Appendix C: Accepted Timber Supply Analysis Information Package

MJD

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September 16, 2008

Mr. Mike Davis, R.P.F.
Planning Forester
Western Forest Products Inc.
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Dear Mr. Davis:

Thank you for the Tree Farm Licence 19 Timber Supply Analysis Information Package (IP) that you submitted February 4, 2008.

I have extensively reviewed the document along with Ministry of Forests and Range (MFR) branch, regional, and district staff, and Ministry of Environment specialists. As the MFR timber supply forester responsible for reviewing this IP, I accept the document for use in the timber supply analysis for TFL 19 subject to the attached conditions and notes.

Please note that this letter does not mean that the MFR endorses every aspect of the IP. During the AAC determination meeting, MFR staff will advise the deputy chief forester of the technical validity of the information and the implications the assumptions. The deputy chief forester will consider this advice as he develops the rationale for his determination of the AAC for TFL 19.

Yours truly,

Doug Layden, R.P.F.
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Attachment

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Notes and Conditions on Acceptance of Information Package for TFL 19

The following are items that must be addressed in the timber supply analysis for TFL 19.

Site productivity sensitivity analysis

Please add a sensitivity analysis where the site indices are reduced by 3 metres for existing managed and future stands.

An accuracy assessment has not been done for the terrestrial ecosystem mapping (TEM) of TFL 19. This would normally be required before the TEM can be used for the base case. In the case of TFL 19 the adjusted inventory site indices are clearly too low based on a comparison with site indices from nearby units. I believe that SIBEC provides the best available information of site productivity on TFL 19. In order to use SIBEC site indices you have to use the TEM. The requested sensitivity analysis will allow the uncertainty associated with the TEM to be evaluated.

Minimum merchantability standards

For the base case please report the projected volume scheduled for harvesting by period coming from stands between 50 and 60 years of age and between 350 and 450 cubic metres per hectare.

Also I would prefer that for the base case you use the minimum harvest ages that you say you are considering in your email of September 5, 2008 rather than those proposed in the information package; namely 50 years for good sites in the CWHxm2 variant (Fd stands) and 60 years for all others.

While it is difficult to predict the minimum merchantability standards that will apply in the future, in the IP you state that "little activity has occurred in stands between 50 and 60 years." This indicates to me that there is some uncertainty around the minimum criteria that you proposed in the IP. The requested information will allow the significance of the less restrictive criteria to be evaluated.

WESTERN FOREST PRODUCTS INC.

Tree Farm Licence 19

Timber Supply Analysis Information Package

In Preparation of

MANAGEMENT PLAN 10

Submitted to the Ministry of Forests and Range
Forest Analysis & Inventory Branch
Victoria, BC

October 2008

Mike Davis, R.P.F
Planning Forester
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Acknowledgements

The signatory greatly appreciates the following for their contributions to the preparation of this document:

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- Pat Bryant and Paul Bavis of WFP for their advice and comments on several of the inputs for the analysis and possible approaches to take in the analysis; and
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1 INTRODUCTION

This Information Package provides a summary of data, assumptions, and modelling procedures to be used in the Timber Supply Analysis for Western Forest Products' (WFP) Tree Farm Licence (TFL) 19 Management Plan (MP) #10. The analysis will not include areas recently removed from TFL 19 to create two woodlots with a total AAC of 10,000 m^3; nor will it include the area that will eventually be removed from TFL 19 to create an operating area for BC Timber Sales (BCTS) – see Figure 1 - TFL 19. All references to TFL 19 in this document refer to the portion of TFL 19 managed by WFP on an on-going basis (i.e. excludes the BCTS area).

The timber supply analysis will be conducted using Remsoft's spatial planning system Woodstock–Stanley (www.remsoft.com). Woodstock is the aspatial component of the suite and addresses the majority of the model objectives and constraints. Woodstock performs a similar function as the Ministry of Forests and Range's FSSIM model whereby management zones and constraints are defined, yield curves incorporated and applied to an aggregated area file. The primary difference between Woodstock and FSSIM is that Woodstock is capable of using either optimization or sequential simulation in developing a harvest forecast.

Stanley, the spatial component of the suite, applies the Woodstock harvest forecast to specific polygons on the land base. Stanley will aggregate individual polygons into suitable harvest units (blocks) based on specified minimum, maximum and target block sizes. The model will also enforce green-up and adjacency requirements as it schedules the harvest spatially.

For this analysis, optimization will be used in Woodstock to develop the base case harvest schedule. The optimization will be subject to a number of harvest constraints including the requirement to produce a long-term sustainable harvest forecast.

WFP will complete the timber supply analysis to estimate timber harvest over a 250-year planning horizon (in five-year planning periods) based on the current harvestable land base, existing old forest timber volumes, and regenerating forest growth rates. The harvest forecast will project the timber supply impacts of current environmental protection and management practices including operational requirements of the Forest and Range Practices Act (FRPA), approved Forest Stewardship Plans (FSPs), orders, other regulations and guidelines with significance to timber supply. Sensitivity analyses will be used to investigate the expected impacts of different management scenarios, and to examine the relative importance of variations in assumptions. These may include the removal of area from the timber harvesting land base (THLB), imposing forest-cover harvest constraints, or changes in growth & yield (G&Y) estimates.

The timber supply forecast will attempt to achieve the long-term harvest potential, and minimize the rate of change during the transition from the current level of harvest to the mid- and long-term sustainable levels. Due to the large proportion of area in older age classes within the TFL and a shortage of maturing age classes, it is expected that the majority of the harvest in the short- and medium-term will be concentrated in mature and over-mature stands.

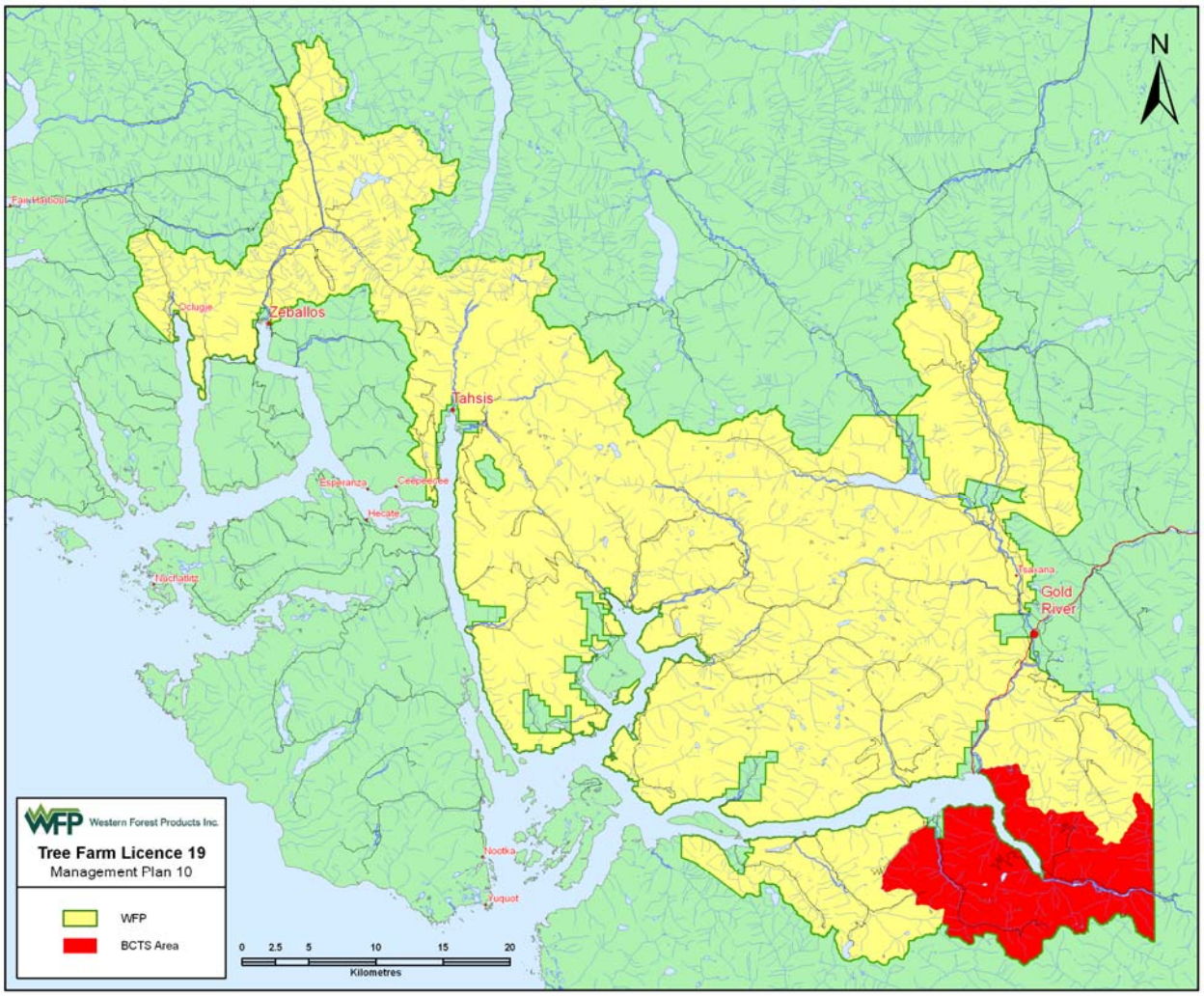


Figure 1 - TFL 19.

2 PROCESS

2.1 Overview

The information package was submitted for review to the Ministry of Forests and Range (MoFR) Timber Supply Forester at Forest Analysis and Inventory Branch and was accepted subject to a few conditions. This revised and approved package will guide the timber supply analysis and, with the timber supply analysis report, will be appended to MP #10. These in turn will be considered by the Chief Forester in determining the new Allowable Annual Cut (AAC) for TFL 19. This revised document incorporates the conditions of acceptance by MoFR and reflects the removal of the BCTS management area from the landbase for the purposes of the timber supply analysis.

2.2 Growth and Yield

Yield tables for existing stands will be divided into four groups based on age. Existing mature stands greater than age 120 years will have existing volumes estimated with VDYP 6.6d. These generated volumes will remain static (flat line) throughout the analysis, as the assumption for these stands is that growth net decay is zero. Stands that are less than age 121 years and greater than age 45 years will have existing and projected volumes estimated with VDYP. Existing stands less than age 46 years will be split into two categories based on age and will have yields estimated and projected with TIPSY version 4.1c. Current stands aged 11 years to 45 years will be differentiated from younger stands (1 to 10 years of age) for which genetic gains are expected. TIPSY yield projections will be assigned to existing not satisfactorily restocked (NSR) areas and simulated harvest areas according to their expected management regime.

3 TIMBER SUPPLY FORECASTS/OPTIONS/SENSITIVITY ANALYSES

3.1 Overview

This section describes the management scenarios to be included in the timber supply analysis. The details, assumptions, and sensitivities of each are also described.

3.2 Current Management Option

The current management option (or the "Base Case") represents the present operational requirements and management practices on the TFL. The forecast of current management incorporates existing land use designations, including Resource Management Zones[1], and current regulations and guidelines including the Forest and Range Practices Act and the Nootka Forest Stewardship Plan. This option is used as the basis for analysing various timber supply projections.

Current management on TFL 19 includes:

- The operable land base of forested area accessible using conventional (Oc) and helicopter (Oh) harvesting methods.
- Silviculture to meet free growing requirements is carried out on all regenerated stands. All harvested areas are planted.
- Known tree improvement gains will be applied to existing stands ≤ 10 years old and future regenerated stands.
- Visual quality objectives (VQOs) are modelled based on the VQOs established for the Campbell River Forest District on December 14, 2005 with upper range disturbance assumed.
- Recreation constraints are applied based on the *Order to Identify Recreation Resource Features for the Campbell River Forest District* dated April 12, 2006.
- Karst features management based on the karst vulnerability potential (KVP) identified in the TFL 19 Planning-Level Karst Inventory dated March 31, 2003.
- Green-up heights for cutblock adjacency are assigned based on Resource Management Zones established in the Vancouver Island Higher Level Plan. Special and General zones have a 3m green-up requirement while Enhanced zones have a 1.3m green-up height.
- Future Wildlife Tree and other stand-level retention within the THLB is accounted for by a blanket percent volume reduction in the timber supply model.
- Biodiversity and Landscape Units – old seral stage targets are applied to each biogeoclimatic variant within each landscape unit based on the *Order Establishing Provincial Non-Spatial Old Growth Objectives* effective June 30, 2004 (NSOG). Mature seral targets are incorporated for the two Special Management Zones within TFL 19.
- Established Ungulate Winter Ranges (UWRs) and Wildlife Habitat Areas (WHAs) are removed from the THLB.

[1] Vancouver Island land Use Plan (VILUP) Resource Management Zones and Resource Management Zone objectives approved by Government in December 2000.

- 356 hectares of suitable Marbled Murrelet habitat are removed from the THLB to account for the *Forest Planning and Practices Regulation* (FPPR) section 7(2) notice for the Campbell River District and the strategy in the approved FSP.
- Minimum harvest age varies by leading species and site productivity and the minimum harvestable volume is 350m^3 per hectare. Both minimum age and minimum volume requirements must be met before a stand can be harvested.
- Minor deciduous leading stands are included in the THLB and any volume in these stands contributes to the analysis.

The total area of TFL 19 managed by WFP has declined by 20,270 ha during MP #9. Most of this change results from the removal of the remaining private land (2,007 ha) from the TFL effective January 31, 2007 and agreement on an area to eventually be removed from the TFL and be managed by BC Timber Sales as a result of the Forest Revitalization Act (2003). This latter area totals approximately 16,500 ha. Smaller areas were removed in 2001 (private land) and in 2004 (Schedule B crown land).

The area available to WFP for timber production (the THLB) has declined by 15,254 ha from 94,702 ha listed in MP #9 to 79,448 ha for MP #10. In effect, the MP #9 THLB was 4,627 ha lower due to the area described as "inferred area net-down for recreation". The effective THLB decrease of 10,627 ha (15,254 – 4,627) is largely attributable to:

- The decrease in the total area of TFL 19 (removal of private land from the TFL and BCTS area agreement);
- More productive forest area (classified as non-productive in the previous inventory) classified as non-commercial and inoperable; and
- The establishment of revised Ungulate Winter Ranges (UWRs) and of Wildlife Habitat Areas (WHAs).

Table 1 - TFL 19 land base: MP #10 compared to MP #9

	MP #10	MP #9	Difference
Total Area (ha)	171,722	191,992	-20,270
THLB Area (ha)	79,448	94,702	-15,254

The Forest Revitalization Act has resulted in allocations of the TFL 19 AAC to B.C. Timber Sales (BCTS), First Nations and woodlots as well as to Western Forest Products Inc. The current AAC allocations are summarized in Table 2.

Table 2 – TFL 19 Current (October 2008) AAC Allocations

	Current AAC Allocations (m^3) (October 2008)
BCTS	65,253
First Nations	12,152
WFP	833,795
Total	**911,200**

Within TFL 19, a management area has been defined for the BCTS allocation and areas have been removed from the TFL for the woodlot allocation of 10,000 m^3 (refer to Figure 1 and to Table 3). It is

expected that the BCTS defined management area will be removed from TFL 19 in the near future and it is not being included in the timber supply analysis.

Table 3 – TFL 19 Current Management Areas

	Total Area (ha)	THLB (ha)
BCTS Area	16,452	5,795
Remaining Area	171,722	79,448
Total	**188,174**	**85,243**

3.3 Sensitivity Analyses

Sensitivity analyses will be conducted for the current management option to examine the potential impact of uncertainty in several key attributes. These may include the removal of operable areas from the THLB, imposing forest-cover harvest constraints, or changes in growth & yield estimates.

Sensitivities for the base case will include:

1) Operability: Operability classes have been developed that reflect current harvesting methods, timber quality, terrain stability, and economic accessibility. The purpose of this analysis is to examine potential timber supply impacts of both reduced access to more difficult areas and of improved economic conditions by including operability classes that are currently not economic to harvest. Sensitivity analyses will model the impacts of:
    - Removing the non-conventional area (Oh – 9,156 ha), and;
    - Including areas that are considered economically marginal (Oce – 341 ha and Ohe – 3,835 ha).
2) Volume: The impact on harvest forecasts of over- or under-estimating the yields for all stands will be tested by adjusting
    i) all natural stands (age 46 plus) by ±10%, and
    ii) all regenerated stands (stands currently less than 46 years and future stands) by ±10%.
3) Site Productivity: Site indices for natural (currently aged 46 years plus) stands are assigned using the forest inventory database. For existing managed (currently aged less than 46 years) and future stands, site indices are based on the MoFR SIBEC database.
    i) As the SIBEC values are assigned based on terrestrial ecosystem mapping (TEM) and the TEM for TFL 19 has not been subject to an accuracy assessment, a sensitivity analysis will be done where the SIBEC values are globally reduced by 3m. The intent of this sensitivity analysis is to approximate the use of inventory site indices for managed stands. In many areas forest inventory site indices have been shown to underestimate site productivity for managed stands. This sensitivity analysis will give an indication of the timber supply impacts of such underestimates.

ii) The Potential Site Index (PSI) estimates compiled by Timberline Natural Resource Group are higher on average than the SIBEC estimates and will be used in a separate sensitivity analysis (see Section 8.2).

4) Harvest Age: The effect of rotation length will be tested by increasing both the minimum harvest age by 10 years and the minimum volume by 100 m^3/ha.

5) Visual Quality: Current management incorporates constraints from VQOs established by the Campbell River Forest District in December 2005. A sensitivity analysis will be used to examine the impacts of varying the percentage of area below Visually Effective Green-up (VEG) to the mid-range percent disturbance limit recommended for the VQO class (see Section 10.3.2).

6) Silviculture Opportunities: The current management option includes expectations of incremental silviculture such as fertilizing and genetically improved stock. Excluding these treatments from future activities will assess the impacts of these expectations.

7) Silviculture Systems: Current management is based on the use of clearcut and clearcut-with-reserves silviculture systems. A sensitivity analysis will examine the potential impacts of implementing WFP's Forest Strategy, in particular variable retention systems.

3.4 Alternate Harvest Flow

The harvest level in the current management option will adjust each period (5 years) in the first part of the run towards the estimated Long Term Harvest Level (LTHL) and will attempt to change at a rate that does not exceed 10% of the initial harvest per decade. The results of the base case will determine potential alternate harvest flows. One option will be to continue the initial harvest as long as possible while avoiding later reductions of more than 10% of the initial harvest per decade.

During preparation of the timber supply analysis, the need for further sensitivity analyses or harvest flows may become apparent. If warranted, additional analyses will be included in the final timber supply analysis for consideration by the Chief Forester.

Table 4 – Summary of Current Management and Sensitivity Analyses

Issue Tested	Proposed Options / Sensitivity Analysis	
	Title	**Reason for Analysis and Range to be tested**
To project the timber supply based on current management practices, performance, operational requirements and currently enforced guidelines while meeting the objective of maintaining a timber supply which is not excessively variable over time and which maintains the long-term productivity of the TFL.	**Current Management Option**	Current Management Option includes the following: • Conventional and helicopter harvesting • Visual Quality based on government established VQOs • Recreation constraints based on government established features • Karst potential constraints based on TFL inventory • WTRA – 4% volume net down to reflect WTRA requirements and to account for riparian management area and other stand level retention • Riparian reserves based on FRPA requirements • Silviculture practices as described in Section 8.8. • Landscape Unit biodiversity targets for old seral based on Non-Spatial Old Growth Order • UWR & WHA (established and draft) excluded;
	(1) Operability	The impact on the harvest flow of including different operability classes in the THLB will be evaluated by (current management practices for all): • Removing non-conventional areas. • Including economically marginal areas.
	(2) Volumes	The impact on the harvest flow of varying stand yields will be evaluated by: • Varying existing natural stand volumes ±10%; and, • Varying regenerated stand volumes ±10%.
	(3) Site Productivity	The impact on the harvest flow of varying site indices will be evaluated by: ▪ Reducing SIBEC values globally by 3m; and, ▪ Using managed and future second growth Site Indices (SI 50) based on the Potential Site Indices compiled by Timberline.
	(4) Harvest Age	Increasing both the minimum harvest age by 10 years and the minimum harvest volume for the stand by 100 m3/ha will assess the effect of harvestability limits.
	(5) Visual Quality	The effects on varying the percent disturbed limit to the mid range.
	(6) Silviculture Opportunities	The impact of not fertilizing or using genetically improved stock in the future will be assessed.
	(7) Silviculture Systems	The potential impacts of implementing the use of the retention silviculture system as detailed in WFP's Forest Strategy will be evaluated.
	(8) Alternative Harvest Flow	The implications on timber supply associated with varying the rate of decline towards the long term harvest level (LTHL).

4 HARVEST MODEL

4.1 Woodstock/Stanley

The TFL 19 timber supply analysis including harvest level and forest inventory projections will be developed using Remsoft's spatial planning system Woodstock (www.remsoft.com).

Woodstock is a pseudo-spatial timber supply model that projects harvesting activities across a land base over a specific period of time. These models are referred to as pseudo-spatial because the data used to create the model has spatial components to it; however, the harvest schedules produced by these models are not spatially explicit. It is possible to bring spatial context into this type of model by applying constraints to spatial attributes of the land base such as landscape units or watersheds; however harvest schedules produced using these types of models report the timing of the harvest of different types of stands as opposed to specific polygons harvested in each period. For these reasons it is not possible to explicitly model spatial management objectives such as cutblock size, adjacency and green-up requirements, or patch size targets using this type of model.

Woodstock uses optimization to establish a harvest schedule that incorporates objectives such as visual quality, biodiversity, wildlife habitat with the objective of timber harvest. In Woodstock, harvest volume is maximized subject to the maintenance of other values on the land base.

Stanley, the spatial component of the Remsoft modelling suite, will be used for the 20-year spatial feasibility analysis ("20 Year Plan"). Stanley applies the Woodstock harvest forecast to specific polygons on the land base. Individual polygons are aggregated into suitable harvest units (cutblocks) based on specified minimum, maximum and target block sizes. Stanley can also enforce green-up and adjacency requirements as it schedules the harvest spatially.

5 FOREST COVER INVENTORY

5.1 Vegetation Resources Inventory

Management Plan #9 included a statement that completion of a new forest cover inventory was planned. A Vegetation Resource Inventory (VRI) project was initiated in 2000. Phase I (forest cover polygon boundaries delineated and attributes estimated using aerial photography) was completed in 2002. Phase II (ground sampling) occurred in 2002 and 2003 and the Net Volume Adjustment Factor (NVAF) sampling was carried out in 2003 and 2004. The last component, the statistical adjustment, was completed and reported on by J.S. Thrower & Associates (now part of Timberline Natural Resource Group) in early 2006, with a revision of the report for minor typographical errors in January 2007.

The VRI project was funded by the Forest Investment Account (FIA).

The forest cover has been updated for silvicultural treatments and assessments to the end of 2005 and for harvest depletion to the end of 2006. Table 5 indicates the current age class distribution of the forested land base of TFL 19.

Table 5 – Age Class Distribution

Age Class	Age (years)	Productive Forest (ha)	THLB (ha)
0	0	4,807	3,930
1	1-20	16,280	14,409
2	21-40	12,529	10,546
3	41-60	11,797	9,221
4	61-80	2,382	1,683
5	81-100	1,048	665
6	101-120	4,307	2,106
7	121-140	1,374	735
8	141-250	28,877	11,788
9	>250	56,366	24,365
Total		**139,767**	**79,448**

5.2 VRI Attribute Adjustments

Standard adjustment methods were used to adjust volume but non-standard methods were used for the age and height adjustment. The median age of the ground plots were used instead of the average age to provide more robust age estimates in old-growth stands. Using the median rather than the average age had little impact on site index and volume since these two variables are rather insensitive to a variation in age in old-growth stands. Non-standard top height trees (O and X trees) were used when no standard top height tree (T, L, and S trees) information existed. This significantly increased the number of valid height observations. Height adjustment ratios using the extra information were compared to the ratios based on the standard information only and shown to be similar in magnitude. The non-standard method

therefore had little impact on the polygon-level height estimates. Using the extra information however provided more precise estimates and therefore a higher level of confidence that the average height in each stratum was reliable.

The results have been reviewed by the MoFR, Forest Analysis & Inventory Branch and approved for use in the TFL 19 MP #10 timber supply analysis.

6 DESCRIPTION OF LAND BASE

6.1 Overview

This section describes the TFL 19 land base and the methods used to determine the portion of the land base that contributes to timber harvesting (THLB). Some portions of the productive land base, while not contributing to harvest, are crucial in meeting the demands for non-timber resource sustainability. Areas within all tables in this section may not sum due to rounding.

6.2 Timber Harvesting Land Base Determination

The THLB and the total long-term land base in TFL19 are presented in Table 6 – areas are reported for both Schedule A (Timber Licences within the TFL) and Schedule B (Crown land) land classes. Mature volume (stands ≥ 121 years old) estimates are indicated in Table 7. Areas and volumes have been compiled from a stand database constructed for the preparation of this information package.

For MP #9, in 2001, the total area of reductions amounted to 101,917 ha (if the inferred net-down for recreation is applied), then equal to 53% of the total area. For MP #10 the reductions are 92,303 ha, which is 54% of the total area.

The following sections show total area classified in each category noted in Table 6 – and serve to summarise the area deducted from the land base in the order the categories appear in Table 6 (i.e. overlapping constraints are addressed in a hierarchy).

The new forest inventory (VRI) used in this analysis affects some of the area reductions compared to those reported for MP #9. In particular the classification of areas as non-forest, non-productive forest and non-commercial forest is different. The resulting productive forest area is substantially higher than that reported in the MP #9 analysis. This additional area classified as productive forest is largely netted out as inoperable (refer to Section 6.8).

6.3 Total Area

The total area of the TFL is 171,722 ha. The total area in 2001 was 191,992 ha. The net decrease of 20,270 ha is due to the deletion of areas (primarily private land) from the TFL and the agreement on a management area for BCTS due to the Forest Revitalization Act (2003).

Table 6 – Timber harvesting land base for TFL 19[1]

Classification	Schedule A (ha)	Schedule B (ha)	Total (ha)
Total Area	**4,518**	**167,204**	**171,722**
Less: Non-Forest	91	16,195	16,286
Less: Non-Productive Forest	145	15,523	15,698
Total Productive Forest	**4,282**	**135,485**	**139,767**
Less Reductions to Total Productive Forest:			
Non-Commercial Brush	13	933	946
Riparian Reserves	254	3,519	3,773
Inoperable / Inaccessible	831	47,676	48,507
Wildlife Habitat Reserves	475	3,779	4,254
Road Right of Way	81	2,081	2,162
Karst	0	475	475
Recreation	1	203	204
Total Reductions to Productive Forest	**1,654**	**58,665**	**60,319**
Current Timber Harvesting Land Base	**2,628**	**76,820**	**79,448**
Less: Allowance for future WTRA (4%)	105	3,073	3,178
Less: Future Roads, Trails and Landings	28	930	958
Total Long Term Land Base	**2,495**	**72,817**	**75,312**

[1] Portion of TFL 19 that will be managed by WFP on an on-going basis (i.e. excludes BCTS management area)

Table 7 - Timber harvesting land base (mature volume) for TFL 19[1]

Classification	Schedule A (m^3)	Schedule B (m^3)	Total (m^3)
Total Volume	**1,468,845**	**46,472,481**	**47,941,326**
Less: Non-Forest	0	0	0
Less: Non-Productive Forest	0	0	0
Total Productive Forest	**1,468,845**	**46,472,481**	**47,941,326**
Less Reductions to Total Productive Forest:			
Non-Commercial Brush	614	64,776	65,390
Riparian Reserves	131,782	1,240,281	1,372,063
Inoperable / Inaccessible	338,328	20,268,098	20,606,426
Wildlife Habitat Reserves	357,311	2,243,546	2,600,857
Road Right of Way	3,997	131,900	135,897
Karst	0	186,041	186,041
Recreation	0	64,219	64,219
Total Reductions to Productive Forest	**832,032**	**24,198,861**	**25,030,893**
Total Reduced Land base	**636,813**	**22,273,621**	**22,910,434**
Less: Volume Reductions (WTRA – 4%)	25,473	890,945	916,418
Current Timber Harvesting Land Base	**611,340**	**21,382,676**	**21,994,016**

[1] Portion of TFL 19 that will be managed by WFP on an on-going basis (i.e. excludes BCTS management area)

6.4 Non-Forest

The non-forest portion of TFL 19 includes area where merchantable tree species are largely absent. Most of this area is in alpine, rocks and slides, and wet areas (Table 8).

Table 8 - Non-forest area in TFL 19

Description	Gross Non-forest Area (ha)	Total Area Reduction (ha)
Alpine	2,296	2,296
Rock and slides	11,262	11,262
Swamp, Marsh, Creek, River, Lake	2,421	2,421
Dump, Camps and Sort	64	64
Classified Roads and Pits	71	71
Hydro and Telephone RoW	172	172
TOTAL	**16,286**	**16,286**

6.5 Non-Productive Forests

TFL 19 includes 15,698 ha of non-productive land (Table 9). These largely alpine forest areas also contain brush (shrubs) and grass.

Table 9 – Non-productive area in TFL 19

Description	Gross Non-productive Area (ha)	Total Area Reduction (ha)
Non-productive	15,698	15,698

6.6 Non-commercial Cover

Approximately 946 ha of TFL19 is classified as non-commercial cover (Table 10). Most of this area is occupied by brush.

Table 10 - Non-commercial area

Description	Gross Non-commercial Area (ha)	Total Area Reduction (ha)
Brush	946	946

6.7 Riparian Reserves

Detailed riparian features mapping is ongoing for TFL 19 through cutblock development. Operational stream inventories associated with development planning have been conducted since 1988 and reconnaissance (1:20,000) fish and fish habitat inventory projects to RIC standards were completed between 1999 and 2002. These inventories provide information on fish distribution, fish habitat, and habitat restoration opportunities.

This detailed information provided the basis for estimating riparian classes and hence reserve areas for watercourses. A review of cutblocks harvested over the past ten years indicated that within-block retention within the riparian management zone has been minimal and it is not expected to change in the future. The approach employed in the timber supply analysis was to utilise the available stream classification in the GIS to apply reserves to known fish bearing streams, in accordance to specifications in the Forest and Range Practices Act. A non-spatial allowance for retention within riparian management zones and streams not mapped at 1:20,000 (generally narrow and not expected to contain fish) is incorporated with the volume reduction for wildlife tree retention (see Section 10.3.5).

Table 11 - Riparian Reserve Zones

Riparian Feature Class	Feature Size	Riparian Reserve width from FRPA (metres)
Double Line Streams (ha)		
S1	493	50
S2	103	30
Single Line streams (km)		
S1	36	50
S2	205	30
S3	291	20
S4	3	0
S5	793	0
S6	3,023	0
Lakes and Wetlands (ha)		
L1	1,385	**10**
W1	96	**10**
W2	10	**10**
W3	132	**0**
W5	15	**10**

Double line streams – Within the GIS all double-lined streams (i.e. polygons) are assigned a riparian reserve based on their classification.

Operationally, riparian reserve zones are established using slope distance; these zones are modelled using horizontal distance. Therefore the area of riparian reserve zones is slightly overestimated in the GIS data used in the timber supply analysis. This additional unquantifiable area also helps account for retention within riparian management zones and streams not mapped at 1:20,000.

Table 12 - Riparian Reserves in TFL 19

Description	Gross Riparian Reserve Area (ha)	Total Area Reduction (ha)
S1	1,407	1,370
S2	1,384	1,335
S3	1,060	905
L1	117	105

Description	Gross Riparian Reserve Area (ha)	Total Area Reduction (ha)
W1	71	40
W2	10	9
W5	12	9
TOTAL	**4,061**	**3,773**

6.8 Inoperable/Inaccessible

Operability classes have been developed for TFL 19 that reflect the harvesting system, timber quality, terrain stability, and economic accessibility. Some of the operability criteria were based on attributes from the previous forest inventory. Significantly more productive forest area is classified as inoperable compared to that for MP #9. A large part of the difference is area classified as productive in the VRI, but considered non-productive in the previous inventory (approximately 4,500 ha out of the total difference of 8,000 ha). Updating the operability mapping to reflect the current forest inventory (VRI) may change the operability classification somewhat, however changes are expected to largely be in areas of marginal economics.

Three major categories are recognized:

Inoperable (I) - This includes areas not available for timber harvesting due to being physically inaccessible, of low productivity and/or unmerchantable. Physical inoperability relates to the presence of a physical barrier or terrain constraint leaving access virtually impossible. Low productivity and/or unmerchantable relates to stands that do not produce wood volumes or quality that is economical to harvest and manage under an even-aged silviculture system regardless of market conditions.

Marginal (Oce/Ohe) - Timber harvesting under normal market conditions is not justified given costs of harvesting and the expected value of the timber. Oce refers to conventional harvesting areas and Ohe refers to helicopter logging areas that could be logged and managed under an even-aged silviculture system profitably should markets improve sufficiently.

