Appendix I
TFL Amendments

TFL 19 Amendments

Amend No.	Date	Schedule		Net Change	Amendment Description	Operation	Local Area
		A (ha)	B (ha)				
n/a	Oct 20, 1955	-12.2		-12.2	Lot 623 is deleted from sched A	n/a	n/a
1	Dec 9, 1955	-86.1	86.1	0.0	Lot 656 (TL 243) is transferred from sched A to sched B (reverted)	n/a	n/a
2	Apr 12, 1956	-54.4		-54.4	Lot 443 is deleted from sched A	n/a	n/a
3	May 1, 1956		-0.4	-0.4	Pt of Lot 81 is deleted from sched A for a repeater site	Tahsis	Tahsis
4	June 18,1957	64.5		64.5	Lot 441 is added to sched A	n/a	n/a
5	Nov 5, 1956		-0.1	-0.1	R/W area adjacent to lot 441(near mouth of Conuma R.) is deleted from sched B	n/a	n/a
6	June 21, 1957			0.0	Lot 5, Tbr lease 144 is deleted from sched A and TFL 19	n/a	n/a
7	Aug 1, 1957	1375.1		1375.1	Lot 174 & northerly portion of Lot 175 near Gold R town site are added to sched A	Gold River	Gold R. townsite
8	May 20,1958		-75.5	-75.5	Crown area (Lot 625) is deleted from sched B	n/a	n/a
9	Jan 27,1959		-0.1	-0.1	SUP 2094 area is deleted from sched B	Head Bay	Head Bay
10	Sept 27, 1960		0.0	0.0	SUP 4013 is deleted from sched B for the life of the SUP. It is supposed that SUP 4013 has since expired and area is added back into TFL (no amend made)	Gold River	Southeast arm of Muchalat inlet
11	Oct 7, 1960	0.0	0.0	0.0	TS X52967, X61770, X61970 & X65054 expired and area is deleted from sched A and added to sched B	n/a	n/a
12	Mar 30, 1961	-1.1		-1.1	Part of Lot 595 is deleted from sched A and TFL 19	n/a	n/a
13	Mar 26, 1963		-4.1	-4.1	A parcel of crown land SW of Gold R townsite on a mtn top is deleted for purposes of a fire lookout station	Gold River	Overlooks Gold R from SW mountain
14	Feb 5, 1965		-246.2	-246.2	Crown land is deleted for the creation of the Gold R townsite (Lot 174 and 175)	Gold River	Gold R. townsite
15	Feb 24, 1965	-13.0		-13.0	Area is deleted from sched A for the creation of the Gold R townsite (Lot 175)	Gold River	Gold R. townsite
16	Not Used			0.0	Amendment 16 was never issued		
17	Sept 2, 1965			0.0	SUP 5583 is deleted from sched B for the lifetime of the permit. (It is not currently known if such permit still exists).	Gold River	Gold R townsite

Amend No.	Date	Schedule		Net Change	Amendment Description	Operation	Local Area
		A (ha)	B (ha)				
18	Feb 14, 1966			0.0	Amend lists the sched A & B properties of TFL 19	Nootka Region	Nootka Region
19	Mar 1, 1966	-1.2		-1.2	Portion of L 175 is deleted from sched A and the TFL for a road r/w	Gold River	Gold R townsite
20	May 12, 1966			0.0	TS X93344 is transferred to sched A and TS X92146 will revert to sched B when sale expires	TS X93355 is at Kleeptee and TS X93355 is at Zeballos	Kleeptee and Zeballos
21	May 30, 1966	-4.1		-4.1	Lot 174 has approx 4.1 ha deleted for a community park	Gold River	Gold R townsite
22	July 11, 1966			0.0	TL 1035 is deleted from sched A and transferred to sched B	Tahsis Inlet	Santiago Creek
23	Oct 24, 1966	-8.9		-8.9	L 649 (formerly part of L 6) was deleted from sched A	Gold River	Gold R townsite (just north of - with BC hydro substation on it)
24	Nov 7, 1966	-1.1		-1.1	Part of Lot 175 (known as Lot 1 Blk F) is deleted from sched A and the TFL for a water reservoir	Gold River	Gold R townsite
25	Nov 15, 1966	-2.4		-2.4	Lot 651 is deleted from sched A and the TFL	Gold River	Gold R Pulp Mill site
26	Dec 23, 1966			0.0	Amends Clause 10A of TFL contract		
27	Dec 20, 1966		-0.1	-0.1	Sched B land deleted from atop Mt. McKelvie for a TV (repeater) site	Gold River	Mt McKelvie east of Tahsis townsite
28	Dec 20, 1966		-0.1	-0.1	Sched B land deleted from atop Mt. Big Baldy for a TV (repeater) site	Gold River	Mt Baldy west of Gold R townsite
29	May 31, 1967	144.2		144.2	L 3 is added to sched A of the TFL	Gold River	Gold R Mill site
30	Nov 21, 1967	-13.6	-39.5	-53.1	Pts of L 54, 217 & 216 have been deleted as has part of sched B for a government highway	Gold River	Gold R Mill site to Townsite
31	Mar 14, 1968		-0.1	-0.1	Sched B land is deleted for purposes of a gravel pit (SUP 6108)	Gold River	Gold R townsite
32	Apr 11, 1968	2.5	-2.5	0.0	Deletes and replaces amendment 25 which incorrectly deleted sched A instead of sched B	Holberg	near Nahwitti Lake
33	July 3, 1968		-4.1	-4.1	Sched B land is deleted for purposes of a gravel pit (SUP 6163)	Gold River	Gold R townsite
34	Feb 3, 1969	14.2		14.2	Lot 62 is added to sched A	Head Bay	Head Bay
35	June 17, 1969	-22.8	-24.2	-46.9	Parts of L 74, 54, 174, 175, 216 & 217 and sched B are deleted for a BC Hydro r/w from Gold R town to Muchalat Inlet (pulp mill)	Gold River	Gold R Mill site to Townsite

Amend No.	Date	Schedule		Net Change	Amendment Description	Operation	Local Area
		A (ha)	B (ha)				
36	Jan 7, 1971	-62.5		-62.5	L 595 & 600 are deleted from sched A for the purposes of Tahsis townsite	Tahsis	Tahsis townsite
37	Mar 8, 1971			0.0	Amends clause 30 in text	Nootka Region	Nootka Region
38	Sept 15, 1971		-7.3	-7.3	Sched B land is deleted for industrial purposes	Zeballos	Zeballos townsite
39	Feb 16, 1972	-0.8		-0.8	Lot 1 of Lot 596 is deleted from sched A	Tahsis	Tahsis townsite
40	Not Used			0.0	Amendment 40 was never used		
41	Apr 21, 1972		-5.8	-5.8	Sched B land is deleted for purposes of a trailer park	Tahsis	Tahsis townsite
42	June 26, 1972		0.0	0.0	Sched B land is deleted for TV tower site (repeater) (SUP 7271)	Gold R	Gold R townsite (Mt Ucona)
43	June 26, 1972		0.9	0.9	Sched B land is deleted for a cable r/w to the TV tower site (SUP 7272)	Gold R	Gold R townsite (Mt Ucona)
44	Aug 7, 1972		-5.3	-5.3	Sched B land is deleted for a recreation area	Tahsis	Tahsis townsite
45	Jan 15, 1973		-2.6	-2.6	Sched B land is deleted for a BC hydro substation (L39)	Gold R	Gold R townsite
46	July 30, 1973		-31.2	-31.2	Sched B lands are deleted for a recreation area (golf course)	Gold R	Gold R townsite
47	Mar 5, 1975		-175.0	-175.0	Sched B land is deleted for the Gold R to Tahsis road r/w	Gold R-Tahsis	Gold R-Tahsis
48	Feb 2, 1976		-33.6	-33.6	Sched B land is deleted for Zeballos townsite expansion	Zeballos	Zeballos townsite
49	May 30, 1977		-2.6	-2.6	Sched B land is deleted for a recreation area along Gold River	Gold River	Gold River south of townsite
50	Feb 7, 1980		3.6	3.6	Amend 50 cancels Amend 13 and Fire Lookout station is added back into sched B	Gold River	Overlooks Gold R from SW mountain
51	June 26, 1980	-4.0	-80.3	-84.3	Pts of L 234, 235, 441 & 596 have been deleted as has part of sched B for a BC Hydro r/w along Head Bay road	Head Bay - Tahsis	Head Bay - Tahsis
52	Sept 29, 1980		-15.4	-15.4	Sched B land is deleted for purposes of a new section of the Head Bay Forest Road	Gold River	Upana Lake
53	Jan. 23, 1981	-1.3		-1.3	Part of Lot 441 is deleted from sched A for purposes of a fish hatchery	Head Bay	Conuma River
54	Jan. 12, 1982		-10.0	-10.0	Lot 108 is deleted from sched B land	Zeballos	Zeballos townsite
55	July 27, 1982		-6.0	-6.0	Sched B land is deleted for the purposes of a BC Hydro r/w	Head Bay	Head Bay
56	July 27, 1982		2.3	2.3	Sched B land is added as portion of BC Hydro r/w is no longer needed	Head Bay	Head Bay

Amend No.	Date	Schedule		Net Change	Amendment Description	Operation	Local Area
		A (ha)	B (ha)				
57	Aug 2, 1984		-0.6	-0.6	Lot 126 is deleted from sched B land	Gold River	Gold River south of townsite
58	Oct 30, 1985		-2.1	-2.1	Sched B land is deleted as it is a cemetery site.	Zeballos	Zeballos Valley
59	Nov 1, 1985			0.0	Amend changes text in paragraphs 3,02, 3.03 & 3.04	Nootka Region	Nootka Region
60	Sept 26, 1989		-7.0	-7.0	Lot 663 is deleted from sched B for purposes of a golf course	Gold River	Gold River townsite
61	June 6, 1989	-81.4		-81.4	Part of L 175 is deleted from sched A for Gold River townsite purposes	Gold River	Gold River townsite
62	June 1, 1990			0.0	Amend is for the purposes of changing the AAC for the inclusion of Small Business in the TFL. Starting from Jan 1/99 the SB cut is 45,868 m3.	Nootka Region	Nootka Region
63	Mar 21, 1995	-19.0	-106.0	-125.0	T 0657 sched A area and sched B area is deleted for the purposes of creating a First Nations Community	Gold River	Mowachaht Community north of Gold River
64	Aug 19, 1999	-9.9		-9.9	Land Deletion - Tahsis community industrial park deletion	Tahsis	Tahsis townsite
65	Not Used			0.0			
66	8-Dec-99			0.0	Amend is for the purposes of replacing TFL contract with a new generic contract	Nootka Region	Nootka Region
Total hectares added or deleted in TFL.		**1200.7**	**-794.6**	**406.1**			

Appendix II
Timber Supply Analysis
Information Package

Western Forest Products Limited

Tree Farm Licence 19

Timber Supply Analysis Information Package

In Preparation of

MANAGEMENT PLAN 9

Submitted to the Ministry of Forests
Timber Supply Branch
Victoria, BC

March 2001

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Planning and Resource Inventory Forester
Western Forest Products Limited

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1.0 INTRODUCTION

This Information Package provides a summary of data, assumptions, and modelling procedures to be used in the Timber Supply Analysis for Western Forest Product's (WFP) Tree Farm Licence (TFL) 19 Management Plan (MP) 9. The timber supply analysis will be completed with spatially explicit management objectives and the information in this package is presented accordingly.

The forest estate model Complan® will be used to complete the timber supply analysis. Complan is a spatially-explicit harvest scheduling model for forest management planning and will allow the effects of adjacency to be modelled and incorporated in the timber supply analysis. Complan allows for the inclusion of existing Forest Development Plans (FDP) and the 20–Year Plan providing greater operational relevance. The result is a detailed analysis that will guide operational planning and that can be checked and verified as planning proceeds.

WFP will complete the timber supply analysis to estimate timber harvest over a 250-year planning horizon based on the current harvestable land base, existing old forest timber volumes, and secondary forest growth rates. Spatial accuracy is an important consideration in environmental protection and non-timber resource management; these factors will also be spatially modelled as part of the timber supply analysis. The harvest forecast will project the timber supply impacts of current environmental protection and management practices including operational requirements of the Forest Practices Code (FPC) and other regulations and guidelines. 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. In meeting these objectives WFP will continue to harvest to the timber inventory profile within the constraints set by objectives for other resources, cut control regulations, approved harvesting plans, market demand and maintenance of long-term productivity. Due to the large proportion of area in older age classes on the TFL and a shortage of maturing age classes, we expect that the majority of the cut in the short- and medium-term to be concentrated in mature and over-mature stands.

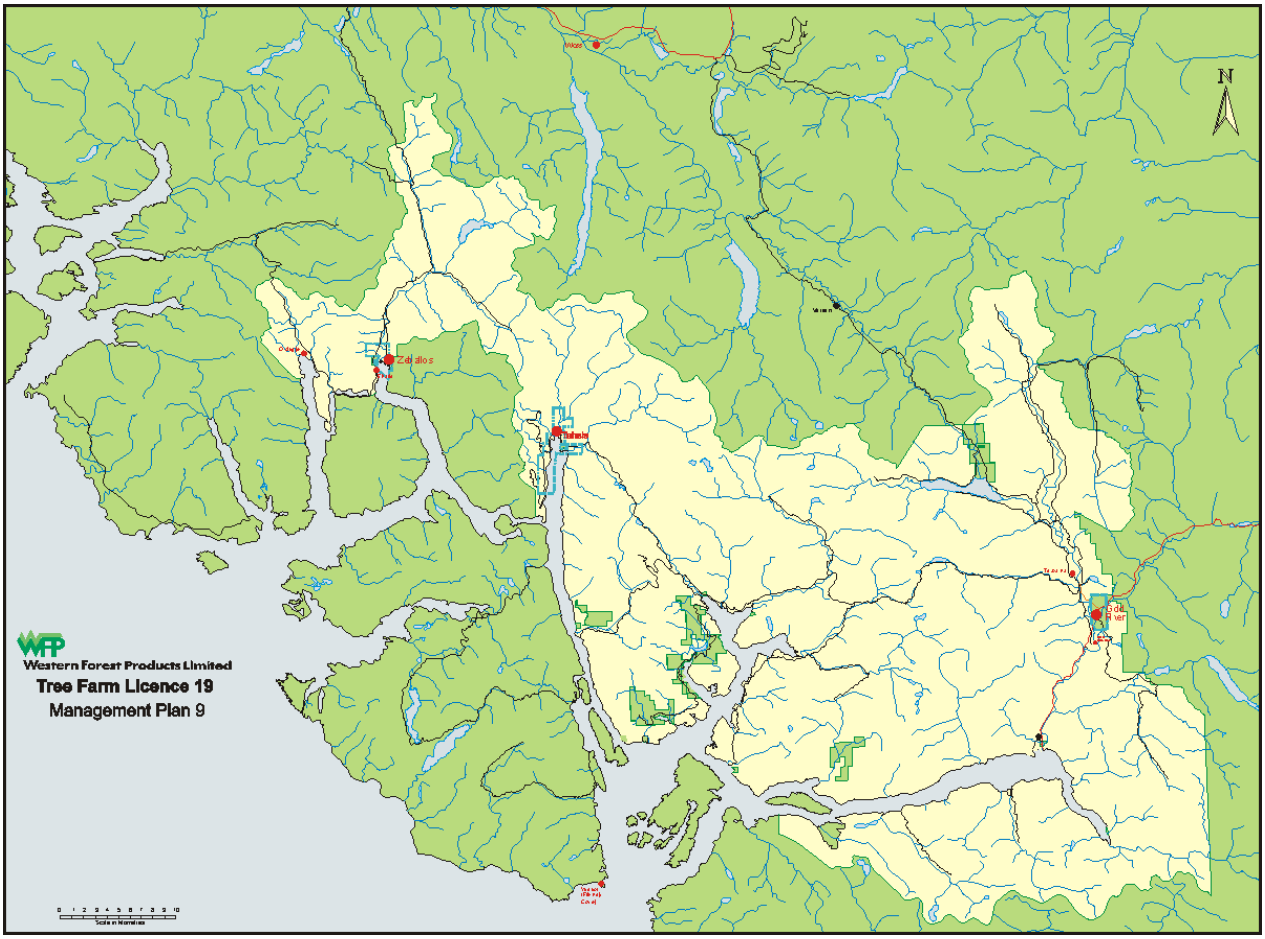


Figure 1 - TFL 19.

2.0 PROCESS

2.1 Overview

This information package was developed under the new management plan provisions of the Ministry of Forests (MOF) without the previously required Statement of Management Objectives, Options, and Procedures (SMOOP). This information package is being submitted for review to the MOF Timber Supply Forester at Timber Supply Branch. The revised and approved package will guide the timber supply analysis and with the timber supply analysis report will be appended to MP 9.

2.2 Growth and Yield

Yield tables for existing stands will be divided into three groups based on age class. Existing mature stands greater than age class 6 will have existing volumes estimated with VDYP. These generated volumes will remain static (flat line) throughout the analysis, as the assumption for these stands is that growth net decay is zero. Inventory that is less than age class 7 and greater than age class 2 will have existing and projected volumes estimated with VDYP. Existing stands less than age class 3 will have yields estimated and projected with TIPSY version 3.0. TIPSY yield projections will be assigned to existing NSR areas and simulated harvest areas according to their expected management regime.

3.0 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 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,[3] and currently enforced regulations and guidelines including the FPC. 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.
- Incremental silviculture has been conducted for many years under various funding arrangements and is expected to continue. Some data on previous treatments is unavailable and has note been included.
- Known tree Improvement gains will be applied primarily to future regenerated stands.
- Visual quality classes (VQC) are modelled based on newly completed inventory revisions with upper range denudation assumed.
- Recreation constraints are applied based on newly completed inventory, which identifies recreation feature significance, sensitivity and karst potential.
- Green-up heights are assigned based on Resource Management Zoning 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 requirement.
- Future Wildlife Tree Patch retention within the THLB is accounted for by a blanket percent volume reduction in the timber supply model.
- Biodiversity and Landscape Units – seral stage targets for only old seral will be applied to each landscape unit based on target proportions of 10/45/45, for high/intermediate/low.
- Ungulate Winter Ranges and Wildlife Habitat Areas are removed from the timber harvesting land base. Potential Wildlife Areas have a forest cover constraint that ensures 50% of the area identified is greater than 140 years of age throughout the simulation.

[3] Resource Management Zones and Resource Management Zone objectives approved by Government in December 2000. Planning documents submitted after April 1, 2001 must conform to the RMZ management objectives.

- Minimum harvest age is 60 years 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.
- Harvest rules are set to minimize growth loss and to harvest oldest stands first.

The area available for timber production under Management Plan 9 is 94,702 ha (Table 1). The THLB under Management Plan 8 was 95,705 ha. There has been a decrease of 1,003 ha of forestland available for timber production since the last MP. This decrease is attributable to the addition of two new parks within the TFL (Weymer Creek Karst Park – 315 ha and Gold Muchalaht Park – 643 ha), the removal of Tsaxana (129 ha Mowachaht-Muchalaht First Nation community), and a Wildlife Habitat Area (27.7ha). Revised operability classification and mapping refinements to the TFL boundary along various heights of land has both added and subtracted land from the total landbase and the THLB (+111.7ha.).

Table 1 - TFL 19 landbase comparison for MP 9 compared to MP 8.

	MP 9	MP 8	Difference
Total Area	191,992	192,551	(559)
THLB Area	94,702	95,705	(1003)

3.3 Alternate Harvest Flow

The timber supply analysis will approach harvest flow by transitioning from current harvest level to long-term harvest level in increments of change not to exceed 10% per decade.

3.4 Sensitivity Analyses

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

Sensitivities for the base case will include:

1) Land Base: The TFL land base will be reduced by approximately 9% to determine how sensitive the harvest forecast is to a potential withdrawal of land. This will be done spatially by removing all Terrain Stability Class 4 areas located on the steepest slopes (>80%) and all Terrain Stability Class 5 land.

Table 2 – Land base removal sensitivity.

Terrain Class	Total THLB ha	THLB ha to be removed
4	20137.9	6103.5
5	2621.6	2621.6

2) 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 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 – 11,754.7 ha), and;
   - Including areas that are considered economically marginal (Oce – 356.9 ha and Ohe – 5031.9 ha).

3) Volume: The impact on harvest forecasts of over- or under-estimating the yields for all stands will be tested by adjusting 1) all age class 3+ stands by ±10% and 2) all regenerated stands by ±10%.

4) Site Productivity: Site indices for natural immature stands are assigned using the inventory database. For existing and future stands, site indices are based on the MOF SIBEC database tempered by site productivity and biogeoclimatic ecological classification predictions for an ecologically similar TFL (Canadian Forest Products' TFL 37). To investigate the effect of using adjusted site indices on future stands, site indices from the inventory database will be used in this sensitivity.

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

6) Visual Quality: Current management incorporates constraints from VQCs assigned by the revised landscape inventory completed for the TFL in 2000. A sensitivity analyses will be used to examine the impacts of varying the percentage of area below Visually Effective Green-up (VEG) to the mid range percent denudation limit recommended for the VQC class.

7) Biodiversity and Landscape Units: The current management option seral stage constraints will be expanded to include targets for early and mature plus old seral stages. This analysis will be used to determine the overall sensitivity of applying biodiversity guidebook seral stage targets.

8) Biodiversity Emphasis Options: The current management option does not consider assigned Biodiversity Emphasis Options (BEO) ratings for individual Landscape Units in TFL 19. BEO ratings on Landscape Units will be considered in a sensitivity analysis to study the implications of managing to maintain biodiversity at the landscape unit level. Old seral targets will be modelled within each Landscape Unit according to guidebook procedures for draw down in low emphasis units.

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

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

3.5 Other Options

An unconstrained option (operability the only constraint) will show the potential timber flow for the TFL. The difference between this option and the current management option represents timber foregone to protect environmental values.

Table 3 – 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 known scenic areas within the TFL inventory • Recreation and Karst potential constraints based on TFL inventory • WTP – 4% volume net down to meet WTP requirements (current WTP retention is at 13%; we are conservatively estimating that 69% of the WTP designated will be previously constrained areas) • Riparian reserves based on FPC requirements • Silviculture practices as described in Section 3.2 • Biodiversity Landscape Unit targets for old seral based on the 10/45/45, high intermediate, low proportions • Parks excluded, major recreational sites excluded; UWR & WHA excluded; 50% > 140 years cover constraint on Potential Wildlife Areas.
	(1) Land Base	The impact of reducing the land base by approximately 9% will be evaluated by removing all Terrain Stability Class 4 areas on slopes greater than 80% and all Terrain Stability Class 5 areas from the THLB.
	(2) Operability	The impact on the harvest flow will be evaluated by including different operability classes in the THLB as follows (current management practices for all): • Non-conventional areas removed. • Economically marginal areas included.
	(3) Volumes	The impact on the harvest flow will be evaluated by varying stand yields as follows: • ±10% existing natural stand volumes; and, • ±10% future stand volumes
	(4) Site Productivity	Managed and future second growth site Indices (SI 50) will be unadjusted and based on the inventory database.
	(5) Harvest Age	Increasing 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.
	(6) Visual Quality	The effects on varying the percent-denudated limit to the mid range
	(7) Biodiversity	The implications on timber supply associated with managing to early seral and mature plus old seral stage targets as outlined in the biodiversity guidebook.
	(8) Biodiversity Emphasis Options	The implications on timber supply associated with managing for biodiversity by individual landscape unit as dictated by the Biodiversity Emphasis Options (guidebook procedures for old seral targets requirements).
	(9) Silviculture Opportunities	The impact of not fertilizing, spacing or using genetically improved stock in the future will be assessed.

Table 4 - Other Analyses

Option	Issue to be Tested	Constraints
Unconstrained Run	To quantify non-timber values in terms of timber flow foregone.	No constraints will be imposed upon this run with the exception of operability.

4.0 HARVEST MODEL

4.1 Complan

This section presents a brief description of the analytical model used to produce harvest level and forest inventory projections. The proprietary forest estate simulation model Complan will be employed in TFL 19 to determine the AAC based on spatially-explicit, volume-based cut control.

Complan is a spatially explicit forest estate model that schedules harvests at the cutblock or stand level subject to adjacency (green-up) and non-timber resource constraints (cover constraints). The model's hierarchy of spatial units make it possible to evaluate many different scenarios with improved realism.

Complan software uses a hierarchical data structure that takes advantage of a compartment management approach to spatial data organization. Advantages of this approach include easy integration with GIS systems, adaptation to a wide variety of tenure administration structures and integration of both strategic and operational planning.

Tests have been completed which compare results of Complan with those from the B.C. Ministry of Forests' model FSSIM. These tests, done in cooperation with the MOF showed that Complan could produce results that are extremely similar to that of FSSIM. The minor differences are well understood and documented.

Key Features

Complan offers a number of key features that make it suited for both strategic and operational planning:

- Annual internal time increment allows accurate representation of growth, harvest, adjacency and constraint status.
- Yield table structures allow for many additional variables other than volume to be modelled.
- Constraints are localized to site-specific conditions (e.g. green-up time will be longer for cutblocks on poor sites compared with cutblocks on good sites).
- Cover constraints that address non-timber values can overlap so that it is not necessary to divide the area into management zones according to which constraint is most restrictive.
- All forested land base is retained in the simulation and contributes to cover requirements even if it is not part of the timber harvesting land base.
- Commercial thinning can be modelled.
- Spatially explicit nature allows harvest schedules to be easily mapped and verified.
- Flexible yield table columns and the ability to shift yield tables at different ages allow for modelling of succession as well as alternative silvicultural strategies.
- Several different prioritization algorithms are available, including minimize growth loss, oldest first, geographic priority and analysis unit priority.
- Cutblock aggregation can be used.
- Several options exist for "harvesting the profile".
- There are no artificial limitations on numbers of polygons, yield tables, or other model inputs.

5.0 CURRENT FOREST COVER INVENTORY

5.1 Overview

The purpose of this section is to summarise:

1) History of the current forest-cover inventory.
2) Updates and changes to the inventory since the last timber supply analysis.
3) Area of the inventory.
4) Audits and reviews.
5) Plans for future updates.

5.2 History

The current inventory of TFL 19 was completed in 1989 by Reid, Collins and Associates Ltd. This inventory was based on 1975 and 1980 photography (1:15,840 and 1:20,000) and mapped to 1:20,000. The inventory addressed all stands in age classes 4-9 with emphasis on old-growth (age class 7+). Stands in age class 1-3 were re-inventoried prior to this date for MP 7.

The 1989 inventory included new photo-typing and about 3,900 air calls, 90 ground calls, and 1,900 cruise plots. The cruise plots were located in age class 4-9 stands using stratified random sampling and located systematically along transects. Tree measurements were taken from a ratio of two count-plots for each measure plot. About 87% of the cruise plots were located in old-growth stands (87% of sampled area) and 13% in older second-growth stands (age class 4-6, 13% of sampled area). Volumes were estimated using the 1976 MOF taper equations and DWB factors. The utilization standard was 30 cm stump, 17.5 cm dbh, and 15 cm top. Volume estimates were computed as averages for each stratum (AVL method) and presented for each of 44 old-growth strata and 11 second-growth strata. The estimated overall precision was $\pm$3% (95% confidence) for the total volume.

5.3 Updates

The inventory for the Timber Supply Analysis has been updated for depletion (harvesting and natural) and reforestation to January 1, 2000. Volumes for the TFL19 Inventory are based on cruise estimates of average volume lines.

The inventory is maintained by WFP in the Vancouver office in the PAMAP GIS system and is currently in UTM NAD 83. The inventory contains coverages for:

1) Forest cover
2) Operability class
3) Terrain and stability classification
4) Riparian Zones

5) Roads
6) Silviculture Activities
7) Biogeoclimatic classification
8) Terrestrial Ecosystem Mapping
9) Visual Quality and Recreation Inventories
10) Landscape Units
11) Resource Management Zones
12) Elevation
13) Ungulate Winter Range and Potential Wildlife Areas

5.4 Inventory Audits

A MOF inventory audit for TFL 19 is was completed in December 2000. The audit results for the mature component of the inventory for the TFL 19 suggest that the inventory is acceptable. Audit results for the immature component of the inventory suggest that site index assignment in unmanaged (age class 3+) stands is acceptable.

6.0 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 landbase 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.

6.2 Timber Harvesting Land Base Determination

The THLB and the total long-term land base in TFL19 are presented in Table 5. Areas are reported for both Schedule A and Schedule B land classes. Areas and volumes have been compiled from a stand database constructed for the preparation of this information package. Appendix II-A shows detailed area and volume summaries for the timber harvesting land base. Mature and immature stand volumes have been derived from growth and yield projections.

For MP 8, in 1992, the total area of reductions applied against the forest landbase amounted to 52,807 ha, then equal to 34% of the total productive forest. For MP9 the total area of reductions is 53,475 ha, which is 36% of the productive forest.

The following sections show total area classified in each category noted in Table 5 and serve to summarise the area deducted from the timber harvesting land base including overlaps.

6.3 Total Area

The total area of the TFL is 191,992 ha. The total area in 1995 was 192,551 ha. The net decrease of 559 ha is due to the creation of two parks within the TFL and mapping refinements to the TFL, as well as boundary along heights of land.

Table 5 - Timber harvesting landbase for TFL 19

Classification	Area (ha)			Mature Volume (m^3)		
	Schedule A	Schedule B	Total	Schedule A	Schedule B	Total
Total Area	6,674.4	185,317.3	191,991.7	2,120,821.2	48,949,951.3	51,070,772.5
Less: Non-Forest	350.8	35,845.8	36,196.6	0	0	0
Less: Non-Productive Forest	37.3	7,580.4	7,617.7	2,319.8	507,070.4	509,390.2
Total Productive Forest	6,286.3	141,891.1	148,177.4	2,118,501.4	48,442,880.9	50,561,382.3
Less Reductions to Total Productive Forest:						
Non-Commercial (NP Br)	4.0	20.9	24.9	0	0	0
Riparian Reserves	309.0	3,663.2	3,972.2	142,089.2	1,310,022.2	1,452,111.4
Inoperable / Inaccessible (I, Oce, Ohe)	1,090.3	43,973.7	45,064.0	485,086.1	17,028,760.9	17,513,847
Wildlife Habitat Reserves (e.g. UWR, WHA)	260.8	2206.0	2466.8	225,700.4	1,505,040.2	1,730,740.6
Unclassified Roads, Trails and Landings	119.8	1,827.3	1,947.1	14,888.8	189,821.2	204,710.0
Total Reductions to Productive Forest	1,783.9	51,691.1	53,475.0	867,764.5	20,033,644.5	20,901,409.0
Total Reduced Land Base	4,502.4	90,200	94,702.4	1,250,736.9	28,409,236.4	29,659,973.3
Less: Not Sufficiently Restocked Areas	150.0	3,062.4	3,212.4	0	0	0
Add: Not Sufficiently Restocked Areas	150.0	3,062.4	3,212.4	0	0	0
Timber Harvesting Land Base	4,502.4	90,200	94,702.4	1,250,736.9	28,409,236.4	29,659,973.3
Less: Future Roads, Trails and Landings	46.3	1,407.6	1,453.9	18,701.8	443,731.6	462,433.4
Less: Inferred Area Net Down (Recreation)	311.3	4,315.4	4,626.7	100,408.0	1,143,386.0	1,243,794.0
Less: Volume Reductions (WTP – 4%)	165.8	3,379.1	3,544.9	45,265.1	1,072,884.8	1,118,149.9.0
Total Long Term Land Base	3,979.0	81,097.9	85,076.9	1,086,362.0	25,749,234.0	26,835,596.0

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 6).

Table 6 - Non-forest area in TFL 19

Type	Non-Forest Area (ha)
Alpine	28,190.0
Rock and Slides	4,764.4
Swamp, Marsh, Creek, River, Lake	2,835.8
Town	299.5
Dump, Camps and Sort	53.5
Islands	40.9
Classified Roads and Pits	10.7
Hydro and Telephone R-of-Way	1.8
TOTAL	**36,196.6**

6.5 Non-Productive Forests

TFL 19 includes 7,618 ha of non-productive land (Table 7). These largely alpine forest areas also contain brush (shrubs) and grass.

Table 7 - Non-productive area in TFL 19

Criteria	Total
Alpine forest	7,266.2
Brush	193.8
Non-productive forests	157.7
Total	**7,617.7**

6.6 Non-commercial Cover

Approximately 25 ha of TFL 16 are classified as non-commercial cover (Table 8). Most of this area is occupied by brush.

Table 8 - Non-commercial area

Non-Commercial	Total Area (ha)	Total Area Reduced
NCD	24.9	24.9

6.7 Riparian Reserves – Streams

Overview mapping is ongoing for TFL 19. Operational stream inventories associated with development planning have been conducted since 1988 and a reconnaissance (1:20,000) fish and fish habitat inventory project to RIC standards will be completed by 2001. This inventory will provide information on fish distribution, fish habitat, and habitat restoration opportunities.

This detailed information in conjunction with GIS modelling helped to obtain an overall estimate of the riparian classes for watercourses and reserve areas for the TFL. The approach employed in the timber supply analysis was to utilise the available stream classification in the GIS to apply reserves to all known and predicted fish bearing streams, in accordance to specifications in the Forest Practices Code.

Currently within the GIS streams are classed as S1 to S6 (as per FPC definitions), and Unclassified (which are streams of unknown fish presence and width).

