	CW-GOOD-TOFDC-EBM	341	19.4	23.3	19.3	23.4
144	HW/BA-GOOD-TOFDC-EBM	344	24.9	26.2	24.7	26.2
145	HW/BA-MED-TOFDC-EBM	345	22.3	23.3	22.1	23.3
146	HW/BA-POOR-TOFDC-EBM	346	24.8	15.0	24.5	15.0
147	SS-TOFDC-EBM	347	27.4	27.7	26.5	26.1
148	DR-TOFDC-EBM	348	24.3	24.2	18.7	18.3
151	CW-GOOD-TOFDC-EBM-VQO	351			20.0	20.0
154	HW/BA-GOOD-TOFDC-EBM-VQO	354			26.3	25.4
155	HW/BA-MED-TOFDC-EBM-VQO	355			23.5	22.8
158	DR-TOFDC-EBM-VQO	358			25.5	25.5
162	HW/BA-MARG	362	19.3	19.3	19.3	19.3
163	CW-MARG-EBM	363	16.7	16.7	16.7	16.7
164	HW/BA-MARG-EBM	364	18.3	18.3	19.0	19.0
167	CW-MARG-TOFDC	367	8.0	8.0	8.0	8.0
401	CW-GOOD	401	19.3	19.3	19.3	19.3
402	CW-MED	402	21.5	21.5	21.5	21.5
403	CW-POOR	403	20.6	20.6	20.6	20.6
404	HW/BA-GOOD	404	23.7	23.7	23.7	23.7
405	HW/BA-MED	405	23.0	23.0	23.0	23.0
406	HW/BA-POOR	406	22.5	22.5	22.5	22.5
410	FDC	410	27.8	27.8	27.8	27.8
411	CW-GOOD-EBM	411	18.0	18.0	18.0	18.0
412	CW-MED-EBM	412	18.4	18.4	18.4	18.4
413	CW-POOR-EBM	413	19.3	19.3	19.5	19.5
414	HW/BA-GOOD-EBM	414	23.9	23.9	23.9	23.9
415	HW/BA-MED-EBM	415	22.3	22.3	22.2	22.2
416	HW/BA-POOR-EBM	416	17.7	17.7	17.7	17.7
419	ACT-EBM	419	25.0	25.0		
420	FDC-EBM	420	21.8	21.8	21.9	21.9
421	CW-GOOD-EBM-VQO	421			15.3	15.3
422	CW-MED-EBM-VQO	422			17.5	17.5
423	CW-POOR-EBM-VQO	423			18.6	18.6
424	HW/BA-GOOD-EBM-VQO	424			25.5	25.5
461	CW-MARG	461	13.4	13.4	13.4	13.4

Current AU	Current AU Description	Future AU	Pre-EBM		EBM	
			Present SI	Future SI	Present SI	Future SI
462	HW/BA-MARG	462	12.8	12.8	12.8	12.8
463	CW-MARG-EBM	463	12.0	12.0	12.3	12.3
464	HW/BA-MARG-EBM	464	15.9	15.9	15.4	15.4
Average Existing Natural			**16.0**	**20.1**	**16.0**	**20.1**
Average Existing Managed			**21.8**	**21.9**	**21.8**	**21.9**
Average NSR			**19.7**	**19.7**	**19.9**	**19.9**
Average Total			**17.2**	**20.4**	**17.3**	**20.5**

7.5 Utilization Levels

The utilization level defines the maximum height of stumps that may be left on harvested areas and the minimum top diameter inside bark (DIB) and minimum diameter (DBH) of stems that must be removed from harvested areas. These factors are needed to calculate merchantable stand volume for use in the analysis. The levels used in the analysis reflect the current operational practice (Table 45).

Table 45 – Utilization levels

Era	Utilization		
	Minimum DBH (cm)	Maximum Stump Height (cm)	Minimum Top DIB (cm)
Existing Natural Stands	17.5	30.0	15.0
Existing Managed Stands	12.5	30.0	10.0
Future Managed Stands	12.5	30.0	10.0

7.6 Decay, Waste and Breakage for Natural Unmanaged Stands

The decay, waste and breakage (DWB) factors are applied to unmanaged stand yield tables to obtain net volume per hectare. These factors are assigned to natural stand volumes automatically in VDYP based on the Public Sustained Yield Unit (PSYU) location (#195 for Kingcome TSA). Licensee experience suggests that red cedar volumes are being underestimated because decay, waste and breakage factors are too high. However, no data is available to support this assumption, so the default PSYU factors will be used in this analysis.

7.7 Operational Adjustment Factors

Operational adjustment factors (OAFs) are applied in order to adjust managed stand yields generated by TIPSY to reflect such factors as gaps in stands and decay. The default factors most commonly used are an OAF1 of 15 percent and an OAF2 of 5 percent for a combined reduction of 20% in stand yield, or more at ages greater than 100 years before any other management-level netdowns are applied. OAF1 is a constant percentage reduction to account for unmapped openings in stands, distribution of stems, endemic pests and diseases, and other risks to potential yield. OAF2 is an increasing percentage reduction that can be applied to account for decay, waste and breakage. The MoFR recommends that the standard OAF1 of 15% and an OAF2 of 5% be used for existing and future managed stands.

Interfor has expressed concern that the 15% OAF1 adjustment overstates the impacts that it is designed to capture. Smaller block sizes characteristic of current operations, and those expected under EBM, reduce the variability of factors associated with the OAF1 allowance as they are more likely to be typed out as non-productive features or incorporated into adjacent unharvested conditions such as wildlife features. On this basis, it has been proposed by Interfor that the OAF1 allowance should be reduced to 8% for existing post-1995 and future regenerating types, to capture the changes in operating practices. While the base case will employ the status quo 15% OAF1, a sensitivity analysis will be conducted to determine the impact of the proposed 8% OAF1.

8.0 SILVICULTURE

Silvicultural practices and the conditions of existing regenerating conditions in the TSA need to be considered as a prelude to developing managed yield curves.

8.1 Regeneration Delay

Licensees have indicated that regeneration delays range from one to three years, with most cutblocks being replanted within one year of harvest.

8.2 Current and Backlog Not Satisfactorily Restocked Areas

NSR areas originally contained operable timber, were harvested and have not yet regenerated to commercial species. For every stand scheduled for harvest there is a target period for regeneration following harvest. Under the Silviculture Regulations land is not allowed to become backlog. It must be planted within the regeneration delay period if it has not regenerated naturally before that. No backlog NSR exists in the Kingcome TSA. Land that has been harvested recently, for which the regeneration delay period has not yet expired, is current NSR. Current NSR is part of the working forest and is expected to be regenerated on schedule. Stands were designated NSR where the current inventory attribute information is missing or unreliable, in one of three ways, resulting in a total NSR area of 12,937 hectares:

1. If previous stand attribute data were available, the previous stand attributes were used to assign analysis units using a combination of leading species, age, height and stocking classes to assign broad good, medium, and poor site classes. This applied to 3,809 hectares.
2. If no previous stand attribute data was available, the dominant analysis unit in a given BGC subzone was used to assign an equivalent analysis unit to each stand occurring in the same BGC subzone. This applied to 8,851 hectares.
3. In some cases, the combination of age, height, and inventory site index from the current VRI was considered questionable (*ie*., height 1.3m, age 250yrs). For these stands, the current inventory attributes were ignored, and the stands were assumed to be NSR. No change was made to the analysis unit assignment. This applied to 277 hectares.

Some of these NSR areas may actually be regenerated, but new forest cover inventory attributes have not yet been assigned to the inventory database.

8.3 Genetic Gain

Improvements in growth due to the use of genetically improved seed were modelled during yield table development. Genetic gain is attributed to class ‘A’ seed. Genetic gain estimates are based on Tree Improvement Branch three year average gains between 2005 and 2007. For the Kingcome TSA, genetic gains were assigned only to future managed stands and specifically only for planted regimes of either redcedar or Douglas-fir. One hundred percent of class A seed is used for planted redcedar, and the 3-year average genetic gain is 3%. The genetic gain for Douglas-fir is 6.3%. However, the current operational use of Fdc select seed is 50% Therefore, there is a 3% realized gain for Fdc.

8.4 Pre-EBM Silviculture

8.4.1 Silviculture Management Regimes

In the Pre-EBM scenario, clearcutting is the silvicultural system most commonly employed in the Kingcome TSA. Trees are retained when necessary to meet riparian or wildlife habitat objectives.

Reductions to account for wildlife trees will be applied when the forest estate model is run, rather than directly on the yield curves. All yield curves have been generated assuming even-aged management of all stands. Any retention that is left is assumed to be permanently lost to harvesting.

Riparian reserve zones have been spatially netted out of the THLB, and no retention modelling will be required for these areas.

Pre-EBM yield curves are reported in Appendix 1 of this Data Package.

8.4.2 Existing Natural Stands – Pre-EBM

Any stand that is 38 years of age or older in 2007 is deemed to be an existing natural (unmanaged) stand and will have yields predicted using VDYP. This is consistent with the assumption that existing managed stands were established starting in 1970. Table 46 lists the average input parameters used for NSYTs.

Table 46 – Input attributes for existing natural stands

Current Analysis Unit	Analysis Unit Description	Species 1	Species 2	Species 3	Species Percent 1	Species Percent 2	Species Percent 3	Other Species Percent	Crown Closure (%)	Inventory Site Index (m)	Height (m)	Total Age (yrs)	Conifer Proportion (%)	Volume Adjustment Factor	Utilization Limit
1	CW-GOOD	CW	HW	FDC	70	19	8	3	54	24	23	57	99%	1.19	17.5
2	CW-MED	CW	HW	BA	61	30	4	5	64	17	36	279	100%	1.19	17.5
3	CW-POOR	CW	HW	YC	58	28	10	4	63	13	28	297	100%	1.23	17.5
4	HW/BA-GOOD	HW	SS	BA	77	7	7	9	73	27	30	67	98%	1.18	17.5
5	HW/BA-MED	HW	CW	BA	73	11	9	7	70	22	29	91	98%	1.20	17.5
6	HW/BA-POOR	HW	CW	BA	64	15	14	7	65	16	33	205	100%	1.23	17.5
7	SS	SS	HW	CW	64	25	7	4	60	19	38	199	98%	1.17	17.5
8	DR	DR	HW	SS	71	18	6	5	69	23	24	62	100%	1.15	17.5
10	FDC	FDC	HW	CW	66	23	11	0	54	31	29	52	100%	1.19	17.5
11	CW-GOOD-EBM	CW	HW	DR	61	31	4	4	70	23	25	82	96%	1.16	17.5
12	CW-MED-EBM	CW	HW	YC	60	26	8	6	65	16	33	251	98%	1.18	17.5
13	CW-POOR-EBM	CW	HW	YC	59	20	18	3	62	13	29	306	100%	1.21	17.5
14	HW/BA-GOOD-EBM	HW	CW	BA	79	9	6	6	76	28	34	75	96%	1.17	17.5
15	HW/BA-MED-EBM	HW	CW	BA	72	14	6	8	74	23	29	86	96%	1.18	17.5
16	HW/BA-POOR-EBM	HW	CW	BA	61	19	12	8	63	16	32	201	98%	1.19	17.5

Current Analysis Unit	Analysis Unit Description	Species 1	Species 2	Species 3	Species Percent 1	Species Percent 2	Species Percent 3	Other Species Percent	Crown Closure (%)	Inventory Site Index (m)	Height (m)	Total Age (yrs)	Conifer Proportion (%)	Volume Adjustment Factor	Utilization Limit
17	SS-EBM	SS	HW	CW	68	18	6	8	46	20	44	231	97%	1.20	17.5
18	DR-EBM	DR	HW	CW	74	14	7	5	73	25	26	72	100%	1.18	17.5
19	ACT-EBM	ACT	DR	SS	72	15	7	6	66	29	37	105	85%	1.17	17.5
20	FDC-EBM	FDC	HW	CW	55	32	10	3	67	25	34	125	98%	1.15	17.5
32	CW-MED-TOFDC	CW	HW	YC	44	39	10	7	70	16	35	284	100%	1.26	17.5
33	CW-POOR-TOFDC	YC	HW	CW	40	37	17	6	46	12	26	282	100%	1.20	17.5
34	HW/BA-GOOD-TOFDC	HW	CW	SS	94	2	2	2	75	27	35	93	98%	1.19	17.5
35	HW/BA-MED-TOFDC	HW	CW	BA	74	13	9	4	69	23	25	64	99%	1.19	17.5
36	HW/BA-POOR-TOFDC	HW	CW	YC	57	20	12	11	69	15	34	240	100%	1.25	17.5
38	DR-TOFDC	DR	HW	SS	66	20	10	4	77	21	21	53	100%	1.19	17.5
42	CW-MED-TOFDC-EBM	CW	HW	YC	53	32	7	8	57	17	36	283	100%	1.22	17.5
43	CW-POOR-TOFDC-EBM	CW	HW	YC	49	24	21	6	54	13	29	343	100%	1.21	17.5
44	HW/BA-GOOD-TOFDC-EBM	HW	CW	DR	74	12	7	7	66	29	33	71	93%	1.19	17.5
45	HW/BA-MED-TOFDC-EBM	HW	FDC	CW	67	10	10	13	69	23	33	106	96%	1.20	17.5
46	HW/BA-POOR-TOFDC-EBM	HW	CW	BA	62	16	11	11	64	16	32	186	100%	1.21	17.5
47	SS-TOFDC-EBM	SS	HW	ACT	60	22	7	11	48	22	44	205	99%	1.23	17.5
48	DR-TOFDC-EBM	DR	HW	CW	68	20	5	7	71	24	26	68	100%	1.14	17.5
49	ACT-TOFDC-EBM	ACT	DR	SS	76	12	12	0	45	30	40	113	88%	1.23	17.5
61	CW-MARG	CW	HW	YC	57	26	14	3	64	11	24	288	100%	1.23	17.5
62	HW/BA-MARG	HW	CW	BA	62	18	11	9	64	13	30	231	100%	1.24	17.5
63	CW-MARG-EBM	CW	YC	HW	55	26	15	4	61	11	24	311	100%	1.20	17.5
64	HW/BA-MARG-EBM	HW	CW	BA	50	20	16	14	60	13	30	257	100%	1.17	17.5
67	CW-MARG-TOFDC	YC	HW	CW	50	30	18	2	57	11	24	286	100%	1.26	17.5
68	HW/BA-MARG-TOFDC	HW	YC	CW	62	14	14	10	69	13	31	243	100%	1.26	17.5
69	CW-MARG-TOFDC-EBM	YC	CW	HW	42	31	20	7	54	11	24	304	100%	1.18	17.5
70	HW/BA-MARG-TOFDC-EBM	HW	CW	BA	58	22	12	8	59	13	30	229	100%	1.24	17.5

8.4.3 Existing Managed Stands – Pre-EBM

Any stand that is 37 years of age or younger in 2007 is deemed to be an existing managed stand and will have yields predicted using TIPSY. This is consistent with the assumption that existing managed stands were established starting in 1970. Table 47 lists the average input parameters used for existing MSYTs.

Table 47 – Silviculture regimes for existing managed stands

Current AU	Regime #	Analysis Unit Description	Planted / Natural	Regen Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	OAF1 (%)	OAF2 (%)
101	1	CW/CY-GOOD	P	1	95%	CW	80%	HW	20%			1000	15%	5%
101	2	CW/CY-GOOD	N	3	5%	HW	60%	CW	40%			4000	15%	5%
102	1	CW/CY-MED	P	1	85%	CW	80%	HW	20%			1000	15%	5%
102	2	CW/CY-MED	N	3	15%	HW	60%	CW	40%			4000	15%	5%
103	1	CW/CY-POOR	P	2	65%	CW	80%	HW	20%			1000	15%	5%
103	2	CW/CY-POOR	N	3	35%	HW	60%	CW	40%			4000	15%	5%
104	1	HWC/BA-GOOD	P	1	5%	CW	40%	HW	40%	BA	20%	1200	15%	5%
104	2	HWC/BA-GOOD	N	3	95%	HW	60%	BA	20%	CW	20%	5000	15%	5%
105	1	HWC/BA-MED	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15%	5%
105	2	HWC/BA-MED	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15%	5%
106	1	HWC/BA-POOR	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15%	5%
106	2	HWC/BA-POOR	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15%	5%
107	1	SS	P	2	70%	SS	40%	BA	40%	HW	20%	1000	15%	5%
107	2	SS	N	3	30%	HW	40%	SS	30%	BA	30%	5000	15%	5%
108	1	DR	P	2	75%	DR	100%					1000	15%	5%
108	2	DR	P	2	25%	CW	100%					1000	15%	5%
111	1	CW/CY-GOOD-EBM	P	1	95%	CW	80%	HW	20%			1000	15%	5%
111	2	CW/CY-GOOD-EBM	N	3	5%	HW	60%	CW	40%			4000	15%	5%
112	1	CW/CY-MED-EBM	P	1	85%	CW	80%	HW	20%			1000	15%	5%
112	2	CW/CY-MED-EBM	N	3	15%	HW	60%	CW	40%			4000	15%	5%
113	1	CW/CY-POOR-EBM	P	2	65%	CW	80%	HW	20%			1000	15%	5%
113	2	CW/CY-POOR-EBM	N	3	35%	HW	60%	CW	40%			4000	15%	5%
114	1	HWC/BA-GOOD-EBM	P	1	5%	CW	40%	HW	40%	BA	20%	1200	15%	5%
114	2	HWC/BA-GOOD-EBM	N	3	95%	HW	60%	BA	20%	CW	20%	5000	15%	5%
115	1	HWC/BA-MED-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15%	5%
115	2	HWC/BA-MED-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15%	5%
116	1	HWC/BA-POOR-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15%	5%
116	2	HWC/BA-POOR-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15%	5%
117	1	SS-EBM	P	2	70%	SS	40%	BA	40%	HW	20%	1000	15%	5%
117	2	SS-EBM	N	3	30%	HW	40%	SS	30%	BA	30%	5000	15%	5%
118	1	DR-EBM	P	2	75%	DR	100%					1000	15%	5%
118	2	DR-EBM	P	2	25%	CW	100%					1000	15%	5%
119	1	ACT-EBM	P	2	100%	ACT	100%					1000	15%	5%
120	1	FDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	15%	5%
131	1	CW/CY-TOFDC-GOOD	P	1	95%	CW	80%	HW	20%			1000	15%	5%
131	2	CW/CY-TOFDC-GOOD	N	3	5%	HW	60%	CW	40%			4000	15%	5%
132	1	CW/CY-TOFDC-MED	P	1	85%	CW	80%	HW	20%			1000	15%	5%

Current AU	Regime #	Analysis Unit Description	Planted / Natural	Regen Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	OAF1 (%)	OAF2 (%)
132	2	CW/CY-TOFDC-MED	N	3	15%	HW	60%	CW	40%			4000	15%	5%
135	1	HWC/BA-TOFDC-MED	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15%	5%
135	2	HWC/BA-TOFDC-MED	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15%	5%
141	1	CW/CY-GOOD-TOFDC-EBM	P	1	95%	CW	80%	HW	20%			1000	15%	5%
141	2	CW/CY-GOOD-TOFDC-EBM	N	3	5%	HW	60%	CW	40%			4000	15%	5%
144	1	HWC/BA-GOOD-TOFDC-EBM	P	1	5%	CW	40%	HW	40%	BA	20%	1200	15%	5%
144	2	HWC/BA-GOOD-TOFDC-EBM	N	3	95%	HW	60%	BA	20%	CW	20%	5000	15%	5%
145	1	HWC/BA-MED-TOFDC-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15%	5%
145	2	HWC/BA-MED-TOFDC-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15%	5%
146	1	HWC/BA-POOR-TOFDC-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15%	5%
146	2	HWC/BA-POOR-TOFDC-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15%	5%
147	1	SS-TOFDC-EBM	P	2	70%	SS	40%	BA	40%	HW	20%	1000	15%	5%
147	2	SS-TOFDC-EBM	N	3	30%	HW	40%	SS	30%	BA	30%	5000	15%	5%
148	1	DR-TOFDC-EBM	P	2	75%	DR	100%					1000	15%	5%
148	2	DR-TOFDC-EBM	P	2	25%	CW	100%					1000	15%	5%
162	1	HWC/BA-MARG	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15%	5%
162	2	HWC/BA-MARG	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15%	5%
163	1	CW/CY-MARG-EBM	P	2	65%	CW	80%	HW	20%			1000	15%	5%
163	2	CW/CY-MARG-EBM	N	3	35%	HW	60%	CW	40%			4000	15%	5%
164	1	HWC/BA-MARG-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15%	5%
164	2	HWC/BA-MARG-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15%	5%
167	1	CW/CY-TOFDC-MARG	P	2	65%	CW	80%	HW	20%			1000	15%	5%
167	2	CW/CY-TOFDC-MARG	N	3	35%	HW	60%	CW	40%			4000	15%	5%

8.4.4 Future Managed Stands – Pre-EBM

Once a stand is harvested, it is assigned a future managed stand yield curve that reflects current silviculture practices. Table 48 lists the average input parameters used for future MSYTs.

Table 48 – Silviculture regimes for future managed stands

Future Analysis Unit	Regime #	Analysis Unit Description	Planted / Natura	Regeneratin Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	Genetic Gain Species 1	Genetic Gain Species 2	Genetic Gain Species 3	OAF1 (%)	OAF2 (%)
201	1	CW/CY-GOOD	P	1	95%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
201	2	CW/CY-GOOD	N	3	5%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
202	1	CW/CY-MED	P	1	85%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
202	2	CW/CY-MED	N	3	15%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
203	1	CW/CY-POOR	P	2	65%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
203	2	CW/CY-POOR	N	3	35%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
204	1	HWC/BA-GOOD	P	1	5%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
204	2	HWC/BA-GOOD	N	3	95%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
205	1	HWC/BA-MED	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
205	2	HWC/BA-MED	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
206	1	HWC/BA-POOR	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
206	2	HWC/BA-POOR	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
207	1	SS	P	2	70%	SS	40%	BA	40%	HW	20%	1000	0%	0	0%	15%	5%
207	2	SS	N	3	30%	HW	40%	SS	30%	BA	30%	5000	0%	0	0%	15%	5%
208	1	DR	P	2	75%	DR	100%					1000	0%	0	0%	15%	5%
208	2	DR	P	2	25%	CW	100%					1000	3%	0	0%	15%	5%
210	1	FDC	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
211	1	CW/CY-GOOD-EBM	P	1	95%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
211	2	CW/CY-GOOD-EBM	N	3	5%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
212	1	CW/CY-MED-EBM	P	1	85%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
212	2	CW/CY-MED-EBM	N	3	15%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
213	1	CW/CY-POOR-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
213	2	CW/CY-POOR-EBM	N	3	35%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
214	1	HWC/BA-GOOD-EBM	P	1	5%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
214	2	HWC/BA-GOOD-EBM	N	3	95%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
215	1	HWC/BA-MED-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
215	2	HWC/BA-MED-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
216	1	HWC/BA-POOR-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
216	2	HWC/BA-POOR-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
217	1	SS-EBM	P	2	70%	SS	40%	BA	40%	HW	20%	1000	0%	0	0%	15%	5%
217	2	SS-EBM	N	3	30%	HW	40%	SS	30%	BA	30%	5000	0%	0	0%	15%	5%
218	1	DR-EBM	P	2	75%	DR	100%					1000	0%	0	0%	15%	5%
218	2	DR-EBM	P	2	25%	CW	100%					1000	3%	0	0%	15%	5%
219	1	ACT-EBM	P	2	100%	ACT	100%					1000	0%	0	0%	15%	5%
220	1	FDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
232	1	CW/CY-TOFDC-MED	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%

Future Analysis Unit	Regime #	Analysis Unit Description	Planted / Natura	Regeneratin Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	Genetic Gain Species 1	Genetic Gain Species 2	Genetic Gain Species 3	OAF1 (%)	OAF2 (%)
233	1	CW/CY-TOFDC-POOR	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
234	1	HWC/BA-TOFDC-GOOD	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
235	1	HWC/BA-TOFDC-MED	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
236	1	HWC/BA-TOFDC-POOR	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
238	1	DR-TOFDC	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
242	1	CW/CY-MED-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
243	1	CW/CY-POOR-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
244	1	HWC/BA-GOOD-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
245	1	HWC/BA-MED-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
246	1	HWC/BA-POOR-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
247	1	SS-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
248	1	DR-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
249	1	ACT-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
261	1	CW/CY-MARG	P	2	65%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
261	2	CW/CY-MARG	N	3	35%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
262	1	HWC/BA-MARG	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
262	2	HWC/BA-MARG	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
263	1	CW/CY-MARG-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
263	2	CW/CY-MARG-EBM	N	3	35%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
264	1	HWC/BA-MARG-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
264	2	HWC/BA-MARG-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
267	1	CW/CY-TOFDC-MARG	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
268	1	HWC/BA-TOFDC-MARG	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
269	1	CW/CY-MARG-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
270	1	HWC/BA-MARG-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
301	1	CW/CY-GOOD	P	1	95%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
301	2	CW/CY-GOOD	N	3	5%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
302	1	CW/CY-MED	P	1	85%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
302	2	CW/CY-MED	N	3	15%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
303	1	CW/CY-POOR	P	2	65%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
303	2	CW/CY-POOR	N	4	35%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
304	1	HWC/BA-GOOD	P	1	5%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
304	2	HWC/BA-GOOD	N	3	95%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
305	1	HWC/BA-MED	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
305	2	HWC/BA-MED	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
306	1	HWC/BA-POOR	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
306	2	HWC/BA-POOR	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
307	1	SS	P	2	70%	SS	40%	BA	40%	HW	20%	1000	0%	0	0%	15%	5%