Operable (Oc/Oh) - Areas that are classified as operable for the timber supply analysis. Oc refers to conventional harvesting areas and Oh refers to helicopter logging areas.

Of the net inoperable land base, 4,418 ha are currently classified as Oce/Ohe and 44,089 ha are currently classified as I. The total area excluded from the productive forest land base for operability reasons is 48,507 ha (see Table 13).

Table 13 - Inoperable area (ha) by class

Description	Gross Inoperable Area (ha)	Total Area Reduction (ha)
I – Physically Inoperable/ low productivity/unmerchantable	72,563	44,089
Oce – Operable for conventional logging with economic constraints removed	430	374

Description	Gross Inoperable Area (ha)	Total Area Reduction (ha)
Ohe – Operable for heli-logging with economic constraints removed	4,616	4,044
TOTAL	**77,609**	**48,507**

Harvest areas by operability class and within terrain classes IV and V have been reported during MP #9. The results for the years 2001 to 2006 are summarized in Table 14 and Table 15.

Table 14 - TFL 19 Harvest Area for 2001 to 2006 by Operability Class

Operability Class	% of Harvest Area	% of THLB
Conventional (Oc)	87.1%	87.9%
Non-conventional (Oh)	6.0%	12.1%
Marginal (Oce & Ohe)	1.6%	0%
Inoperable	5.3%	0%
Total	**100.0%**	**100.0%**

Table 15 - TFL 19 Harvest Area for 2001 to 2006 on Class IV and Class V Terrain

Terrain and Slope Classes	% of Harvest Area	% of THLB
Class IV < 80%	21.9%	17.8%
Class IV > 80%	3.3%	4.1%
Class V < 80%	2.1%	2.4%
Class V > 80%	0.4%	0.5%
Total	**27.7%**	**24.8%**

6.9 Forest Regeneration

Inventories maintained by the previous Licensee indicated areas of potentially poor regeneration associated with harsh geoclimatic conditions and biotic damage, largely within inoperable areas. The area within the operable land base subject to harsh geoclimatic conditions was small and operational foresters believe these areas are widely-scattered, small patches and therefore appropriately accounted for within operational adjustment factors. Definable areas of failed regeneration due to brush or wildlife browsing have not been realized and are no longer anticipated within the THLB. WFP does not consider this classification applicable to TFL 19 and has not included it within the inventory files.

6.10 Wildlife Habitat

Revised Ungulate Winter Ranges (UWRs) for Columbian black-tailed deer and Roosevelt elk were approved in December 2004 (U-1-014). The original 73 UWRs had a total area of 6,231 ha (excluding 648 ha in Provincial Parks). Two UWRs were amended slightly on January 30, 2006 to accommodate adjacent cutblocks. With the deletion of the private land from the TFL, a total of 163 ha of UWR was

removed from the TFL. A total of 189 ha of replacement UWR has been identified within TFL 19 and was legally established on November 9, 2007. These replacement UWRs are included in the data set for the analysis and will be excluded from the THLB.

Six Wildlife Habitat Areas (WHAs) have been approved in TFL 19. Five of these for the Queen Charlotte Goshawk were approved in December of 2004 and the sixth for the Keen's Long-eared Myotis was approved in April of 2000. The WHAs have a total area of 689 ha.

Marbled Murrelet habitat capability inventories have been developed for northern and western portions of Vancouver Island. Collaboration between WFP and the Ministry of Environment (MoE) is proceeding on defining and refining draft Marbled Murrelet WHAs within TFL 19. A total of 813 ha of draft WHAs are included in the data set to account for managing Marbled Murrelet habitat within TFL 19. The inclusion of these draft WHAs in no way gives them any legal status but is merely the current best estimate of spatially accounting for the FPPR section 7 notice and the approved strategy in the FSP for Marbled Murrelet habitat.

Area reductions of 4,254 ha for wildlife habitat exceeds the 2,467 ha allowed for in MP #9. The difference is due to the establishment of UWR areas equivalent to Ew2 areas (cover class constraint) applied in MP #9 and the establishment of WHAs.

Wildlife Tree Retention Areas (WTRA) and other stand-level retention will be handled through a volume reduction of 4% in the timber supply analysis as described in Section 10.3.5.

Table 16 - Wildlife areas

Description	Gross Wildlife Area (ha)	Total Area Reduction (ha)
Ungulate Winter Range	5,880	3,550
Wildlife Habitat Area - Established	689	348
Wildlife Habitat Area - Draft	831	356
TOTAL	**7,382**	**4,254**

6.11 Recreation Feature Inventory and Karst Potential

On April 12, 2006, a Government Actions Regulation (GAR) Order was established to identify Recreation Resource Features for the Campbell River Forest District. Many of the TFL 19 polygons in the Order correspond to areas identified in the TFL 19 recreation features inventory, with the majority located in areas that are non-forested or non-productive forest.

It is recognized that as operational planning proceeds some harvesting may occur in these areas. Most of the productive forest area in the GAR Order polygons is netted-down as inoperable or for karst (see following paragraph). Additional 100% netdowns are applied to the GAR Order polygons where the corresponding recreation features in the TFL 19 inventory have a very high or high significance and a high or moderate sensitivity, resulting in 162 ha (approximately 10%) of the 1,558 ha of productive forest in the GAR Order polygons remaining in the THLB.

A Planning Level Karst Inventory of TFL 19 was completed in March 2003. Funding was primarily from Forest Renewal BC (FRBC) and the Forest Investment Account (FIA). The impact of protecting karst features on timber supply is uncertain. To date, little area has been reserved during operational planning to protect karst features. Estimates of impacts will improve as operational planning proceeds in karst areas. In the meantime, for this analysis, karst polygons rated as very high and high vulnerability will be netted down at 100%. This is representative of possible impacts as it is recognized that areas may be reserved in lower vulnerability classes and that not all areas will need to be reserved in very high and particularly high vulnerability classes. This is also consistent with the Campbell River Forest District GAR *Order to Identify Karst Resource Features* of May 30, 2007.

These more specific directions on defining areas of recreation value have resulted in lower area reductions than in MP #9 (679 ha compared to 4,627 ha).

Table 17 – Karst and Recreation areas

Description	Karst Vulnerability Potential	Gross Recreation Area (ha)	Total Area Reduction (ha)
Karst	VH	315	71
Karst	H	612	404
Recreation		4,415	204
TOTAL			**679**

6.12 Cultural Heritage Resources

An archaeological overview assessment for the Nootka and Kyuquot Sound areas including TFL 19 was completed by Arcas Consulting Archaeologists Ltd. in 1998 and was updated in early 2007 by Baseline Archaeological Services Ltd.. This overview deals with archaeological sites and resources and indicates where past human activities are likely to have occurred. This assessment is used in operational planning. Areas with high potential of past activities are subject to field reconnaissance and inventory.

Some recently harvested cutblocks have had numerous culturally modified trees (CMTs) inventoried within the harvest boundaries (e.g. cutblocks near Galiano Bay on Tlupana Inlet). The vast majority of the CMTs were harvested under Site Alteration Permits issued under the Heritage Conservation Act with no areas being reserved specifically to manage CMTs. No explicit reductions for cultural heritage resources have been made to the inventory file as management of the most common features such as CMTs are addressed by already-accounted-for reserves for riparian protection or wildlife tree retention.

6.13 Deciduous Stands

Table 18 shows the area of stands defined as deciduous leading in the inventory. This represents about 0.65% of the THLB. These are included in the THLB and these minor deciduous volumes will be included in modelled timber flows.

Table 18 - Area of Deciduous forest types

Inventory Type Group	Net Deciduous Area (ha)
Pure deciduous	48
Deciduous leading	470
TOTAL	**518**

6.14 Roads, Trails and Landings

6.14.1 Existing Roads

Existing roads are excluded from the timber harvesting land base. This reduction is due to the combination of classified and unclassified roads. Classified roads are those that are mapped as forest cover polygons distinctly separate from adjacent polygons. Unclassified roads have been mapped as lineal features. For the purposes of determining the total area of unclassified roads, all mainlines are assumed to occupy a 13 metre wide unproductive width; all other unclassified roads are assumed to occupy a 10 metre wide unproductive width. As all trails and the majority of the landings are rehabilitated and restocked immediately following logging, the associated area reduction is thought insignificant. Table 19 summarizes the areas of existing roads in the TFL.

Table 19 - Existing roads

Description	Gross Road Area (ha)	Total Area Reduction (ha)
Existing road	2,372	2,162

Further road development and a larger allowance for main roads (13m width compared to 10m) have increased the reduction for existing roads from the 1,948 ha in the MP #9 analysis.

6.14.2 Future Roads

A projected road system was developed as part of the operability classification for TFL 19. This road system was digitized into the GIS in conjunction with the operability classification, which allowed for the same approach used with existing roads to predict area summaries. The area available for timber production will be reduced when the model harvests these polygons.

Table 20 indicates the area of future roads in the TFL that have yet to be developed.

Road development during MP #9 has reduced this allowance from that applied in MP #9.

Table 20 - Future roads

Description	Gross Road Area (ha)	Total Area Reduction (ha)
Future road	1,194	958

7 INVENTORY AGGREGATION

7.1 Overview

This section describes the delineation of the TFL land base and definition of stand types needed to complete the timber supply analysis. The TFL area is categorized in a hierarchy of different management zones to allow for a variety of forest cover constraints (e.g., biodiversity). Stand types are grouped in analysis units (AU) based on similar leading species, history and productivity. Areas within all tables in this section may not sum due to rounding.

7.2 Management Zones

Unique forest cover objectives will be modelled through the different management zones. Landscape Units, Special Management Zone (SMZ) and Resource Management Zone (RMZ) are delineated in the data and may be used to report seral stage distributions and other ecological parameters for selected sensitivity analyses (Table 21 and Table 22).

Table 21 - Management zones and landscape units

Mgmt Zone	Mgmt Unit	Landscape Unit	Seral[1] Stage	Productive Forest (ha)	Management Considerations (from Vancouver Island Summary Land Use Plan)
EMZ 24	Burman	Burman *Low BEO*	Early	2,552	***Enhanced Forestry Zone*** suited for enhanced silviculture, as well as limited enhanced timber harvesting; due consideration and integration of riparian and wildlife values associated with Burman River corridor into Strathcona Park; integration of biodiversity, recreation and scenic values.
			Mid	534	
			Mature	725	
			Old	5,324	
			Total	**9,135**	
EMZ 18	Eliza	Eliza *Low BEO*	Early	932	***Enhanced Forestry Zone,*** particularly suited for enhanced timber harvesting in suitable areas (e.g. areas which are not visually sensitive), as well as enhanced silviculture on most productive sites; emphasis on scenic values along coast, and integration of associated recreation/tourism opportunities; objectives for biodiversity are to be integrated at the basic stewardship; adaptive road engineering/deactivation efforts are indicated to maintain terrain and watershed integrity.
			Mid	1,242	
			Mature	178	
			Old	2,672	
			Total	**5,024**	

[1] Early seral is <40 years old; Mid seral is 40-80 years old in CWH zone and 40-120 years old in MH zone; Mature seral is 81-250 years old in CWH zone and 121-250 years old in MH zone; Old seral is >250 years old.

Mgmt Zone	Mgmt Unit	Landscape Unit	Seral Stage	Productive Forest (ha)	Management Considerations (from Vancouver Island Summary Land Use Plan)
GMZ 22	Gold	Gold *High BEO*	Early	7,493	***General Management Zone***, with high fish, wildlife and biodiversity values, as well as significant timber values; landscape level development of riparian recovery plan for the Gold-Muchalat-Oktwanch-Nimpkish riparian corridor recommended.
			Mid	6,993	
			Mature	9,537	
			Old	15,160	
			Total	**39,184**	
EMZ 23	Kleeptee	Kleeptee *Low BEO*	Early	2,694	***Enhanced Forestry Zone***, suited for enhanced timber harvesting and silviculture, while maintaining fish and wildlife, as well as watershed integrity; basic level of biodiversity conservation; integration of coastal scenic and recreation values.
			Mid	845	
			Mature	4,193	
			Old	5,703	
			Total	**13,435**	
SMZ 11	Schoen-Strathcona	Gold *High BEO*	Early	721	***Special Management Zone***, the focus should be on maintenance of old growth biodiversity and habitat values, as well as backcountry recreation potential and maintenance of viewsheds around Victoria and Warden Peaks; this SMZ should become a focal area for old growth retention at the landscape level.
			Mid	333	
			Mature	9	
			Old	1,076	
			Total	**2,139**	
EMZ 19	Tahsis	Tahsis *Low BEO*	Early	4,316	***Enhanced Forestry Zone,*** with opportunity for enhanced timber harvesting, as well as enhanced silviculture on most productive sites; emphasis on integration of visual values along coastline; objectives for biodiversity are to be integrated at the basic stewardship level; adaptive road engineering/ deactivation efforts are indicated to maintain terrain and watershed integrity.
			Mid	2,622	
			Mature	5,115	
			Old	7,993	
			Total	**20,046**	
EMZ 21	Tlupana	Tlupana *Intermediate BEO*	Early	8,766	***Enhanced Forestry Zone***, with significant opportunity for enhanced timber harvesting and silviculture, while maintaining high fish, wildlife and intermediate biodiversity values; integration of scenic/recreation/tourism values along coastline.
			Mid	1,977	
			Mature	15,877	
			Old	10,732	
			Total	**37,353**	
SMZ 6	Woss-Zeballos	Zeballos *Low BEO*	Early	64	This ***Special Management Zone*** should become a focal area for old growth biodiversity conservation; focus should also be on maintenance of recreation opportunities associated with lakes and alpine/subalpine, and maintenance of scenic values associated with recreation sites and access corridors.
			Mid	40	
			Mature	46	
			Old	2,122	
			Total	**2,272**	
GMZ 16	Zeballos	Zeballos *Low BEO*	Early	2,914	***General Management Zone***, with lower biodiversity conservation objectives; sensitive development of timber values on unstable terrain
			Mid	1,586	
			Mature	460	
			Old	6,220	
			Total	**11,180**	
GRAND TOTAL				**139,768**	

Table 22 - Area by landscape unit and BEC variant

Landscape Unit	BEC	Seral Stage	Productive Forest (ha)[1]	Non Contributing Area		THLB Area	
				ha	%	ha	%
Burman	CWH vm 1	Early	2,127	143	7%	1,984	93%
		Mid	477	77	16%	400	84%
		Mature	476	52	11%	424	89%
		Old	2,908	1,143	39%	1,765	61%
	CWH vm 1 Total		5,988	1,415	24%	4,573	76%
	CWH vm 2	Early	285	19	7%	266	93%
		Mid	37	31	84%	6	16%
		Mature	65	48	74%	17	26%
		Old	1,986	1,104	56%	882	44%
	CWH vm 2 Total		2,373	1,202	51%	1,171	49%
	MH mm 1	Early	3	0	0%	3	100%
		Mid	5	5	100%	0	0%
		Mature	180	115	64%	65	36%
		Old	353	269	76%	84	24%
	MH mm 1 Total		541	389	72%	152	28%
	MH mmp1	Mature	1	1	100%	0	0%
		Old	8	8	100%	0	0%
	MH mmp1 Total		9	9	100%	0	0%
Burman Total			***8,911***	***3,015***	***34%***	***5,896***	***66%***
Eliza	CWH vm 1	Early	786	88	11%	698	89%
		Mid	1,192	111	9%	1,081	91%
		Mature	161	55	34%	106	66%
		Old	1,994	859	43%	1,135	57%
	CWH vm 1 Total		4,133	1,112	27%	3,020	73%
	CWH vm 2	Early	105	7	6%	98	94%
		Mid	2	1	50%	1	50%
		Mature	17	17	100%	0	0%
		Old	603	324	54%	279	46%
	CWH vm 2 Total		726	348	48%	378	52%
	MH mm 1	Old	69	64	93%	5	7%
	MH mm 1 Total		69	64	93%	5	7%
Eliza Total			***4,928***	***1,524***	***31%***	***3,403***	***69%***

Landscape Unit	BEC	Seral Stage	Productive Forest (ha)[1]	Non Contributing Area		THLB Area	
				ha	%	ha	%
Gold	CWH vm 1	Early	4,613	442	10%	4,171	90%
		Mid	4,282	634	15%	3,648	85%
		Mature	2,078	1,162	56%	916	44%
		Old	3,445	1,875	54%	1,570	46%
	CWH vm 1 Total		14,418	4,113	29%	10,305	71%
	CWH vm 2	Early	2,528	121	5%	2,407	95%
		Mid	676	226	33%	450	67%
		Mature	3,304	2,232	68%	1,072	32%
		Old	7,112	3,576	50%	3,536	50%
	CWH vm 2 Total		13,620	6,155	45%	7,465	55%
	CWH xm 2	Early	220	42	19%	178	81%
		Mid	1,888	279	15%	1,609	85%
		Mature	1,551	1,033	67%	518	33%
		Old	311	287	92%	24	8%
	CWH xm 2 Total		3,970	1,641	41%	2,329	59%
	MH mm 1	Early	372	11	3%	361	97%
		Mid	147	114	78%	33	22%
		Mature	2,361	1,944	82%	417	18%
		Old	5,088	3,199	63%	1,889	37%
	MH mm 1 Total		7,968	5,268	66%	2,700	34%
	MH mmp1	Mature	122	122	100%	0	0%
		Old	59	59	100%	0	0%
	MH mmp1 Total		181	181	100%	0	0%
Gold Total			***40,157***	***17,358***	***43%***	***22,799***	***57%***
Kleeptee	CWH vm 1	Early	1,710	125	7%	1,586	93%
		Mid	608	117	19%	491	81%
		Mature	1,424	556	39%	868	61%
		Old	2,460	931	38%	1,529	62%
	CWH vm 1 Total		6,202	1,728	28%	4,474	72%
	CWH vm 2	Early	805	41	5%	764	95%
		Mid	42	18	43%	24	57%
		Mature	1,725	1,032	60%	694	40%
		Old	2,352	1,414	60%	938	40%
	CWH vm 2 Total		4,924	2,505	51%	2,419	49%
	CWH xm 2	Early	42	5	11%	37	89%
		Mid	141	17	12%	124	88%
		Mature	366	234	64%	132	36%
		Old	35	8	22%	27	78%
	CWH xm 2 Total		584	264	45%	321	55%
	MH mm 1	Early	7	0	6%	6	94%
		Mid	26	26	99%	0	1%
		Mature	659	574	87%	86	13%
		Old	830	755	91%	75	9%
	MH mm 1 Total		1,522	1,355	89%	167	11%
Kleeptee Total			***13,232***	***5,851***	***44%***	***7,381***	***56%***

Landscape Unit	BEC	Seral Stage	Productive Forest (ha)[1]	Non Contributing Area		THLB Area	
				ha	%	ha	%
Tahsis	CWH vm 1	Early	3,066	329	11%	2,737	89%
		Mid	2,218	297	13%	1,922	87%
		Mature	3,460	1,115	32%	2,345	68%
		Old	3,837	1,803	47%	2,034	53%
	CWH vm 1 Total		12,581	3,544	28%	9,037	72%
	CWH vm 2	Early	937	66	7%	866	93%
		Mid	259	97	37%	162	63%
		Mature	1,329	780	59%	549	41%
		Old	2,949	2,055	70%	894	30%
	CWH vm 2 Total		5,468	2,998	55%	2,471	45%
	MH mm 1	Early	52	5	9%	48	91%
		Mid	62	61	98%	1	2%
		Mature	276	256	93%	20	7%
		Old	1,092	989	91%	104	9%
	MH mm 1 Total		1,482	1,310	88%	172.0	12%
	MH mmp1	Mid	1	1	100%	0	0%
		Mature	5	5	100%	0	0%
		Old	22	22	100%	0	0%
	MH mmp1 Total		27	27	100%	0	0%
Tahsis Total			***19,559***	***7,879***	***40%***	***11,680***	***60%***
Tlupana	CWH vm 1	Early	7,217	659	9%	6,558	91%
		Mid	1,647	335	20%	1,312	80%
		Mature	9,499	4,119	43%	5,380	57%
		Old	3,987	1,427	36%	2,560	64%
	CWH vm 1 Total		22,350	6,540	29%	15,810	71%
	CWH vm 2	Early	1,025	105	10%	920	90%
		Mid	154	125	81%	29	19%
		Mature	5,142	3,395	66%	1,747	34%
		Old	4,778	3,014	63%	1,764	37%
	CWH vm 2 Total		11,099	6,639	60%	4,460	40%
	MH mm 1	Early	28	27	96%	1	4%
		Mid	51	51	100%	0	0%
		Mature	1,132	1,057	93%	75	7%
		Old	1,873	1,750	93%	123	7%
	MH mm 1 Total		3,084	2,885	94%	199	6%
	MH mmp1	Early	1	1	100%	0	0%
		Mature	12	12	100%	0	0%
		Old	13	13	100%	0	0%
	MH mmp1 Total		26	26	100%	0	0%
Tlupana Total			***36,559***	***16,090***	***44%***	***20,469***	***56%***

Landscape Unit	BEC	Seral Stage	Productive Forest (ha)[1]	Non Contributing Area		THLB Area	
				ha	%	ha	%
Zeballos	CWH vm 1	Early	2,129	159	7%	1,970	93%
		Mid	1,406	197	14%	1,209	86%
		Mature	348	49	14%	299	86%
		Old	3,321	1,599	48%	1,721	52%
	CWH vm 1 Total		7,204	2,004	28%	5,200	72%
	CWH vm 2	Early	618	58	9%	560	91%
		Mid	99	74	75%	25	25%
		Mature	79	63	80%	16	20%
		Old	3,949	2,281	58%	1,668	42%
	CWH vm 2 Total		4,745	2,476	52%	2,269	48%
	MH mm 1	Early	24	24	98%	0	2%
		Mid	44	44	99%	0	1%
		Mature	69	56	82%	13	18%
		Old	996	706	71%	290	29%
	MH mm 1 Total		1,134	830	73%	304	27%
	MH mmp1	Early	0	0	100%	0	0%
		Mid	0	0	100%	0	0%
		Mature	1	1	100%	0	0%
		Old	12	9	78%	3	22%
	MH mmp1 Total		13	10	80%	3	20%
Zeballos Total			***13,095***	***5,320***	***41%***	***7,775***	***59%***
GRAND TOTAL			**136,441**	**57,037**	**42%**	**79,403**	**58%**

[1] All existing roads and Non-commercial brush are excluded in area totals.

7.3 Analysis Units

The forested area in the THLB is aggregated into groups of similar stands to produce growth and yield information needed to model timber supply. For existing stands, analysis units are based on biogeoclimatic subzone/variant (subzone), site productivity class, age class, and leading species. These grouping are described in more detail in the following sections.

"Base" refers to analysis units in the THLB for the base option. "Marginal" refers to the additional areas classified for the sensitivity that includes marginal lands (Oce and Ohe – refer to Section 6.8)

7.3.1 Subzone assignment

Subzones were assigned using the TFL 19 Terrestrial Ecosystem Mapping (TEM). Each polygon in the THLB was assigned to one of four analysis unit level subzones. Resultant polygons with missing subzones were assigned the subzone with the largest representative area for that particular forest cover polygon (this only affected 30 ha). MHmmp1 was combined with MHmm1 to limit the number of unique combinations (Table 23).

Table 23 – Analysis Units Subzones

	Area (ha)		
Subzone	**Base AUs**	**Marginal AUs**	**Total**
CWHvm1	52,439	1,008	53,447
CWHvm2	20,656	2,158	22,814
MHmm1	3,704	1,008	4,712
CWHxm2	2,649	2	2,651
Total	**79,448**	**4,176**	**83,624**

7.3.2 Productivity class assignment

SIBEC site index estimates were attached to each forest cover (for_pid) / subzone resultant polygon. Area weighted-average Fd and Hw SIBEC site index was calculated for each forest cover / subzone resultant polygon based on the component site series within each resultant polygon. Site productivity classes were developed by WFP based on the range and distribution of 3 m site index estimate classes within each subzone (Figure 2, Figure 3, and Table 24). SIBEC site index values for Hw are used in the CWHvm1, CWHvm2, and MHmm1 subzones and Fd is used in the CWHxm2 subzone. Note that the total areas within each subzone indicated in Figure 2 and Figure 3 include the two woodlots now removed from TFL 19 and the BCTS management area as well as the WFP portion of TFL 19.

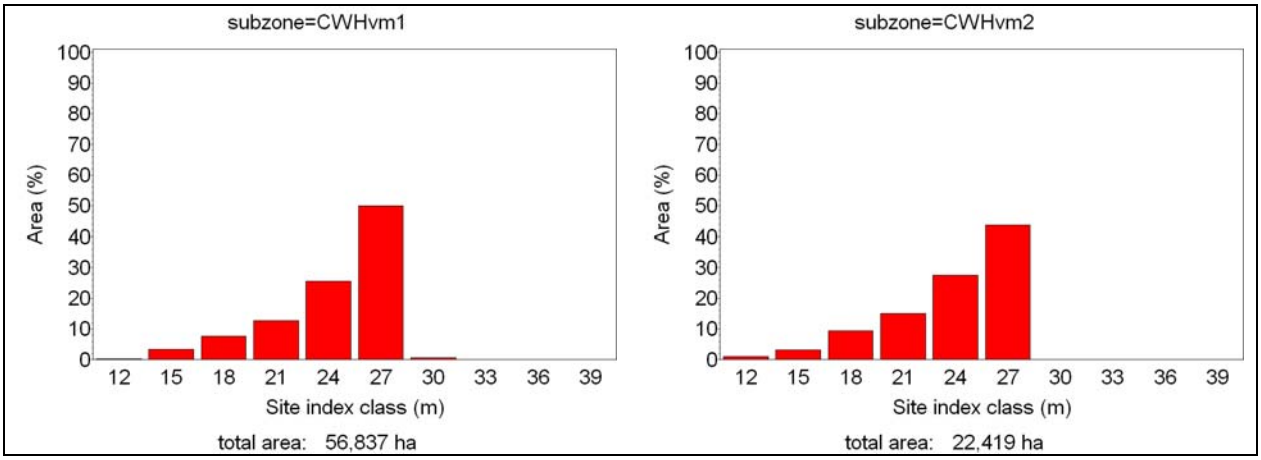


Figure 2 – Site Indices for CWHvm1 and CWHvm2

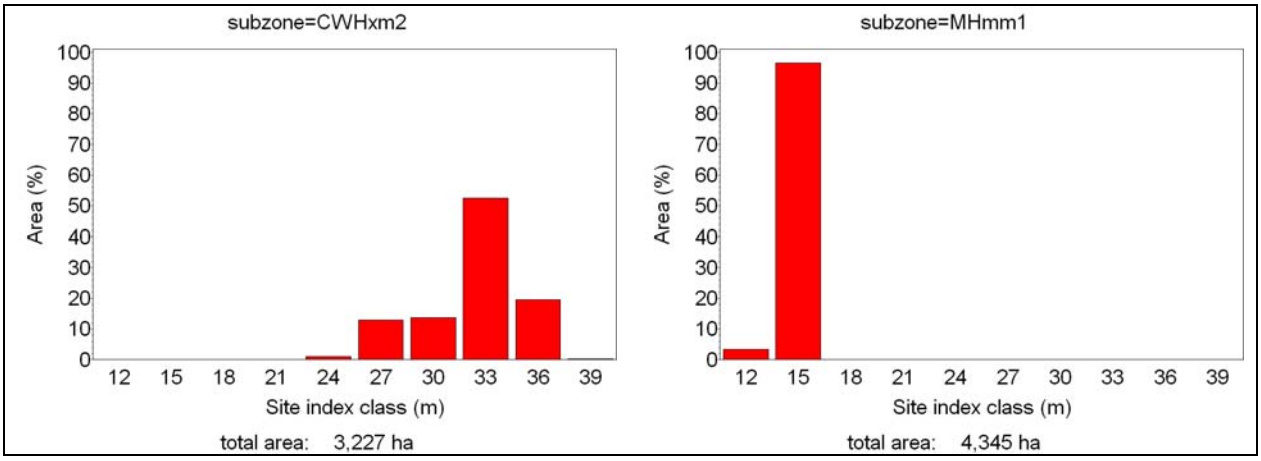


Figure 3 – Site Indices for CWHxm2 and MHmm1

Table 24 –Site Productivity Classes by Subzone – Base AUs

	Productivity class						
	good		medium		poor		
Subzone	SI class (m)	Area (ha)	SI class (m)	Area (ha)	SI class (m)	Area (ha)	Total Area (ha)
CWHvm1	≥ 27	25,318	21-24	20,876	< 21	6,245	52,439
CWHvm2	≥ 27	8,745	21-24	8,951	< 21	2,960	20,656
CWHxm2	≥ 36	579	30-33	1,884	< 30	185	2,649
MHmm1					All	3,704	3,704
Total Area		**34,642**		**31,711**		**13,095**	**79,448**

7.3.3 Species group assignment

Each polygon was assigned to one of six species groups based on the leading species in the inventory label. Sufficiently restocked polygons missing an inventory label (approx. 1,335 ha) were assigned to a leading species group based on management practices within each subzone: Hw for CWHvm1/vm2, Fd for CWHxm2 and Ba for MHmm1.

Table 25 – Species Groups

Species group	Base area (ha)	Marginal area (ha)	Total area (ha)
Hw	47,275	2,006	49,281
Fd	9,909	0	9,909
Cw	8,183	542	8,725
Yc	5,113	1,165	6,278
Other	2,185	394	2,579
Ba	2,754	0	2,754
Total	**75,419**	**4,107**	**79,526**

Other includes Dr, Pl, Mb, and Ss

Recently harvested (projected age=0 years) and NSR polygons are excluded from this summary (4,029ha in the base area and 69 ha in the marginal area) but are assigned to future yield curves based on subzone and productivity class (see Section 8.8.2).

7.3.4 Age class assignment

Each polygon was assigned an age class based on maturity and management era (Table 26). Existing managed stands less than or equal to 10 years of age in the base area were put into separate analysis units to isolate the use of genetically improved stock during this management era in the timber supply model.

Table 26 – Age Classes

Age class	Adjusted age range (years)	Base area (ha)	Marginal area (ha)
Mature natural	≥121	36,875	3,976
Immature natural	46-120	10,355	55
Existing managed $_{>10\ years}$	11-45	20,994	76
Existing managed $_{\leq 10\ years}$	1-10	7,196	n/a
Future	0 (+ NSR polygons)	4,029	69

7.3.5 Analysis unit assignment for timber supply model

Polygons in the timber harvesting land base were assigned to existing analysis units defined by the unique combination of subzone, site productivity class, age class, and leading species. Analysis unit / species combinations representing less than 100 ha were combined into the 'Other' species analysis unit

within the same combination of subzone, site productivity class, and age class. Also, productivity classes were combined within subzone / age class / leading species analyses units in the marginal area representing less than 100 ha (affects 123 ha in total). This resulted in 111 existing analysis units in the base area, and an additional 29 existing analysis units in the marginal area. (Appendix A – Appendix C).

Future analysis units for each polygon were defined by the unique combination of subzone, and site productivity class. Also, productivity classes were combined within subzone analyses units in the marginal area representing less than 100 ha (affects 123 ha in total). This resulted in 10 future analysis units in the base area, and an additional 10 future analysis units in the marginal area. (Appendix D).

7.3.6 Analysis unit codes

A 5-character code identifies the land base area (base or marginal), subzone, productivity class, species group and age class for each analysis unit (Table 27).

Table 27 – Analysis Units Legend

First Character *Land base area*	Second Character *Subzone*	Third Character *Productivity Class*	Fourth Character *Leading Species*	Fifth Character *Age Class*
B Base M Marginal	1 CWHxm2 2 CWHvm1 3 CWHvm2 4 MHmm1/mmp	G Good M Medium P Poor A All	B Balsam C Cedar F Fir H Hemlock O Other Y Cypress	1 1 -10 years 2 11 – 45 years 3 46 – 120 years 4 121+ years 5 Future stands

For example, the code B2GH2 identifies the Base/CWHvm1/Good Site/Hemlock leading/age 11-45 analysis unit.

8 GROWTH AND YIELD

8.1 Overview

This section describes the approach used to develop yield tables for managed and natural stands. The general approach is to develop yield tables for existing and future stands, thus specific yield tables are developed for:

1) Existing natural mature stands.
2) Existing natural immature stands.
3) Existing managed stands.
4) Future managed stands.

Table 28 describes the different input parameters for the different sets of yield tables.