Table 9 - Riparian Reserve Zones

Riparian Feature Class	Feature Size		Proportion (%) of Class relative to total Classified Streams	Total Riparian reserve width From FPC (metres)	Weighted Average Riparian reserve zone Unclassified Streams
	Topography <30% gradient	Topography > 30% gradient			
Double Line Streams (ha)					
S1	592.5		87%	50	
S2	88.1		13%	30	
Single Line Streams (km)					
S1	21.6	0	7%	50	3.3
S2	211.1	0	64%	30	19.2
S3	96.5	0	29%	20	5.9
S4	0.3	0	0%	0	0.0
S5	578.7	120.5			
S6	776.1	795.4			
Unclassified	945.5	487.5			*28.4 (30)*
Lakes and Wetlands (ha)					
L1 (> 5 ha)	1542.1			10	

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

Unclassified single-line streams – a GIS analysis (terrain model) was used to separate and class streams of less than 30% gradient as being potentially fish bearing. The 30% gradient parameter is more conservative than the normal assumption of <20% due to the coarse nature of the digital elevation model (TRIM) and because fish have been identified, in some cases, in streams of >20% gradient. Based on the 1684.3 km of known S1 to S6 classified single line streams identified as less than 30% gradient, it was estimated that 20% (329.4 km S1-S4/ 1684.3 km S1-S6 =19.6%) of the unclassified single line streams are likely fish bearing. A weighted average riparian width was then calculated (28.4 metres) for the known single line streams and applied to the 20% of unclassified single line streams. To roughly account for basal area retention in riparian management zones not accounted for elsewhere as WTP or other net downs, a further 1.6m of reserve zone equivalent to 59.3 ha was added and supplements the additional 22.7 ha added by rounding 19.6 to 20%. The added 82 ha is equivalent to average basal area retention of 5% in the management zones of all single line streams. The 30m implied riparian zone width was applied sequentially starting with the lower gradient unclassified streams until 20% of the unclassified stream length was tagged with a reserve zone. This amounted to all of the unclassified streams on topography of less than 6%.

The riparian reserve summary applies only to those areas of the productive forested land that fall within the reserve buffer and are currently unconstrained.

Table 10 - Riparian reserves in TFL 19

	Total Area (ha)	Reduction Area (ha)
Riparian Reserves	3972.2	3972.2

6.8 Inoperable/Inaccessible

Operability classes have been developed for TFL 19 that reflect the harvesting system, timber quality, terrain stability, and economic accessibility. Appendix II-B details the methodology and assumptions used in completing the operability classification for TFL 19.

The first category relates to area not available for timber harvesting (I) 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 are economical to harvest regardless of market conditions. The second category uses economic criteria to determine operability (Oce/Ohe). In this case, timber harvesting under normal market conditions is not justified given costs of harvesting and the expected value of the timber. Classifying areas as operable with an economic constraint relates to the inability to harvest stands in a cost-effective manner given the value of the timber. Two classes are recognised in this analysis: (1) Oce for areas that could be logged profitably by conventional harvesting systems should markets improve sufficiently and (2) Ohe for areas that could be heli-logged profitably should markets improve sufficiently.

Of the net inoperable land base, 5,389 ha are currently classified as Oce/Ohe and 39,675 ha are currently classified as I. The total area classified as inoperable and therefore excluded from the productive forest land base is 45,064 ha.

Table 11 - Inoperable area (ha) by class

Criteria	Total Area (ha)	Reduction Area (ha)
I – Physically Inoperable/ low productivity/unmerchantable	40,507.6	39,675.2
Oce – Operable for conventional logging with economic constraints removed	373.7	356.9
Ohe – Operable for heli-logging with economic constraints removed	5,149.1	5,031.9
Total	**46,030.4**	**45,064.0**

6.9 Environmentally Sensitive Areas (ESAs)

Areas assessed as sensitive or valuable for other resource values have been defined by inventories completed before and after MP 8. Land base reductions reflecting the presence of these areas are captured in other sections of the Information Package. These include terrain stability and soil sensitivity, which have been included in the definition of operability classes (Section 6.8), and wildlife habitat (Section 6.11). Productive area net downs for riparian reserves (Section 6.7) and volume reductions are applied to capture the reservation of future Wildlife Tree Patches (WTP) in the THLB. No further reductions have been applied.

6.10 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 landbase 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 our redefined inventory files.

6.11 Wildlife Habitat

Since MP 8 a number of wildlife inventories have been undertaken or broadened in an effort to identify and classify potential wildlife habitat areas suitable for identified species.

Areas previously identified in MP 8 as Ew1 have been reserved as Ungulate Winter Ranges (UWR) under the Forest Practices Code. Further to consultations with MOELP, these areas, including some Ew2, have under gone revisions during the Forest Development Plan process and now encompass 3,706.5 ha of productive forest, of which 1,288 ha are inoperable or constrained by riparian reserves.

Old Ew2 areas, now identified as Potential Wildlife Areas, remain in the THLB pending the outcome of field reviews and consultations with MOELP staff. A cover constraint maintaining 50% of these areas in ages greater than 140 years has been imposed for this analysis to constrain short-term timber supply until additional UWRs are spatially located by 2003. Modifications to UWR boundaries have been ongoing as part of the FDP process and are incorporated.

Recently within the TFL one of the first Wildlife Habitat Areas in the province has been designated. This area, which is 27.7 ha in size, was established to protect one of two known caves used for maternity roosts by the Keen's long-eared Myotis

Future WTPs will be handled through a volume reduction in the timber supply analysis as described in Section 10.3.1.5. As per policy direction at least 75% of the WTPs are assumed incorporated in riparian reserves or other constrained areas.

An additional 2,466.8 ha of the productive land base has been specifically reserved for wildlife habitat and 2,812.4 ha is managed under a cover constraint. This compares to the 2,728.0 ha reserved and the 2,615 ha managed under a cover constraint identified in MP 8. Table 12 summarises the operable and total productive forest areas managed for wildlife habitat.

Table 12 - Wildlife areas

	Total Area (ha)	Area Reduction (ha)	THLB Area with Cover Constraint
Ungulate Winter Range Area	3,706.5	2,439.1	0.0
Potential Wildlife Area	4,635.3	0.0	2,812.4
Wildlife Habitat Area	27.7	27.7	0.0

6.12 Recreation Feature Inventory and Karst Potential

Updated recreation inventory mapping includes recreation feature significance and the features sensitivity to alteration, including known cave / karst features. To manage for recreation features in the timber supply analysis area net downs are assumed. Table 13 outlines the area net down applied by the feature significance and sensitivity combination. The net downs are applied within each individual recreation polygon and are applied equally to each forest stand within the polygon. For example if a recreation polygon is made up of 15 forest stands and has an area net down requirement of 50%, the model parameters are set to constrain 50% of each of the 15 forest stand area from harvest.

The updated inventory also included karst potential classification. An area net down will also be used to simulate the reserving of 7% of the karst potential areas in the timber supply analysis. This area net down is designed to be inclusive of other allowances already present in areas of karst potential. For example if the 7% area requirement is meet in the constrained area of an individual karst potential polygon no further reduction is applied. An analysis of the inventory indicates that of the 45 polygons with karst potential, totaling 13,705 ha, approximately 34%, on average, of the area by polygon is constrained. It is expected that riparian reserves and inoperable land account for a large proportion of the constrained area. Further analysis indicates that only 6 karst potential polygons will require additional unconstrained area to meet the 7% area net down amounting to18.3 ha.

Table 13 – Recreation Feature significance and sensitivity

Feature Significance	Feature Sensitivity	Area Net-Down	Total Forested Area (ha)	THLB Area (ha)	Inferred Area Reduction (ha)
VH	H	100%	2,283.2	1,255.8	1,255.8
	M	50%	1,060.0	498.3	249.1
H	H	100%	2,774.3	2,081.5	2,081.5
	M	50%	3,761.7	2,080.5	1,040.3
	L	0%	1,148.1	261.0	0
M	M	0%	22,029.2	14,705.1	0
	L	0%	10,256.8	6,420.5	0
L	M	0%	1,379.9	1,046.6	0
	L	0%	102,310.2	65,590.1	0

6.13 Cultural Heritage Resource Reductions

An archaeological overview assessment for the Nootka and Kyuquot Sound areas including TFL 19 was completed in 1998. This overview deals with archaeological sites and resources and indicates where past human activities are likely to have occurred. This assessment is used in planning. Areas with high potential of past activities are subject to field reconnaissance and inventory. No explicit reductions for cultural heritage resources have been made to the inventory file although the most common features such as culturally modified trees are commonly included in already-accounted-for reserves for riparian protection or wildlife tree patches.

6.14 Deciduous Stands

Table 14 shows the area of stands defined as deciduous leading in the inventory. This represents about 0.44% of the long-term harvestable land base. These are included in the THLB and for simplicity deciduous volume harvested, which is expected to be minor, will be included in modelled timber flows.

Table 14 - Area of Deciduous forest types

Inventory Type Group	Total Area (ha) By Age					Total
	0-20	21-40	41-60	61-80	80-120	
Pure Deciduous	0	5.2	0.6	0	0.4	6.2
Deciduous-Leading	10.8	52.7	188.3	112.7	88.8	453.3
Total	**10.8**	**57.9**	**188.9**	**112.7**	**89.2**	**459.5**

6.15 Roads, Trails and Landings

6.15.1 Classified Roads, Trails and Landings

Classified roads, trails and landings are those that are mapped as forest cover polygons distinctly separate from adjacent polygons. Only the mainline roads have been identified as separate polygons on the forest cover maps. Table 15 summarizes the areas of classified roads in the TFL.

Table 15 - Classified roads, trails and landings

	Total Area of Road (ha) in Productive Forest Land	Total Area Reduction (ha)
Existing Roads	9.3	9.3

6.15.2 Unclassified Roads, Trails and Landings

Unclassified roads on the TFL have been mapped as lineal features. For the purposes of determining the total area of unclassified roads, all are assumed to occupy a 10 metre wide unproductive width. As with classified trails and landings, all trails and the majority of the landings are rehabilitated and restocked immediately following logging and consequently the associated area reduction is thought insignificant. Table 16 indicates the area of unclassified roads in the TFL that is excluded from the timber harvesting land base.

Table 16 - Unclassified roads, trails and landings

	Road Length (km) in Productive Forest Land	Total Area Reduction (ha)
Existing Roads	2,035.5	1,947.1

6.15.3 Future Roads, Trails and Landings

A projected road system was developed as part of the operability classification for TFL 6. This road system was digitized into the GIS in conjunction with the operability classification, which allowed for the same approach used with unclassified roads to predict area summaries. Table 17 indicates the area of future roads in the TFL that have yet to be developed.

Table 17 - Future roads, trails and landings

	Total Road Length (km) in Productive Forest Land	Total Area Reduction (ha)
Roads	1,556.9	1,453.9

7.0 INVENTORY AGGREGATION

7.1 Overview

This section describes the delineation of the TFL landbase 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., for wildlife habitat, VQOs, biodiversity, etc.). Stand types are grouped in analysis units based on similar leading species, history and productivity.

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 18 and Table 19).

Table 18 - Management zones and landscape units

Mgmt Zone	Mgmt Unit	Landscape Unit	Productive Forest (ha)	Management Considerations
EMZ 24	Burman	Burman *Low BEO*	21,949	***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 as described.
EMZ 18	Eliza	Eliza *Low BEO*	5,499	***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 level in accordance with FPC requirements; adaptive road engineering/deactivation efforts are indicated to maintain terrain and watershed integrity.
GMZ 22	Gold	Gold *High BEO*	38,154	***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.
EMZ 23	Kleeptee	Kleeptee *Low BEO*	12,608	***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.

Mgmt Zone	Mgmt Unit	Landscape Unit	Productive Forest (ha)	Management Considerations
SMZ 11	Schoen-Strathcona	Gold *High BEO*	2,238	***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.
EMZ 19	Tahsis	Tahsis *Low BEO*	19,840	***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 in accordance with FPC requirements; adaptive road engineering/ deactivation efforts are indicated to maintain terrain and watershed integrity.
EMZ 21	Tlupana	Tlupana *Intermediate BEO*	34,118	***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.
SMZ 6	Woss-Zeballos	Zeballos *Low BEO*	2,442	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.
GMZ 16	Zeballos	Zeballos *Low BEO*	11,329	***General Management Zone***, with lower biodiversity conservation objectives; sensitive development of timber values on unstable terrain
Total			**148,177**	

Table 19 - Area by landscape unit and BGC variant

Landscape Unit	BEC	Seral Stage	Productive Forest (ha)[1]	Non Contributing Area		THLB Area	
				ha	%	ha	%
Burman	CWH vm 1	Early	2852.8	171.3	1%	2681.4	20%
		Mid	2043.1	455.0	3%	1588.1	12%
		Mature	1954.5	792.0	6%	1162.5	9%
		Old	6253.9	2451.6	19%	3802.3	29%
	CWH vm 1 Total		13104.3	3870.0	30%	9234.3	70%
	CWH vm 2	Early	618.2	14.6	0%	603.7	9%
		Mid	394.6	143.3	2%	251.3	4%
		Mature	526.5	380.6	6%	145.9	2%
		Old	4880.0	2607.2	41%	2272.8	35%
	CWH vm 2 Total		6419.3	3145.6	49%	3273.7	51%
	CWH xm 2	Mid	14.6	4.8	33%	9.8	67%
	CWH xm 2 Total		14.6	4.8	33%	9.8	67%
	MH mm 1	Early	86.5	0.8	0%	85.7	4%
		Mid	253.6	86.4	4%	167.2	8%
		Mature	115.6	75.8	3%	39.8	2%
		Old	1768.9	1051.3	47%	717.6	32%
	MH mm 1 Total		2224.6	1214.3	55%	1010.3	45%
	MH mmp1	Old	7.4	7.4	100%	0.0	0%
	MH mmp1 Total		7.4	7.4	100%	0.0	0%
Burman Total			21770.2	8242.1	38%	13528.1	62%
Eliza	CWH vm 1	Early	1892.8	235.8	5%	1657.1	36%
		Mid	233.6	12.9	0%	220.7	5%
		Mature	832.9	402.6	9%	430.3	9%
		Old	1593.2	616.1	14%	977.1	21%
	CWH vm 1 Total		4552.4	1267.4	28%	3285.1	72%
	CWH vm 2	Early	87.3	1.7	0%	85.6	10%
		Mature	65.3	44.9	5%	20.4	2%
		Old	674.9	332.2	40%	342.7	41%
	CWH vm 2 Total		827.5	378.9	46%	448.6	54%
	MH mm 1	Old	57.4	53.1	92%	4.3	8%
	MH mm 1 Total		57.4	53.1	92%	4.3	8%
Eliza Total			5437.3	1699.3	31%	3738.0	69%

Landscape Unit	BEC	Seral Stage	Productive Forest (ha)[1]	Non Contributing Area		THLB Area	
				ha	%	ha	%
Gold	CWH vm 1	Early	8388.6	676.1	5%	7712.5	52%
		Mid	1037.7	384.3	3%	653.4	4%
		Mature	757.5	219.8	1%	537.6	4%
		Old	4520.3	2302.8	16%	2217.5	15%
	CWH vm 1 Total		14704.1	3583.1	24%	11121.0	76%
	CWH vm 2	Early	2522.7	146.6	1%	2376.2	18%
		Mid	679.7	429.0	3%	250.7	2%
		Mature	505.9	235.0	2%	270.9	2%
		Old	9261.9	4253.5	33%	5008.4	39%
	CWH vm 2 Total		12970.3	5064.1	39%	7906.2	61%
	CWH xm 2	Early	2429.3	238.4	4%	2190.9	39%
		Mid	1920.4	788.4	14%	1132.0	20%
		Mature	714.1	295.9	5%	418.3	7%
		Old	612.2	277.6	5%	334.7	6%
	CWH xm 2 Total		5676.0	1600.2	28%	4075.8	72%
	MH mm 1	Early	228.9	31.1	0%	197.8	3%
		Mid	100.2	41.0	1%	59.2	1%
		Mature	248.2	106.5	2%	141.6	2%
		Old	5935.4	3491.6	54%	2443.8	38%
	MH mm 1 Total		6512.6	3670.2	56%	2842.4	44%
	MH mmp1	Mid	0.9	0.9	3%	0.0	0%
		Old	33.8	32.4	93%	1.4	4%
	MH mmp1 Total		34.7	33.3	96%	1.4	4%
Gold Total			39897.6	13950.8	35%	25946.7	65%
Kleeptee	CWH vm 1	Early	1898.8	119.7	2%	1779.1	27%
		Mid	460.3	188.9	3%	271.3	4%
		Mature	574.7	247.7	4%	327.0	5%
		Old	3574.8	1032.4	16%	2542.4	39%
	CWH vm 1 Total		6508.5	1588.7	24%	4919.8	76%
	CWH vm 2	Early	505.9	18.6	0%	487.4	11%
		Mid	156.9	69.0	2%	87.9	2%
		Mature	187.5	128.8	3%	58.8	1%
		Old	3627.0	1751.0	39%	1876.0	42%
	CWH vm 2 Total		4477.3	1967.3	44%	2510.0	56%
	CWH xm 2	Early	105.3	11.4	2%	93.9	18%
		Mid	264.0	86.6	16%	177.4	34%
		Mature	72.9	47.3	9%	25.6	5%
		Old	83.0	31.0	6%	51.9	10%
	CWH xm 2 Total		525.1	176.3	34%	348.7	66%
	MH mm 1	Early	13.3	1.6	0%	11.7	1%
		Mid	0.8	0.8	0%	0.0	0%
		Mature	2.3	2.3	0%	0.0	0%
		Old	962.7	811.2	83%	151.5	15%
	MH mm 1 Total		979.1	815.9	83%	163.2	17%
Kleeptee Total			12490.0	4548.2	36%	7941.8	64%

Landscape Unit	BEC	Seral Stage	Productive Forest (ha)[1]	Non Contributing Area		THLB Area	
				ha	%	ha	%
Tahsis	CWH vm 1	Early	3930.9	142.1	1%	3788.8	30%
		Mid	2686.5	604.2	5%	2082.3	16%
		Mature	1568.8	425.6	3%	1143.2	9%
		Old	4618.7	1878.7	15%	2740.0	21%
	CWH vm 1 Total		12805.0	3050.7	24%	9754.3	76%
	CWH vm 2	Early	895.9	14.7	0%	881.2	16%
		Mid	92.4	45.1	1%	47.3	1%
		Mature	425.8	224.8	4%	201.1	4%
		Old	4060.0	2538.1	46%	1521.9	28%
	CWH vm 2 Total		5474.1	2822.6	52%	2651.5	48%
	MH mm 1	Early	49.5	0.5	0%	49.0	4%
		Mid	2.5	2.5	0%	0.0	0%
		Mature	3.5	3.0	0%	0.5	0%
		Old	1317.2	1140.4	83%	176.8	13%
	MH mm 1 Total		1372.7	1146.4	84%	226.3	16%
	MH mmp1	Old	7.2	7.2	100%	0.0	0%
	MH mmp1 Total		7.2	7.2	100%	0.0	0%
Tahsis Total			19659.0	7026.9	36%	12632.1	64%
Tlupana	CWH vm 1	Early	7333.1	466.8	2%	6866.3	30%
		Mid	2337.1	710.7	3%	1626.4	7%
		Mature	8005.5	2353.5	10%	5652.1	25%
		Old	5185.0	1500.3	7%	3684.7	16%
	CWH vm 1 Total		22860.7	5031.2	22%	17829.5	78%
	CWH vm 2	Early	744.0	30.6	0%	713.3	8%
		Mid	210.2	143.4	2%	66.8	1%
		Mature	1888.0	1208.7	13%	679.3	7%
		Old	6361.4	3194.2	35%	3167.2	34%
	CWH vm 2 Total		9203.5	4576.9	50%	4626.6	50%
	MH mm 1	Early	3.8	2.9	0%	0.9	0%
		Mid	16.2	13.7	1%	2.5	0%
		Mature	171.0	160.1	9%	10.9	1%
		Old	1505.2	1304.8	77%	200.4	12%
	MH mm 1 Total		1696.2	1481.5	87%	214.7	13%
	MH mmp1	Old	5.3	5.3	100%	0.0	0%
	MH mmp1 Total		5.3	5.3	100%	0.0	0%
Tlupana Total			33765.7	11095.0	33%	22670.7	67%

Landscape Unit	BEC	Seral Stage	Productive Forest (ha)[1]	Non Contributing Area		THLB Area	
				ha	%	ha	%
Zeballos	CWH vm 1	Early	2085.8	113.4	2%	1972.5	28%
		Mid	1302.2	140.4	2%	1161.8	16%
		Mature	387.1	162.5	2%	224.6	3%
		Old	3395.9	1346.9	19%	2048.9	29%
	CWH vm 1 Total		7171.0	1763.2	25%	5407.7	75%
	CWH vm 2	Early	566.3	18.9	0%	547.5	11%
		Mid	24.1	11.4	0%	12.7	0%
		Mature	249.9	216.9	4%	33.0	1%
		Old	4075.2	2254.6	46%	1820.7	37%
	CWH vm 2 Total		4915.5	2501.7	51%	2413.8	49%
	MH mm 1	Early	3.2	2.2	0%	1.0	0%
		Mid	14.3	14.3	1%	0.0	0%
		Mature	12.7	9.2	1%	3.5	0%
		Old	1504.3	1087.9	71%	416.4	27%
	MH mm 1 Total		1534.5	1113.6	73%	420.9	27%
	MH mmp1	Old	26.0	23.5	90%	2.5	10%
	MH mmp1 Total		26.0	23.5	90%	2.5	10%
Zeballos Total			13647.0	5402.0	40%	8245.0	60%
Grand Total			146666.8	51964.3	35%	94702.4	65%

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

7.3 Analysis Units

The forest 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, site productivity (as determined from the dominant ecosystem site series within each polygon), and leading species groups. There are three leading species groups with each subzone/site productivity combination, representing the most common leading species within a subzone. These species groups are Hw, Fdc, and Others for the CWHxm2 and CWHvm1; and Hw, Ba, and Others for the CWHvm2 and MHmm1/MHmmp1.

Table 20 - Analysis units for existing stands

Analysis Unit	Subzone/Variant	Productivity Class	Species Group	Area (ha)	% THLB
111	CWHxm2	Good	Hw	126	0.1%
112	CWHxm2	Good	Fdc	395	0.4%
114	CWHxm2	Good	Others	25	0.0%
121	CWHxm2	Medium	Hw	621	0.7%
122	CWHxm2	Medium	Fdc	2645	2.8%
124	CWHxm2	Medium	Others	180	0.2%
131	CWHxm2	Poor	Hw	47	0.0%
132	CWHxm2	Poor	Fdc	225	0.2%
134	CWHxm2	Poor	Others	49	0.1%
211	CWHvm1	Good	Hw	4127	4.4%
212	CWHvm1	Good	Fdc	1406	1.5%
214	CWHvm1	Good	Others	1604	1.7%
221	CWHvm1	Medium	Hw	23406	24.7%
222	CWHvm1	Medium	Fdc	6469	6.8%
224	CWHvm1	Medium	Others	8853	9.3%
231	CWHvm1	Poor	Hw	6110	6.5%
232	CWHvm1	Poor	Fdc	2203	2.3%
234	CWHvm1	Poor	Others	5851	6.2%
311	CWHvm2	Good	Hw	820	0.9%
313	CWHvm2	Good	Ba	318	0.3%
314	CWHvm2	Good	Others	131	0.1%
321	CWHvm2	Medium	Hw	11176	11.8%
323	CWHvm2	Medium	Ba	1733	1.8%
324	CWHvm2	Medium	Others	3500	3.7%
331	CWHvm2	Poor	Hw	2673	2.8%
333	CWHvm2	Poor	Ba	206	0.2%
334	CWHvm2	Poor	Others	2514	2.7%
411	MHmm1/MHmmp1	Good	Hw	229	0.2%
413	MHmm1/MHmmp1	Good	Ba	35	0.0%
414	MHmm1/MHmmp1	Good	Others	49	0.1%
421	MHmm1/MHmmp1	Medium	Hw	2878	3.0%
423	MHmm1/MHmmp1	Medium	Ba	695	0.7%
424	MHmm1/MHmmp1	Medium	Others	505	0.5%
431	MHmm1/MHmmp1	Poor	Hw	338	0.4%
433	MHmm1/MHmmp1	Poor	Ba	37	0.0%
434	MHmm1/MHmmp1	Poor	Others	61	0.1%

Analysis units for previously harvested and future stands were based on variants and site class. There were a total of 12 analysis units for future stands (four variants and three site classes). All yield tables were generated with Tipsy 3.0 and established as planted stock.

Table 21 - Analysis units for future stands

Analysis Unit	Subzone	Site Class	Treatments (% of AU)	Current NSR (ha)	% THLB
110	CWHxm2	Good		32	0.0%
120	CWHxm2	Medium	Fertilized (40%)	84	0.1%
130	CWHxm2	Poor	Fertilized (30%)	5	0.0%
210	CWHvm1	Good		150	0.2%
220	CWHvm1	Medium		1125	1.2%
230	CWHvm1	Poor		247	0.3%
310	CWHvm2	Good		48	0.1%
320	CWHvm2	Medium		614	0.6%
330	CWHvm2	Poor		99	0.1%
410	MHmm1MHmmp1	Good		1	0.0%
420	MHmm1MHmmp1	Medium		53	0.1%
430	MHmm1MHmmp1	Poor		4	0.0%

Table 22 - Analysis Units Legend

i.e. . 111-1							
First Number *Subzone/Variant*		Second Number *Productivity Class*		Third Number *Leading Species*		Fourth Number *Age Group*	
1	CWH xm2	1	Good	1	Hemlock	1	Age Class 1 to 2
2	CWH vm1	2	Medium	2	Fir	2	Age Class 3 to 6
3	CWH vm2	3	Poor	3	Balsam	3	Age Class 7 to 9
4	MH mm1/mmp1			4	Other	Nil	Future Stands

7.4 Productivity Class

Productivity classes were assigned based on the expected productivity of the leading ecosystem site series within a variant.

Table 23 – Productivity Classes

Site_Series	CWHvm1	CWHvm2	CWHxm2	MHmm1	MHmmp1
00	Poor	Poor	Poor	Poor	Poor
01	Medium	Medium	Medium	Medium	Medium
02	Poor	Poor	Poor	Poor	
03	Poor	Poor	Poor	Medium	
04	Poor		Medium		
05	Good	Good	Good	Good	
07	Good	Good	Good		
08			Good		
09	Good	Poor	Medium		
10		Poor	Poor		
11	Poor	Poor			
12	Poor		Poor		
13	Poor				
14	Poor				
15			Medium		

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

Table 24 describes the different input parameters for the four different yield tables. It also summarizes the main output results. The average culmination MAI for future stands will be about twice as much as the average for existing immature natural stands even though MAI is reached at about 85 years for both stand types. Although based on the inventory database acquired from the predecessor Licensee, the volume at culmination for existing immature natural stands seems underestimated and will be the focus of future investigation. However, a large proportion of existing immature natural stands are on low sites.

Table 24 - Modeling overview

	Existing Immature Natural Stands	Existing Mature Natural Stands	Existing Immature Managed Stands	Future Stands
Inputs				
Model	Batch VDYP (6.6d)	Flat Line	Batch TIPSY (3.0)	Batch TIPSY (3.0)
Age Class	3-6	7-9	1-2	All
Area	13,128	46,329	32,783	2,462
Proportion of THLB	14%	49%	35%	2%
Outputs				
Average Culm MAI	5.5 m^3/ha/yr	N/A	10.5 m^3/ha/yr	10.3 m^3/ha/yr
Average Culm Age	84 years	N/A	81 years	88 years
Average Volume at Culm Age	452 m^3/ha	N/A	826 m^3/ha	849 m^3/ha

8.2 Site Index

Site index estimates for existing immature natural stands were taken from the inventory database.

Site index estimates for future stands were based on the SIBEC database and site indices predicted by experts in site productivity and biogeoclimatic ecological classification for TFL 37. Ground sampling done by J.S. Thrower & Associates Ltd. in 1998 showed that these expert-based site indices were under-estimating the true site index average for Fdc in the CWHxm2 by 6.6%, and over-estimating the average for Hw in the CWHvm1 and CWHvm2 by 3%. Since TFL 37 is ecologically similar to TFL 19,

these expert-based site indices are a good benchmark to evaluate site productivity on TFL 19.

Using the new but unverified Terrestrial Ecosystem Mapping (TEM), a site index was assigned to each site series within the THLB, based on the expected future leading species on that site series. This was done for both the SIBEC database and the expert-based site indices. The average site index within each analysis unit was then calculated for both site index sources. The site index assigned to the analysis unit was the mid-range between the expert-based and the SIBEC averages. Section 8.8.2 outlines the calculations used to derive site index.

Site index for previously harvested stands were assigned the same site index as future stands for variants and site classes for which an adjusted site index was available. If no site index was available, but a site index conversion equation could be used, the site index was derived from the conversion equation. If no adjusted site index estimates or site index conversion equation existed, the site index from the inventory was used.

8.3 Utilization Levels

The utilization level is 12.5 cm for all existing stands less than 41 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 conifer stands is 17.5 cm, with stump height of 30 cm and top DIB of 15 cm (Table 25).

Table 25 - Utilization levels

Species Group	Utilization			Firmwood Standard
	Minimum DBH (cm)	Stump Height (cm)	Top DIB (cm)	
Managed Conifers (0 - 40 yrs, future)	12.5	30.0	10.0	50%
Immature (41 – 140 yrs)	17.5	30.0	15.0	50%
Mature (141+ 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

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 the retention of Wildlife Tree Patches in the THLB. 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 6 ha, deciduous-leading stands represent 453 ha, and mixed, conifer-leading stands represent 884 ha. Interest in alder harvest is increasing so utilization seems more likely than previously.

8.7 Yield Tables For Unmanaged Stands

8.7.1 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 inventory site index was used to generate the yield tables. Yield tables were first calculated for each individual polygon using VDYP 6.6d. An area-based weighted average yield table was then calculated for the analysis unit. Average VDYP input for existing natural immature stands is given in Table 26. Stocking class is the stocking class with the most area within the analysis unit. The average yield curves are shown in Figure 2.

Table 26 - Average VDYP inputs for existing natural immature stands

Existing AU	Spp1	Spp2	Spp3	Spp4	Spp5	Spp6	% Spp 1	% Spp 2	% Spp 3	% Spp 4	% Spp 5	% Spp 6	Stocking class	Avg. SI (spp1)	Avg. Crown Closure
111-2	Hw	Fd	Cw	Dr	Ss	Pw	56	31	6	5	2	0	0	25.9	62
112-2	Fd	Hw	Cw	Pl	Dr	Pw	69	25	3	2	1	0	0	27.8	57
114-2	Pl	Dr	Hw	Fd	Pw		37	32	22	7	2	0	0	26.7	62
121-2	Hw	Fd	Cw	Pw	Pl	Dr	55	31	10	2	1	1	0	22.2	72
122-2	Fd	Hw	Cw	Pl	Pw	Dr	57	28	7	6	1	1	0	25.2	70
124-2	Pl	Fd	Hw	Pw	Cw	Dr	52	21	17	9	0	0	0	20.0	78
131-2	Hw	Fd	Cw	Dr	Pl	Ss	54	28	14	3	2	0	0	22.4	72
132-2	Fd	Hw	Cw	Pl	Dr	Pw	52	21	15	12	0	0	0	20.6	74
134-2	Pl	Fd	Cw	Hw	Pw	Dr	48	23	14	13	2	0	0	16.4	60
211-2	Hw	Cw	Fd	Ba	Dr	Ss	54	21	12	10	3	0	0	27.8	37
212-2	Fd	Hw	Cw	Dr	Pl	Ba	64	26	8	2	0	0	0	27.3	58
214-2	Dr	Hw	Ba	Fd	Cw	Ss	51	32	9	3	3	2	0	27.5	59
221-2	Hw	Fd	Cw	Ba	Dr	Pl	52	20	20	6	1	0	0	24.5	56
222-2	Fd	Hw	Cw	Pl	Dr	Pw	57	27	11	3	1	0	0	26.4	73
224-2	Hw	Cw	Dr	Fd	Pl	Ba	28	26	18	13	8	6	0	18.9	62
231-2	Hw	Fd	Cw	Ba	Dr	Pl	51	21	21	4	2	1	0	21.3	67
232-2	Fd	Hw	Cw	Pl	Dr	Ba	56	25	12	7	0	0	0	22.7	68
234-2	Cw	Fd	Pl	Hw	Dr	Yc	34	21	20	18	3	3	0	15.2	67
311-2	Hw	Ba	Cw	Fd	Dr	Yc	55	31	8	4	2	1	0	21.4	74
313-2	Ba	Hw					65	35	0	0	0	0	0	28.9	80
314-2	Fd	Hw	Cw	Ba			58	30	10	2	0	0	0	29.6	80
321-2	Hw	Ba	Fd	Cw	Yc	Pl	49	17	16	14	3	0	0	19.7	76
323-2	Ba	Hw	Yc				68	31	1	0	0	0	0	24.7	73
324-2	Fd	Hw	Cw	Pl	Ba	Yc	44	27	17	6	3	2	0	23.8	76
331-2	Hw	Fd	Cw	Ba	Yc	Pl	47	19	17	10	6	1	0	17.4	74
333-2	Ba	Hw					60	40	0	0	0	0	0	24.4	80
334-2	Fd	Hw	Cw	Pl	Yc	Dr	42	23	19	11	2	2	0	17.8	71
411-2	Hw	Ba	Yc	Fd			50	30	19	1	0	0	0	13.7	80
414-2	Fd	Hw	Cw	Pl			56	22	16	6	0	0	0	16.5	80
421-2	Hw	Ba	Fd	Yc	Cw		45	24	17	7	7	0	0	16.6	74
423-2	Ba	Hw	Yc				55	35	10	0	0	0	0	22.8	79
424-2	Fd	Hw	Cw	Yc	Ba		60	28	12	0	0	0	0	28.4	79
431-2	Hw	Ba	Yc	Fd	Cw		46	25	14	11	3	0	0	16.1	69
433-2	Ba	Hw	Yc				50	30	20	0	0	0	0	21.4	50
434-2	Fd	Hw	Cw	Yc			33	30	20	17	0	0	0	24.9	80

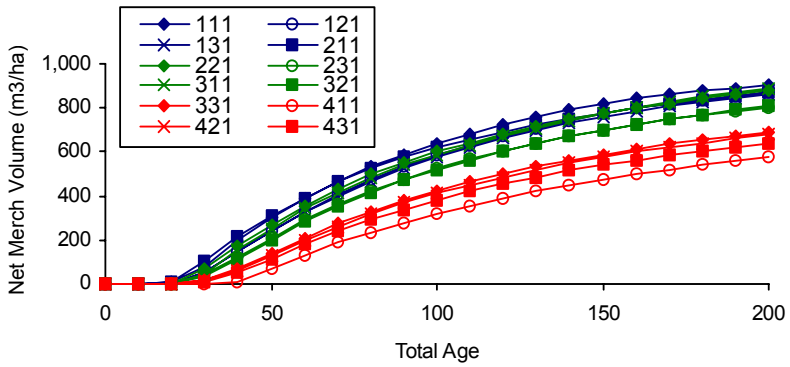


Figure 2 - Yield curves for Hw existing analysis units, age class 3 to 6

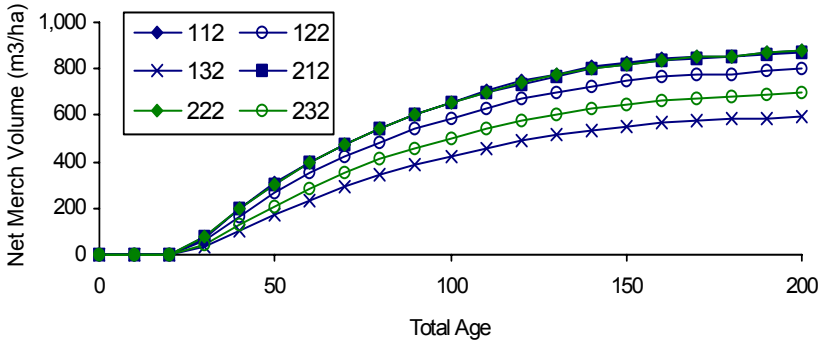


Figure 3 - Yield curves for Fdc existing analysis units, age class 3 to 6

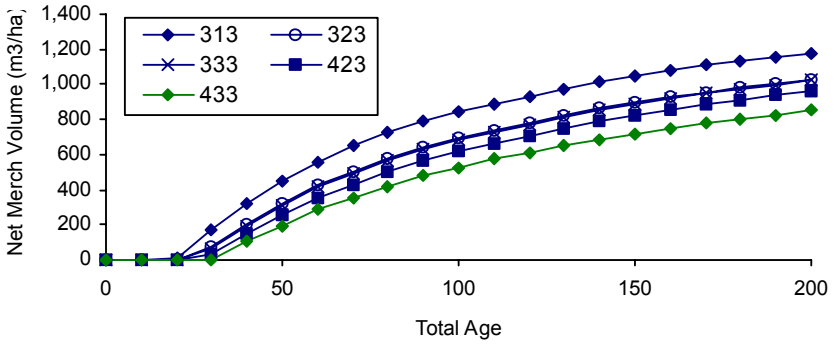


Figure 4 - Yield curves for Ba existing analysis units, age class 3 to 6

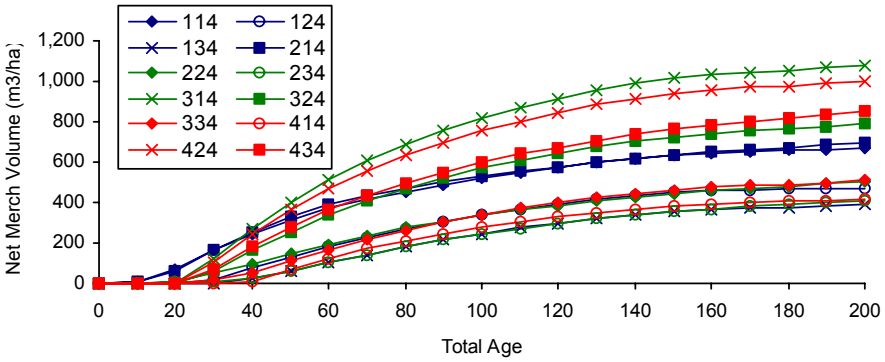


Figure 5 - Yield curves for Others existing analysis units, age class 3 to 6

8.7.2 Existing Mature Stand Volumes

The timber volume in existing mature stands (those ≥ 120 years) was determined for each analysis unit by using area weighted average volumes as calculated from VDYP for these stands (Table 27).