Future Analysis Unit	Regime #	Analysis Unit Description	Planted / Natura	Regeneratin Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	Genetic Gain Species 1	Genetic Gain Species 2	Genetic Gain Species 3	OAF1 (%)	OAF2 (%)
307	2	SS	N	4	30%	HW	40%	SS	30%	BA	30%	5000	0%	0	0%	15%	5%
308	1	DR	P	2	75%	DR	100%					1000	0%	0	0%	15%	5%
308	2	DR	P	2	25%	CW	100%					1000	3%	0	0%	15%	5%
311	1	CW/CY-GOOD-EBM	P	1	95%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
311	2	CW/CY-GOOD-EBM	N	3	5%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
312	1	CW/CY-MED-EBM	P	1	85%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
312	2	CW/CY-MED-EBM	N	3	15%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
313	1	CW/CY-POOR-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
313	2	CW/CY-POOR-EBM	N	4	35%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
314	1	HWC/BA-GOOD-EBM	P	1	5%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
314	2	HWC/BA-GOOD-EBM	N	3	95%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
315	1	HWC/BA-MED-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
315	2	HWC/BA-MED-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
316	1	HWC/BA-POOR-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
316	2	HWC/BA-POOR-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
317	1	SS-EBM	P	2	70%	SS	40%	BA	40%	HW	20%	1000	0%	0	0%	15%	5%
317	2	SS-EBM	N	4	30%	HW	40%	SS	30%	BA	30%	5000	0%	0	0%	15%	5%
318	1	DR-EBM	P	2	75%	DR	100%					1000	0%	0	0%	15%	5%
318	2	DR-EBM	P	2	25%	CW	100%					1000	3%	0	0%	15%	5%
319	1	ACT-EBM	P	2	100%	ACT	100%					1000	0%	0	0%	15%	5%
320	1	FDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
331	1	CW/CY-TOFDC-GOOD	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
332	1	CW/CY-TOFDC-MED	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
335	1	HWC/BA-TOFDC-MED	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
341	1	CW/CY-GOOD-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
344	1	HWC/BA-GOOD-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
345	1	HWC/BA-MED-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
346	1	HWC/BA-POOR-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
347	1	SS-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
348	1	DR-TOFDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
362	1	HWC/BA-MARG	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
362	2	HWC/BA-MARG	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
363	1	CW/CY-MARG-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
363	2	CW/CY-MARG-EBM	N	4	35%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
364	1	HWC/BA-MARG-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
364	2	HWC/BA-MARG-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
367	1	CW/CY-TOFDC-MARG	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
601	1	CW/CY-GOOD	P	1	95%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%

Future Analysis Unit	Regime #	Analysis Unit Description	Planted / Natura	Regeneratin Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	Genetic Gain Species 1	Genetic Gain Species 2	Genetic Gain Species 3	OAF1 (%)	OAF2 (%)
601	2	CW/CY-GOOD	N	3	5%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
602	1	CW/CY-MED	P	1	85%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
602	2	CW/CY-MED	N	3	15%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
603	1	CW/CY-POOR	P	2	65%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
603	2	CW/CY-POOR	N	4	35%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
604	1	HWC/BA-GOOD	P	1	5%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
604	2	HWC/BA-GOOD	N	3	95%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
605	1	HWC/BA-MED	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
605	2	HWC/BA-MED	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
606	1	HWC/BA-POOR	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
606	2	HWC/BA-POOR	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
610	1	FDC	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
611	1	CW/CY-GOOD-EBM	P	1	95%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
611	2	CW/CY-GOOD-EBM	N	3	5%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
612	1	CW/CY-MED-EBM	P	1	85%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
612	2	CW/CY-MED-EBM	N	3	15%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
613	1	CW/CY-POOR-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
613	2	CW/CY-POOR-EBM	N	4	35%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
614	1	HWC/BA-GOOD-EBM	P	1	5%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
614	2	HWC/BA-GOOD-EBM	N	3	95%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
615	1	HWC/BA-MED-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
615	2	HWC/BA-MED-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
616	1	HWC/BA-POOR-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
616	2	HWC/BA-POOR-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
619	1	ACT-EBM	P	2	100%	ACT	100%					1000	0%	0	0%	15%	5%
620	1	FDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0	3%	15%	5%
661	1	CW/CY-MARG	P	2	65%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
661	2	CW/CY-MARG	N	4	35%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
662	1	HWC/BA-MARG	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
662	2	HWC/BA-MARG	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%
663	1	CW/CY-MARG-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0	0%	15%	5%
663	2	CW/CY-MARG-EBM	N	4	35%	HW	60%	CW	40%			4000	0%	0	0%	15%	5%
664	1	HWC/BA-MARG-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0	0%	15%	5%
664	2	HWC/BA-MARG-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0	0%	15%	5%

8.5 EBM Silviculture

8.5.1 EBM Silviculture Regimes

In the EBM scenario, harvesting and silviculture regimes are established to meet the EBM stand-level retention Objective 16.

1. *"Maintain forest structure and diversity at the stand level:*
   - a) *In cutblocks where a clearcut harvest system is used, by establishing stand retention equal to or greater than 15% of the cutblock; and*
   - b) *"In cutblocks 15 hectares or greater in size where a clearcut system is used, by distributing 50% of stand retention within the cutblock, except in second growth stands where a wind throw hazard assessment indicates a high biophysical hazard for wind throw.*
2. *To the extent practicable, include the following within stand retention:*
   - a) *Habitat elements important for species at risk, ungulate winter range, and regionally important wildlife;*
   - b) *Representation of ecosystems and plant communities that are red-listed or blue-listed in the watershed and landscape;*
   - c) *Functional riparian forest adjacent to active fluvial units, forested swamps, fen and marsh wetlands and upland streams with unique climate and other characteristics;*
   - d) *Western red cedar and Yellow cedar in a range of diameters and species representative of the preharvest stand; and*
   - e) *Wildlife trees and coarse woody debris.*

In the Pre-EBM scenario no specific stand-level retention requirements are modelled beyond the general wildlife tree patch (WTP) requirement documented in 5.1.18. In the EBM scenario, these requirements will be maintained in the non-EBM zone (Vancouver Island). In the EBM zone, specific stand-level retention objectives have been established (Table 49). These requirements are deemed to capture the Pre-EBM WTP requirements as well. The stand-level impacts are incorporated into the existing yield curves using an appropriate operational adjustment factor (OAF) to reduce the harvested volume. The impacts on existing regeneration and future yield are captured in future managed curves using the volume retention adjustment factor (VRAF) in TIPSY. TIPSY's variable retention model quantifies the regenerated stand's growth and yield impacts due to overstory shading from the retained stand.

TIPSY applies a VRAF that reduces future yields of the regenerated stand. VRAFs have been developed for two coastal species only (Hw and Fdc). Assumptions used in applying VRAFS include:

- The crown shadow area of the retained trees is completely removed from timber production;
- Approximately 50% of the regenerated trees growing into the shaded area die, while the remaining 50% grow at some reduced rate;
- TIPSY Version 4.1 is used;
- Apply only in the EBM management zone;
- Apply only to future managed yield tables; and
- Apply only to the Hw/Ba and Fdc AU's.

VRAFs are not applied to Cw AU's, as confirmed and agreed to by Mario Di Lucca (MoFR Research Branch). The reason is that TIPSY uses HW as a substitute species for CW stands, and these VRAFs will not represent the cedar old-growth conditions being modelled.

The parameters required by TIPSY to compute a VRAF are:

- the percentage crown cover of the original stand that is retained;
- the top height at the time of the VR harvest;
- the proportional allocation of aggregate (*i.e.*, groups) vs. dispersed (*i.e.*, single tree) retention; and
- the total amount of affected edge, estimated by the average size of aggregate groups (10,000 m^2 in this case), and the average crown width of dispersed trees.

Based on discussions with licensees and MoFR, agreement was reached on modelling the EBM retention yield tables as follows:

- The % VRAF retention in the EBM general zone will be reduced from 15% to 10%, to recognize retention from other modelling constraints (riparian, esa, etc);
- The aggregate / dispersed proportion to be 95% aggregate / 5% dispersed, based on Interfor's internal block review;
- Blocks less than 15ha in size will not have a VRAF applied in the EBM zone (consistent with the current Ministerial Order). Interfor estimates that 40% of its cutblocks (area based) are less than 15 hectares in size. This will not be addressed by splitting AUs, but rather by applying a weighted average to the AU (this area cannot be identified spatially, so it is treated as an aspatial weight);
- The high retention EBM zone is defined using VQO preservation and retention designations; and
- Two potential sensitivity analyses were identified (high and low).

Table 49 – EBM stand-level retention requirements

Scenario	EBM Zone	VQO	Total Retention Amount (%)	Portion that is Aggregated	Portion that is Dispersed (m^2/ha)	WTP Allowance	OAF1	OAF2	VRAF Applied
Base Line	Non-EBM	Current VQO	N/A	N/A	N/A	6%	15%	5%	No
	General		10%	95%	5%	-	15%	5%	40% No 60% Yes
	High retention	P & R	40%	80%	20%	-	15%	5%	Yes
High Sensitivity	Non-EBM	Current VQO	N/A	N/A	N/A	6%	15%	5%	No
	General		15%	80%	20%	-	15%	5%	Yes
	High retention	Expand to include wildzones and/or special viewscapes	50%	20%	80%	-	15%	5%	Yes
Low Sensitivity	Non-EBM	Current VQO	N/A	N/A	N/A	6%	15%	5%	No
	General		5%	95%	5%	-	15%	5%	40% No 60% Yes
	High retention	P & R	30%	60%	40%	-	15%	5%	Yes

The EBM-high retention zone has two different area configurations depending on the scenario. The ‘Base EBM’ and ‘Low sensitivity scenarios’ include all the preservation and retention VQOs as defined in the Kingcome Visual Landscape Inventory. The ‘High sensitivity’ scenario area includes all these VQOs and adds the Wild Zone and Special Zone from the CCLRMP Visual Management Zone map provided by the MoFR.

In the Base EBM scenario and Low Sensitivity scenarios, the EBM-general percent retention numbers reflect the fact that a considerable amount of land base is reserved for other non-timber values such as riparian, terrain, cultural and wildlife. At the cutblock level these areas are included as non-harvest areas within or adjacent to the block and are often the basis for retention. The combination of these non-timber values along with a suggested total retention amount of 10% and 5% respectively will fulfill the requirements of the stand level retention objective.

Yield curves are reported in Appendix 2 of this Data Package. As the Pre-EBM scenario yield curves for stands in the non-EBM zone (Vancouver Island) are unchanged in the EBM scenario, they are not presented.

8.5.2 Existing Natural Stands - EBM

Table 50 lists the average input parameters used for existing NSYTs.

Table 50 – Input attributes for existing natural stands - EBM

Current Analysis Unit	Analysis Unit Description	Species 1	Species 2	Species 3	Species 1 Percent	Species 2 Percent	Species 3 Percent	Other Species Percent	Crown Closure (%)	Inventory Site Index (m)	Height (m)	Total Age (yrs)	Conifer Proportion (%)	Volume Adjustment Factor	Utilization Limit
11	CW-GOOD-EBM	CW	HW	DR	61	31	4	4	23	25	23	81	96%	1.16	17.5
12	CW-MED-EBM	CW	HW	YC	61	26	8	5	17	32	36	242	98%	1.18	17.5
13	CW-POOR-EBM	CW	HW	YC	59	20	18	3	13	29	28	306	100%	1.21	17.5
14	HW/BA-GOOD-EBM	HW	CW	BA	79	9	6	6	28	33	30	74	96%	1.17	17.5
15	HW/BA-MED-EBM	HW	CW	BA	73	14	6	7	23	29	29	84	96%	1.18	17.5
16	HW/BA-POOR-EBM	HW	CW	BA	60	20	12	8	16	32	33	195	98%	1.19	17.5
17	SS-EBM	SS	HW	CW	57	27	8	8	18	37	38	196	98%	1.14	17.5
18	DR-EBM	DR	HW	CW	75	15	8	2	24	25	24	68	100%	1.18	17.5
19	ACT-EBM	ACT	CW	DR	67	14	10	9	24	29	29	78	90%	1.13	17.5
20	FDC-EBM	FDC	HW	CW	56	30	11	3	26	34	25	115	98%	1.18	17.5
21	CW-GOOD-EBM-VQO	CW	HW	DR	67	29	4	0	25	29	32	81	96%	1.10	17.5
22	CW-MED-EBM-VQO	CW	HW	FDC	67	29	2	2	16	34	29	267	100%	1.11	17.5
23	CW-POOR-EBM-VQO	CW	HW	YC	64	23	11	2	13	29	33	293	100%	1.16	17.5
24	HW/BA-GOOD-EBM-VQO	HW	CW	BA	76	11	5	8	28	37	29	85	96%	1.15	17.5
25	HW/BA-MED-EBM-VQO	HW	CW	FDC	69	14	10	7	23	31	32	92	98%	1.15	17.5
26	HW/BA-POOR-EBM-VQO	HW	CW	FDC	66	19	9	6	17	31	37	151	100%	1.16	17.5
27	SS-EBM-VQO	SS	HW	FDC	43	40	15	2	19	37	25	151	98%	1.22	17.5
28	DR-EBM-VQO	DR	HW	CW	79	15	5	1	26	28	29	74	100%	1.18	17.5

Current Analysis Unit	Analysis Unit Description	Species 1	Species 2	Species 3	Species 1 Percent	Species 2 Percent	Species 3 Percent	Other Species Percent	Crown Closure (%)	Inventory Site Index (m)	Height (m)	Total Age (yrs)	Conifer Proportion (%)	Volume Adjustment Factor	Utilization Limit
30	FDC-EBM-VQO	FDC	HW	CW	54	35	8	3	24	35	34	129	99%	1.11	17.5
42	CW-MED-TOFDC-EBM	CW	HW	YC	52	32	8	8	57	17	36	282	100%	1.22	17.5
43	CW-POOR-TOFDC-EBM	CW	HW	YC	49	24	22	5	54	13	29	343	100%	1.20	17.5
44	HW/BA-GOOD-TOFDC-EBM	HW	CW	DR	74	12	7	7	66	29	33	71	93%	1.19	17.5
45	HW/BA-MED-TOFDC-EBM	HW	CW	BA	67	12	8	13	69	24	32	90	95%	1.19	17.5
46	HW/BA-POOR-TOFDC-EBM	HW	CW	BA	63	16	12	9	63	16	32	187	99%	1.21	17.5
47	SS-TOFDC-EBM	SS	HW	CW	58	22	9	11	56	23	44	169	100%	1.26	17.5
48	DR-TOFDC-EBM	DR	HW	FDC	70	21	5	4	72	24	26	73	100%	1.18	17.5
52	CW-MED-TOFDC-EBM-VQO	CW	HW	FDC	49	25	13	13	61	15	33	252	100%	1.06	17.5
53	CW-POOR-TOFDC-EBM-VQO	CW	HW	YC	49	32	10	9	54	13	26	222	100%	1.23	17.5
55	HW/BA-MED-TOFDC-EBM-VQO	HW	FDC	SS	68	20	11	1	68	21	39	165	100%	1.26	17.5
56	HW/BA-POOR-TOFDC-EBM-VQO	HW	FDC	CW	58	19	15	8	67	16	31	169	100%	1.20	17.5
57	SS-TOFDC-EBM-VQO	SS	HW	FDC	40	40	8	12	61	19	36	143	99%	1.23	17.5
58	DR-TOFDC-EBM-VQO	DR	HW	CW	50	30	20	0	80	26	30	101	100%	1.19	17.5
63	CW-MARG-EBM	CW	YC	HW	55	26	15	4	61	11	24	311	100%	1.20	17.5
64	HW/BA-MARG-EBM	HW	CW	BA	51	20	15	14	60	13	30	258	100%	1.18	17.5
65	CW-MARG-EBM-VQO	CW	HW	YC	67	18	11	4	62	11	24	291	100%	1.19	17.5
66	HW/BA-MARG-EBM-VQO	HW	CW	BA	53	26	14	7	61	13	27	181	100%	1.12	17.5
69	CW-MARG-TOFDC-EBM	YC	CW	HW	44	28	20	8	54	11	24	295	100%	1.18	17.5
70	HW/BA-MARG-TOFDC-EBM	HW	CW	BA	60	21	12	7	58	13	30	238	100%	1.24	17.5
72	HW/BA-MARG-TOFDC-EBM-VQO	HW	CW	BA	45	30	9	16	60	13	28	195	100%	1.24	17.5

8.5.3 Existing Managed Stands - EBM

Table 51 – Input attributes for existing managed stands - EBM

Current AU	Regime #	Analysis Unit Description	Planted / Natural	Regen Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	OAF1 (%)	OAF2 (%)
111	1	CW/CY-GOOD-EBM	P	1	95%	CW	80%	HW	20%			1000	15	5
111	2	CW/CY-GOOD-EBM	N	3	5%	HW	60%	CW	40%			4000	15	5
112	1	CW/CY-MED-EBM	P	1	85%	CW	80%	HW	20%			1000	15	5
112	2	CW/CY-MED-EBM	N	3	15%	HW	60%	CW	40%			4000	15	5

Current AU	Regime #	Analysis Unit Description	Planted / Natural	Regen Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	OAF1 (%)	OAF2 (%)
113	1	CW/CY-POOR-EBM	P	2	65%	CW	80%	HW	20%			1000	15	5
113	2	CW/CY-POOR-EBM	N	3	35%	HW	60%	CW	40%			4000	15	5
114	1	HWC/BA-GOOD-EBM	P	1	5%	CW	40%	HW	40%	BA	20%	1200	15	5
114	2	HWC/BA-GOOD-EBM	N	3	95%	HW	60%	BA	20%	CW	20%	5000	15	5
115	1	HWC/BA-MED-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15	5
115	2	HWC/BA-MED-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15	5
116	1	HWC/BA-POOR-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15	5
116	2	HWC/BA-POOR-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15	5
117	1	SS-EBM	P	2	70%	SS	40%	BA	40%	HW	20%	1000	15	5
117	2	SS-EBM	N	3	30%	HW	40%	SS	30%	BA	30%	5000	15	5
118	1	DR-EBM	P	2	75%	DR	100%					1000	15	5
118	2	DR-EBM	P	2	25%	CW	100%					1000	15	5
119	1	ACT-EBM	P	2	100%	ACT	100%					1000	15	5
120	1	FDC-EBM	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	15	5
121	1	CW/CY-GOOD-EBM-VQO	P	1	95%	CW	80%	HW	20%			1000	15	5
121	2	CW/CY-GOOD-EBM-VQO	N	3	5%	HW	60%	CW	40%			4000	15	5
122	1	CW/CY-MED-EBM-VQO	P	1	85%	CW	80%	HW	20%			1000	15	5
122	2	CW/CY-MED-EBM-VQO	N	3	15%	HW	60%	CW	40%			4000	15	5
124	1	HWC/BA-GOOD-EBM-VQO	P	1	5%	CW	40%	HW	40%	BA	20%	1200	15	5
124	2	HWC/BA-GOOD-EBM-VQO	N	3	95%	HW	60%	BA	20%	CW	20%	5000	15	5
125	1	HWC/BA-MED-EBM-VQO	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15	5
125	2	HWC/BA-MED-EBM-VQO	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15	5
128	1	DR-EBM-VQO	P	2	75%	DR	100%					1000	15	5
128	2	DR-EBM-VQO	P	2	25%	CW	100%					1000	15	5
130	1	FDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	15	5
141	1	CW/CY-GOOD-TOFDC-EBM	P	1	95%	CW	80%	HW	20%	0	0%	1000	15	5
141	2	CW/CY-GOOD-TOFDC-EBM	N	3	5%	HW	60%	CW	40%	0	0%	4000	15	5
144	1	HWC/BA-GOOD-TOFDC-EBM	P	1	5%	CW	40%	HW	40%	BA	20%	1200	15	5
144	2	HWC/BA-GOOD-TOFDC-EBM	N	3	95%	HW	60%	BA	20%	CW	20%	5000	15	5
145	1	HWC/BA-MED-TOFDC-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15	5
145	2	HWC/BA-MED-TOFDC-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15	5
146	1	HWC/BA-POOR-TOFDC-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15	5
146	2	HWC/BA-POOR-TOFDC-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15	5
147	1	SS-TOFDC-EBM	P	2	70%	SS	40%	BA	40%	HW	20%	1000	15	5
147	2	SS-TOFDC-EBM	N	3	30%	HW	40%	SS	30%	BA	30%	5000	15	5
148	1	DR-TOFDC-EBM	P	2	75%	DR	100%					1000	15	5
148	2	DR-TOFDC-EBM	P	2	25%	CW	100%					1000	15	5
151	1	CW/CY-GOOD-TOFDC-EBM-VQO	P	1	95%	CW	80%	HW	20%			1000	15	5

Current AU	Regime #	Analysis Unit Description	Planted / Natural	Regen Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	OAF1 (%)	OAF2 (%)
151	2	CW/CY-GOOD-TOFDC-EBM-VQO	N	3	5%	HW	60%	CW	40%			4000	15	5
154	1	HWC/BA-GOOD-TOFDC-EBM-VQO	P	1	5%	CW	40%	HW	40%	BA	20%	1200	15	5
154	2	HWC/BA-GOOD-TOFDC-EBM-VQO	N	3	95%	HW	60%	BA	20%	CW	20%	5000	15	5
155	1	HWC/BA-MED-TOFDC-EBM-VQO	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15	5
155	2	HWC/BA-MED-TOFDC-EBM-VQO	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15	5
158	1	DR-TOFDC-EBM-VQO	P	2	75%	DR	100%					1000	15	5
158	2	DR-TOFDC-EBM-VQO	P	2	25%	CW	100%					1000	15	5
163	1	CW/CY-MARG-EBM	P	2	65%	CW	80%	HW	20%			1000	15	5
163	2	CW/CY-MARG-EBM	N	3	35%	HW	60%	CW	40%			4000	15	5
164	1	HWC/BA-MARG-EBM	P	1	30%	CW	40%	HW	40%	BA	20%	1200	15	5
164	2	HWC/BA-MARG-EBM	N	3	70%	HW	60%	BA	20%	CW	20%	5000	15	5

8.5.4 Future Managed Stands - EBM

In modelling future managed stands, operational adjustment factors are unchanged from the Pre-EBM analysis (OAF1 = 15% and OAF2 = 5%). Table 52 lists the silviculture input regimes for MSYTs.

Table 52 – Silviculture regimes for future managed stands - EBM

Future Analysis Unit	Regime #	Analysis Unit Description	Planted / Natura	Regeneratin Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	Genetic Gain Species 1	Genetic Gain Species 2	Genetic Gain Species 3	EBM retention %	EBM %dispersed	EBM % Aggregate	Residual Stand Ht (m)
211	1	CW/CY-GOOD-EBM	P	1	95%	CW	80%	HW	20%			1000	3%	0%	0%				
211	2	CW/CY-GOOD-EBM	N	3	5%	HW	60%	CW	40%			4000	0%	0%	0%				
212	1	CW/CY-MED-EBM	P	1	85%	CW	80%	HW	20%			1000	3%	0%	0%				
212	2	CW/CY-MED-EBM	N	3	15%	HW	60%	CW	40%			4000	0%	0%	0%				
213	1	CW/CY-POOR-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0%	0%				
213	2	CW/CY-POOR-EBM	N	3	35%	HW	60%	CW	40%			4000	0%	0%	0%				
214	1	HWC/BA-GOOD-EBM	P	1	3%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
214	2	HWC/BA-GOOD-EBM	N	3	57%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30
214	3	HWC/BA-GOOD-EBM	P	1	2%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				
214	4	HWC/BA-GOOD-EBM	N	3	38%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				
215	1	HWC/BA-MED-EBM	P	1	18%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
215	2	HWC/BA-MED-EBM	N	3	42%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30

Future Analysis Unit	Regime #	Analysis Unit Description	Planted / Natura	Regeneratin Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	Genetic Gain Species 1	Genetic Gain Species 2	Genetic Gain Species 3	EBM retention %	EBM %dispersed	EBM % Aggregate	Residual Stand Ht (m)
215	3	HWC/BA-MED-EBM	P	1	12%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				
215	4	HWC/BA-MED-EBM	N	3	28%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				
216	1	HWC/BA-POOR-EBM	P	1	18%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
216	2	HWC/BA-POOR-EBM	N	3	42%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30
216	3	HWC/BA-POOR-EBM	P	1	12%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				
216	4	HWC/BA-POOR-EBM	N	3	28%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				
217	1	SS-EBM	P	2	70%	SS	40%	BA	40%	HW	20%	1000	0%	0%	0%				
217	2	SS-EBM	N	3	30%	HW	40%	SS	30%	BA	30%	5000	0%	0%	0%				
218	1	DR-EBM	P	2	75%	DR	100%					1000	0%	0%	0%				
218	2	DR-EBM	P	2	25%	CW	100%					1000	3%	0%	0%				
219	1	ACT-EBM	P	2	100%	ACT	100%					1000	0%	0%	0%				
220	1	FDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
220	2	FDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
221	1	CW/CY-GOOD-EBM-VQO	P	1	95%	CW	80%	HW	20%			1000	3%	0%	0%				
221	2	CW/CY-GOOD-EBM-VQO	N	3	5%	HW	60%	CW	40%			4000	0%	0%	0%				
222	1	CW/CY-MED-EBM-VQO	P	1	85%	CW	80%	HW	20%			1000	3%	0%	0%				
222	2	CW/CY-MED-EBM-VQO	N	3	15%	HW	60%	CW	40%			4000	0%	0%	0%				
223	1	CW/CY-POOR-EBM-VQO	P	2	65%	CW	80%	HW	20%			1000	3%	0%	0%				
223	2	CW/CY-POOR-EBM-VQO	N	3	35%	HW	60%	CW	40%			4000	0%	0%	0%				
224	1	HWC/BA-GOOD-EBM-VQO	P	1	5%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	40%	20%	80%	30
224	2	HWC/BA-GOOD-EBM-VQO	N	3	95%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	40%	20%	80%	30
225	1	HWC/BA-MED-EBM-VQO	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	40%	20%	80%	30
225	2	HWC/BA-MED-EBM-VQO	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	40%	20%	80%	30
226	1	HWC/BA-POOR-EBM-VQO	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	40%	20%	80%	30
226	2	HWC/BA-POOR-EBM-VQO	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	40%	20%	80%	30
227	1	SS-EBM-VQO	P	2	70%	SS	40%	BA	40%	HW	20%	1000	0%	0%	0%				
227	2	SS-EBM-VQO	N	3	30%	HW	40%	SS	30%	BA	30%	5000	0%	0%	0%				
228	1	DR-EBM-VQO	P	2	75%	DR	100%					1000	0%	0%	0%				
228	2	DR-EBM-VQO	P	2	25%	CW	100%					1000	3%	0%	0%				
230	1	FDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
242	1	CW/CY-MED-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
242	2	CW/CY-MED-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
243	1	CW/CY-POOR-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
243	2	CW/CY-POOR-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
244	1	HWC/BA-GOOD-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
244	2	HWC/BA-GOOD-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
245	1	HWC/BA-MED-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
245	2	HWC/BA-MED-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				