Table 28 - Modelling overview

	Existing Natural Mature Stands	Existing Natural Immature Stands	Existing Managed Stands	Future Stands
Inputs				
Model	Batch VDYP (6.6d) (Flatline)	Batch VDYP (6.6d)	Batch TIPSY (4.1)	Batch TIPSY (4.1)
Age Class	121+ years	46 - 120 years	1 - 45 years	All
Current Area (ha)	36,875	10,355	28,190	4,029
Proportion of THLB	47%	13%	35%	5%
Outputs SIBEC scenario				
Average Culm MAI	N/A	5.6 m^3/ha/yr	9.6 m^3/ha/yr	9.2 m^3/ha/yr
Average Culm Age	N/A	89 years	82 years	86 years
Average Volume at Culm Age	N/A	440 m^3/ha	743 m^3/ha	707 m^3/ha
Outputs PSI scenario				
Average Culm MAI	N/A	5.6 m^3/ha/yr	10.1 m^3/ha/yr	10.0 m^3/ha/yr
Average Culm Age	N/A	89 years	80 years	82 years
Average Volume at Culm Age	N/A	440 m^3/ha	780 m^3/ha	774 m^3/ha

8.2 Site Index

Site index estimates for existing immature natural stands are from the adjusted inventory database.

Site index estimates for existing and future managed stands are based on the SIBEC database. A site index was assigned to each site series in the Terrestrial Ecosystem Mapping (TEM) within the THLB, based on the current-leading species in the inventory for existing managed stands. Site index for future managed stands was based on the expected future leading species on that site series. This was done for both the SIBEC estimate (to generate yield tables for the base case) and potential site index (PSI) estimates (to generate yield tables for a PSI scenario).

In MP #9, the site indexes used for managed stands, were estimated by averaging SIBEC and TFL 37 site indexes by site series. The result was an average site index of 26, substantially higher than the SIBEC estimates (average of 23.9) to be used in the MP #10 base case.

SIBEC estimates for TFL 19 were compared to site index data collected from random sampling in other coastal management units including TFL 6, 37, 46, 47, and 54 (SIA projects). High elevation data from permanent and temporary sample plots on TFL 39 and 44 was also reviewed.

Potential site index (PSI) estimates were developed from these existing data by Timberline to reflect the local conditions on TFL 19. Expert opinion was used to fill data gaps or inconsistencies and to ensure that expected site productivity trends were applied across species, subzone variant, site series, and soil moisture and nutrient regimes. See Appendix G: Timberline Memo Re: SIBEC and PSI Estimates for TFL 19 for the Timberline document.

PSI estimates average 25.4 m across the THLB compared to an average of 23.9 using SIBEC. Refer to Appendix H: SIBEC and PSI Estimates for Major Site Series in TFL 19 for a comparison of SIBEC and PSI values for significant site series in TFL 19.

A significant difference between PSI and SIBEC estimates is for western hemlock in the CWHvm1/03 site series (approximately 13% of the net land base). This site series has been sampled to improve the Hw site index estimate. Preliminary results support the lower SIBEC site index estimate in the CWHvm1/03 site series.

Notwithstanding the results of the sampling, the PSI estimates will be included as a sensitivity of higher (on average) site indexes for managed and future stands (refer to Section 3.3).

8.3 Utilization Levels

The utilization level is 12.5 cm for all existing stands less than 46 years old and for future stands. Stump height for these stands is 30 cm and top diameter inside bark (DIB) is 10 cm. Utilization level for immature and mature natural stands is 17.5 cm, with stump height of 30 cm and top DIB of 15 cm (Table 29). Operationally stands aged 46 to 120 years are utilized to the same minimum DBH as listed for the younger managed stands; however, volumes for these stands are being calculated using VDYP and VDYP does not accept the smaller DBH standards for TFL 19.

Table 29 - Utilization levels

Species Group	Utilization			Firmwood Standard
	Minimum DBH (cm)	Stump Height (cm)	Top DIB (cm)	
Managed Conifers (1 - 45 yrs, future)	12.5	30.0	10.0	50%
Immature (46 – 120 yrs)	17.5	30.0	10.0	50%
Mature (121+ yrs)	17.5	30.0	15.0	50%

8.4 Decay, Waste, and Breakage

The default decay, waste, and breakage factors for TFL19 within VDYP 6.6d were used for existing natural stands.

8.5 Operational Adjustment Factors (OAFs)

An OAF1 of 15% and OAF2 of 5% were used for yield tables generated with TIPSY.

8.6 Volume Deductions

A volume deduction of 4% will be used to model stand-level retention in the THLB – for more detail see Section 10.3.5. This reduction will occur when individual stands are harvested during modelling. Yield curves are left unaltered.

Deciduous volumes existing in pure or mixed stands have not been removed from the volume calculations. Pure deciduous stands represent only 63 ha and deciduous-leading stands represent 528 ha.

8.7 Yield Tables for Unmanaged Stands

8.7.1 Existing Mature Stand Volumes

The timber volume in existing mature stands (those ≥ 120 years) was determined for each analysis unit by calculating the area-weighted average adjusted inventory volumes (Table 30).

Table 30 - Existing mature volume

Analysis Unit	THLB Area (ha)	Weighted Avg Age (years)	Weighted Avg Volume/ha (m^3/ha)	Analysis Unit Volume (m^3)
B1GO4	58	222	667	38,395
B1MF4	203	182	676	136,929
B1MH4	105	178	702	73,811
B1MO4	31	251	511	16,028
B1PF4	89	183	582	51,915

Analysis Unit	THLB Area (ha)	Weighted Avg Age (years)	Weighted Avg Volume/ha (m^3/ha)	Analysis Unit Volume (m^3)
B2GB4	587	313	985	577,602
B2GC4	998	339	639	638,270
B2GF4	208	233	740	154,212
B2GH4	3,858	300	801	3,088,979
B2GY4	204	324	506	103,483
B2MB4	126	269	958	120,508
B2MC4	3,029	303	572	1,732,170
B2MF4	808	230	632	510,846
B2MH4	4,522	286	655	2,962,139
B2MY4	701	309	459	322,151
B2PC4	1,675	282	370	619,003
B2PF4	466	205	522	243,413
B2PH4	1,572	240	483	759,031
B2PO4	163	186	264	43,061
B2PY4	813	326	326	265,405
B3GB4	234	323	874	204,678
B3GC4	269	310	611	164,577
B3GH4	3,766	316	772	2,908,969
B3GO4	11	210	493	5,398
B3GY4	390	333	446	173,930
B3MB4	121	320	978	118,107
B3MC4	653	301	560	365,437
B3MH4	4,065	303	658	2,674,251
B3MO4	33	197	592	19,379
B3MY4	1,458	315	438	639,058
B3PC4	320	315	408	130,471
B3PF4	91	186	385	34,919
B3PH4	937	290	511	479,357
B3PO4	1	254	683	901
B3PY4	1,143	310	360	411,056
B4PB4	151	319	700	105,414
B4PC4	101	337	553	55,953
B4PH4	2,495	315	631	1,574,808
B4PO4	15	163	408	6,195
B4PY4	403	322	403	162,321
Total Base	**36,873**	**295**	**616**	**22,692,530**
M1PO4	2	185	603	1,141
M2GO4	49	317	634	30,868
M2MC4	131	340	402	52,695
M2MH4	195	319	639	124,427
M2MO4	101	286	424	42,996
M2PC4	129	343	321	41,505
M2PH4	160	294	442	70,660
M2PO4	0	178	416	66
M2PY4	123	301	361	44,459
M3GH4	269	314	583	156,537
M3GO4	21	328	449	9,497
M3GY4	105	314	393	41,140
M3MC4	162	291	400	64,905
M3MH4	579	299	559	323,199

Analysis Unit	THLB Area (ha)	Weighted Avg Age (years)	Weighted Avg Volume/ha (m^3/ha)	Analysis Unit Volume (m^3)
M3MO4	15	231	843	12,832
M3MY4	294	300	370	108,505
M3PC4	119	307	378	45,100
M3PH4	195	301	452	87,993
M3PO4	11	182	418	4,558
M3PY4	329	314	348	114,348
M4PH4	609	308	521	317,120
M4PO4	63	272	506	31,901
M4PY4	315	294	353	111,462
Total Marginal	**3,976**	**306**	**464**	**1,837,914**
Grand Total	**40,849**	**296**	**601**	**24,530,444**

8.7.2 Natural Immature Stand Volumes

For existing natural immature stands, an analysis unit was assigned to every forest cover polygon based on criteria defined in Section 7.3. The adjusted height and adjusted age was used to generate the yield tables for each individual polygon using VDYP 6.6d. Raw yield table output from VDYP was shifted left or right so the yield table volume matched the adjusted volume in the inventory at the adjusted age (Figure 4). Yield tables for each analysis unit were calculated as the area-weighted average of the component polygon-level yield tables. Average input to VDYP for existing natural immature stands are listed in Table 31.

The area-weighted yield curves for each natural immature analysis unit are listed and shown in Appendix A: Natural Immature Yield Tables.

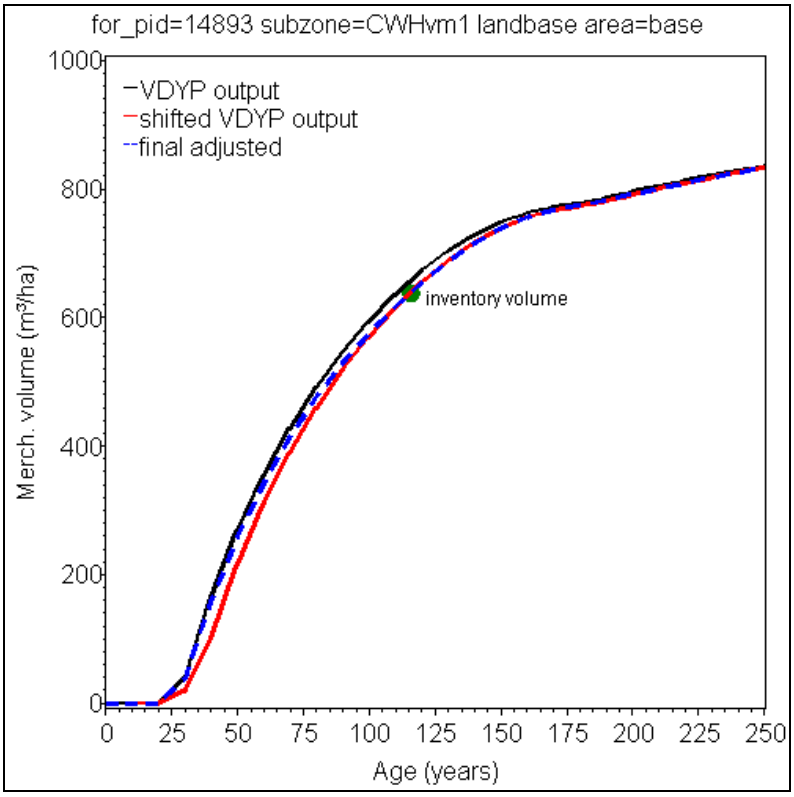


Figure 4 – Example of VDYP output shift

Table 31 - Average VDYP inputs for existing natural immature stands

Existing AU	Spp 1	Spp 2	Spp 3	Spp 4	Spp 5	Spp 6	% Spp 1	% Spp 2	% Spp 3	% Spp 4	% Spp 5	% Spp 6	Stk Cls	Avg. SI (spp1)	Avg. Crn Cls	Area (ha)
B1GF3	Fd	Hw	Pl	Dr			68.9	31.0	0.1	0.0			0	37.8	57.4	437
B1GO3	Hw	Fd	Cw	Dr			50.3	30.4	13.1	6.3			0	38.5	53.7	34
B1MF3	Fd	Hw	Cw	Pl	Dr	Ba	68.4	26.8	2.5	1.1	0.8	0.4	0	30.8	49.5	868
B1MH3	Hw	Fd	Cw	Dr	Pl	Ba	53.1	34.2	8.4	2.0	1.9	0.4	0	29.9	51.8	155
B1MO3	Pl	Fd	Dr	Hw			38.0	31.7	17.9	12.4			0	24.1	45.2	41
B1PF3	Fd	Pl	Hw	Cw	Pw	Ba	51.8	23.6	21.9	2.5	0.1	0.1	0	18.2	41.6	61
B1PO3	Pl	Hw	Fd	Cw	Pw	Ba	33.1	28.5	28.2	7.1	3.0	0.1	0	19.4	42.5	30
B2GF3	Fd	Hw	Cw	Dr	Ba	Pl	70.4	26.3	2.0	1.0	0.3	0.1	0	34.0	51.8	2,315
B2GH3	Hw	Fd	Cw	Ba	Dr	Yc	56.7	19.3	15.3	6.7	1.4	0.5	0	28.2	54.4	2,334
B2GO3	Dr	Hw	Mb	Fd	Cw	Ss	77.2	12.5	3.7	2.9	2.1	1.6	0	26.2	56.3	308
B2MC3	Cw	Hw	Fd	Ba	Dr		48.8	34.7	13.9	1.3	1.3		0	21.1	45.4	101
B2MF3	Fd	Hw	Cw	Pl	Dr	Ba	57.9	30.1	10.5	0.9	0.6	0.1	0	26.0	47.6	605
B2MH3	Hw	Fd	Cw	Ba	Dr	Pl	56.8	19.6	18.8	2.2	1.9	0.6	0	23.9	50.6	1,657
B2MO3	Dr	Pl	Fd	Hw	Cw	Yc	41.7	21.9	16.5	13.6	6.2	0.1	0	19.7	53.1	65
B2PC3	Cw	Fd	Hw	Pl			43.6	24.1	22.7	9.6			0	16.6	43.3	123
B2PF3	Fd	Hw	Cw	Pl	Pw	Yc	46.9	29.9	17.6	4.9	0.6	0.1	0	21.7	44.4	213
B2PH3	Hw	Fd	Cw	Ba	Pl	Yc	47.8	24.6	21.6	2.6	2.6	0.8	0	18.4	48.7	416
B2PO3	Pl	Fd	Hw	Cw			61.1	32.1	5.1	1.6			0	15.1	37.2	30
B3GH3	Hw	Fd	Ba	Cw	Hm	Yc	41.4	16.7	16.0	11.4	7.9	6.6	0	20.5	42.3	180
B3GO3	Fd	Hw	Ba	Yc	Cw	Hm	52.7	29.0	7.5	4.8	3.5	2.5	0	22.3	41.1	55
B3MH3	Hw	Fd	Cw	Yc	Pl	Ba	52.1	29.2	11.3	4.4	1.5	1.5	0	20.4	33.0	108
B3MO3	Fd	Hw	Yc	Ba	Cw	Hm	50.7	15.0	13.9	8.0	6.6	5.8	0	20.5	49.3	44
B3PO3	Hw	Fd	Cw	Pl	Yc	Ba	36.8	31.0	19.3	7.5	3.4	2.0	0	15.8	46.6	142
B4PO3	Hw	Fd	Yc	Ba	Hm	Cw	52.2	28.1	9.9	4.9	3.6	1.4	0	21.2	39.4	32
M2AO3	Hw	Fd	Cw	Dr	Ba	Hm	45.1	28.1	25.0	1.4	0.2	0.1	0	19.3	44.5	25
M3AO3	Hw	Fd	Cw	Yc	Ba	Hm	47.1	21.8	14.1	9.7	4.6	2.6	0	17.8	47.9	12
M4PO3	Hw	Ba	Yc	Fd	Hm	Cw	45.3	21.3	20.3	6.8	5.1	1.3	0	18.1	40.0	18

8.8 Yield Tables for Managed Stands

8.8.1 Existing Managed Stand Volumes

Silviculture assumptions for existing managed stands included a plantation regeneration method for all stands, species composition from the inventory database, establishment density as 10% higher than the free-to-grow density estimates (to account for mortality in the TIPSY model). These silviculture assumptions and SIBEC estimates were used as input into Batch TIPSY 4.1 (Table 33). Genetic gain for Fd, Hw, Cw, Yc, and Ss was applied to stands ≤10 years old. A second set of existing managed yield tables were generated using PSI estimates for a sensitivity analysis.

Yield tables were first calculated for each component site series within a forest cover polygon. The yield table for the forest cover polygon was calculated as the area-weighted average of the component site series-level yield tables. The yield table for the analysis unit was calculated as the area-weighted average of the component forest cover polygon-level yield tables.

8.8.1.1 Stocking density

The 6,893 ha of Free Growing stands in the TFL 19 silviculture file were summarized by subzone / variant for average total stems per ha. The overall average stems per ha and the % of area in the lower stocking class (800 to 1,500 sph) are reported in Table 32.

Table 32 – Free Growing stands

Subzone/variant	Total ha	Average sph (total)	% area with 800-1,500 sph
CWHxm2	89	2,246	23.2%
CWHvm1	5,167	3,167	12.2%
CWHvm2	1,597	3,715	4.6%
MHmm1	40	5,013	0%

TIPSY does not directly model planted stands with natural in-growth. Most of the current managed area has been planted and includes substantial natural in-growth. The Free Growing summaries indicate that there is a variation in stocking; much of the area is well stocked, and some of the area has a lower stocking. Hence the current natural stands are modelled (refer to Table 33) in TIPSY as a combination of:

- Most of the area (75% to 95%) as if planted at 2,000 or 3,000 sph to reflect an average of greater than 2,000 or 3,000 sph (a majority of the area planted combined with substantial in-growth).
- A smaller percentage of the area (5% to 25%) as if planted to 1,000 sph to represent the reduced amount of in-growth in these areas.

Genetic gain for Fd, Hw, Cw, Yc, and Ss was applied to stands ≤10 years old. Records of WFP's Nootka Region (predominately TFL 19 and FL A19231) sowing requests were summarized for the 10 year period from 1996 to 2005. Average genetic (volume) gains by species, reduced to allow for natural regeneration, are shown in Table 33.

8.8.1.2 *Fertilization*

Since 1980, nitrogen fertilization (post-establishment) has occurred on 8,419 ha in TFL 19: 7,495 ha with a single application and 924 ha with two applications. The fertilization treatments have mostly occurred on stands where Douglas fir is the leading species or is a significant component. The stand age has varied, with 61% of the initial application in stands aged 21 to 40 years of age.

In the last four years (2002 to 2006) an average of 534 ha has been fertilized annually as a first application and a further 231 ha annually as a second application. The fertilization program has been contingent on government funding programs and is expected to continue, mostly as second applications in the next few years.

Fertilization will not be incorporated into the yield tables for current stands (much of it occurred in the "younger natural" stands). The impacts of this management effort will be discussed in the sensitivity analysis of yield projections as it will make a contribution to medium-term (in 10 to 50 years) timber supply for TFL 19.

Average TIPSY inputs for existing managed stands are given in Table 34.

Table 33 - Existing managed assumptions

Subzone	Regime no.	Regime %	Regen method	Density at FTG	Input density	Genetic gain (applied to ≤ 10 years AUs only)				
						Fd	Hw	Cw	Yc	Ss
CWHxm2	1	75	P	2000	2200	5	2.3	0.9	6.2	0.5
CWHxm2	2	25	P	1000	1100	5	2.3	0.9	6.2	0.5
CWHvm1	1	85	P	3000	3300	5	2.3	0.9	6.2	0.5
CWHvm1	2	15	P	1000	1100	5	2.3	0.9	6.2	0.5
CWHvm2	1	95	P	3000	3300	5	2.3	0.9	6.2	0.5
CWHvm2	2	5	P	1000	1100	5	2.3	0.9	6.2	0.5
MHmm1	1	95	P	3000	3300	5	2.3	0.9	6.2	0.5
MHmm1	2	5	P	1000	1100	5	2.3	0.9	6.2	0.5

Table 34 - Area-weighted average TIPSY inputs for existing managed stands

Existing AU	Spp 1	Spp 2	Spp 3	Spp 4	Spp 5	Spp 6	% Spp 1	% Spp 2	% Spp 3	% Spp 4	% Spp 5	% Spp 6	SIBEC (m)	PSI (m)	Area (ha)
B1GO1	Fd	Hw	Cw	Bg	Pw		51.3	37.4	8.1	3.0	0.2		29.0	31.3	7
B1GO2	Fd	Hw	Dr	Cw	Ss	Bg	64.0	29.7	3.0	2.5	0.7	0.1	34.0	34.2	35
B1MF2	Fd	Hw	Dr	Pl	Cw	Pw	60.9	27.4	6.9	3.7	0.7	0.3	33.1	32.6	321
B1MO1	Fd	Hw	Cw	Pw	Bg	Dr	52.8	36.3	5.0	4.4	1.4	0.2	27.8	28.4	89
B1MO2	Hw	Fd	Cw	Dr	Ba		55.6	30.0	8.1	5.9	0.4		24.6	26.4	45
B1PO1	Fd	Pw	Hw				80.0	12.0	8.0				27.7	27.8	0
B1PO2	Fd	Hw	Cw	Ss			57.3	36.9	5.6	0.1			23.9	25.1	5
B2GB2	Ba	Hw	Cw	Yc			55.4	39.9	4.3	0.4			24.6	25.5	198
B2GC1	Cw	Hw	Ba	Fd	Dr	Ss	54.9	29.5	8.2	6.2	1.0	0.1	23.2	25.8	143
B2GC2	Cw	Hw	Ba	Fd	Ss	Yc	46.7	37.0	7.5	6.6	1.8	0.4	22.9	25.0	240
B2GF2	Fd	Hw	Cw	Dr	Ss	Pl	60.6	33.0	4.8	1.2	0.2	0.2	35.6	34.2	2,436
B2GH1	Hw	Cw	Ba	Fd	Yc	Ss	69.2	13.5	9.9	6.0	1.0	0.4	26.6	27.6	1,513
B2GH2	Hw	Fd	Ba	Cw	Ss	Yc	60.3	13.3	12.5	12.2	1.1	0.7	26.8	27.9	8,605
B2GO1	Ba	Hw	Fd	Cw	Dr	Yc	35.5	27.7	18.4	13.2	2.7	2.6	29.7	29.8	159

Existing AU	Spp 1	Spp 2	Spp 3	Spp 4	Spp 5	Spp 6	% Spp 1	% Spp 2	% Spp 3	% Spp 4	% Spp 5	% Spp 6	SIBEC (m)	PSI (m)	Area (ha)
B2GO2	Dr	Hw	Fd	Cw	Ss	Ba	74.0	16.2	3.7	3.4	1.9	0.8	27.1	28.2	125
B2MB2	Ba	Hw	Cw	Yc			50.0	30.0	20.0	0.1			22.9	24.8	112
B2MC1	Cw	Hw	Ba	Fd	Yc	Tw	50.1	35.5	6.4	5.1	2.3	0.5	20.5	23.4	317
B2MC2	Cw	Hw	Fd	Ba	Dr	Yc	51.1	37.8	10.0	0.8	0.2	0.2	21.1	23.6	214
B2MF1	Fd	Hw	Cw	Dr	Ss	Pw	55.0	22.9	16.4	3.6	1.2	0.8	33.4	31.8	93
B2MF2	Fd	Hw	Cw	Dr	Pl	Pw	58.7	28.9	9.8	1.5	1.0	0.2	34.5	32.2	571
B2MH1	Hw	Cw	Fd	Ba	Yc	Pw	66.6	17.2	7.7	6.8	1.4	0.3	23.1	25.6	1,772
B2MH2	Hw	Cw	Fd	Ba	Yc	Dr	56.4	18.9	14.6	8.0	1.0	1.0	24.1	26.2	4,571
B2MO1	Ba	Hw	Cw	Fd	Yc	Tw	36.4	25.1	13.9	11.5	10.4	2.9	20.5	24.0	66
B2MO2	Dr	Hw	Fd	Cw			67.9	15.9	8.4	7.9			22.8	25.7	14
B2PH1	Hw	Cw	Ba	Fd	Yc	Ss	71.5	15.5	4.9	4.8	3.2	0.2	17.5	23.4	300
B2PH2	Hw	Cw	Fd	Ba	Dr	Yc	59.6	19.4	9.7	9.5	1.2	0.6	18.0	23.7	163
B2PO1	Cw	Hw	Fd	Yc	Ba	Hm	42.2	28.6	10.3	10.0	7.9	1.1	18.1	22.0	64
B2PO2	Hw	Cw	Fd	Ba	Pl	Yc	32.3	29.1	19.9	11.9	6.2	0.7	19.6	22.7	20
B3GB1	Ba	Hw	Yc	Cw	Hm	Ss	48.6	34.7	10.9	3.9	1.2	0.7	23.8	22.4	272
B3GB2	Ba	Hw	Yc	Cw	Fd		58.0	38.1	2.0	1.5	0.5		23.7	22.4	407
B3GF2	Fd	Hw	Cw	Dr	Ba		56.6	39.6	2.4	1.1	0.3		29.4	30.2	122
B3GH1	Hw	Ba	Cw	Yc	Fd	Yc	65.9	23.5	6.0	3.2	1.0	0.4	26.2	24.8	958
B3GH2	Hw	Ba	Cw	Fd	Yc	Hm	57.2	26.6	6.8	6.3	2.9	0.1	26.2	24.9	1,583
B3GO1	Cw	Ba	Hw	Yc	Fd	Tw	32.3	28.1	20.4	18.1	1.0	0.1	20.3	22.0	53
B3GO2	Cw	Ba	Hw	Yc	Pl	Fd	59.6	37.4	2.5	0.3	0.1	0.0	20.0	21.7	23
B3MB1	Ba	Hw	Yc	Cw	Fd	Hm	45.8	33.0	12.2	5.9	1.6	1.5	20.5	20.4	208
B3MB2	Ba	Hw	Yc	Cw			50.7	28.7	18.5	2.2			21.3	20.8	103
B3MH1	Hw	Ba	Yc	Cw	Fd	Hm	63.7	20.3	8.2	6.2	1.1	0.5	23.7	23.1	696
B3MH2	Hw	Ba	Cw	Fd	Yc	Dr	54.1	23.7	11.2	7.4	3.4	0.2	23.7	23.2	814
B3MO1	Hw	Cw	Ba	Yc	Fd	Tw	29.2	25.4	17.9	15.0	11.3	1.2	21.5	23.0	18
B3MO2	Yc	Hw	Ba	Cw	Fd		34.5	30.8	17.6	11.4	5.7		19.1	20.9	86
B3PH1	Hw	Ba	Cw	Yc	Fd	Hm	61.9	16.0	9.8	9.6	2.0	0.5	17.7	20.0	131
B3PO1	Ba	Hw	Yc	Hm	Cw	Fd	42.3	21.2	15.5	10.3	7.0	3.6	16.6	18.4	50
B3PO2	Hw	Ba	Cw	Yc	Fd	Pw	44.0	28.4	15.3	7.5	4.2	0.6	18.3	20.2	79
B4PB1	Ba	Hw	Yc	Hm	Cw	Fd	72.4	10.5	9.8	5.4	1.7	0.2	13.5	15.9	236
B4PO1	Hw	Ba	Yc	Hm	Cw	Bp	40.6	33.6	16.7	4.2	3.5	1.4	15.4	17.5	52
B4PO2	Hw	Ba	Yc	Cw	Fd	Hm	39.7	29.6	14.2	11.4	5.1	0.0	14.7	17.1	102
M2AO1	Hw	Cw	Ba	Fd	Yc	Hm	66.8	16.6	9.2	4.3	2.7	0.3	20.7	24.7	45
M3AO1	Hw	Ba	Yc	Cw	Fd	Hm	65.9	15.5	7.2	7.1	3.2	1.1	22.1	21.9	30
M4PO1	Hw	Ba	Fd	Yc	Cw	Hm	48.4	32.4	13.0	6.0	0.2	0.1	14.9	16.3	1

The area-weighted yield curves for each existing managed analysis unit are listed and shown in Appendix B: Existing Managed Yield Tables (SIBEC option) and Appendix C: Existing Managed Yield Tables (PSI option).

8.8.2 Future Stand Volumes

Ecologically-based silviculture strategies for future stands were developed by Western Forest Products staff based on current practice (Table 35). Other TIPSY inputs were standard OAFs (OAF1=15%, OAF2=5%) and utilization limit of 12.5 cm.

Stand density is represented by planting at 1500 sph to reflect both the continued practice to plant almost all harvested areas and the substantial natural in-growth experienced on many sites.

Species and stocking levels are portrayed at this broad average level to simplify modelling. It is recognized that this includes a range of specific prescriptions that for example might include establishment of alder on a small % of the landbase or a greater reliance on natural regeneration in some areas.

Projections of Genetic Worth (GW) were developed from WFP's Saanich Forestry Centre seed inventory, development plans and the Forest Genetics Council business plan for 2006/2007. GW is projected to increase somewhat over the period from 2008-2012 to 2018-2028. Average values by species and elevation zone (subzone / variant) listed in Table 35 will be applied to future managed stands.

Two sets of yield tables were generated; one for the base case which used SIBEC estimates for input into Batch TIPSY 4.1 (Appendix D: Future Managed Yield Tables (SIBEC option)), and a second set of future managed yield tables were generated using PSI estimates for a sensitivity analysis (Appendix E: Future Managed Yield Tables (PSI option)). Table 36 shows area-weighted average site index inputs for each analysis unit.

The base management option includes nitrogen fertilization of the CWHxm2 medium and poor site analysis units. The yield tables include fertilizer applications at 40 and 50 years of age (Appendix F: Future Managed Yield Tables (Fertilization options)). The impact will be relatively small as the total area involved is approximately 2,000 ha.

The area-weighted yield curves for each future managed analysis unit are listed and shown in Appendix D: Future Managed Yield Tables (SIBEC option), Appendix E: Future Managed Yield Tables (PSI option) and Appendix F: Future Managed Yield Tables (Fertilization options).

Table 35 - Silviculture strategies for future stands

Subzone	Site class	Regen method	Regen delay (years)	Planting density (sph)	Sp p 1	Sp p 2	Sp p 3	Pct 1	Pct 2	Pct 3	Genetic gain			
											Fd	Hw	Cw	Yc
CWHxm2	G	P	0	1500	Fd	Cw	Hw	60	20	20	14	15	8	N/A
CWHxm2	M	P	0	1500	Fd	Cw	Hw	60	20	20	14	15	8	N/A
CWHxm2	P	P	0	1500	Fd	Cw	Hw	50	30	20	14	15	8	N/A
CWHvm1	G	P	0	1500	Hw	Fd	Cw	50	30	20	14	15	8	N/A
CWHvm1	M	P	0	1500	Hw	Cw	Ba	60	20	20	N/A	15	8	N/A
CWHvm1	P	P	0	1500	Hw	Cw	Ba	50	30	20	N/A	15	8	N/A
CWHvm2	G	P	0	1500	Hw	Ba	Yc	50	30	20	N/A	9	N/A	20
CWHvm2	M	P	0	1500	Hw	Ba	Yc	50	30	20	N/A	9	N/A	20
CWHvm2	P	P	0	1500	Hw	Yc	Ba	50	30	20	N/A	9	N/A	20
MHmm1	P	P	0	1500	Ba	Hm	Yc	40	30	30	N/A	N/A	N/A	20

Table 36 - Area-weighed average TIPSY site index inputs for future managed stands

Future AU	SIBEC (m)	PSI (m)	Area (ha)
B1GF5	35.1	34.7	579
B1MF5	32.6	32.3	1,884
B1PF5	27.2	27.8	185
B2GH5	26.8	28.0	25,316
B2MH5	23.3	25.8	20,873
B2PH5	17.5	23.2	6,245
B3GH5	26.2	24.8	8,745
B3MH5	23.2	22.9	8.951
B3PH5	17.4	19.6	2,960
B4PB5	13.3	15.5	3,704
M1PF5	27.9	29.0	2
M2AH5	21.4	24.9	70

Future AU	SIBEC (m)	PSI (m)	Area (ha)
M2GH5	25.8	26.5	50
M2MH5	21.2	24.9	473
M2PH5	17.0	23.3	416
M3AH5	21.6	21.7	42
M3GH5	26.0	24.3	397
M3MH5	22.2	22.1	1,059
M3PH5	17.2	19.2	660
M4PB5	12.9	15.0	1,008

8.8.3 Regeneration Delay

The regeneration delay refers to the average time between harvesting and establishment of the next rotation. The average regeneration delay as reported in TFL 19 Annual Reports through until 2004 has decreased until it is now approximately 1.5 years.

Nearly all harvested area is planted and prompt establishment after harvesting has continued to be practiced in the TFL. Planted seedlings are typically one year old. Hence the regeneration delay from harvest until germination of the next crop of planted trees is generally less than 1 year. Also, early seedling growth is assisted by the currently common practice in TFL 19 of fertilization at time of planting.

A one year regeneration delay is appropriate for future managed stands and is incorporated into the yield tables that will be used in the analyses. Note that the yield tables in Appendices D, E and F do not reflect a 1-year regen delay as the tables in the appendices were generated when no regeneration delay was proposed. The yield tables in the Woodstock model will reflect a 1-year regeneration delay and will simply be interpolations of the tables in Appendices D, E and F.

8.8.4 Species Conversion

A small amount of non-productive brush type (NP BR) is converted on a yearly basis within the TFL. This occurs in small patches and is usually contiguous to or surrounded by productive forest land. These areas are site prepared in conjunction with the harvested area and planted. As the area converted on a yearly basis is difficult to quantify but thought insignificant, it will not be explicitly modelled but a slight positive impact on future timber supply may be realized operationally.