Table 27 - Existing mature volume.

Analysis Unit	THLB Area	Weighted Avg Age	Weighted Avg Volume/ha	Analysis Unit Volume
111-3	13.3	245	1136.1	15,110
112-3	67.4	265	1075.2	72,468
114-3	2.7	278	560.3	1,513
121-3	78.8	273	793.6	62,536
122-3	290.7	261	880.7	256,019
124-3	23.0	301	540.7	12,436
131-3	4.8	309	646.9	3,105
132-3	18.3	254	630.8	11,544
134-3	7.1	297	568.7	4,038
211-3	978.1	289	881.5	862,195
212-3	114.5	277	976.5	111,809
214-3	900.9	288	900.6	811,351
221-3	7215.4	274	731.6	5,278,787
222-3	890.0	259	760.9	677,201
224-3	6573.0	288	634.0	4,167,282
231-3	2559.7	264	572.0	1,464,148
232-3	559.2	253	663.0	370,750
234-3	4660.2	276	458.0	2,134,372
311-3	554.2	293	719.2	398,581
313-3	240.8	293	917.8	221,006
314-3	113.7	303	493.5	56,111
321-3	8276.7	288	645.9	5,345,921
323-3	675.4	279	847.0	572,064
324-3	2913.0	295	516.3	1,503,982
331-3	1995.1	281	556.8	1,110,872
333-3	102.2	289	887.6	90,713
334-3	2191.3	293	433.3	949,490
411-3	205.2	302	507.9	104,221
413-3	30.6	267	635.3	19,440
414-3	42.5	301	470.9	20,013
421-3	2637.3	279	573.1	1,511,437
423-3	534.0	267	651.0	347,634
424-3	467.9	280	439.1	205,455
431-3	299.2	291	500.3	149,690
433-3	35.8	249	547.6	19,604
434-3	61.7	298	437.3	26,981

8.8 Yield Tables for Managed Stands

8.8.1 Existing Managed Stand Volumes

For existing managed stands, all stands were assumed to be plantations, species composition was taken from the inventory database, establishment density was assumed to be 10% higher than typical free-to-grow density derived from silviculture records, and the adjusted inventory site index was used when possible. Yield tables were first calculated for each individual polygon using Batch Tipsy 3.0. An area-based weighted average yield table was then calculated for the analysis unit. Average Tipsy inputs for existing managed stands are given in Table 28. Site index was estimated using the method described in section 8.2. Average site index by variant and species is shown in Table 32. Free-to-grow density was derived by subzone, site class, and age class from historical records and local knowledge of the TFL. Genetic gain of 2% was assumed for Fdc in age class 1 only. The proportion of each age class within analysis units, and the proportion of genetically-improved Fd is given in Table 29. No other treatment was used in existing managed stands.

Table 28 - TIPSY inputs for existing managed stands

Existing AU	Spp 1	Spp 2	Spp 3	Spp 4	Spp 5	Spp 6	% Spp1	% Spp2	% Spp3	% Spp4	% Spp5	% Spp6	Avg. SI (spp1)	Avg. Density
111-1	Hw	Fd	Cw				57	36	7	0	0	0	31.0	1,671
112-1	Fd	Hw	Dr	Ss	Pl	Cw	75	24	0	0	0	0	35.0	1,727
114-1	Fd	Dr	Ba	Hw			36	30	18	16	0	0	26.6	2,312
121-1	Hw	Fd	Cw	Ba			55	35	9	1	0	0	27.4	1,767
122-1	Fd	Hw	Ss	Pl	Dr	Cw	74	24	1	0	0	0	31.0	1,679
124-1	Pl	Fd	Ba	Hw			59	39	2	0	0	0	25.1	1,694
131-1	Hw	Cw	Fd				50	30	20	0	0	0	20.2	1,100
132-1	Fd	Hw	Cw	Pl			59	27	14	0	0	0	23.0	1,100
211-1	Hw	Cw	Fd	Ba	Ss	Yc	58	14	13	12	3	1	30.0	3,283
212-1	Fd	Hw	Cw	Ss	Ba		62	31	3	2	1	0	33.8	2,391
214-1	Hw	Ba	Cw	Ss	Dr	Fd	31	29	19	9	6	5	24.2	3,585
221-1	Hw	Fd	Cw	Ba	Yc	Ss	57	15	15	11	1	1	29.0	3,399
222-1	Fd	Hw	Cw	Ba	Ss	Dr	64	30	5	1	1	0	32.7	2,650
224-1	Cw	Hw	Ba	Fd	Yc	Dr	36	28	24	9	1	1	22.7	3,991
231-1	Hw	Fd	Cw	Ba	Yc	Ss	57	16	16	10	1	0	20.0	1,981
232-1	Fd	Hw	Cw	Ba	Ss		60	32	7	1	0	0	22.7	1,890
234-1	Cw	Hw	Ba	Fd	Dr	Yc	34	29	18	12	5	2	21.6	2,093
311-1	Hw	Ba	Cw	Fd	Yc		55	29	9	5	3	0	28.0	3,300
313-1	Ba	Hw	Yc	Cw	Fd		56	36	5	3	0	0	31.2	3,300
314-1	Cw	Hw	Fd	Ba	Yc		36	32	21	9	1	0	22.7	3,300
321-1	Hw	Ba	Cw	Yc	Fd	Pw	54	27	9	5	5	0	28.0	3,300
323-1	Ba	Hw	Yc	Cw	Fd	Hm	51	31	9	7	1	0	29.8	3,300
324-1	Fd	Hw	Cw	Ba	Yc		47	30	11	6	6	0	26.1	3,300
331-1	Hw	Ba	Cw	Yc	Fd		50	26	12	6	5	0	14.3	2,200
333-1	Ba	Hw	Yc	Cw	Fd		47	23	15	10	4	0	21.1	2,200
334-1	Yc	Hw	Ba	Fd	Cw		30	30	15	13	12	0	22.6	2,200
411-1	Ba	Hw	Cw	Yc			40	40	10	10	0	0	16.0	4,400
413-1	Ba	Hw	Cw	Yc			40	40	10	10	0	0	18.0	4,400
414-1	Yc	Hw	Ba				50	30	20	0	0	0	23.0	4,400
421-1	Hw	Ba	Cw	Yc	Fd		49	24	20	4	3	0	16.0	4,400
423-1	Ba	Hw	Yc	Cw	Fd		46	26	14	8	6	0	14.0	4,400
424-1	Yc	Hw	Ba	Fd	Cw		45	31	19	4	2	0	23.3	4,400
431-1	Hw	Ba	Fd	Cw			50	26	12	12	0	0	16.0	4,400
433-1	Ba	Hw	Yc				60	30	10	0	0	0	8.0	4,400
434-1	Yc	Hw	Ba				50	30	20	0	0	0	23.0	4,400

Table 29 - Proportion of age class 1 & 2, and genetically improved Fd by analysis unit

AU	Area (ha)	Age Class 1 (%)	Fd_Pct	Age Class 2 (%)
111-1	37.4	1.3%	0.4%	98.7%
112-1	287.7	4.7%	4.0%	95.3%
114-1	201.6	40.1%	18.0%	59.9%
121-1	1764.2	10.6%	3.2%	89.4%
122-1	9.2	2.6%	1.7%	97.4%
124-1	9.6	4.0%	1.8%	96.0%
131-1	49.6	0.0%	0.0%	100.0%
132-1	2195.0	0.0%	0.0%	100.0%
211-1	1161.2	54.7%	3.6%	45.3%
212-1	403.4	9.7%	5.3%	90.3%
214-1	12312.6	70.0%	2.0%	30.0%
221-1	4570.6	60.6%	6.4%	39.4%
222-1	1863.5	22.7%	13.1%	77.3%
224-1	1717.9	90.5%	8.0%	9.5%
231-1	464.8	60.2%	6.9%	39.8%
232-1	336.4	43.6%	22.4%	56.4%
234-1	262.0	80.6%	10.4%	19.4%
311-1	71.9	70.1%	1.4%	29.9%
313-1	15.9	98.5%	0.4%	1.5%
314-1	2572.9	100.0%	21.4%	0.0%
321-1	1041.2	86.4%	2.6%	13.6%
323-1	447.7	96.2%	1.2%	3.8%
324-1	368.9	41.8%	10.2%	58.2%
331-1	98.3	92.0%	4.7%	8.0%
333-1	50.0	98.8%	4.5%	1.2%
334-1	0.7	100.0%	13.4%	0.0%
411-1	4.4	100.0%	0.0%	0.0%
413-1	2.5	100.0%	0.0%	0.0%
414-1	114.0	100.0%	0.0%	0.0%
421-1	136.1	20.6%	0.4%	79.4%
423-1	28.3	99.0%	6.2%	1.0%
424-1	1.2	94.2%	0.5%	5.8%
431-1	0.6	60.9%	12.2%	39.1%
433-1	0.7	100.0%	0.0%	0.0%
434-1	0.4	100.0%	0.0%	0.0%

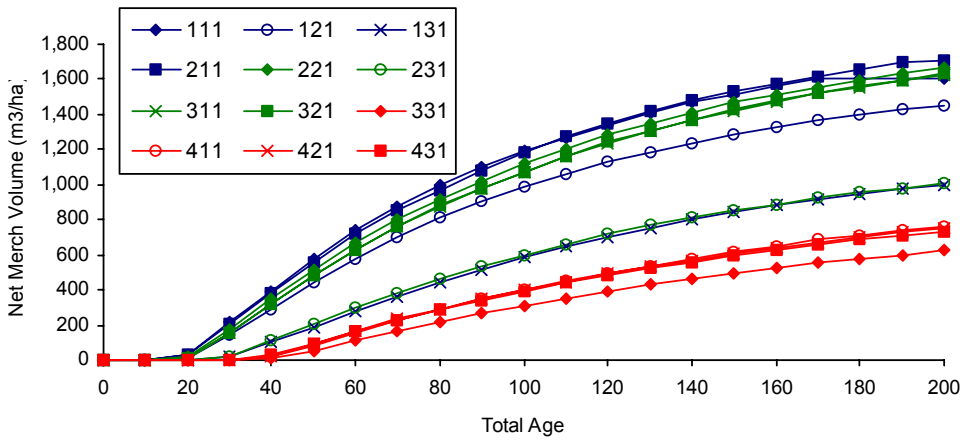


Figure 6 - Yield curves for Hw existing analysis units, age class 1 to 2

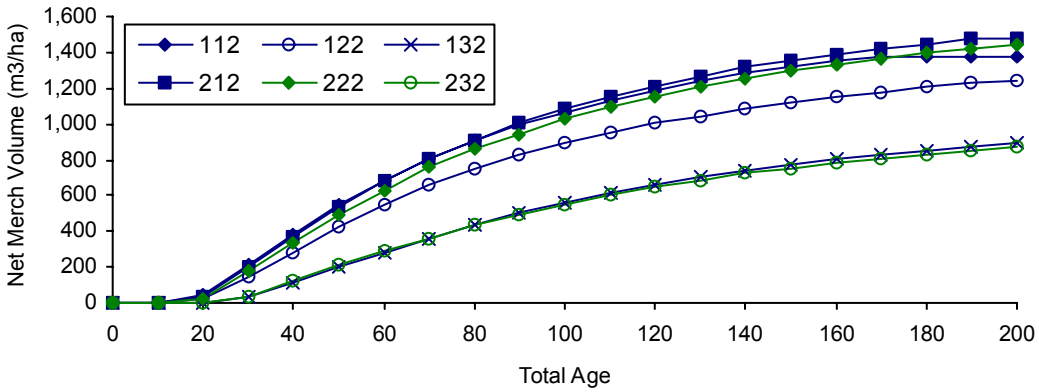


Figure 7 - Yield curves for Fdc existing analysis units, age class 1 to 2

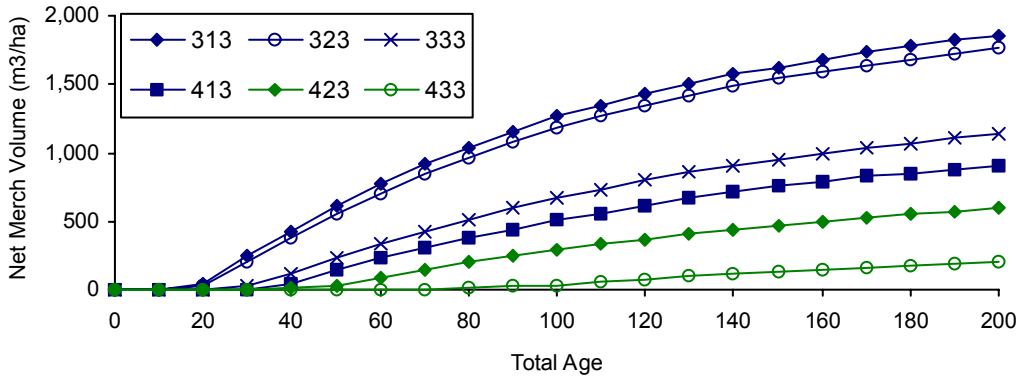


Figure 8 - Yield curves for Ba existing analysis units, age class 1 to 2

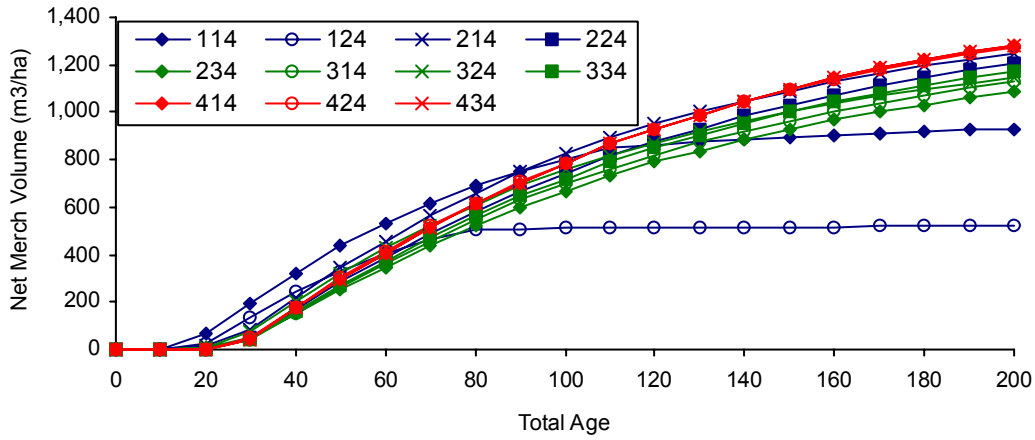


Figure 9 - Yield curves for Other existing analysis units, age class 1 to 2

8.8.2 Future Stand Volumes

For future stands, a series of silviculture strategies were derived based on what is currently being done on the TFL and what Western Forest Products intends to do in the future. These silviculture strategies were based on ecological units. Input information is

given in Table 30. OAF1 was 15%, OAF2 was 5%, utilization limit was 12.5 cm, and regeneration delay is to be applied within the timber supply model.

Fertilization consists of two applications of 435 kg/ha urea pellets at ages 20 and 60. Since fertilization response is only applicable to Douglas-fir, two runs per treated analysis unit were done. First, the Douglas-fir component was run as a pure fir stand with the fertilization applications using custom runs of TASS. Second, the remainder of stand composition was run using Tipsy with its composition adjusted without the fir component. Finally, the runs were re-combined for the analysis unit proportionally to the original stand composition. Ken Polsson of the Ministry of Forests - Research Branch, provided fertilization runs since a second fertilization application is not yet available in TIPSY.

Table 30 - Silviculture strategies for future stands

AUs	Subzone	Site Class	Establish Density	Spc1	%	Spc 2	%	Spc 3	%
110	CWHxm2	Good	1,000	Fd	70	Cw	20	Hw	10
120	CWHxm2	Medium	1,000	Fd	60	Cw	20	Hw	20
130	CWHxm2	Poor	1,000	Fd	50	Cw	40	Hw	10
210	CWHvm1	Good	1,000	Hw	40	Cw	40	Ba	20
220	CWHvm1	Medium	1,000	Hw	50	Cw	20	Ba	20
230	CWHvm1	Poor	1,000	Hw	40	Cw	40	Fd	20
310	CWHvm2	Good	1,000	Hw	40	Ba	30	Yc	30
320	CWHvm2	Medium	1,000	Hw	40	Ba	30	Yc	30
330	CWHvm2	Poor	1,000	Hw	40	Cw	30	Yc	30
410	MHmm1/MHmmp1	Good	1,000	Ba	40	Hm	30	Yc	30
420	MHmm1/MHmmp1	Medium	1,000	Ba	40	Hm	30	Yc	30
430	MHmm1/MHmmp1	Poor	1,000	Ba	40	Hm	30	Yc	30

The average site index by future analysis unit was calculated using two different methods: using expert-based site index developed for TFL 37 and the SIBEC database. Site index estimates for the different site series for both methods is shown in Table 31

Table 31 - Site index adjustment procedure

Subzone	Site Series	Area	Spp	TFL 37	SIBEC
CWHxm2	01	3,520	Fdc	30.3	32
	03	288	Fdc	23.6	24
	04	9	Fdc	31.7	28
	05	496	Fdc	35.1	36
	07	54	Fdc	33.5	32
	08	28	Fdc	38.4	40
CWHvm1	01	39,854	Hw	30	28
	02	484	Hw	12	8
	03	12,470	Hw	23	16
	04	130	Hw	25	24
	05	6,335	Hw	31	28
	07	88	Hw	32	32
	09	864	Hw	32	28
	12	299	Hw	23	16
	14	54	Hw	23	20
CWHvm2	01	17,022	Hw	28	28
	02	573	Yc	8	8
	03	3,764	Yc	16	16
	05	1,064	Hw	29	28
	07	252	Hw	30	28
	09	964	Yc	12	12
	10	10	Yc	8	8
	11	3	Yc	16	16

Subzone	Site Series	Area	Spp	TFL 37	SIBEC
MHmm1	01	4,043	Ba	16	12
	02	296	Ba	8	8
	03	85	Ba	17	12
	05	314	Ba	19	16
MHmmp1	01	4	Ba	16	12

The average site index within productivity class for both TFL 37 and SIBEC were very similar for CWHxm2 and CWHvm2, while TFL 37 averages were higher for CWHvm1 and MHmm1. The site index assigned for TFL 19 was assigned to reflect both sources of information.

Table 32 - Site index for Future Managed Stands

		Area			Site Index			
Beclabel	Prod Class	(ha)	%-Subzone	%-Total	Spp	TFL 37	SIBEC	TFL 19
CWHxm2	Good	579	13.0%	0.6%	Fdc	35.1	35.8	35.0
	Medium	3,529	79.6%	3.7%	Fdc	30.3	32.0	31.0
	Poor	326	7.4%	0.3%	Fdc	23.3	24.0	23.0
	Total	*4,434*		*4.7%*		*30.5*	*32.0*	*30.9*
CWHvm1	Good	7,288	11.8%	7.7%	Hw	31.1	28.0	30.0
	Medium	39,854	64.7%	42.1%	Hw	30.0	28.0	29.0
	Poor	14,410	23.4%	15.2%	Hw	22.6	15.8	20.0
	Total	*61,551*		*65.0%*		*28.5*	*25.3*	*27.0*
CWHvm2	Good	1,317	5.5%	1.4%	Hw	29.2	28.0	28.0
	Medium	17,022	71.4%	18.0%	Hw	28.0	28.0	28.0
	Poor	5,491	23.0%	5.8%	Yc	14.4	14.4	14.0
	Total	*23,830*		*25.2%*		*25.0*	*25.0*	*24.8*
MHmm1	Good	314	6.4%	0.3%	Ba	19.0	16.0	18.0
	Medium	4,132	84.6%	4.4%	Ba	16.0	12.0	14.0
	Poor	440	9.0%	0.5%	Ba	8.0	8.0	8.0
	Total	*4,886*		*5.2%*		*15.7*	*12.0*	*13.7*
Average		94,702				27.1	24.9	26.0

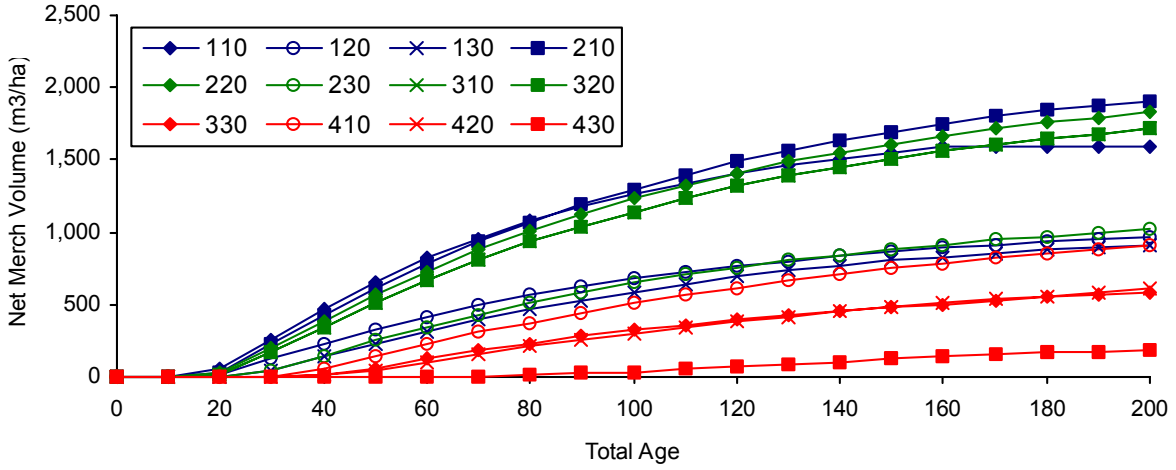


Figure 10 - Yield curves for future stands

8.8.3 Genetic gains for future stands

Genetic gains for future stands will be modelled by applying the gains specified in Table 33.

Table 33 - Genetic gain by regeneration era

Species	Subzone	Genetic gain by era	
		2000-06	2007+
Cw	CWH xm2	0	10%
Cw	CWH vm1	0	10%
Cw	CWH vm2	0	5%
Cw	MH mm1	0	5%
Fd	All	12%	12%
Hw	CWH xm2	8%	14%
Hw	CWH vm1	8%	14%
Hw	CWH vm2	7%	7%
Hw	MH mm1	7%	7%
Yc	All	0%	15%

Current Site Degradation

Western Forest Products' standard operating practices include the rehabilitation and restocking of trails once logging is completed. Highlead landings are typically small and of no measurable consequence. Helicopter landings are rehabilitated. No additional allowance for current site degradation has been made in Table 15 or Table 16 as the area affected is thought negligible.

Future Site Degradation

Future road systems have been projected within the TFL and area reductions will be applied once the model harvests the polygon. Section 6.15.3 outlines the amount of future road to be built in the TFL over the long term.

8.8.4 Regeneration Delay

The regeneration delay refers to the average time elapsed between harvesting and establishment of new plantations on the TFL. For most sites in the TFL actual regeneration delay is around 2.0 years or better. However, with time-of-planting fertilization, which is current management practice on all sites, an “effective” one-year reduction of regeneration delay is appropriate and conservative. Table 34 indicates the regeneration delay period used to shift the yield curve for each regenerated analysis unit. Regeneration delay will be applied in the timber supply model, not in the TIPSY yield model.

Table 34 - Regeneration delay period

Analysis Unit	Regeneration Delay (Years)[1]
110	1.0
120	1.0
130	1.0
210	1.0
220	1.0
230	1.0
310	1.0
320	1.0
330	1.0
410	1.0
420	1.0
430	1.0

[1] Indicate regeneration delay period for stands planted with fertilizer.

8.8.5 Regeneration Assumptions

The timber supply analysis for the TFL will use the regeneration assumptions outlined in Table 35.

Table 35 - Regeneration assumptions

Existing Analysis Unit	Area (ha)	Regenerated Analysis Unit
111-1, -2, -3	126.2	110
112-1, -2, -3	394.9	110
114-1, -2, -3	25.1	110
121-1, -2, -3	621.2	120
122-1, -2, -3	2645.2	120
124-1, -2, -3	179.5	120
131-1, -2, -3	46.7	130
132-1, -2, -3	224.9	130
134-1, -2, -3	49.4	130
211-1, -2, -3	4126.9	210
212-1, -2, -3	1406.0	210
214-1, -2, -3	1604.4	210
221-1, -2, -3	23406.4	220
222-1, -2, -3	6468.9	220
224-1, -2, -3	8853.0	220
231-1, -2, -3	6109.5	230
232-1, -2, -3	2203.1	230
234-1, -2, -3	5851.1	230
311-1, -2, -3	819.7	310
313-1, -2, -3	318.0	310
314-1, -2, -3	130.7	310
321-1, -2, -3	11175.9	320
323-1, -2, -3	1732.8	320
324-1, -2, -3	3499.8	320
331-1, -2, -3	2673.3	330
333-1, -2, -3	205.6	330
334-1, -2, -3	2513.6	330
411-1, -2, -3	229.5	410
413-1, -2, -3	35.0	410
414-1, -2, -3	49.2	410
421-1, -2, -3	2878.5	420
423-1, -2, -3	694.8	420
424-1, -2, -3	505.4	420
431-1, -2, -3	338.1	430
433-1, -2, -3	37.1	430
434-1, -2, -3	60.8	430

8.8.6 Species Conversion

A small amount of non-productive brush type (NP BR) is converted on a yearly basis within the TFL. This type 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.

8.9 Silviculture History

8.9.1 Existing Managed Immature

Table 36 provides a breakdown of the extent of immature managed stands in the TFL by analysis group, silviculture treatment and age class.

Table 36 - Immature management history by THLB area and age class

Analysis Unit	No Treatment		Spaced*		Fertilized*		Grand Total
	1	2	1	2	1	2	
111-1	0.7	30.6		6.5			37.8
112-1	10.4	280.5					290.9
114-1	9.5	7.7					17.1
121-1	54.2	139.3		12.0			205.5
122-1	58.9	1706.7		1.1			1766.7
124-1	0.3	9.2					9.5
131-1	4.9	11.8					16.7
132-1		29.5		20.0			49.6
211-1	1149.9	916.6	81.7	49.2	2.5		2199.8
212-1	114.6	989.1		61.3		0.2	1165.2
214-1	339.1	83.6	1.6	9.0			433.2
221-1	7125.6	4076.0	586.2	459.3	58.8	22.2	12328.1
222-1	1094.8	2992.8	25.7	268.8	24.4	170.6	4577.1
224-1	1713.3	115.0	42.5	10.7			1881.5
231-1	1008.0	589.0	89.5	43.5	0.3	9.8	1740.0
232-1	213.9	241.0		1.7	5.4	3.0	465.1
234-1	317.9	44.0	1.2	2.4			365.4
311-1	189.1	70.5		2.3			262.0
313-1	70.9	1.0					71.9
314-1	15.9						15.9
321-1	2252.4	271.7	45.6	10.1	0.3		2580.1
323-1	1008.9	33.1					1041.9
324-1	220.7	227.3					448.0
331-1	338.6	30.8	7.8				377.2
333-1	97.7	0.9					98.6
334-1	50.0						50.0
411-1	0.7						0.7
413-1	4.4						4.4
414-1	2.5						2.5
421-1	45.6	68.4					114.0
423-1	135.4	0.7					136.1
424-1	26.6	1.7					28.3
431-1	0.7	0.5					1.2
433-1	0.6						0.6
434-1	0.7						0.7
Grand Total	**17677.3**	**12968.7**	**881.8**	**957.7**	**91.7**	**205.8**	**32783.1**

* Spacing and fertilization hectares reported in the GIS are considerably lower than those presented in the TFL 19 Annual Reports. Since 1970 approximately 8,200 ha have been spaced and 4,500 ha have been fertilized. Updating of this data will take place prior to Management Plan 10 for TFL 19.

8.9.2 Backlog and Current Not Sufficiently Restocked (NSR) Areas

As of January 1, 2000 the total area of NSR amounted to 3,440.3 ha. Of the NSR area within the TFL, 3,212.4 ha are in the timber harvesting land base with the remainder in constrained areas. Currently, 267.2 ha of backlog areas are reported in the GIS; however, operational staff estimates indicate that most of these area are incorrectly classified and are in fact SR or NP. Natural NSR areas, blow-down and old slash fire escapes, are also reported in the GIS. These areas are also believed to be misclassified and are most likely fully stocked stands. Western Forest Products' target is to re-stock denudated areas within three years of harvest. Since 1987 WFP has planted an average of approximately 1,200 ha/yr, compared to the 1,000 ha/yr harvested.

Table 37 - NSR area

	Total Area (ha)
THLB	3,212.4
Non-THLB	227.9
Total	***3,440.3***

Timber supply analysis assumption for dealing with reported NSR is as follows:

- Backlog NSR and Natural NSR areas are assumed to be fully stocked and will be assigned to Hw existing managed stands and given an age of 10 years.

- Current NSR will be regenerated to the appropriate future Analysis Unit within the specified regeneration delay period.

9.0 NON-RECOVERABLE LOSSES

9.1 Overview

The intent of this section is to describe the non-recoverable losses that will be deducted from the calculated annual harvest. These losses include epidemic losses from insects, disease, wind-throw, and fire not otherwise accounted foe in the analysis.

9.2 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 operational adjustment factors applied to yield curves.

9.3 Wind-Throw

Since 1997 wind-throw records for the TFL are good. Historically, wind-throw has been isolated in relatively small areas with the only major blowdown event in the last decade occurring in 1995. This event occurred mainly on the outer coast portion of the TFL and resulted in little unsalvaged damage.

Staff foresters and engineers in the Nootka Region estimate mean annual wind-throw damage in the TFL is approximately 12 ha per year resulting in 9,500 m^3, of which 7,125m^3 are recovered through salvage harvesting. Non-recoverable loss is therefore estimated to be 2375 m^3/yr.

9.4 Fire

The risk of loss of timber due to fire is moderate 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.