Future Analysis Unit	Regime #	Analysis Unit Description	Planted / Natura	Regeneratin Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	Genetic Gain Species 1	Genetic Gain Species 2	Genetic Gain Species 3	EBM retention %	EBM %dispersed	EBM % Aggregate	Residual Stand Ht (m)
246	1	HWC/BA-POOR-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
246	2	HWC/BA-POOR-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
247	1	SS-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
247	2	SS-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
248	1	DR-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
248	2	DR-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
249	1	ACT-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
249	2	ACT-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
252	1	CW/CY-MED-TOFDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
253	1	CW/CY-POOR-TOFDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
255	1	HWC/BA-MED-TOFDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
256	1	HWC/BA-POOR-TOFDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
257	1	SS-TOFDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
258	1	DR-TOFDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
263	1	CW/CY-MARG-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0%	0%				
263	2	CW/CY-MARG-EBM	N	3	35%	HW	60%	CW	40%			4000	0%	0%	0%				
264	1	HWC/BA-MARG-EBM	P	1	18%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
264	2	HWC/BA-MARG-EBM	N	3	42%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30
264	3	HWC/BA-MARG-EBM	P	1	12%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				
264	4	HWC/BA-MARG-EBM	N	3	28%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				
265	1	CW/CY-MARG-EBM-VQO	P	2	65%	CW	80%	HW	20%			1000	3%	0%	0%				
265	2	CW/CY-MARG-EBM-VQO	N	3	35%	HW	60%	CW	40%			4000	0%	0%	0%				
266	1	HWC/BA-MARG-EBM-VQO	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	40%	20%	80%	30
266	2	HWC/BA-MARG-EBM-VQO	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	40%	20%	80%	30
269	1	CW/CY-MARG-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
269	2	CW/CY-MARG-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
270	1	HWC/BA-MARG-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
270	2	HWC/BA-MARG-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
272	1	HWC/BA-MARG-TOFDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
311	1	CW/CY-GOOD-EBM	P	1	95%	CW	80%	HW	20%			1000	3%	0%	0%				
311	2	CW/CY-GOOD-EBM	N	3	5%	HW	60%	CW	40%			4000	0%	0%	0%				
312	1	CW/CY-MED-EBM	P	1	85%	CW	80%	HW	20%			1000	3%	0%	0%				
312	2	CW/CY-MED-EBM	N	3	15%	HW	60%	CW	40%			4000	0%	0%	0%				
313	1	CW/CY-POOR-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0%	0%				
313	2	CW/CY-POOR-EBM	N	3	35%	HW	60%	CW	40%			4000	0%	0%	0%				
314	1	HWC/BA-GOOD-EBM	P	1	3%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
314	2	HWC/BA-GOOD-EBM	N	3	57%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30
314	3	HWC/BA-GOOD-EBM	P	1	2%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				

Future Analysis Unit	Regime #	Analysis Unit Description	Planted / Natura	Regeneratin Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	Genetic Gain Species 1	Genetic Gain Species 2	Genetic Gain Species 3	EBM retention %	EBM %dispersed	EBM % Aggregate	Residual Stand Ht (m)
314	4	HWC/BA-GOOD-EBM	N	3	38%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				
315	1	HWC/BA-MED-EBM	P	1	18%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
315	2	HWC/BA-MED-EBM	N	3	42%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30
315	3	HWC/BA-MED-EBM	P	1	12%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				
315	4	HWC/BA-MED-EBM	N	3	28%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				
316	1	HWC/BA-POOR-EBM	P	1	18%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
316	2	HWC/BA-POOR-EBM	N	3	42%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30
316	3	HWC/BA-POOR-EBM	P	1	12%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				
316	4	HWC/BA-POOR-EBM	N	3	28%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				
317	1	SS-EBM	P	2	70%	SS	40%	BA	40%	HW	20%	1000	0%	0%	0%				
317	2	SS-EBM	N	3	30%	HW	40%	SS	30%	BA	30%	5000	0%	0%	0%				
318	1	DR-EBM	P	2	75%	DR	100%					1000	0%	0%	0%				
318	2	DR-EBM	P	2	25%	CW	100%					1000	3%	0%	0%				
319	1	ACT-EBM	P	2	100%	ACT	100%					1000	0%	0%	0%				
320	1	FDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
320	2	FDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
321	1	CW/CY-GOOD-EBM-VQO	P	1	95%	CW	80%	HW	20%			1000	3%	0%	0%				
321	2	CW/CY-GOOD-EBM-VQO	N	3	5%	HW	60%	CW	40%			4000	0%	0%	0%				
322	1	CW/CY-MED-EBM-VQO	P	1	85%	CW	80%	HW	20%			1000	3%	0%	0%				
322	2	CW/CY-MED-EBM-VQO	N	3	15%	HW	60%	CW	40%			4000	0%	0%	0%				
324	1	HWC/BA-GOOD-EBM-VQO	P	1	5%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	40%	20%	80%	30
324	2	HWC/BA-GOOD-EBM-VQO	N	3	95%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	40%	20%	80%	30
325	1	HWC/BA-MED-EBM-VQO	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	40%	20%	80%	30
325	2	HWC/BA-MED-EBM-VQO	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	40%	20%	80%	30
326	1	HWC/BA-POOR-EBM-VQO	P	1	30%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	40%	20%	80%	30
326	2	HWC/BA-POOR-EBM-VQO	N	3	70%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	40%	20%	80%	30
341	1	CW/CY-GOOD-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
341	2	CW/CY-GOOD-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
342	1	CW/CY-MED-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
342	2	CW/CY-MED-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
343	1	CW/CY-POOR-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
343	2	CW/CY-POOR-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
344	1	HWC/BA-GOOD-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
344	2	HWC/BA-GOOD-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
345	1	HWC/BA-MED-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
345	2	HWC/BA-MED-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
346	1	HWC/BA-POOR-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
346	2	HWC/BA-POOR-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				

Future Analysis Unit	Regime #	Analysis Unit Description	Planted / Natura	Regeneratin Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	Genetic Gain Species 1	Genetic Gain Species 2	Genetic Gain Species 3	EBM retention %	EBM %dispersed	EBM % Aggregate	Residual Stand Ht (m)
347	1	SS-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
347	2	SS-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
348	1	DR-TOFDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
348	2	DR-TOFDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
351	1	CW/CY-GOOD-TOFDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
354	1	HWC/BA-GOOD-TOFDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
355	1	HWC/BA-MED-TOFDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
358	1	DR-TOFDC-EBM-VQO	P	1	100%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	40%	20%	80%	30
363	1	CW/CY-MARG-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0%	0%				
363	2	CW/CY-MARG-EBM	N	3	35%	HW	60%	CW	40%			4000	0%	0%	0%				
364	1	HWC/BA-MARG-EBM	P	1	18%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
364	2	HWC/BA-MARG-EBM	N	3	42%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30
364	3	HWC/BA-MARG-EBM	P	1	12%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				
364	4	HWC/BA-MARG-EBM	N	3	28%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				
411	1	CW/CY-GOOD-EBM	P	1	95%	CW	80%	HW	20%			1000	3%	0%	0%				
411	2	CW/CY-GOOD-EBM	N	3	5%	HW	60%	CW	40%			4000	0%	0%	0%				
412	1	CW/CY-MED-EBM	P	1	85%	CW	80%	HW	20%			1000	3%	0%	0%				
412	2	CW/CY-MED-EBM	N	3	15%	HW	60%	CW	40%			4000	0%	0%	0%				
413	1	CW/CY-POOR-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0%	0%				
413	2	CW/CY-POOR-EBM	N	3	35%	HW	60%	CW	40%			4000	0%	0%	0%				
414	1	HWC/BA-GOOD-EBM	P	1	3%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
414	2	HWC/BA-GOOD-EBM	N	3	57%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30
414	3	HWC/BA-GOOD-EBM	P	1	2%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				
414	4	HWC/BA-GOOD-EBM	N	3	38%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				
415	1	HWC/BA-MED-EBM	P	1	18%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
415	2	HWC/BA-MED-EBM	N	3	42%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30
415	3	HWC/BA-MED-EBM	P	1	12%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				
415	4	HWC/BA-MED-EBM	N	3	28%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				
416	1	HWC/BA-POOR-EBM	P	1	18%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
416	2	HWC/BA-POOR-EBM	N	3	42%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30
416	3	HWC/BA-POOR-EBM	P	1	12%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				
416	4	HWC/BA-POOR-EBM	N	3	28%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				
419	1	ACT-EBM	P	2	100%	ACT	100%					1000	0%	0%	0%				
420	1	FDC-EBM	P	1	60%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%	10%	5%	95%	30
420	2	FDC-EBM	P	1	40%	FDC	40%	HW	40%	CW	20%	1000	3%	0%	3%				
421	1	CW/CY-GOOD-EBM-VQO	P	1	95%	CW	80%	HW	20%			1000	3%	0%	0%				
421	2	CW/CY-GOOD-EBM-VQO	N	3	5%	HW	60%	CW	40%			4000	0%	0%	0%				
422	1	CW/CY-MED-EBM-VQO	P	1	85%	CW	80%	HW	20%			1000	3%	0%	0%				

Future Analysis Unit	Regime #	Analysis Unit Description	Planted / Natura	Regeneratin Delay (yrs)	Regime Percent	Species 1	Species 1 Percent	Species 2	Species 2 Percent	Species 3	Species 3 Percent	Establishment Density (stems/ha)	Genetic Gain Species 1	Genetic Gain Species 2	Genetic Gain Species 3	EBM retention %	EBM %dispersed	EBM % Aggregate	Residual Stand Ht (m)
422	2	CW/CY-MED-EBM-VQO	N	3	15%	HW	60%	CW	40%			4000	0%	0%	0%				
423	1	CW/CY-POOR-EBM-VQO	P	2	65%	CW	80%	HW	20%			1000	3%	0%	0%				
423	2	CW/CY-POOR-EBM-VQO	N	3	35%	HW	60%	CW	40%			4000	0%	0%	0%				
424	1	HWC/BA-GOOD-EBM-VQO	P	1	5%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	40%	20%	80%	30
424	2	HWC/BA-GOOD-EBM-VQO	N	3	95%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	40%	20%	80%	30
463	1	CW/CY-MARG-EBM	P	2	65%	CW	80%	HW	20%			1000	3%	0%	0%				
463	2	CW/CY-MARG-EBM	N	3	35%	HW	60%	CW	40%			4000	0%	0%	0%				
464	1	HWC/BA-MARG-EBM	P	1	18%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%	10%	5%	95%	30
464	2	HWC/BA-MARG-EBM	N	3	42%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%	10%	5%	95%	30
464	3	HWC/BA-MARG-EBM	P	1	12%	CW	40%	HW	40%	BA	20%	1200	3%	0%	0%				
464	4	HWC/BA-MARG-EBM	N	3	28%	HW	60%	BA	20%	CW	20%	5000	0%	0%	0%				

9.0 Integrated Resource Management

9.1 Forest Cover Objectives – Rationale

Forest cover objectives place maximum and/or minimum limits on the amount of young, mature and/or old growth found in land base aggregates such as combinations of landscape units and ecosystem units or resource emphasis areas. Three classes of forest cover constraints can be modelled to capture these management objectives within management zones:

1. Disturbance: the maximum area that can be younger than a specified age or shorter than a specified height. This is intended to model cutblock adjacency and green-up requirements.
2. Old-growth Retention: the minimum area that must be older than, or as old as, a specified age. This is intended to model both retention of cover and retention of old growth.
3. Mature Retention: the minimum proportion of area that must be retained over a lower retention age. This is intended to model thermal cover for wildlife or mature biodiversity requirements. Mature and old growth retention forest cover objectives may overlap and area that qualifies for both is counted in both.

9.2 Pre-EBM Objectives

9.2.1 Cut-Block Adjacency , Maximum Disturbance and Minimum Retention

Visual quality is maintained by limiting the rate of harvest in areas that are identified as visually sensitive in the Visual Landscape Inventory. Each polygon has a forest cover constraint applied to it, depending on its visual quality objective and Visual Absorption Capacity (VAC). The forest cover constraint specifies the maximum area that can be below the specified green-up height at any point in time. In the analysis, harvesting will not occur within a VQO polygon in any period when doing so would violate this constraint.

Areas outside the VQO polygons are assigned a disturbance constraint designed to mimic cut-block adjacency. The Enhanced Zones of the VILUP portion of the TSA have a reduced green-up requirement to permit additional harvesting activity.

Minimum retention constraints are necessary to ensure sufficient old forest is maintained within the VILUP Special Management Zones.

Table 53 summarizes the disturbance and retention forest cover constraints for the management zones defined for management under Pre-EBM rules.

Table 53 – Forest cover requirements for disturbance and mature retention

Objective	Visual Absorption Capacity	Green-up Height (metres)	Maximum Area Below Green-up (%)	Minimum Retention (% > years)	Land Base Component
Visual Quality – Preservation	L M H	5.0 5.0 5.0	0.0 0.5 1.0		Productive
Visual Quality – Retention	L M H	5.0 5.0 5.0	1.1 3.0 5.0		Productive
Visual Quality – Partial Retention	L M H	5.0 5.0 5.0	5.1 10.0 15.0		Productive
Visual Quality – Modification	L M H	5.0 5.0 5.0	15.1 20.0 25.0		Productive
VILUP – Enhanced Zones	n/a	1.3	25.0		THLB
Integrated Resource Management	n/a	3.0	25.0		THLB
VILUP – Special MZ 1, 2, 3				25% > 140	Productive
VILUP – Special MZ 7				30% > 140	Productive

9.2.2 Landscape Level Biodiversity

For TSR 2 analysis, landscape level biodiversity objectives were met by applying cover constraints based on VILUP and the *Biodiversity Guidebook*. Since then, old growth management areas have been established in five landscape units (see Section 5.1.15). These OGMAs have been netted out of the timber harvesting land base, replacing the *Biodiversity Guidebook* targets for the corresponding landscape units. In the balance of the Landscape Units, old seral constraints, as defined through legislation in the Order Establishing Provincial Non-spatial Old Growth Objectives (June 30, 2004), will be applied at the LU/BEC variant level based on the biodiversity emphasis option (BEO) and BEC natural disturbance type (NDT). Old growth seral constraint zones are summarized in Table 54. *Biodiversity Guidebook* old growth seral constraints for these zones are listed in Table 55. All of the productive forest is considered in applying these constraints.

In the EBM analysis, these aspatial targets will be replaced in the EBM zone with the biodiversity objectives set out in the Order (see Section 9.3.3).

Table 54 – Old growth seral constraint zones

Landscape Unit		BEO	BEC	
Number	**Name**			
1	Adam-Eve	Low	CMA	Unp
2	Ahnuhati-kwalate	High	CMA	Unp
2	Ahnuhati-kwalate	High	CWH	vm 1
2	Ahnuhati-kwalate	High	CWH	vm 2
2	Ahnuhati-kwalate	High	MH	mm 1
3	Ahta	High	CMA	Unp
3	Ahta	High	CWH	vm 1
3	Ahta	High	CWH	vm 2
3	Ahta	High	MH	mm 1
4	Allison	Low	CWH	vh 1
5	Artlish	Intermediate	CMA	Unp
5	Artlish	Intermediate	CWH	vm 2
5	Artlish	Intermediate	MH	mm 1
6	Belize	Intermediate	CMA	Unp
6	Belize	Intermediate	CWH	vh 1
6	Belize	Intermediate	CWH	vm 1
6	Belize	Intermediate	CWH	vm 2
6	Belize	Intermediate	MH	mm 1
7	Bonanza	Intermediate	CMA	Unp
7	Bonanza	Intermediate	CWH	vm 1
7	Bonanza	Intermediate	CWH	vm 2
7	Bonanza	Intermediate	MH	mm 1
8	Brooks	Low	CWH	vh 1
9	Broughton	Low	CWH	vm 1
10	Charles	Intermediate	CMA	Unp
10	Charles	Intermediate	CWH	vm 1
10	Charles	Intermediate	CWH	vm 2
10	Charles	Intermediate	MH	mm 1
11	Franklin	High	CMA	Unp
11	Franklin	High	CWH	Dm
11	Franklin	High	CWH	vm 1
11	Franklin	High	CWH	vm 2
11	Franklin	High	MH	mm 1
12	Fulmore	Intermediate	CMA	Unp
12	Fulmore	Intermediate	CWH	vm 1
12	Fulmore	Intermediate	CWH	vm 2
12	Fulmore	Intermediate	MH	mm 1
13	Gilford	Low	CMA	Unp
13	Gilford	Low	CWH	vm 1

Landscape Unit		BEO	BEC	
Number	Name			
13	Gilford	Low	CWH	vm 2
13	Gilford	Low	MH	mm 1
14	Holberg	Low	CWH	vh 1
14	Holberg	Low	CWH	vm 1
15	Homathko	High	CMA	Unp
16	Huaskin	Intermediate	CWH	vh 1
16	Huaskin	Intermediate	CWH	vm 1
16	Huaskin	Intermediate	CWH	vm 2
16	Huaskin	Intermediate	MH	mm 1
17	Kakweiken	Intermediate	CMA	Unp
17	Kakweiken	Intermediate	CWH	vm 1
17	Kakweiken	Intermediate	CWH	vm 2
17	Kakweiken	Intermediate	MH	mm 1
18	Kashutl	Low	CWH	vm 1
18	Kashutl	Low	CWH	vm 2
18	Kashutl	Low	MH	mm 1
19	Keogh	Low	CWH	vm 1
20	Klaskish	High	CWH	vh 1
20	Klaskish	High	CWH	vm 1
20	Klaskish	High	CWH	vm 2
20	Klaskish	High	MH	mm 1
21	Klinaklini Glacier	Intermediate	CMA	Unp
21	Klinaklini Glacier	Intermediate	CWH	ws 2
21	Klinaklini Glacier	Intermediate	MH	mm 2
22	Knight East	Low	CMA	Unp
22	Knight East	Low	CWH	Dm
22	Knight East	Low	CWH	vm 1
22	Knight East	Low	CWH	vm 2
22	Knight East	Low	MH	mm 1
23	Lower Kingcome	Intermediate	CMA	Unp
23	Lower Kingcome	Intermediate	CWH	vm 1
23	Lower Kingcome	Intermediate	CWH	vm 2
23	Lower Kingcome	Intermediate	MH	mm 1
24	Lower Klinaklini	Intermediate	CMA	Unp
24	Lower Klinaklini	Intermediate	CWH	vm 1
24	Lower Klinaklini	Intermediate	CWH	vm 2
24	Lower Klinaklini	Intermediate	CWH	ws 2
24	Lower Klinaklini	Intermediate	MH	mm 1
24	Lower Klinaklini	Intermediate	MH	mm 2
25	Lower Nimpkish	Low	CMA	Unp

Landscape Unit		BEO	BEC	
Number	Name			
25	Lower Nimpkish	Low	CWH	vm 1
25	Lower Nimpkish	Low	CWH	vm 2
25	Lower Nimpkish	Low	CWH	xm 2
25	Lower Nimpkish	Low	MH	mm 1
26	Lull-Sallie	Intermediate	CMA	Unp
26	Lull-Sallie	Intermediate	CWH	vm 1
26	Lull-Sallie	Intermediate	CWH	vm 2
26	Lull-Sallie	Intermediate	MH	mm 1
27	Mahatta	Low	CWH	vh 1
27	Mahatta	Low	CWH	vm 1
27	Mahatta	Low	CWH	vm 2
27	Mahatta	Low	MH	mm 1
29	Marble	Intermediate	CWH	vm 1
29	Marble	Intermediate	CWH	vm 2
29	Marble	Intermediate	MH	mm 1
30	Middle Klinaklini	Intermediate	CMA	Unp
30	Middle Klinaklini	Intermediate	CWH	ds 2
30	Middle Klinaklini	Intermediate	CWH	ws 2
30	Middle Klinaklini	Intermediate	ESS	Fmw
30	Middle Klinaklini	Intermediate	IDF	Ww
30	Middle Klinaklini	Intermediate	MH	mm 2
31	Miriam	Intermediate	CMA	Unp
31	Miriam	Intermediate	CWH	vm 1
31	Miriam	Intermediate	CWH	vm 2
31	Miriam	Intermediate	MH	mm 1
34	Nasparti	Low	CWH	vh 1
34	Nasparti	Low	CWH	vm 2
35	Neechanz	High	CWH	vm 3
35	Neechanz	High	MH	mm 1
36	Neroutsos	Low	CWH	vm 1
36	Neroutsos	Low	CWH	vm 2
37	Nigei	Low	CWH	vh 1
39	Seymour	Intermediate	CMA	Unp
39	Seymour	Intermediate	CWH	vm 1
39	Seymour	Intermediate	CWH	vm 2
39	Seymour	Intermediate	CWH	vm 3
39	Seymour	Intermediate	MH	mm 1
41	Sim	Intermediate	CMA	Unp
41	Sim	Intermediate	CWH	vm 1
41	Sim	Intermediate	CWH	vm 2

Landscape Unit		BEO	BEC	
Number	Name			
41	Sim	Intermediate	MH	mm 1
42	Smith Sound	Low	CWH	vh 1
43	Smokehouse	Low	CWH	vh 1
43	Smokehouse	Low	CWH	vm 1
43	Smokehouse	Low	CWH	vm 2
43	Smokehouse	Low	MH	mm 1
44	Snowdrift	Intermediate	CMA	Unp
44	Snowdrift	Intermediate	CWH	vm 1
44	Snowdrift	Intermediate	CWH	vm 2
44	Snowdrift	Intermediate	MH	mm 1
45	Stafford	High	CMA	Unp
45	Stafford	High	MH	mm 1
47	Tahsish	Intermediate	CWH	vm 1
47	Tahsish	Intermediate	CWH	vm 2
47	Tahsish	Intermediate	MH	mm 1
50	Upper Kingcome	Intermediate	CMA	Unp
50	Upper Kingcome	Intermediate	CWH	vm 1
50	Upper Kingcome	Intermediate	CWH	vm 2
50	Upper Kingcome	Intermediate	MH	mm 1
51	Upper Klinaklini	Intermediate	BAF	Aunp
51	Upper Klinaklini	Intermediate	CMA	Unp
51	Upper Klinaklini	Intermediate	CWH	ds 2
51	Upper Klinaklini	Intermediate	CWH	ws 2
51	Upper Klinaklini	Intermediate	ESS	Fmw
51	Upper Klinaklini	Intermediate	IDF	Ww
51	Upper Klinaklini	Intermediate	IMA	Unp
51	Upper Klinaklini	Intermediate	MH	mm 2
52	Upper Nimpkish	Intermediate	CMA	Unp
52	Upper Nimpkish	Intermediate	CWH	vm 1
52	Upper Nimpkish	Intermediate	CWH	vm 2
52	Upper Nimpkish	Intermediate	MH	mm 1
53	Wakeman	Intermediate	CMA	Unp
53	Wakeman	Intermediate	CWH	vm 1
53	Wakeman	Intermediate	CWH	vm 2
53	Wakeman	Intermediate	MH	Mm 1
54	Walker	N/A	CWH	vh 1

Table 55 – Landscape unit old seral forest cover requirements

BEC	NDT	BEO	Retention Age	Retention %
CWH dm	2	High	250	13
CWH dm	2	Low	250	9
CWH ds 2	2	Intermediate	250	9
CWH vh 1	1	High	250	19
CWH vh 1	1	Intermediate	250	19
CWH vh 1	1	Low	250	13
CWH vm 1	1	High	250	19
CWH vm 1	1	Intermediate	250	19
CWH vm 1	1	Low	250	13
CWH vm 2	1	High	250	19
CWH vm 2	1	Intermediate	250	19
CWH vm 2	1	Low	250	13
CWH vm 3	1	High	250	19
CWH vm 3	1	Intermediate	250	19
CWH ws 2	2	Intermediate	250	9
ESSFmw	2	Intermediate	250	9
IDF ww	4	Intermediate	250	13
MH mm 1	1	High	250	28
MH mm 1	1	Intermediate	250	19
MH mm 1	1	Low	250	19
MH mm 2	1	Intermediate	250	19

9.2.3 Stand Level Biodiversity

After other land classification are complete additional area reductions to the timber harvesting land base, and/or volume reductions to yield curves may be required to provide sufficient reserves of productive timber for wildlife at the site-specific level. These small reserves are referred to as wildlife tree patches. The stand level biodiversity requirement will account for both wildlife trees and tree patches by reducing the average volume per hectare that is harvested, to account for trees which must be left standing within cut-blocks. In the pre-EBM scenario, no additional reductions will be applied for variable retention harvesting.

9.2.4 Community Watersheds

Community watersheds will have a five percent per five year rate-of-cut constraint applied to them, consistent with the Forest Planning and Practices Regulation.

9.3 EBM Objectives

9.3.1 EBM Objective 8 – Important Fisheries Watersheds

As stated in Section 6.2.1, a 20% ECA target, based on a hydrological greenup height of nine metres is to be applied to sensitive fisheries zones. Following recommendations provided by the

MoFR Forest Analysis and Inventory Branch, this will be modelled by establishing a maximum disturbance constraint equal to 16% of the productive forest less than six metres in height.

9.3.2 EBM Objective 12 – Upland Streams

For the watersheds summarized in Section 6.2.2, a 30% maximum disturbance constraint will be applied. This will ensure that 70% or more of the forest will be maintained as functional riparian forest.

9.3.3 EBM Objective 14 – Landscape Level Biodiversity

In the EBM zone, the aspatial targets specified in Section 9.2.2 will be replaced in the EBM zone with the biodiversity objectives set out in the Order. The old seral forest cover retention targets defined in Table 56 will be applied to the site series surrogates as defined in Section 6.2.3. In this case, minimum old seral is defined as age 180.