8.8.5 Not Satisfactorily Restocked (NSR) Areas

The data set prepared for the analysis includes 4,098 ha, described as not regenerated (NSR). Of this "NSR" area 4,029 ha are in the base case timber harvesting land base with the remainder in marginal areas. The "NSR" area is significantly larger than in operational records as it includes areas planted that did not have a regeneration survey as of 2005 and areas planted in 2006. NSR areas will be regenerated to the appropriate future Analysis Unit.

Table 37 - NSR area

	Total Area (ha)
Base option area	4,029
Marginal area	69

Total	***4,098***

9 NON-RECOVERABLE LOSSES

9.1 Overview

Windthrow, insects, disease and fire can cause catastrophic losses of whole stands of trees. Over the long-term the probability of losses to such natural causes can be predicted. Where losses occur in merchantable stands some of the dead or dying timber may be salvageable. When modelling timber supply, unsalvaged losses are added to the desired harvest forecast and then subtracted from the forecast upon completion of the modelling exercise.

The analysis will model 6,335 m^3/year of non-recoverable losses.

9.2 Windthrow

Historically, windthrow has occurred mainly in relatively small areas. Records for the twelve year period from 1993 to 2004 show an average of 13.4 ha or 9,595 m^3 a year of windthrow in the TFL of which 3,260 m^3 is recovered through salvage. Non-recoverable losses from windthrow are therefore estimated at 6,335 m^3/year.

9.3 Insects and Disease

The forests of TFL 19 have been relatively free of major insect or disease infestations and therefore no losses are associated. There have been no major catastrophic outbreaks causing significant unsalvaged mortality or volume losses. The main active agents have been various defoliators and bark beetles. The last defoliator outbreak was in the mid-70's by western black-headed budworm (*Acleris gloverana*) in stands above 600m near Zeballos. Douglas fir and mountain pine beetle caused pockets of mortality in the mid-60's around Gold River.

Hemlock dwarf mistletoe is widespread throughout merchantable sized stands. Sanitation treatments of advanced regeneration are sometimes required to prevent the spread in newly regenerated western hemlock stands. Usually regenerated stands are not impacted significantly by hemlock dwarf mistletoe.

Root diseases sometimes result in small pockets of mortality. These losses are assumed accounted for by standard operational adjustment factors (OAFs) applied to yield curves. Impacts of laminated root rot (*Phellinus weirii*) are less than observed in other areas. Additional OAF allowances are not applied.

9.4 Fire

The risk of loss of timber due to fire is low within the TFL. The bulk of the TFL has a wet climate characterized by cool, wet summers and fire suppression has been efficient; hence the likelihood of losses to forest fire is small.

10 INTEGRATED RESOURCE MANAGEMENT

10.1 Overview

The intent of this section is to give an overview of the resource inventories available and being used for the timber supply review. The section also describes other resource management information that is being utilized for planning within TFL 19.

10.2 Forest Resource Inventory

Table 38 summarizes the forest resource inventories currently being maintained for the TFL.

Table 38 - Forest resource inventory status

Item	Status	MOF Acceptance Date	Plan
Vegetation Resource Inventory (VRI)	Initiated in 2000. The last component, the statistical adjustment was completed by the Timberline natural Resource Group in early 2006.		Inventory revisions updated annually.
Ecosystems	Mapping completed by Madrone Consulting Ltd (Nov 00).		
Terrain Stability	Completed in 1997 by Terence Lewis et al.		
Karst	Planning-Level Karst Inventory of TFL 19 completed March 31, 2003 by Terra Firma Geoscience Services. Included refinements to the planning-level karst inventory procedures (RISC 2003).		
Recreation Inventory	Recreation inventory completed in 2000 by Jeremy Webb of Recreation Resources Limited. Basis for the TFL 19 portion of the GAR Order to identify Recreation Resource Features for the Campbell River Forest District.	GAR Order Established April, 2006	
Visual Landscape Inventory	Completed by Recreation Resources Limited (Jeremy Webb) in 2000. Basis for the TFL 19 portion of the GAR Order to establish Scenic Areas and Visual Quality Constraints for the Campbell River Forest District.	GAR Order Established December, 2005	

Ungulate Winter Ranges (UWRs)	Revised UWRs for Columbian black tailed deer and Roosevelt elk (U-1-014). Plus replacement UWRs for those removed with deletion of private land from TFL 19.	Approved December 2004. Replacement UWRs established November 2007	
Wildlife Habitat Areas (WHAs)	Six WHAs established – five for Queen Charlotte Goshawks and one for Keen's Long-eared Myotis.	Established December 2004 and April 2000	Draft Marbled Murrelet WHAs defined – refinement and establishment expected in 2008
Item	**Status**	**MOF Acceptance Date**	**Plan**
Old Growth Management areas (OGMAs)	Preliminary draft OGMAs – need further work before review and establishment.		
Stream Classification	Operational stream inventories. Reconnaissance (1:20,000) fish and fish habitat inventories to RIC standards – completed in 1999 and 2002.		On-going with operational planning.
Archaeological	Archaeological Overview Assessment completed by Arcas in 1998. Updated in early 2007 by Baseline Archaeological Services Ltd. Site-specific maps and description on file (held in confidence at request of First Nations).	Undertaken by the Campbell River Forest District	Used in operational planning
Operability	Completed by WFP in 1999.	October 2000	

10.3 Forest Cover Requirements

10.3.1 Forest Cover Objectives - Rationale

The rationale for each forest cover objective reported in the timber analysis is described below. The rationales are based on the unique attributes of the TFL.

10.3.2 Visual Quality

The District Manager of the Campbell River Forest District in a Government Actions Regulation Order established Visual Quality Objectives (VQOs) for the Forest District on December 14, 2005. This includes VQOs in TFL 19.

Visual Quality Objectives to be modelled in the timber supply analysis are Retention (R), Partial Retention (PR) and Modification (M). The amount of area that can be disturbed (i.e. has not achieved visually effective green-up) is 5%, 15% and 25% for each VQO respectively. These levels are set at the upper end of the % disturbance range for use in timber supply analyses as visual landscape design during cutblock layout has become common practice in sensitive viewscapes. A sensitivity analysis in which these percentages are reduced to the mid-point of the range for each VQO (2.5%, 10% and 20% respectively) will indicate the sensitivity of timber supply to management of visual quality objectives and the design of cutblocks within visually sensitive areas.

A 5 m visually effective green-up (VEG) height is proposed for TFL 19. As Woodstock uses volume over age curves for yield tables, an age surrogate of 15 years old (3 periods) will be established to represent VEG height for each analysis unit.

Table 39 outlines the management assumptions for dealing with visual quality within the TFL. The areas reported are based on the recently completed inventory.

Table 39 – Visual Quality Management Assumptions

Visual Quality Objective	Productive Forest	THLB Area	Disturbance %
M	32,306	17,577	25%
PR	20,609	12,810	15%
R	1,277	895	5%

10.3.3 Adjacent Cutblock Green-up

A 3 metre green-up height in General and Special Resource Management Zones is proposed for areas without visual quality objectives. A 10 year (2 periods) age surrogate will be used within the model to represent the 3 m height. This is a reasonable approximation (on average) with prompt planting, planting of improved seedlings and fertilization at time of planting in some areas. Work elsewhere has shown that early height growth for western hemlock has been underestimated – refer to section 8.4.2 in the TFL 44 MP #4 Information Package. The Woodstock model applies cover class constraints by period. The analysis will use five-year periods to coincide with the five-year interval for AAC determinations. Ten years is more appropriate than fifteen years for the 3m requirement. As Woodstock does not have the capability to spatially model adjacency requirements, a proxy will be used: a maximum of 25% of the THLB within a zone but outside of VQO polygons will be able to be less than 10 years old. No green-up requirements will be modelled in the Enhanced Resource Management Zones (outside of VQO polygons) as the approved FSP contains a result/strategy that in addressing objective #7 of the VILUP Higher Level Plan Order effectively eliminates green-up in these zones (due to the maximum 40 hectare cutblock size limit being removed and no alternate limit specified by the VILUP order).

10.3.4 Landscape Level Biodiversity

Biodiversity Emphasis Options (BEOs) and Landscape Units were designated through the *Order Establishing Provincial Non-Spatial Old Growth Objectives* effective June 30, 2004 (NSOG order). This order is in effect until Old Growth Management Areas (OGMAs) are spatially determined through Landscape Unit planning. As OGMAs are not yet established within TFL 19, an old seral stage cover constraint will be applied based on the designations in the NSOG order. For the forest types within TFL 19, old forest is defined as stands >250 years old. The old seral target is based on the combination of BEO, BEC variant, and the natural disturbance type (NDT) of the variant.

Landscape units with a Low BEO will have the old seral target drawn down to 1/3 for the first rotation (80 years). The target for the end of the second rotation (160 years) will be 2/3 of the full target, with the full old seral target being achieved by the end of the third rotation (240 years). Intermediate and High BEO landscape units will be subject to the full target constraint throughout the planning period. Table 40

indicates the landscape biodiversity constraints that will be applied for old seral forest. For a breakdown of the current forest age by landscape unit and variant, see Table 22.

Table 40 – Landscape biodiversity assumptions

Landscape Unit	BEO	BEC Variant	NDT	Area (ha)		Old Seral constraint (% of productive)		
				Productive	THLB	1st rotation	After 2nd rotation	After 3rd rotation
Burman	Low	CWHvm1	1	5,998	4,573	4.3	8.7	13
		CWHvm2	1	2,373	1,171	4.3	8.7	13
		CWHxm2	2	0	0	N/A	N/A	N/A
		MHmm1	1	541	152	6.3	12.7	19
		MHmmp1	5	9	0	0	0	0
Eliza	Low	CWHvm1	1	4,133	3,020	4.3	8.7	13
		CWHvm2	1	726	378	4.3	8.7	13
		MHmm1	1	69	5	6.3	12.7	19
Gold	High	CWHvm1	1	14,418	10,305	19	19	19
		CWHvm2	1	13,620	7,465	19	19	19
		CWHxm2	2	3,970	2,329	13	13	13
		MHmm1	1	7,968	2,700	28	28	28
		MHmmp1	5	181	0	0	0	0
Kleeptee	Low	CWHvm1	1	6,202	4,474	4.3	8.7	13
		CWHvm2	1	4,924	2,419	4.3	8.7	13
		CWHxm2	2	584	321	3	6	9
		MHmm1	1	1,522	167	6.3	12.7	19
Tahsis	Low	CWHvm1	1	12,581	9,037	4.3	8.7	13
		CWHvm2	1	5,468	2,471	4.3	8.7	13
		MHmm1	1	1,482	172	6.3	12.7	19
		MHmmp1	5	27	0	0	0	0
Tlupana	Intermediate	CWHvm1	1	22,350	15,810	13	13	13
		CWHvm2	1	11,099	4,460	13	13	13
		MHmm1	1	3.084	199	19	19	19
		MHmmp1	5	26	0	0	0	0
Zeballos	Low	CWHvm1	1	7,204	5,200	4.3	8.7	13
		CWHvm2	1	4,745	2,269	4.3	8.7	13
		MHmm1	1	1,134	304	6.3	12.7	19
		MHmmp1	5	13	3	0	0	0

10.3.5 Reductions to Reflect Volume Retention in Cutblocks

Where feasible and wildlife objectives can be met, WTRA are located in constrained areas such as riparian reserves, inoperable stands or unstable slopes. In order to capture those WTRA located in harvestable areas a volume reduction will be implemented in the timber supply model. A review of 9 years of harvested cutblocks (1997-2005) in the TFL indicated that total stand-level retention was averaging about 14% (see Appendix I: Results of Review of 1997-2005 Harvested Cutblocks). As per the FSP, future WTRA retention is expected to average 7%. The remaining 7% is expected to be retained but be classified as some other type of stand-level retention (e.g. riparian management areas). Assuming 75% of the total stand-level retention is in constrained areas (based on the *Forest Practices Code Timber Supply Impact Analysis*) a volume reduction of 3.5% (0.25 x 14%) is recommended for use to account for operable area in stand-level retention. The deduction is rounded up for precaution to 4%. It is expected that this retention level will also address gully management areas left around non-fish bearing streams and account for basal area retention in riparian management zones and other areas.

10.3.6 Community Watersheds

The Village of Tahsis draws its water supply from McKelvie Creek, a designated community watershed draining into the Tahsis River. Due to the small size of this watershed (2112ha total area within TFL 19; 1145ha of productive forest; 483ha of THLB) issues surrounding water quality will mainly be dealt with at an operational level. A cover constraint will be applied so no more than 5% of the productive area within the watershed will be covered with stands less than 5 years old.

10.3.7 Higher Level Plans

The order establishing Resource Management Zones and Resource Management Zone objectives within the area covered by the Vancouver Island Land Use Plan came into effect as of December 1, 2000. Each Special Management Zone (SMZ) established by the order has an objective of maintaining mature seral forest over one quarter to one third of the forested area of the SMZ; the final target is to be established through landscape unit planning which has not yet been completed for TFL 19.

There are portions of two SMZ's within TFL 19 – SMZ 6 (Woss-Zeballos) and SMZ 11 (Schoen-Strathcona). For this analysis, a constraint will be incorporated that maintains 25% of the productive forest land base in the mature and/or old seral stage within these SMZ's.

10.4 Timber Harvesting

10.4.1 Minimum Harvestable Age

Minimum harvestable ages are simply minimum criteria for use in the timber supply model. While harvesting may occur in stands at or below the minimum requirements, in order to meet forest level objectives (i.e. maintaining overall timber flows) many stands will not be harvested until well past the minimum timber production ages because consideration of other resource values may take precedence or timber may be in ample supply.

Minimum harvestable ages were selected based on leading species and site productivity (see Table 41). The minimum volume was selected to be 350m^3 per hectare. Both minimum age and minimum volume requirements must be met before a stand can be harvested; this results in several analysis units not being eligible until older than the minimum age in order that the minimum volume requirement is met. These minimum harvest criteria will be used in the new analysis, and sensitivity analysis will investigate the impacts of using higher minimums. A minimum harvestable age of 60 years was used in the previous two analyses. Operational planners indicate that little activity has occurred in stands aged between 50 and 60 years but that they expect to be harvesting Douglas fir stands in this age range on better sites in the near future. The timber supply analysis will report on the volume harvested in stands less than 60 years old. These minimum harvest ages were selected to reflect the expectation that stands on poorer sites take longer to reach an economically viable condition (DBH and height distributions) than a similar stand on a good site.

Table 41 - Minimum Harvest Ages

	Minimum Harvest Age by Leading Species (years)		Minimum Volume (m^3/ha)
Site Productivity	**Douglas fir**	**Other**	
Good	50	60	350
Medium	60	80	350
Poor	70	100	350

10.4.2 Initial Harvest Rate

The strategy is to gradually adjust harvest levels towards the best estimate of the Long Term Harvest Level (LTHL) for the forest.

The harvest level for the first five-year period of the analysis will initially be set at 813,800 m^3, 3.8% lower than the current AAC of 845,947 m^3. This is consistent with the change in harvest in the second period of the MP #9 analysis. For the first period, 300,000 m^3 will be added to reflect the awarding of licences to first nations for undercut volume in TFL 19 and the portion of the Hisnit woodlot that remains within TFL 19 until March 31, 2010. A total of 350,000 m^3 of undercut volume has been or will be awarded to first nations of which approximately 17,000 m^3 has been logged as of October 2008. For simplicity the entire Hisnit woodlot has been removed from the data set for the analysis eventhough a portion remains within TFL 19 until March 31, 2010. WFP estimates that this area will provide 33,000 m^3 of harvest to WFP in the first period of the analysis. Table 42 summarizes this additional volume to be scheduled in the first period of the analysis.

Table 42 - Additional Volume for First Period of Analysis

Description	**Volume (m^3)**
Total TFL 19 undercut volume awarded or in discussion	350,000
Less: TFL 19 undercut volume harvested to October 2008	(17,000)
Less: Estimated WFP harvest in Hisnit woodlot area	(33,000)
Total volume to add to first period of analysis	**300,000**

It should be noted that the undercut volume is attributable to the entire TFL and as such a portion should be allocated to the BCTS management area.

This “initial harvest rate” provides a starting point for the analysis. However, the timber harvesting land base and other assumptions have changed since the MP #9 analysis. Therefore, the initial harvest level may subsequently be adjusted to achieve harvest flow objectives over the entire planning period. For all subsequent periods, harvest level changes will be based on an initial harvest rate that does not include the undercut volume.

10.4.3 Harvest Rules

The analysis will be undertaken with the model Woodstock, using optimization to project harvest schedules. With optimization, the model determines harvest order to achieve the defined objective. This is different from a simulation approach where rules are specified for harvest priority.

Harvest constraints will, however, be applied to model a gradual transition from old-growth harvest to second-growth harvest and to reflect performance within the non-conventional portion of the THLB. Recent harvest numbers and short-term plans indicate low levels of second-growth harvest in TFL 19. Second-growth harvest in the base case option will commence at approximately 5% of the total harvest and will gradually increase over time until the transition to second-growth harvest is largely complete (small volumes of old-growth harvest may continue because of the scheduling impacts of cover class constraints).

As discussed in section 6.8 recent harvest within the non-conventional portion of the THLB has been approximately 6.0% of the total harvest area whereas it represents approximately 12% of the THLB. The level of performance in the non-conventional THLB is not anticipated to increase significantly in the near future. Therefore, a 50,000 m^3/year constraint will be applied in the timber supply model. This value represents approximately 6.1% of the initial harvest level.

10.4.4 Silviculture Systems

The majority of the TFL is currently harvested using clearcut and clearcut with reserves silviculture systems. The retention silviculture system (group retention) has been used on a small number of cutblocks. There is no significant selection or partial cutting with dispersed retention occurring at this time.

WFP is currently reviewing its Forest Strategy. Included in this is a program for conserving biodiversity on company tenures. The approach is to vary the use of retention systems and the amount of stand level retention by Resource Management Zones of the Vancouver Island Land Use Plan and by ecosection and is being phased in over the next few years.

In Enhanced Management Zones the retention system will be used for 30% of the harvested area in the high wind environment of the northwest coast of Vancouver Island (Nahwitti Lowlands and the northern portion of the Windward Island Mountains Ecosection), and 50% of the harvested area in other Ecosections (60% in drier variants – CWHdm, xm, mm1). The minimum long-term stand-level retention target is 10% (15% in drier variants – CWHdm, xm, mm1).

In General Management Zones the retention system will be used for 40% of the harvested area in the high wind environment of the northwest coast of Vancouver Island (Nahwitti Lowlands and the northern portion of the Windward Island Mountains Ecosection), and 60% of the harvested area in other Ecosections (70% in drier variants – CWHdm, xm, mm1). The minimum long-term stand-level retention target is 15% (20% in drier variants – CWHdm, xm, mm1).

In Special Management Zones the VILUP Higher Level Plan Order specifies: "applying a variety of silvicultural systems, patch sizes and patch shapes across the zone, subject to a maximum cutblock size of 5 ha if clearcut, clearcut with reserves or seed tree silvicultural systems are applied, and 40 ha if shelterwood, selection or retention silvicultural systems are applied." A minimum of 20% long-term stand-level retention is recommended for SMZs in the Western Forest Strategy based on both social and biological criteria.

This retention is long-term - it must remain for at least one rotation. TFL 19 is roughly split two-thirds in the northern portion of the Windward Island Mountains Ecosection and one-third in the Northern Island Mountains Ecosection. Applying the above retention system requirements to the Ecosection/VILUP Zone/BEC variant combinations present within TFL 19 results in an average overall stand level retention requirement of 5.6% for TFL 19.

A sensitivity analysis will be done where current stand yields are further reduced by 3% to reflect the area retained to meet the retention targets discussed above. This assumes the other 2.6% is already accounted for by all other netdowns. In this sensitivity analysis, future stand yields will be further reduced by 5% to reflect the area retained (3%) and the impact of trees retained in the first harvest entry on growth and yield of the future stands (2%).

10.4.5 Harvest Flow Objectives

Harvest projections will reflect a balance of the following objectives:

- Gradually adjust harvest levels towards the best estimate of the long-term harvest level;
- Limit harvest reductions per decade to no more than 10% unless greater reductions are necessitated by timberland reallocation to higher land use; and
- Achieve a stable long-term harvest level.

11 Glossary

Allowable Annual Cut (AAC)	The rate of timber harvest permitted each year from a specified area of land, usually expressed as cubic metres per year.
Analysis Unit (AU)	A grouping of forest types – for example, by biogeoclimatic zone, site productivity, leading tree species, and age - done to simplify analysis and the generation of timber yield tables.
Base case harvest forecast (Current Management Option)	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.
Biodiversity (biological diversity)	The diversity of plants, animal 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 zones and variants (BEC)	A large geographic area with broadly homogeneous climate and similar dominant tree species.
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 cutblocks must achieve a desired condition (green-up) before nearby or adjacent areas can be harvested.
Forest inventory	An assessment of 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 wildlife habitat.
Forest and Range Practices Act	Legislation that governs forest and range practices and planning, with a focus on ensuring management of all forest values.
Forest type	The classification or label given to a forest stand, usually based on tree species composition.

11 Glossary

Free-growing	An established seedling of an acceptable species that is free from growth-inhibiting brush, weeds and excessive tree competition.
Geographic Information System (GIS)	A geographic information system, also known as a geographical information system or geospatial information system, is a system for capturing, storing, analyzing and managing data and associated attributes which are spatially referenced to the Earth.
Green-up	The time needed after harvesting for a stand of trees to reach a desired condition (usually expressed as 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 potential flow of timber harvest 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 a 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.
Inoperable areas	Areas defined as unavailable for timber 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.
Karst features	Karst is a distinctive topography that develops as a result of the dissolving action of water on carbonate bedrock (usually limestone, dolomite or marble). Karst features include fluted rock surfaces, vertical shafts, sinkholes, sinking streams, springs, complex sub-surface drainage systems and caves.

11 Glossary

Landscape-level biodiversity	The *Landscape Unit Planning Guide* and the *Order Establishing Provincial Non-Spatial Old Growth Objectives* provide objectives for maintaining biodiversity at the landscape level and stand level. At the landscape level, objectives are provided for the maintenance of old growth.
Landscape unit	A planning area based on topographic or geographic features, that is appropriately sized (up to 100,000ha), 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.
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 specifications for minimum harvestable ages, utilization levels, and integrated resource management and silviculture and pest management programs.
Model	An abstraction and simplification of reality constructed to help understand an actual system. Forest managers and planners have made extensive use of models, such as maps, classification systems and yield projections, to help management activities.
Natural disturbance type (NDT)	An area that is characterized by a natural disturbance regime, such as wildfires and wind, which affects the natural distribution of seral stages. For example areas subject to less frequent stand-initiating disturbances usually have more old forests.
Non-recoverable losses	The volume of timber killed or damaged annually by natural causes (e.g. fire, wind, insects and disease) that is not harvested.
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.

11 Glossary

Riparian area	Areas of land adjacent to wetlands or bodies of water such as swamps, streams, rivers or lakes.
Riparian habitat	The stream bank and flood plain area adjacent to streams or water bodies.
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 the base case.
Site index	A measure of site productivity. The indices are reported as the average height, in metres, that the tallest trees in a stand are expected to achieve at 50 years (age is measured at 1.3 metres above the ground).
Site Index by Biogeoclimatic Ecosystem Classification site series (SIBEC)	Site index estimates for tree species according to site units of the Biogeoclimatic Ecosystem Classification system of British Columbia.
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.
TIPSY (Table Interpolation Program for Stand Yields)	A BC 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 (THLB)	Crown forest land within the TFL where timber harvesting is considered both acceptable and economically feasible, given objectives for all relevant forest values, existing timber quality, market values and harvesting 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.
Tree farm licence (TFL)	Provides rights to harvest timber, and outlines responsibilities for forest management, in a particular area.
Ungulate	A hoofed herbivore, such as a deer.

11 Glossary

VDYP (Variable Density Yield Prediction model)	An empirical yield prediction system supported by the BC Forest Service designed to predict average yields and provide forest inventory over large areas (e.g. TFLs). It is intended for use in unmanaged natural stands of pure or mixed species composition.
Volume estimates (yield projections)	Estimates of yields from forest stands over time. Yield projections can be developed for stand volume, stand diameter or specific products.
Watershed	An area drained by a stream or river. A large watershed may contain several smaller watersheds (basins).
Wildlife tree	A standing live or dead tree with special characteristics that provide valuable habitat for wildlife.

APPENDICES

Appendix A: Natural Immature Yield Tables

Appendix B: Existing Managed Yield Tables (SIBEC option)

Appendix C: Existing Managed Yield Tables (PSI option)

Appendix D: Future Managed Yield Tables (SIBEC option)

Appendix E: Future Managed Yield Tables (PSI option)

Appendix F: Future Managed Yield Tables (Fertilization options)

Appendix G: Timberline Memo Re: SIBEC and PSI Estimates for TFL 19

Appendix H: SIBEC and PSI Estimates for Major Site Series in TFL 19

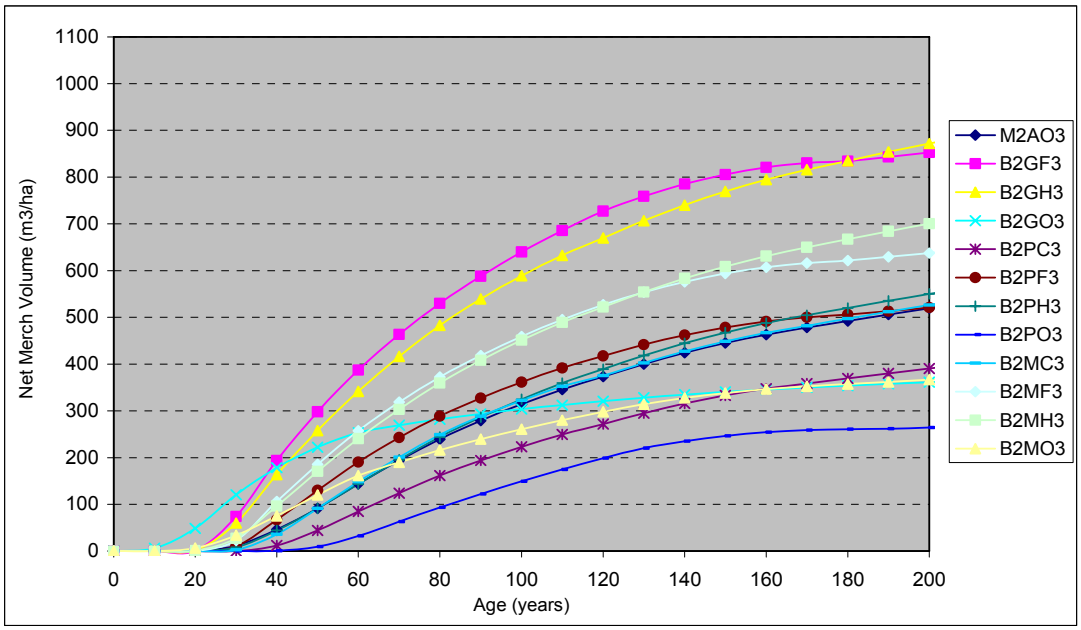
Appendix I: Results of Review of 1997-2005 Harvested Cutblocks

Appendix A: Natural Immature Yield Tables

Net Merchantable Volume Yield Curves

Natural Immature Stands within the CWHvm1 Subzone

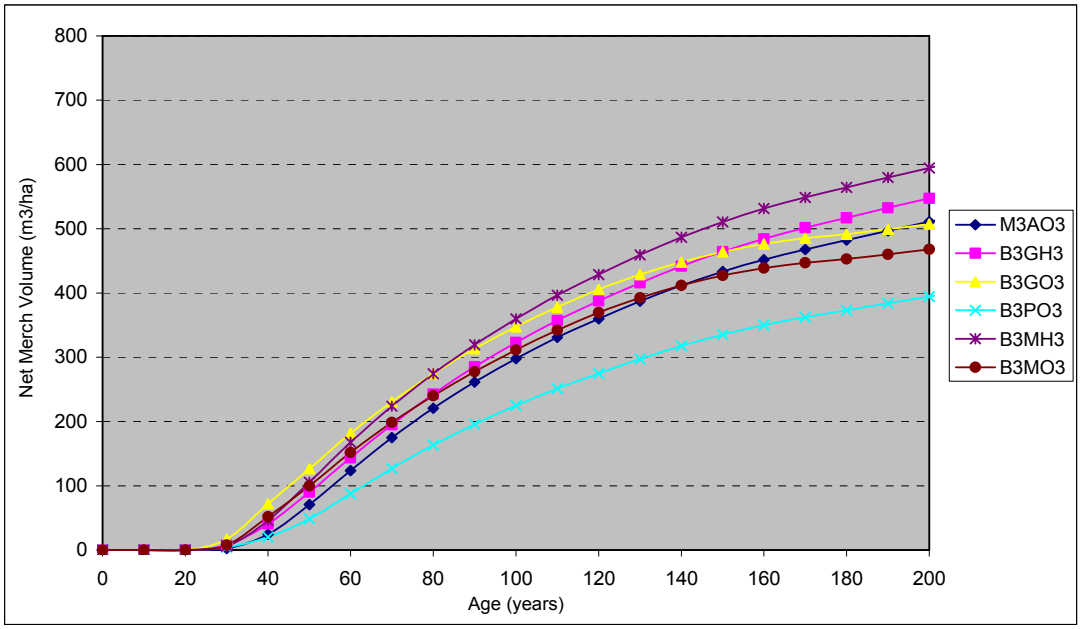
	Analysis Units											
Age	M2AO3	B2GF3	B2GH3	B2GO3	B2PC3	B2PF3	B2PH3	B2PO3	B2MC3	B2MF3	B2MH3	B2MO3
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	6	0	0	0	0	0	0	0	0
20	1	0	1	49	0	0	0	0	0	0	1	6
30	12	74	60	121	0	11	8	0	2	23	27	34
40	46	194	163	178	12	67	44	0	36	106	96	76
50	91	298	258	222	44	130	91	9	91	186	170	120
60	144	387	342	253	85	190	143	32	148	257	240	161
70	194	463	416	269	124	243	196	63	201	319	303	190
80	240	530	483	282	162	289	244	93	249	372	359	216
90	279	588	539	294	194	327	286	122	288	419	408	239
100	314	640	589	304	223	361	325	149	322	459	451	261
110	346	686	633	313	249	391	359	175	352	495	489	280
120	373	727	670	321	272	418	389	199	375	527	522	298
130	400	759	707	328	295	442	418	220	402	554	554	314
140	424	785	740	334	316	462	445	235	427	576	583	328
150	445	806	769	340	333	478	468	246	449	594	609	338
160	463	821	794	345	347	491	488	254	467	607	631	346
170	478	830	816	350	359	500	504	259	482	616	650	353
180	492	834	835	354	369	506	520	261	497	622	667	357
190	506	843	854	358	380	513	535	262	512	629	684	362
200	520	853	872	361	391	521	550	264	527	638	700	367
210	532	862	889	365	401	528	564	267	540	646	716	372
220	544	871	905	368	413	535	577	270	557	653	730	377
230	556	879	919	371	425	542	589	272	573	661	743	382
240	567	887	933	374	437	548	601	275	588	667	756	386
250	577	894	946	376	449	554	612	277	603	674	767	390
260	580	895	951	378	451	557	616	278	606	676	772	392
270	582	896	956	379	452	558	620	280	607	677	776	393
280	584	897	960	381	454	559	623	281	609	678	779	395
290	586	897	963	382	455	559	625	282	610	679	782	396
300	588	898	966	383	457	560	628	283	612	679	784	398
310	589	898	968	384	458	560	630	283	613	680	786	399
320	590	898	970	385	459	561	631	284	614	680	788	400
330	591	898	972	386	460	561	633	284	614	681	790	400
340	592	898	973	386	461	561	634	283	615	681	791	401
350	592	898	974	387	462	561	635	284	615	681	792	401