10.0 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
Timber Inventory	Completed in 1988 by Reid, Collins and Associates (now Olympic Resource Management). MOF field audit completed in 1999.	Yes 19-May-93	Inventory revisions updated annually.
Ecosystems	Mapping completed by Madrone Consulting Ltd (Nov 00). Internal review ongoing	Yes	Finalization and quality assurance to be completed in 2001.
Terrain Stability	Completed in 1997 by Terence Lewis et al.	Submitted 11-Apr-99	Currently being reviewed by MOF
ESAs	No longer used for planning. New inventories replace the need for this classification.	Yes 08-July-94	
Recreation Inventory and Recreation Analysis	Recreation inventory completed in 2000 by Jeremy Webb of Recreation Resources Limited. Includes karst overview.	Yes	Update completed in 2000. Has been submitted to MOF and is currently being reviewed
Visual Landscape Inventory	Completed by Recreation Resources Limited (Jeremy Webb) in 2000. VQCs considered draft. VQOs updated in 1998 as part of MOF visual impact mitigation program are incorporated into new inventory.	Yes	Update completed in 2000. Has been submitted to MOF and is currently being reviewed
Stream Classification	MP#8 classification based on A, B and C stream designations. FDP process has updated to FPC Riparian Classes for a large part of the TFL	DFO 13-July-94 MOE 08-July-94	Stream Inventories - in progress.
Archaeological	Archaeological Overview Assessment completed by Arcas in 1998. Site-specific maps and description on file (held in confidence at request of First Nations).	No	
Operability	Completed by WFP in 1999.	Yes 16-Oct-00	
20-Year Plan		Under review	Submitted as part of MP 9

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.

10.3.1.1 Visual Quality

Visual quality is currently being managed in all areas having a VQC in the TFL inventory. Visual Quality Classes to be modelled in the timber supply analysis are Preservation (P), 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 1%, 5%, 15% and 25% for each VQC respectively. These levels are set at the upper end of the % denudation range for use in timber supply analyses as visual landscape design during cutblock layout has become common practice in sensitive viewscapes.

A 5 m visually effective green-up (VEG) height is proposed for TFL 19. As Complan uses volume over age curves for yield tables, an age surrogate 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 Class	Productive Forest	THLB Area	Denudation %
M	33,479.0	20,995.5	25%
PR	22,459.0	15,506.5	15%
R	1,701.0	1,233.0	5%
P	7.5	0.0	1%

10.3.1.2 Wildlife

10.3.1.2.1 Ungulate winter range

Ungulate winter ranges and subsequent updates have been identified and delineated in wildlife habitat inventories. These areas are deducted from the timber harvesting land base. Work is underway to identify potential UWRs from Potential Wildlife Areas (old Ew2 designations) and following consultations with MoELP new UWRs will be recommended. As this process is not complete, a cover constraint will be imposed within the Potential Wildlife Areas for timber supply modelling purposes. The cover constraint will ensure that at least 50% of the Potential Wildlife Area is retained in stands >140 years old. This method will ensure that short-term timber flow projections reflect these as yet undesignated UWRs, but the LTHL may decline with the next management plan once any new UWRs are spatially fixed and removed from the THLB.

10.3.1.2.2 Identified wildlife

Recently within the TFL one of the first Wildlife Habitat Areas in the province has been designated. This area, which is 27.7 ha in size, has established to protect one of two known caves used for maternity roosts by the Keen's long-eared Myotis. This area has been removed from the timber harvesting land base.

10.3.1.3 Adjacent Cutblock Green-up

A 3 metre green-up height in General and Special Resource Management Zones and a 1.3 metre green-up height in Enhanced Resource Management Zones are proposed for areas without visual quality objectives. As described in Section 10.3.1.1, an age surrogate for each analysis unit will be used within the model to represent height.

10.3.1.4 Landscape Level Biodiversity

As Biodiversity Emphasis Options assigned to Landscape Units were in draft form at the time of data preparation, the current management option will have forest cover constraints imposed based on government policy. According to the policy, approximately 45 percent of the TFL will be in the lower BEO, 45 percent in the intermediate BEO and 10 percent in the high BEO. As a result, in the current management option the area-weighted average (i.e. 45/45/10) biodiversity constraints (old seral only) for the three BEOs will be applied for each variant in each draft LU.

Sensitivity analyses will evaluate the impacts of managing for biodiversity as specified by the interim BEO ratings assigned to each Landscape Unit. Modelling of the management of Landscape Units assigned Low, Intermediate and High BEO ratings will be guided by the Biodiversity Guidebook and, as indicated to date by government policy, only old seral targets will be modelled during the sensitivity.

Table 40 – Landscape biodiversity assumptions

Current Management Option									
NDT 1		Early seral stage	Off		*Draw down acceptable in Low BEO Lunits*				
		Mature + old	Off		*Only if timber supply impact is noted*				
		Old seral stage	On		*All other Lunits are to be assigned the full constraint*				
					Implement old seral cover %				
					0 years		guidebook *0.33		
					70 years		guidebook *0.67		
					140 years		guidebook*1.0		
CWH					***MH***				
Time 0	H	19%*0.10	1.9	**9.7**	Time 0	H	28%*0.10	2.8	**14.2**
(OLD)	I	13%*0.45	5.9		*(OLD)*	I	19%*0.45	8.6	
	L	13%*0.33)*0.45	1.9			L	(19%*0.33)*0.45	2.8	
Time 70	H	19%*0.10	1.9	**11.6**	Time 70	H	28%*0.10	2.8	**17.0**
(OLD)	I	13%*0.45	5.9		*(OLD)*	I	19%*0.45	8.6	
	L	(13%*0.66)*0.45	3.9			L	(19%*0.66)*0.45	5.6	
Time 140	H	19%*0.10	1.9	**13.6**	Time 140	H	28%*0.10	2.8	**19.9**
(OLD)	I	13%*0.45	5.9		*(OLD)*	I	19%*0.45	8.6	
	L	13%*0.45	5.9			L	19%*0.45	8.6	
Old seral biodiversity targets									
		Low		Intermediate			High		
CWH		>13%		>13%			>19%		
MH		*>19%*		*>19%*			*>28%*		

10.3.1.5 Reductions to Reflect Volume Retention in Cutblocks

Where feasible and wildlife objectives can be met WTP are located in constrained areas such as riparian reserves, unmerchantable stands or unstable slopes. In order to capture those WTP located in harvestable areas a volume reduction will be implemented in the timber supply model. Current management direction from the Ministry of Forests – Campbell River District is that at least 10% WTP retention is to be managed for. However, operational staff indicates that about 13% WTP retention is being realized in the TFL. Assuming 75% of the WTP retention is in constrained areas (based on the *Forest Practices Code Timber Supply Impact Analysis*) a volume reduction of 3.25% (0.25x13%) is recommended for use to account for operable area in WTPs. 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 management zones and other areas.

10.3.1.6 Community Watersheds

The Village of Tahsis draws its water supply from McKelvie Creek, which is an unlogged watershed draining into Tahsis River and designated community watershed. Due to the small size of this watershed issues surrounding water quality will mainly be dealt with at an operational level. However, at the request of Timber Supply Branch a cover constraint will be implemented so no more than 5% of the productive area within the watershed will be covered with stands less than 5 years old.

10.3.1.7 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. All plans filed after April 1, 2001 are to conform to this order. WFP is conducting operations within the Resource Management Zones within TFL 19 to meet the spirit and intent of the stated management objectives. For modelling purposes, current management constraints such as UWRs, VQOs, and FPC requirements and sensitivity analyses for BEOs will be adequate to address most RMZ objectives, hence no additional forest cover constraints are being modelled specifically for RMZ objectives.

10.4 Timber Harvesting

10.4.1 Minimum Harvestable Age

Minimum harvestable ages are simply minimum criteria. While harvesting may occur in stands at 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 maybe in ample supply.

In the previous analysis, minimum harvestable age and volume were selected to be 60 years and 350m^3 per hectare. Both minimum age and minimum volume requirements must be met before a stand can be harvested. To retain consistency this minimum

harvest criteria will be used in the new analysis, but sensitivity analysis will investigate the possibility of using higher minimums. The timber supply analysis will explore the average diameters associated with this minimum harvest age criteria.

10.4.2 Operability

The criteria used to determine operability for use in the timber supply analysis are highlighted in Section 6.7. A *Terms of Reference* document outlining the operability classification process was submitted to Ministry of Forests in August 1998 and contains detailed information regarding the assumptions and criteria used. This document has been included as Appendix II-B.

Table 41 – Operability Summary

Operability	Area (ha)
Oc – Operable Conventional	82,981.2 (87.6%)
Oh – Operable Helicopter	11,754.7 (12.4%)
Total	94,735.9

10.4.3 Initial Harvest Rate

Initially, the timber supply analysis will be set at the currently approved annual harvest level of 978,000m^3. Rates will be varied to meet the objectives stated in Section 10.4.7. Once a suitable flow is established sensitivity analyses will be performed. Should these analyses suggest an alternative flow pattern is warranted, additional runs may be initiated.

10.4.4 Harvest Rules

Harvest rules priorize forest stands for harvest based on specified criteria. Since the timber supply model is spatially based, a couple of options are available to implement harvest rules. Like aspatial timber supply models, harvesting stands on an oldest first basis is available as a harvest rule. However, an additional rule of closest to the log dump can be used. This rule allows the model to harvest in a pattern typical of actual operations. Additional rules can be placed on the model to control the harvest levels by operating area. A number of options may be run to test sensitivity to changes of harvest rules.

10.4.5 Harvest Profile

Harvesting to the inventory profile in TFL19 has been achieved and will continue. No constraints will be imposed in the model to target certain species or product grades.

10.4.6 Silviculture Systems

The majority of the TFL is currently harvested using clearcut with reserve or retention harvest methods. There is no significant selection or partial cutting with dispersed retention occurring at this time.

For the purposes of modelling clumped retention, volume reductions as discussed in Section 10.2.1.6 in combination with even-aged growth and yield projections for the remaining harvested area should be adequate, albeit imperfect.

To date the Licensee has focussed management strategies for conservation of biodiversity at the landscape level. Riparian reserves, larger wildlife tree patches and other exclusions from the timber harvesting land base are examples of areas being managed for conservation. Strategies for stand level retention within the TFL are now being investigated to augment higher-level conservation plans. A committee is active within WFP to explore the use of a variety of silviculture systems to retain more within-stand structure during harvesting.

As pressures to adopt non-traditional cutting methods and uneven-aged silviculture systems mount, growth and yield models need to be developed and calibrated for predicting the long term outcome of partial cutting in coastal old-growth and second-growth stands. As there is little experience on the coast and few, if any, stands to sample for partial cutting response, models will have to deviate significantly from the usual strategy of permanent sample plot analyses. Due to the lack of growth and yield data and predictive tools, the licensee will not attempt to model partial cutting for this timber supply analysis. However the Licensee is, and will be, supportive of any initiatives of the Ministry of Forests to meet the challenge of developing uneven-aged models for the Coastal Western Hemlock Zone.

10.4.7 Harvest Flow Objectives

The objective of the volume-based analysis in the TFL is to maintain harvest levels near current levels for as long as reasonable to ensure long term sustainability through the transition from current harvest levels to the long-term harvest level. The rate of volume change per decade will be restricted to 10% or less, unless a steeper decline is needed to make the transition.

APPENDIX II-A - DETAILED AREA AND VOLUME SUMMARIES

Table 42 - Area (ha) by leading species, and age class

Leading Species	Age_class										Immature Area	Mature Area	Total Area	Immature Volume	Mature Volume	Total Volume
	0	1	2	3	4	5	6	7	8	9						
Hw		12,363.1	6,750.1	2,993.8	2,663.4	2,056.0	157.8	294.1	3,767.8	20,756.0	26,984	24,818	51,802	3,481,036	16,306,634	19,787,670
Ba		2,236.4	79.5		10.8	68.1	30.4	10.8	254.5	2,699.8	2,425	2,965	5,390	78,038	2,591,615	2,669,653
Cw		1,617.7	123.2	71.2	460.0	304.6	70.7	32.1	2,247.7	7,903.6	2,647	10,183	12,831	173,266	5,726,376	5,899,642
Yc		97.5	15.6		4.2	7.7		0.2	351.7	5,823.4	125	6,175	6,300	2,135	2,642,846	2,644,981
Ss		18.3	37.7							73.0	56	73	129		93,823	93,823
Fd		1,626.8	6,989.3	277.3	2,229.9	767.2	125.2	105.3	740.7	1,268.1	12,016	2,114	14,130	1,610,443	1,605,925	3,216,368
Pl			9.2	30.0	305.8	102.5			0.9		448	1	448	81,693	168	81,861
Dec		10.8	57.8	188.9	112.8	84.0	5.2				459	0	459	161,411		161,411
NSR	3,212.4										3,212	0	3,212			
Total	3,212.4	17,970.6	14,062.5	3,561.3	5,786.9	3,390.0	389.4	442.4	7,363.3	38,523.9	48,373	46,329	94,702	5,588,023	28,967,386	34,555,409

APPENDIX II-B - OPERABILITY CLASSIFICATION

1) SOURCES OF INFORMATION

a) Resource Inventories

i) Report of the Forest Inventory, TFL (1989) – Reid Collins

ii) Forest cover mapping – WFP G.I.S. inventory base; 1:10,000 scale. TRIM base mapping UTM NAD 83.

iii) Terrain stability overview mapping (1997) – T. Lewis; MOF 5 Class System; 1:20,000 scale

iv) Stream classification mapping – WFP; known fish streams; 1:20,000 scale

v) Landscape Inventory and Analysis – Recreation Resources Ltd., Aug. 1994

vi) Recreation Resource Inventory TFL 19 (1993) – J.B. Webb, Recreation Resources Limited

vii) Recreation Analysis Report (1994) – Recreation Resources Ltd.

b) Reconnaissance

i) Aerial

ii) Ground

c) Photography

i) 1:15,000 scale aerial photography (1995)

2) ASSUMPTIONS AND PLANNING CONSIDERATIONS

Terrain Stability Note:

The level "C" terrain stability overview mapping is by definition, a relatively coarse filter. Local knowledge and historical evidence show that at a more refined level, Class 4 and Class 5 terrain as identified on the overview may include terrain of more stable classifications. There will, therefore, be small areas identified as operable, which will be in apparent conflict with the overview mapping.

Ultimately, the area excluded from the operable land base as Class 4 and Class 5 terrain, will be that identified by the overview mapping net of those areas deemed to be of a more stable classification. Prior to any development activity, field terrain stability assessments will be conducted on all areas identified on the overview as having stability concerns, as required by the Forest Practices Code.

a) Forest Road Specifications

i) Grades

(1) Favourable

(a) Maximum sustained grades of +18%

(b) Switchbacks and short pitches up to +20%

(2) Adverse

(a) Maximum sustained grades of –8%

(b) Short intervals up to –12%

ii) Terrain

(1) Roads are not proposed on Class 5 terrain

(2) Roads may cross Class 4 inclusions to access timber (terrain field assessments will be conducted prior to development as per the Forest Road Regulation)

(3) Roads can be constructed on Class 1 through 3 terrain.

(b) Yarding Systems – Physical Constraints

i) Conventional Yarding Systems (O_C or O_{CE})
Conventional yarding is subdivided into two operable types based on forest cover: "Operational Conventional" (O_C) and "Operable Conventional with Economic constraints based on forest cover" (O_{CE}). (Refer to section 2)c);Yarding Systems – Forest Cover Constraints). The physical constraints described hereafter hold true for both conventionally operable subtypes.

(1) Highlead (includes 27.4 meter tower and grapple yarders)
- (a) Square Lead
  - (i) 250 meters preferred maximum yarding distance
  - (ii) 350 meters acceptable in occasional situations with adequate deflection
- (b) Corners
  - (i) 350 meters preferred maximum yarding distance
  - (ii) 400 meters acceptable in occasional situations with adequate deflection
- (c) Terrain
  - (i) Logs are fully suspended on Class 4
  - (ii) Not considered on Class 5

(2) Longline
- (a) Distance Constraints – Uphill Yarding (shotgun system preferable)
  - (i) Maximum yarding – 1,000 meters
- (b) Distance Constraints – Downhill Yarding
  - (i) Maximum yarding and tail hold – 750 meters
- (c) Not considered on Class 5 terrain
- (d) Situations indicating consideration for use
  - (i) Terrain stability concerns
    1. Largely continuous terrain Class 4 road development required to yard conventionally
    2. Improve deflection to minimize ground disturbance
  - (ii) Portion of setting inaccessible by road due to terrain constraints
    1. Class 5
    2. Rock bluffs
    3. Canyons
  - (iii) Minimize isolation of timber
  - (iv) Preferable to heli-logging where useable
  - (v) Economics dictates skyline over extra and expensive road

(3) Ground Based (hydraulic hoe forwarders) (note: this type may also include ground based systems used in alternative systems such as forwarders and skidders where suitable)
- (a) Distance Constraints
  - (i) 150 meters maximum distance to road side
  - (ii) May be used, where appropriate, to forward to highlead system (60m maximum)
- (b) Terrain
  - (i) Class 1 and 2 terrain with minor inclusions of Class 3
  - (ii) 30% maximum sustained slope
  - (iii) small inclusions of steeper ground acceptable

(ii) Non-Conventional Yarding Systems

Non-conventional yarding is subdivided into two operable types, Operable Helicopter (O_H) or Operable Helicopter with Economic constraints (O_{HE}). (Refer to section 2)c); Yarding Systems – Forest Cover Constraints). The physical constraints hereafter apply to both the economically constrained and non-economically constrained helicopter operable types.

(1) Helicopter (O_E or O_{HE})
  (a) Flight Distance
    (i) 1.0 kilometer or less preferred
    (ii) Up to 2.0 kilometers acceptable where no alternative exists

  (b) Both water and land drops are considered
  (c) Uphill flight acceptable using same constraints as in (1) above
  (d) Slope constraint determined by terrain class (i.e. not considered on Class 5 terrain; steep slopes on class 4 or less terrain are considered)
  (e) Situations indicating consideration for use
    (i) Timber inaccessible by road due to terrain constraints
      1.Class 5
      2.Rock bluffs
      3.Canyons
    (ii) Isolated location (i.e. conventional development uneconomic due to sheer distance from current development and insufficient merchantable timber in between)
    (iii) Terrain stability issues

(c) Yarding Systems – Forest Cover Constraints

As previously mentioned, forest cover is broken into two operable types, one with economic constraints (denoted by the subscript "E" in the operability descriptor) and the other without economic constraints (and no modifier in the descriptor).

The economic constraint is indicative of timber, which is on the margin of operability in terms of volume, quality and species. In good economic times, operability types with the "E" modifier will be operable. In poor economic times these same types may not be operable. These types are seen as opportunity timber and given the unpredictability of the economy, should have no associated requirement to harvest for cut control purposes.

i) Conventional yarding systems (O_C)
  (1) All height class 4 and above
  (2) All height class 3 with cedar or cypress as primary species with the exception of stocking class 3 stands which are excluded
  (3) Height class 3 stands with hembal or Douglas fir as primary species which are in close proximity to O_C types noted in points (1) and (2)

ii) Conventional Yarding Systems with Economic Constraints (O_{CE})
  (1) Height class 3 stands with hemlock or balsam as primary species which are not in close proximity to O_C types described in points i) (1) and (2)
  (2) Stocking class 3 stands with Douglas fir, cedar, cypress or spruce as primary or secondary species
  (3) Deciduous stands – operability determination based upon local knowledge

iii) Non-Conventional Yarding Systems
  (1) Helicopter (O_H)
    (a) All height class 4 and above

(2) Helicopter with Economic Constraints (O_{HE})
   (a) Height class 3 stands with cedar, cypress, spruce or Douglas fir as primary species (excluding stocking class 3 stands)
   (b) Height class 3 stands with cedar, cypress, spruce or Douglas fir as secondary species with the exception of all height class 3 stocking class 3 combinations which are excluded
   (c) Pure hemlock balsam height class 3 stands are excluded

d) Economically Inoperable Forest Cover (I_E)

(1) All mature height class 1 and 2
(2) Pure hemlock balsam height class 3 stocking class 3 open stands
(3) Pine dominant stands

e) Physically Inoperable Lands (I_P)

(1) All non-productive types (i.e. rock, brush, swamp, alpine, lakes, rivers, dryland sorts, camps, quarries, etc.)
(2) Land feature limitations (eg. Major gullies)
(3) Areas rendered physically and/or economically inaccessible by extreme terrain and/or distance, from development, which is physically and/or economically possible. (This distinction pertains to those areas to which access is physically possible, but so physically onerous that it is economically prohibitive)

f) Other Inoperable

Areas which are inoperable for environmental or institutional reasons, will be withdrawn through the G.I.S. (eg. ESA, terrain class 5, riparian, wetland or lake reserves, deer winter ranges, research plots, etc.)

Appendix III
Timber Supply Analysis

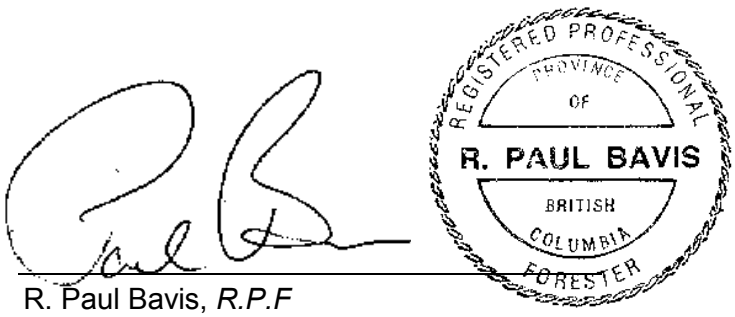
Western Forest Products Limited

Tree Farm Licence 19

Timber Supply Analysis

MANAGEMENT PLAN 9

May 2001



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Executive Summary

This analysis examines timber supply projections for Tree Farm Licence 19 located on west-central Vancouver Island.

Complan 3.0, a spatially-explicit harvest model, was used to simulate current management practices for protection and maintenance of ecological values and to estimate the residual timber potential through the year 2250.

After allowances for non-recoverable losses, the simulation of current management practice as agreed and set out in the associated information package suggests an AAC of 938,000 m^3/year for the term of the proposed management plan. This represents a reasonable harvest level that accommodates ecological and social concerns in the short and longer terms. The simulation suggests that a minimum of 51,200 ha (27%) will be maintained in older forests (>140 yrs) and a minimum 54,000,000 m^3 of merchantable growing stock retained throughout the 250-year simulation horizon. These forests are expected to contribute significantly to biodiversity conservation and complement protected areas (~258,000 ha) within and adjacent to the Tree Farm Licence.

A number of data uncertainties exist and estimates around these values are precautionary; as a result timber flows are likely underestimated. An alternative timber flow which incorporates better estimates for these uncertainties suggests that the AAC suggested above could be increased by at least 2,000 m^3/year and up to 40,000 m^3/year depending on the desired step down approach. On the other hand, adopting the best estimates but following the current management trajectory would permit a shift to longer rotation ages and in the long term, larger logs of higher value, a higher harvest level, and perhaps enhance biological attributes or unconventional values such as carbon storage.

Sensitivity analyses suggest that the current management simulation is sensitive to land base, yield, and minimum harvest age changes, but relatively less sensitive to adjacency and minimum harvest volume restrictions.

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Acknowledgements

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1.0 Introduction

1.1 Purpose

Tree Farm Licence 19 is located on the west coast of central Vancouver Island in the vicinity of Gold River and Nootka Sound. The TFL encompasses 191,992 ha of which 94,702 ha is available for long term timber production. The TFL was acquired from Pacific Forest Products in 1997. The allowable annual cut (AAC) at the time of transfer to Western Forest Products had been set at 978,000 m^3 per annum.

1.2 Objectives

The primary objective of this report is to estimate reasonably achievable timber flows for the consideration of the Provincial Chief Forester in making his determination of Allowable Annual Cut for the term of Management Plan 9. More specifically:

1. A multitude of non-timber values such as fish and wildlife habitat, biodiversity, recreation, visual quality, and terrain stability are to be given priority over timber. Protection of non-timber targets will be satisfied by land base removals, yield net downs and/or by maintaining a percentage of polygons in older stands.
2. Residual timber flow is to be estimated by considering harvestable inventory, growth potential of present and future stands, silvicultural treatments, potential timber losses, operational and legislative constraints.
3. Impacts of declining timber flow on community stability and employment are to be lessened by keeping rates of decline per decade as low as possible, and preferably less than 10%, without inducing undue impacts on other values or long term timber sustainability.

Secondary objectives include:

1. evaluation of the impacts of and effectiveness of forest policies.
2. identification of potential silvicultural or other interventions that may have social and/or ecological benefit.
3. identification of data and inventory uncertainties that may significantly improve estimates.

1.3 Timber Supply Model

Timber supply simulations were completed with Complan 3.0 software developed by Olympic Resource Management. Complan is a spatially-explicit supply model and is described in more detail in the associated information package (MP 9, Appendix II, section 4.1)

The inventory database was current to January 1, 2000 and the simulation was set up to include a one-year initial harvest period at the current AAC to bring the effective inventory date ahead to 2001. This initialization year was included in all runs but is not presented in the tables or graphs herein. This initialization year was followed by four 5-year harvest reporting periods to correspond to the 20-year plan intervals. A 20-year plan was prepared manually and the simulation was guided by the plan through the initial periods. Ten-year reporting intervals were used thereafter for a total simulation horizon of 250 years.

Analysis units and associated yield curve parameters are described in more detail in the associated information package (MP 9, Appendix II, sections 7 & 8).

To ensure optimization of harvest scenarios, harvest request levels were incrementally changed until small deficits were induced in the vicinity of the transition to second growth and in the long term. The rule-of-thumb for allowable deficits was up to 10,000 m^3/year in the first century and up to 25,000 m^3/year thereafter.

2.0 Current Management or Base Case

The current management (CM) simulation includes the following assumptions and modelling parameters that are described in more detail in the associated information package (MP 9, Appendix II, section 3.2):

- Future Wildlife Tree Patches are projected to occupy 13% of the land base, 4% of which is assumed to come from the otherwise harvestable land base[4]. Old seral stage targets are maintained based on guideline recommendations of 10% high, 45% intermediate, and 45% low biodiversity emphasis landscape units. Designated wildlife habitat areas such as ungulate winter ranges are not included for timber production. At least one half of other potential wildlife habitat area is retained as older forest throughout the simulation. Weymer Creek and Gold-Muchalat Parks were removed from the TFL. Green-up heights are assigned based on Resource Management Zoning established in the Vancouver Island Land Use Plan. "Special" and "General" zones have a 3m green-up requirement and "Enhanced" zones a 1.3m limit.

- The operable land base includes stands accessible to helicopter and conventional cable or ground-based harvesting systems.

- All harvested stands are planted promptly. Future plantations are assumed to use seed orchard stock. Yield reductions for stocking gaps are 20% at one hundred years. Future medium and poor Douglas-fir stands are assumed fertilized twice per rotation. Electronic records of historic spacing and fertilization were lost in the change of Licensees; hence neither is modelled.

- Visual quality restrictions are based on the latest inventory revisions with upper range denudation assumed. Recreation constraints are based on a newly completed inventory of features including karst potential.

- All stands less than 60 years old or 350 m^3/ha merchantable are deemed not harvestable. Incidental alder volumes contribute to the timber supply.

- Harvest priorities are to minimize growth loss and then to harvest oldest stands first. A manually prepared 20-Year Plan was used to guide harvesting through the first two decades.

The Current Management flow is presented in Table 1 and Figure 1.

[4] As the 4% is not area based, growing stock and age class distributions and summaries do not reflect this reserved area or volume.

Table 1 Current management harvest request and results

Period Start	Request	Achieved Harvest Level	Deficit	Δ (%) /decade
2000	978,000	978,000		
2001	940,347	940,347		
2006	904,144	904,144		-7.55%
2011	869,334	869,334		
2016	835,865	835,865		-7.55%
2021	803,684	803,684		
2031	742,992	742,992		-7.55%
2041	725,100	725,100		-2.41%
2051	725,100	719,326	5,774	0.00%
2061	768,000	768,000		5.92%
2071	769,000	769,000		0.13%
2081	770,000	770,000		0.13%
2091	772,500	772,500		0.32%
2101	772,500	772,500		0.00%
2111	772,500	770,071	2,429	0.00%
2121	785,000	785,000		1.62%
2131	785,000	785,000		0.00%
2141	785,000	785,000		0.00%
2151	785,000	785,000		0.00%
2161	785,000	785,000		0.00%
2171	785,000	785,000		0.00%
2181	785,000	785,000		0.00%
2191	785,000	785,000		0.00%
2201	785,000	785,000		0.00%
2211	785,000	785,000		0.00%
2221	785,000	769,065	15,935	0.00%
2231	785,000	785,000		0.00%
2241	785,000	784,161	839	0.00%

The simulation suggests that immediate declines in AACs need to be initiated and maintained for the next 30-40 years. A decline of about 7-8% per decade will allow for an orderly transition to the long term sustainable level estimated to be about 725,000 m^3/year before inclusion of tree improvement gains. A few decades after the 725,000 level is reached, AACs are expected to increase as stands planted today with higher yielding seed orchard stock reach harvestable ages. Yield gains through tree planting and particularly tree improvement to date are expected to eventually lead to a long-term harvest level (LTHL) of about 785,000 m^3/year.

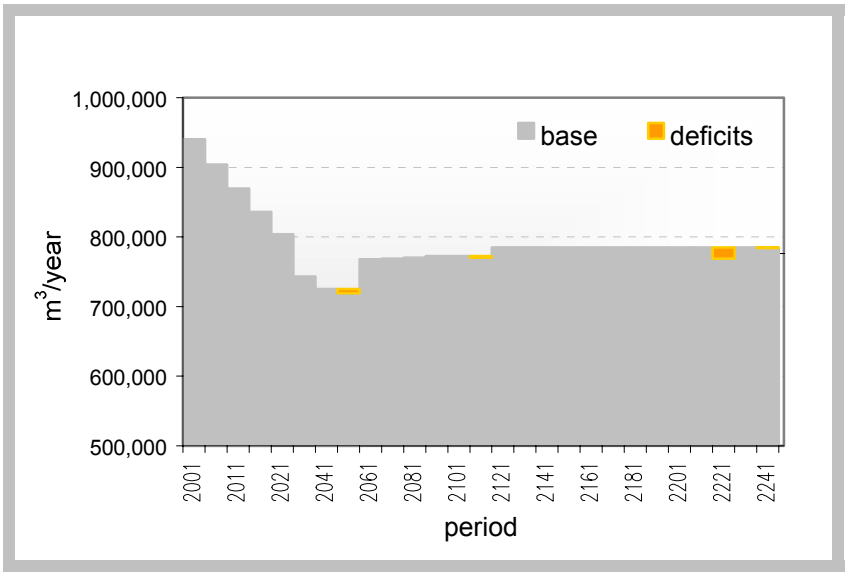

Figure 1 Current management base 2001-2250

Note that a steeper initial rate of decline could eliminate the dip in timber supply between 2031 and 2061[5], but to do so would unfairly penalize the present generation for implementing programs of planting with improved seedlings. If such programs had not been implemented (Figure A-1, Appendix III-A) the LTHL would never rise above the 725,000 level.

Age Class Distributions are examined in Figure 2 and Figure 3. Generally the youngest age class remains stable through the simulation. Initially the oldest age class declines by about a third and then stabilizes (Figure 2). Twenty- to sixty-year-old stands (Age Class 1-3) increase initially until a relatively balanced age class distribution is achieved on the timber harvesting land base (THLB).

Figure 4 illustrates harvestable and gross growing stock levels for the THLB and total TFL land base. Growing stock declines until the transition to second growth harvesting is completed and then stabilizes or rises slightly through the remainder of the simulation. Growing stock in TFL 19 declines by 16% through the transition to second growth and then climbs back to near current levels and at no time through the simulation does growing stock fall below 54 million cubic metres or roughly 348 cubic metres per forested hectare. This standing inventory of wood permanently provides the basis for timber flow in the long term and provides substantial habitat and other environmental value.