Table 56 – SSS old seral forest cover requirements - EBM

Very Rare (70% of RONV)		Rare (70% of RONV)		Modal (70% of RONV)		Common (30% of RONV)		Very Common (30% of RONV)	
SS Surrogate	Old Forest Target	SS Surrogate	Old Forest Target	SS Surrogate	Old Forest Target	SS Surrogate	Old Forest Target	SS Surrogate	Old Forest Target
CWHds2-AU10	60%	CWHds2-AU6	60%	CWHds2-AU1	42%	CWHdm-AU1	23%	CWHdm-AU7	23%
CWHds2-AU11	60%	CWHmm1-AU5	53%	CWHds2-AU7	60%	CWHdm-AU2	17%	CWHds2-AU12	12%
CWHmm1-AU4	53%	CWHvh1-AU2	63%	CWHmm1-AU3	41%	CWHdm-AU8	23%	CWHds2-AU2	18%
CWHmm1-AU12	29%	CWHvm2-AU1	49%	CWHmm1-AU6	61%	CWHds2-AU5	22%	CWHds2-AU3	22%
CWHvm2-AU10	59%	CWHvm2-AU2	49%	CWHmm1-AU9	23%	CWHds2-AU9	26%	CWHds2-AU8	26%
CWHxm-AU1	53%	CWHvm2-AU3	49%	CWHms2-AU10	61%	CWHmm1-AU7	23%	CWHms2-AU2	17%
CWHxm-AU3	41%	CWHxm-AU2	41%	CWHms2-AU11	61%	CWHmm1-AU8	23%	CWHms2-AU3	17%
CWHxm-AU4	53%	CWHxm-AU7	53%	CWHms2-AU4	53%	CWHms2-AU1	23%	CWHms2-AU5	23%
CWHxm-AU5	53%	CWHxm-AU8	53%	CWHvh1-AU11	25%	CWHms2-AU6	26%	CWHms2-AU7	23%
CWHxm2-AU10	61%	CWHxm2-AU5	53%	CWHvh1-AU9	29%	CWHms2-AU12	12%	CWHms2-AU8	23%
ESSFmwh-AU12	29%	CWHxm2-AU9	53%	CWHvh2-AU11	59%	CWHvh1-AU12	12%	CWHms2-AU9	23%
ESSFmwh-AU8	60%	ESSFmw-AU3	50%	CWHvh2-AU4	63%	CWHvh1-AU4	27%	CWHvh1-AU5	29%
ESSFmwh-AU9	60%	IDFww-AU11	60%	CWHvm2-AU11	59%	CWHvh1-AU7	25%	CWHvh1-AU6	29%
IDFww-AU6	60%	IDFww-AU5	50%	CWHvm2-AU12	29%	CWHvh1-AU8	29%	CWHvh2-AU5	29%
IDFww-AU7	60%	IDFww-AU9	60%	CWHvm2-AU4	59%	CWHvh2-AU10	25%	CWHvh2-AU6	29%

Very Rare (70% of RONV)		Rare (70% of RONV)		Modal (70% of RONV)		Common (30% of RONV)		Very Common (30% of RONV)	
SS Surrogate	Old Forest Target	SS Surrogate	Old Forest Target	SS Surrogate	Old Forest Target	SS Surrogate	Old Forest Target	SS Surrogate	Old Forest Target
MHmm1-AU11	59%	MHmm1-AU3	49%	CWHws2-AU11	60%	CWHvh2-AU12	12%	CWHvh2-AU7	25%
MHmm1-AU12	29%	MHmm2-AU3	49%	CWHws2-AU5	50%	CWHvm1-AU1	21%	CWHvh2-AU8	29%
MHmm1-AU2	49%	MHmm2-AU6	65%	CWHws2-AU6	60%	CWHvm1-AU12	12%	CWHvh2-AU9	29%
MHmm1-AU4	59%	MHmm2-AU7	59%	CWHxm2-AU6	61%	CWHvm1-AU3	21%	CWHvm1-AU10	25%
MHmm2-AU2	29%	MHmm2e-AU9	59%	ESSFmw-AU12	29%	CWHws2-AU12	12%	CWHvm1-AU11	25%
MHmm2-AU5	65%	MHwh1-AU5	68%	IDFww-AU2	42%	CWHws2-AU2	18%	CWHvm1-AU2	21%
MHmm2e-AU12	29%	MHwh1-AU8	68%	IDFww-AU8	60%	CWHws2-AU3	22%	CWHvm1-AU4	25%
MHmm2e-AU3	49%			MHmm1-AU5	65%	CWHws2-AU7	26%	CWHvm1-AU5	28%
MHmmp-AU8	59%			MHmm1-AU7	59%	CWHxm2-AU1	23%	CWHvm1-AU6	28%
MHmmp-AU9	59%			MHmm2-AU12	29%	CWHxm2-AU2	17%	CWHvm1-AU7	25%
				MHwh1-AU9	68%	CWHxm2-AU8	23%	CWHvm1-AU8	25%
						ESSFmw-AU8	26%	CWHvm1-AU9	25%
						ESSFmw-AU9	26%	CWHvm2-AU5	28%
						IDFww-AU12	12%	CWHvm2-AU6	28%
						IDFww-AU3	22%	CWHvm2-AU7	25%
						MHwh1-AU6	29%	CWHvm2-AU8	25%
						CWHdm-AU3	18	CWHvm2-AU9	25%
						CWHdm-AU5	23	CWHvm3-AU9	25%
						CWHdm-AU6	26	CWHws2-AU8	26%
						CWHdm-AU12	13	CWHws2-AU9	26%
						CWHdm-AU4	23	CWHxm2-AU7	23%
						CWHdm-AU9	23	MHmm1-AU6	28%
						CWHmm1-AU1	23	MHmm1-AU8	25%
						CWHmm1-AU2	18	MHmm1-AU9	25%

Very Rare (70% of RONV)		Rare (70% of RONV)		Modal (70% of RONV)		Common (30% of RONV)		Very Common (30% of RONV)	
SS Surrogate	**Old Forest Target**	**SS Surrogate**	**Old Forest Target**	**SS Surrogate**	**Old Forest Target**	**SS Surrogate**	**Old Forest Target**	**SS Surrogate**	**Old Forest Target**
						CWHxm2-AU12	26	MHmm2-AU8	25%
						CWHxm2-AU4	23	MHmm2-AU9	25%
						CWHxm2-AU3	17		

10.0 GENERAL MODELLING CONSIDERATIONS

This section describes the assumptions used to model the harvesting systems employed in the Kingcome TSA.

10.1 Minimum Harvest Age

Minimum harvest ages are necessary for timber supply modelling to ensure the model does not, at times of low timber availability, select young stands unlikely to be harvested operationally. In TSR 2 minimum harvest ages were based on achieving minimum volume thresholds and/or 95% of the culmination of mean annual increment (CMAI). Culmination age is defined as the age at which stand volume, less decay, waste and breakage, is maximized to a precision of one decimal place. Minimum volume thresholds for TSR 3 are set at 350 m^3/ha for cedar-leading stands, 500 m^3/ha for other coniferous-leading stands, and 250 m^3/ha for deciduous-leading stands. The minimum volume for deciduous-leading stands was reduced from the TSR 2 threshold of 350 m^3/ha, based on input from Northwest Hardwoods. Minimum ages based on 95% of CMAI and the TSR 2 minimum volume thresholds are presented in Table 57. In the analysis, minimum harvest age for each AU will be the greater of the age at CMAI and age at minimum volume.

In the majority of cases, the minimum volume threshold is the limiting factor in determining minimum harvest age. Only in one case (AU 167/367) did the stand not achieve the minimum volume threshold. This AU represents only a minor area (26 hectares), and will be excluded from the analysis.

Table 57 – Minimum harvest ages

Existing stands					Future stands				
Current AU	Age @ CMAI	Volume @CMAI	Age at Minimum Volume	Leading Species	Future AU	Age @ CMAI	Volume @ CMAI	Age at Minimum Volume	Leading Species
1	60	320	70	Cw,Yc	201	70	307	70	Cw
2	70	244	90	Cw,Yc	202	60	319	90	Cw
3	90	220	130	Cw,Yc	203	60	319	130	Cw
4	50	454	60	Hwc,Hm,Ba	204	80	626	60	Hw
5	60	409	80	Hwc,Hm,Ba	205	60	380	80	Hw
6	70	270	120	Hwc,Hm,Ba	206	60	348	120	Hw
7	70	398	90	Ss	207	80	557	90	Ss
8	50	285	50	Dr,Mb	208	30	145	50	Dr
10	60	617	60	Fdc	210	60	653	60	Fd
11	80	478	70	Cw,Yc	211	60	305	70	Cw
12	70	230	100	Cw,Yc	212	70	333	100	Cw
13	90	228	130	Cw,Yc	213	70	341	130	Cw
14	50	441	60	Hwc,Hm,Ba	214	80	685	60	Hw
15	60	392	80	Hwc,Hm,Ba	215	60	391	80	Hw
16	70	267	120	Hwc,Hm,Ba	216	70	405	120	Hw
17	60	342	90	Ss	217	80	571	90	Ss

Existing stands					Future stands				
Current AU	**Age @ CMAI**	**Volume @CMAI**	**Age at Minimum Volume**	**Leading Species**	**Future AU**	**Age @ CMAI**	**Volume @ CMAI**	**Age at Minimum Volume**	**Leading Species**
18	40	236	50	Dr,Mb	218	30	160	50	Dr
19	50	267	50	Act	219	50	267	50	Act
20	60	396	80	Fdc	220	70	486	80	Fd
32	80	293	100	Cw/Yc	232	80	194	100	Fd
33	140	308	170	Cw/Yc	233	110	140	170	Fd
34	60	548	60	Hwc,Hm,Ba	234	70	550	60	Fd
35	60	434	70	Hwc,Hm,Ba	235	80	500	70	Fd
36	80	303	130	Hwc,Hm,Ba	236	80	169	130	Fd
38	50	296	50	Dr	238	80	401	50	Fd
42	70	244	90	Cw/Yc	242	80	225	90	Fd
43	90	218	130	Cw/Yc	243	100	157	130	Fd
44	50	425	60	Hwc,Hm,Ba	244	70	659	60	Fd
45	60	418	70	Hwc,Hm,Ba	245	80	482	70	Fd
46	70	262	120	Hwc,Hm,Ba	246	80	192	120	Fd
47	60	381	80	Ss	247	80	438	80	Fd
48	40	239	50	Dr	248	70	473	50	Fd
49	50	267	50	Act	249	70	697	50	Fd
61	140	289	180	Cw,Yc	261	60	332	180	Cw
62	90	267	170	Hwc,Hm,Ba	262	70	402	170	Hw
63	140	289	190	Cw,Yc	263	70	344	190	Cw
64	90	231	190	Hwc,Hm,Ba	264	80	375	190	Hw
67	140	296	180	Cw,Yc	267	120	128	180	Fd
68	90	267	160	Hwc,Hm,Ba	268	100	151	160	Fd
69	140	280	190	Cw,Yc	269	120	128	190	Fd
70	90	259	170	Hwc,Hm,Ba	270	100	155	170	Fd
101	60	313	70	Cw,Yc	301	60	321	70	Cw
102	60	401	60	Cw,Yc	302	80	621	60	Cw
103	140	338	150	Cw,Yc	303	100	224	150	Cw
104	80	701	70	Hwc,Hm,Ba	304	80	701	70	Hw
105	80	603	70	Hwc,Hm,Ba	305	80	604	70	Hw
106	60	339	80	Hwc,Hm,Ba	306	60	341	80	Hw
107	70	644	60	Ss	307	70	644	60	Ss
108	30	134	60	Dr,Mb	308	30	135	60	Dr
111	70	353	70	Cw,Yc	311	60	281	70	Cw
112	70	325	80	Cw,Yc	312	70	331	80	Cw
113	60	326	70	Cw,Yc	313	60	332	70	Cw
114	80	668	70	Hwc,Hm,Ba	314	80	668	70	Hw
115	60	396	80	Hwc,Hm,Ba	315	80	598	80	Hw
116	70	431	80	Hwc,Hm,Ba	316	60	335	80	Hw
117	80	710	70	Ss	317	80	710	70	Sc

Existing stands					Future stands				
Current AU	**Age @ CMAI**	**Volume @CMAI**	**Age at Minimum Volume**	**Leading Species**	**Future AU**	**Age @ CMAI**	**Volume @ CMAI**	**Age at Minimum Volume**	**Leading Species**
118	30	137	60	Dr,Mb	318	30	138	60	Dr
119	50	267	50	Act	319	50	267	50	Act
120	80	466	90	Fdc	320	80	474	90	Fd
131	70	752	50	Cw,Yc	331	70	572	50	Fd
132	90	288	110	Cw,Yc	332	90	201	110	Fd
135	70	433	80	Hwc,Hm,Ba	335	60	264	80	Fd
141	60	293	70	Cw/Cy	341	80	496	70	Fd
144	80	663	70	Hwc,Hm,Ba	344	70	541	70	Fd
145	60	371	80	Hwc,Hm,Ba	345	80	495	80	Fd
146	70	595	70	Hwc,Hm,Ba	346	90	201	70	Fd
147	70	732	60	Ss	347	70	612	60	Fd
148	30	167	50	Dr	348	70	456	50	Fd
162	70	350	90	Cw,Yc	362	70	351	90	Cw
163	80	310	90	Hwc,Hm,Ba	363	80	315	90	Hw
164	80	384	100	Cw,Yc	364	80	385	100	Cw
167	150	195	-	Hwc,Hm,Ba	367	130	123	-	Fd
401	60	292	70	Cw,Yc	601	60	292	70	Cw
402	60	371	60	Cw,Yc	602	60	371	60	Cw
403	60	325	70	Cw,Yc	603	60	325	70	Cw
404	80	613	70	Hwc,Hm,Ba	604	80	613	70	Hw
405	80	602	70	Hwc,Hm,Ba	605	80	602	70	Hw
406	60	380	80	Hwc,Hm,Ba	606	60	380	80	Hw
410	70	608	60	Fdc	610	70	608	60	Fd
411	70	326	80	Cw,Yc	611	70	326	80	Cw
412	70	335	80	Cw,Yc	612	70	335	80	Cw
413	70	355	70	Cw,Yc	613	70	355	70	Cw
414	60	405	70	Hwc,Hm,Ba	614	60	405	70	Hw
415	60	372	80	Hwc,Hm,Ba	615	60	372	80	Hw
416	80	360	110	Hwc,Hm,Ba	616	80	360	110	Hw
419	50	268	50	Act	619	50	268	50	Act
420	80	443	90	Fdc	620	80	443	90	Fd
461	90	227	130	Cw,Yc	661	90	227	130	Cw
462	140	367	200	Hwc,Hm,Ba	662	110	271	200	Hw
463	140	288	180	Cw,Yc	663	110	214	180	Cw
464	90	337	130	Hwc,Hm,Ba	664	90	337	130	Hw

It should be recognized that the application of cover constraints in particular zones may delay stand entry well beyond these minimum ages. Areas are often harvested well beyond their “merchantability” ages, depending on the availability of “merchantable” timber and cover class constraints.

A sensitivity analysis investigating the impact of increasing or decreasing the minimum harvest age by ten years will also be performed.

10.2 Harvest Systems

In the Pre-EBM analysis, clearcutting with wildlife tree patch retention is applied in all cases. In the EBM analysis, variable retention harvesting is applied in specific areas within the EBM zone, as described in Section 8.5, with wildlife tree patch retention applied only in the non-EBM zone.

10.3 Harvest Flow Objectives

A number of different harvest flows will be explored, based on tradeoffs between short and mid-term harvest levels. The forest cover constraints and biological capacity of the THLB will dictate timber availability and harvest level options.

The overall strategy employed in the TSA is to gradually adjust harvest levels towards the best estimate of the long-term harvest level (LTHL) for the forest. In all timber supply scenarios, the choice(s) of harvest flow will reflect the following objectives:

- Achieve an acceptable short-term harvest level;
- Decrease the periodic harvest level in acceptable steps (≤ 10%) when declines are required to meet all objectives associated with the various resources on the land base;
- Do not permit the mid-term harvest level to fall below a level reflecting the productive capacity of the TSA (based on VDYP yield estimates); and
- Achieve a stable long-term harvest level over a 250-year time horizon reflecting the productive capacity of the TSA (based on TIPSY yield estimates).

10.4 Non-recoverable Losses

In the analysis, an allowance must be made for non-recoverable losses (volume losses due to fire, windthrow and insect damage that are not captures in stand yield forecasts). In TSR 2 these losses were estimated at 3,083 m^3 per year from fire and 10,500 m^3/year from windthrow, for a total of 13,583 m^3/year. The 2008-2010 Coast Timber Supply Areas Regional Forest Health Overview indicates that this estimate is now too conservative with the increased use of partial cutting and retention system harvesting. However, at this time a revised estimate is not available, and therefore the TSR 2 estimate will be used.

10.5 Initial Harvest Level

The current AAC for the Kingcome TSA is 1,232,000 m3/yr. In addition, an allowance must be made for non-recoverable losses (NRLs). As the timber supply analysis is based on the net harvest plus NRLs, the initial gross harvest level for the TSR 3 Pre-EBM option will be set to 1,245,600 m3/yr, as summarized in Table 58.

Table 58 – Initial harvest level

Management Unit	Volumes (m^3/yr)		
	Net Harvest	NRLs	Gross Harvest
Kingcome TSA	1,232,000	13,600	1,245,600

This "initial harvest rate" provides a starting point for the analysis. However, the timber harvesting land base and cover constraints have changed since the TSR 2 analysis. Therefore, the initial harvest levels may subsequently be adjusted to achieve harvest flow objectives over the entire planning period.

10.6 Long Run Sustained Yield

Long run sustained yield (LRSY) values calculated on the basis of both natural and managed stand yield curves are shown in Table 59. These estimates provide a benchmark for establishing mid-term and long-term harvest flow targets in the timber supply analysis. However, due to the imposition of forest cover constraints, minimum harvest levels, and harvest scheduling constraints, the realized timber flow will always fall below these levels.

Table 59 – LRSY values for natural and managed stands – Pre-EBM analysis

Description	Natural	Managed
THLB, including NSR (ha)	208,175	208,175
- Future roads (ha)	3,071	3,071
= Long term THLB (ha)	205,104	205,104
* Average MAI at culmination (m^3/ha)	4.3	5.5
= Theoretical Gross LRSY (m^3/yr)	**881,947**	**1,128,072**
- Wildlife tree patch retention (m^3/yr)	-52,917	-67,684
- Non-recoverable losses (m^3/yr)	-13,600	-13,600
= Theoretical Net LRSY (m^3/yr)	**815,430**	**1,046,788**

10.7 Harvest Rules

A relative oldest first harvest rule will be used. Under this rule stands that have the largest difference between their minimum harvest age and their current age are prioritized first. However, as a result of previous discussions with government, licensees are permitted to, and are harvesting second growth. This reflects current practice, and fits with the Coast Revitalization Strategy announced by the Minister in 2007. Consequently, second growth harvest contribution will be monitored in the base case by analysis unit. Short-term harvest of second growth may be limited if the contribution from this inventory component is deemed to be excessive and compromises timber supply. Any constraints imposed on second growth harvest will be described in the Timber Supply Analysis report. This approach will allow an acceptable maximum second growth harvest rate to be identified that does not adversely affect the long-term harvest level.

Allowing second growth harvest to otherwise be constrained by market demand in the five year term of this TSR will ensure that the Government's revitalization objective is appropriately addressed in this analysis.

10.8 Natural Disturbance Modelling

In timber supply analysis, the productive non-contributing land base is available to fulfill various resource management requirements, (*i.e.* seral requirements, retention requirements and thermal requirements). The productive non-contributing land base is not available for harvest. Therefore, unless modelled otherwise, it will continuously age throughout the planning horizon. This is of concern as it becomes unrealistically old and over-contributes to the fulfillment of certain forest cover requirements, thereby reducing the impact on the timber harvest land base (MoFR, 2003b). In reality there will be some level of natural disturbance within the non-contributing land base component, although the frequency, location, and size of these disturbances cannot be reliably predicted.

The following modelling methodology will be employed in these analyses in order to capture the impact of natural disturbances patterns on the productive land base, and in particular on seral and old growth retention requirements:

The methodology follows that outlined in "*Modelling Options for Disturbance of Areas Outside of the Timber Harvesting Land base, Draft Working Paper, March 2004*".

For each BEC variant containing pre-EBM THLB, the following parameters were determined based on the Biodiversity Guidebook.

A. Disturbance event return interval (based on NDT).

B. Old growth minimum age.

C. The estimated percentage of area older than the applicable old seral stage. (Biodiversity Guidebook, Table A.4.2)

D. Effective rotation age (B / (1-C/100))

E. Minimum target area (contributing non-THLB area / D)

F. Application of disturbance targets at the LU/BEC level to simulate disturbance rates in the contributing non-THLB.

This process will achieve the natural range of variation for each biogeoclimatic zone within the forest estate, but by design there will be some variations within individual landscape units. The model will recruit the oldest stands in order to achieve the seral requirements as soon as possible. This will impose the desired disturbance each year and achieve a seral stage distribution compatible with the natural range of variation.

Table 60 provides a summary of disturbance targets, to be applied in the analysis at the LU/BEC level.

Table 60 – Natural disturbance parameters for the non-THLB

BEC	Productive Area (ha)	THLB Area (ha)	Non-contributing Area (ha)	Disturbance Interval	% Older Than Age 250	Effective Rotation	Target Disturbance (ha/year)
CMA unp	4,974	67	4,907	250	37	397	12
CWH dm	702	185	517	250	37	397	1
CWH vh 1	202,870	57,748	145,122	250	37	397	366
CWH vm 1	258,743	128,872	129,871	250	37	397	327
CWH vm 2	111,232	19,795	91,437	250	37	397	230
MH mm 1	41,570	1,509	40,062	350	49	490	82
Total	**620,092**	**208,175**	**411,917**				**1,019**

10.9 Harvest Reporting

In reporting on the timber flow, the following components will be tracked:

- The contribution of "marginal" cedar/cypress and hemlock/balsam stands, in order that these components can be compared to past performance;
- The contribution of deciduous stand types (alder and cottonwood) independent of conifer types;
- The harvest levels within and outside of the EBM zone.

10.10 EBM

10.10.1 Objective 6 – Monumental cedar

1. *"Maintain a sufficient volume and quality of monumental cedar to support the applicable First Nation's present and future cultural use of monumental cedar, following information-sharing or consultation with the applicable First Nation, and to the extent practical".*

10.10.2 Objective 7 – Stand level retention of cedar

1. *"Maintain a sufficient volume and quality of Western red cedar and Yellow cedar to support the applicable First Nation's cultural use of Western red cedar and Yellow cedar, to the extent possible.*
2. *Within a cutblock where a partial cut silviculture system is used, design dispersed stand retention so that the first 15% of the total retained basal area maintains mature and old Western red cedar and Yellow cedar representative of the preharvest stand".*

In the EBM scenario, the harvest of cedar/cypress will be monitored and reported on to ensure that EBM objectives 6 and 7 will be met. Forest legislation allows for each First Nation to annually access up to 250 m^3 of timber free of stumpage for cultural and traditional uses on-Reserve. Based on there being 10 First Nations in the Kingcome TSA, an annual allowance of 2,500 m^3/year is estimated to address EBM objectives 6 and 7. (Ted Stevens, personal communications).

11.0 SENSITIVITY ANALYSES

Sensitivity analysis will be used to provide a measure of the upper and lower bounds of the Pre-EBM harvest forecast that reflects the uncertainty in the data and/or the management assumptions made. A specific variable is adjusted and the magnitude of the increase and decrease in the sensitivity variable reflects the degree of uncertainty surrounding the assumption associated with that given variable. By developing and testing a number of sensitivity analyses, it is possible to determine which variables most affect results. Table 61 summarizes the sensitivity issues currently identified.