Net Merchantable Volume Yield Curves

Natural Immature Stands within the CWHvm2 Subzone

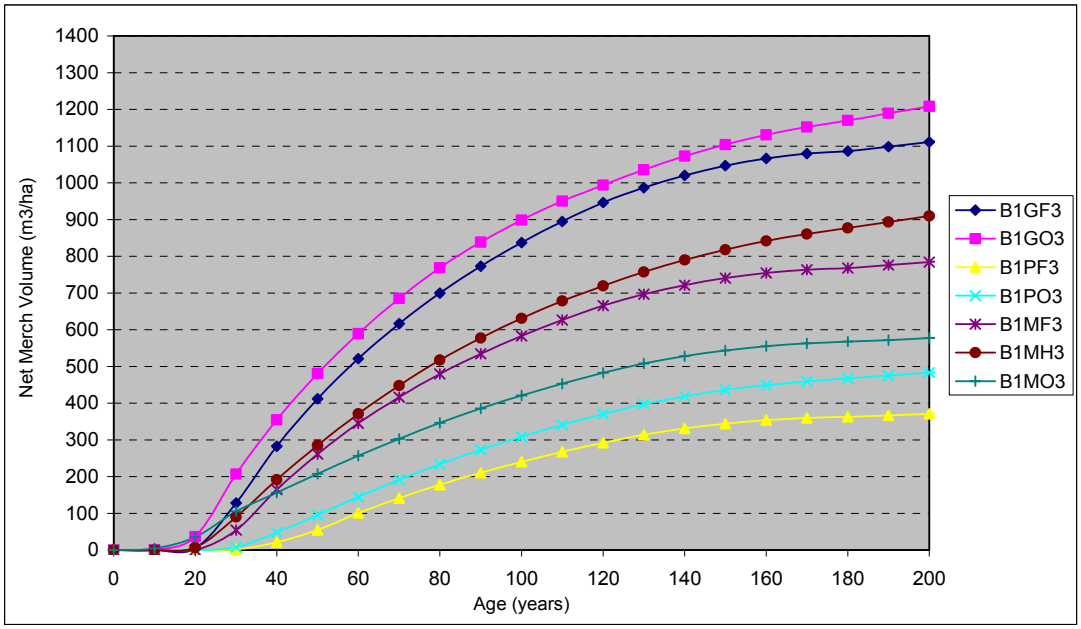
	Analysis Units					
Age	**M3AO3**	**B3GH3**	**B3GO3**	**B3PO3**	**B3MH3**	**B3MO3**
0	0	0	0	0	0	0
10	0	0	0	0	0	0
20	0	0	0	0	0	0
30	2	8	17	4	6	8
40	24	41	72	20	46	52
50	71	90	127	49	106	100
60	124	143	182	88	168	152
70	175	195	231	127	224	199
80	221	243	274	163	274	240
90	261	285	313	196	319	277
100	298	323	347	225	360	311
110	331	357	378	251	396	342
120	360	387	406	275	429	370
130	387	416	429	298	459	392
140	412	442	448	318	487	412
150	433	464	464	335	511	427
160	452	484	476	350	531	439
170	468	501	485	362	549	447
180	482	517	492	373	564	453
190	497	533	499	384	580	460
200	511	547	507	394	595	468
210	524	561	514	404	608	475
220	536	574	522	414	621	483
230	548	586	528	423	633	490
240	559	598	534	432	645	497
250	570	609	540	440	655	504
260	574	614	543	443	660	506
270	577	619	545	446	664	508
280	580	623	547	448	668	509
290	583	626	549	450	671	511
300	586	630	551	452	674	512
310	588	633	552	453	677	513
320	590	636	554	455	679	514
330	592	638	555	456	681	515
340	594	640	556	457	683	516
350	595	642	557	458	684	517



Net Merchantable Volume Yield Curves

Natural Immature Stands within the CWHxm2 Subzone

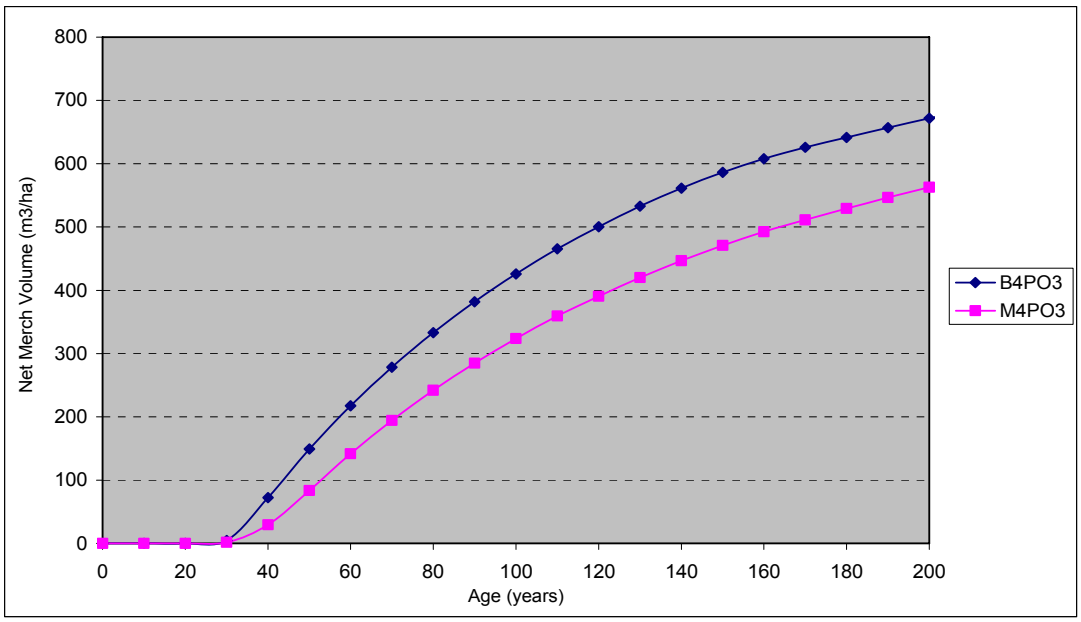
	Analysis Units						
Age	**B1GF3**	**B1GO3**	**B1PF3**	**B1PO3**	**B1MF3**	**B1MH3**	**B1MO3**
0	0	0	0	0	0	0	0
10	0	1	0	0	0	0	4
20	4	36	0	0	0	7	35
30	128	207	2	8	54	90	105
40	282	354	21	48	165	192	157
50	412	481	55	96	261	285	208
60	521	590	101	145	345	371	257
70	616	685	142	191	417	448	303
80	700	769	178	234	479	517	346
90	773	838	211	273	534	577	385
100	837	898	240	308	583	631	421
110	895	950	267	341	627	678	453
120	946	994	292	371	666	719	483
130	987	1036	314	397	696	757	508
140	1020	1073	331	419	721	790	528
150	1047	1104	344	436	741	818	543
160	1066	1131	354	449	755	841	555
170	1080	1152	360	460	764	861	563
180	1086	1170	363	467	768	877	568
190	1099	1189	367	475	776	893	572
200	1111	1208	371	483	784	909	577
210	1124	1225	376	491	793	924	583
220	1135	1242	380	498	801	938	588
230	1147	1257	384	505	808	951	593
240	1158	1271	388	512	816	964	597
250	1168	1284	391	518	822	975	601
260	1169	1288	393	521	823	979	604
270	1170	1290	394	523	824	983	606
280	1171	1292	395	525	825	986	607
290	1171	1293	397	527	825	989	608
300	1171	1294	397	529	826	991	609
310	1171	1294	398	530	826	993	610
320	1171	1294	399	531	826	995	611
330	1171	1293	399	532	826	996	611
340	1171	1292	399	533	826	997	612
350	1171	1291	399	533	826	997	612



Net Merchantable Volume Yield Curves

Natural Immature Stands within the MHmm1 Subzone

	Analysis Units	
Age	**B4PO3**	**M4PO3**
0	0	0
10	0	0
20	0	0
30	5	2
40	72	29
50	149	84
60	217	142
70	278	194
80	333	242
90	382	285
100	426	324
110	465	359
120	500	390
130	533	420
140	561	447
150	586	471
160	608	492
170	626	511
180	641	529
190	657	547
200	672	563
210	685	578
220	698	592
230	709	606
240	720	619
250	730	631
260	735	637
270	740	643
280	744	648
290	748	653
300	751	658
310	753	662
320	756	665
330	758	669
340	760	672
350	761	675

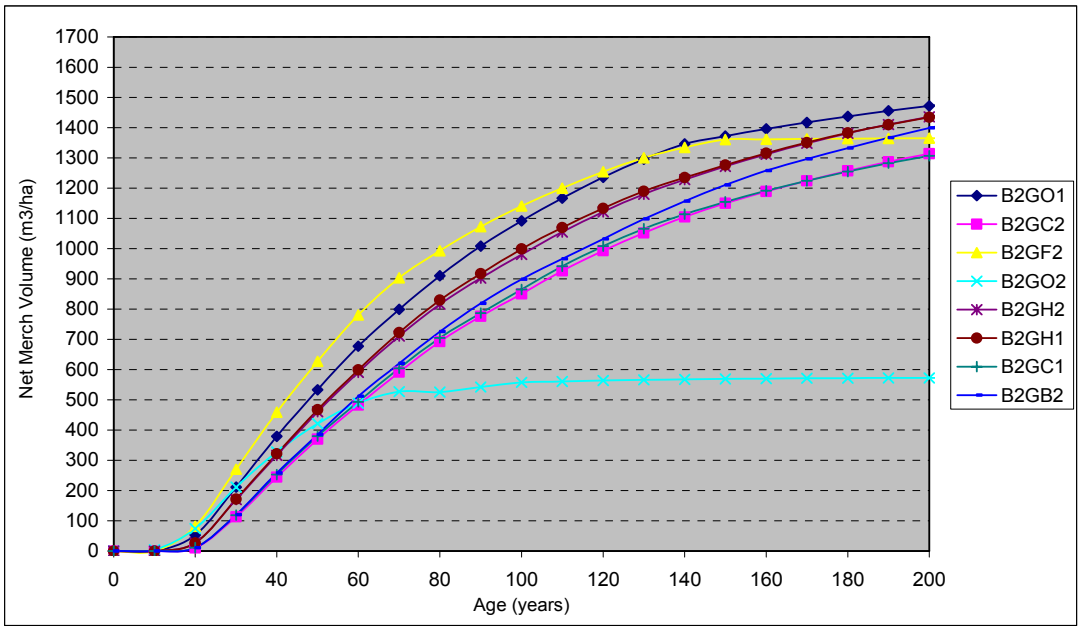


Appendix B: Existing Managed Yield Tables (SIBEC option)

Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm1 Subzone (SIBEC scenario, good productivity)

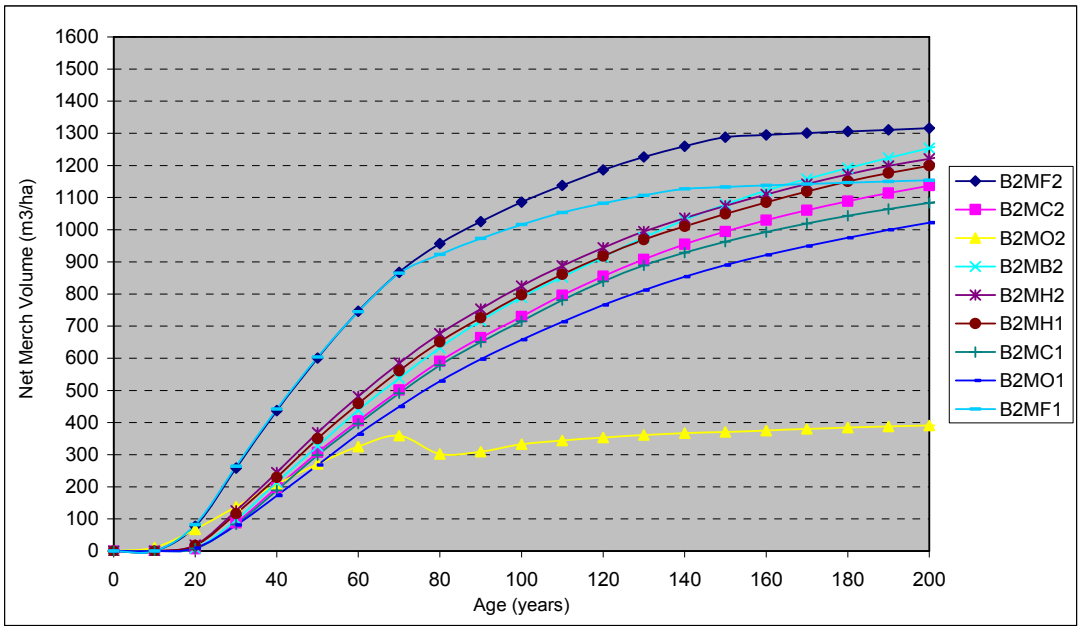
	Analysis Units							
Age	**B2GO1**	**B2GC2**	**B2GF2**	**B2GO2**	**B2GH2**	**B2GH1**	**B2GC1**	**B2GB2**
0	0	0	0	0	0	0	0	0
10	0	0	0	5	0	0	0	0
20	53	10	82	74	28	27	11	10
30	212	113	270	212	170	172	119	120
40	379	245	459	328	317	322	253	258
50	534	370	628	421	461	468	380	385
60	678	483	780	489	591	599	494	512
70	799	592	903	527	711	723	605	621
80	910	693	993	526	816	830	705	725
90	1008	776	1072	542	902	917	787	819
100	1092	851	1141	558	981	999	865	899
110	1167	926	1200	561	1055	1069	942	966
120	1236	993	1254	564	1121	1133	1008	1032
130	1295	1052	1300	566	1180	1190	1066	1097
140	1346	1105	1335	568	1228	1235	1114	1157
150	1372	1150	1360	569	1271	1277	1155	1211
160	1396	1189	1362	570	1312	1315	1192	1258
170	1418	1224	1363	571	1348	1351	1225	1297
180	1437	1257	1364	572	1381	1383	1255	1333
190	1456	1287	1365	572	1410	1410	1282	1367
200	1471	1314	1366	572	1436	1434	1307	1399
210	1486	1340	1366	572	1460	1455	1332	1428
220	1498	1367	1367	573	1482	1476	1358	1456
230	1508	1391	1367	573	1503	1494	1381	1480
240	1518	1414	1368	573	1522	1512	1403	1500
250	1527	1435	1368	573	1540	1528	1424	1520
260	1534	1453	1368	573	1557	1543	1441	1538
270	1542	1470	1368	573	1571	1556	1457	1555
280	1547	1486	1368	573	1581	1565	1472	1571
290	1552	1501	1368	573	1590	1573	1486	1586
300	1552	1501	1368	573	1590	1573	1486	1586
310	1552	1501	1368	573	1590	1573	1486	1586
320	1552	1501	1368	573	1590	1573	1486	1586
330	1552	1501	1368	573	1590	1573	1486	1586
340	1552	1501	1368	573	1590	1573	1486	1586
350	1552	1501	1368	573	1590	1573	1486	1586



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm1 Subzone (SIBEC scenario, medium productivity)

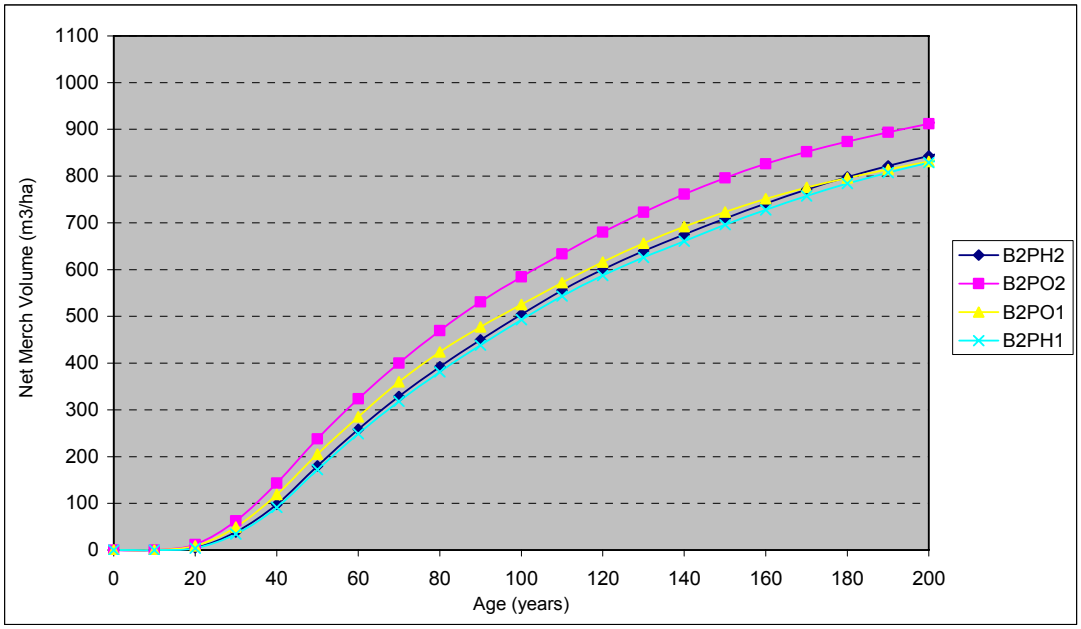
	Analysis Units								
Age	**B2MF2**	**B2MC2**	**B2MO2**	**B2MB2**	**B2MH2**	**B2MH1**	**B2MC1**	**B2MO1**	**B2MF1**
0	0	0	0	0	0	0	0	0	0
10	0	0	11	0	0	0	0	0	0
20	77	7	68	8	19	17	8	9	82
30	258	88	138	98	125	116	83	81	264
40	437	197	207	214	245	229	189	173	442
50	601	307	271	326	368	349	298	267	603
60	746	405	325	438	481	459	397	363	745
70	867	501	359	538	585	561	491	449	864
80	957	590	302	632	676	651	579	528	923
90	1025	664	310	717	753	726	650	597	972
100	1086	730	333	790	825	798	715	657	1016
110	1138	796	344	853	888	861	781	713	1054
120	1186	855	354	915	944	918	839	766	1082
130	1227	908	362	975	995	969	889	812	1107
140	1260	954	367	1030	1036	1010	929	853	1127
150	1288	995	371	1079	1074	1049	963	890	1133
160	1295	1030	375	1122	1110	1085	993	921	1138
170	1301	1061	380	1158	1142	1119	1020	949	1142
180	1306	1089	384	1192	1172	1150	1043	975	1146
190	1311	1114	388	1224	1198	1176	1064	999	1150
200	1316	1137	391	1254	1221	1199	1084	1021	1153
210	1320	1161	394	1281	1243	1220	1103	1043	1156
220	1324	1184	396	1308	1264	1240	1123	1063	1158
230	1327	1206	396	1332	1282	1258	1140	1081	1159
240	1330	1227	396	1352	1299	1275	1157	1098	1161
250	1332	1246	396	1372	1315	1290	1172	1114	1163
260	1333	1262	396	1390	1330	1304	1186	1127	1163
270	1334	1277	396	1407	1343	1316	1198	1140	1163
280	1334	1292	396	1424	1352	1325	1210	1151	1163
290	1334	1305	396	1438	1361	1333	1221	1160	1163
300	1334	1305	396	1438	1361	1333	1221	1160	1163
310	1334	1305	396	1438	1361	1333	1221	1160	1163
320	1334	1305	396	1438	1361	1333	1221	1160	1163
330	1334	1305	396	1438	1361	1333	1221	1160	1163
340	1334	1305	396	1438	1361	1333	1221	1160	1163
350	1334	1305	396	1438	1361	1333	1221	1160	1163



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm1 Subzone (SIBEC scenario, poor productivity)

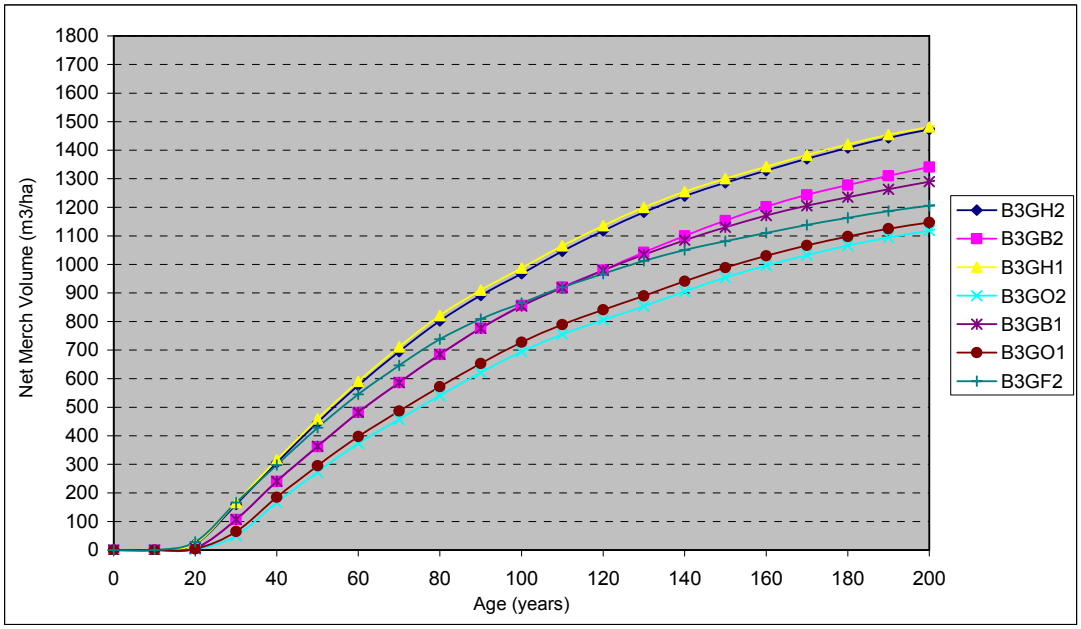
	Analysis Units			
Age	**B2PH2**	**B2PO2**	**B2PO1**	**B2PH1**
0	0	0	0	0
10	0	0	0	0
20	5	12	9	4
30	39	63	49	34
40	98	143	119	91
50	180	238	205	172
60	258	324	285	249
70	329	400	360	318
80	392	470	424	381
90	450	531	478	438
100	504	585	525	493
110	556	634	572	543
120	600	680	616	587
130	640	723	657	626
140	675	762	692	661
150	709	796	723	696
160	742	826	751	728
170	771	852	776	758
180	798	874	796	784
190	822	894	814	808
200	843	912	831	829
210	863	930	848	849
220	883	948	866	868
230	897	964	881	882
240	911	980	897	896
250	924	996	912	909
260	936	1010	925	921
270	946	1023	937	932
280	956	1034	949	941
290	964	1043	959	949
300	964	1043	959	949
310	964	1043	959	949
320	964	1043	959	949
330	964	1043	959	949
340	964	1043	959	949
350	964	1043	959	949



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm2 Subzone (SIBEC scenario, good productivity)

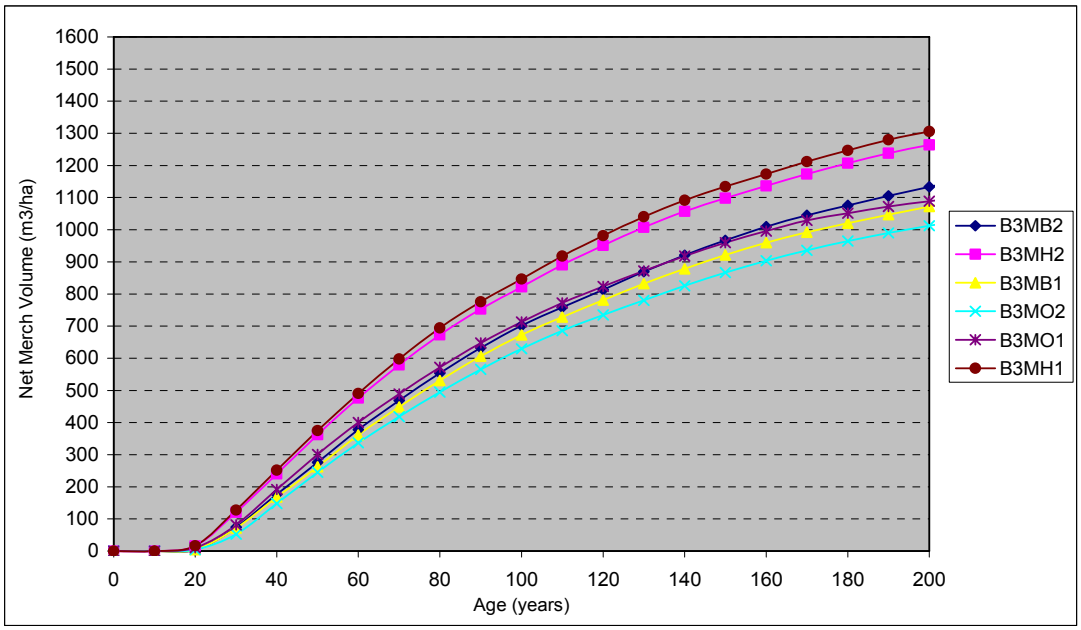
	Analysis Units						
Age	**B3GH2**	**B3GB2**	**B3GH1**	**B3GO2**	**B3GB1**	**B3GO1**	**B3GF2**
0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	22	6	23	2	7	4	29
30	160	107	166	50	107	65	166
40	307	240	316	166	241	185	297
50	447	362	459	273	363	295	428
60	576	482	590	374	482	397	545
70	695	587	712	458	587	487	647
80	802	685	821	541	686	572	739
90	892	777	910	621	776	653	809
100	968	856	987	694	854	727	865
110	1046	921	1065	755	919	790	920
120	1117	980	1136	806	979	841	968
130	1182	1042	1200	854	1034	890	1013
140	1239	1100	1255	906	1084	941	1050
150	1286	1153	1300	954	1130	989	1082
160	1329	1202	1342	996	1171	1030	1111
170	1370	1243	1383	1032	1206	1066	1138
180	1408	1278	1420	1066	1235	1098	1163
190	1443	1310	1454	1094	1263	1125	1187
200	1472	1341	1481	1118	1290	1147	1206
210	1499	1371	1507	1143	1315	1170	1222
220	1524	1398	1531	1169	1338	1193	1238
230	1547	1424	1553	1194	1360	1215	1252
240	1568	1445	1574	1218	1378	1236	1265
250	1588	1464	1594	1240	1394	1255	1276
260	1607	1481	1612	1258	1408	1272	1287
270	1625	1496	1628	1274	1422	1287	1297
280	1641	1511	1643	1289	1434	1301	1307
290	1654	1526	1654	1303	1445	1314	1316
300	1654	1526	1654	1303	1445	1314	1316
310	1654	1526	1654	1303	1445	1314	1316
320	1654	1526	1654	1303	1445	1314	1316
330	1654	1526	1654	1303	1445	1314	1316
340	1654	1526	1654	1303	1445	1314	1316
350	1654	1526	1654	1303	1445	1314	1316



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm2 Subzone (SIBEC scenario, medium productivity)

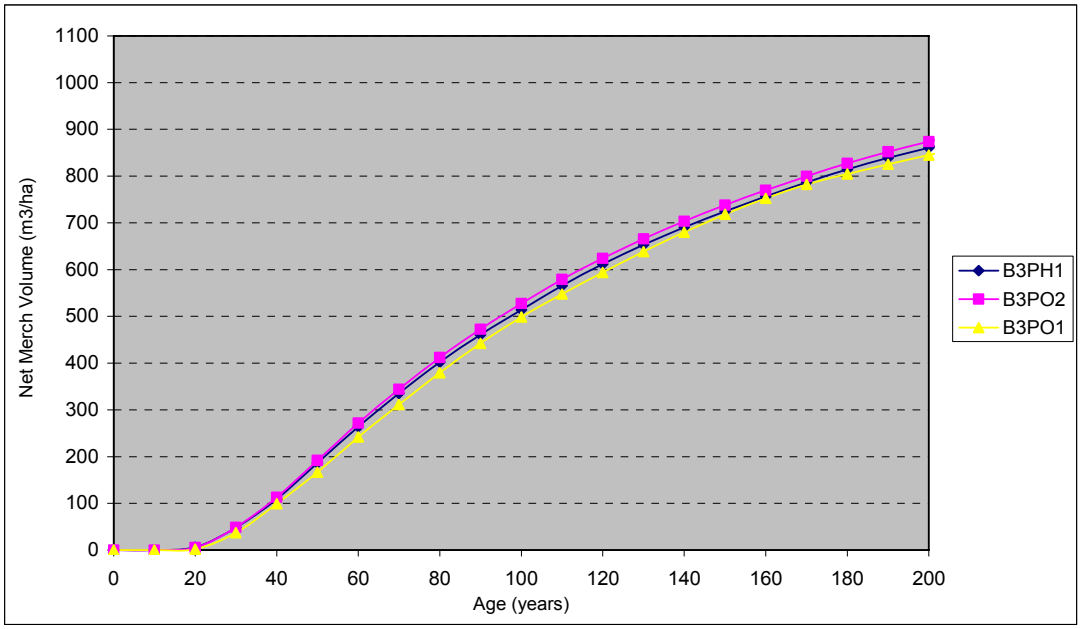
	Analysis Units					
Age	**B3MB2**	**B3MH2**	**B3MB1**	**B3MO2**	**B3MO1**	**B3MH1**
0	0	0	0	0	0	0
10	0	0	0	0	0	0
20	4	16	4	4	10	17
30	74	120	72	52	82	128
40	177	240	168	148	192	251
50	276	362	263	245	300	375
60	378	476	361	337	400	491
70	468	579	448	418	489	598
80	554	673	531	495	572	695
90	633	753	607	565	647	776
100	701	822	673	629	713	847
110	758	890	728	685	772	918
120	813	951	781	735	823	982
130	870	1007	832	780	872	1041
140	920	1057	879	826	918	1091
150	967	1098	921	867	959	1134
160	1009	1137	960	904	996	1173
170	1045	1173	992	936	1029	1212
180	1076	1207	1020	965	1052	1247
190	1105	1238	1047	990	1072	1280
200	1133	1264	1072	1012	1089	1305
210	1161	1288	1097	1034	1106	1329
220	1186	1310	1120	1056	1122	1352
230	1211	1331	1142	1077	1136	1373
240	1231	1350	1161	1097	1149	1394
250	1250	1368	1177	1116	1162	1413
260	1266	1385	1192	1133	1173	1431
270	1282	1400	1205	1148	1183	1448
280	1296	1414	1218	1163	1193	1463
290	1311	1426	1230	1176	1201	1475
300	1311	1426	1230	1176	1201	1475
310	1311	1426	1230	1176	1201	1475
320	1311	1426	1230	1176	1201	1475
330	1311	1426	1230	1176	1201	1475
340	1311	1426	1230	1176	1201	1475
350	1311	1426	1230	1176	1201	1475



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm2 Subzone (SIBEC scenario, poor productivity)

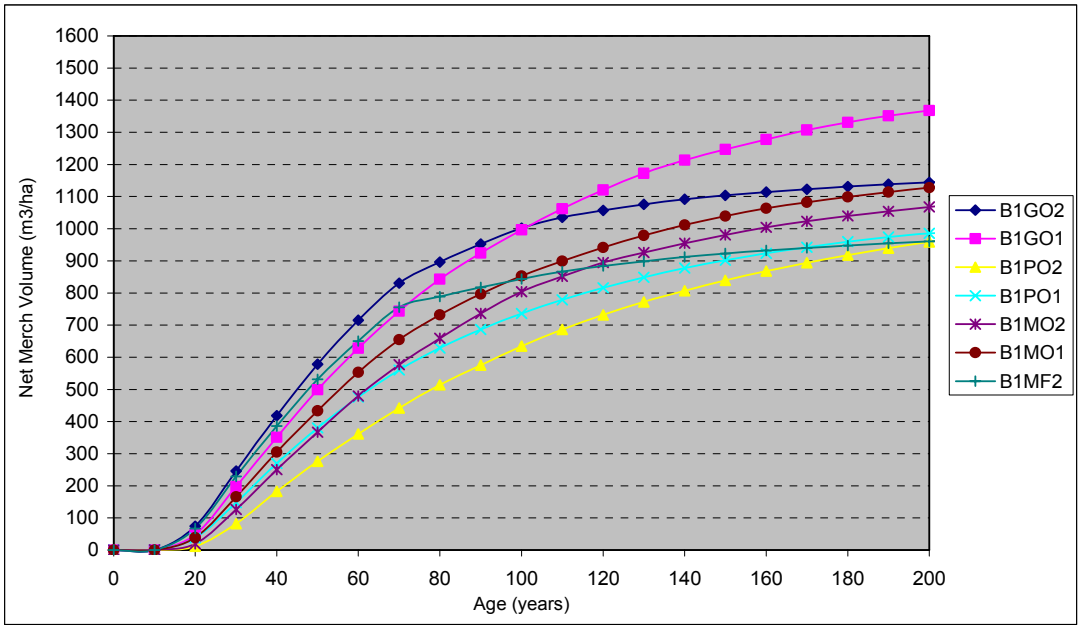
	Analysis Units		
Age	**B3PH1**	**B3PO2**	**B3PO1**
0	0	0	0
10	0	0	0
20	6	5	2
30	48	49	37
40	109	113	99
50	186	192	167
60	264	272	242
70	335	344	311
80	402	412	379
90	461	472	442
100	514	528	498
110	566	579	548
120	612	624	594
130	653	666	639
140	690	703	680
150	725	738	718
160	757	770	752
170	787	800	782
180	814	827	805
190	839	852	825
200	861	874	845
210	881	894	864
220	899	914	882
230	916	931	898
240	931	946	913
250	946	961	926
260	960	975	938
270	972	987	949
280	983	999	959
290	993	1008	969
300	993	1008	969
310	993	1008	969
320	993	1008	969
330	993	1008	969
340	993	1008	969
350	993	1008	969