[5] See Figure 7 or Figure 8 for example

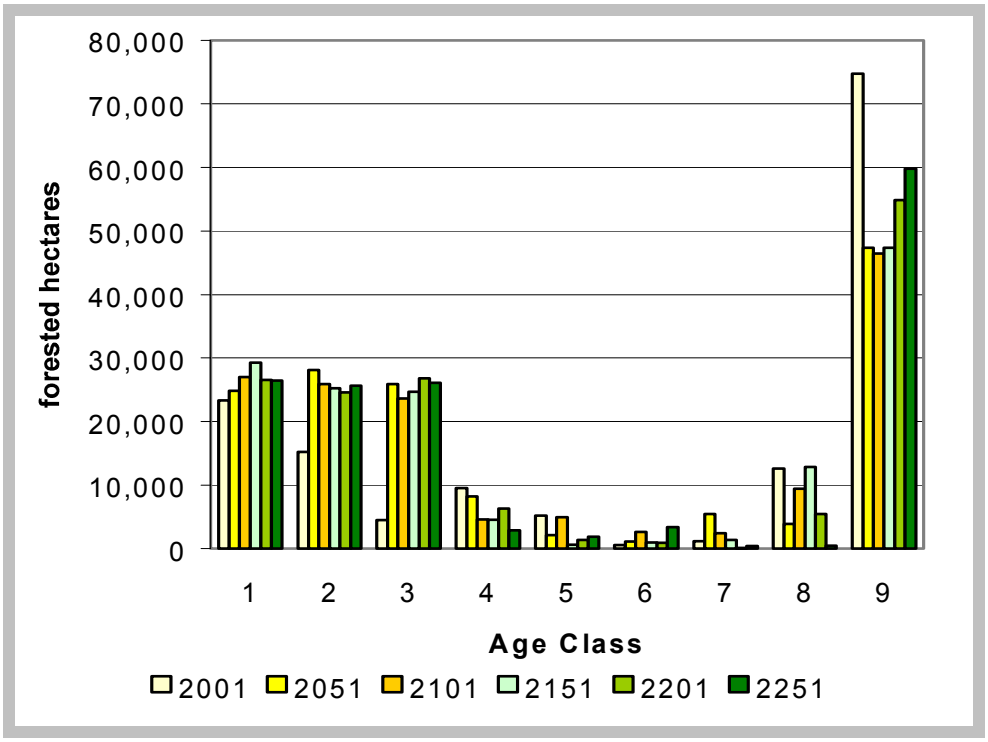

Figure 2 Age class distribution on total land area

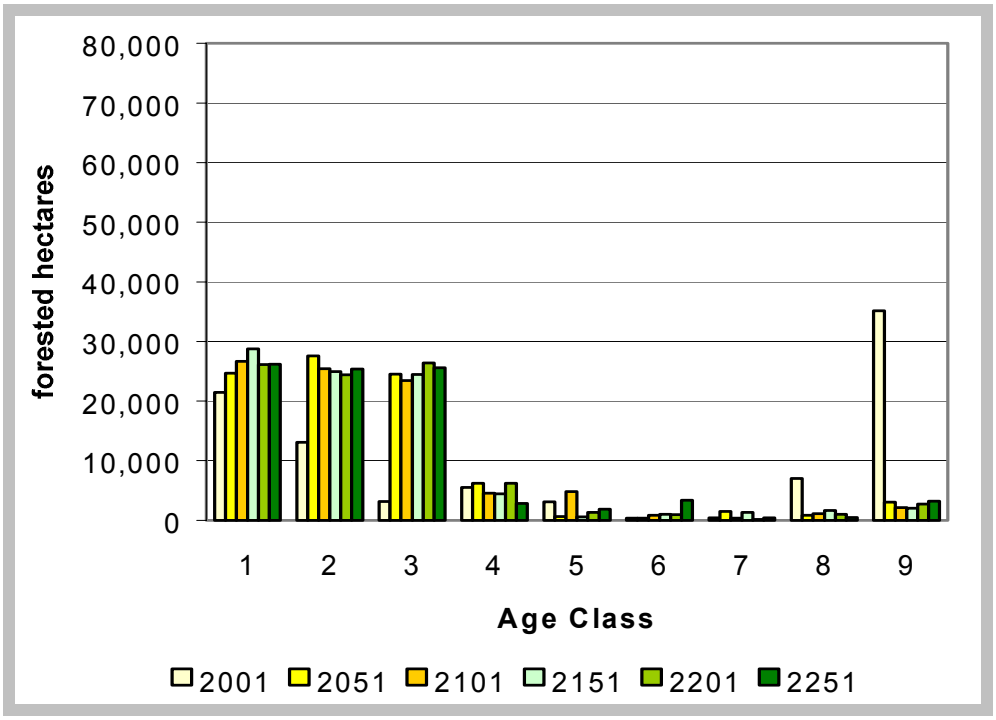

Figure 3 Age class distribution on timber harvesting land base

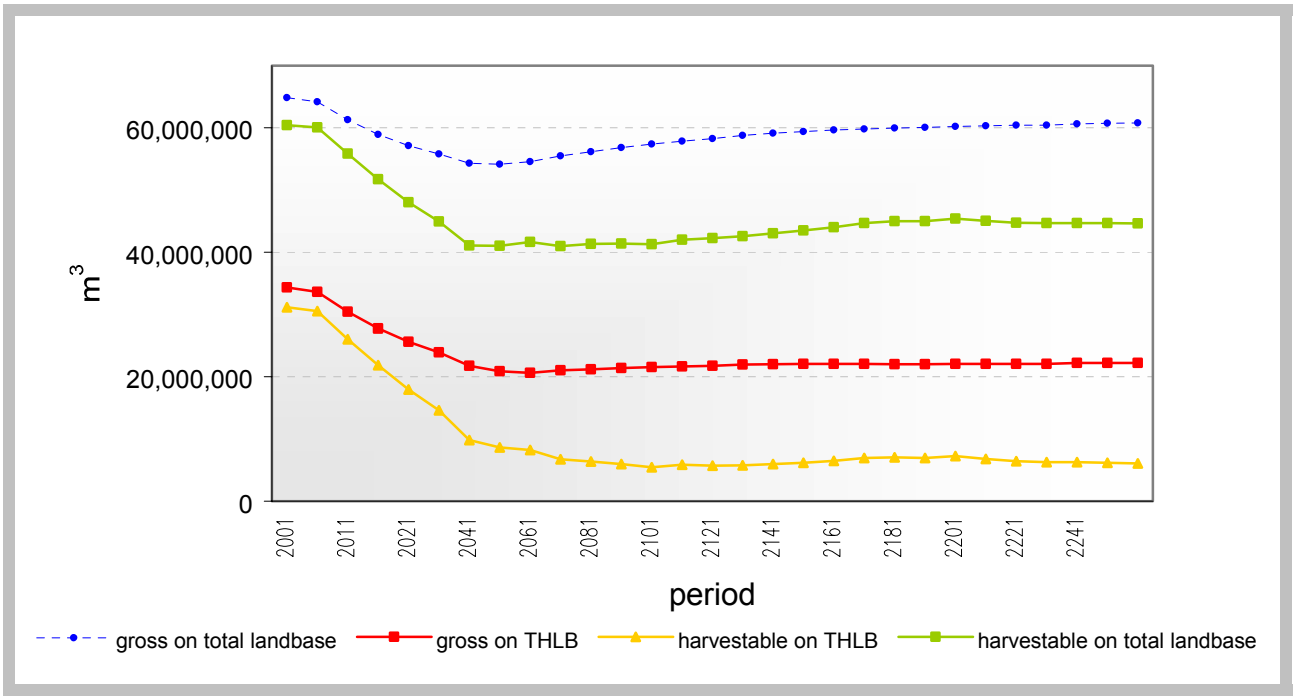

Figure 4 Growing stock

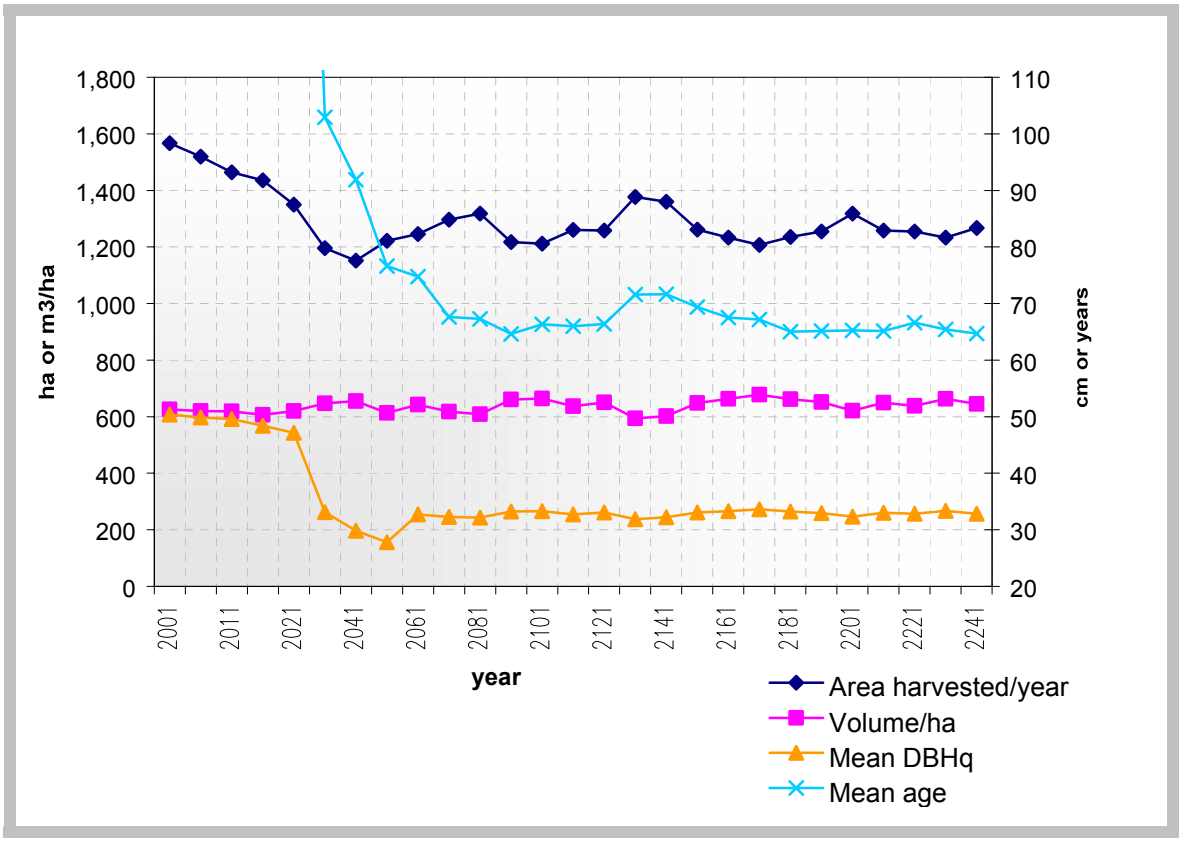

Figure 5 Harvest Statistics 2001 – 2250

Figure 5 provides average statistics for timber harvested through the simulation. As expected, mean age of stands harvested declines rapidly as the transition to second growth harvesting occurs and by 2071 averages 65-70 years. This also corresponds with a decline in quadratic mean diameter at breast height (DBHq) which stabilizes at around 32cm. During the 2041 to 2060 period the mean drops below 30cm and corresponds to the dip in growing stock. A shortage of harvestable timber through this period drives harvesting into stands at minimum harvestable ages and volumes.

Annual area harvested declines for the next few decades in tandem with the proposed decline in harvest levels. Once the transition to second growth harvesting is completed, annual area harvested fluctuates between 1200 to 1400 hectares per annum. Area-based cut regulations may then be appropriate. Merchantable volume/hectare remains relatively stable through the simulation at around 600+ m^3/ha.

3.0 Alternate Harvest Flows

Figure 6 through Figure 9 examine alternate flow scenarios.

Figure 6 (CM-mAAC) represents an attempt to maintain the current harvest level for as long as possible. Requested decline rate is 13.5% per decade from 2011 with deficits induced at 2011-2015 (18,368 m^3/year) and 2051-2060. Compared to the CM base, this run results in a 107,810 m^3 loss to 2050 but a 492,722 m^3 gain through the entire simulation.

Figure 7 shows the impact of immediately dropping to the long term harvest level of 785,000 m^3/year. Even with this drastic curtailment, deficits that rival the trough in the CM base are induced 2081-2100 (CM_LT). A further adjustment to a level of 778,000 m^3/year is needed to eliminate significant deficits (CM_LTal). An additional drop to the 778,000 level is required to produce an even flow through the long term.

Figure 8 examines alternate step down rates. Step downs at 10% and 15% fill the supply trough at 2031-2060 (CM_10l, CM_15) but would penalize today's population for implementing tree improvement programs. (The dip is created by improved trees becoming harvestable after about 2060.) Overall, the 10% and 15% decline rates result in a 173,841m^3 gain and a 589,101m^3 loss, respectively, through the simulation. In the 2001-2050 period the losses are 371,986 m^3 and 1,008,748 m^3 respectively.

Figure 9 examines the implication of cut control legislation and policy. Run CMa_cc90 examines the impact of achieving 90% of the 5-year cut control volume in the current year. This was modelled by setting up a one-year period for 2001 in which the current under-harvest is assumed harvested. For purposes of the graph this volume was spread through the 2001-2005 period. This suggests that if the Licensee succeeded in achieving 90%, or alternatively the under-harvested volume was transferred to other operators, the forecast harvest declines will be further exacerbated.

Run CMa_cc90cf10 assumes that 90% is achieved as above, and examines the impact of the 10% under-harvest volume being carried forward into the 2001-2005 period. This scenario induces deficits quickly and during the term of the next management plan starting in 2006.

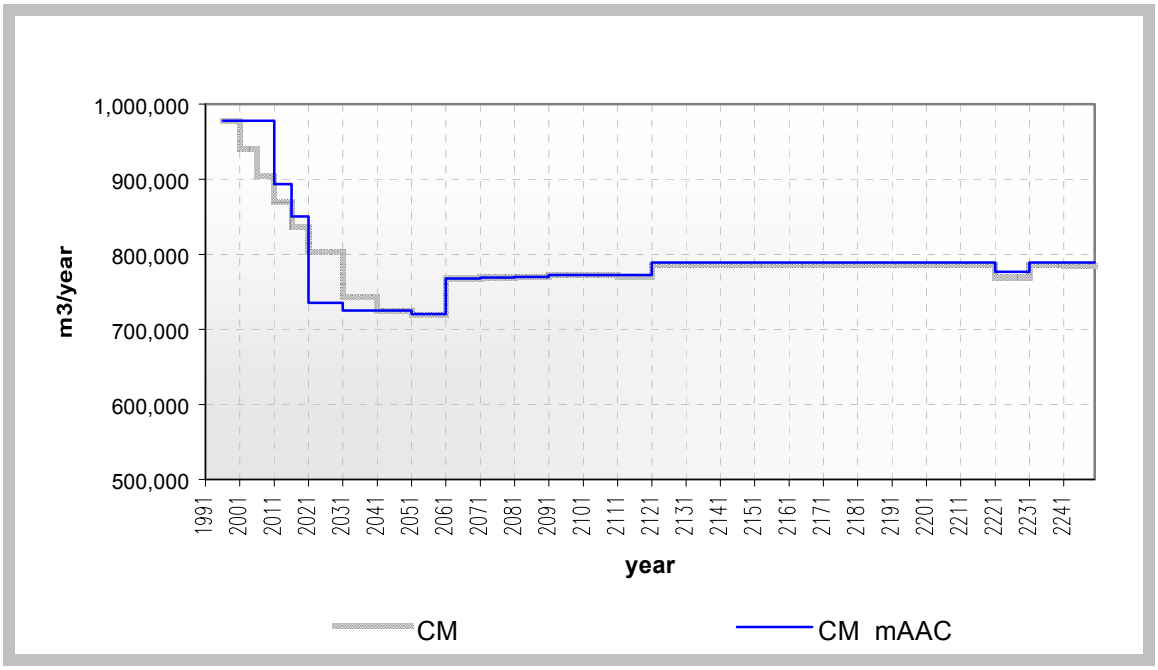

Figure 6 Maintain current AAC

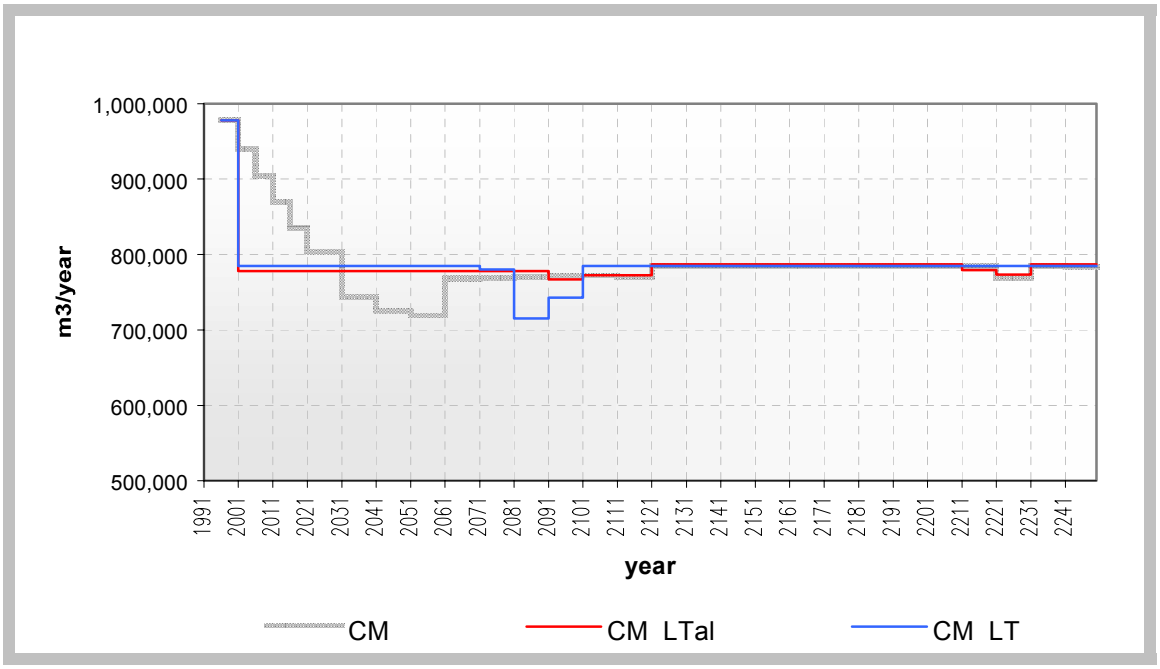

Figure 7 Reduce to LTHL

Clearly current cut control policy will exacerbate a harvest flow already projected to decline, by inducing short term overcutting and transfer of past market-induced layoffs into the near future.

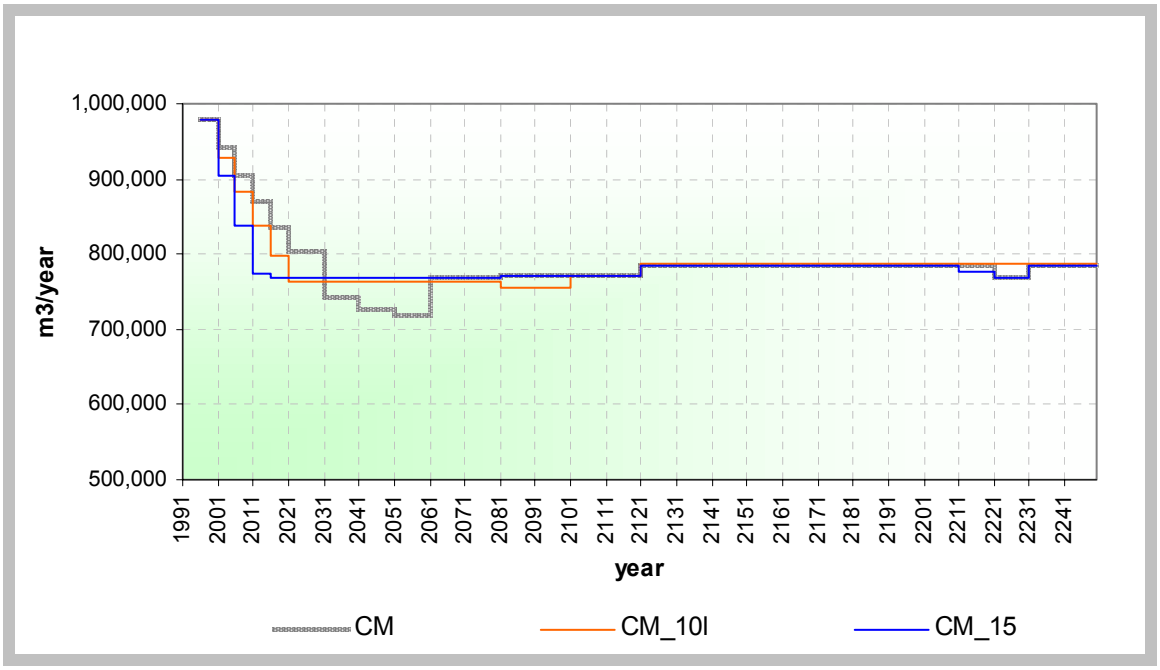

Figure 8 Alternative step down rates

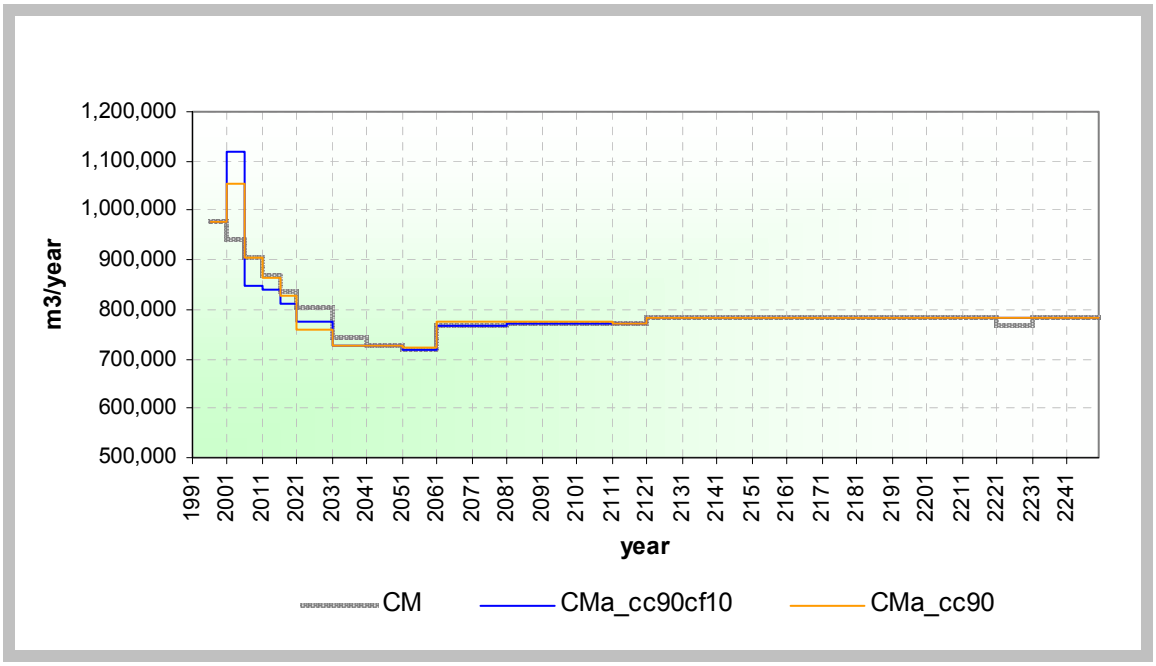

Figure 9 Cut Control

4.0 Sensitivity Analyses

Sensitivity graphs are numerous and for ease of reference have been appended as Figure A-1 through Figure A-18 in Appendix III-A. Appendix III-B summarizes volume changes in the short, mid, and long terms for each sensitivity or alternate flow. Runs are briefly described herein, but further descriptions for each run code are provided in Appendix III-C.

In general, sensitivities with negative impacts were left unadjusted, except where very erratic flows resulted. Where impacts were positive, flow request adjustments were, for consistency, made to (1) first fill the dip at 2041-2060, (2) raise the medium and long term flow, and optionally (3) lessen the short term decline slope in instances where the positive impact was felt both substantial and a realistic possibility.

Letter and underscore modifiers in the run codes indicate how flow requests were altered from the CM base. These are outlined in Appendix III-C. Plus and negative signs indicate the parameter modified for the sensitivity with "+" generally indicating the addition of a constraint or parameter and "-" indicating a removal.

Many sensitivities which resulted in a reduction of harvest levels in the first half century of the simulation resulted in a slight increase in LTHL. For example see runs –vol3, +BEO, +VQmid, or +gr3. As defining the exact magnitude of this increase was a time consuming activity and generally it amounted to less than a few thousand m^3/year, it was not necessarily completed for other runs.

4.1 Tree improvement removed

CM_LT –impr (Figure A-1) Before establishing the current management (CM) flow, this and similar runs (step down varied) were performed to establish what probable mid-term and long-term harvest levels would have been without the benefit of current tree improvement programs. This level then became the minimum harvest level for short to mid term harvest levels in the CM simulation. Harvests below this level penalize future generations. On the other hand, it would be unfair to the present generation to hold mid- or long-term harvests above this level if current AAC had to be sacrificed to do so. If this were the case, the current generation would be penalized for implementing tree improvement programmes that ultimately benefit future generations.

CM –impr (Figure A-2) Tree improvement programmes increase total harvest through the simulation by 13,370,803 m^3 but the effect is not felt until after 2051 when significant harvest of improved stock begins. In the long term current tree improvement programs augment timber supply by about 8%. Tree breeders predict that next generation orchards will add significantly to the gain simulated here.

4.2 Achieve 5 year Cut Control requirements

CMa_cc90 (Figure 9) This run investigates the impact of 5-year cut control legislation and policy. In this simulation an additional 514,000 m^3 were harvested in 2001 to achieve 90% of the 5-year allowable harvest for the cut control period ending in 2001. Harvest of this wood in 2001 induces additional deficits in 2016-2040 totalling 529,555 m^3. In effect, imposition of cut control and forcing a short term

increase of harvest in a situation of declining AAC shifts bygone production curtailments into critical periods of timber shortage in the future.

CMa_cc90cf10 (Figure 9) This run complements the one above and investigates the impact of also carrying forward the under-harvested volume (469,268 m^3 or 10%) into the years 2002 through 2005. Carry forward policy significantly exacerbates the negative impacts noted above. Harvest of this additional 117,317 m^3/year through 2002-2005 induces additional deficits in the immediately following periods amounting to 673,585 m^3, relative to CM. It is possible that the effect is, in part, amplified by adjacency impacts related to inducing a large harvesting spurt in the 2001-2005 period, but this has not been investigated.

4.3 Increase minimum harvest age and volume

CMl +minhar (Figure A-3) In this run minimum harvest restrictions are changed from 350 m^3/ha and 60 years to 450 m^3/ha and 70 years, respectively. Clearly there is significant sensitivity to changes in minimum harvestable definitions as volume yield is reduced by 4,687,573 m^3 through the first one hundred years and increased by 8,787,023 m^3 through the 2101-2250 period.

4.4 Increase minimum harvest age to 70 years

CMl +min70 (Figure A-3) In this run only minimum harvest age was changed from 60 to 70 years. This run is similar to the one above (reduced 3,646,192 m^3 for 2001-2100 and increased 9,682,445 m^3 for 2101-2250) suggesting that the bulk of the sensitivity noted above is related to minimum harvest age rather than to minimum harvest volume/ha. The substantial increase in the LTHL indicates that harvesting in the CM simulation is generally occurring below culmination age.

4.5 Decrease minimum harvest age to 50 years

CM +min50 (Figure A-4) For this run the minimum harvestable age was lowered to 50 years. Minimum harvestable volume/ha was maintained at 350 m^3/ha. In the long term at CM harvest request levels, actual harvests decline and harvesting occurs on average, well below culmination age. Total yield is reduced by 8,388,591 m^3 in the 2101-2250 period.

CMa +min50 (Figure A-4) This simulation was as above with harvest requests modified to lower the short-term rate of decline and smooth the LTHL. The result is a 1,530,860 m^3 increase through 2001-2050 and an 10,869,515 m^3 loss through 2051-2250.

4.6 Remove site index adjustments for managed and future stands

CM –SIadjM (Figure A-5) This simulation tests the impact of using the inventory unadjusted site indexes obtained from the previous Licensee for generating yields for existing and future managed stands. The site indices derived from old growth inventories are significantly underestimated.

4.7 Apply site index adjustments to immature unmanaged stands

CMt +SIadj3 (Figure A-6) This run applies site indices to immature existing Age Classes 3-6 using draft terrestrial ecosystem mapping in a manner similar to the procedure used for existing (Age Classes 1-2) and future managed stands[6]. This results in an additional 809,080 m^3 through the first fifty years and 1,418,274 m^3 through the simulation.

CMu +SIadj3 (Figure A-6) This run is as above with short term harvest levels adjusted upwards while still respecting the 725,000 floor. In this case current harvest level was increased 25,000 m^3/year and overall volume harvested increased by 1,734,247 m^3 over CM and 315,973 m^3 over CMt +SIadj3. As the trough remains significantly above the floor, a further gain in current harvest level could be induced by dropping to the 725,000 level.

4.8 Substitute site indices from equivalent site to Other curves

CM +otherSI (Figure A-6) In the CM case, unadjusted site indices were used to generate managed yield curves for those existing stands that were not Douglas-fir, hemlock, or balsam leading. This sensitivity adjusts site index for these "other" analysis units by adopting the adjusted site index of analysis units with the same ecological characteristics (BEC variant, site series) and a common "leading" species. (The aggregated "leading" species was often Douglas-fir or hemlock even though other species were leading in individual polygons.) Although this procedure is a simplification and subject to error due to differences in species composition and aggregation procedures, it suggests the magnitude of the impact of underestimating site index on sites of less common leading species. Due to compensatory effects (high elevation site indices were adjusted downward as a result) the simulation results in a modest 705,997 m^3 increase through the simulation with most relief in the 2031-2060 trough (643,748 m^3).

4.9 Decrease volume of managed stands by 10%

CMa –volM (Figure A-7) This examines the sensitivity of decreasing yields generated with TIPSY (existing Age Class 1-2 and future stands) by 10%. Total volume through the simulation is reduced by 16,296,633 m^3. The very erratic flow created by CM harvest requests was modified to parallel the CM flow.

4.10 Increase volume of managed stands by 10%

CMtl +volM (Figure A-7) The reverse of the above increases total volume through the simulation by 16,377,137 m^3 suggesting that CM is about equally sensitive to decreases and increases to managed stand yield assumptions.

[6] Originally a consultant was contracted to complete the timber supply analysis and after discussions with timber supply personnel had thought that agreement had been reached on the procedure for generating yield curves. After the information package had been submitted, the managed stand yield curves were rejected. Shortly thereafter the Licensee received draft maps of terrestrial ecosystem mapping and after further negotiations, agreement was reached to delay commencement of timber supply simulations so that the managed stand yield curves could be based on the ecological classification. Logically the same procedure would have also been applied to the Age Class 3-6 unmanaged second growth but further delays would have been required to include this in the CM case so for expediency the Licensee has included this option as a sensitivity run instead.

CMl +volM (Figure A-7) This run is as above with a modified flow and results in increased total volume through the simulation by 11,640,297 m^3 over CM

4.11 Increase volume of unmanaged stands by 10%

CMut +vol3 (Figure A-8) Increasing the yield of VDYP-generated curves by 10% (existing unmanaged stands, Age Classes >2) results in a simulation increase of 2,751,534 m^3 or 3.5% in the first 100 years. The CM base appears sensitive to increased estimates of existing volume. The completion of a Vegetation Resource Inventory will prove interesting in this light.

4.12 Decrease volume of unmanaged stands by 10%

CM –vol3 (Figure A-8) Decreasing the yield of VDYP-generated curves by 10% results in a simulation decrease of 3,657,676 m^3 or 4.7% in the first hundred years suggesting somewhat more sensitivity to over estimates of volume. Volumes for unmanaged second growth are likely underestimated in this simulation as discussed elsewhere. The old growth inventory has been audited and found acceptable. A Vegetation Resource Inventory is planned and old growth volume estimates may decrease or increase, but probably not dramatically.

4.13 Apply TFL 37 site indices

CM +SI37 (Figure A-8) Adopting site indices used for equivalent ecosystems in the adjacent TFL 37 results in an estimated 21,114,148 m^3 increase in volume harvested through the simulation and a 10.5% increase in LTHL, suggesting that TFL 19 timber supply may be underestimated to some degree.

4.14 Decrease land base

CM –lb9 (Figure A-9) This run simulates a decrease in land base by removing approximately 9% of the steeper ground from the THLB. The result of this 9.2% short-term decrease and 10.3% long-term decrease[7] in THLB is a 17,366,538 m^3 or 8.9% drop in harvested timber.

CMa –lb9 (Figure A-9) This run is as above with harvest flow smoothed and results in a drop of 17,668,783 or 9.0 %

4.15 Remove operable helicopter area

CMa –heli (Figure A-10) This run retains only those areas operable for conventional harvesting by excluding helicopter operable areas included in the CM. The run confirms that helicopter harvesting must be a significant proportion of annual harvest and amounts to 23,337,743 m^3 of harvest through the simulation. In the first 50 years of the simulation helicopter wood represents 5,297,360 m^3 or about 106,000 m^3/year. The unadjusted flow is presented as CM –heli.

[7] 8725.1 ha removed from short term land base of 94,702.4 ha and 85,016.9 ha long term land base.

4.16 Include Marginally operable areas

CMtl +marg op — (Figure A-10) For this run 5,032 ha of marginally economic, mostly helicopter-accessible-only wood is included (THLB increased 5.3 and 5.9%, respectively, in short and long term) and results in an additional 7,698,654 m^3 or 3.9% harvested.

4.17 Remove deciduous volume

CM –Dr — (Figure A-11) This is not a sensitivity run per se but rather an analysis of deciduous volume harvested through the CM simulation. Deciduous volumes are small amounting to 147,938 m^3 through the simulation. The model harvests on average less than 2,500 m^3/year though the first 50 years and roughly 1,000 m^3/year through the first decade.

4.18 Full implementation of biodiversity guidebook seral targets

CM+early+matold — (Figure A-12) This sensitivity investigates the impact of fully implementing the biodiversity guidebook. The result is a near cessation of harvesting in the short term and severe disruption throughout the mid term with some recovery late in the simulation. The biodiversity guidelines as originally intended would seem, for this TFL, to be inadequate with respect to the social and economic aspects of sustainability.

4.19 Biodiversity guidebook old targets by Landscape Units

CMl +BEO — (Figure A-12) In this simulation old seral biodiversity targets were applied by designated landscape units and the appropriate emphasis option and included drawdown in low emphasis units as per current policy. The CM uses the 10/45/45 method for estimating proportion of high/intermediate/low emphasis (as outlined in the submission guidelines in effect for preparation of the information package).

Through the first century, implementation of old seral targets by landscape unit reduces timber supply by 3,007,146 m^3. In the remainder of the simulation, timber supply increases by 2,400,224 m^3 and a somewhat higher LTHL is attained.

CMl +BEO –dd — (Figure A-12) This simulation is as above but with no drawdown permitted and reduces timber supply 3,451,456 m^3 in the first one hundred years. Through the remaining 2101-2250 period timber supply increases by 1,963,644 m^3.

4.20 Adjusted recreation constraints

CMlu –rec — (Figure A-13) TFL 19 includes 5,916.1 ha of lands designated as having high or very high recreation significance with high to medium sensitivity. The effect on timber supply of various cover constraints ranging up to 100% retention as old forest are significant at 8,849,649 m^3 and could amount to about 35,000 m^3/year during the term of the upcoming management plan.

CMlu +recmod (Figure A-13) This run investigates the use of somewhat less restrictive conditions as suggested by the author of the recreation inventory. In this case the 2001-2250 gain in timber supply is 2,517,062 m^3 and roughly 8,500 m^3/year in 2001-2005.

4.21 Adjusted Potential wildlife area constraints

CM +pwa250 (Figure A-14) Potential wildlife area (Ew2 in the previous Licensee's inventory) was modelled in the CM base by applying a 50% >140 years cover constraint on the THLB portion of designated polygons. Non-THLB portions were reserved. In this run the cover constraint was changed to 50% > 250 years throughout the simulation in an attempt to satisfy MoELP concerns. The result was a slight deficit in the 2051-2060 period of 16,194 m^3/year. The impact on current AAC could be in the order of 2,700 m^3/year[8].