Table 61 – Sensitivity analysis issues

Issue	Tested Sensitivity Level
Harvest flow	Establish highest initial harvest level Establish non-declining even flow (NDEF) harvest level Regulate the flow from the EBM and non-EBM zones
Harvest rule	Use absolute oldest first Alternate deciduous harvest profiles
Land base	Adjust timber harvesting land base by +/- 10% Alter economic thresholds in operability assessment Exclude marginal cedar/cypress and hemlock/balsam types
Growth and yield	Adjust existing yields by +/- 10% Adjust managed yield site index values by +/- 2 metres. Apply inventory SI values instead of SIA values to managed stands Apply 8% OAF1 adjustments to TIPSY yield curves
Visual landscape	Adjust green-up ages +/- 5 years
Green-up	Adjust all green-up ages +/- 5 years
Minimum harvest ages	Adjust minimum harvest ages +/- 10 years
Second growth	Evaluation of alternative second growth harvest rates on short and long-term harvest levels
Variable retention	Apply alternative (high and low) EBM variable retention rules

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APPENDIX I
PRE-EBM YIELD TABLES

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
1	VDYP6	0	0	1	41	138	231	320	401	478	548	613	675	725	775	820	859	893	921	951	981	1,009	1,037	1,071	1,103	1,134	1,165	1,167	1,169	1,171	1,173	1,174	1,175	1,176	1,177	1,178	1,178
2	VDYP6	0	0	0	1	42	114	182	244	301	354	403	449	487	524	557	587	612	633	655	677	698	718	741	765	787	809	813	817	820	823	826	829	831	834	836	838
3	VDYP6	0	0	0	0	3	35	85	133	178	220	259	296	326	356	382	404	424	439	457	473	489	504	522	539	556	573	576	579	582	584	587	589	591	593	595	596
4	VDYP6	0	0	7	163	320	454	568	666	751	824	888	944	993	1,040	1,082	1,120	1,154	1,184	1,211	1,237	1,260	1,281	1,300	1,318	1,334	1,349	1,360	1,369	1,378	1,386	1,393	1,399	1,404	1,409	1,413	1,417
5	VDYP6	0	0	1	64	196	310	409	496	572	638	697	750	795	839	880	916	948	977	1,005	1,030	1,054	1,075	1,095	1,114	1,131	1,147	1,158	1,167	1,176	1,183	1,190	1,197	1,202	1,207	1,212	1,216
6	VDYP6	0	0	0	3	43	127	203	270	331	385	434	478	517	554	588	619	648	673	697	720	742	762	781	798	815	830	840	850	858	866	873	880	886	892	898	902
7	VDYP6	0	0	16	76	156	240	324	398	464	522	574	621	662	702	739	772	803	830	856	881	903	925	945	963	981	998	1,012	1,025	1,038	1,050	1,061	1,072	1,082	1,092	1,102	1,111
8	VDYP6	0	1	41	130	216	285	340	368	393	414	434	452	467	482	495	507	518	527	536	545	553	560	568	575	581	587	591	595	598	601	604	607	609	611	614	616
10	VDYP6	0	0	1	148	331	486	617	731	831	920	999	1,069	1,132	1,181	1,222	1,255	1,279	1,295	1,304	1,322	1,339	1,356	1,372	1,388	1,403	1,417	1,418	1,419	1,420	1,420	1,420	1,421	1,421	1,420	1,420	1,420
11	VDYP6	0	0	0	38	138	234	323	403	478	546	610	669	717	765	809	847	880	908	938	966	994	1,020	1,052	1,083	1,112	1,141	1,145	1,149	1,152	1,155	1,157	1,159	1,161	1,163	1,165	1,166
12	VDYP6	0	0	0	0	37	106	171	230	285	337	384	429	466	502	534	562	586	606	628	649	669	688	711	734	756	778	781	783	786	788	791	793	795	796	798	799
13	VDYP6	0	0	0	0	4	42	93	141	186	228	268	305	336	365	392	414	434	449	467	484	500	516	534	552	570	587	589	591	593	595	597	598	600	601	603	604
14	VDYP6	0	0	6	157	310	441	553	648	730	802	864	919	966	1,012	1,053	1,090	1,122	1,151	1,178	1,203	1,225	1,246	1,265	1,282	1,298	1,313	1,322	1,330	1,338	1,344	1,350	1,355	1,360	1,363	1,366	1,369
15	VDYP6	0	0	0	60	186	295	392	474	547	611	668	719	763	806	845	879	910	938	964	988	1,011	1,032	1,051	1,069	1,086	1,102	1,111	1,119	1,127	1,133	1,140	1,145	1,150	1,154	1,158	1,162
16	VDYP6	0	0	0	2	48	127	201	267	325	378	426	470	508	544	577	608	635	659	682	704	725	745	763	781	797	813	821	828	835	842	848	853	858	862	866	870
17	VDYP6	0	0	23	80	168	259	342	413	476	531	580	623	661	698	732	762	789	814	837	859	879	898	915	932	947	962	974	985	996	1,007	1,017	1,026	1,035	1,043	1,052	1,059
18	VDYP6	0	5	60	154	236	301	352	376	398	417	434	450	464	477	489	500	509	518	526	534	541	548	555	562	568	574	577	579	582	584	586	587	589	591	592	593
19	VDYP7	0	0	41	117	195	267	331	387	435	476	509	534	552	561	563	558	548	536	522	508	493	477	461	445	430	415	400	386	372	358	345	335	327	319	311	304
20	VDYP6	0	0	1	49	183	299	396	478	549	612	667	717	761	796	825	849	866	878	885	896	908	919	930	940	950	959	961	963	965	967	968	969	971	972	973	973
32	VDYP6	0	0	0	0	24	100	171	234	293	347	397	444	482	520	553	583	608	629	652	674	694	714	737	759	781	802	808	813	818	822	826	830	834	837	840	843
33	VDYP6	0	0	0	0	1	16	50	93	132	169	202	234	261	285	308	327	343	357	371	385	398	410	424	439	452	465	469	472	474	477	479	481	483	485	487	488
34	VDYP6	0	0	2	145	301	434	548	645	729	802	865	920	967	1,013	1,055	1,092	1,125	1,155	1,182	1,207	1,229	1,249	1,267	1,284	1,299	1,312	1,323	1,333	1,341	1,349	1,355	1,361	1,366	1,371	1,374	1,377
35	VDYP6	0	0	1	78	213	331	434	523	601	670	730	784	831	876	917	954	987	1,017	1,044	1,070	1,094	1,116	1,136	1,155	1,172	1,188	1,198	1,207	1,216	1,223	1,229	1,235	1,240	1,245	1,249	1,252
36	VDYP6	0	0	0	0	27	106	178	243	303	357	407	452	492	530	565	596	625	650	675	699	722	744	764	784	802	820	828	836	842	849	855	860	865	870	874	878
38	VDYP6	0	0	38	119	210	296	368	403	433	460	484	505	523	541	558	573	586	599	611	622	632	641	650	658	666	673	680	686	692	698	703	708	713	718	722	726
41	VDYP6	0	0	0	14	93	177	256	327	393	454	510	563	607	649	686	718	745	768	790	813	835	856	881	906	930	954	957	960	963	965	967	970	971	973	975	976
42	VDYP6	0	0	0	0	38	111	181	244	303	357	406	453	491	529	562	591	616	637	660	681	701	721	744	767	789	811	814	818	821	824	826	829	831	833	834	836
43	VDYP6	0	0	0	0	3	36	85	132	177	218	256	292	322	351	376	398	417	432	449	466	481	496	514	531	548	564	567	569	571	573	575	577	578	580	581	582
44	VDYP6	0	0	9	156	301	425	530	618	693	759	817	867	910	951	988	1,021	1,050	1,075	1,098	1,120	1,140	1,158	1,175	1,190	1,205	1,217	1,224	1,230	1,235	1,240	1,243	1,246	1,249	1,251	1,252	1,253
45	VDYP6	0	0	0	67	200	317	418	505	581	649	709	762	809	853	892	927	958	986	1,010	1,034	1,056	1,076	1,095	1,112	1,128	1,143	1,153	1,161	1,168	1,175	1,181	1,186	1,191	1,195	1,199	1,202
46	VDYP6	0	0	0	1	37	118	194	262	323	378	427	472	512	549	583	613	641	665	687	709	730	749	767	784	800	815	824	831	838	845	851	856	861	866	870	874
47	VDYP6	0	0	24	79	182	288	381	461	531	592	645	691	731	769	804	834	861	885	907	927	946	964	981	996	1,011	1,024	1,036	1,046	1,057	1,066	1,075	1,084	1,092	1,100	1,108	1,115
48	VDYP6	0	3	52	149	239	312	369	399	426	449	470	489	506	521	535	547	558	567	576	584	592	599	606	613	620	626	629	632	635	637	640	642	644	646	647	649
49	VDYP7	0	0	41	117	195	267	331	387	435	476	509	534	552	561	563	558	548	536	522	508	493	477	461	445	430	415	400	386	372	358	345	335	327	319	311	304
61	VDYP6	0	0	0	0	0	9	41	80	117	153	186	217	243	267	289	308	324	337	351	365	378	390	404	419	433	446	449	451	454	456	458	460	462	464	465	467

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
62	VDYP6	0	0	0	0	2	51	113	169	221	267	310	349	384	417	447	475	500	522	544	565	585	603	620	637	653	667	676	684	692	699	705	711	717	722	727	732
63	VDYP6	0	0	0	0	0	11	46	84	120	154	187	218	243	268	289	307	323	335	349	362	375	387	401	416	430	443	445	446	448	449	450	452	453	454	455	456
64	VDYP6	0	0	0	0	1	40	93	143	189	231	270	306	338	368	396	421	443	463	484	503	521	538	554	570	585	599	606	612	618	624	629	633	638	642	646	649
67	VDYP6	0	0	0	0	0	7	38	80	119	155	189	222	248	274	296	315	332	345	360	374	387	400	415	430	444	458	461	463	466	468	470	473	474	476	478	480
68	VDYP6	0	0	0	0	1	48	111	168	220	267	311	351	386	420	451	479	504	527	549	571	591	610	628	645	662	677	686	694	701	708	714	720	726	731	736	740
69	VDYP6	0	0	0	0	0	8	39	78	114	148	180	211	236	259	280	299	314	327	340	354	366	378	392	406	420	433	435	437	439	441	443	445	447	448	449	451
70	VDYP6	0	0	0	0	0	44	105	161	213	259	302	341	376	408	438	465	490	511	532	553	572	590	607	623	638	653	660	667	673	679	684	689	694	698	702	705
101	TIPSY	0	0	3	45	126	222	313	402	486	560	628	693	752	805	853	896	934	968	998	1,025	1,050	1,075	1,101	1,126	1,149	1,170	1,189	1,207	1,223	1,239	1,240	1,240	1,240	1,240	1,240	1,240
102	TIPSY	0	0	5	67	175	294	401	510	611	697	776	854	926	989	1,043	1,092	1,135	1,173	1,207	1,238	1,266	1,294	1,324	1,352	1,378	1,403	1,425	1,445	1,464	1,480	1,483	1,483	1,483	1,483	1,483	1,483
103	TIPSY	0	0	0	1	11	32	69	106	147	184	221	256	287	314	338	360	381	400	419	436	451	466	481	496	509	521	533	543	553	562	565	565	565	565	565	565
104	TIPSY	0	0	1	56	196	341	473	590	701	799	889	973	1,051	1,120	1,181	1,236	1,286	1,331	1,371	1,407	1,440	1,470	1,499	1,526	1,550	1,572	1,592	1,611	1,627	1,642	1,655	1,655	1,655	1,655	1,655	1,655
105	TIPSY	0	0	2	45	155	280	397	504	603	692	773	848	916	978	1,034	1,085	1,132	1,173	1,210	1,244	1,275	1,303	1,330	1,355	1,378	1,399	1,418	1,436	1,452	1,466	1,476	1,476	1,476	1,476	1,476	1,476
106	TIPSY	0	0	1	29	121	231	339	437	526	610	687	755	816	873	927	978	1,023	1,063	1,098	1,129	1,158	1,184	1,211	1,235	1,257	1,278	1,296	1,313	1,328	1,342	1,351	1,351	1,351	1,351	1,351	1,351
107	TIPSY	0	0	9	95	235	377	515	644	760	866	961	1,045	1,118	1,179	1,234	1,281	1,323	1,358	1,387	1,411	1,429	1,445	1,459	1,469	1,479	1,487	1,495	1,501	1,506	1,510	1,511	1,511	1,511	1,511	1,511	1,511
108	TIPSY	0	19	79	134	187	231	267	284	166	155	170	187	201	215	229	240	251	259	267	274	281	287	295	302	308	314	319	324	329	333	333	333	333	333	333	333
111	TIPSY	0	0	2	33	104	189	273	353	428	498	562	621	674	723	767	807	843	876	905	931	954	978	1,003	1,025	1,046	1,066	1,084	1,101	1,116	1,131	1,131	1,131	1,131	1,131	1,131	1,131
112	TIPSY	0	0	1	25	88	169	250	325	397	464	525	579	630	678	721	760	795	827	856	881	903	925	948	969	988	1,007	1,024	1,041	1,056	1,070	1,072	1,072	1,072	1,072	1,072	1,072
113	TIPSY	0	0	2	33	123	224	326	414	500	582	656	721	779	833	885	933	975	1,013	1,046	1,075	1,101	1,127	1,153	1,178	1,201	1,221	1,240	1,258	1,274	1,289	1,294	1,294	1,294	1,294	1,294	1,294
114	TIPSY	0	0	1	46	179	319	449	562	668	765	853	933	1,007	1,076	1,137	1,193	1,242	1,286	1,326	1,362	1,395	1,424	1,453	1,479	1,503	1,525	1,545	1,563	1,579	1,594	1,607	1,607	1,607	1,607	1,607	1,607
115	TIPSY	0	0	1	40	155	279	396	500	597	686	767	842	910	973	1,030	1,081	1,127	1,169	1,206	1,240	1,270	1,298	1,325	1,350	1,373	1,394	1,413	1,431	1,447	1,461	1,470	1,470	1,470	1,470	1,470	1,470
116	TIPSY	0	0	1	29	118	227	334	431	519	602	677	745	807	864	918	967	1,010	1,048	1,083	1,115	1,144	1,171	1,197	1,221	1,243	1,264	1,282	1,299	1,315	1,329	1,338	1,338	1,338	1,338	1,338	1,338
117	TIPSY	0	0	5	82	213	347	475	602	710	812	908	992	1,064	1,127	1,174	1,217	1,256	1,291	1,321	1,346	1,368	1,386	1,402	1,417	1,431	1,443	1,454	1,463	1,470	1,477	1,477	1,477	1,477	1,477	1,477	1,477
118	TIPSY	0	19	82	137	188	232	267	285	160	146	160	177	192	205	217	228	238	246	254	260	266	273	280	287	293	299	304	309	314	318	318	318	318	318	318	318
119	VDYP7	0	0	41	117	195	267	331	387	435	476	509	534	552	561	563	558	548	536	522	508	493	477	461	445	430	415	400	386	372	358	345	335	327	319	311	304
120	TIPSY	0	0	4	55	139	227	308	388	466	536	597	654	707	754	797	834	867	895	922	946	969	990	1,010	1,028	1,045	1,061	1,076	1,090	1,101	1,111	1,111	1,111	1,111	1,111	1,111	1,111
131	TIPSY	0	0	24	147	304	460	617	752	886	1,002	1,111	1,203	1,284	1,363	1,434	1,492	1,543	1,592	1,634	1,672	1,706	1,742	1,780	1,816	1,849	1,878	1,905	1,930	1,938	1,945	1,946	1,946	1,946	1,946	1,946	1,946
132	TIPSY	0	0	0	4	31	79	132	184	238	288	331	369	404	440	474	504	532	556	578	599	616	635	651	667	681	694	707	719	730	740	742	742	742	742	742	742
135	TIPSY	0	0	2	29	111	225	333	433	525	606	679	748	812	868	920	967	1,011	1,051	1,087	1,122	1,152	1,179	1,205	1,229	1,251	1,272	1,291	1,308	1,324	1,338	1,347	1,347	1,347	1,347	1,347	1,347
141	TIPSY	0	0	4	38	115	204	293	376	453	527	593	656	711	762	807	848	884	918	948	975	999	1,024	1,049	1,073	1,096	1,116	1,135	1,153	1,170	1,184	1,185	1,185	1,185	1,185	1,185	1,185
144	TIPSY	0	0	1	43	177	317	446	560	663	761	850	929	1,002	1,070	1,132	1,189	1,239	1,284	1,322	1,358	1,390	1,420	1,450	1,476	1,500	1,522	1,542	1,559	1,575	1,590	1,603	1,603	1,603	1,603	1,603	1,603
145	TIPSY	0	0	1	33	138	259	371	473	565	651	731	804	868	928	984	1,035	1,081	1,122	1,158	1,191	1,221	1,249	1,276	1,301	1,324	1,344	1,363	1,380	1,396	1,410	1,420	1,420	1,420	1,420	1,420	1,420
146	TIPSY	0	0	6	83	207	346	475	595	704	800	889	968	1,042	1,108	1,165	1,215	1,262	1,305	1,345	1,381	1,413	1,444	1,473	1,498	1,522	1,544	1,558	1,570	1,581	1,592	1,597	1,597	1,597	1,597	1,597	1,597
147	TIPSY	0	0	18	128	285	444	595	732	861	970	1,064	1,150	1,225	1,289	1,339	1,384	1,426	1,464	1,496	1,505	1,510	1,515	1,519	1,522	1,525	1,527	1,528	1,529	1,530	1,531	1,531	1,531	1,531	1,531	1,531	1,531
148	TIPSY	0	25	95	167	234	289	333	356	224	213	233	254	273	290	306	320	333	343	352	361	368	377	386	394	402	410	417	423	428	433	433	433	433	433	433	433
162	TIPSY	0	0	1	16	74	165	261	350	430	504	572	632	689	738	784	827	869	905	939	969	997	1,023	1,047	1,069	1,089	1,109	1,127	1,144	1,160	1,174	1,183	1,183	1,183	1,183	1,183	1,183

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
163	TIPSY	0	0	1	14	59	121	188	251	310	369	423	470	513	552	588	622	654	683	710	733	753	774	794	813	830	845	859	873	885	897	901	901	901	901	901	901
164	TIPSY	0	0	0	11	63	144	229	309	384	451	512	571	626	675	720	759	795	829	860	889	916	942	966	989	1,009	1,027	1,044	1,060	1,074	1,087	1,095	1,095	1,095	1,095	1,095	1,095
167	TIPSY	0	0	0	0	1	7	20	34	55	79	101	122	143	162	179	195	210	224	237	250	261	272	283	294	304	314	321	327	333	339	341	341	341	341	341	341
169	TIPSY	0	0	0	0	1	7	20	34	55	79	101	122	143	162	179	195	210	224	237	250	261	272	283	294	304	314	321	327	333	339	341	341	341	341	341	341
201	TIPSY	0	0	2	26	84	160	235	307	374	438	495	546	593	639	679	713	745	774	801	826	848	870	892	911	929	945	960	974	987	1,001	1,001	1,001	1,001	1,001	1,001	1,001
202	TIPSY	0	0	3	45	128	225	319	407	491	566	636	700	757	809	857	900	938	973	1,003	1,030	1,054	1,079	1,104	1,127	1,148	1,168	1,187	1,205	1,221	1,236	1,238	1,238	1,238	1,238	1,238	1,238
203	TIPSY	0	0	2	37	123	222	319	409	493	571	642	707	766	819	868	912	951	987	1,019	1,047	1,073	1,098	1,123	1,147	1,169	1,190	1,208	1,225	1,241	1,256	1,260	1,260	1,260	1,260	1,260	1,260
204	TIPSY	0	0	2	47	162	291	414	524	626	719	801	878	948	1,013	1,071	1,123	1,169	1,211	1,248	1,283	1,314	1,343	1,371	1,397	1,421	1,443	1,462	1,480	1,496	1,510	1,522	1,522	1,522	1,522	1,522	1,522
205	TIPSY	0	0	2	41	144	265	380	484	580	666	746	818	884	945	1,000	1,050	1,095	1,136	1,173	1,206	1,236	1,264	1,291	1,315	1,338	1,359	1,378	1,395	1,411	1,425	1,434	1,434	1,434	1,434	1,434	1,434
206	TIPSY	0	0	2	39	133	241	348	446	537	619	695	765	828	886	938	985	1,028	1,067	1,102	1,133	1,162	1,189	1,214	1,238	1,260	1,280	1,298	1,315	1,330	1,343	1,352	1,352	1,352	1,352	1,352	1,352
207	TIPSY	0	0	6	59	153	258	365	464	557	643	720	789	852	908	957	1,000	1,037	1,070	1,099	1,123	1,144	1,164	1,182	1,197	1,212	1,225	1,236	1,245	1,253	1,261	1,261	1,261	1,261	1,261	1,261	1,261
208	TIPSY	0	21	87	145	199	244	281	298	163	146	161	176	190	203	215	225	234	242	250	256	262	268	275	281	286	291	296	301	306	310	310	310	310	310	310	310
210	TIPSY	0	0	43	185	342	502	653	787	902	1,006	1,094	1,170	1,239	1,303	1,357	1,402	1,442	1,479	1,497	1,513	1,528	1,541	1,553	1,565	1,575	1,586	1,595	1,605	1,614	1,622	1,622	1,622	1,622	1,622	1,622	1,622
211	TIPSY	0	0	3	43	123	216	305	390	470	543	610	671	728	779	825	866	903	935	964	990	1,013	1,038	1,063	1,086	1,107	1,128	1,146	1,163	1,178	1,192	1,193	1,193	1,193	1,193	1,193	1,193
212	TIPSY	0	0	1	26	93	175	256	333	405	471	532	588	640	687	729	768	802	833	860	885	907	929	952	974	994	1,013	1,030	1,046	1,061	1,075	1,077	1,077	1,077	1,077	1,077	1,077
213	TIPSY	0	0	1	24	93	178	263	341	415	484	546	604	657	705	749	789	824	856	885	911	934	957	980	1,002	1,022	1,041	1,058	1,073	1,088	1,101	1,106	1,106	1,106	1,106	1,106	1,106
214	TIPSY	0	0	1	52	189	331	463	578	685	784	873	954	1,030	1,098	1,161	1,216	1,265	1,309	1,349	1,386	1,419	1,448	1,477	1,503	1,527	1,549	1,569	1,587	1,603	1,618	1,630	1,630	1,630	1,630	1,630	1,630
215	TIPSY	0	0	2	42	152	275	391	495	592	680	760	834	902	964	1,020	1,071	1,116	1,157	1,194	1,227	1,257	1,285	1,312	1,337	1,360	1,381	1,400	1,418	1,433	1,448	1,457	1,457	1,457	1,457	1,457	1,457
216	TIPSY	0	0	1	28	112	212	312	405	491	570	642	708	768	824	875	920	962	999	1,033	1,063	1,092	1,118	1,143	1,166	1,187	1,207	1,225	1,241	1,256	1,269	1,278	1,278	1,278	1,278	1,278	1,278
217	TIPSY	0	0	3	49	148	259	371	475	571	662	745	820	887	948	1,003	1,052	1,096	1,133	1,167	1,196	1,222	1,245	1,266	1,284	1,300	1,313	1,324	1,334	1,343	1,350	1,351	1,351	1,351	1,351	1,351	1,351
218	TIPSY	0	24	95	160	221	272	311	328	177	158	172	189	204	218	231	242	251	260	267	274	280	287	294	301	307	312	318	323	327	332	332	332	332	332	332	332
219	VDYP7	0	0	41	117	195	267	331	387	435	476	509	534	552	561	563	558	548	536	522	508	493	477	461	445	430	415	400	386	372	358	345	335	327	319	311	304
220	TIPSY	0	0	13	85	188	291	391	486	573	651	721	784	839	888	932	971	1,006	1,037	1,065	1,091	1,113	1,134	1,154	1,172	1,188	1,202	1,214	1,225	1,235	1,244	1,244	1,244	1,244	1,244	1,244	1,244
232	TIPSY	0	0	0	8	33	69	113	155	194	228	259	289	317	345	371	396	417	436	454	470	484	498	512	525	537	549	560	570	580	589	589	589	589	589	589	589
233	TIPSY	0	0	0	1	6	19	37	57	78	100	121	140	157	174	190	203	216	228	238	248	256	266	274	282	290	298	304	312	317	323	323	323	323	323	323	323
234	TIPSY	0	0	15	103	218	330	447	550	644	734	811	878	936	988	1,037	1,081	1,120	1,155	1,185	1,210	1,232	1,254	1,274	1,294	1,312	1,327	1,340	1,354	1,365	1,376	1,376	1,376	1,376	1,376	1,376	1,376
235	TIPSY	0	0	6	62	154	244	332	421	500	571	638	699	754	801	843	879	913	944	972	998	1,022	1,044	1,064	1,081	1,097	1,112	1,125	1,137	1,148	1,158	1,158	1,158	1,158	1,158	1,158	1,158
236	TIPSY	0	0	0	5	26	57	96	134	169	202	232	259	284	308	330	352	372	390	407	422	436	449	462	474	485	495	505	514	522	530	530	530	530	530	530	530
238	TIPSY	0	0	5	47	116	186	264	339	401	463	518	568	612	652	688	722	752	780	805	828	848	865	881	897	912	926	939	951	962	972	972	972	972	972	972	972
241	TIPSY	0	0	3	44	119	200	271	344	415	480	536	587	638	682	722	758	788	815	839	861	883	902	921	939	955	970	984	997	1,010	1,020	1,020	1,020	1,020	1,020	1,020	1,020
242	TIPSY	0	0	0	12	43	88	137	182	225	263	299	334	366	397	426	451	475	496	515	533	549	565	580	594	607	619	630	641	650	658	658	658	658	658	658	658
243	TIPSY	0	0	0	2	11	30	54	81	107	133	157	179	199	218	235	251	265	279	292	304	315	326	336	346	355	363	372	379	386	392	392	392	392	392	392	392
244	TIPSY	0	0	28	140	274	409	541	659	764	859	942	1,014	1,078	1,133	1,185	1,229	1,268	1,304	1,335	1,362	1,385	1,408	1,429	1,449	1,463	1,475	1,486	1,496	1,505	1,513	1,513	1,513	1,513	1,513	1,513	1,513
245	TIPSY	0	0	6	59	147	235	321	406	482	553	618	677	729	776	817	854	887	918	945	971	994	1,014	1,033	1,051	1,066	1,081	1,094	1,106	1,118	1,127	1,127	1,127	1,127	1,127	1,127	1,127
246	TIPSY	0	0	0	8	34	71	113	154	192	228	261	292	320	347	371	394	416	435	453	470	485	499	513	525	537	548	558	567	576	584	584	584	584	584	584	584