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHxm2 Subzone (SIBEC scenario)

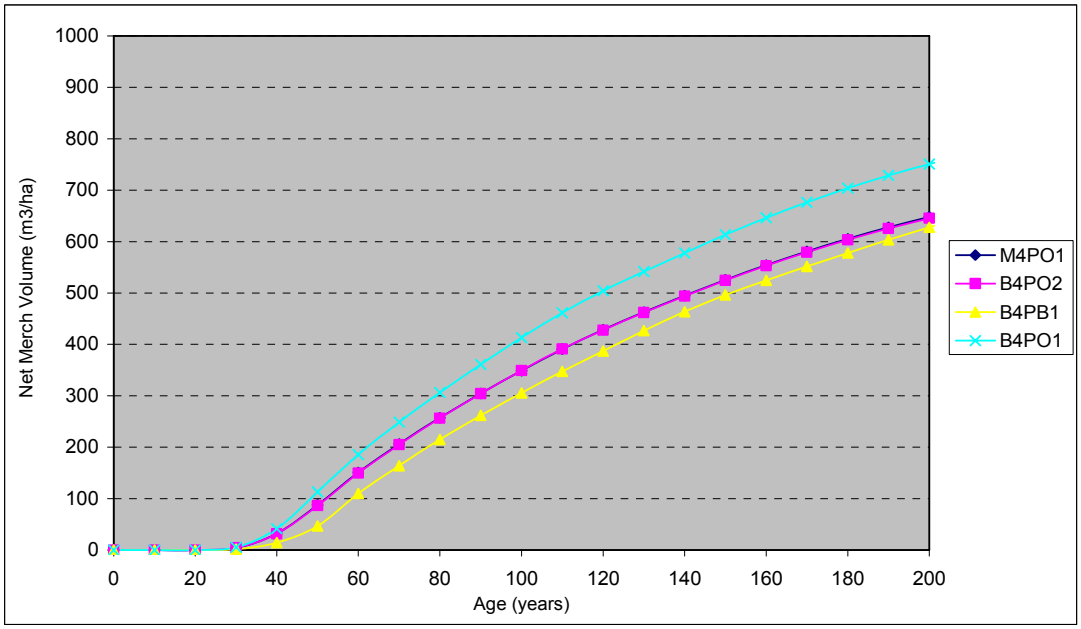
	Analysis Units						
Age	**B1GO2**	**B1GO1**	**B1PO2**	**B1PO1**	**B1MO2**	**B1MO1**	**B1MF2**
0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	74	48	11	37	20	39	67
30	246	197	82	148	126	166	229
40	418	351	182	270	250	305	386
50	578	499	276	380	367	434	531
60	715	628	361	476	480	553	650
70	831	743	442	560	577	655	756
80	896	843	514	629	659	732	789
90	953	924	576	687	736	797	818
100	1001	997	634	736	804	853	844
110	1036	1062	686	779	851	899	866
120	1057	1121	732	817	895	941	884
130	1076	1172	772	849	926	979	899
140	1092	1213	807	877	954	1012	912
150	1104	1247	839	902	981	1039	923
160	1114	1278	868	923	1005	1063	932
170	1123	1307	894	942	1024	1082	940
180	1131	1331	918	960	1040	1099	948
190	1139	1351	940	974	1054	1114	955
200	1144	1368	959	986	1068	1128	960
210	1149	1384	977	991	1081	1139	965
220	1153	1399	993	996	1093	1149	969
230	1156	1411	1007	1000	1104	1158	972
240	1156	1423	1018	1004	1114	1166	972
250	1156	1434	1028	1008	1121	1172	972
260	1157	1444	1036	1010	1128	1178	972
270	1157	1453	1043	1012	1135	1183	972
280	1157	1459	1050	1014	1141	1187	972
290	1157	1464	1056	1016	1146	1191	972
300	1157	1464	1056	1016	1146	1191	972
310	1157	1464	1056	1016	1146	1191	972
320	1157	1464	1056	1016	1146	1191	972
330	1157	1464	1056	1016	1146	1191	972
340	1157	1464	1056	1016	1146	1191	972
350	1157	1464	1056	1016	1146	1191	972



Net Merchantable Volume Yield Curves

Existing Managed Stands within the MHmm1 Subzone (SIBEC scenario)

	Analysis Units			
Age	**M4PO1**	**B4PO2**	**B4PB1**	**B4PO1**
0	0	0	0	0
10	0	0	0	0
20	0	0	0	0
30	4	5	2	5
40	32	32	14	42
50	88	86	47	113
60	151	149	110	186
70	206	205	164	249
80	257	256	215	306
90	305	304	262	361
100	349	349	306	413
110	391	391	348	462
120	428	428	387	504
130	463	462	427	542
140	495	494	464	578
150	526	525	496	613
160	554	553	525	646
170	581	579	552	676
180	605	603	578	704
190	628	625	604	729
200	648	645	628	751
210	667	664	651	771
220	685	682	671	790
230	700	698	691	805
240	713	712	710	819
250	727	726	727	833
260	739	738	743	843
270	750	750	754	852
280	760	760	766	860
290	770	770	776	869
300	770	770	776	869
310	770	770	776	869
320	770	770	776	869
330	770	770	776	869
340	770	770	776	869
350	770	770	776	869

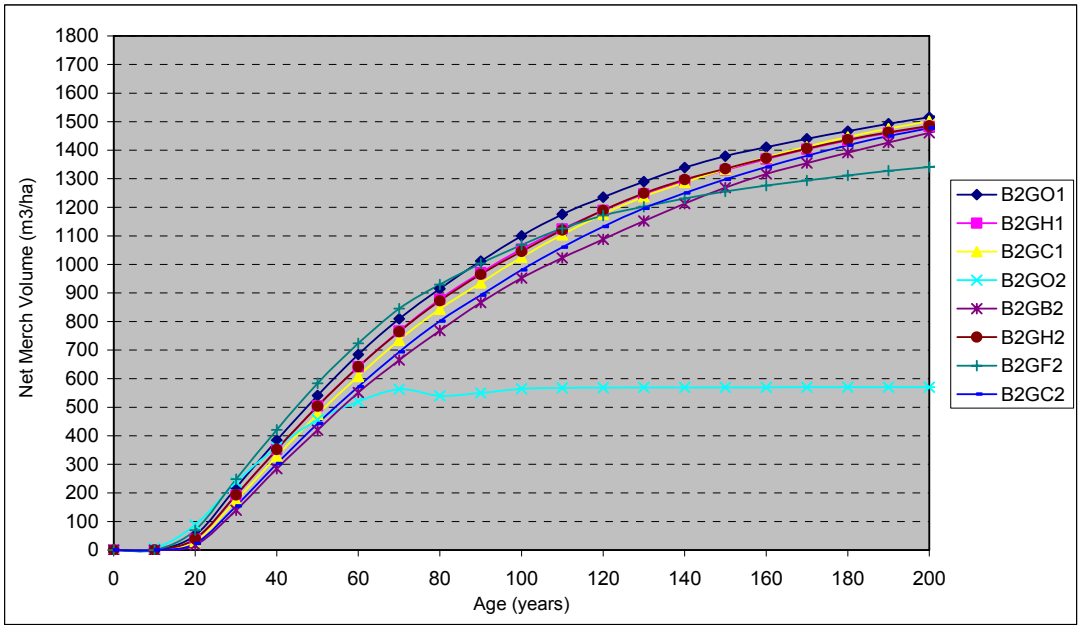


Appendix C: Existing Managed Yield Tables (PSI option)

Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm1 Subzone (PSI scenario, good productivity)

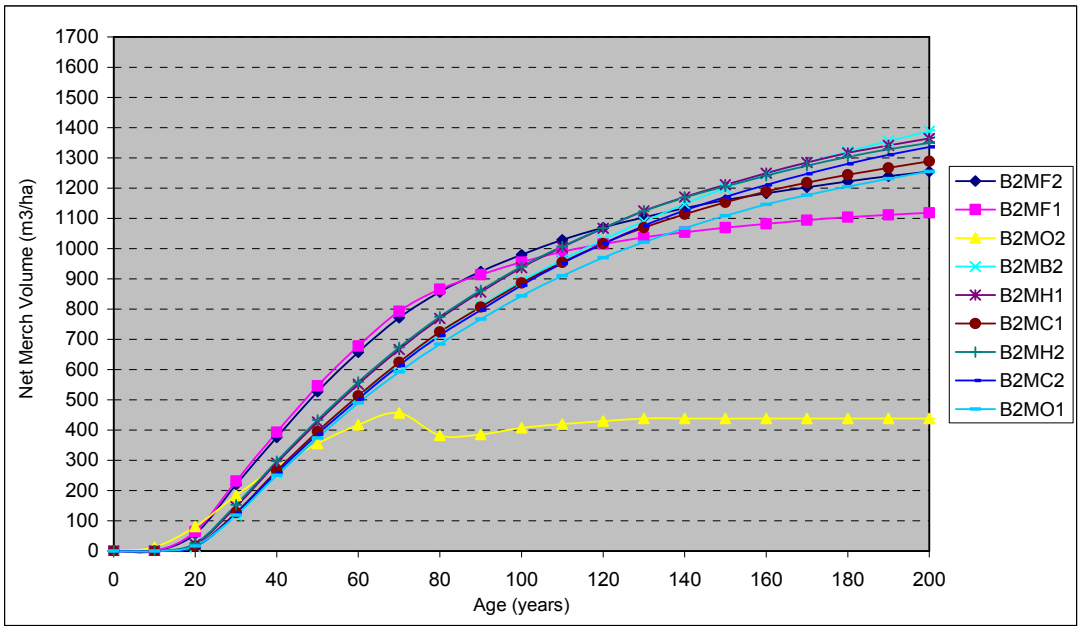
	Analysis Units							
Age	**B2GO1**	**B2GH1**	**B2GC1**	**B2GO2**	**B2GB2**	**B2GH2**	**B2GF2**	**B2GC2**
0	0	0	0	0	0	0	0	0
10	0	0	0	6	0	0	0	0
20	52	38	31	89	17	40	70	23
30	218	192	173	238	140	193	248	154
40	384	352	328	360	285	352	421	303
50	541	504	475	457	420	504	584	443
60	685	642	609	520	551	642	724	572
70	810	767	735	563	665	764	845	694
80	915	878	843	540	769	873	929	802
90	1012	971	936	550	866	965	1003	893
100	1100	1054	1025	565	953	1046	1069	981
110	1175	1124	1104	568	1023	1120	1126	1061
120	1236	1189	1176	569	1088	1189	1172	1132
130	1290	1246	1237	569	1152	1249	1202	1196
140	1339	1291	1287	570	1213	1297	1230	1250
150	1379	1331	1333	570	1268	1335	1255	1298
160	1411	1368	1375	570	1317	1371	1276	1341
170	1439	1403	1412	570	1355	1406	1294	1381
180	1467	1435	1446	570	1391	1437	1311	1417
190	1493	1460	1476	570	1426	1463	1328	1449
200	1515	1483	1502	570	1461	1485	1341	1477
210	1537	1503	1529	570	1492	1506	1353	1505
220	1557	1522	1555	570	1520	1526	1363	1532
230	1567	1540	1578	570	1543	1545	1373	1556
240	1577	1555	1593	570	1563	1560	1373	1579
250	1584	1568	1607	570	1582	1574	1373	1597
260	1592	1580	1620	570	1599	1588	1374	1613
270	1599	1591	1631	570	1616	1599	1374	1628
280	1604	1598	1641	570	1632	1607	1374	1640
290	1609	1605	1650	570	1647	1615	1374	1651
300	1609	1605	1650	570	1647	1615	1374	1651
310	1609	1605	1650	570	1647	1615	1374	1651
320	1609	1605	1650	570	1647	1615	1374	1651
330	1609	1605	1650	570	1647	1615	1374	1651
340	1609	1605	1650	570	1647	1615	1374	1651
350	1609	1605	1650	570	1647	1615	1374	1651



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm1 Subzone (PSI scenario, medium productivity)

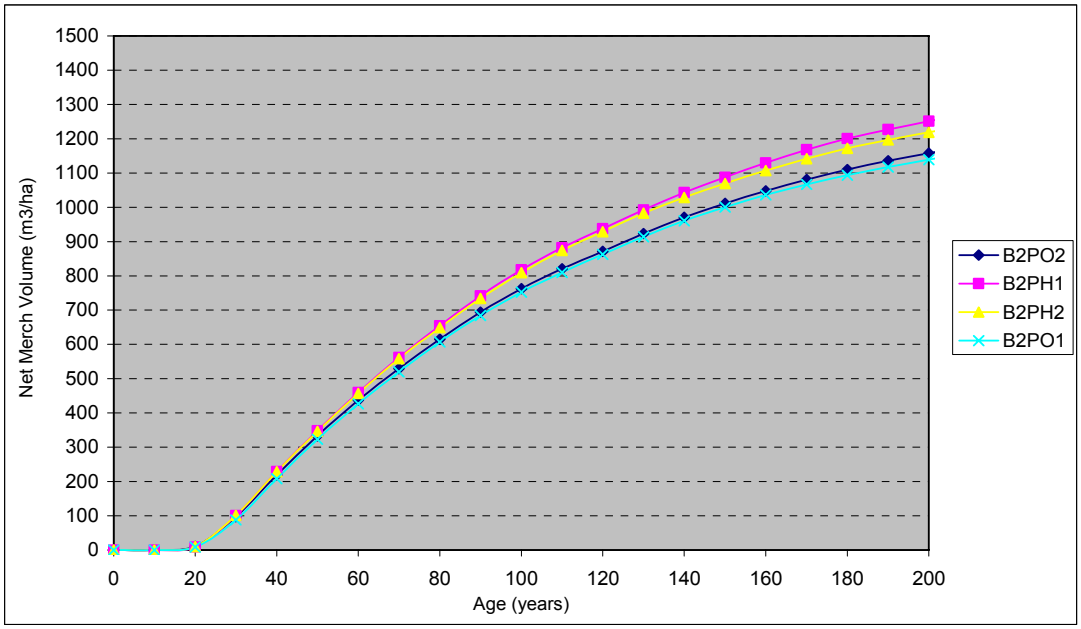
	Analysis Units								
Age	**B2MF2**	**B2MF1**	**B2MO2**	**B2MB2**	**B2MH1**	**B2MC1**	**B2MH2**	**B2MC2**	**B2MO1**
0	0	0	0	0	0	0	0	0	0
10	0	0	13	0	0	0	0	0	0
20	57	64	81	14	22	16	25	15	17
30	220	231	184	119	147	127	153	123	119
40	376	393	278	257	291	265	297	259	251
50	527	547	355	385	427	395	434	386	374
60	658	678	417	508	551	514	559	503	489
70	772	793	457	617	666	625	673	614	592
80	856	865	382	717	769	724	775	713	684
90	924	914	385	810	857	807	862	797	767
100	980	955	408	893	937	886	940	879	844
110	1029	990	420	963	1005	955	1008	951	910
120	1070	1015	429	1029	1067	1017	1068	1016	970
130	1103	1037	438	1090	1125	1069	1124	1075	1021
140	1134	1054	438	1148	1171	1114	1169	1126	1067
150	1160	1069	438	1200	1211	1153	1206	1171	1109
160	1183	1082	438	1246	1249	1189	1241	1211	1146
170	1203	1094	438	1285	1285	1218	1274	1247	1177
180	1222	1104	438	1321	1316	1244	1303	1280	1205
190	1240	1112	438	1356	1342	1268	1328	1310	1231
200	1255	1119	438	1388	1365	1288	1350	1336	1255
210	1268	1123	438	1419	1386	1310	1370	1362	1273
220	1281	1127	438	1447	1406	1331	1390	1388	1290
230	1292	1130	438	1471	1426	1350	1409	1412	1304
240	1295	1132	438	1492	1444	1366	1426	1433	1317
250	1298	1134	438	1512	1459	1381	1441	1452	1330
260	1300	1135	438	1531	1474	1395	1455	1470	1341
270	1303	1137	438	1548	1487	1408	1468	1486	1352
280	1304	1138	438	1565	1496	1418	1477	1499	1361
290	1306	1139	438	1580	1504	1428	1485	1511	1370
300	1306	1139	438	1580	1504	1428	1485	1511	1370
310	1306	1139	438	1580	1504	1428	1485	1511	1370
320	1306	1139	438	1580	1504	1428	1485	1511	1370
330	1306	1139	438	1580	1504	1428	1485	1511	1370
340	1306	1139	438	1580	1504	1428	1485	1511	1370
350	1306	1139	438	1580	1504	1428	1485	1511	1370



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm1 Subzone (PSI scenario, poor productivity)

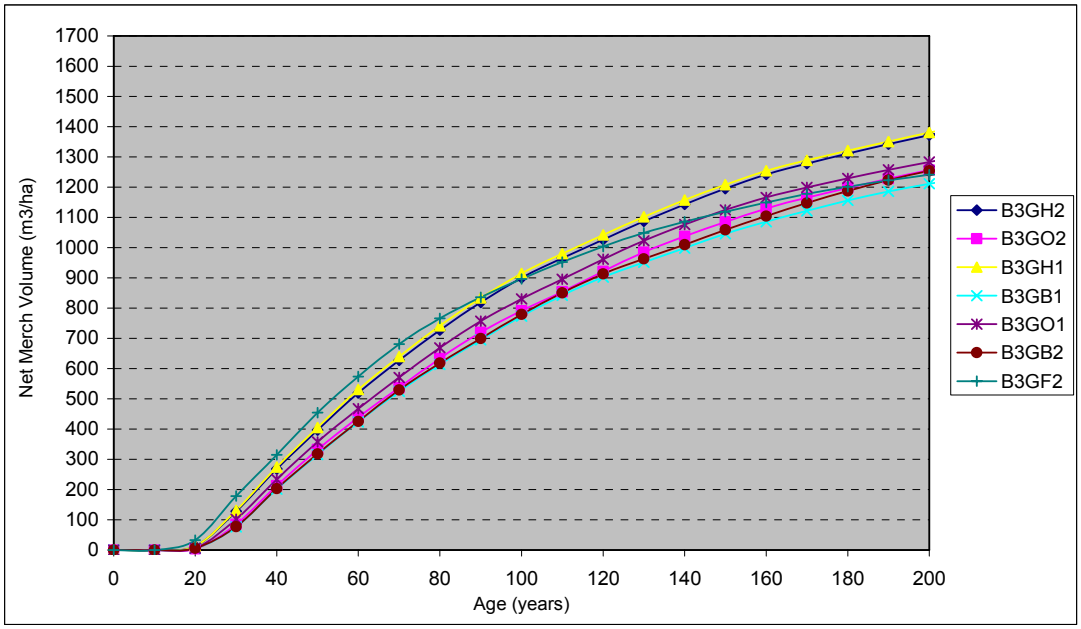
	Analysis Units			
Age	**B2PO2**	**B2PH1**	**B2PH2**	**B2PO1**
0	0	0	0	0
10	0	0	0	0
20	11	9	10	9
30	97	101	101	88
40	219	229	229	208
50	333	348	346	323
60	437	460	457	426
70	529	562	558	520
80	615	655	649	607
90	694	742	734	684
100	763	818	809	752
110	820	882	874	810
120	872	937	929	862
130	923	993	983	914
140	971	1043	1029	961
150	1011	1088	1069	1000
160	1048	1130	1107	1036
170	1081	1168	1142	1067
180	1110	1201	1172	1094
190	1135	1227	1197	1118
200	1158	1251	1219	1139
210	1180	1274	1240	1161
220	1202	1297	1261	1183
230	1223	1318	1280	1201
240	1241	1337	1298	1219
250	1256	1356	1315	1234
260	1269	1373	1330	1248
270	1280	1386	1343	1260
280	1291	1396	1353	1271
290	1301	1406	1363	1282
300	1301	1406	1363	1282
310	1301	1406	1363	1282
320	1301	1406	1363	1282
330	1301	1406	1363	1282
340	1301	1406	1363	1282
350	1301	1406	1363	1282



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm2 Subzone (PSI scenario, good productivity)

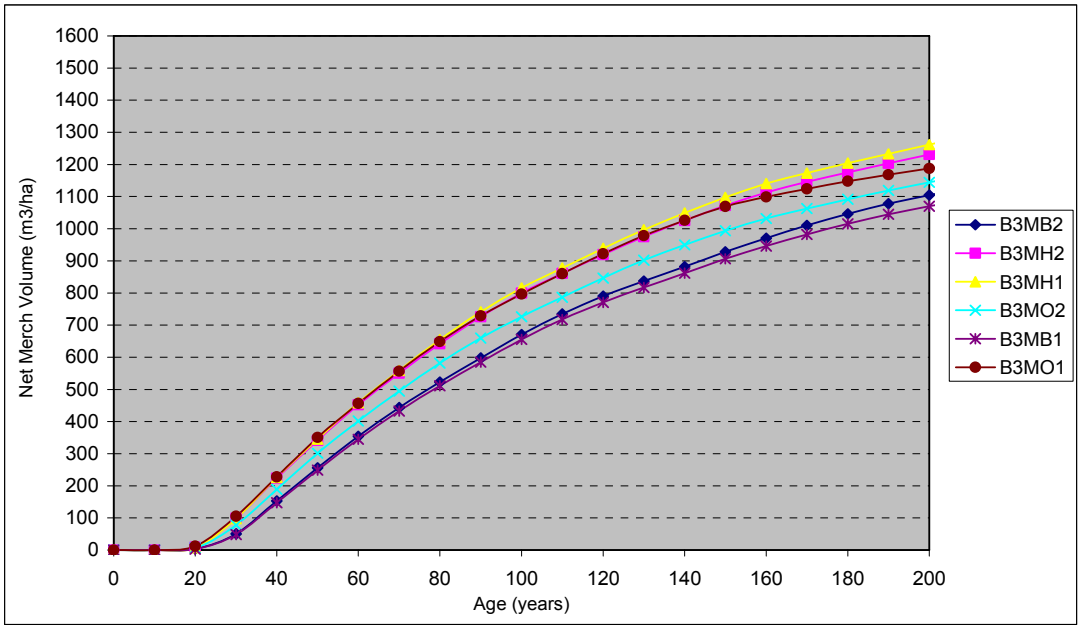
	Analysis Units						
Age	**B3GH2**	**B3GO2**	**B3GH1**	**B3GB1**	**B3GO1**	**B3GB2**	**B3GF2**
0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	13	4	13	6	6	6	33
30	128	85	131	77	102	77	178
40	268	213	274	202	234	203	315
50	396	333	405	316	358	318	454
60	520	439	531	423	468	426	574
70	628	537	640	525	570	529	681
80	727	633	741	613	669	618	766
90	819	720	834	695	757	700	836
100	900	792	914	773	830	779	897
110	965	854	980	842	896	851	952
120	1027	922	1042	902	962	913	1004
130	1087	985	1102	952	1023	963	1049
140	1143	1037	1157	998	1076	1010	1086
150	1195	1085	1208	1046	1125	1059	1118
160	1242	1129	1254	1085	1166	1104	1149
170	1278	1165	1288	1122	1199	1148	1177
180	1311	1198	1320	1156	1229	1187	1202
190	1342	1228	1351	1186	1257	1224	1223
200	1372	1257	1380	1211	1284	1254	1241
210	1401	1284	1408	1232	1309	1280	1258
220	1427	1313	1434	1252	1336	1304	1272
230	1451	1338	1457	1271	1359	1327	1287
240	1471	1360	1475	1288	1378	1349	1301
250	1487	1382	1490	1305	1398	1370	1314
260	1502	1403	1505	1320	1416	1389	1325
270	1516	1423	1519	1334	1433	1407	1334
280	1530	1443	1533	1346	1450	1422	1340
290	1542	1462	1545	1356	1466	1435	1345
300	1542	1462	1545	1356	1466	1435	1345
310	1542	1462	1545	1356	1466	1435	1345
320	1542	1462	1545	1356	1466	1435	1345
330	1542	1462	1545	1356	1466	1435	1345
340	1542	1462	1545	1356	1466	1435	1345
350	1542	1462	1545	1356	1466	1435	1345



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm2 Subzone (PSI scenario, medium productivity)

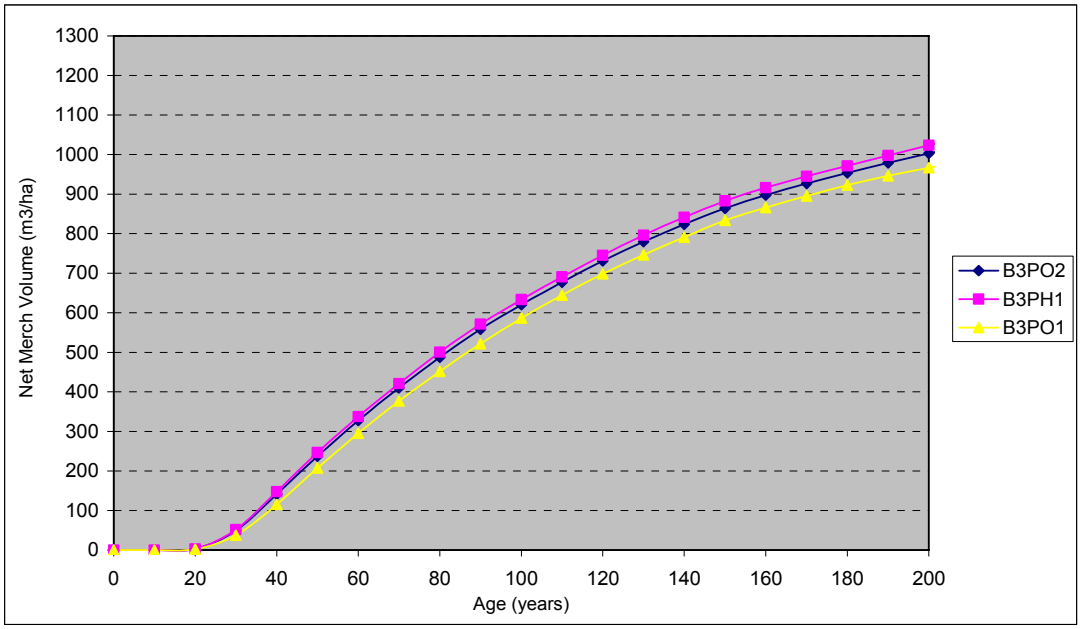
	Analysis Units					
Age	**B3MB2**	**B3MH2**	**B3MH1**	**B3MO2**	**B3MB1**	**B3MO1**
0	0	0	0	0	0	0
10	0	0	0	0	0	0
20	3	9	7	7	3	12
30	51	99	98	78	48	105
40	153	223	226	189	147	228
50	256	341	346	301	249	350
60	354	452	459	402	345	456
70	443	550	559	495	432	557
80	523	642	655	582	511	649
90	598	726	741	659	585	729
100	670	800	815	726	656	797
110	735	861	877	787	718	860
120	790	920	939	846	771	922
130	837	975	996	902	817	978
140	882	1025	1049	950	861	1026
150	928	1072	1098	994	907	1069
160	970	1113	1140	1031	946	1099
170	1010	1146	1173	1063	982	1124
180	1046	1175	1204	1092	1015	1148
190	1078	1204	1233	1119	1045	1168
200	1105	1231	1262	1144	1070	1187
210	1129	1257	1289	1171	1091	1206
220	1152	1282	1315	1197	1112	1223
230	1174	1304	1338	1221	1131	1238
240	1195	1323	1357	1242	1150	1253
250	1215	1340	1374	1262	1167	1267
260	1234	1355	1390	1280	1184	1279
270	1252	1369	1404	1296	1199	1289
280	1267	1382	1418	1312	1213	1299
290	1280	1395	1431	1326	1225	1308
300	1280	1395	1431	1326	1225	1308
310	1280	1395	1431	1326	1225	1308
320	1280	1395	1431	1326	1225	1308
330	1280	1395	1431	1326	1225	1308
340	1280	1395	1431	1326	1225	1308
350	1280	1395	1431	1326	1225	1308



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHvm2 Subzone (PSI scenario, poor productivity)

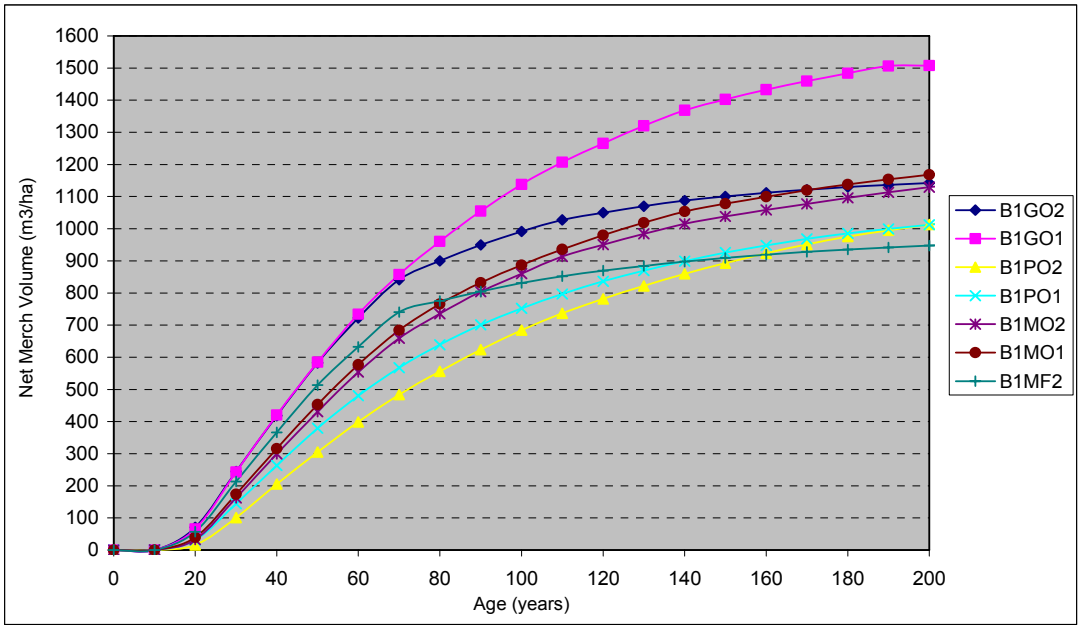
	Analysis Units		
Age	**B3PO2**	**B3PH1**	**B3PO1**
0	0	0	0
10	0	0	0
20	3	3	2
30	49	51	37
40	141	148	115
50	237	246	207
60	328	337	295
70	410	421	377
80	488	500	452
90	558	571	522
100	621	633	586
110	677	691	645
120	731	745	698
130	780	796	746
140	824	841	791
150	864	883	833
160	898	916	866
170	927	945	895
180	954	971	923
190	979	998	946
200	1003	1023	967
210	1027	1048	985
220	1049	1072	1003
230	1070	1094	1020
240	1089	1114	1036
250	1106	1132	1051
260	1121	1147	1065
270	1135	1162	1077
280	1147	1175	1088
290	1159	1187	1098
300	1159	1187	1098
310	1159	1187	1098
320	1159	1187	1098
330	1159	1187	1098
340	1159	1187	1098
350	1159	1187	1098



Net Merchantable Volume Yield Curves

Existing Managed Stands within the CWHxm2 Subzone (PSI scenario)