CMtl +pwainop (Figure A-14) In this run the cover constraint of 50% > 140 years was applied to the entire potential wildlife area – i.e. the inoperable portions, as well as the THLB portion were included. Although the Licensee believes this better represents the policy intent of the Chief Forester as outlined in memos and MoUs (Aug. 6, 1998 and Aug. 21, 2000), in the interests of avoiding further lengthy discussions and completing the analysis in a timely manner, this method was not used in the CM base. The run increased timber harvest by 2,053,497 m^3 and 612,974 m^3 in the critical 2031-2061 period. Current AAC could have been about 10,200 m^3/year[9] higher if inoperable portions were credited toward the 50% retention.

4.22 Adjusted visual quality constraints

CM +VQmid (Figure A-15) Landscape visualization tools currently in use allow planners to perform careful and detailed block configuration analysis hence the CM base assumes that upper ranges of allowable disturbances for visual quality categories will continue to be achieved. This run investigates the sensitivity of this factor by applying mid range cover constraints rather than the upper ranges applied in the CM base. The result is 1,367,853 m^3 of lost timber harvest through the simulation (long term unadjusted).

CMu +VQmid (Figure A-15) This run is as above with the harvest requests revised to smooth the flow and parallel the CM base. With a revised long term harvest request, this flow results in a gain of 1,116,759 m^3 which includes a 2,037,104 m^3 gain in the long term and a 1,162,408 m^3 loss in the 2001-2050 period.

4.23 Adjusted green-up constraints

CMt –gr (Figure A-16) This run tests the impact of green-up policy on timber supply by changing the required green-up height to 0m. Green-up requirements for visually sensitive areas remain.

[8] 16,194 m3/year X 10 years / 60 years
[9] 612,974 m3 / 60 years

The result is a modest gain of 348,540 m^3 or about 17,400 m^3/year in the 2041-2060 trough and overall virtually no change (23,051 m^3 2001-2250) suggesting that green-up is not overly restrictive in this TFL.

CMl +gr3 (Figure A-16) Increasing green-up height to 3m in "Enhanced" zones results in an increase of 119,393 m^3 through the simulation but a 608,671 m^3 loss in the trough at 2051-2060 roughly equivalent to 10,100 m^3/year of AAC 2001-2060.

4.24 Adjusted adjacency and aggregation parameters

CMl –aggr –adj (Figure A-17) In this run the model was made aspatial by turning off adjacency and block aggregation rules and using a 25% less than green-up height (1.3 or 3.0m depending on RMZ) cover constraint to simulate adjacency policy and emulate FSSIM procedures. Analysis of outputs indicates that the cover limit was not reached at any point in the simulation.

4.25 Originally proposed yield curves

CM +origyld (Figure A-18) In this run the original yield curves proposed in August 2000 were used. This confirms that the revised yield curves for future management are more conservative (~12%) but also that that short to mid term timber supply is relatively unaffected by the yield table revisions.

5.0 Adjusted CM

After the completion of sensitivity runs, a re-designed potential base case was developed and two potential harvest flows established. These are illustrated in Figure 10.

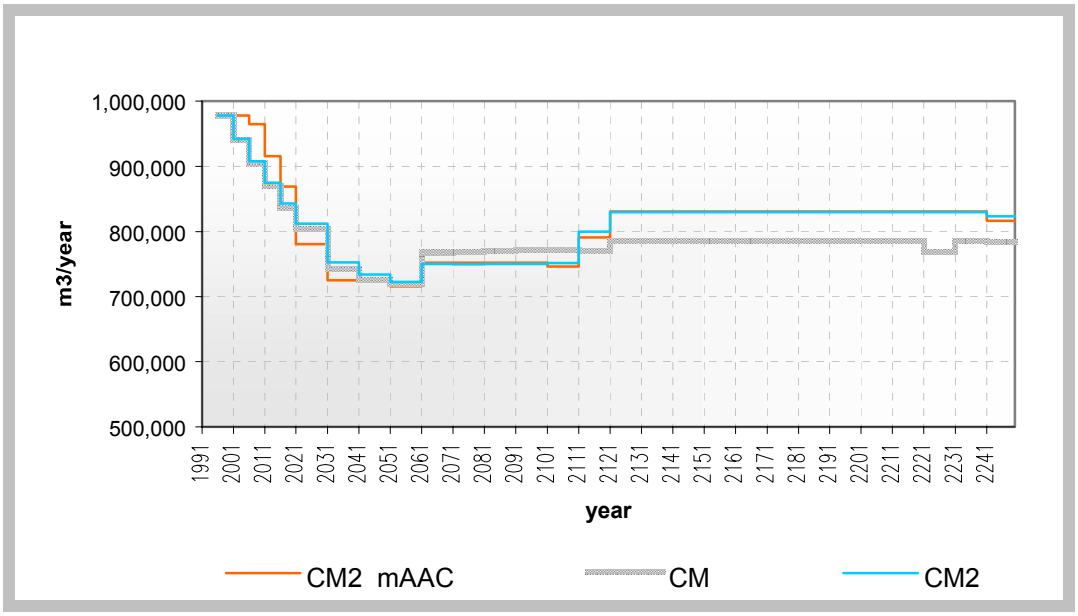

Figure 10 Current Management 2

CM2 This run is effectively a combination of +BEO, +Sladj3, +recmod, +pwainop, and +pwa250 as described above and in Appendix C with a revised harvest flow. The rate of step down was slackened to 7.3% per decade and the 725,000 floor retained. Relative to CM an additional 5,586,697 m^3 was harvested through the simulation with an additional 361,635 m^3 through the first fifty years.

CM2_cm +min25cm This run (Figure A-19, Appendix III-A) is as above but changes the minimum harvest rules to prevent harvest of stands less than 25cm quadratic mean diameter (DBHq). The CM rather than the CM2 flow request was used. In this simulation, this run may not be particularly realistic, as historic and future juvenile spacing is not explicitly modelled. It seems probable that many of the deficits suggested in the 2041-2070 period would be alleviated by the roughly 5,000 ha of spacing undertaken in the past 15 years and currently.

CM2_mAAC This run adopts an adjusted harvest flow to attempt to retain the current harvest level longer. In this scenario an additional 65,979 m^3 is harvested over CM2 through the simulation and 119,190 m^3 in the 2001-2050 period.

6.0 Protection of Non-Timber Resources

In timber supply modelling generally, and in this analysis, non-timber resource values have received priority protection through:

- land base removals (e.g. ungulate winter ranges, wildlife habitat areas, existing wildlife tree patches and riparian reserves, recreation sites),
- yield net downs (e.g. future wildlife tree patches, riparian management) and/or,
- by priority maintenance of older stands (e.g. cover constraints for recreation, visual quality, potential wildlife areas, seral stage biodiversity targets

The timber supply projected is a residual after making many allowances for other values of significance. Figure 11 shows that these allowances have been substantial. The simulation suggests that the timber foregone by society to ensure a multitude of resource values is in the order of 52,135,000 m^3 through the simulation and roughly 282,000 m^3/year of current AAC. At an average sales value of \$100/m^3 this represents an economic potential of about \$30 million annually foregone from local economies to provide this assurance.

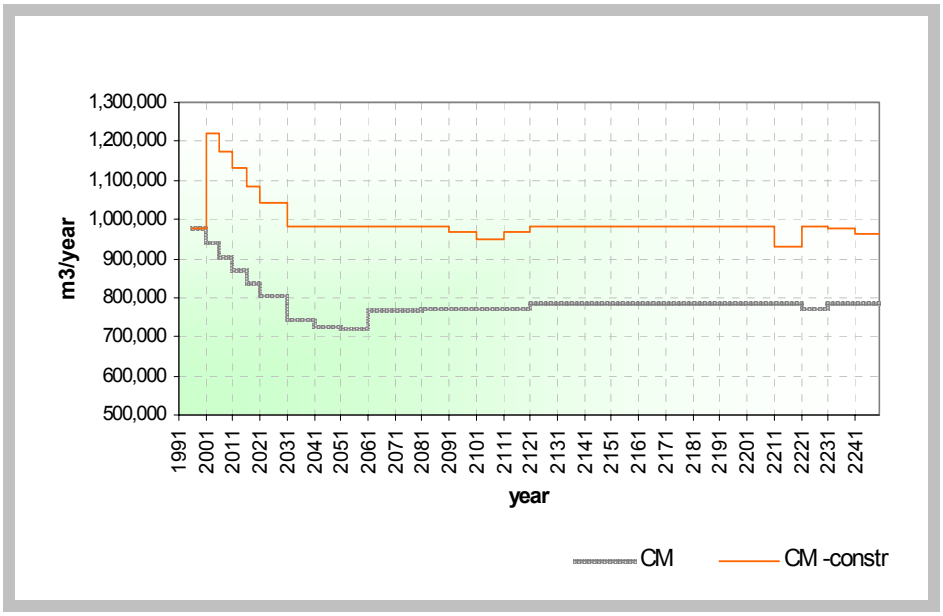

Figure 11 Land base growth potential

7.0 Uncertainties

In the course of preparing for, and developing this analysis, a number of uncertainties in the underlying data and assumptions have become evident. These are listed below in order of perceived potential impact on timber supply, especially in the short term, and the nature (increase/decrease) of the potential change.

+/(-)	Site indices for managed and unmanaged second growth stands were based on Provincial SIBEC averages adjusted somewhat to reflect adjacent TFL 37. These estimates need to be field checked and re-determined based on field sampling.
+/-	Estimates of remaining old growth inventory volumes need to be confirmed in light of recent harvesting and withdrawals from the timber harvesting land base. A Vegetation Resource Inventory is in the early stages of implementation.
+	In the CM base, age classes 3-6 were assigned old inventory site indexes as were existing managed stands with less common leading species. Adjusting site indices for these stands using ecosystem mapping should alleviate forecasted mid term timber shortages and more accurately predict longer term yields.
+/-	Operational adjustment factors for managed stands were TIPSY defaults. Field estimates for the more common stand types would improve estimates of mid to long term yield.
+	Historic spacing and fertilization treatments need to be digitized, entered into the GIS, and appropriately modeled. Assuming future analyses were to use a minimum harvestable stand DBHq criterion, these treatments may have an important positive impact on impending timber shortages by effectively reducing rotation age.
-	As retention and partial harvesting systems become more common both in riparian management and more widely, yield adjustments to reflect increased shading of crop trees and harvest damage of residual crop trees will be needed. Long term estimates of retention and its nature are as yet unreliable due to the short period of application and variability of implementation strategies to date. As adjacency does not seem to be restrictive in this analysis, partial cutting is unlikely to exert a positive influence on timber supply in this regard.
-	The age and volume minimum harvest rules used did not consider stand diameters.
+	Commercial thinning is proven in Douglas-fir stands in the drier variants of the Coastal Western Hemlock Zone and may be used in future to alleviate timber supply shortfalls. Further analyses are warranted.
+/-	The 4% volume allowance for future Wildlife Tree Patches needs to be verified against actual area withdrawals from the timber harvesting land base for WTP designations.

-/+	Land base reductions and/or volume net downs for future riparian management need to be confirmed in light of evolving practices, shifting expectations, and the relatively short implementation experience so far. Although no-harvest zones had dominated earlier management thinking, more recently there has been a move to more active intervention and flexibility around streams.
+	Future tree improvement gains are expected to be larger than modelled herein.
+/-	Higher elevation site index estimates are less certain than for more lower elevation ecosystems where older second growth is common and site index estimates are more reliable.
+/-	These simulations are not optimized for harvest sequencing (model follows inherent stand database order) although variations in harvest sequence may yield somewhat better timber yields. This would however be a time consuming exercise in the current modelling environment. In any case operational forest development is not inherently optimized either.

8.0 Recommendations

8.1 Short Term

In the short term a harvest level of 938,000 m^3/year (reflects removal of non-recoverable loss of 2,375 m^3/year) 2001-2005 would represent a reasonable step toward the long term sustainable harvest level without imposing undue loss of harvesting and related employment on communities already contracting due to losses in the processing sector. A significant component (about 100,000-120,000 m^3/year) of the harvest needs to be in forest types designated as only accessible to helicopters.

8.2 Mid Term

By 2030 harvest levels will have declined by about one quarter from current levels and every opportunity to alleviate this decline should be investigated.

Reductions to the effective timber harvesting land base have been significant with respect to non-timber values such as ungulate winter range, recreation potential, and biodiversity. These should be considered carefully to confirm that the desired values are being managed appropriately to reflect provincial and local social and ecological objectives.

Should economic conditions become favourable, efforts to prove the feasibility of harvesting in forest types deemed marginally uneconomic (not included in this analysis) are encouraged. If such harvests were charged against AAC there would however, be less incentive to target these stands.

Under-harvest carry forward is likely to impact timber supplies in the not-too-distant future and should be considered in this light.

A strategic silviculture analysis should investigate opportunities for fertilization, commercial thinning, or other interventions that may help to alleviate the timber shortage projected for 2031-2060.