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
247	TIPSY	0	0	5	51	129	210	289	368	438	502	562	618	667	710	749	783	815	844	870	894	916	937	955	972	988	1,001	1,013	1,024	1,034	1,043	1,043	1,043	1,043	1,043	1,043	1,043
248	TIPSY	0	0	12	82	181	283	379	473	557	633	700	762	818	867	910	948	983	1,014	1,041	1,067	1,088	1,109	1,129	1,148	1,164	1,179	1,192	1,204	1,214	1,223	1,223	1,223	1,223	1,223	1,223	1,223
249	TIPSY	0	0	30	152	291	437	572	697	808	902	990	1,066	1,131	1,186	1,237	1,284	1,327	1,363	1,393	1,421	1,445	1,469	1,493	1,502	1,510	1,516	1,521	1,526	1,531	1,535	1,535	1,535	1,535	1,535	1,535	1,535
261	TIPSY	0	0	2	43	132	234	332	424	510	589	661	728	788	842	891	936	976	1,012	1,044	1,073	1,098	1,123	1,149	1,173	1,196	1,216	1,235	1,252	1,268	1,282	1,287	1,287	1,287	1,287	1,287	1,287
262	TIPSY	0	0	1	32	116	214	311	402	486	564	635	701	760	815	864	909	951	988	1,022	1,052	1,080	1,105	1,129	1,152	1,172	1,191	1,209	1,225	1,239	1,253	1,261	1,261	1,261	1,261	1,261	1,261
263	TIPSY	0	0	1	26	96	181	265	344	418	487	550	607	660	709	752	792	828	860	889	915	939	961	985	1,006	1,027	1,045	1,062	1,078	1,093	1,106	1,110	1,110	1,110	1,110	1,110	1,110
264	TIPSY	0	0	0	18	77	152	230	304	375	442	503	560	612	659	703	742	779	812	842	870	895	918	940	961	980	997	1,013	1,028	1,041	1,053	1,061	1,061	1,061	1,061	1,061	1,061
267	TIPSY	0	0	0	0	2	12	25	41	61	79	96	113	128	143	158	171	183	194	204	213	221	229	236	243	250	256	263	269	275	280	280	280	280	280	280	280
268	TIPSY	0	0	0	1	10	27	50	75	101	127	151	172	192	210	227	241	256	269	281	294	304	315	326	335	344	353	360	368	374	381	381	381	381	381	381	381
269	TIPSY	0	0	0	0	2	11	25	40	60	78	95	112	128	142	156	169	181	192	202	211	220	227	235	242	249	255	262	267	273	278	278	278	278	278	278	278
270	TIPSY	0	0	0	1	10	28	51	77	104	130	155	177	197	215	231	247	260	274	286	298	310	321	332	343	352	360	368	375	381	387	387	387	387	387	387	387
301	TIPSY	0	0	4	49	132	230	321	411	495	569	638	703	761	814	861	903	941	974	1,004	1,030	1,054	1,079	1,105	1,129	1,151	1,171	1,190	1,208	1,224	1,239	1,240	1,240	1,240	1,240	1,240	1,240
302	TIPSY	0	0	5	71	181	302	410	520	621	707	786	865	936	998	1,051	1,100	1,142	1,180	1,213	1,243	1,270	1,298	1,328	1,355	1,380	1,404	1,426	1,446	1,464	1,480	1,483	1,483	1,483	1,483	1,483	1,483
303	TIPSY	0	0	0	1	12	34	72	109	150	187	224	259	291	316	340	362	383	403	421	438	453	467	483	497	510	522	533	544	553	563	565	565	565	565	565	565
304	TIPSY	0	0	1	56	197	341	473	591	701	800	890	973	1,051	1,121	1,181	1,236	1,286	1,331	1,371	1,407	1,440	1,470	1,499	1,526	1,550	1,572	1,593	1,611	1,627	1,642	1,655	1,655	1,655	1,655	1,655	1,655
305	TIPSY	0	0	2	46	156	281	399	506	604	693	775	850	918	979	1,035	1,087	1,133	1,174	1,211	1,245	1,275	1,303	1,330	1,355	1,378	1,399	1,418	1,436	1,452	1,466	1,476	1,476	1,476	1,476	1,476	1,476
306	TIPSY	0	0	1	29	122	233	341	439	527	612	689	756	817	875	929	979	1,024	1,064	1,098	1,130	1,158	1,185	1,211	1,235	1,258	1,278	1,296	1,313	1,328	1,342	1,351	1,351	1,351	1,351	1,351	1,351
307	TIPSY	0	0	9	95	235	377	515	644	760	866	961	1,045	1,118	1,179	1,234	1,281	1,323	1,358	1,387	1,411	1,429	1,445	1,459	1,469	1,479	1,487	1,495	1,501	1,506	1,510	1,511	1,511	1,511	1,511	1,511	1,511
308	TIPSY	0	19	80	135	189	234	270	287	169	158	174	190	205	219	232	243	253	262	269	276	282	289	296	303	309	314	320	324	329	333	333	333	333	333	333	333
311	TIPSY	0	0	3	36	109	195	281	361	436	507	570	629	683	731	774	814	850	882	910	936	959	982	1,005	1,027	1,048	1,067	1,085	1,101	1,117	1,131	1,132	1,132	1,132	1,132	1,132	1,132
312	TIPSY	0	0	1	26	92	175	256	331	404	471	531	586	637	684	727	766	800	832	860	884	906	928	950	971	990	1,008	1,025	1,041	1,056	1,070	1,072	1,072	1,072	1,072	1,072	1,072
313	TIPSY	0	0	2	36	127	230	332	420	507	589	663	727	784	839	891	938	980	1,017	1,050	1,079	1,104	1,129	1,155	1,180	1,202	1,222	1,241	1,258	1,274	1,289	1,294	1,294	1,294	1,294	1,294	1,294
314	TIPSY	0	0	1	46	179	319	449	563	668	765	853	933	1,008	1,076	1,137	1,193	1,242	1,286	1,326	1,362	1,395	1,425	1,453	1,479	1,503	1,525	1,545	1,563	1,579	1,594	1,607	1,607	1,607	1,607	1,607	1,607
315	TIPSY	0	0	1	41	156	280	397	501	598	687	769	843	912	974	1,031	1,082	1,128	1,169	1,207	1,240	1,271	1,299	1,326	1,351	1,374	1,395	1,414	1,431	1,447	1,461	1,470	1,470	1,470	1,470	1,470	1,470
316	TIPSY	0	0	1	29	119	228	335	432	521	604	679	746	808	865	919	968	1,011	1,049	1,084	1,116	1,145	1,171	1,197	1,221	1,243	1,264	1,283	1,299	1,315	1,329	1,338	1,338	1,338	1,338	1,338	1,338
317	TIPSY	0	0	5	82	213	347	475	602	710	812	908	992	1,064	1,127	1,174	1,217	1,256	1,291	1,321	1,346	1,368	1,386	1,402	1,417	1,431	1,443	1,454	1,463	1,470	1,477	1,477	1,477	1,477	1,477	1,477	1,477
318	TIPSY	0	19	82	138	191	234	270	288	163	149	164	180	195	208	220	231	240	248	256	262	268	274	281	288	294	300	305	309	314	318	318	318	318	318	318	318
319	VDYP7	0	0	41	117	195	267	331	387	435	476	509	534	552	561	563	558	548	536	522	508	493	477	461	445	430	415	400	386	372	358	345	335	327	319	311	304
320	TIPSY	0	0	5	59	144	232	314	395	474	544	603	661	714	761	803	840	872	901	926	950	972	993	1,012	1,030	1,047	1,063	1,077	1,091	1,102	1,111	1,111	1,111	1,111	1,111	1,111	1,111
331	TIPSY	0	0	18	111	230	347	467	572	672	761	839	905	966	1,020	1,071	1,114	1,151	1,183	1,212	1,240	1,264	1,286	1,308	1,326	1,343	1,358	1,372	1,385	1,397	1,409	1,409	1,409	1,409	1,409	1,409	1,409
332	TIPSY	0	0	0	5	25	56	95	132	168	201	230	256	281	304	328	350	370	389	405	420	433	447	459	471	482	492	502	510	519	527	527	527	527	527	527	527
335	TIPSY	0	0	2	43	115	193	264	333	403	467	521	573	621	664	704	739	769	796	820	842	862	882	900	917	934	949	963	976	987	995	995	995	995	995	995	995
341	TIPSY	0	0	6	61	153	243	329	416	496	565	631	692	746	793	835	871	904	935	962	987	1,009	1,031	1,053	1,072	1,091	1,104	1,116	1,127	1,137	1,146	1,146	1,146	1,146	1,146	1,146	1,146
344	TIPSY	0	0	15	99	213	322	434	541	628	714	793	861	919	969	1,014	1,056	1,094	1,130	1,162	1,191	1,215	1,235	1,255	1,270	1,284	1,298	1,311	1,322	1,332	1,341	1,341	1,341	1,341	1,341	1,341	1,341
345	TIPSY	0	0	6	60	151	241	328	415	495	563	631	692	746	793	834	871	904	935	962	988	1,011	1,034	1,055	1,072	1,089	1,103	1,115	1,126	1,136	1,146	1,146	1,146	1,146	1,146	1,146	1,146

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
346	TIPSY	0	0	0	5	25	56	95	132	168	201	230	256	281	304	328	350	370	389	405	420	433	447	459	471	482	492	502	510	519	527	527	527	527	527	527	527
347	TIPSY	0	0	23	127	249	378	500	612	714	805	880	948	1,011	1,069	1,119	1,159	1,194	1,227	1,258	1,285	1,309	1,330	1,352	1,371	1,388	1,404	1,421	1,435	1,449	1,462	1,462	1,462	1,462	1,462	1,462	1,462
348	TIPSY	0	0	11	80	176	273	371	456	541	617	685	742	793	842	887	927	963	993	1,018	1,040	1,061	1,083	1,103	1,121	1,138	1,152	1,166	1,178	1,189	1,199	1,199	1,199	1,199	1,199	1,199	1,199
362	TIPSY	0	0	1	17	75	167	262	351	431	505	573	634	690	739	785	828	870	906	940	970	998	1,023	1,047	1,069	1,090	1,109	1,128	1,144	1,160	1,174	1,183	1,183	1,183	1,183	1,183	1,183
363	TIPSY	0	0	1	14	61	124	192	255	315	373	427	474	517	556	591	626	658	686	713	735	756	776	796	814	830	846	860	873	886	897	901	901	901	901	901	901
364	TIPSY	0	0	0	12	64	145	230	310	385	452	514	572	627	676	721	760	796	829	861	890	917	942	967	989	1,009	1,027	1,044	1,060	1,074	1,087	1,095	1,095	1,095	1,095	1,095	1,095
367	TIPSY	0	0	0	0	2	7	19	31	49	66	81	96	110	123	135	147	157	167	177	186	194	202	210	217	225	232	238	243	247	252	252	252	252	252	252	252
369	TIPSY	0	0	0	0	2	7	19	31	49	66	81	96	110	123	135	147	157	167	177	186	194	202	210	217	225	232	238	243	247	252	252	252	252	252	252	252
401	TIPSY	0	0	2	32	111	197	292	370	445	521	591	654	705	749	788	833	874	911	945	970	993	1,017	1,041	1,063	1,083	1,102	1,120	1,137	1,154	1,168	1,169	1,169	1,169	1,169	1,169	1,169
402	TIPSY	0	0	4	58	157	269	371	470	564	648	722	792	857	917	970	1,016	1,057	1,093	1,125	1,154	1,180	1,207	1,235	1,260	1,284	1,306	1,326	1,344	1,362	1,377	1,379	1,379	1,379	1,379	1,379	1,379
403	TIPSY	0	0	4	45	130	229	325	415	500	577	648	713	772	826	875	917	956	991	1,022	1,050	1,075	1,100	1,126	1,150	1,172	1,191	1,209	1,226	1,241	1,254	1,259	1,259	1,259	1,259	1,259	1,259
404	TIPSY	0	0	1	46	160	285	403	513	613	703	788	864	934	996	1,051	1,103	1,151	1,193	1,229	1,263	1,294	1,322	1,350	1,376	1,399	1,419	1,438	1,456	1,472	1,487	1,498	1,498	1,498	1,498	1,498	1,498
405	TIPSY	0	0	2	39	153	279	399	507	602	692	777	851	917	978	1,035	1,088	1,137	1,181	1,218	1,252	1,282	1,309	1,337	1,362	1,386	1,406	1,426	1,443	1,458	1,473	1,482	1,482	1,482	1,482	1,482	1,482
406	TIPSY	0	0	1	33	142	264	380	486	579	668	752	824	886	947	1,005	1,057	1,107	1,152	1,187	1,218	1,247	1,275	1,302	1,327	1,351	1,372	1,389	1,406	1,421	1,435	1,445	1,445	1,445	1,445	1,445	1,445
410	TIPSY	0	0	23	126	250	376	502	608	715	806	884	949	1,012	1,069	1,123	1,168	1,203	1,234	1,262	1,289	1,313	1,336	1,359	1,378	1,395	1,410	1,424	1,437	1,449	1,461	1,461	1,461	1,461	1,461	1,461	1,461
411	TIPSY	0	0	2	31	93	172	250	326	397	459	518	575	625	670	711	747	780	809	835	859	880	902	926	948	968	987	1,004	1,019	1,034	1,047	1,048	1,048	1,048	1,048	1,048	1,048
412	TIPSY	0	0	2	28	93	175	256	335	405	469	531	589	641	688	729	766	799	829	857	882	905	928	952	974	995	1,014	1,031	1,047	1,062	1,075	1,077	1,077	1,077	1,077	1,077	1,077
413	TIPSY	0	0	2	28	100	187	275	355	430	501	566	625	678	727	771	812	849	882	911	937	961	984	1,008	1,030	1,051	1,070	1,087	1,103	1,117	1,130	1,135	1,135	1,135	1,135	1,135	1,135
414	TIPSY	0	0	1	39	154	283	405	515	615	705	789	866	937	1,001	1,058	1,110	1,157	1,201	1,239	1,274	1,306	1,335	1,362	1,388	1,412	1,433	1,452	1,470	1,486	1,501	1,513	1,513	1,513	1,513	1,513	1,513
415	TIPSY	0	0	2	38	140	258	372	476	569	654	734	807	873	932	986	1,035	1,081	1,122	1,160	1,193	1,222	1,249	1,276	1,300	1,323	1,343	1,362	1,379	1,395	1,409	1,418	1,418	1,418	1,418	1,418	1,418
416	TIPSY	0	0	1	14	58	126	208	288	360	425	486	543	595	641	682	721	757	789	819	847	872	896	918	939	958	976	993	1,007	1,022	1,035	1,042	1,042	1,042	1,042	1,042	1,042
419	TIPSY	0	0	51	125	198	268	315	325	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332
420	TIPSY	0	0	8	58	134	215	297	372	443	507	565	616	662	705	745	780	810	837	862	883	903	923	941	958	974	988	1,000	1,012	1,023	1,033	1,033	1,033	1,033	1,033	1,033	1,033
461	TIPSY	0	0	1	9	31	65	103	143	186	227	266	299	330	359	388	414	438	459	478	495	510	524	539	553	566	578	590	601	610	618	621	621	621	621	621	621
462	TIPSY	0	0	0	1	8	26	59	101	147	191	232	271	306	338	367	395	421	446	469	488	507	523	539	554	568	582	594	606	616	627	633	633	633	633	633	633
463	TIPSY	0	0	0	2	12	31	57	88	122	154	185	214	240	265	288	310	330	349	365	380	392	405	417	429	441	451	461	470	477	485	487	487	487	487	487	487
464	TIPSY	0	0	0	9	44	96	157	219	281	337	391	441	486	526	563	598	631	662	690	715	737	757	777	795	812	829	843	857	869	881	889	889	889	889	889	889
601	TIPSY	0	0	2	32	111	197	292	370	445	521	591	654	705	749	788	833	874	911	945	970	993	1,017	1,041	1,063	1,083	1,102	1,120	1,137	1,154	1,168	1,169	1,169	1,169	1,169	1,169	1,169
602	TIPSY	0	0	4	58	157	269	371	470	564	648	722	792	857	917	970	1,016	1,057	1,093	1,125	1,154	1,180	1,207	1,235	1,260	1,284	1,306	1,326	1,344	1,362	1,377	1,379	1,379	1,379	1,379	1,379	1,379
603	TIPSY	0	0	4	45	130	229	325	415	500	577	648	713	772	826	875	917	956	991	1,022	1,050	1,075	1,100	1,126	1,150	1,172	1,191	1,209	1,226	1,241	1,254	1,259	1,259	1,259	1,259	1,259	1,259
604	TIPSY	0	0	1	46	160	285	403	513	613	703	788	864	934	996	1,051	1,103	1,151	1,193	1,229	1,263	1,294	1,322	1,350	1,376	1,399	1,419	1,438	1,456	1,472	1,487	1,498	1,498	1,498	1,498	1,498	1,498
605	TIPSY	0	0	2	39	153	279	399	507	602	692	777	851	917	978	1,035	1,088	1,137	1,181	1,218	1,252	1,282	1,309	1,337	1,362	1,386	1,406	1,426	1,443	1,458	1,473	1,482	1,482	1,482	1,482	1,482	1,482
606	TIPSY	0	0	1	33	142	264	380	486	579	668	752	824	886	947	1,005	1,057	1,107	1,152	1,187	1,218	1,247	1,275	1,302	1,327	1,351	1,372	1,389	1,406	1,421	1,435	1,445	1,445	1,445	1,445	1,445	1,445
610	TIPSY	0	0	23	126	250	376	502	608	715	806	884	949	1,012	1,069	1,123	1,168	1,203	1,234	1,262	1,289	1,313	1,336	1,359	1,378	1,395	1,410	1,424	1,437	1,449	1,461	1,461	1,461	1,461	1,461	1,461	1,461
611	TIPSY	0	0	2	31	93	172	250	326	397	459	518	575	625	670	711	747	780	809	835	859	880	902	926	948	968	987	1,004	1,019	1,034	1,047	1,048	1,048	1,048	1,048	1,048	1,048

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
612	TIPSY	0	0	2	28	93	175	256	335	405	469	531	589	641	688	729	766	799	829	857	882	905	928	952	974	995	1,014	1,031	1,047	1,062	1,075	1,077	1,077	1,077	1,077	1,077	1,077
613	TIPSY	0	0	2	28	100	187	275	355	430	501	566	625	678	727	771	812	849	882	911	937	961	984	1,008	1,030	1,051	1,070	1,087	1,103	1,117	1,130	1,135	1,135	1,135	1,135	1,135	1,135
614	TIPSY	0	0	1	39	154	283	405	515	615	705	789	866	937	1,001	1,058	1,110	1,157	1,201	1,239	1,274	1,306	1,335	1,362	1,388	1,412	1,433	1,452	1,470	1,486	1,501	1,513	1,513	1,513	1,513	1,513	1,513
615	TIPSY	0	0	2	38	140	258	372	476	569	654	734	807	873	932	986	1,035	1,081	1,122	1,160	1,193	1,222	1,249	1,276	1,300	1,323	1,343	1,362	1,379	1,395	1,409	1,418	1,418	1,418	1,418	1,418	1,418
616	TIPSY	0	0	1	14	58	126	208	288	360	425	486	543	595	641	682	721	757	789	819	847	872	896	918	939	958	976	993	1,007	1,022	1,035	1,042	1,042	1,042	1,042	1,042	1,042
619	TIPSY	0	0	51	125	198	268	315	325	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332
620	TIPSY	0	0	8	58	134	215	297	372	443	507	565	616	662	705	745	780	810	837	862	883	903	923	941	958	974	988	1,000	1,012	1,023	1,033	1,033	1,033	1,033	1,033	1,033	1,033
661	TIPSY	0	0	1	9	31	65	103	143	186	227	266	299	330	359	388	414	438	459	478	495	510	524	539	553	566	578	590	601	610	618	621	621	621	621	621	621
662	TIPSY	0	0	0	1	8	26	59	101	147	191	232	271	306	338	367	395	421	446	469	488	507	523	539	554	568	582	594	606	616	627	633	633	633	633	633	633
663	TIPSY	0	0	0	2	12	31	57	88	122	154	185	214	240	265	288	310	330	349	365	380	392	405	417	429	441	451	461	470	477	485	487	487	487	487	487	487
664	TIPSY	0	0	0	9	44	96	157	219	281	337	391	441	486	526	563	598	631	662	690	715	737	757	777	795	812	829	843	857	869	881	889	889	889	889	889	889

APPENDIX II
EBM YIELD TABLES

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
1	VDYP6	0	0	1	41	138	231	320	401	478	548	613	675	725	775	820	859	893	921	951	981	1,009	1,037	1,071	1,103	1,134	1,165	1,167	1,169	1,171	1,173	1,174	1,175	1,176	1,177	1,178	1,178
2	VDYP6	0	0	0	1	42	114	182	244	301	354	403	449	487	524	557	587	612	633	655	677	698	718	741	765	787	809	813	817	820	823	826	829	831	834	836	838
3	VDYP6	0	0	0	0	3	35	85	133	178	220	259	296	326	356	382	404	424	439	457	473	489	504	522	539	556	573	576	579	582	584	587	589	591	593	595	596
4	VDYP6	0	0	7	163	320	454	568	666	751	824	888	944	993	1,040	1,082	1,120	1,154	1,184	1,211	1,237	1,260	1,281	1,300	1,318	1,334	1,349	1,360	1,369	1,378	1,386	1,393	1,399	1,404	1,409	1,413	1,417
5	VDYP6	0	0	1	64	196	310	409	496	572	638	697	750	795	839	880	916	948	977	1,005	1,030	1,054	1,075	1,095	1,114	1,131	1,147	1,158	1,167	1,176	1,183	1,190	1,197	1,202	1,207	1,212	1,216
6	VDYP6	0	0	0	3	43	127	203	270	331	385	434	478	517	554	588	619	648	673	697	720	742	762	781	798	815	830	840	850	858	866	873	880	886	892	898	902
7	VDYP6	0	0	16	76	156	240	324	398	464	522	574	621	662	702	739	772	803	830	856	881	903	925	945	963	981	998	1,012	1,025	1,038	1,050	1,061	1,072	1,082	1,092	1,102	1,111
8	VDYP6	0	1	41	130	216	285	340	368	393	414	434	452	467	482	495	507	518	527	536	545	553	560	568	575	581	587	591	595	598	601	604	607	609	611	614	616
10	VDYP6	0	0	1	148	331	486	617	731	831	920	999	1,069	1,132	1,181	1,222	1,255	1,279	1,295	1,304	1,322	1,339	1,356	1,372	1,388	1,403	1,417	1,418	1,419	1,420	1,420	1,420	1,421	1,421	1,420	1,420	1,420
11	VDYP6	0	0	0	38	138	234	324	404	478	547	610	669	717	765	809	847	880	908	938	966	994	1,020	1,052	1,082	1,112	1,141	1,145	1,148	1,152	1,154	1,157	1,159	1,161	1,163	1,165	1,166
12	VDYP6	0	0	0	1	38	107	172	231	286	337	385	430	466	502	534	562	586	606	628	649	669	689	712	735	757	778	781	784	786	789	791	793	795	797	798	800
13	VDYP6	0	0	0	0	4	42	92	140	185	227	267	304	334	364	390	413	432	448	465	482	498	513	532	550	568	585	587	589	591	593	594	596	598	599	600	601
14	VDYP6	0	0	6	157	310	441	553	648	731	802	865	920	967	1,013	1,054	1,091	1,124	1,153	1,180	1,205	1,227	1,248	1,267	1,284	1,300	1,315	1,325	1,333	1,340	1,347	1,353	1,358	1,362	1,366	1,369	1,372
15	VDYP6	0	0	0	60	186	296	392	475	548	612	669	720	764	807	846	881	912	939	965	990	1,012	1,033	1,053	1,071	1,088	1,104	1,113	1,121	1,129	1,136	1,142	1,147	1,152	1,157	1,161	1,164
16	VDYP6	0	0	0	2	48	127	201	266	325	377	425	468	506	543	576	606	633	657	680	703	724	743	762	779	796	811	819	827	834	840	845	851	856	860	864	867
17	VDYP6	0	0	9	46	120	204	281	349	409	462	509	552	588	624	657	686	712	736	759	780	799	818	835	851	866	880	891	902	912	922	931	939	947	955	962	969
18	VDYP6	0	3	49	141	227	296	351	378	401	422	442	459	475	489	502	514	525	534	543	552	560	568	576	583	591	598	600	603	605	607	609	611	613	614	616	617
19	VDYP7	0	0	41	117	195	267	331	387	435	476	509	534	552	561	563	558	548	536	522	508	493	477	461	445	430	415	400	386	372	358	345	335	327	319	311	304
20	VDYP6	0	0	1	57	197	315	415	500	573	638	695	747	792	829	859	883	901	913	920	933	945	957	968	979	989	998	1,000	1,002	1,004	1,005	1,006	1,007	1,008	1,009	1,010	1,010
21	VDYP6	0	0	0	58	157	253	342	422	498	567	631	691	740	789	833	872	905	934	964	994	1,022	1,049	1,082	1,114	1,145	1,175	1,178	1,181	1,184	1,186	1,188	1,189	1,191	1,192	1,193	1,194
22	VDYP6	0	0	0	0	32	95	157	214	266	315	361	403	438	472	502	529	552	571	591	611	630	648	670	691	712	732	735	738	740	742	744	746	748	749	751	752
23	VDYP6	0	0	0	0	4	41	90	136	180	221	259	295	324	353	378	400	419	434	451	467	483	498	515	533	550	566	569	571	573	575	577	578	580	581	583	584
24	VDYP6	0	0	8	158	308	436	546	639	719	789	851	905	951	996	1,036	1,072	1,103	1,131	1,157	1,181	1,203	1,223	1,242	1,259	1,275	1,289	1,298	1,305	1,312	1,318	1,323	1,328	1,331	1,335	1,337	1,340
25	VDYP6	0	0	0	57	180	290	387	471	545	611	670	723	769	813	852	887	917	944	969	993	1,015	1,036	1,055	1,073	1,090	1,106	1,114	1,121	1,128	1,134	1,139	1,144	1,148	1,152	1,155	1,158
26	VDYP6	0	0	0	4	61	145	221	290	352	407	458	504	544	582	616	647	674	698	721	743	764	784	802	820	836	851	859	866	873	879	884	890	894	898	902	905
27	VDYP6	0	0	9	43	117	226	326	411	485	550	607	657	701	742	778	810	838	862	883	904	923	940	956	971	985	998	1,009	1,019	1,029	1,038	1,047	1,055	1,063	1,070	1,077	1,083
28	VDYP6	0	0	74	186	270	334	383	405	425	443	459	473	486	498	508	518	526	534	541	548	554	560	566	572	578	583	585	588	589	591	593	594	596	597	598	599
30	VDYP6	0	0	0	41	169	280	374	453	521	581	635	682	724	758	786	808	824	836	842	853	864	875	885	894	903	912	914	917	919	921	922	924	926	927	928	929
32	VDYP6	0	0	0	0	24	100	171	234	293	347	397	444	482	520	553	583	608	629	652	674	694	714	737	759	781	802	808	813	818	822	826	830	834	837	840	843
33	VDYP6	0	0	0	0	1	16	50	93	132	169	202	234	261	285	308	327	343	357	371	385	398	410	424	439	452	465	469	472	474	477	479	481	483	485	487	488
34	VDYP6	0	0	2	145	301	434	548	645	729	802	865	920	967	1,013	1,055	1,092	1,125	1,155	1,182	1,207	1,229	1,249	1,267	1,284	1,299	1,312	1,323	1,333	1,341	1,349	1,355	1,361	1,366	1,371	1,374	1,377
35	VDYP6	0	0	1	78	213	331	434	523	601	670	730	784	831	876	917	954	987	1,017	1,044	1,070	1,094	1,116	1,136	1,155	1,172	1,188	1,198	1,207	1,216	1,223	1,229	1,235	1,240	1,245	1,249	1,252
36	VDYP6	0	0	0	0	27	106	178	243	303	357	407	452	492	530	565	596	625	650	675	699	722	744	764	784	802	820	828	836	842	849	855	860	865	870	874	878
38	VDYP6	0	0	38	119	210	296	368	403	433	460	484	505	523	541	558	573	586	599	611	622	632	641	650	658	666	673	680	686	692	698	703	708	713	718	722	726
42	VDYP6	0	0	0	0	39	113	183	246	305	359	409	456	494	532	565	595	620	641	663	684	705	724	748	771	793	814	818	821	824	827	830	832	834	836	838	840