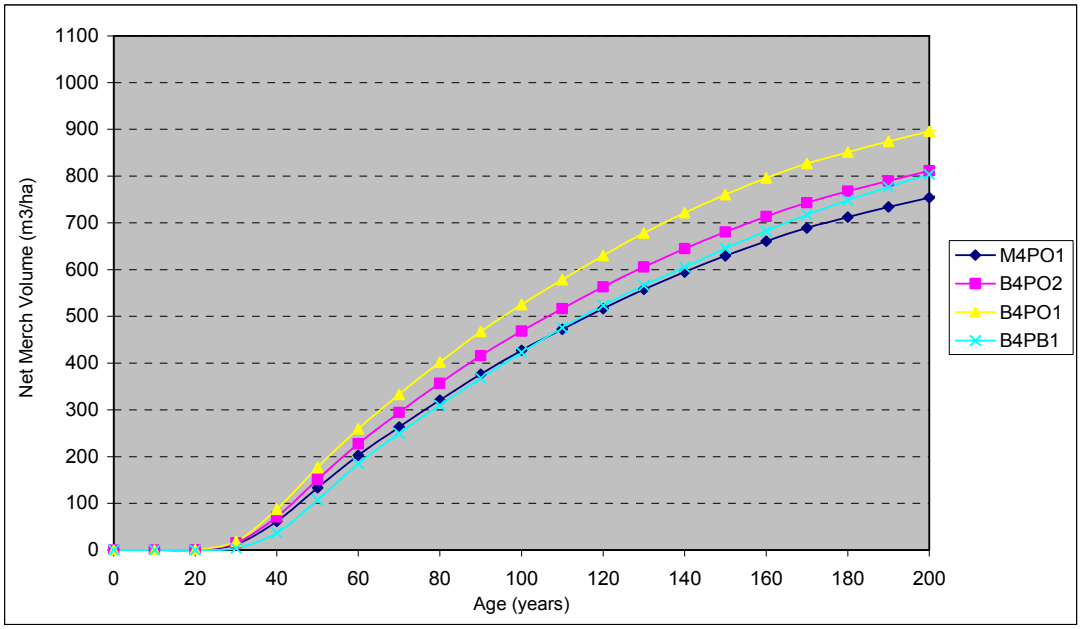
	Analysis Units						
Age	**B1GO2**	**B1GO1**	**B1PO2**	**B1PO1**	**B1MO2**	**B1MO1**	**B1MF2**
0	0	0	0	0	0	0	0
10	0	0	0	0	1	0	0
20	71	66	16	31	33	39	57
30	244	243	101	144	162	174	214
40	418	421	205	263	299	316	366
50	583	585	305	380	431	453	514
60	723	734	399	480	554	577	633
70	841	858	484	568	659	684	741
80	900	961	556	639	735	766	775
90	949	1055	624	701	804	832	805
100	992	1138	685	752	860	887	831
110	1027	1207	737	797	914	936	852
120	1050	1265	781	836	950	980	869
130	1070	1320	822	869	984	1019	884
140	1087	1369	859	899	1015	1053	897
150	1100	1402	893	926	1038	1078	909
160	1112	1432	924	948	1059	1100	919
170	1121	1459	951	968	1077	1120	928
180	1130	1484	976	986	1096	1138	936
190	1136	1506	995	999	1114	1154	942
200	1142	1508	1013	1012	1129	1168	947
210	1148	1509	1030	1023	1141	1180	953
220	1148	1509	1042	1027	1152	1188	953
230	1148	1509	1053	1031	1162	1195	953
240	1148	1509	1064	1035	1170	1202	953
250	1148	1509	1075	1038	1179	1208	953
260	1148	1509	1084	1041	1187	1214	953
270	1148	1509	1092	1043	1194	1219	953
280	1148	1509	1099	1045	1200	1224	953
290	1148	1509	1104	1046	1206	1224	953
300	1148	1509	1104	1046	1206	1224	953
310	1148	1509	1104	1046	1206	1224	953
320	1148	1509	1104	1046	1206	1224	953
330	1148	1509	1104	1046	1206	1224	953
340	1148	1509	1104	1046	1206	1224	953
350	1148	1509	1104	1046	1206	1224	953



Net Merchantable Volume Yield Curves

Existing Managed Stands within the MHmm1 Subzone (PSI scenario)

	Analysis Units			
Age	**M4PO1**	**B4PO2**	**B4PO1**	**B4PB1**
0	0	0	0	0
10	0	0	0	0
20	1	1	1	0
30	12	15	19	4
40	61	71	87	37
50	133	151	177	107
60	203	228	259	185
70	263	295	333	250
80	321	357	402	310
90	376	416	468	368
100	427	468	525	423
110	473	517	578	476
120	517	563	630	524
130	558	606	678	566
140	595	645	722	605
150	629	681	761	645
160	661	714	796	683
170	689	743	827	717
180	712	768	851	748
190	734	790	874	777
200	754	812	896	804
210	774	831	917	825
220	792	851	938	845
230	810	870	953	864
240	826	887	968	881
250	842	905	982	898
260	857	921	995	915
270	871	936	1007	931
280	883	950	1018	946
290	895	962	1027	960
300	895	962	1027	960
310	895	962	1027	960
320	895	962	1027	960
330	895	962	1027	960
340	895	962	1027	960
350	895	962	1027	960



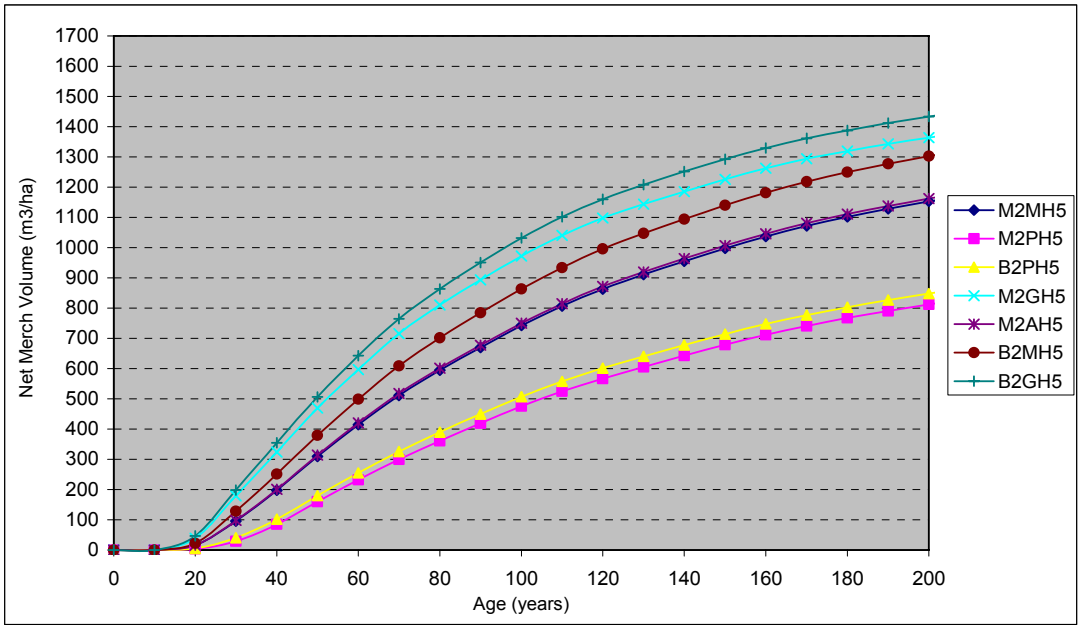
Appendix D: Future Managed Yield Tables (SIBEC option)

Note that the yield tables in this appendix do not reflect a 1-year regen delay as the tables were generated when no regeneration delay was proposed. The corresponding yield tables in the Woodstock model will reflect a 1-year regeneration delay and will simply be interpolations of the tables in this appendix.

Net Merchantable Volume Yield Curves

Future Managed Stands within the CWHvm1 Subzone (SIBEC scenario)

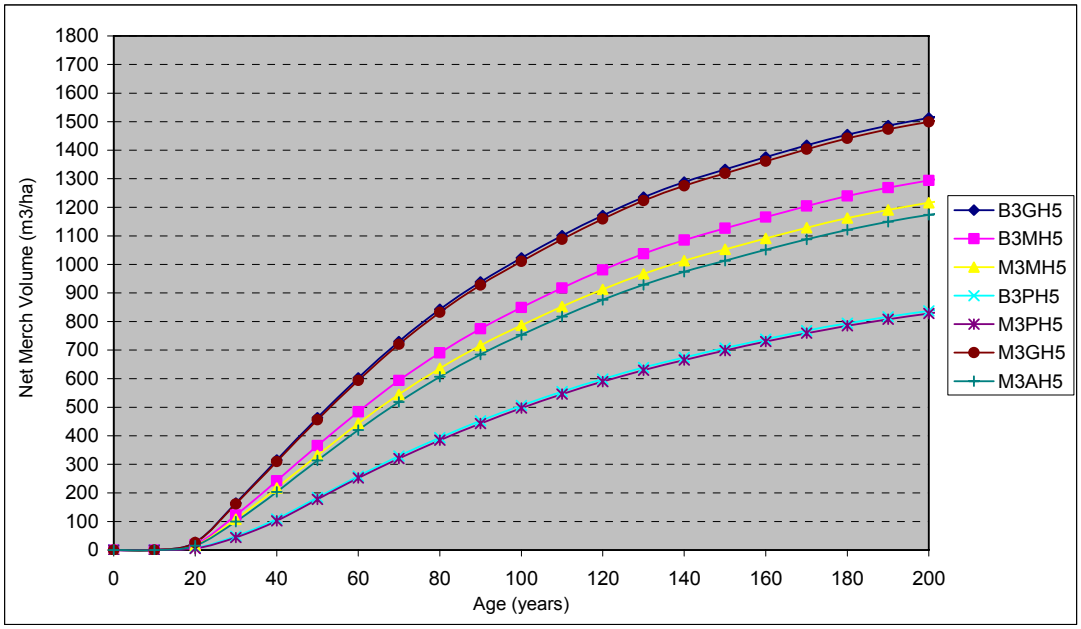
	Analysis Units						
Age	**M2MH5**	**M2PH5**	**B2PH5**	**M2GH5**	**M2AH5**	**B2MH5**	**B2GH5**
0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	16	4	6	39	16	23	47
30	96	29	41	179	98	128	199
40	197	85	102	324	201	251	355
50	309	160	180	469	314	379	507
60	415	232	255	597	420	499	643
70	511	299	326	715	518	609	764
80	595	361	390	811	602	702	863
90	670	419	450	894	677	784	951
100	742	476	507	972	750	863	1032
110	806	525	558	1040	815	934	1101
120	863	567	602	1098	871	996	1160
130	911	605	641	1144	919	1048	1208
140	955	643	678	1185	964	1094	1252
150	998	679	714	1226	1007	1140	1293
160	1037	712	747	1262	1046	1181	1329
170	1072	741	777	1294	1081	1218	1361
180	1102	767	803	1319	1111	1249	1387
190	1129	791	827	1343	1138	1277	1412
200	1153	812	848	1364	1162	1302	1433
210	1175	832	868	1384	1184	1325	1454
220	1195	848	884	1403	1204	1347	1472
230	1213	864	900	1420	1222	1366	1488
240	1230	878	916	1436	1239	1384	1504
250	1246	893	930	1449	1255	1401	1517
260	1260	905	943	1459	1270	1416	1524
270	1272	916	954	1467	1281	1428	1530
280	1282	926	964	1474	1291	1438	1536
290	1292	936	974	1481	1301	1449	1541
300	1292	936	974	1481	1301	1449	1541
310	1292	936	974	1481	1301	1449	1541
320	1292	936	974	1481	1301	1449	1541
330	1292	936	974	1481	1301	1449	1541
340	1292	936	974	1481	1301	1449	1541
350	1292	936	974	1481	1301	1449	1541



Net Merchantable Volume Yield Curves

Future Managed Stands within the CWHvm2 Subzone (SIBEC scenario)

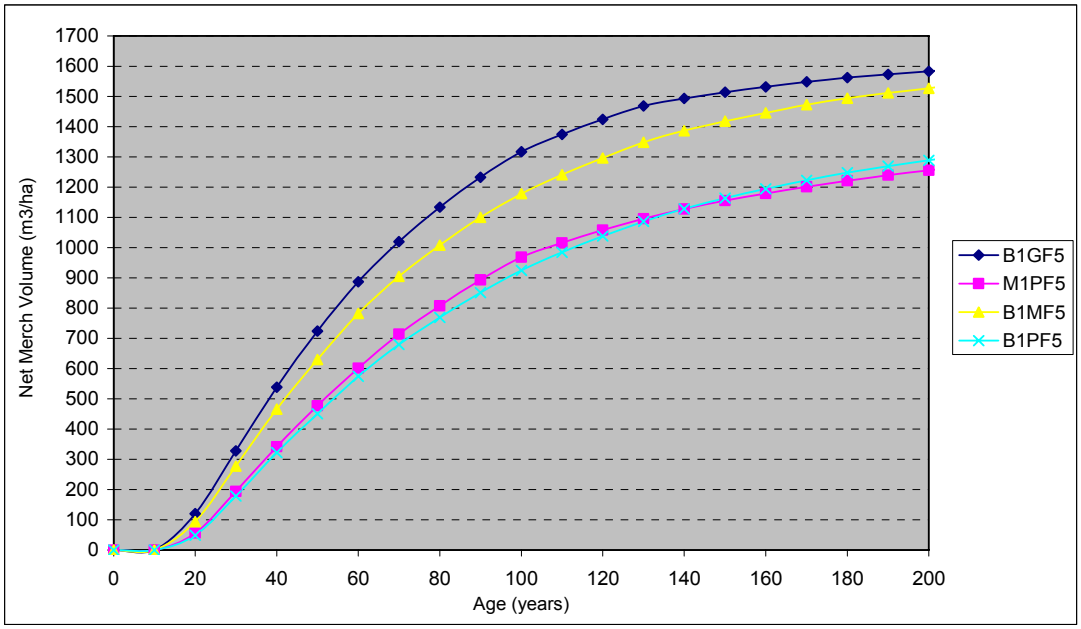
	Analysis Units						
Age	**B3GH5**	**B3MH5**	**M3MH5**	**B3PH5**	**M3PH5**	**M3GH5**	**M3AH5**
0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	27	19	17	7	6	26	15
30	165	123	108	49	43	161	100
40	315	243	217	109	103	310	203
50	463	366	332	184	178	456	314
60	603	485	443	259	252	594	420
70	730	593	545	329	321	720	519
80	843	690	636	394	385	832	607
90	939	774	716	452	443	928	685
100	1023	849	787	506	497	1011	754
110	1100	917	852	555	546	1088	818
120	1172	981	913	599	589	1159	876
130	1235	1037	967	639	629	1223	929
140	1288	1085	1013	674	665	1275	974
150	1333	1126	1053	707	699	1319	1014
160	1376	1166	1091	738	730	1361	1051
170	1417	1204	1128	768	759	1403	1088
180	1455	1239	1162	794	785	1441	1121
190	1486	1269	1191	817	808	1473	1150
200	1513	1294	1216	837	829	1499	1174
210	1536	1316	1237	856	847	1522	1195
220	1560	1338	1258	874	865	1546	1216
230	1581	1357	1277	889	880	1567	1234
240	1601	1375	1295	904	895	1587	1252
250	1620	1393	1312	917	909	1605	1269
260	1637	1409	1327	930	921	1622	1284
270	1653	1424	1342	942	933	1639	1299
280	1667	1438	1355	953	944	1653	1311
290	1678	1448	1365	962	953	1663	1321
300	1678	1448	1365	962	953	1663	1321
310	1678	1448	1365	962	953	1663	1321
320	1678	1448	1365	962	953	1663	1321
330	1678	1448	1365	962	953	1663	1321
340	1678	1448	1365	962	953	1663	1321
350	1678	1448	1365	962	953	1663	1321



Net Merchantable Volume Yield Curves

Future Managed Stands within the CWHxm2 Subzone (SIBEC scenario)

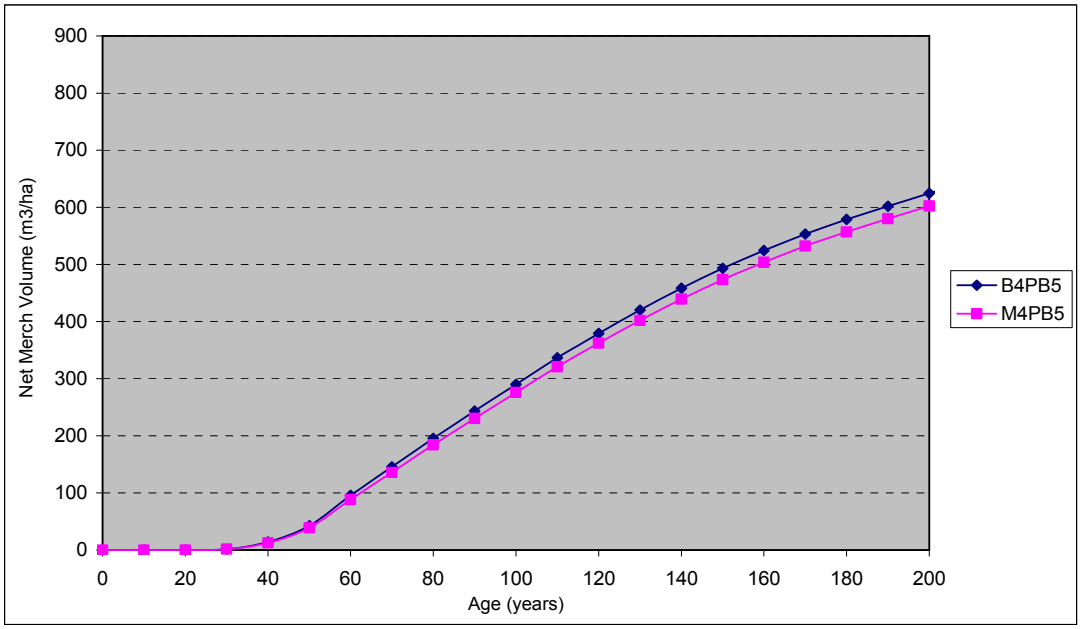
	Analysis Units			
Age	**B1GF5**	**M1PF5**	**B1MF5**	**B1PF5**
0	0	0	0	0
10	1	0	0	0
20	120	56	94	49
30	328	194	277	178
40	539	342	466	323
50	724	478	630	450
60	887	602	782	574
70	1020	714	904	680
80	1134	808	1008	769
90	1233	893	1100	851
100	1317	968	1179	925
110	1375	1016	1241	985
120	1424	1058	1297	1038
130	1469	1095	1348	1086
140	1493	1128	1386	1128
150	1514	1156	1418	1164
160	1531	1179	1446	1195
170	1548	1201	1472	1222
180	1562	1221	1494	1248
190	1573	1240	1512	1269
200	1583	1255	1527	1289
210	1594	1271	1544	1308
220	1594	1286	1545	1318
230	1594	1299	1547	1327
240	1595	1310	1548	1335
250	1595	1320	1549	1342
260	1595	1329	1550	1348
270	1595	1338	1551	1353
280	1596	1346	1552	1359
290	1596	1353	1553	1363
300	1596	1353	1553	1363
310	1596	1353	1553	1363
320	1596	1353	1553	1363
330	1596	1353	1553	1363
340	1596	1353	1553	1363
350	1596	1353	1553	1363



Net Merchantable Volume Yield Curves

Future Managed Stands within the MHmm1 Subzone (SIBEC scenario)

	Analysis Units	
Age	**B4PB5**	**M4PB5**
0	0	0
10	0	0
20	0	0
30	2	2
40	14	13
50	42	39
60	96	89
70	146	136
80	195	184
90	243	231
100	290	276
110	336	321
120	379	362
130	420	402
140	458	439
150	493	473
160	524	504
170	553	532
180	579	557
190	602	580
200	625	602
210	646	624
220	666	643
230	686	663
240	703	680
250	719	696
260	733	710
270	745	721
280	756	732
290	766	742
300	766	742
310	766	742
320	766	742
330	766	742
340	766	742
350	766	742



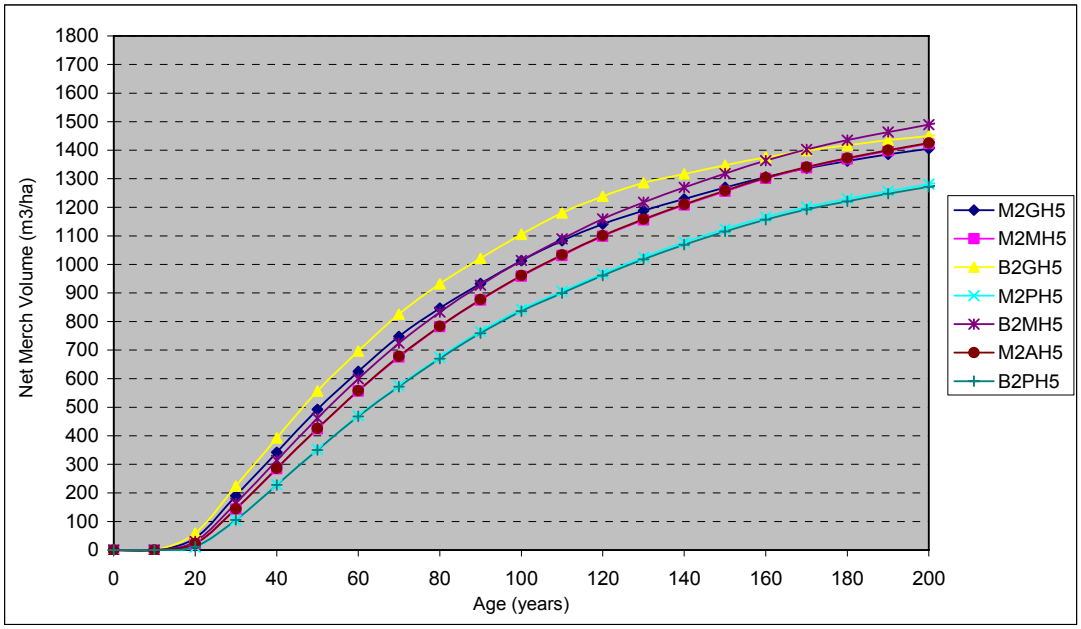
Appendix E: Future Managed Yield Tables (PSI option)

Note that the yield tables in this appendix do not reflect a 1-year regen delay as the tables were generated when no regeneration delay was proposed. The corresponding yield tables in the Woodstock model will reflect a 1-year regeneration delay and will simply be interpolations of the tables in this appendix.

Net Merchantable Volume Yield Curves

Future Managed Stands within the CWHvm1 Subzone (PSI scenario)

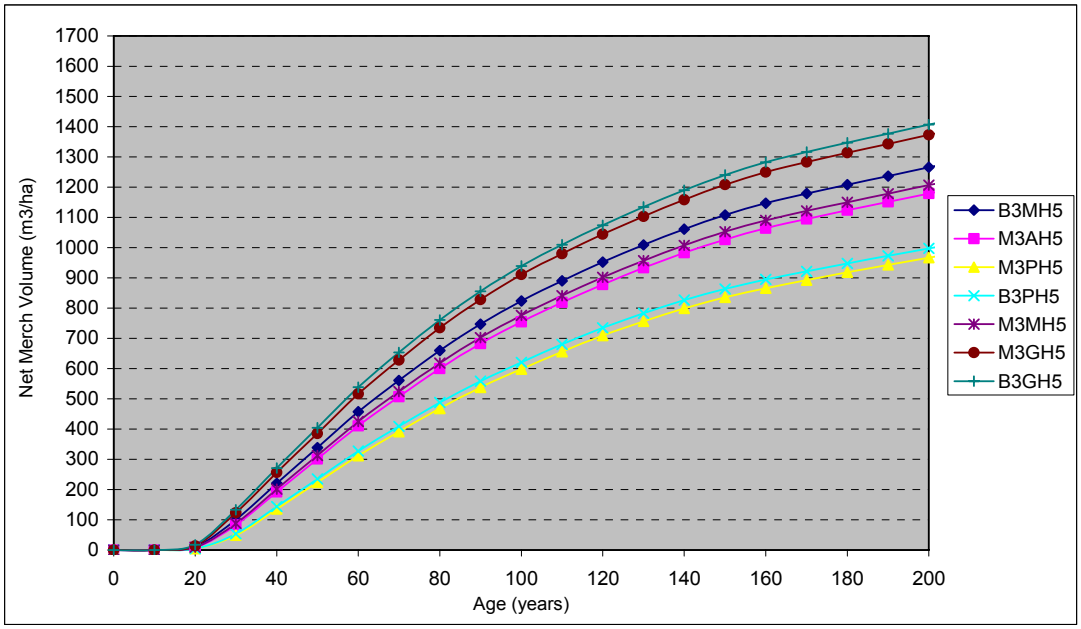
	Analysis Units						
Age	**M2GH5**	**M2MH5**	**B2GH5**	**M2PH5**	**B2MH5**	**M2AH5**	**B2PH5**
0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	42	22	59	11	30	22	12
30	190	143	224	105	164	144	106
40	342	285	393	229	314	287	228
50	493	424	557	352	462	426	350
60	625	556	697	470	599	558	468
70	748	676	826	575	724	678	572
80	847	782	932	675	833	784	670
90	932	875	1021	766	927	877	759
100	1013	959	1106	843	1014	961	836
110	1083	1031	1180	906	1090	1033	900
120	1141	1098	1238	968	1159	1100	961
130	1188	1156	1286	1025	1217	1158	1018
140	1229	1207	1317	1078	1269	1210	1069
150	1269	1256	1347	1124	1318	1258	1115
160	1306	1301	1375	1166	1364	1303	1157
170	1337	1338	1398	1201	1402	1341	1192
180	1362	1370	1417	1230	1435	1372	1221
190	1386	1397	1435	1257	1464	1400	1248
200	1405	1423	1450	1281	1489	1425	1272
210	1426	1448	1466	1307	1515	1451	1298
220	1445	1472	1480	1331	1537	1474	1322
230	1462	1493	1493	1353	1558	1496	1342
240	1478	1514	1505	1374	1577	1516	1363
250	1491	1531	1515	1392	1594	1533	1381
260	1500	1545	1522	1405	1607	1547	1393
270	1509	1556	1528	1417	1618	1558	1405
280	1516	1566	1534	1429	1627	1568	1417
290	1523	1577	1539	1440	1637	1579	1428
300	1523	1577	1539	1440	1637	1579	1428
310	1523	1577	1539	1440	1637	1579	1428
320	1523	1577	1539	1440	1637	1579	1428
330	1523	1577	1539	1440	1637	1579	1428
340	1523	1577	1539	1440	1637	1579	1428
350	1523	1577	1539	1440	1637	1579	1428



Net Merchantable Volume Yield Curves

Future Managed Stands within the CWHvm2 Subzone (PSI scenario)

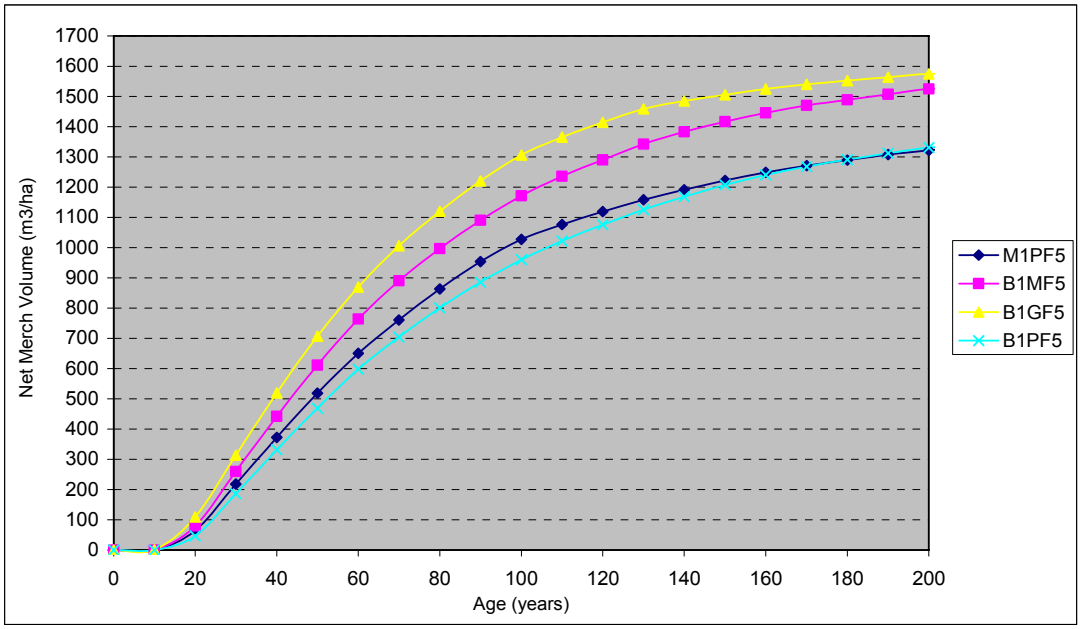
	Analysis Units						
Age	**B3MH5**	**M3AH5**	**M3PH5**	**B3PH5**	**M3MH5**	**M3GH5**	**B3GH5**
0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
20	11	8	4	5	9	14	18
30	100	83	49	53	88	123	133
40	221	193	136	144	201	257	271
50	339	301	224	235	313	385	405
60	458	411	312	327	425	516	538
70	561	507	392	409	524	628	653
80	659	600	468	488	618	735	761
90	747	682	537	559	703	829	856
100	824	755	598	621	776	911	939
110	890	819	656	680	841	980	1010
120	952	878	709	734	901	1044	1074
130	1009	933	757	783	957	1103	1135
140	1061	983	799	826	1007	1158	1190
150	1108	1027	835	864	1052	1208	1240
160	1147	1064	866	895	1090	1250	1282
170	1179	1095	893	922	1121	1283	1316
180	1208	1124	919	948	1150	1314	1347
190	1237	1152	943	973	1178	1343	1377
200	1266	1179	967	997	1207	1373	1407
210	1292	1205	990	1020	1233	1401	1434
220	1318	1230	1012	1043	1258	1428	1461
230	1339	1251	1031	1062	1279	1449	1482
240	1357	1269	1049	1081	1296	1465	1499
250	1373	1285	1065	1097	1313	1481	1516
260	1388	1300	1080	1111	1328	1497	1532
270	1403	1314	1093	1125	1342	1511	1546
280	1416	1327	1105	1137	1355	1525	1560
290	1427	1338	1115	1147	1366	1537	1572
300	1427	1338	1115	1147	1366	1537	1572
310	1427	1338	1115	1147	1366	1537	1572
320	1427	1338	1115	1147	1366	1537	1572
330	1427	1338	1115	1147	1366	1537	1572
340	1427	1338	1115	1147	1366	1537	1572
350	1427	1338	1115	1147	1366	1537	1572



Net Merchantable Volume Yield Curves

Future Managed Stands within the CWHxm2 Subzone (PSI scenario)

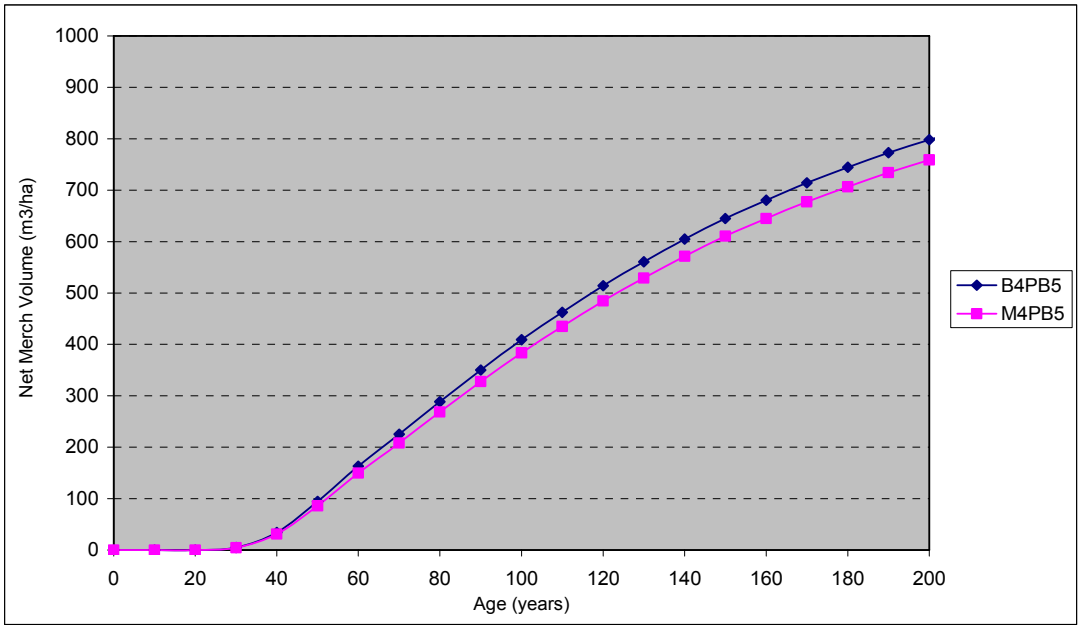
	Analysis Units			
Age	**M1PF5**	**B1MF5**	**B1GF5**	**B1PF5**
0	0	0	0	0
10	0	0	1	0
20	64	80	110	47
30	218	260	313	187
40	372	442	519	332
50	518	611	707	469
60	650	763	869	599
70	761	891	1006	704
80	864	997	1120	801
90	954	1090	1220	886
100	1028	1171	1306	960
110	1076	1235	1365	1022
120	1120	1291	1414	1076
130	1158	1343	1459	1125
140	1191	1383	1485	1168
150	1222	1416	1506	1207
160	1248	1445	1524	1240
170	1271	1470	1540	1268
180	1290	1489	1552	1291
190	1307	1507	1563	1313
200	1322	1524	1574	1331
210	1336	1526	1575	1341
220	1351	1527	1575	1351
230	1365	1528	1575	1360
240	1377	1530	1575	1369
250	1389	1531	1575	1377
260	1399	1532	1575	1384
270	1409	1533	1576	1390
280	1416	1533	1576	1396
290	1425	1534	1576	1401
300	1425	1534	1576	1401
310	1425	1534	1576	1401
320	1425	1534	1576	1401
330	1425	1534	1576	1401
340	1425	1534	1576	1401
350	1425	1534	1576	1401



Net Merchantable Volume Yield Curves

Future Managed Stands within the MHmm1 Subzone (PSI scenario)

	Analysis Units	
Age	**B4PB5**	**M4PB5**
0	0	0
10	0	0
20	0	0
30	5	5
40	34	31
50	95	86
60	163	150
70	226	208
80	289	269
90	350	327
100	409	384
110	462	435
120	514	485
130	561	529
140	605	571
150	645	610
160	681	645
170	714	677
180	744	707
190	773	734
200	798	759
210	820	781
220	841	801
230	861	821
240	877	837
250	891	851
260	905	865
270	917	877
280	928	888
290	939	899
300	939	899
310	939	899
320	939	899
330	939	899
340	939	899
350	939	899



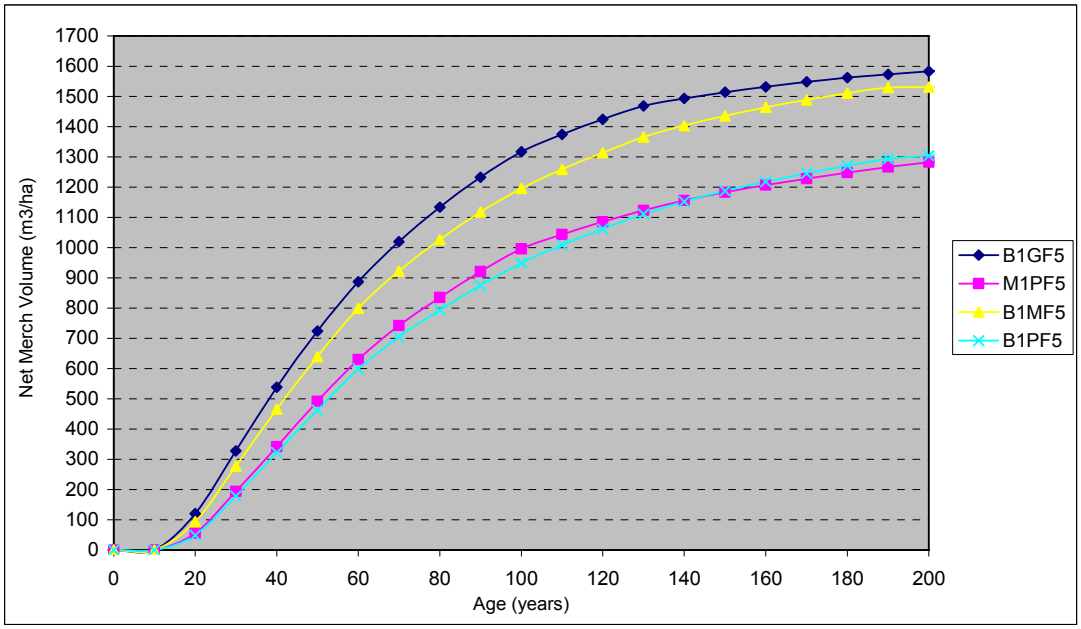
Appendix F: Future Managed Yield Tables (Fertilization options)

Note that the yield tables in this appendix do not reflect a 1-year regen delay as the tables were generated when no regeneration delay was proposed. The corresponding yield tables in the Woodstock model will reflect a 1-year regeneration delay and will simply be interpolations of the tables in this appendix.