Appendix III-A
Sensitivity Analyses

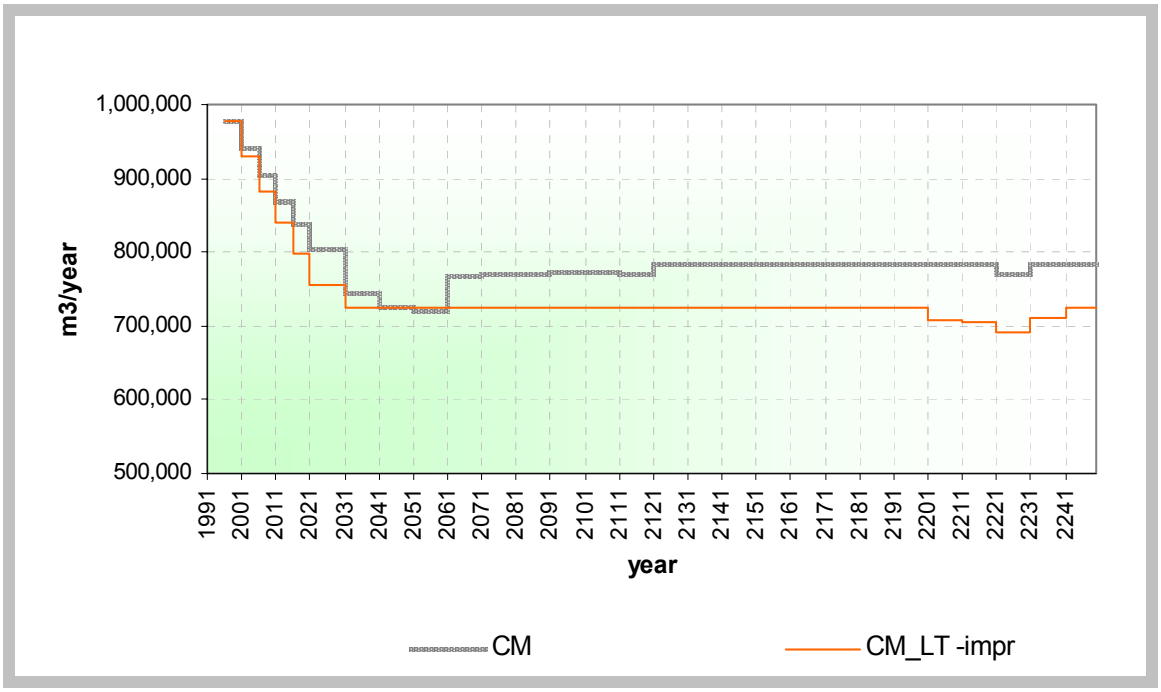

Figure A-1 LTHL prior to tree improvement

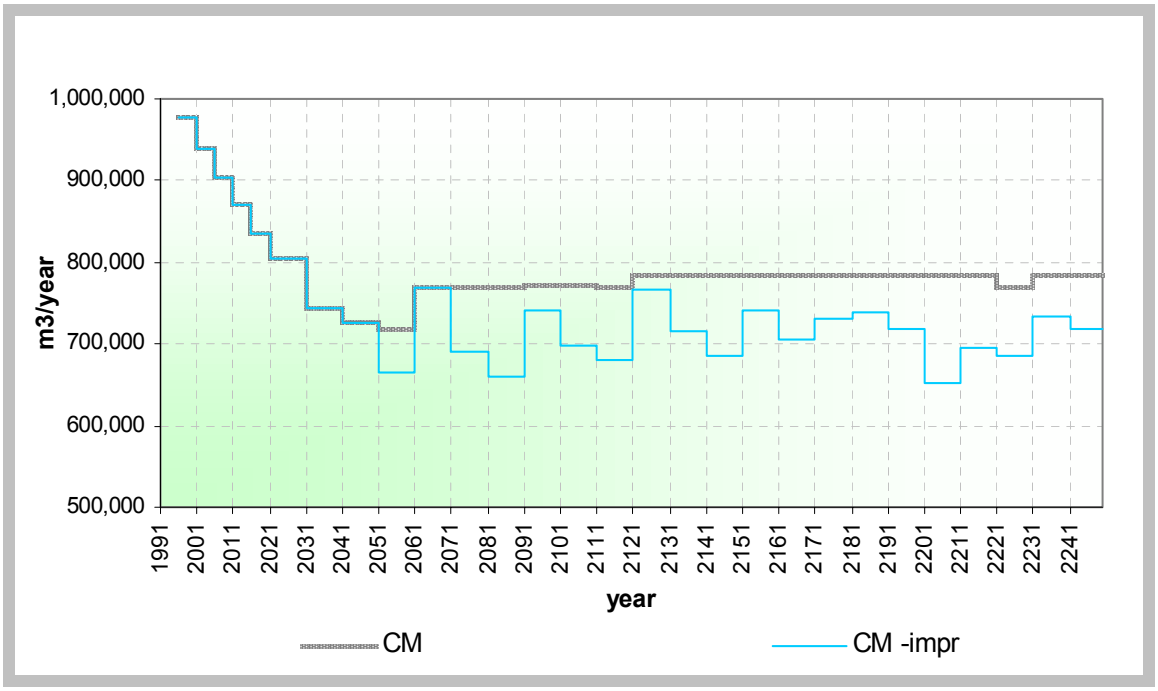

Figure A-2 Tree improvement removed

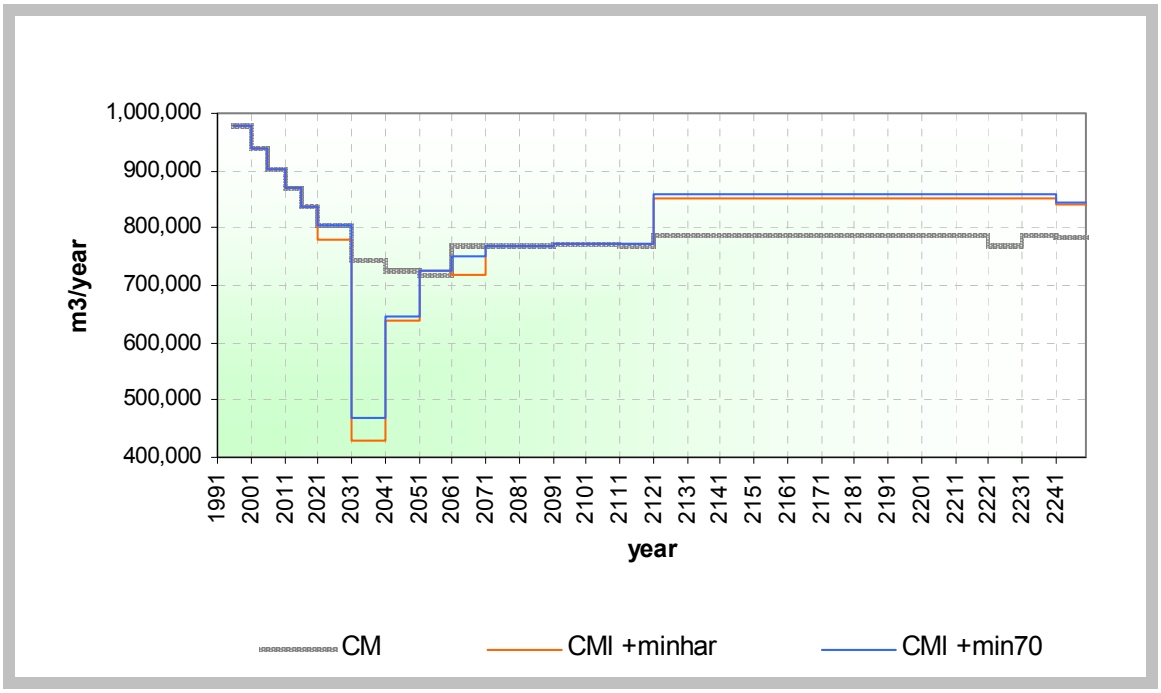

Figure A-3 Minimum harvest rules

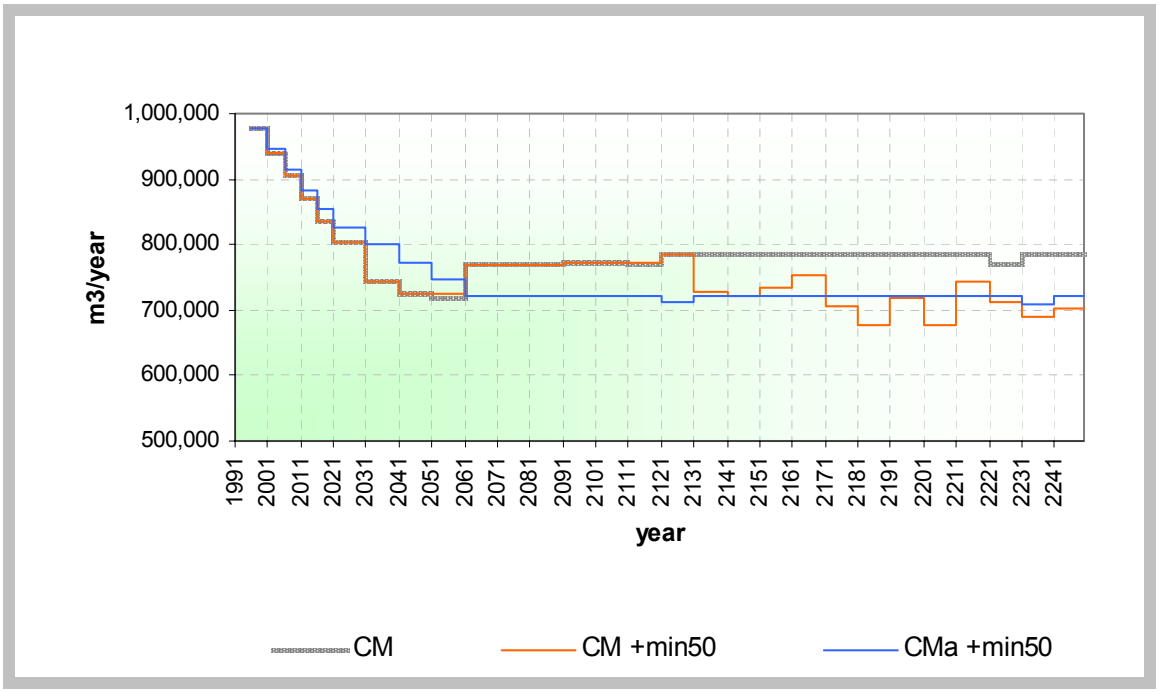

Figure A-4 Minimum harvest rules 2

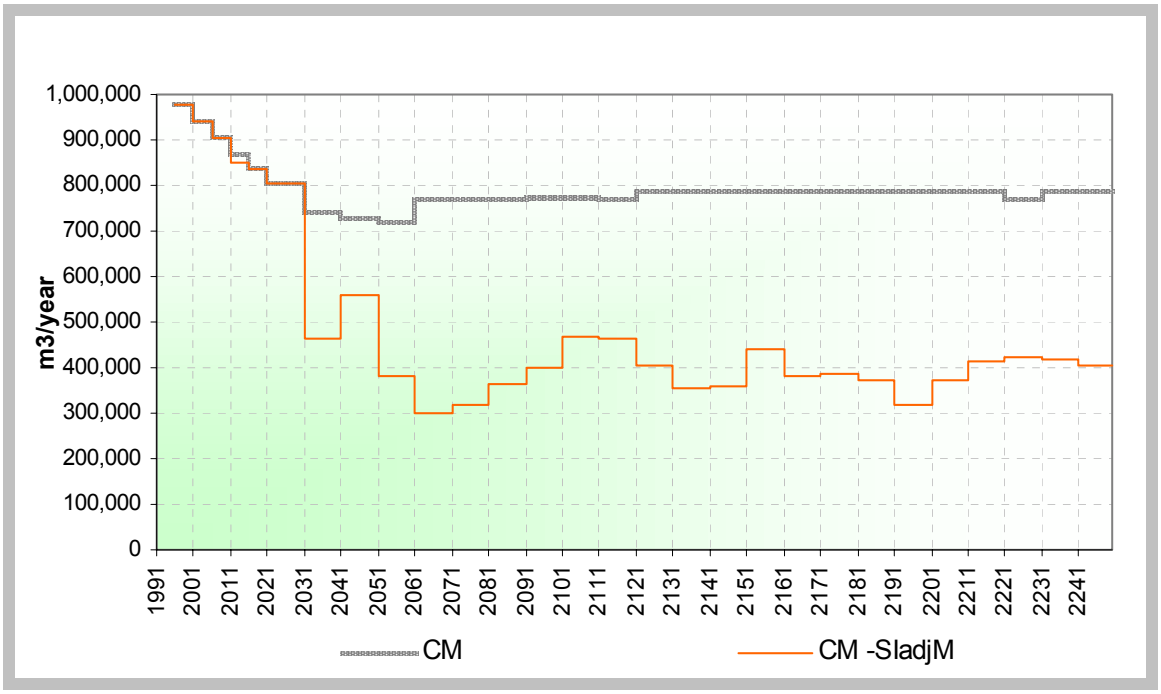

Figure A-5 Unadjusted SI for managed stands

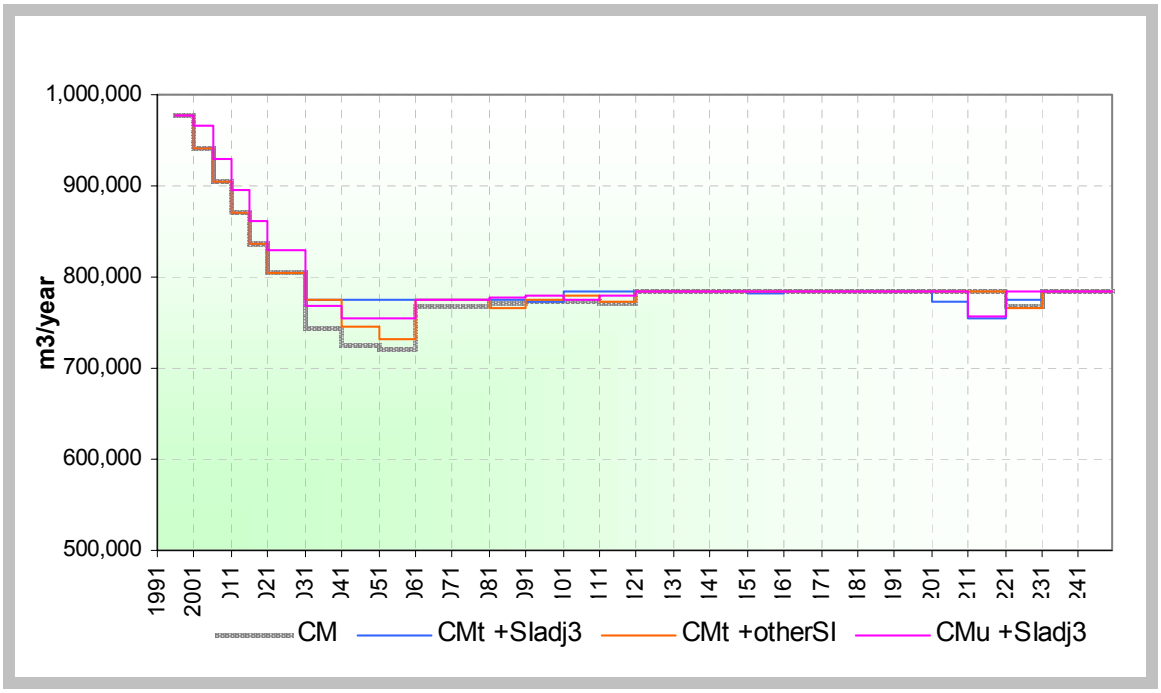

Figure A-6 Additional application of TEM site indices

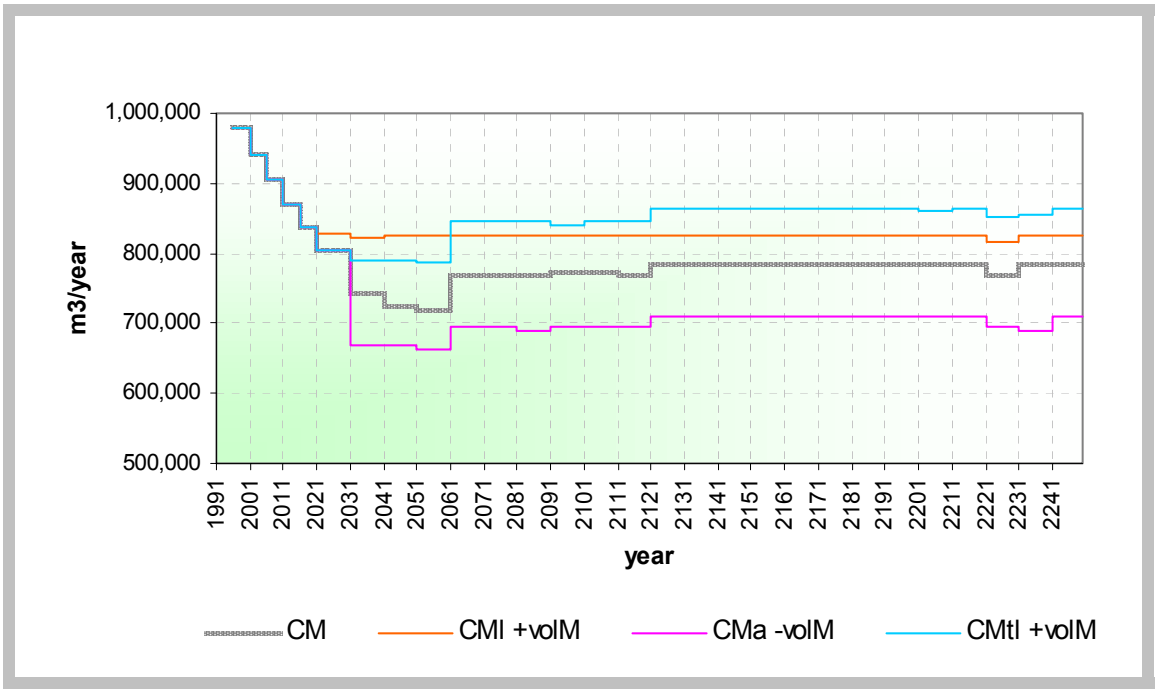

Figure A-7 Managed stand yields

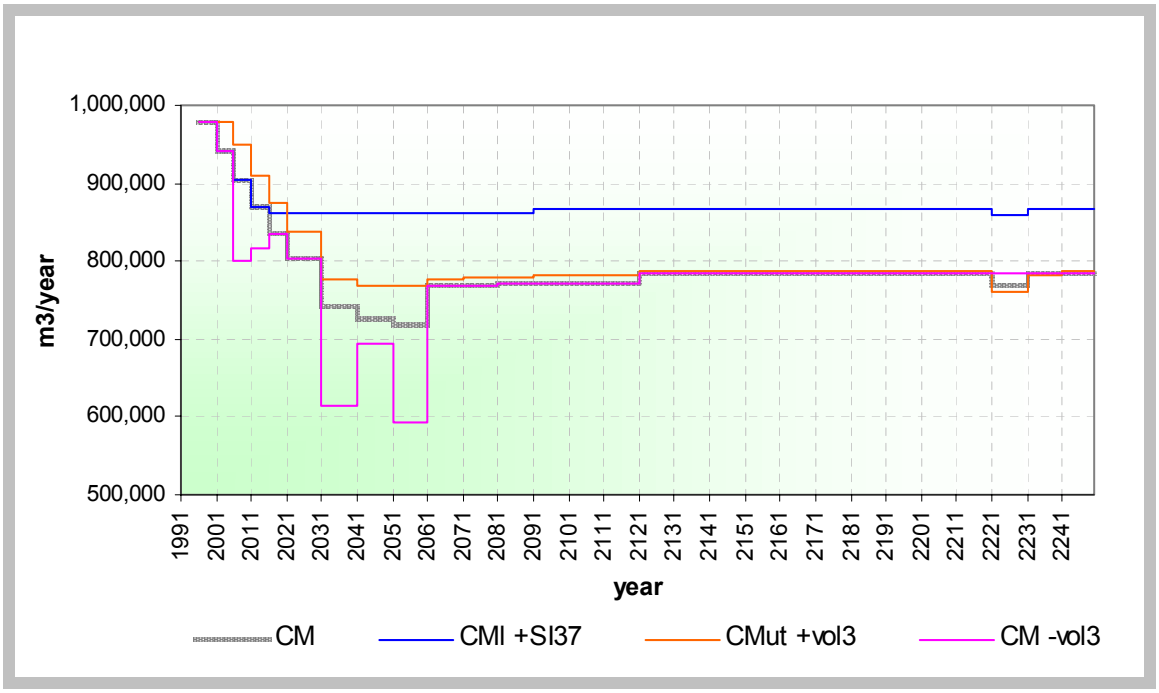

Figure A-8 Unmanaged stand yields and TFL 37 site indices

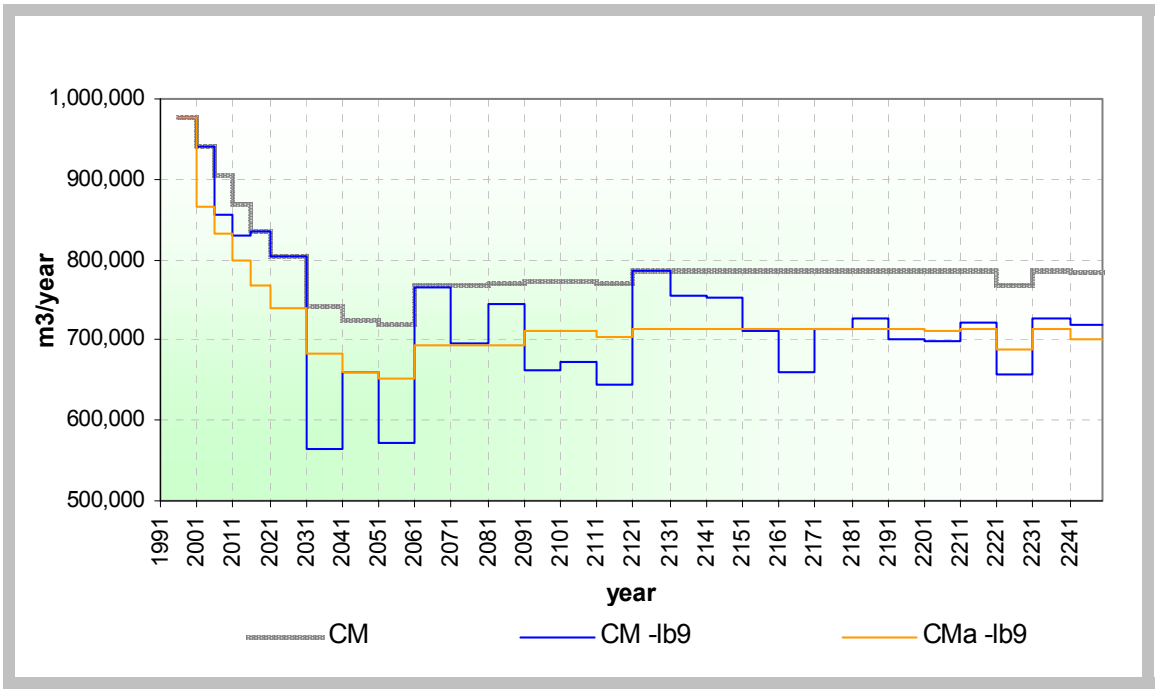

Figure A-9 Land base decrease

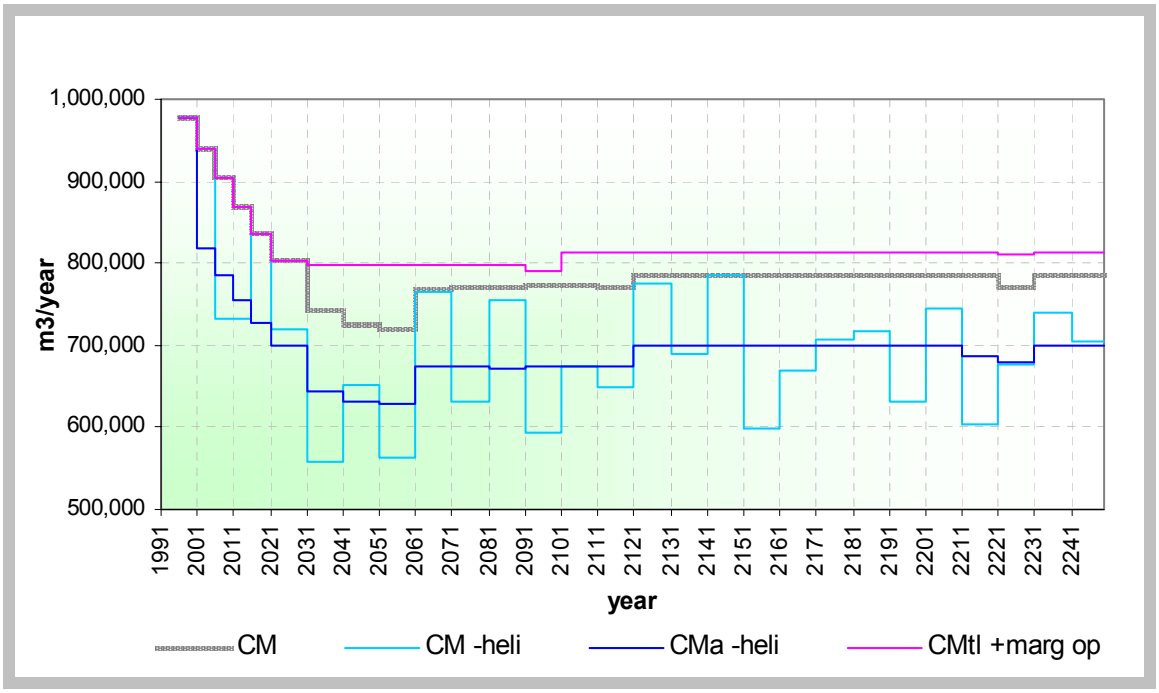

Figure A-10 Other land base changes

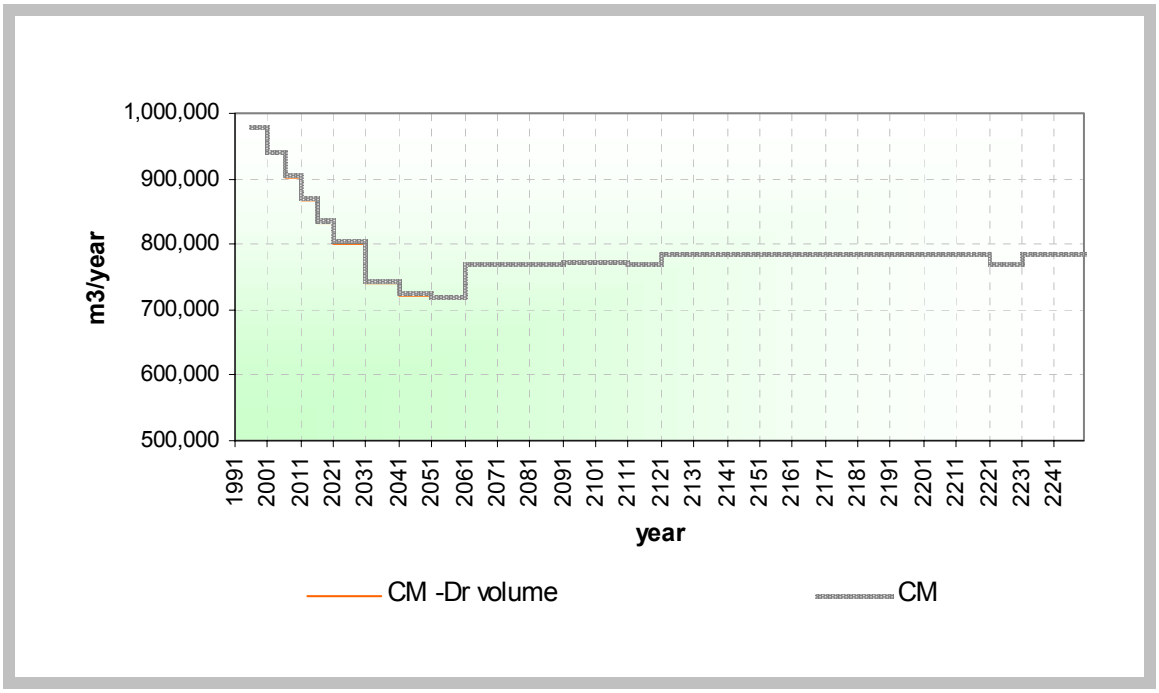

Figure A-11 Deciduous harvest

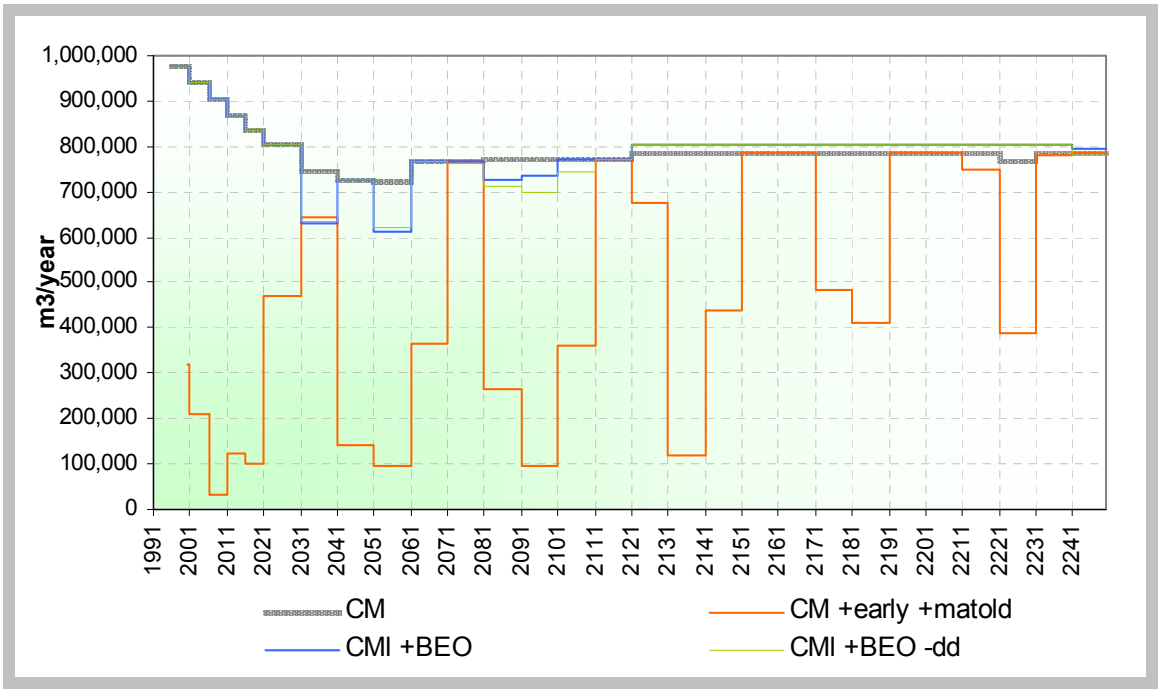

Figure A-12 Biodiversity guidelines

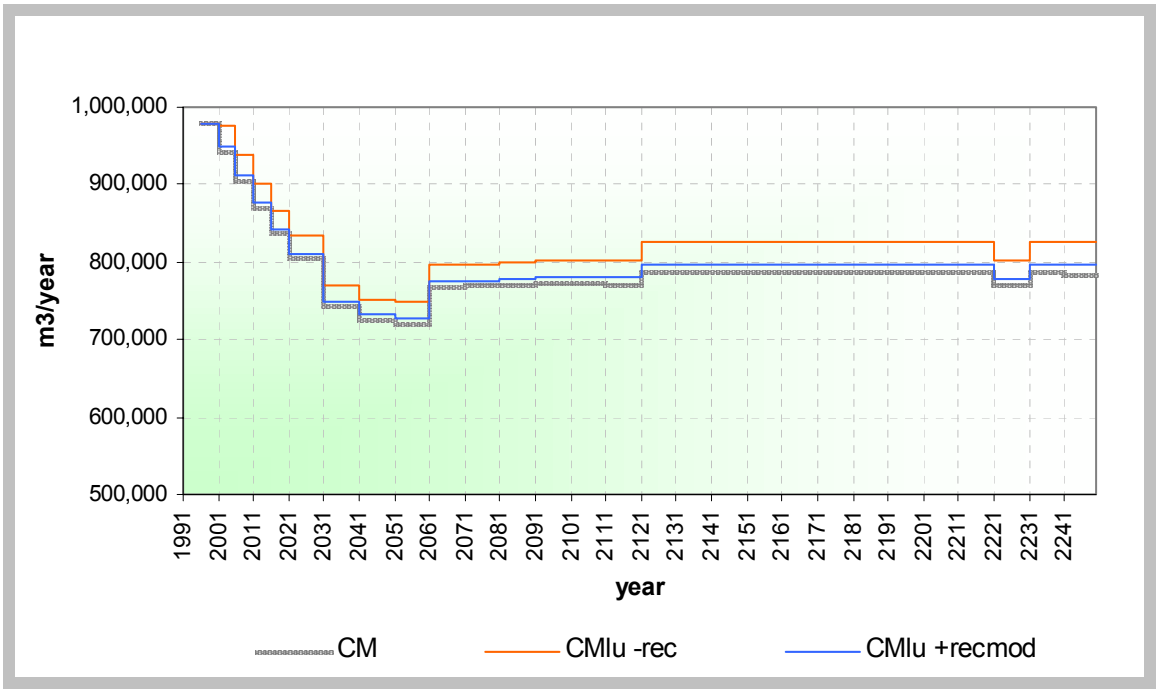

Figure A-13 Recreation

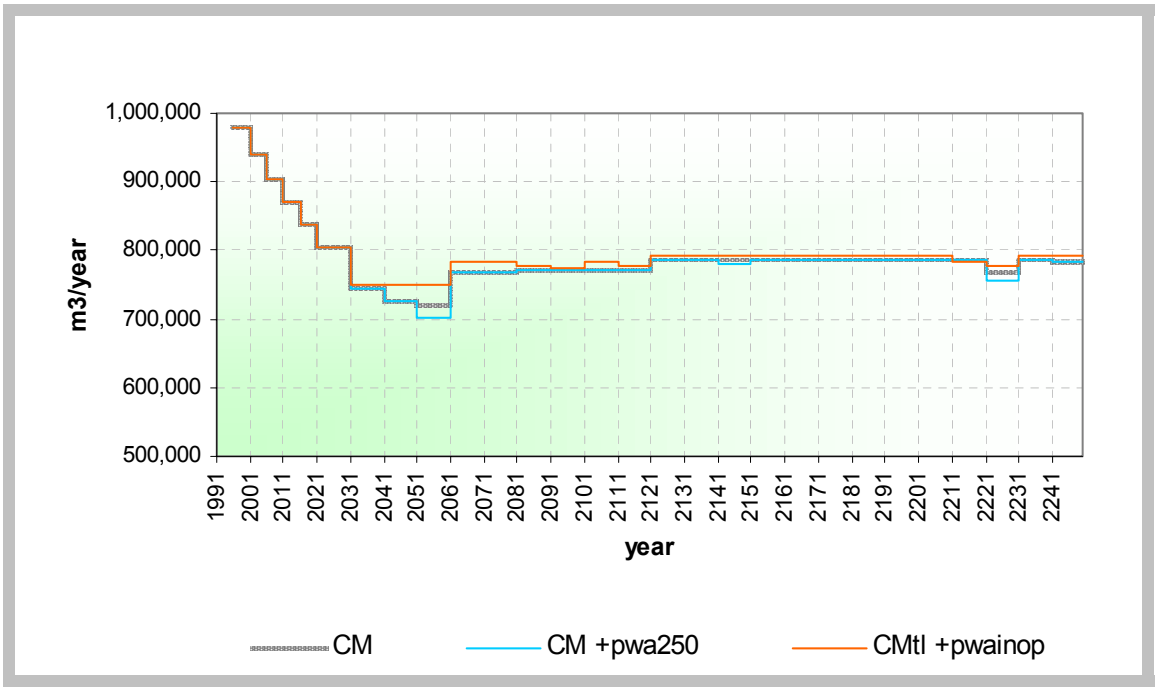

Figure A-14 Potential wildlife area

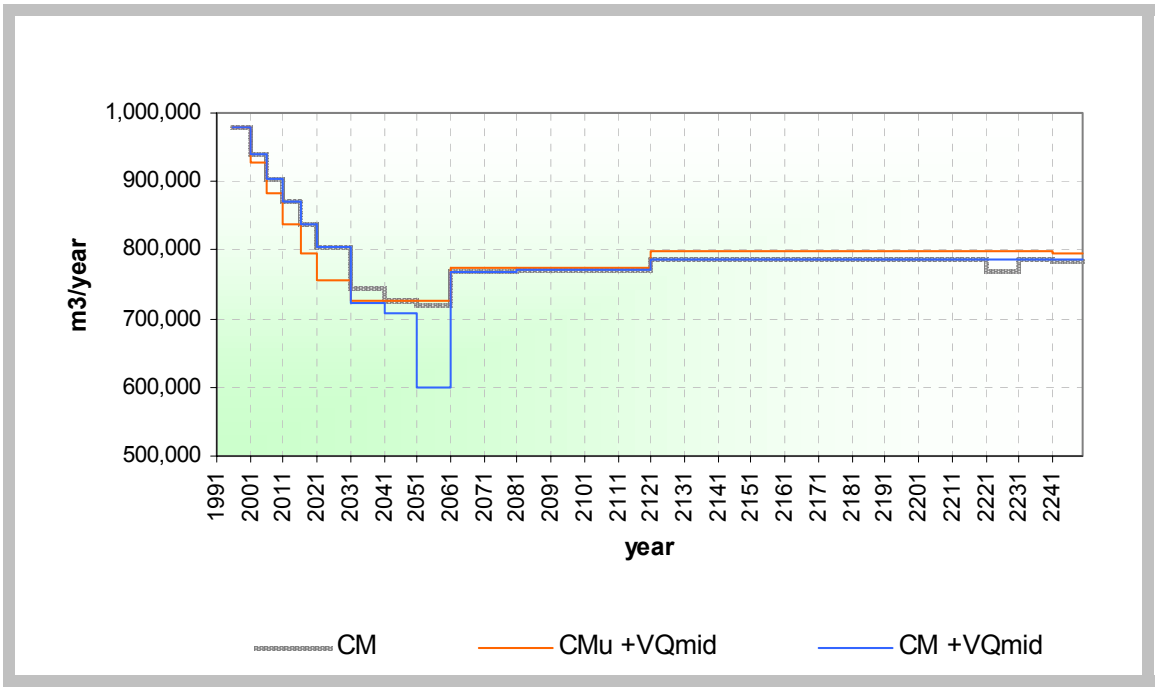

Figure A-15 Visual quality management

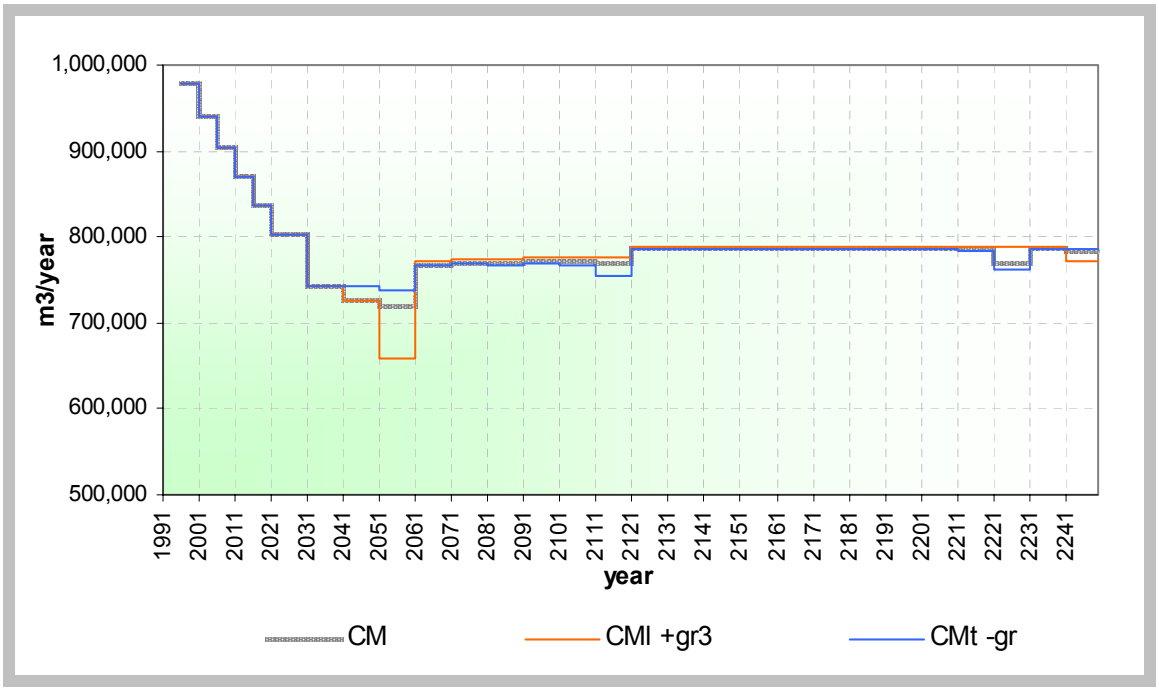

Figure A-16 Adjacency and green-up

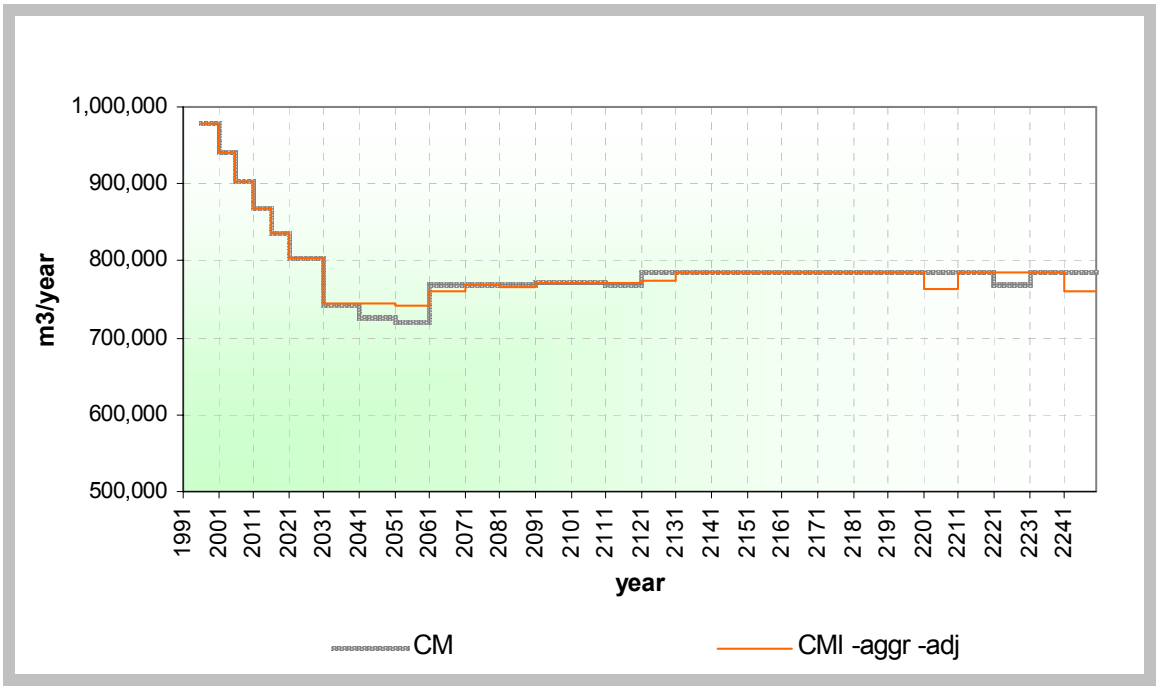

Figure A-17 Aggregation and non-spatial adjacency (FSSIM)

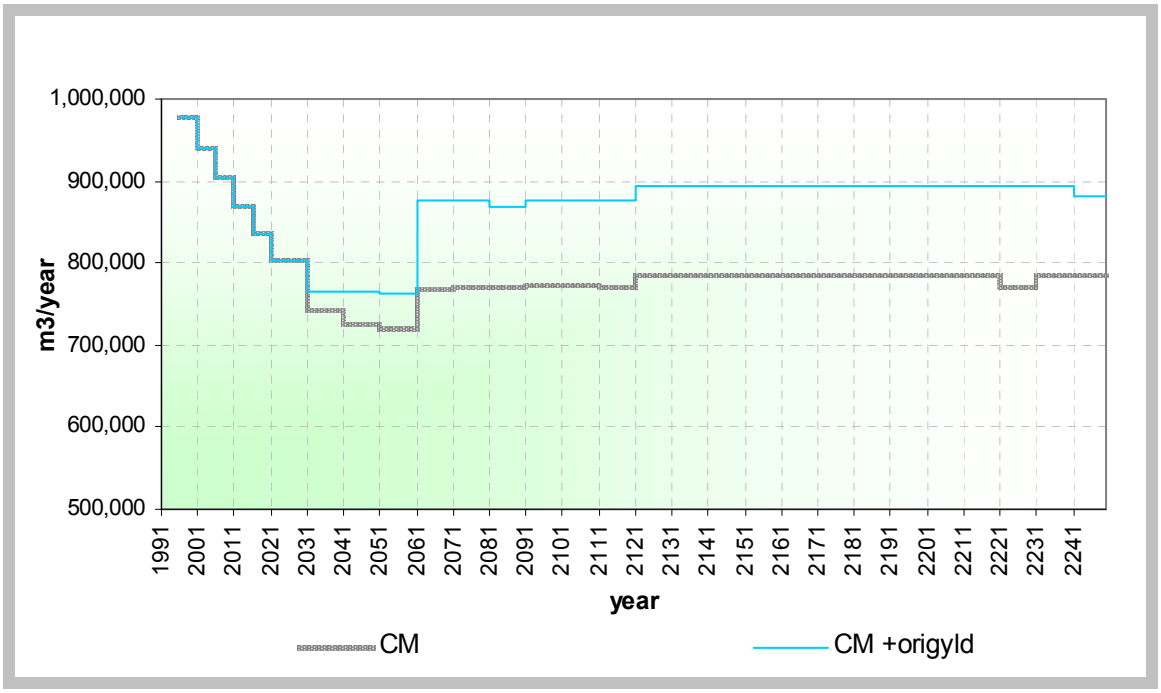

Figure A-18 Original second growth yield curves

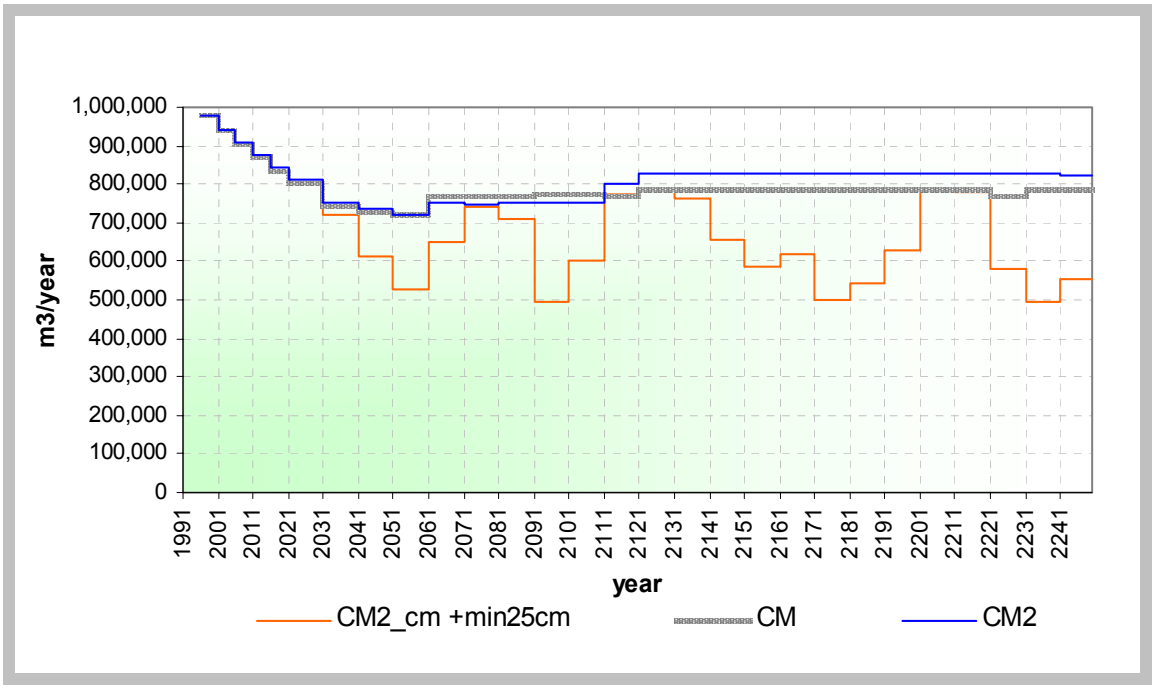

Figure A-19 Minimum harvest diameter (CM2)

Appendix III-B
Volume Change Summaries
Relative to CM

	Short 2001-2050	Mid 2051-2100	Long 2101-2250	TOTAL 2001-2250
CM_LT -impr	(1,162,405)	(1,733,256)	(9,417,486)	(12,313,148)
CMa_cc90cf10	(111,387)	(537)		
CM base for cc90cf10 (with period adjustment)	0	(44,025)		
CMa_cc90	(104,328)	288,177	79,091	262,940
CMtl +marg op	1,277,240	1,815,424	4,605,990	7,698,654
CM -heli	(4,999,896)	(4,912,631)	(13,627,481)	(23,540,008)
CMa -heli	(5,297,360)	(4,738,366)	(13,302,016)	(23,337,743)
CM-lb9	(2,879,183)	(3,605,709)	(10,881,646)	(17,366,538)
CMa -lb9	(3,313,710)	(3,552,846)	(10,802,226)	(17,668,783)
CM +SI37	3,255,415	5,133,484	12,725,249	21,114,148
CMtl +vol3	1,904,790	846,744	259,574	3,011,107
CM -vol3	(2,389,600)	(1,268,076)	192,034	(3,465,643)
CMtl +volM	1,144,080	3,637,184	11,595,874	16,377,137
CMl+volM	2,018,070	3,261,744	6,360,484	11,640,297
CM -volM	(1,280,920)	(3,614,116)	(11,401,596)	(16,296,633)
CMa -constr	12,654,790	10,890,784	28,589,254	52,134,827
CM_10l	(371,986)	(31,896)	577,724	173,841
CM_10	(371,986)	(31,896)	192,034	(211,849)
CM_15	(1,008,748)	486,744	(67,096)	(589,101)
CM +gr3	0	(608,671)	192,034	(416,637)
CMl +gr3	0	(448,671)	568,064	119,393
CMt -gr	159,080	143,577	(279,606)	23,051
CMa -aggr -adj	199,080	95,354	(370,606)	(76,173)
CMlu -rec	1,505,344	1,430,651	5,913,654	8,849,649
CMlu -recmod	364,196	345,283	1,807,584	2,517,062
CMl +BEO -dd	(1,102,790)	(2,348,666)	1,963,644	(1,487,813)
CM +early +matold	(25,622,650)	(44,025)	(26,257,416)	(51,924,091)
CM +BEO	(1,125,490)	(1,881,656)	192,034	(2,815,113)
CMl +BEO	(1,125,490)	(44,025)	192,034	(977,481)
CMl +minhar	(4,260,929)	(426,644)	8,787,023	4,099,450

	Short 2001-2050	Mid 2051-2100	Long 2101-2250	TOTAL 2001-2250
CMl +min70	(3,539,675)	(106,517)	9,682,445	6,036,252
CM +min50	(0)	57,744	(8,388,591)	(8,330,848)
CMa +min50	1,530,860	(1,690,856)	(9,178,659)	(9,338,656)
CM_AAC	523,853	(262,584)	(611,173)	(349,904)
CM_mAAC	(107,810)	9,654	590,878	492,722
CM_LT	(1,216,210)	95,690	442,034	(678,487)
CM_LTal	(1,566,210)	800,559	235,505	(530,146)
CMtl +pwainop	319,080	669,194	1,065,224	2,053,497
CM +pwa250	0	(161,939)	(135,836)	(297,775)
CMu +VQmid	(1,162,408)	242,064	2,037,104	1,116,759
CM +VQmid	(350,820)	(1,209,066)	192,034	(1,367,853)
CMl +VQmid	(350,820)	(1,209,066)	3,853,914	2,294,027
CMt +origyld	619,080	4,630,982	16,215,051	21,465,112
CM +SIadjM	(4,574,690)	(20,376,299)	(57,528,837)	(82,479,826)
CMt +SIadj3	809,080	728,101	(118,907)	1,418,274
CMt +otherSI	519,080	226,245	(39,328)	705,997
CM +5&200ha -20yp	(0)	(415,976)	663,774	247,797
CM2	361,635	(758,406)	5,983,468	5,586,697
CM2 +min25cm	(1,331,647)	(6,732,659)	(20,831,663)	(28,895,968)
CM2_mAAC	480,825	(733,050)	5,904,901	5,652,676

Appendix III-C
Sensitivity Analyses

Rules

+ means factor added
– means factor removed
CM = current management
_15 = 15% step down
t = increase harvest request to fill trough until <10,000 m3/yr deficit occurs
u = small uniform change of step down or step down % until <10,000 m3/yr deficit occurs
l = medium and/or long term change until deficit occurs as below
a = other adjustments not as above

Requested minus actual deficits not to exceed 10,000 m3/year in first 100 years or 25,000 m3/year thereafter.