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
43	VDYP6	0	0	0	0	3	36	85	132	176	217	255	291	321	349	375	397	415	431	448	464	480	494	512	529	546	562	565	567	569	571	573	575	576	578	579	580
44	VDYP6	0	0	9	157	302	425	531	618	694	760	818	868	911	953	990	1,023	1,051	1,077	1,100	1,122	1,142	1,160	1,177	1,192	1,206	1,219	1,226	1,232	1,237	1,241	1,245	1,248	1,250	1,252	1,254	1,255
45	VDYP6	0	0	0	77	208	324	424	510	585	651	710	762	808	851	890	925	955	982	1,007	1,031	1,052	1,073	1,091	1,109	1,125	1,140	1,148	1,156	1,163	1,169	1,175	1,180	1,184	1,188	1,191	1,194
46	VDYP6	0	0	0	1	39	120	195	262	322	376	425	469	508	545	578	608	635	660	683	704	725	744	762	779	795	810	818	826	834	840	846	852	857	862	866	870
47	VDYP6	0	0	23	97	236	360	468	563	645	717	780	835	882	927	967	1,002	1,033	1,060	1,085	1,109	1,131	1,152	1,171	1,189	1,205	1,221	1,234	1,245	1,256	1,267	1,277	1,287	1,296	1,304	1,313	1,321
48	VDYP6	0	3	57	152	244	318	375	405	431	454	475	493	509	524	537	549	559	568	576	584	592	599	605	612	618	623	627	629	632	635	637	639	641	642	644	645
51	VDYP6	0	0	0	14	93	177	256	327	393	454	510	563	607	649	686	718	745	768	790	813	835	856	881	906	930	954	957	960	963	965	967	970	971	973	975	976
52	VDYP6	0	0	0	0	17	66	122	173	221	265	306	345	377	407	434	457	477	493	510	527	543	558	576	594	612	629	631	634	636	638	640	641	643	644	646	647
53	VDYP6	0	0	0	0	3	36	86	134	179	219	257	293	323	351	376	397	416	431	447	463	478	492	509	525	542	557	560	564	566	569	572	574	576	578	580	582
54	VDYP6	0	0	0	134	289	420	532	627	708	778	839	892	938	982	1,021	1,057	1,089	1,117	1,143	1,166	1,186	1,205	1,222	1,237	1,250	1,262	1,273	1,282	1,291	1,298	1,305	1,310	1,315	1,319	1,323	1,325
55	VDYP6	0	0	1	35	175	296	401	494	576	649	714	771	823	870	913	950	983	1,011	1,036	1,060	1,083	1,104	1,123	1,141	1,157	1,173	1,184	1,194	1,203	1,211	1,219	1,226	1,232	1,238	1,243	1,248
56	VDYP6	0	0	0	1	34	115	193	263	326	382	434	482	524	562	597	628	655	678	700	721	741	761	779	796	812	827	834	841	848	854	859	864	868	873	876	880
57	VDYP6	0	0	6	31	124	238	340	429	507	575	635	688	734	777	815	849	879	905	929	952	973	992	1,010	1,026	1,042	1,056	1,067	1,078	1,088	1,097	1,106	1,114	1,121	1,128	1,135	1,142
58	VDYP6	0	0	43	203	334	441	533	596	654	706	754	798	836	873	906	935	961	983	1,006	1,028	1,049	1,069	1,091	1,111	1,131	1,150	1,155	1,159	1,163	1,167	1,170	1,173	1,176	1,178	1,180	1,182
61	VDYP6	0	0	0	0	0	9	41	80	117	153	186	217	243	267	289	308	324	337	351	365	378	390	404	419	433	446	449	451	454	456	458	460	462	464	465	467
62	VDYP6	0	0	0	0	2	51	113	169	221	267	310	349	384	417	447	475	500	522	544	565	585	603	620	637	653	667	676	684	692	699	705	711	717	722	727	732
63	VDYP6	0	0	0	0	0	11	46	84	120	155	187	218	244	268	289	307	323	335	349	362	375	387	402	416	430	443	445	447	448	449	450	452	453	454	455	456
64	VDYP6	0	0	0	0	1	41	96	148	195	238	278	315	347	378	406	432	455	476	496	516	535	552	569	585	600	615	622	628	634	640	645	650	654	659	663	666
65	VDYP6	0	0	0	0	0	11	46	85	123	158	191	222	248	272	294	313	328	341	355	369	382	394	408	423	437	451	452	454	456	458	459	460	462	463	464	465
66	VDYP6	0	0	0	0	1	44	100	151	198	241	280	316	348	378	405	430	453	473	492	511	528	545	561	576	591	604	611	617	623	628	633	638	642	646	650	653
67	VDYP6	0	0	0	0	0	7	38	80	119	155	189	222	248	274	296	315	332	345	360	374	387	400	415	430	444	458	461	463	466	468	470	473	474	476	478	480
68	VDYP6	0	0	0	0	1	48	111	168	220	267	311	351	386	420	451	479	504	527	549	571	591	610	628	645	662	677	686	694	701	708	714	720	726	731	736	740
69	VDYP6	0	0	0	0	0	8	39	77	113	147	179	210	235	258	279	297	313	325	339	352	365	377	391	405	418	431	433	436	438	440	442	443	445	446	448	449
70	VDYP6	0	0	0	0	0	45	106	163	214	260	303	341	375	408	438	465	489	510	532	552	571	588	605	621	636	650	658	665	671	677	683	688	693	697	701	705
72	VDYP6	0	0	0	0	0	39	95	150	201	248	291	332	367	400	430	457	481	502	523	543	563	581	599	616	632	648	654	659	664	668	672	676	680	683	686	689
101	TIPSY	0	0	3	45	126	222	313	402	486	560	628	693	752	805	853	896	934	968	998	1,025	1,050	1,075	1,101	1,126	1,149	1,170	1,189	1,207	1,223	1,239	1,240	1,240	1,240	1,240	1,240	1,240
102	TIPSY	0	0	5	67	175	294	401	510	611	697	776	854	926	989	1,043	1,092	1,135	1,173	1,207	1,238	1,266	1,294	1,324	1,352	1,378	1,403	1,425	1,445	1,464	1,480	1,483	1,483	1,483	1,483	1,483	1,483
103	TIPSY	0	0	0	1	11	32	69	106	147	184	221	256	287	314	338	360	381	400	419	436	451	466	481	496	509	521	533	543	553	562	565	565	565	565	565	565
104	TIPSY	0	0	1	56	196	341	473	590	701	799	889	973	1,051	1,120	1,181	1,236	1,286	1,331	1,371	1,407	1,440	1,470	1,499	1,526	1,550	1,572	1,592	1,611	1,627	1,642	1,655	1,655	1,655	1,655	1,655	1,655
105	TIPSY	0	0	2	45	155	280	397	504	603	692	773	848	916	978	1,034	1,085	1,132	1,173	1,210	1,244	1,275	1,303	1,330	1,355	1,378	1,399	1,418	1,436	1,452	1,466	1,476	1,476	1,476	1,476	1,476	1,476
106	TIPSY	0	0	1	29	121	231	339	437	526	610	687	755	816	873	927	978	1,023	1,063	1,098	1,129	1,158	1,184	1,211	1,235	1,257	1,278	1,296	1,313	1,328	1,342	1,351	1,351	1,351	1,351	1,351	1,351
107	TIPSY	0	0	9	95	235	377	515	644	760	866	961	1,045	1,118	1,179	1,234	1,281	1,323	1,358	1,387	1,411	1,429	1,445	1,459	1,469	1,479	1,487	1,495	1,501	1,506	1,510	1,511	1,511	1,511	1,511	1,511	1,511
108	TIPSY	0	19	79	134	187	231	267	284	166	155	170	187	201	215	229	240	251	259	267	274	281	287	295	302	308	314	319	324	329	333	333	333	333	333	333	333
111	TIPSY	0	0	2	33	103	187	272	351	425	495	559	617	671	720	763	803	839	872	901	927	950	974	998	1,021	1,042	1,061	1,079	1,096	1,112	1,126	1,127	1,127	1,127	1,127	1,127	1,127
112	TIPSY	0	0	1	24	88	169	250	324	397	464	524	578	630	677	720	759	794	826	855	880	902	924	947	968	988	1,006	1,023	1,040	1,055	1,069	1,071	1,071	1,071	1,071	1,071	1,071

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
113	TIPSY	0	0	2	33	123	224	326	414	500	582	656	721	779	833	885	933	975	1,012	1,046	1,075	1,101	1,127	1,153	1,178	1,200	1,221	1,240	1,258	1,274	1,289	1,293	1,293	1,293	1,293	1,293	1,293
114	TIPSY	0	0	1	45	178	317	447	560	665	762	850	930	1,004	1,072	1,134	1,189	1,239	1,283	1,322	1,359	1,391	1,421	1,449	1,475	1,499	1,521	1,541	1,559	1,576	1,591	1,603	1,603	1,603	1,603	1,603	1,603
115	TIPSY	0	0	1	40	154	278	394	498	594	684	765	839	907	970	1,027	1,078	1,124	1,165	1,203	1,236	1,267	1,295	1,322	1,347	1,370	1,391	1,410	1,427	1,443	1,457	1,467	1,467	1,467	1,467	1,467	1,467
116	TIPSY	0	0	1	28	118	227	333	430	518	601	676	743	805	863	916	965	1,008	1,047	1,082	1,114	1,143	1,170	1,195	1,219	1,242	1,262	1,281	1,298	1,313	1,327	1,336	1,336	1,336	1,336	1,336	1,336
117	TIPSY	0	0	5	84	216	352	479	607	716	818	914	999	1,070	1,133	1,178	1,221	1,259	1,292	1,322	1,347	1,367	1,385	1,401	1,415	1,430	1,442	1,453	1,461	1,469	1,475	1,475	1,475	1,475	1,475	1,475	1,475
118	TIPSY	0	19	82	137	188	231	266	284	158	144	158	174	189	203	214	225	235	243	251	257	263	269	277	283	290	295	301	306	310	314	314	314	314	314	314	314
120	TIPSY	0	0	5	60	148	238	323	406	486	558	621	679	733	781	824	862	896	925	951	976	999	1,020	1,041	1,058	1,076	1,091	1,107	1,121	1,132	1,141	1,141	1,141	1,141	1,141	1,141	1,141
121	TIPSY	0	0	1	14	61	129	197	263	327	382	430	480	528	571	611	646	679	705	728	748	765	784	804	825	845	865	883	900	917	930	930	930	930	930	930	930
122	TIPSY	0	0	0	10	50	114	181	246	310	362	408	456	503	545	584	619	650	677	698	717	736	754	773	791	812	831	849	866	882	897	899	899	899	899	899	899
124	TIPSY	0	0	2	65	221	372	513	633	751	855	945	1,033	1,115	1,192	1,257	1,310	1,359	1,406	1,450	1,487	1,518	1,548	1,578	1,605	1,630	1,654	1,676	1,696	1,710	1,724	1,736	1,736	1,736	1,736	1,736	1,736
125	TIPSY	0	0	1	36	136	253	365	467	559	645	723	795	859	918	974	1,024	1,068	1,109	1,145	1,178	1,208	1,235	1,262	1,286	1,309	1,330	1,349	1,366	1,382	1,395	1,405	1,405	1,405	1,405	1,405	1,405
126	TIPSY	0	0	0	2	19	58	113	176	235	290	339	384	428	469	504	536	565	593	618	641	664	683	704	722	739	755	770	784	795	807	814	814	814	814	814	814
128	TIPSY	0	13	66	112	160	199	234	250	156	152	169	184	198	211	225	237	248	256	264	271	277	284	291	298	304	310	315	320	324	328	328	328	328	328	328	328
131	TIPSY	0	0	24	147	304	460	617	752	886	1,002	1,111	1,203	1,284	1,363	1,434	1,492	1,543	1,592	1,634	1,672	1,706	1,742	1,780	1,816	1,849	1,878	1,905	1,930	1,938	1,945	1,946	1,946	1,946	1,946	1,946	1,946
132	TIPSY	0	0	0	4	31	79	132	184	238	288	331	369	404	440	474	504	532	556	578	599	616	635	651	667	681	694	707	719	730	740	742	742	742	742	742	742
135	TIPSY	0	0	2	29	111	225	333	433	525	606	679	748	812	868	920	967	1,011	1,051	1,087	1,122	1,152	1,179	1,205	1,229	1,251	1,272	1,291	1,308	1,324	1,338	1,347	1,347	1,347	1,347	1,347	1,347
141	TIPSY	0	0	3	37	113	200	289	371	447	520	586	647	703	753	798	838	874	908	937	964	988	1,013	1,038	1,062	1,085	1,105	1,124	1,141	1,158	1,173	1,173	1,173	1,173	1,173	1,173	1,173
144	TIPSY	0	0	1	40	171	309	438	551	653	749	838	916	988	1,055	1,116	1,173	1,224	1,268	1,306	1,341	1,374	1,404	1,433	1,459	1,483	1,505	1,525	1,542	1,558	1,573	1,586	1,586	1,586	1,586	1,586	1,586
145	TIPSY	0	0	1	30	132	251	361	462	552	637	716	788	852	911	967	1,017	1,063	1,103	1,139	1,172	1,202	1,230	1,256	1,281	1,304	1,324	1,343	1,360	1,376	1,390	1,400	1,400	1,400	1,400	1,400	1,400
146	TIPSY	0	0	6	80	201	338	465	584	692	787	874	953	1,026	1,092	1,148	1,198	1,244	1,287	1,327	1,363	1,395	1,425	1,454	1,480	1,503	1,526	1,539	1,552	1,564	1,574	1,580	1,580	1,580	1,580	1,580	1,580
147	TIPSY	0	0	10	107	259	407	556	686	810	922	1,019	1,103	1,178	1,245	1,301	1,350	1,393	1,430	1,458	1,478	1,492	1,505	1,516	1,526	1,534	1,538	1,542	1,545	1,549	1,552	1,552	1,552	1,552	1,552	1,552	1,552
148	TIPSY	0	13	65	109	150	186	216	232	139	131	146	162	177	189	199	209	217	225	232	239	245	252	259	266	272	278	282	287	291	294	294	294	294	294	294	294
151	TIPSY	0	0	2	37	124	217	314	393	479	560	632	694	744	794	847	895	938	971	1,002	1,029	1,053	1,078	1,104	1,129	1,152	1,174	1,192	1,208	1,224	1,239	1,240	1,240	1,240	1,240	1,240	1,240
154	TIPSY	0	0	2	62	215	364	504	621	736	841	929	1,016	1,096	1,172	1,238	1,292	1,340	1,386	1,428	1,466	1,499	1,528	1,557	1,584	1,609	1,632	1,654	1,673	1,689	1,705	1,716	1,716	1,716	1,716	1,716	1,716
155	TIPSY	0	0	3	51	165	296	418	532	632	723	807	887	953	1,014	1,074	1,127	1,174	1,217	1,257	1,291	1,321	1,349	1,376	1,402	1,426	1,448	1,468	1,486	1,501	1,516	1,525	1,525	1,525	1,525	1,525	1,525
158	TIPSY	0	28	103	183	256	315	362	385	240	228	248	270	289	307	324	340	353	363	373	382	390	398	407	416	424	432	440	446	452	457	457	457	457	457	457	457
162	TIPSY	0	0	1	16	74	165	261	350	430	504	572	632	689	738	784	827	869	905	939	969	997	1,023	1,047	1,069	1,089	1,109	1,127	1,144	1,160	1,174	1,183	1,183	1,183	1,183	1,183	1,183
163	TIPSY	0	0	1	14	59	121	188	250	309	368	422	469	512	551	587	621	653	682	709	732	752	772	793	811	828	844	858	871	884	895	899	899	899	899	899	899
164	TIPSY	0	0	0	13	70	158	248	333	411	481	544	605	662	714	760	801	837	872	904	935	963	989	1,015	1,038	1,059	1,078	1,095	1,111	1,125	1,139	1,147	1,147	1,147	1,147	1,147	1,147
167	TIPSY	0	0	0	0	1	7	20	34	55	79	101	122	143	162	179	195	210	224	237	250	261	272	283	294	304	314	321	327	333	339	341	341	341	341	341	341
169	TIPSY	0	0	0	0	1	7	20	34	55	79	101	122	143	162	179	195	210	224	237	250	261	272	283	294	304	314	321	327	333	339	341	341	341	341	341	341
201	TIPSY	0	0	2	26	84	160	235	307	374	438	495	546	593	639	679	713	745	774	801	826	848	870	892	911	929	945	960	974	987	1,001	1,001	1,001	1,001	1,001	1,001	1,001
202	TIPSY	0	0	3	45	128	225	319	407	491	566	636	700	757	809	857	900	938	973	1,003	1,030	1,054	1,079	1,104	1,127	1,148	1,168	1,187	1,205	1,221	1,236	1,238	1,238	1,238	1,238	1,238	1,238
203	TIPSY	0	0	2	37	123	222	319	409	493	571	642	707	766	819	868	912	951	987	1,019	1,047	1,073	1,098	1,123	1,147	1,169	1,190	1,208	1,225	1,241	1,256	1,260	1,260	1,260	1,260	1,260	1,260
204	TIPSY	0	0	2	47	162	291	414	524	626	719	801	878	948	1,013	1,071	1,123	1,169	1,211	1,248	1,283	1,314	1,343	1,371	1,397	1,421	1,443	1,462	1,480	1,496	1,510	1,522	1,522	1,522	1,522	1,522	1,522

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
205	TIPSY	0	0	2	41	144	265	380	484	580	666	746	818	884	945	1,000	1,050	1,095	1,136	1,173	1,206	1,236	1,264	1,291	1,315	1,338	1,359	1,378	1,395	1,411	1,425	1,434	1,434	1,434	1,434	1,434	1,434
206	TIPSY	0	0	2	39	133	241	348	446	537	619	695	765	828	886	938	985	1,028	1,067	1,102	1,133	1,162	1,189	1,214	1,238	1,260	1,280	1,298	1,315	1,330	1,343	1,352	1,352	1,352	1,352	1,352	1,352
207	TIPSY	0	0	6	59	153	258	365	464	557	643	720	789	852	908	957	1,000	1,037	1,070	1,099	1,123	1,144	1,164	1,182	1,197	1,212	1,225	1,236	1,245	1,253	1,261	1,261	1,261	1,261	1,261	1,261	1,261
208	TIPSY	0	21	87	145	199	244	281	298	163	146	161	176	190	203	215	225	234	242	250	256	262	268	275	281	286	291	296	301	306	310	310	310	310	310	310	310
210	TIPSY	0	0	43	185	342	502	653	787	902	1,006	1,094	1,170	1,239	1,303	1,357	1,402	1,442	1,479	1,497	1,513	1,528	1,541	1,553	1,565	1,575	1,586	1,595	1,605	1,614	1,622	1,622	1,622	1,622	1,622	1,622	1,622
211	TIPSY	0	0	3	42	122	214	303	388	468	541	607	668	724	776	822	863	899	931	960	986	1,009	1,033	1,058	1,082	1,103	1,123	1,141	1,158	1,174	1,188	1,188	1,188	1,188	1,188	1,188	1,188
212	TIPSY	0	0	1	27	95	178	260	337	410	477	538	594	647	694	737	776	810	841	869	894	916	938	962	983	1,004	1,022	1,040	1,056	1,071	1,085	1,087	1,087	1,087	1,087	1,087	1,087
213	TIPSY	0	0	1	25	94	179	264	343	416	485	548	606	659	707	751	791	826	858	887	913	936	959	982	1,004	1,024	1,043	1,060	1,076	1,091	1,104	1,108	1,108	1,108	1,108	1,108	1,108
214	TIPSY	0	0	1	46	170	300	419	524	621	711	792	865	934	996	1,053	1,103	1,148	1,188	1,224	1,257	1,287	1,314	1,340	1,363	1,385	1,405	1,423	1,440	1,455	1,468	1,479	1,479	1,479	1,479	1,479	1,479
215	TIPSY	0	0	1	38	140	253	359	455	543	624	698	765	828	884	935	982	1,023	1,060	1,094	1,124	1,152	1,177	1,202	1,225	1,245	1,264	1,282	1,298	1,312	1,325	1,333	1,333	1,333	1,333	1,333	1,333
216	TIPSY	0	0	1	27	107	201	294	380	459	532	599	660	717	768	815	857	895	929	960	989	1,015	1,038	1,062	1,083	1,102	1,120	1,137	1,152	1,165	1,178	1,186	1,186	1,186	1,186	1,186	1,186
217	TIPSY	0	0	1	33	114	210	310	403	491	574	651	722	785	843	897	945	989	1,027	1,060	1,090	1,117	1,142	1,164	1,184	1,201	1,217	1,231	1,243	1,253	1,263	1,264	1,264	1,264	1,264	1,264	1,264
218	TIPSY	0	22	89	150	206	254	291	308	168	152	166	182	197	210	222	233	242	251	258	265	271	277	284	291	297	302	307	312	317	321	321	321	321	321	321	321
219	VDYP7	0	0	41	117	195	267	331	387	435	476	509	534	552	561	563	558	548	536	522	508	493	477	461	445	430	415	400	386	372	358	345	335	327	319	311	304
220	TIPSY	0	0	14	88	189	290	387	481	564	638	707	768	820	865	906	942	975	1,005	1,032	1,056	1,076	1,096	1,114	1,132	1,148	1,159	1,170	1,179	1,188	1,196	1,196	1,196	1,196	1,196	1,196	1,196
221	TIPSY	0	0	8	55	141	240	336	426	510	584	656	721	779	831	880	923	961	994	1,022	1,048	1,070	1,093	1,118	1,141	1,162	1,182	1,200	1,215	1,229	1,241	1,241	1,241	1,241	1,241	1,241	1,241
222	TIPSY	0	0	1	16	68	139	210	279	344	402	454	504	552	595	635	670	702	730	754	776	796	815	836	855	874	892	909	924	939	952	954	954	954	954	954	954
223	TIPSY	0	0	1	18	75	150	225	297	365	427	483	536	585	630	671	708	741	771	797	820	842	862	884	904	923	941	957	972	986	999	1,004	1,004	1,004	1,004	1,004	1,004
224	TIPSY	0	0	1	28	91	154	212	262	307	348	385	419	448	476	501	523	542	559	574	588	601	612	622	632	640	648	655	661	666	672	675	675	675	675	675	675
225	TIPSY	0	0	0	14	54	105	152	195	234	268	299	328	355	379	400	419	437	453	467	480	491	502	512	522	530	538	545	551	557	562	566	566	566	566	566	566
226	TIPSY	0	0	0	6	31	66	104	140	173	203	231	255	278	298	317	334	349	363	376	387	398	408	417	426	434	441	448	454	460	465	468	468	468	468	468	468
227	TIPSY	0	0	2	26	88	175	269	358	444	523	597	665	727	784	836	883	925	963	997	1,028	1,056	1,080	1,104	1,125	1,146	1,162	1,177	1,189	1,202	1,213	1,216	1,216	1,216	1,216	1,216	1,216
228	TIPSY	0	31	107	173	233	283	320	335	162	135	147	162	175	188	199	209	217	224	230	236	241	248	254	261	267	272	277	282	286	290	290	290	290	290	290	290
230	TIPSY	0	0	5	36	83	129	173	215	253	288	319	347	371	393	413	430	446	459	472	482	492	501	510	517	524	531	536	541	546	550	550	550	550	550	550	550
232	TIPSY	0	0	0	8	33	69	113	155	194	228	259	289	317	345	371	396	417	436	454	470	484	498	512	525	537	549	560	570	580	589	589	589	589	589	589	589
233	TIPSY	0	0	0	1	6	19	37	57	78	100	121	140	157	174	190	203	216	228	238	248	256	266	274	282	290	298	304	312	317	323	323	323	323	323	323	323
234	TIPSY	0	0	15	103	218	330	447	550	644	734	811	878	936	988	1,037	1,081	1,120	1,155	1,185	1,210	1,232	1,254	1,274	1,294	1,312	1,327	1,340	1,354	1,365	1,376	1,376	1,376	1,376	1,376	1,376	1,376
235	TIPSY	0	0	6	62	154	244	332	421	500	571	638	699	754	801	843	879	913	944	972	998	1,022	1,044	1,064	1,081	1,097	1,112	1,125	1,137	1,148	1,158	1,158	1,158	1,158	1,158	1,158	1,158
236	TIPSY	0	0	0	5	26	57	96	134	169	202	232	259	284	308	330	352	372	390	407	422	436	449	462	474	485	495	505	514	522	530	530	530	530	530	530	530
238	TIPSY	0	0	5	47	116	186	264	339	401	463	518	568	612	652	688	722	752	780	805	828	848	865	881	897	912	926	939	951	962	972	972	972	972	972	972	972
242	TIPSY	0	0	0	11	41	83	129	172	212	248	282	315	345	374	401	425	447	467	485	502	517	531	546	559	571	582	593	602	611	619	619	619	619	619	619	619
243	TIPSY	0	0	0	1	11	28	50	75	100	124	147	167	186	203	219	234	248	260	272	283	294	304	314	322	331	339	347	354	360	366	366	366	366	366	366	366
244	TIPSY	0	0	26	131	255	382	505	616	713	802	879	947	1,006	1,058	1,106	1,147	1,184	1,217	1,246	1,271	1,293	1,314	1,334	1,352	1,365	1,376	1,387	1,396	1,404	1,412	1,412	1,412	1,412	1,412	1,412	1,412
245	TIPSY	0	0	6	60	147	231	316	399	473	541	605	661	712	756	795	830	862	891	918	942	965	984	1,002	1,018	1,033	1,046	1,059	1,070	1,081	1,091	1,091	1,091	1,091	1,091	1,091	1,091
246	TIPSY	0	0	0	8	32	67	106	145	181	214	245	274	301	325	348	370	390	408	425	440	455	468	481	492	503	513	523	531	539	547	547	547	547	547	547	547