Net Merchantable Volume Yield Curves

Future Managed Stands within the CWHxm2 Subzone (SIBECfert scenario)

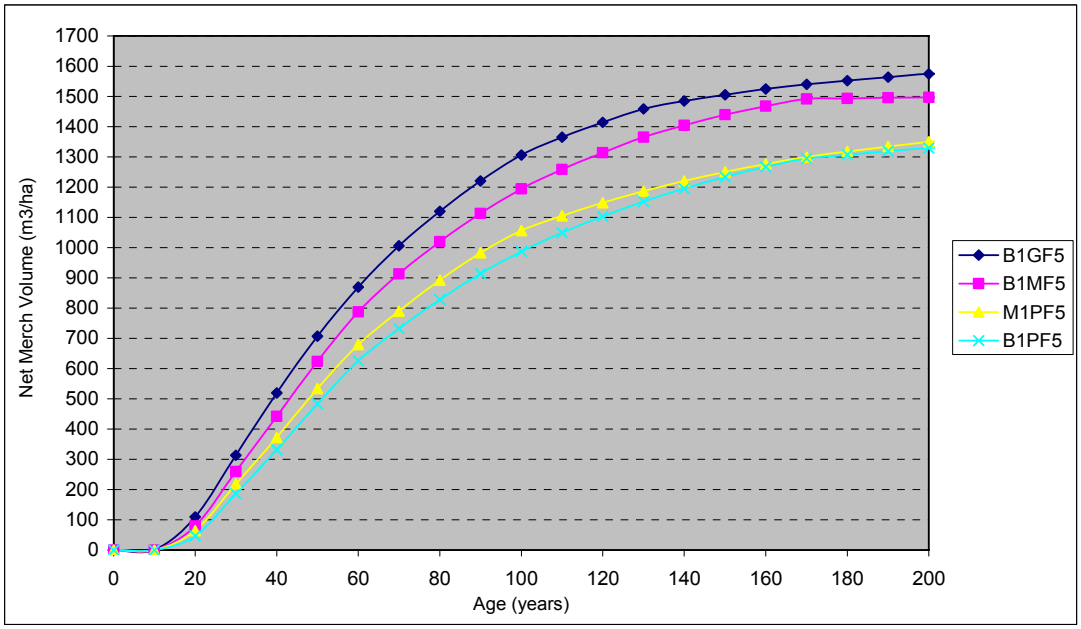
	Analysis Units			
Age	**B1GF5**	**M1PF5**	**B1MF5**	**B1PF5**
0	0	0	0	0
10	1	0	0	0
20	120	56	94	49
30	328	194	277	178
40	539	342	466	323
50	724	492	639	463
60	887	630	800	599
70	1020	742	923	705
80	1134	835	1026	793
90	1233	921	1118	875
100	1317	996	1196	949
110	1375	1044	1259	1009
120	1424	1086	1314	1062
130	1469	1123	1366	1111
140	1493	1156	1404	1152
150	1514	1183	1436	1187
160	1531	1206	1464	1218
170	1548	1228	1489	1246
180	1562	1248	1510	1271
190	1573	1266	1529	1293
200	1583	1282	1531	1304
210	1594	1297	1533	1314
220	1594	1312	1534	1324
230	1594	1324	1535	1332
240	1595	1336	1537	1340
250	1595	1347	1538	1348
260	1595	1356	1539	1354
270	1595	1364	1540	1360
280	1596	1372	1540	1365
290	1596	1379	1541	1369
300	1596	1379	1541	1369
310	1596	1379	1541	1369
320	1596	1379	1541	1369
330	1596	1379	1541	1369
340	1596	1379	1541	1369
350	1596	1379	1541	1369



Net Merchantable Volume Yield Curves

Future Managed Stands within the CWHxm2 Subzone (PSIfert scenario)

	Analysis Units			
Age	**B1GF5**	**B1MF5**	**M1PF5**	**B1PF5**
0	0	0	0	0
10	1	0	0	0
20	110	80	64	47
30	313	260	218	187
40	519	442	372	332
50	707	624	534	484
60	869	787	680	626
70	1006	914	790	732
80	1120	1020	893	828
90	1220	1113	983	914
100	1306	1195	1057	988
110	1365	1258	1105	1050
120	1414	1314	1149	1103
130	1459	1366	1187	1153
140	1485	1405	1220	1195
150	1506	1439	1250	1234
160	1524	1468	1277	1267
170	1540	1491	1299	1294
180	1552	1493	1318	1307
190	1563	1495	1335	1319
200	1574	1497	1350	1329
210	1575	1498	1364	1339
220	1575	1499	1379	1349
230	1575	1501	1392	1358
240	1575	1502	1405	1366
250	1575	1503	1416	1374
260	1575	1504	1426	1381
270	1576	1505	1435	1387
280	1576	1505	1444	1393
290	1576	1506	1452	1399
300	1576	1506	1452	1399
310	1576	1506	1452	1399
320	1576	1506	1452	1399
330	1576	1506	1452	1399
340	1576	1506	1452	1399
350	1576	1506	1452	1399



Appendix G: Timberline Memo Re: SIBEC and PSI Estimates for TFL 19

Timberline Natural Resource Group

Suite 401, 958 West 8th Ave.,
Vancouver, BC V5Z 1E5
Tel (604) 733-0731
Fax (604) 733-0634
www.timberline.ca

MEMO

DATE: June 29, 2007
TO: Patrick Bryant, Mike Davis, and Peter Kofoed
FROM: Tara McCormick
RE: SIBEC Estimates for TFL 19

1. Terms of Reference

In November 2006, Western Forest Products Ltd. (Western) contacted Timberline Natural Resource Group Ltd. (TNRG)[1] seeking options to incorporate the best available site index estimates for the upcoming Timber Supply Review (TSR) for Tree Farm Licence (TFL) 19, and to provide recommendations to improve the estimates across the TFL for future TSRs. Following a preliminary review of background information, TNRG and Western decided that the Ministry of Forests and Range (MoFR) Site Index Biogeoclimatic Ecosystem Classification (SIBEC)[2] estimates provided the best available, and MoFR-approved, site productivity information for the upcoming TSR.

Patrick Bryant *RPF*, Peter Kofoed *RPF*, and Mike Davis *RPF* were the company contacts for Western. The TNRG team included Tara McCormick *BSc*, Guillaume Thérien *PhD*, and Hamish Robertson *RPF*. Minor revisions were made to the original version submitted April 19th to incorporate suggestions and clarify questions identified by Western.

2. Background

Growth and yield practitioners in British Columbia generally recognize that the site index estimates of old, natural stands do not accurately reflect the potential height growth that can be achieved in managed, second-growth stands regenerating on the same sites. The site index of these old stands has often been negatively impacted by non-site factors including past suppression, cumulative height growth damage, and application bias of the site index equations in very old stands. In managed stands, where non-site factors are minimized through management practices, we expect that site index will better reflect the potential productivity of the site. Application of under-estimated site indices to future managed stands in timber supply analysis results in inaccurate predictions of stand volume, which ultimately leads to under-stating the sustainable harvest in TSR. This under-estimation in current inventories has been repeatedly confirmed in studies completed across the province.[3,4,5] In December 2002, the MoFR released the second approximation SIBEC estimates for use in base case timber supply analyses to help improve estimates of managed stand site index.[6]

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[1] J.S. Thrower & Associates Ltd., Timberline Inventory Consultants Ltd., and GeoSpatial Consulting Inc. merged operations in May 2006 to become Timberline Natural Resource Group (TNRG).
[2] MoFR SIBEC website: http://www.for.gov.bc.ca/hre/sibec/
[3] TNRG has completed 25 Site Index Adjustment (SIA) projects on management units across BC including 11 coastal units, two of which were Western's TFL 6 and TFL 37.
[4] Nigh, G.D. 1998. Site index adjustments for old-growth stands based on veteran trees B.C. Min. For., Res. Br., Victoria, B.C. Work. Pap. 36.
[5] Nussbaum, A.F. 1998. Site index adjustments for old-growth stands based on paired plots. B.C. Min. For., Res. Br., Victoria, B.C. Work Pap. 37.
[6] Mah, S and G. Nigh. 2003. SIBEC site index estimates in support of forest management in British Columbia. Tech. Rep. 04. B.C. Min. For. Res. Br. Victoria, BC. Available from website: http://www.for.gov.bc.ca/hfd/pubs/docs/tr/tr004.htm

In the last TSR, Western incorporated interim site productivity estimates for managed stands derived from MoFR first approximation SIBEC estimates and SIA results from TFL 37.[1,2] Western has reviewed available site index sources in preparation for the upcoming TSR, and has decided to use the updated SIBEC estimates to develop managed stand yield tables.[2]

3. Memo Objectives

This document outlines the methods used to assign SIBEC estimates to the TFL 19 land base, summarizes the results, compares the proposed SIBEC estimates to other sources of site index, and provides recommendations for future refinements.

4. Methods

4.1. TFL 19 Dataset

Western provided TNRG with a TFL 19 resultant dataset created from the overlay of the Terrestrial Ecosystem Mapping (TEM) and Vegetation Resources Inventory (VRI).[3] These inventories were completed on the TFL in 2000 and 2001, respectively.[4,5] TNRG attached the operability layer to the VRI/TEM resultant and provided an average elevation, derived from the Digital Elevation Model (DEM), to each resultant polygon. Non-forested and non-productive polygons identified in the VRI (based on DESCRIPTOR_ attribute) were excluded (Table 1). The population of interest for the SIBEC assignment was the productive forested land base (PFLB) where TEM information was available, and included 171,646 ha (Table 1). Data summaries provided in this memo distinguish the operable (approximation of timber harvesting land base) and inoperable areas within the forested land base.

Table 1. Netdown to the productive forested land base on TFL 19

Land base/ Descriptor	Area (ha)	Excluded Area (ha)	% TFL	% Forested
Entire TFL	191,696		100%	
Non-Productive & Non-Forested (VRI)		19,017	10%	
A		2,998	2%	
BRUSH		1,121	1%	
CAMP		46	0%	
CLEAR		2	0%	
CUTBK		3	0%	
HIWAY		42	0%	
HYDRW		195	0%	
LAKE		1,550	1%	
OUTLD		2	0%	
PIT		42	0%	
RIVER		796	0%	
ROAD		7	0%	
ROCK		11,641	6%	
SLIDE		447	0%	
SORT		21	0%	
SWAMP*		82	0%	

[1] Province of British Columbia. 1997. Site index estimates by site series for coniferous tree species in British Columbia. Site Productivity Working Group, BC Ministry of Forests and Forest Renewal BC. 265 pp.
[2] British Columbia Ministry of Forests. Tree Farm Licence 19 Rationale for Allowable Annual Cut (AAC) Determination. Effective August 1, 2001. 32 pp. + App.
[3] TNRG downloaded the TFL 19 resultant dataset and the operability layer from Western's FTP site on January 23, 2007.
[4] Olympic Resource Management completed Phase I of the VRI on TFL 19 in 2001, based on 1995 aerial photos.
[5] Madrone Consultants Ltd. 2000. Terrestrial Ecosystem Mapping of TFL 19. Final Report. Contract report to Western Forest Products Ltd. Campbell River, BC. 50 pp.

NPFOR*		22	0%	
Productive Forested	172,679		90%	100%
FOR	148,438		77%	86%
FORSN	245		0%	0%
FORWF	42		0%	0%
NSR	83		0%	0%
NSR00	18		0%	0%
NSR04	396		0%	0%
NSR05	991		1%	1%
NSR91	1		0%	0%
NSR99	16		0%	0%
NSRSN	129		0%	0%
NSRWF	41		0%	0%
NSSR0	6		0%	0%
SR	593		0%	0%
SR01	3		0%	0%
SR02	203		0%	0%
SR03	672		0%	0%
SR04	828		0%	0%
SR05	810		0%	0%
SR96	181		0%	0%
SR97	0		0%	0%
SWAMP*	253		0%	0%
NPFOR*	18,834		10%	11%
Null TEM		1,033	0%	0%
Forested with TEM	171,646		90%	99%
Operable	106,440		56%	62%
Inoperable	65,206		34%	38%

* SWAMP and NPFOR attributes represented both productive and non-productive polygons. Hence, only polygons without a species label were assumed non-productive, and were excluded.

Ninety percent (90%) of the operable TFL area is located in the Coastal Western Hemlock (CWH) very wet maritime subzone (CWHvm), with 64% within the submontane variant (CWHvm1) and 26% in the montane variant (CWHvm2). The remaining areas occur in the very dry maritime variant (CWHxm2) and the Mountain Hemlock (MH) windward moist maritime variant (MHmm1) (Table 2). The most important tree species on the TFL, based on the leading species in the current inventory, are western hemlock (Hw), Douglas-fir (Fd), western redcedar (Cw), and yellow cedar (Yc). These four species are leading in 93% of the forested area. Minor areas of amabilis fir (Ba), lodgepole pine (Pl), Sitka spruce (Ss), red alder (Dr), and bigleaf maple (Mb) also exist on the TFL.

Table 2. Area distribution by BGC variant and operability

BGC	Operable Area		Inoperable Area		Total Area	
Variant	(ha)	(%)	(ha)	(%)	(ha)	(%)
CWHxm2	4,910	4%	1,493	2%	6,403	4%
CWHvm1	67,803	64%	17,969	28%	85,772	50%
CWHvm2	27,323	26%	25,540	39%	52,863	31%
MHmm1	6,393	6%	19,048	29%	25,442	15%
MHmmp1	10	0%	1,108	2%	1,118	1%
AT		0%	47	0%	47	0%
All	*106,440*	*100%*	*65,206*	*100%*	*171,645*	*100%*

4.2. SIBEC Estimates

SIBEC estimates were collated from the most up to date provincial SIBEC database for the biogeoclimatic (BGC) subzone variants, site series, and main management species on the TFL (Table 3).[1,1] The MoFR has been developing

[1] SIBEC estimates are available at: http://www.for.gov.bc.ca/hre/sibec/reports/sisuBybgcUnit.xls

the SIBEC program since the early 1990s. The provincial SIBEC database was initially compiled in 1994/95, collating existing data from various sources, and developing the first approximation estimates by site unit. Since the release of these first approximations, SIBEC data and sampling standards have been developed and additional data have been collected to build on the SIBEC database. Second approximation estimates were released in December 2002, and yearly updates occur to the database to reflect new data collection.

The SIBEC database provides average site indices for each site series/tree species combination with a minimum sample size of seven. Site series combinations not meeting this sample size retain the first approximation estimates. Many of the CWHvm1 combinations are populated with more reliable second approximations, as noted by the sample sizes shown in Table 3. Conversely, all SIBEC estimates in the CWHvm2, MHmm2, and CWHxm2 (with the exception of the CWHxm2/01) are based on historical expert knowledge and extrapolated trends from other BGC variants. Low reliability ratings were assigned to the first approximations in the CWHvm2 and MHmm1 in their initial publication; whereas high and medium reliability ratings were given to the SIBEC estimates for the common site series in the CWHxm2.[1]

Table 3. SIBEC estimates (m) for the site series and management species on TFL 19
n=sample size

BGC	Site	%	%	SIBEC					
Variant	Series	OPFLB	PFLB	Hw SI	Hw n	Fd SI	Fd n	Cw SI	Cw n
CWHxm2	01	3%	2%	24.0		32.9	13	24.0	
CWHxm2	02	0%	0%			20.0			
CWHxm2	03	0%	1%			24.0		20.0	
CWHxm2	04	0%	0%			28.0		28.0	
CWHxm2	05	1%	1%			36.0		24.0	
CWHxm2	07	0%	0%			40.0		28.0	
CWHxm2	08	0%	0%					24.0	
CWHxm2	09	0%	0%					24.0	
CWHxm2	11	0%	0%					8.0	
CWHxm2	12	0%	0%	32.0				16.0	
CWHxm2	15	0%	0%					24.0	
CWHvm1	01	34%	25%	27.7	94	35.8	9	22.6	34
CWHvm1	02	1%	1%	8.0		8.0		8.0	
CWHvm1	03	13%	12%	16.0		32.2	9	16.0	
CWHvm1	04	0%	0%	26.2	7	32.0		22.5	10
CWHvm1	05	9%	6%	28.5	35	36.0		24.0	15
CWHvm1	07	1%	1%	32.6	13			24.0	
CWHvm1	09	1%	1%	28.0				24.0	
CWHvm1	10	0%	0%					24.0	
CWHvm1	12	1%	1%	16.0				12.0	
CWHvm1	13	0%	0%					8.0	
CWHvm1	14	0%	0%	21.0	10			19.4	13
CWHvm2	01	17%	18%	28.0				20.0	
CWHvm2	02	1%	2%	8.0		8.0		8.0	
CWHvm2	03	4%	5%	16.0		24.0		16.0	
CWHvm2	05	2%	2%	28.0				24.0	
CWHvm2	07	1%	1%	28.0				24.0	
CWHvm2	09	1%	1%	12.0				12.0	
CWHvm2	11	0%	0%	16.0				16.0	
MHmm1	01	5%	8%	16.0					
MHmm1	02	1%	3%	12.0					
MHmm1	03	0%	0%	12.0					
MHmm1	05	0%	1%	16.0					

[1] Western identified the main management species as Hw, Fd, and Cw.

MHmm1	06	0%	0%	8.0

4.3. Application of SIBEC Estimates to TFL 19

SIBEC estimates were not always available for Hw, Fd, and Cw in each site series because some site series/species combinations are not populated in the provincial database. Where missing values occurred in plausible BGC variant/site series/species combinations, we used the SIBEC estimate from the available species to generate a converted SIBEC estimate for the missing species using the MoFR site index conversion equations.[1,2] Estimates were not generated for Fd or Cw in the MHmm1.

We assigned SIBEC estimates for Hw, Fd, and Cw to each resultant polygon in the PFLB based on the TEM site series delineation. An area-weighted site index was calculated for each forest cover polygon based on the site series proportions in that polygon. SIBEC estimates were not available for alpine tundra (AT), MH parkland (MHmm1p), or for non-productive or non-forested BEC site series.[3] This resulted in a total of 16,547 ha without SIBEC estimates in the PFLB, of which 3,986 ha were operable. Inventory site index should be used for polygons that fall entirely into non-forested/non-productive site series or in AT and MHmmp1 areas. Where non-productive inclusions occur in a "forested" polygon, the null site index of the non-productive site series component is ignored when calculating the weighted average site index. The component areas of productive and non-productive site series were identified within each forest cover polygon (FOR_PID) in the productive forest land base to allow for appropriate yield reductions in the managed stand yield table process (in TFL19_AVG_SIBEC_by_FOR_PID.xls).

TNRG confirmed with the MoFR that specific methods or protocols do not exist for assigning SIBEC to TSR datasets; rather the forest licensees must document their methods and assumptions in the data package for review by MoFR in the TSR process (pers. comm., Shirley Mah *RPF MSc*, MoFR, Research Branch on January 29, 2007).

4.4. Results

Application of SIBEC estimates to all polygons in the PFLB where estimates were available resulted in an average site index of 22.2 m for Hw, 31.2 m for Fd, and 20.2 m for Cw (Table 4). This approach assumes that the three species are growing everywhere; however, it is more appropriate to apply the species estimates solely to areas where they will be planted (*i.e.*, their natural range of sites). For comparative purposes, we applied the respective species estimates only to areas where H (Hw or Hm), Fd, or C (Cw or Cy) were currently leading in the VRI and where SIBEC estimates were available, representing a subset of 135,809 ha (79% of the PFLB) (Table 5). The average was 22.8 m for H, 32.8 m for Fd, and 18.3 m for C in the PFLB. The overall average SIBEC estimate for all species was 23.1 m, which represents a 27% (4.9 m) increase over the current inventory estimate.

[1] Nigh, G.D. and G. Kayahara. 2000. Site index conversion equations for western redcedar and western hemlock. Northwest Sci. 74(2): 146-150.
[2] Nigh, G. D. 1995a. Site index conversion equations for mixed species stands. B.C. Min. For., Res. Br., Victoria, B.C. Res. Rep. 01.
[3] Although the majority of non-productive and non-forested polygons identified in the VRI were netted out of the population of interest (some SWAMP and NONFOR remain), the TEM identified areas of non-productive or non-forested inclusions within forested polygons.

To increase the level-of-comfort that the SIBEC estimates proposed for TFL 19 are reasonable and consistent with other data sources, we compared the computed average SIBEC estimates to site index data collected from random sampling in other coastal management units. The latter site index source was termed "preliminary site index" and represents TNRG's predicted estimate of site productivity of managed stands on TFL 19 based on our data and experience in ecologically similar areas (Table 5).[1] The SIBEC estimates generally reflect the expected productivity across BGC unit and species. The two sources were within 5% overall, with SIBEC estimates being more conservative.

Based on the comparison, the average Hw SIBEC estimate may under-predict the potential productivity in the CWHvm1 by ~10%. A review of the SIBEC estimates by site series illustrates that part of the under-estimate results from the impact of a very conservative first approximation estimate of 16 m for Hw in the CWHvm1/03 (Table 3). This site series represents 13% of the operable PFLB and is likely under-estimated by 5-6 m (*i.e.*, Hw PSI was 22 m for this site series). Western should consider developing a second approximation estimate for this cell of the SIBEC matrix by populating it with 7 to 10 Hw plots. This would be a relatively easy and low-cost improvement.

Table 4. Average SIBEC estimate by species, operability, and BGC variant based on the site series distribution across the PFLB

Operability	BGC Variant	Area (ha)	SIBEC SI (m)		
			Hw	Fd	Cw
Operable	CWHxm2	4,910	24.3	32.7	23.9
	CWHvm1	67,803	24.2	34.3	21.3
	CWHvm2	27,323	23.2	27.2	18.9
	MHmm1	6,403	15.2	NA	NA
	Subtotal		*23.4*	*32.3*	*20.8*
		106,440			
Inoperable	CWHxm2	1,493	22.1	28.7	22.7
	CWHvm1	17,969	21.0	32.7	19.2
	CWHvm2	25,540	22.1	26.0	18.2
	MHmm1	19,048	14.4	NA	NA
	MHmmp1	1,108	NA	NA	NA
	AT	47	NA	NA	NA
	Subtotal	*65,206*	*19.8*	*28.7*	*18.7*
All	CWHxm2	6,403	23.8	31.8	23.6
	CWHvm1	85,772	23.6	34.0	20.8
	CWHvm2	52,863	22.7	26.6	18.6
	MHmm1	25,442	14.6	NA	NA
	MHmmp1	1,118	NA	NA	NA
	AT	47	NA	NA	NA
All	*Total*		*22.2*	*31.2*	*20.2*
		171,645			

NA – SIBEC estimates were not available for these species/variant

[1] TNRG has collated site index data from growth & yield projects completed over the past 15 years. The TNRG site index database consists of 6,888 observations across the province; 1,105 of which were sampled within the CWH, Coastal Douglas Fir (CDF), and MH zones. The majority of these observations are from randomly located SIA plots, thus provide unbiased estimates for the areas where they were sampled.

Table 5. Comparison of inventory (Inv), SIBEC, and preliminary site index (PSI) by species and BGC variant for the operable productive and productive forested land bases for a subset of PFLB area where Hw, Fd, Cw, or Yc are currently leading

BGC Variant	Spc1	Operable PFLB				PFLB			
		Area (ha)	InvSI (m)	SIBEC (m)	PSI (m)	Area (ha)	InvSI (m)	SIBEC (m)	PSI (m)
CWHxm2	Hw	798	25.8	24.1	25.8	1,050	24.4	23.7	25.3
	Fd	3,710	29.3	32.9	32.6	4,535	27.8	32.1	32.0
	Cw	44	17.3	23.7	23.6	59	16.3	23.2	23.1
	Yc	13	9.9	24.1	23.9	13	9.9	24.1	23.8
	All	*4,565*	*28.5*	*31.3*	*31.3*	*5,657*	*27.0*	*30.4*	*30.6*
CWHvm1	Hw	37,316	22.4	24.7	26.8	44,707	21.4	24.3	26.6
	Fd	9,817	28.5	34.5	33.1	12,010	27.2	34.0	32.6
	Cw	8,750	17.2	19.9	23.1	11,450	16.5	19.6	22.9
	Yc	2,836	12.1	18.7	22.6	4,848	11.5	18.4	22.4
	All	*58,719*	*22.1*	*25.3*	*27.1*	*73,015*	*20.9*	*24.7*	*26.7*
CWHvm2	Hw	15,060	18.1	23.9	23.4	23,801	16.8	23.8	23.3
	Fd	707	22.5	26.6	28.1	1,629	20.2	25.7	27.6
	Cw	1,991	15.8	18.1	19.8	3,460	15.2	18.0	19.7
	Hm	1,310	10.8	24.1	23.7	4,182	9.4	24.3	23.8
	Yc	4,761	12.5	17.5	19.5	12,509	11.3	17.1	19.1
	All	*23,829*	*16.5*	*22.2*	*22.4*	*45,582*	*14.6*	*21.6*	*22.0*
MHmm1	Hw	2,780	15.3	15.5	17.4	5,709	14.5	15.2	17.0
	Hm	1,355	8.2	15.0	17.4	5,847	7.5	14.7	16.4
	All	*4,135*	*12.9*	*15.3*	*17.4*	*11,555*	*10.9*	*14.9*	*16.7*
All	Hw	55,686	21.0	24.0	25.4	74,752	19.5	23.4	24.8
	Fd	14,234	28.4	33.7	32.7	18,175	26.7	32.8	32.0
	Cw	10,786	16.9	19.6	22.5	14,969	16.2	19.3	22.1
	Hm	2,933	9.7	19.8	21.0	10,542	8.4	18.8	19.8
	Yc	7,610	12.4	18.0	20.7	17,371	11.4	17.4	20.0
	All	*91,248*	*20.6*	*24.4*	*25.7*	*135,809*	*18.2*	*23.1*	*24.5*

Western should also consider improving the confidence in the CWHvm2 and MHmm1 estimates, which are based on low reliability first approximations. Although the two sources (SIBEC and PSI) predict very similar averages for this variant, we caution that both sources are based on sparse data and extrapolations from other areas. Much of the existing site index data (SIBEC, SIA, Permanent Sample Plots [PSP]) and the resulting professional expertise are focused in lower elevation areas with extensive harvest history (*i.e.,* below 600 m). Few data have been collected in higher elevation areas due to a lack of managed stands with sufficient years above breast height to provide reliable site index estimates through height and age measurements. The scarcity of data and the known declining site index trend with increasing elevation lead to more uncertainty and potential bias in existing high elevation site productivity estimates. Further work is needed to ensure the proposed CWHvm2 estimates reflect the actual potential productivity of managed stands. A more detailed discussion of this issue was provided in the high elevation site index options analysis completed for Western by TNRG.[1]

4.5. Conclusions

Western applied SIBEC estimates to all areas in the productive forest for the timber supply analysis in support of the current TSR on TFL 19. A comparison between the proposed SIBEC estimates and other coastal data sources showed

[1] Timberline Natural Resource Group Ltd. 2007. Site index options analysis for high elevation areas on Western Forest Products Ltd. Tree Farm Licences. Unpublished Report, Project No. WPC-009. April 17, 2007. 13 pp.

that, on average, the SIBEC estimates generally reflect the expected productivity of managed stands on TFL 19. The application of SIBEC provides more reliable site index than inventory-based estimates and should generally lead to more accurate projections of future growth and yield in managed stands; however, Western should improve the confidence in the high elevation estimates which are based on expert opinion rather than data, and do not incorporate an elevation model to account for the decrease in site index with increasing altitude. Increased certainty in the high elevation site productivity estimates will become more important as harvesting activities expand into these areas.

Appendix H: SIBEC and PSI Estimates for Major Site Series in TFL 19

Table 43 - SIBEC and PSI Site Index Comparisons

BEC Variant	Site Series	% of Operable Productive Forest	Western hemlock		Douglas-fir		Western red cedar	
			SIBEC (m)	PSI (m)	SIBEC (m)	PSI (m)	SIBEC (m)	PSI (m)
CWHxm2	01	3%	24.0	25.5	32.9	32.0	24.0	23.1
	05	1%	26.4	30.0	36.0	36.0	24.0	27.4
CWHvm1	01	34%	26.5	26.5	35.8	33.0	23.0	24.1
	02	1%	8.0	16.0	8.0	20.0	8.0	14.1
	03	13%	16.0	23.0	32.2	29.0	16.0	20.8
	05	9%	28.5	32.0	36.0	38.0	24.0	29.3
	07	1%	32.6	33.0	36.7	38.0	24.0	30.3
	09	1%	28.0	33.0	31.6	38.0	24.0	30.3
	12	1%	16.0	24.0	18.2	27.1	12.0	21.7
CWHvm2	01	17%	26.0	24.0	29.3	30.0	20.0	21.7
	02	1%	8.0	12.0	8.0	18.0	8.0	10.3
	03	4%	16.0	19.0	24.0	25.0	16.0	16.9
	05	2%	28.0	29.0	31.6	35.0	24.0	26.5
	07	1%	28.0	30.0	31.6	36.0	24.0	27.4
	09	1%	12.0	19.0	13.8	18.0	12.0	16.9
MHmm1	01	5%	16.0	18.0				16.0
	02	1%	12.0	10.0				8.3

Appendix I: Results of Review of 1997-2005 Harvested Cutblocks

A review of cutblocks harvested between 1997 and 2005 was undertaken to determine the accuracy of the netdowns used in MP #9 when compared to operational results. The GIS data for the cutblocks harvested in these years was overlaid upon the THLB determined for MP #9. The total area harvested within these cutblocks compared very favourably with the strategic estimate (Table 44).

Table 44 – MP #9 THLB Estimate Compared to Actual Harvest Area

Description	Area (ha)
Total area in cutblocks	11,135
MP #9 THLB within cutblocks	9,687
Less 3.25% WTRA allowance	(315)
MP #9 estimate of harvest area	9,372
Actual harvest area	9,511
Difference	139 (1.5%)

The results also indicate that operationally, overall retention was approximately 14% ((11,135-9,511)/11,135)