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
247	TIPSY	0	0	5	52	135	218	295	374	449	511	570	627	677	721	760	793	823	851	877	899	920	940	960	978	995	1,010	1,021	1,031	1,039	1,048	1,048	1,048	1,048	1,048	1,048	1,048
248	TIPSY	0	0	13	80	171	267	357	443	523	593	654	711	763	809	849	884	916	944	970	992	1,012	1,032	1,051	1,069	1,083	1,098	1,110	1,120	1,129	1,137	1,137	1,137	1,137	1,137	1,137	1,137
251	TIPSY	0	0	1	22	58	97	131	165	200	230	256	280	303	324	342	359	372	385	396	406	415	425	433	441	448	454	460	466	472	476	476	476	476	476	476	476
252	TIPSY	0	0	0	4	15	32	53	73	91	108	122	136	149	162	174	185	195	204	212	220	226	234	240	246	251	257	261	265	270	273	273	273	273	273	273	273
253	TIPSY	0	0	0	1	6	16	28	42	55	68	80	92	101	111	119	127	134	141	147	153	159	164	169	174	178	183	186	190	193	196	196	196	196	196	196	196
254	TIPSY	0	0	6	45	99	150	204	251	293	333	368	399	425	448	468	487	505	520	534	545	554	563	572	580	587	593	599	605	610	614	614	614	614	614	614	614
255	TIPSY	0	0	1	20	54	92	125	157	189	219	244	268	290	310	328	344	357	369	381	391	400	408	416	424	431	438	444	449	454	457	457	457	457	457	457	457
256	TIPSY	0	0	0	4	17	36	57	77	97	114	131	146	160	172	184	196	206	215	224	232	239	246	252	259	264	269	274	278	283	286	286	286	286	286	286	286
257	TIPSY	0	0	0	11	35	65	93	120	146	169	191	211	230	248	263	277	290	301	311	321	329	337	345	352	359	364	370	375	380	385	385	385	385	385	385	385
258	TIPSY	0	0	8	51	105	157	210	257	299	339	374	403	428	450	472	491	509	524	536	546	555	564	573	581	589	596	601	606	611	614	614	614	614	614	614	614
261	TIPSY	0	0	2	43	132	234	332	424	510	589	661	728	788	842	891	936	976	1,012	1,044	1,073	1,098	1,123	1,149	1,173	1,196	1,216	1,235	1,252	1,268	1,282	1,287	1,287	1,287	1,287	1,287	1,287
262	TIPSY	0	0	1	32	116	214	311	402	486	564	635	701	760	815	864	909	951	988	1,022	1,052	1,080	1,105	1,129	1,152	1,172	1,191	1,209	1,225	1,239	1,253	1,261	1,261	1,261	1,261	1,261	1,261
263	TIPSY	0	0	1	27	97	183	268	347	421	491	555	612	666	714	758	798	834	867	896	922	945	968	992	1,014	1,034	1,053	1,070	1,086	1,100	1,114	1,118	1,118	1,118	1,118	1,118	1,118
264	TIPSY	0	0	0	17	74	146	220	291	358	420	478	531	580	624	665	702	736	767	795	821	844	866	886	906	923	939	954	968	980	991	999	999	999	999	999	999
265	TIPSY	0	0	1	21	70	131	193	254	314	370	421	468	512	552	588	622	651	679	703	724	744	763	782	799	816	832	846	860	872	883	887	887	887	887	887	887
266	TIPSY	0	0	0	2	11	25	46	70	94	116	137	156	173	189	203	217	230	241	252	261	269	277	284	291	298	304	310	315	320	324	327	327	327	327	327	327
267	TIPSY	0	0	0	0	2	12	25	41	61	79	96	113	128	143	158	171	183	194	204	213	221	229	236	243	250	256	263	269	275	280	280	280	280	280	280	280
268	TIPSY	0	0	0	1	10	27	50	75	101	127	151	172	192	210	227	241	256	269	281	294	304	315	326	335	344	353	360	368	374	381	381	381	381	381	381	381
269	TIPSY	0	0	0	0	2	11	23	38	56	73	89	104	119	133	146	158	169	179	188	197	205	212	219	226	232	238	244	249	255	259	259	259	259	259	259	259
270	TIPSY	0	0	0	1	9	26	48	72	98	121	145	165	184	201	216	230	243	256	268	279	290	300	311	320	329	337	344	350	356	362	362	362	362	362	362	362
272	TIPSY	0	0	0	0	5	14	25	38	51	64	76	87	97	106	114	121	128	134	141	146	152	157	162	167	172	176	180	183	186	189	189	189	189	189	189	189
301	TIPSY	0	0	4	49	132	230	321	411	495	569	638	703	761	814	861	903	941	974	1,004	1,030	1,054	1,079	1,105	1,129	1,151	1,171	1,190	1,208	1,224	1,239	1,240	1,240	1,240	1,240	1,240	1,240
302	TIPSY	0	0	5	71	181	302	410	520	621	707	786	865	936	998	1,051	1,100	1,142	1,180	1,213	1,243	1,270	1,298	1,328	1,355	1,380	1,404	1,426	1,446	1,464	1,480	1,483	1,483	1,483	1,483	1,483	1,483
303	TIPSY	0	0	0	1	12	34	72	109	150	187	224	259	291	316	340	362	383	403	421	438	453	467	483	497	510	522	533	544	553	563	565	565	565	565	565	565
304	TIPSY	0	0	1	56	197	341	473	591	701	800	890	973	1,051	1,121	1,181	1,236	1,286	1,331	1,371	1,407	1,440	1,470	1,499	1,526	1,550	1,572	1,593	1,611	1,627	1,642	1,655	1,655	1,655	1,655	1,655	1,655
305	TIPSY	0	0	2	46	156	281	399	506	604	693	775	850	918	979	1,035	1,087	1,133	1,174	1,211	1,245	1,275	1,303	1,330	1,355	1,378	1,399	1,418	1,436	1,452	1,466	1,476	1,476	1,476	1,476	1,476	1,476
306	TIPSY	0	0	1	29	122	233	341	439	527	612	689	756	817	875	929	979	1,024	1,064	1,098	1,130	1,158	1,185	1,211	1,235	1,258	1,278	1,296	1,313	1,328	1,342	1,351	1,351	1,351	1,351	1,351	1,351
307	TIPSY	0	0	9	95	235	377	515	644	760	866	961	1,045	1,118	1,179	1,234	1,281	1,323	1,358	1,387	1,411	1,429	1,445	1,459	1,469	1,479	1,487	1,495	1,501	1,506	1,510	1,511	1,511	1,511	1,511	1,511	1,511
308	TIPSY	0	19	80	135	189	234	270	287	169	158	174	190	205	219	232	243	253	262	269	276	282	289	296	303	309	314	320	324	329	333	333	333	333	333	333	333
311	TIPSY	0	0	3	35	108	194	279	359	434	504	567	626	679	727	770	810	846	878	906	932	954	977	1,001	1,023	1,043	1,063	1,080	1,097	1,112	1,126	1,127	1,127	1,127	1,127	1,127	1,127
312	TIPSY	0	0	1	26	92	174	256	331	404	471	531	585	636	684	726	765	800	831	859	884	906	927	950	970	989	1,007	1,024	1,040	1,055	1,069	1,072	1,072	1,072	1,072	1,072	1,072
313	TIPSY	0	0	2	36	127	230	332	420	506	589	663	727	784	839	891	938	980	1,017	1,050	1,079	1,104	1,129	1,155	1,180	1,202	1,222	1,241	1,258	1,274	1,289	1,294	1,294	1,294	1,294	1,294	1,294
314	TIPSY	0	0	1	41	163	291	410	514	610	699	779	852	920	982	1,038	1,088	1,133	1,173	1,209	1,242	1,272	1,299	1,325	1,348	1,370	1,390	1,408	1,424	1,439	1,453	1,464	1,464	1,464	1,464	1,464	1,464
315	TIPSY	0	0	1	37	142	256	363	458	547	628	703	771	833	890	942	989	1,030	1,068	1,102	1,133	1,160	1,186	1,210	1,233	1,254	1,273	1,290	1,306	1,320	1,333	1,342	1,342	1,342	1,342	1,342	1,342
316	TIPSY	0	0	1	27	109	210	308	396	478	554	622	684	741	793	842	887	926	962	993	1,022	1,049	1,073	1,097	1,119	1,139	1,158	1,174	1,190	1,204	1,216	1,225	1,225	1,225	1,225	1,225	1,225

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
317	TIPSY	0	0	5	84	216	352	479	607	716	818	914	999	1,070	1,133	1,178	1,221	1,259	1,292	1,322	1,347	1,367	1,385	1,401	1,415	1,430	1,442	1,453	1,461	1,469	1,475	1,475	1,475	1,475	1,475	1,475	1,475
318	TIPSY	0	19	82	138	190	234	269	287	162	147	161	178	192	206	217	228	237	245	253	259	265	271	278	284	290	296	301	306	310	314	314	314	314	314	314	314
320	TIPSY	0	0	6	59	143	228	308	385	461	527	585	640	690	734	774	809	840	867	891	914	934	954	973	989	1,005	1,019	1,033	1,045	1,056	1,064	1,064	1,064	1,064	1,064	1,064	1,064
321	TIPSY	0	0	1	16	66	134	202	271	334	388	438	487	535	578	617	652	684	710	731	751	768	786	806	827	847	866	884	901	917	930	931	931	931	931	931	931
322	TIPSY	0	0	1	12	53	119	185	252	316	368	413	463	509	551	589	624	654	682	702	721	738	755	774	793	814	833	850	867	883	898	899	899	899	899	899	899
324	TIPSY	0	0	0	29	98	163	222	272	320	363	399	435	466	497	522	542	561	579	594	608	620	631	642	652	661	669	677	684	689	694	699	699	699	699	699	699
325	TIPSY	0	0	0	16	61	113	161	204	244	279	312	341	367	391	414	434	451	467	481	494	505	516	526	536	544	552	559	565	571	576	579	579	579	579	579	579
326	TIPSY	0	0	0	1	9	27	52	80	107	132	154	174	193	211	226	240	252	264	274	284	294	302	311	318	325	332	339	344	349	353	356	356	356	356	356	356
328	TIPSY	0	13	66	114	163	202	237	253	160	156	172	187	201	214	228	240	250	259	266	273	279	285	292	299	305	311	316	320	324	328	328	328	328	328	328	328
331	TIPSY	0	0	18	111	230	347	467	572	672	761	839	905	966	1,020	1,071	1,114	1,151	1,183	1,212	1,240	1,264	1,286	1,308	1,326	1,343	1,358	1,372	1,385	1,397	1,409	1,409	1,409	1,409	1,409	1,409	1,409
332	TIPSY	0	0	0	5	25	56	95	132	168	201	230	256	281	304	328	350	370	389	405	420	433	447	459	471	482	492	502	510	519	527	527	527	527	527	527	527
335	TIPSY	0	0	2	43	115	193	264	333	403	467	521	573	621	664	704	739	769	796	820	842	862	882	900	917	934	949	963	976	987	995	995	995	995	995	995	995
341	TIPSY	0	0	6	57	143	228	308	389	465	529	590	647	698	742	781	815	846	874	900	923	943	964	984	1,003	1,020	1,033	1,044	1,054	1,063	1,072	1,072	1,072	1,072	1,072	1,072	1,072
344	TIPSY	0	0	15	93	200	302	407	507	589	669	743	806	860	907	950	989	1,024	1,057	1,087	1,114	1,137	1,156	1,175	1,188	1,201	1,214	1,226	1,236	1,245	1,253	1,253	1,253	1,253	1,253	1,253	1,253
345	TIPSY	0	0	5	56	142	226	307	388	462	526	590	647	697	741	779	813	845	873	899	923	945	966	986	1,002	1,017	1,030	1,042	1,052	1,061	1,070	1,070	1,070	1,070	1,070	1,070	1,070
346	TIPSY	0	0	0	5	24	52	88	123	157	188	214	239	262	284	306	326	345	363	377	391	404	416	428	439	450	459	468	476	484	491	491	491	491	491	491	491
347	TIPSY	0	0	14	92	196	299	402	499	583	663	733	795	850	898	941	979	1,014	1,046	1,075	1,100	1,122	1,142	1,160	1,177	1,192	1,207	1,221	1,234	1,245	1,256	1,256	1,256	1,256	1,256	1,256	1,256
348	TIPSY	0	0	1	22	66	118	172	224	273	316	356	395	430	462	491	517	540	562	582	600	617	633	648	663	677	688	698	706	715	723	723	723	723	723	723	723
351	TIPSY	0	0	1	16	46	79	111	138	167	194	220	241	259	278	296	312	325	337	348	357	365	373	381	388	395	401	407	412	416	420	420	420	420	420	420	420
354	TIPSY	0	0	5	42	93	141	191	239	277	315	350	380	404	426	446	465	481	497	510	522	532	541	549	556	563	570	576	581	586	591	591	591	591	591	591	591
355	TIPSY	0	0	2	26	69	111	150	188	225	256	285	314	337	359	378	394	408	422	434	445	454	463	473	482	490	496	501	505	510	514	514	514	514	514	514	514
358	TIPSY	0	0	6	45	95	145	195	237	280	317	350	377	402	425	446	464	481	495	506	516	525	534	544	552	560	566	571	577	581	585	585	585	585	585	585	585
362	TIPSY	0	0	1	17	75	167	262	351	431	505	573	634	690	739	785	828	870	906	940	970	998	1,023	1,047	1,069	1,090	1,109	1,128	1,144	1,160	1,174	1,183	1,183	1,183	1,183	1,183	1,183
363	TIPSY	0	0	1	14	61	124	192	254	314	372	426	473	516	555	590	625	657	685	711	734	754	774	794	812	829	844	858	872	884	895	899	899	899	899	899	899
364	TIPSY	0	0	0	12	65	147	230	308	380	444	503	558	611	658	700	738	772	803	833	861	887	911	934	955	974	991	1,007	1,022	1,035	1,047	1,054	1,054	1,054	1,054	1,054	1,054
367	TIPSY	0	0	0	0	2	7	19	31	49	66	81	96	110	123	135	147	157	167	177	186	194	202	210	217	225	232	238	243	247	252	252	252	252	252	252	252
369	TIPSY	0	0	0	0	1	6	18	29	45	61	76	89	103	115	126	137	146	156	165	173	181	188	196	203	209	216	222	226	230	235	235	235	235	235	235	235
401	TIPSY	0	0	2	32	111	197	292	370	445	521	591	654	705	749	788	833	874	911	945	970	993	1,017	1,041	1,063	1,083	1,102	1,120	1,137	1,154	1,168	1,169	1,169	1,169	1,169	1,169	1,169
402	TIPSY	0	0	4	58	157	269	371	470	564	648	722	792	857	917	970	1,016	1,057	1,093	1,125	1,154	1,180	1,207	1,235	1,260	1,284	1,306	1,326	1,344	1,362	1,377	1,379	1,379	1,379	1,379	1,379	1,379
403	TIPSY	0	0	4	45	130	229	325	415	500	577	648	713	772	826	875	917	956	991	1,022	1,050	1,075	1,100	1,126	1,150	1,172	1,191	1,209	1,226	1,241	1,254	1,259	1,259	1,259	1,259	1,259	1,259
404	TIPSY	0	0	1	46	160	285	403	513	613	703	788	864	934	996	1,051	1,103	1,151	1,193	1,229	1,263	1,294	1,322	1,350	1,376	1,399	1,419	1,438	1,456	1,472	1,487	1,498	1,498	1,498	1,498	1,498	1,498
405	TIPSY	0	0	2	39	153	279	399	507	602	692	777	851	917	978	1,035	1,088	1,137	1,181	1,218	1,252	1,282	1,309	1,337	1,362	1,386	1,406	1,426	1,443	1,458	1,473	1,482	1,482	1,482	1,482	1,482	1,482
406	TIPSY	0	0	1	33	142	264	380	486	579	668	752	824	886	947	1,005	1,057	1,107	1,152	1,187	1,218	1,247	1,275	1,302	1,327	1,351	1,372	1,389	1,406	1,421	1,435	1,445	1,445	1,445	1,445	1,445	1,445
410	TIPSY	0	0	23	126	250	376	502	608	715	806	884	949	1,012	1,069	1,123	1,168	1,203	1,234	1,262	1,289	1,313	1,336	1,359	1,378	1,395	1,410	1,424	1,437	1,449	1,461	1,461	1,461	1,461	1,461	1,461	1,461
411	TIPSY	0	0	2	31	94	173	251	327	398	460	519	576	627	672	713	749	782	811	837	861	882	904	928	950	971	990	1,007	1,022	1,037	1,050	1,051	1,051	1,051	1,051	1,051	1,051

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
412	TIPSY	0	0	2	28	93	174	256	334	405	469	530	589	641	687	728	765	798	828	856	881	904	927	951	973	994	1,013	1,030	1,046	1,061	1,074	1,076	1,076	1,076	1,076	1,076	1,076
413	TIPSY	0	0	2	29	104	193	282	364	441	513	579	639	693	742	787	829	866	899	929	956	980	1,003	1,028	1,050	1,071	1,090	1,107	1,123	1,138	1,151	1,156	1,156	1,156	1,156	1,156	1,156
414	TIPSY	0	0	1	36	143	263	375	475	567	650	727	798	863	922	974	1,021	1,065	1,104	1,139	1,171	1,200	1,226	1,252	1,275	1,297	1,316	1,334	1,350	1,364	1,378	1,389	1,389	1,389	1,389	1,389	1,389
415	TIPSY	0	0	2	34	128	237	341	436	521	599	672	739	799	853	902	947	989	1,027	1,061	1,091	1,118	1,142	1,166	1,189	1,209	1,228	1,245	1,261	1,275	1,288	1,296	1,296	1,296	1,296	1,296	1,296
416	TIPSY	0	0	1	13	54	118	193	267	334	394	450	503	551	593	631	667	700	731	757	783	806	828	849	868	886	902	917	931	944	956	963	963	963	963	963	963
420	TIPSY	0	0	7	55	125	201	278	347	414	474	527	575	618	659	695	728	757	782	805	825	843	861	879	895	910	923	934	945	955	964	964	964	964	964	964	964
421	TIPSY	0	0	0	6	41	98	155	210	266	317	361	399	434	472	507	539	568	592	615	636	654	672	690	704	718	731	743	754	766	777	778	778	778	778	778	778
422	TIPSY	0	0	1	17	72	146	219	291	358	415	466	519	569	614	655	692	726	753	776	796	815	833	854	875	896	916	934	951	967	981	983	983	983	983	983	983
423	TIPSY	0	0	1	20	84	167	249	324	396	462	520	573	624	672	717	756	792	824	852	876	897	918	939	959	978	995	1,013	1,029	1,045	1,058	1,063	1,063	1,063	1,063	1,063	1,063
424	TIPSY	0	0	0	22	86	148	206	252	297	339	374	407	438	467	493	514	532	549	564	578	591	602	612	622	631	639	646	653	660	665	669	669	669	669	669	669
430	TIPSY	0	0	4	33	81	126	170	215	253	287	321	350	375	397	416	433	448	463	476	488	499	510	518	525	532	538	543	548	552	557	557	557	557	557	557	557
461	TIPSY	0	0	1	9	31	65	103	143	186	227	266	299	330	359	388	414	438	459	478	495	510	524	539	553	566	578	590	601	610	618	621	621	621	621	621	621
462	TIPSY	0	0	0	1	8	26	59	101	147	191	232	271	306	338	367	395	421	446	469	488	507	523	539	554	568	582	594	606	616	627	633	633	633	633	633	633
463	TIPSY	0	0	0	3	14	37	65	99	135	169	202	231	259	284	309	332	353	372	389	405	417	431	444	456	468	478	488	498	506	514	516	516	516	516	516	516
464	TIPSY	0	0	0	5	32	76	129	184	238	288	335	380	420	456	489	520	549	577	603	626	645	663	681	697	713	727	741	753	764	775	781	781	781	781	781	781
601	TIPSY	0	0	2	32	111	197	292	370	445	521	591	654	705	749	788	833	874	911	945	970	993	1,017	1,041	1,063	1,083	1,102	1,120	1,137	1,154	1,168	1,169	1,169	1,169	1,169	1,169	1,169
602	TIPSY	0	0	4	58	157	269	371	470	564	648	722	792	857	917	970	1,016	1,057	1,093	1,125	1,154	1,180	1,207	1,235	1,260	1,284	1,306	1,326	1,344	1,362	1,377	1,379	1,379	1,379	1,379	1,379	1,379
603	TIPSY	0	0	4	45	130	229	325	415	500	577	648	713	772	826	875	917	956	991	1,022	1,050	1,075	1,100	1,126	1,150	1,172	1,191	1,209	1,226	1,241	1,254	1,259	1,259	1,259	1,259	1,259	1,259
604	TIPSY	0	0	1	46	160	285	403	513	613	703	788	864	934	996	1,051	1,103	1,151	1,193	1,229	1,263	1,294	1,322	1,350	1,376	1,399	1,419	1,438	1,456	1,472	1,487	1,498	1,498	1,498	1,498	1,498	1,498
605	TIPSY	0	0	2	39	153	279	399	507	602	692	777	851	917	978	1,035	1,088	1,137	1,181	1,218	1,252	1,282	1,309	1,337	1,362	1,386	1,406	1,426	1,443	1,458	1,473	1,482	1,482	1,482	1,482	1,482	1,482
606	TIPSY	0	0	1	33	142	264	380	486	579	668	752	824	886	947	1,005	1,057	1,107	1,152	1,187	1,218	1,247	1,275	1,302	1,327	1,351	1,372	1,389	1,406	1,421	1,435	1,445	1,445	1,445	1,445	1,445	1,445
610	TIPSY	0	0	23	126	250	376	502	608	715	806	884	949	1,012	1,069	1,123	1,168	1,203	1,234	1,262	1,289	1,313	1,336	1,359	1,378	1,395	1,410	1,424	1,437	1,449	1,461	1,461	1,461	1,461	1,461	1,461	1,461
611	TIPSY	0	0	2	31	94	173	251	327	398	460	519	576	627	672	713	749	782	811	837	861	882	904	928	950	971	990	1,007	1,022	1,037	1,050	1,051	1,051	1,051	1,051	1,051	1,051
612	TIPSY	0	0	2	28	93	174	256	334	405	469	530	589	641	687	728	765	798	828	856	881	904	927	951	973	994	1,013	1,030	1,046	1,061	1,074	1,076	1,076	1,076	1,076	1,076	1,076
613	TIPSY	0	0	2	29	104	193	282	364	441	513	579	639	693	742	787	829	866	899	929	956	980	1,003	1,028	1,050	1,071	1,090	1,107	1,123	1,138	1,151	1,156	1,156	1,156	1,156	1,156	1,156
614	TIPSY	0	0	1	36	143	263	375	475	567	650	727	798	863	922	974	1,021	1,065	1,104	1,139	1,171	1,200	1,226	1,252	1,275	1,297	1,316	1,334	1,350	1,364	1,378	1,389	1,389	1,389	1,389	1,389	1,389
615	TIPSY	0	0	2	34	128	237	341	436	521	599	672	739	799	853	902	947	989	1,027	1,061	1,091	1,118	1,142	1,166	1,189	1,209	1,228	1,245	1,261	1,275	1,288	1,296	1,296	1,296	1,296	1,296	1,296
616	TIPSY	0	0	1	13	54	118	193	267	334	394	450	503	551	593	631	667	700	731	757	783	806	828	849	868	886	902	917	931	944	956	963	963	963	963	963	963
620	TIPSY	0	0	7	55	125	201	278	347	414	474	527	575	618	659	695	728	757	782	805	825	843	861	879	895	910	923	934	945	955	964	964	964	964	964	964	964
621	TIPSY	0	0	0	6	41	98	155	210	266	317	361	399	434	472	507	539	568	592	615	636	654	672	690	704	718	731	743	754	766	777	778	778	778	778	778	778
622	TIPSY	0	0	1	17	72	146	219	291	358	415	466	519	569	614	655	692	726	753	776	796	815	833	854	875	896	916	934	951	967	981	983	983	983	983	983	983
623	TIPSY	0	0	1	20	84	167	249	324	396	462	520	573	624	672	717	756	792	824	852	876	897	918	939	959	978	995	1,013	1,029	1,045	1,058	1,063	1,063	1,063	1,063	1,063	1,063
624	TIPSY	0	0	0	22	86	148	206	252	297	339	374	407	438	467	493	514	532	549	564	578	591	602	612	622	631	639	646	653	660	665	669	669	669	669	669	669
630	TIPSY	0	0	4	33	81	126	170	215	253	287	321	350	375	397	416	433	448	463	476	488	499	510	518	525	532	538	543	548	552	557	557	557	557	557	557	557
661	TIPSY	0	0	1	9	31	65	103	143	186	227	266	299	330	359	388	414	438	459	478	495	510	524	539	553	566	578	590	601	610	618	621	621	621	621	621	621

Au	Model	age_0	age_10	age_20	age_30	age_40	age_50	age_60	age_70	age_80	age_90	age_100	age_110	age_120	age_130	age_140	age_150	age_160	age_170	age_180	age_190	age_200	age_210	age_220	age_230	age_240	age_250	age_260	age_270	age_280	age_290	age_300	age_310	age_320	age_330	age_340	age_350
662	TIPSY	0	0	0	1	8	26	59	101	147	191	232	271	306	338	367	395	421	446	469	488	507	523	539	554	568	582	594	606	616	627	633	633	633	633	633	633
663	TIPSY	0	0	0	3	14	37	65	99	135	169	202	231	259	284	309	332	353	372	389	405	417	431	444	456	468	478	488	498	506	514	516	516	516	516	516	516
664	TIPSY	0	0	0	5	32	76	129	184	238	288	335	380	420	456	489	520	549	577	603	626	645	663	681	697	713	727	741	753	764	775	781	781	781	781	781	781