Name	Description	Details
CM	Current Management	• 7.7% stepdown • BASE.YLD • 20-year plan used to guide harvest • Oce and Ohe excluded • tree improvement • upper range denudation limits by VQC • 3m green-up Special and General, 1.3m Enhanced • 4% volume reduction for THLB WTPs • old seral target for 10/45/45 • 50% >140 years cover constraint for potential wildlife habitat • recreation net downs and cover restrictions • minimum harvestable 60 years AND 350 m3/ha • deciduous stands and volume included
CM -constr	Timber potential	All polygons available for harvest except physically inoperable
CM –constr2	Timber potential	All polygons available for harvest except physically inoperable and all adjacency and cover constraints removed. Minimum harvestable unchanged.
CMa –lb9	Landbase reduction	Remove terrain class 4 >80% slope and all terrain class 5
CM -heli	Remove heli-wood	Remove 11,755 ha (?%) of helicopter operable area to test the importance of heli-logging
CMa -heli		As above with smooth flow to parallel CM
CMtl +marg op	Add marginally economic area	Add 357 ha of Oce and 5,032 ha of Ohe to THLB
CMut +vol3	Increase volume of unmanaged Age Class 3+ stands by 10%	Increase VDYP yields (curves ending -2 and -3) by 10%
CM –vol3	Decrease volume of unmanaged Age Class 3+ stands by 10%	Decrease VDYP yields (curves ending -2 and -3) by 10%

Name	Description	Details
CMtl +volM CMl +volM	Increase volume of managed stands by 10%	Increase existing (age Class 1-2) and future TIPSY yields (curves ending –1) by 10%
CMa -volM	Decrease volume of managed stands by 10%	Decrease existing (age Class 1-2) and future TIPSY yields (curves ending –1) by 10%
CM -SIadjM	Do not use SI adjustments	Use unadjusted inventory site indices to generate TIPSY yields (curves ending –1) for existing managed stands (Age Class 1-2) and future stands
CMt +SI adj3	Apply SI adjustments to immature unmanaged Age Class 3-6	Apply SI adjustments using TEM to immature Age Class 3-6 yields generated with VDYP (curves ending –2)
CMl +SI 37	Apply TFL 37 site indices	Use draft terrestrial ecosystem mapping to apply site indices for TFL 37 site series to TFL 19 second growth stands.
CMl +minhar	Increase minimum harvestable volume and age	Increase minimum harvestable volume criteria to 450 m3/ha and minimum harvestable age criteria to 70 years
CMa +min50 CM +min50	Decrease minimum harvestable age	Decrease minimum harvestable age criteria to 50 years. Minimum harvestable volume remains 350 m3/ha
CMl +min70	Increase minimum harvestable age only	Increase minimum harvestable age criteria to 70 years. Minimum harvestable volume remains 350 m3/ha
CM –VQmid CMu +VQmid	Change to mid range denudation for VQC	Change to mid range denudation limit for each Visual Quality Class
CM +early +matureold	biodiversity guidebook targets	Apply biodiversity targets for early seral and mature plus old targets using 10/45/45 method
CMl +BEO	Biodiversity guidebook old targets by LU	Apply old seral biodiversity targets by landscape units and emphasis with draw down in low emphasis units
CMl +BEO-dd	Biodiversity guidebook old targets by LU without drawdown	Apply old seral biodiversity targets by landscape units and emphasis with no draw downs
CM -impr	No genetic gains for future stands (was no future silviculture)	Use default curves instead of tree improvement curves for future stands (In CM0 future stands originate from plantation densities so no spacing is assumed and fertilization yield gains are very minor hence sensitivities for spacing and fertilization are not included for simplicity)
CMlu –recmod	Reduce recreation restrictions to consultant recommendation	Relax recreation cover constraints to cover retention percentages recommended by Jeremy Webb.
CMlu -rec	Remove recreation	Remove recreation cover constraints
CMl +gr3	Increase green-up height	Adjust green-up height in enhanced zones to 3m
CMt -gr	Remove green-up restrictions	Reduce green-up height to 0 m except for VEG in sensitive VQCs
CMtl +origyld	Use original yield curves	Use yield curves originally produced by J.S. Thrower
CM –aggr -adj	Remove spatial constraints	Simulate FSSIM results by turning off all adjacency and aggregation rules. <25% < green-up height cover constraint
CM +5-200ha -20YP	Combined 5 and 200 ha blocks	Permit up to 200 ha blocks in Enhanced Zones and up to 5 ha in Special Management Zones. Remove forced harvest of 20-year plan. [David to provide output analysis for Enhanced and Special Management Zones]

Name	Description	Details
CM +pwa250	Change cover constraint in PWA to 50% >250 years	Investigate impact on LTHL of reserving 50% of potential wildlife areas
CMtl +pwainop	Apply cover constraint to entire PWA	Investigate impact of applying 50% >140years cover constraint to entire (THLB + non-THLB) potential wildlife areas rather than THLB only
CM -Dr	Exclude alder volumes from analysis	Perhaps could address by yield curve analysis
CM_cc90	Achieve cut control	Harvest 1,446,000 m3 in 2001 to achieve 90% of 5-year cut control requirement; then step down as needed to achieve 725,000 base.
CM_cc90cf10	Achieve cut control and carry forward under harvest	As above with recovery of 10% carry forward volume during the 2002-2005 period.
CM_10	Step down 10%	Step down 10% and maintain highest midterm level possible [alternate harvest flow]
CM_10l		
CM_mAAC	Maintain current AAC for as long as possible	Maintain current AAC for as long as possible without compromising LTHL established with CM –impr [alternate harvest flow]
CM_LT	Start immediately at LTHL	Try to maintain LTHL starting immediately for as long as possible [alternate harvest flow]
CM_LTal		As above raising long term
CM_15	Step down 15%	Step down 15% to midterm [alternate harvest flow]
CM +other SI	Substitute SI from equivalent site to Other curves	Apply SI from curve 112-1 to 114-1; 121-1 to 124-1; 121-1 to 124-1; 211-1 to 214-1; 221-1 to 224-1; 231-1 to 234-1; 311-1 to 314-1; 321-1 to 324-1; 331-1 to 334-1; 411-1 to 414-1; 421-1 to 424-1; 431-1 to 434-1 using Hw as reference site index
CM2	Modified CM base	=CM +BEO +SIadj3 +recmod +pwainop +pwa250
CM2 +min25cm	Minimum harvest DBHq	Restrict harvesting to DBHq>=25cm
CM2_mAAC	Maintain AAC	As above with revised flow to maintain current AAC for as long as possible without later drop below 725,000 m3/year

Appendix IV
Silviculture Project History

TFL 19 Silviculture Project History

Year	Denuded (ha)	Planted (ha)	No. Trees Planted	Juvenile Spacing (ha)	Brushing (ha)	Prescribed Burning (ha)	Mechanical Site Prep. (ha)	Fertilization (ha)	Pruning (ha)
Pre									
1965	5065	4731	3502000	83	70	3089	0		
1965	420	483	425000	28	5	577	0		
1966	585	790	726000	12	49	382	37		
1967	547	564	434000	140	178	616	0		
1968	683	639	539000	155	98	545	0		
1969	683	744	474000	204	92	340	0		
1970	825	682	535000	274	0	594	0		
1971	1205	1533	1123000	57	16	588	0		
1972	623	1411	912000	56	15	299	0		
1973	1241	995	699000	99	28	377	0		
1974	885	1499	1324000	90	38	333	0		
1975	469	1307	942000	29	33	300	0		
1976	1055	1009	709000	30	0	831	0		
1977	1236	1085	631000	30	48	963	0		
1978	1178	889	494000	52	176	113	0		
1979	1108	1181	524000	314	310	111	0		
1980	1296	955	473000	424	190	17	0	1296	
1981	922	1195	579000	564	10	295	56	1042	
1982	800	1228	735000	235	54	71	0	990	
1983	1116	792	566000	804	184	102	0	1052	
1984	1136	562	325000	397	877	0	3	0	
1985	1190	973	452000	554	311	16	0	0	
1986	953	742	346000	114	358	0	0	0	
1987	1446	1304	686000	874	302	0	0	0	14
1988	966	930	563000	467	435	6	0	0	24
1989	889	1252	755000	473	165	0	0	0	43
1990	1068	1122	707000	140	80	0	0	0	0
1991	1297	784	439000	608	77	0	0	0	0
1992	976	1346	757000	300	113	1	19	0	0
1993	887	1221	683000	161	153	10	36	0	0
1994	856	967	674000	266	57	39	80	0	137
1995	923	1665	1040000	226	292	15	20	0	39
1996	1071	1772	1140000	249	61	51	28	188	20
1997	1000	1512	1067000	163	88	8	14	0	111
1998	631	719	675550	165	5	0	2	0	40
1999	650	466	382881	303	26	39	3	764	117
2000	1110	993	858364	256	46	8	6	958	233
TOTAL	38991	42042	27896795	9396	5040	10736	304	6290	778

Appendix V
Silviculture Prescription Sample

Doman-Western Lumber Limited

Silviculture Prescription
Agreement

[X] Original
[ ] Amendment # [ ] 2000/01/05

TENURE

REGION	DISTRICT	TSA	TSB	LICENSE NO.	TIMBERMARK(s)	C.P.	BLOCK
VA	DCR			TFL 19	XX	XX	K516

C/P	LOCATION	MAPSHEET/OPENING	LICENSEE
	STAR LAKE	92E080	DOMAN-WESTERN LUMBER LTD.

LICENSE TYPE	FUNDING	PHOTO LINE NO.(s)	COMMUNITY WATERSHED	
	IA		YES [ ] NO [X]	

FIELD WORK BY	DATE COMPLETED
N. Nielsen	1999/11/25 (YMD)

AREA SUMMARY

TOTAL AREA UNDER PRESCRIPTION		NPUNN		NPNAT		RESERVE & WTP		RRZ		IMM/OTHER NCC > 4 HA		NET AREA TO BE REFORESTED (NAR)	
ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
247.8	100.0	4.3	1.7	0.0	0.0	48.9	19.7	0.0	0.0	139.7	56.4	**54.9**	22.2

MANAGEMENT OBJECTIVES

LONG TERM MANAGEMENT OBJECTIVES

TIMBER: To harvest existing timber and to regenerate the stand to produce conifer sawlogs, poles and pulp logs, on a 60 - 100 year technical rotation. The block is to be harvested over several entries (see landscape, and future development area sections for details).

VISUAL: Visual quality is an important aspect for harvesting block K516. The shape of the block, and the intervals between harvest entries will be designed to maintain the visual quality objective for the block (see Landscape section for details).

ADMINISTRATIVE: Block K516 will be treated as one "management unit" for ease of adminstration. The first entry, for which this SP is written, will result in 59.2 ha being harvested as a partial cut silviculture system (see silviculture system section for details). Section 11(3) (b (i) B) of the Operational Planning Regulation allows for a larger cutblock size where the proposed silviculture system is other than a clear cut.

FUTURE DEVELOPMENT: The future development areas identified within Block K516 will be fully engineered at later dates, and updated SPs written to account for detailed plans for harvesting and silviculture activities on those sites.

STAND LEVEL OBJECTIVES, RESOURCE ASSESSMENTS & MANAGEMENT STRATEGIES

Forest Practices Code procedures have been followed for all assessments contained within this section. The silviculture prescription is consistent with the results or recommendations of any assessment carried out.

RECREATION

Pine Mushroom picking has been recognized as a recreational activity within block K516 and surrounding areas. Harvesting K516 will result in a decrease in the total productive area available for pine mushroom habitat, however, access to leave areas and reserve areas will improve due to new road construction. These roads may actually increase the amount of pine mushroom ground being easily accessible, and may improve the recreational opportunities for mushroom picking.

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LANDSCAPE

VQO: Partial Retention.

Assessment/Strategy: A visual landscape assessment was completed in August 1999. The assessment considered six viewpoints from the townsite of Gold River and popular recreation sites near Gold River. The assessment showed that the design of the block is acceptable from a visual landscape perspective. The block is to be harvested over several entries with each entry being determined by visual effective green up of cut over areas. A visual impact assessment will be completed prior to each stand entry.

WILDLIFE

Objective: To maintain some mature forest habitat for wildlife use.

Assessment: A widlife habitat assessment was carried out in April 1998. The assessment determined that the area is a poor winter habitat for deer and elk due to the north aspect and poor snow interception in the young canopy. The area also has low bear denning potential due to the lack of large size Cw which are preferred by bear for denning purposes.

Two eagle nests were observed from a helicopter and are located in the reserve north of Star Lake Creek.

Strategy: The reserves/wildlife tree patches and future development areas will continue to provide some mature forest diversity for various wildlife habitat use. Harvesting will change the stand level forest development from a stem exclusion phase to a stand initiation phase. This will result in an increase in net primary production, thereby increasing the amount of browse vegetation being available for elk and other wildlife species in the area.

RIPARIAN & FISHERIES

Objective: To protect fish habitat and to maintain existing water quality.

Assessment: There is one fish bearing stream (Star Lake Creek) and eleven non fish bearing streams (2 riparian class S5 and 9 riparian class S6) indentified within and adjacent to block K516 management unit.

Strategy: An appropriate riparian reserve zone has been established along the fish bearing stream. Water quality is to be maintained by following prescriptions that have been developed for each stream. Refer to the table on the Silviculture Prescription map for detailed information on stream descriptions and falling and yarding management.

COARSE WOODY DEBRIS

As per current utilization standards.

Danger trees and/or snags required to be felled for safety reasons within wildlife tree patches and outside the falling boundary, may be utilized where they fall within the cut over areas and where safe yarding permits. Otherwise they are to be left to provide coarse woody debris for various wildlife habitat.

BIODIVERSITY

Objective: To maintain some mature forest cover attributes within the block.

Assessment/Strategy: A total of 48.9 ha (19.7 %) of the management unit has been reserved from harvest. These reserve areas are associated with riparian zones along fish bearing streams and unstable gully banks, and on rocky knolls throughout the management unit.

CULTURAL HERITAGE/ABORIGINAL TRADITIONAL USE

There are no known archeaological values within block K516.

WATERSHED

A Coastal Watershed Assessment (CWAP) for the Lower Gold River Watershed was completed in September 1997. The report recommended that appropriate prescriptions be developed for streams and gullies contained within block K516 to protect water quality and fish habitat. These recommendations have been carried out during the engineering of this management unit.

GULLY MANAGEMENT

Objective: To maintain the integrity of gullies within and adjacent to the block.

Assessment: Four gullies have been identified within the management unit.

Strategy: All the gullies have been buffered by riparian reserve zones. Refer to the Silviculture Prescription map for detailed descriptions and management strategies of these gullies.

TERRAIN STABILITY

Assessment/Strategy: A terrain assessment was completed in September 1999. The majority of the block/management unit is located within Class III terrain with some Class IV on steeper slopes. The report recommended that gully reaches of creeks number 1 & 2 be placed in a reserve (this was done). Other recommendations contained in this report will be adhered to during road construction and yarding activities.

WINDTHROW HAZARD

Assessment: Windthrow hazard on adjacent timber appears to be variable. Prevailing winds approaching from the west do not appear to be very damaging to the block. Other damaging winds come from the south (outflow winds from Matchlee Peak).

Actions: The reserve boundary along creeks #1 & #2 and along Star Lake Creek were located away from the gully breaks in a predominantly Fd type. Most of the exposed edges of the block are expected to have minimal windthrow concerns since the boundaries have been located along rock bluffs, "scrubby" timber types, or are unexposed due to the small opening sizes in predominantly Fd timber types. Observations made near similar stand types in the vicinity of K516 show minimal windthrow evidence.

OTHER FOREST VALUES

A growth and yield plot (E2) is located within the management unit. However, research into the status of this plot shows that it is not active and is therefore not a concern, and is not being managed.

ECOLOGICAL ASSESSMENTS

ECOSYSTEM CLASSIFICATION & PHYSIOGRAPHY

SU	AREA (ha)	BEC	SITE SERIES MOF		GRID LOCATION (m/n)	ELEVATION			SLOPE			SLOPE POS'N.	ASPECT
			DOM.	RELATED		LOW (m)	HIGH (m)	AVG (m)	MIN (%)	MAX (%)	AVG (%)		
	139.7			FUTURE DEV									
A	32.9	CWH xm 2	01		3-4/C	120	400	300	20	50	30	MID	E & N
B	13.0	CWH xm 2	03		2/B-C	120	450	220	20	50	30	MID	E,N,W
C	9.0	CWH xm 2	06		5-6/B-C	240	360	260	10	20	10	MID	N
NP	4.3			ROADS									
RES	48.9			RESERVE									

SITE DESCRIPTION & SOILS

SU

A — Fd Hw (Cw Pw) immature, even aged stand (wildfire origin) with scattered Fd vets and Dr in wetter draws throughout the SU. Understory vegetation is composed of vaccinium, salal, and swordfern. There are small patches of NP wet swampy ground and NP rock scattered throughout the SU. There are small (<1ha) root rot pockets identified throughout the block.
Soils: Mor humus (7 - 10 cm) overlaying a sandy loam or loamy sand textured soil (cf 80%). Rooting Depth: 30+ cm and Depth to Restricting Layer: 60+ cm.

B — Fd Hw immature, even aged stand (wildfire origin) with scattered Fd vets throughout the SU. Understory vegetation is composed of vaccinium, with an extensive ground cover of salal in patches. The ground is generally rockier than SU A with shallow soils over rock. There are areas within the SU composed of NP colluvium material near the surface.
Soils: Mor humus (5 - 10 cm) overlaying a loamy sand textured soil (cf 80%). Rooting Depth: 20 - 30+ cm and Depth to Restricting Layer: 20 - 40+ cm.

C — Hw Cw (Fd) larger size trees compared to the other SUs with a more open canopy and surface seepage water throughout. Understory vegetation is composed of vaccinium, deer fern and salal. The ground is generally wet with sphagnum moss found in patches throughout the SU.
Soils: Mor humus (10 - 15 cm) overlaying a sandy loam textured soil (cf 70%). Rooting Depth: 20 - 30+ cm and Depth to Restricting Layer: 20 - 40+ cm.

NP — NPUNN due to proposed roads, landings and quarries. Note: The above area reflects only the amount of road contained within the harvest area for the first pass. The total amount of road to be constructed in the first pass within the entire management unit of block K516 is approximately 6.8 ha (or 2.7% of the management unit). These areas will be amended as second, and subsequent harvesting is proposed.

RES — Timber reserve composed of wildlife trees associated with riparian (gully) management areas along several creeks, and with rocky knolls. The trees contained in the riparian reserves are representative of trees growing within the area to be harvested, and trees growing on the rocky knolls are generally non merchantable and "scrubby" in nature.

FOREST HEALTH

There are some small (<1 ha) root rot pockets scattered throughout block K516. These areas will be identified on the Treatment Regime map. Resistant species such as Cw and/or Pw are to be planted within these pockets.

No other health issues are anticipated.

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SOIL CONSERVATION

SITE DISTURBANCE LIMITS

MAXIMUM PROPORTION OF TOTAL AREA UNDER PRESCRIPTION ALLOWED FOR PERMANENT ACCESS: 5.7 %

The site degradation percentage was calculated as per the WFP Nootka Region procedures.

PERMANENT ACCESS STRUCTURES: Branch road R - Main, and spur roads R-2, R-2A, R-2B, R-5, R-6, R-9, R-10 & U-5G are permanent access roads. These roads are required for future development and are to be semi-permanently deactivated for water management post harvest. (NOTE: the above % only reflects the permanent access structures within the cutover area of the first entry).

TEMPORARY ACCESS STRUCTURES: Spur/stub roads R-1, R-4, R-4A, R-8 are temporary roads required to aid in the harvesting of the block. These roads are to be permanently deactivated for water management concens and productive ground reclaimed where suitable material permits. The net site degradation for temporary access following rehabilitation will be 1.3% of the first pass entry. Reclaiming productive ground will be carried out to meet the regen delay date.

NOTE: The total amount of road to be built to access first pass harvesting is approximately 5.2 km or 6.8 ha. The majority of this road is required for future harvesting and to provide silviculture access post harvest.

SITE SENSITIVITY RATINGS

SU	MASS WASTING	SOIL COMPACTION	SURFACE SOIL EROSION	SOIL DISPLACEMENT	FOREST FLOOR DISPLACEMENT	MAXIMUM FOREST FLOOR DISPLACEMENT (%)	MAXIMUM SOIL DISTURBANCE (%)
A, B,	N/A	Low	Moderate	Moderate	n/a	30.0	5.0

SILVICULTURAL SYSTEMS

SILVICULTURAL SYSTEM

PARTIAL CUT: Clearcut with reserves will account for 39.3 ha and 19.9 ha will be small (<3.5 ha) openings spatially distributed throughout the block. These small openings will have each point within that opening less than 2 tree heights from a forested edge.

RATIONALE FOR PROPOSED SILVICULTURE SYSTEM

1) Biological:
- Even-age management within the openings.
- Silvics of Fd, Cw, Hw, Pw, Bg & Ss are conducive to a partial cut system

2) Environmental: Terrain is stable and conducive to a partial cut system.

3) Social: The partial cut system is well suited to the partial retention VQO for the block.

LEAVE TREE CHARACTERISTICS OUTSIDE RESERVES

At the fallers discretion, and provided WCB regulations are adhered to, snags adjacent to the boundary which are leaning away from the work area are to be left for wildlife trees.

Some residual advanced regeneration within the cutblock which have the following characteristics may be left standing:

1) free of disease
2) exhibit good form
3) do not pose a worker safety hazard during harvesting operations.

These residuals are to provide habitat for vaious wildlife species and will form an integral part of the second growth forest.

FUTURE DEVELOPMENT AREAS

The areas within management unit block K516 identified as future development are composed of similar (and different) timber types as those in the areas to be harvested in the first entry. These areas will be developed for harvesting over a period of time depending on visual and economic concerns at the time of development. Once final engineering is completed, an updated SP will be prepared to account for the new development.

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[ ] Amendment # [ ] 2000/01/05

FREE GROWING STOCKING STANDARDS

SU	NET AREA TO BE REFORESTED (ha)	SPECIES/MIN. FG HEIGHT (cm)		WELL SPACED TREES/HA			REGEN DATE (years)	FREE GROWING (yrs)	
		PREFERRED	ACCEPTABLE	TSS	MSSpa	MSSp		EARLY	LATE
A	32.9	Fdc/300 Cw /150 Hw /200	Pw /250 Bg /300	900	500	400	3	8	11
B	13.0	Fd /200 Cw /100 Hw /200	Pw /250	800	400	400	3	8	11
C	9.0	Cw /150 Hw /200 Fd /300	Ss /150 Bg /300	900	500	400	3	8	11

SU	MIN HOR. INTER-TREE DIST. (m)	CROP TREE HEIGHT RELATIVE TO COMP VEGETATION (%)	MAXIMUM DENSITY (stems/ha)	POST SPACING DENSITY (stems/ha)	
				MIN	MAX
A	2.0	150	10000	800	1200
B	1.0	150	10000	800	1200
C	2.0	150	10000	800	1200

EXPECTED FUTURE SPECIES COMPOSITION

A Fd80, Cw20, (HwBgPw)
B Fd80 Cw20 (Pw, Hw)
C Cw60, Hw30, Fd10 (Ss)

GENERAL STOCKING STANDARD COMMENTS

Stocking and Free Growing surveyors are to accept well spaced conifers at: i) 1.0 metre minimum inter-tree spacing where NP rock/boulders account for a significant portion of the survey plot, and ii) 2.0 metre minimum inter-tree spacing elsewhere.

ADMINISTRATION

PRESCRIBED BY

N. Nielsen, R.P.F., Resident Forester

ATTACHMENTS

# of Map Pages	# of Other Pages
1	1

PRESCRIPTION APPROVAL

SEAL

R.P.F.'s SIGNATURE

I certify that the work described herein fulfills standards acceptable of an RPF, and that I did personally supervise the work.

March 3/00
Date Signed (Y M D)

LICENSEE ACKNOWLEDGEMENT OF COMMITMENT UNDER SECTION 129.3, FOREST ACT

M. Kenny, Operations Manager

DATE SIGNED Y M D

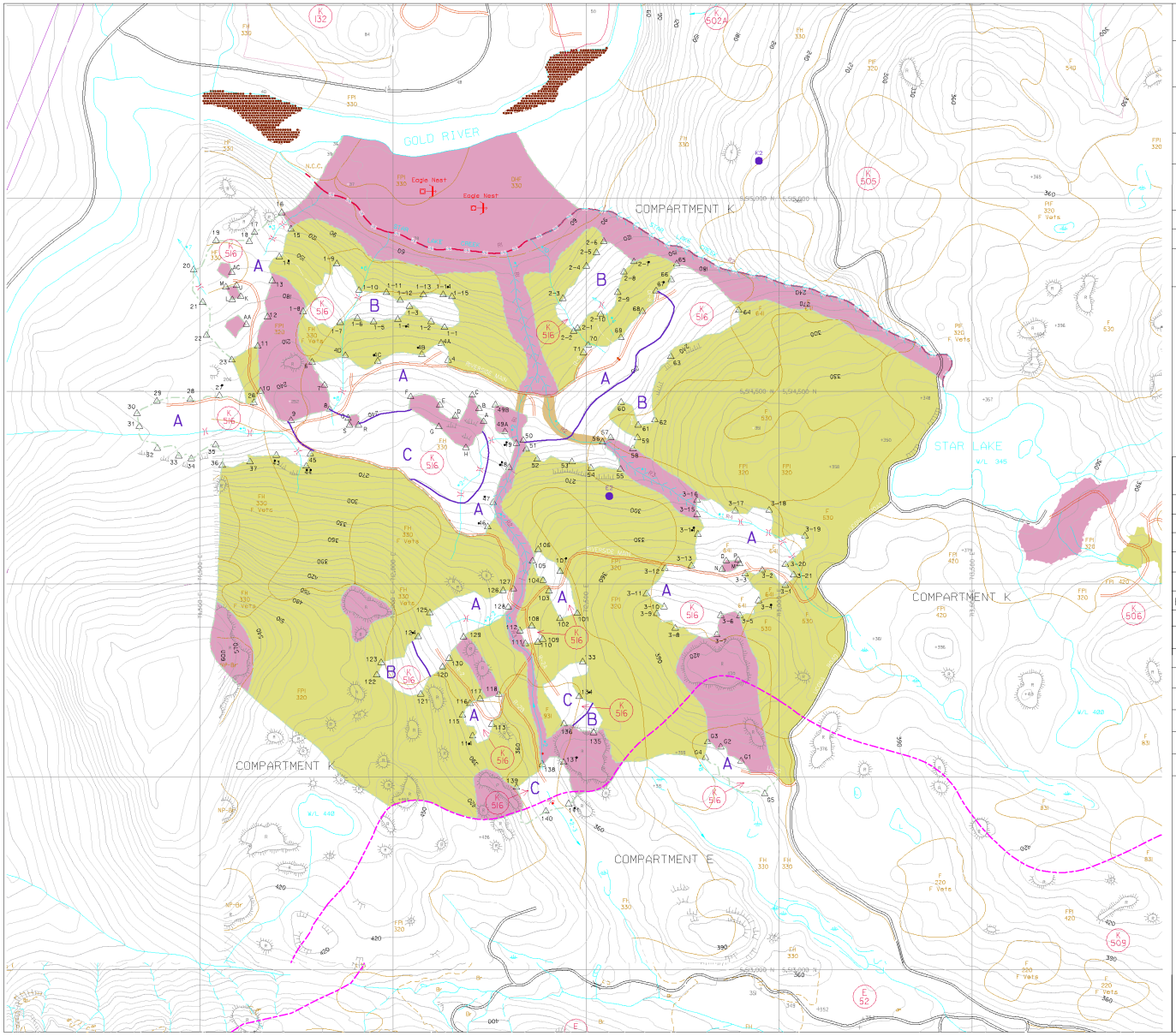
Mar 3/00

GOVERNMENT APPROVAL (District Manager's Signature)

APPROVED DATE SIGNED Y M D

2000/04/19

Timbermark: XX *C.P.: XX* *Block: K516* *Phoenix V2.61 - D.R. systems inc.*



SILVICULTURE PRESCRIPTION #3

Western Forest Products Limited — GOLD RIVER FOREST OPERATION

Block K516	MANAGEMENT UNIT TYPE: TFL	PULPWOOD AGREEMENT	CASCADES EAST:			
	NUMBER: 19		WEST: C			
REFERENCE MAP: 92E09	TIMBER SUPPLY AREA	REG	0	0	3	
BASE MAP: 92E.080	NUMBER 37 STRATHCONA	COMPT	0	0	5	
FOREST REGION: 01 VANCOUVER	BLOCK B KYUQUOT					
FOREST DISTRICT: 18 CAMPBELL RIVER	SUB-B	L	C			
LAND DISTRICT: 38 NOOTKA	PLANNING CELL #					
DRAWN BY: JUDITH CHINN REVISED: Feb 10, 00	AIR PHOTO NO.:					
LATITUDE: 49° 45' LONGITUDE: 126° 03'	SHOWN AS:					

UTM GRID	UTM	EASTING	NORTHING	ORCS #	MDM ID:		
	9	712351	5514278	PROJECT NO.	DATE AUG 17, 99	APPROVED	FIGURE

T.N. 18° 42' 2° 13' Grid North Magnetic North

Approximate Mean Declination 1994 for centre of map 92E.080 Decreasing 10.2' Annually

SILVICULTURE PRESCRIPTION

BCG SUBZONE: CWHxm2

GROSS AREA (Ha.): 247.8

NET AREA TO REFOREST (Ha.): 54.9

DATE OF SURVEY: November 1999

See back of map for Riparian Prescriptions

STANDARD UNITS	ECOSYSTEM ASSOCIATION	AREA (Ha.) PROD.	NPNAT	NPUNN
A	01	32.9		
B	03	13.0		
C	06	9.0		
RES	RESERVES	48.9		
NP	ROADS			4.3
FUTURE DEV		1.9		

FREE GROWING STOCKING STANDARDS

SU	PREFERRED SPECIES/Ht.	ACCEPTABLE SPECIES/Ht.	TSS	MSS	MPS	REGEN DELAY (yrs)	FG EARLY (yrs)	FG LATE (yrs)
A	Fd300 Cw150 Hw200	Pw250 Bg300	900	500	400	3	8	11
B	Fd200 Cw100 Hw200	Pw250	800	400	400	3	8	11
C	Cw150 Hw200 Fd300	Ss150 Bg300	900	500	400	3	8	11

BUILT ROADS; LOCATED ROADS; TEMPORARY ROADS; BACKSPAR TRAIL; BRIDGE, BUILT; DESIGNATED CROSSING; STATION MARKER; PROPOSED QUARRY; OPENING BOUNDARY; STANDARD UNIT; GROWTH YIELD PLOT

CREEK; DRAINAGE INTERMITTENT; GULLY; SEEPAGE; STREAM CLASSIFICATION; FISH BARRIER; SWAMP; INDEX CONTOUR; INTERMEDIATE CONTOUR; TIMBER TYPE LINE; SCRUB

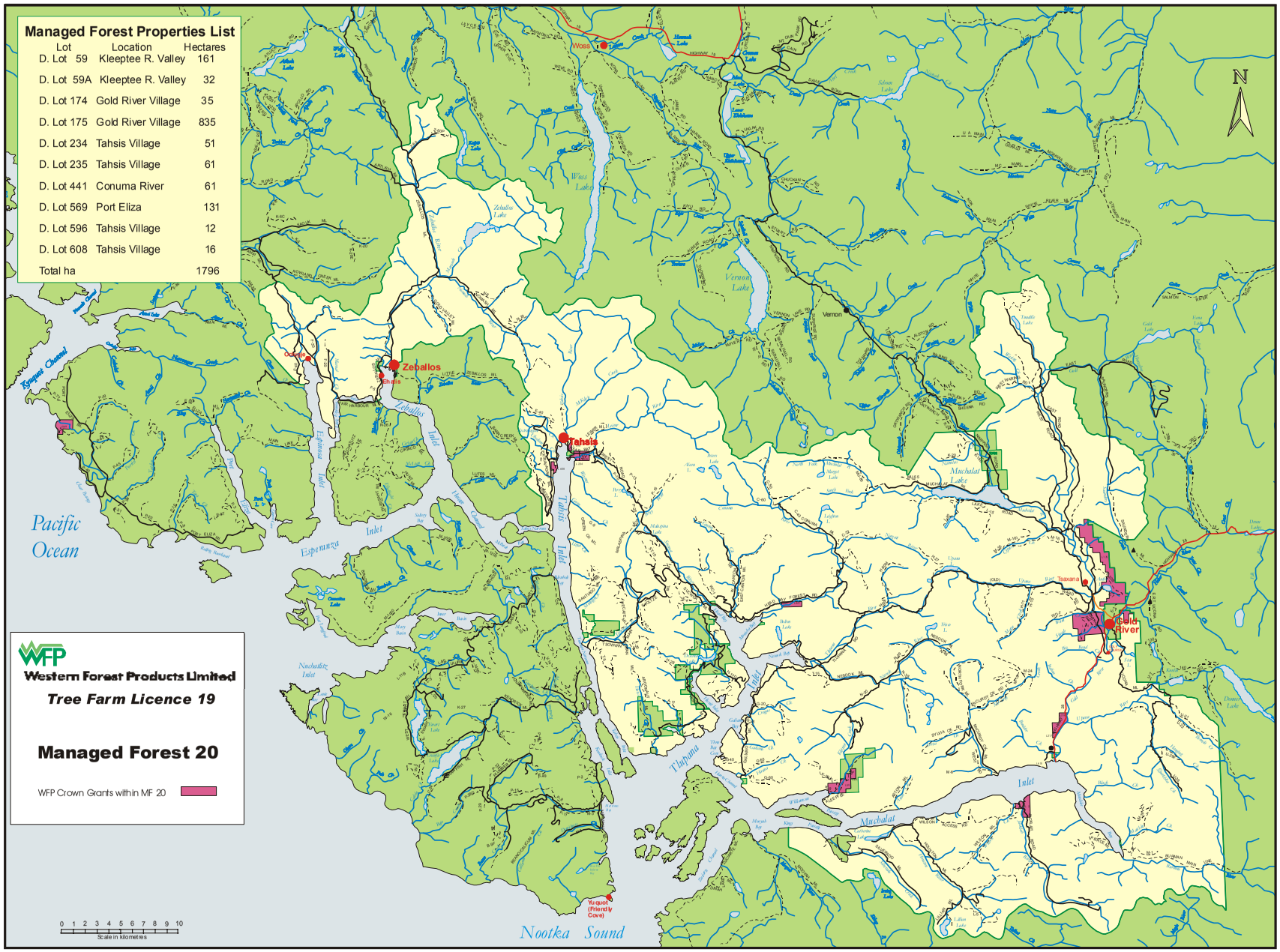
ALPINE; ROCK/BLUFF; SLIDE; BOULDERS; YEAR LOGGED; YEAR PLANTED; SNAG; BLOWDOWN; CULTURALLY MODIFIED TREE; BIRD INFO.

SPECIAL MANAGEMENT ZONE; RIPARIAN RESERVE ZONE/RESERVE; RIPARIAN MANAGEMENT ZONE; FUTURE DEVELOPMENT

0 100 200 300 400 500 METRES

1 : 10000

Appendix VI
Managed Forest No. 20



Managed Forest 20

Managed Forest 20 Properties List

Assessment Roll No.	Legal Description	Area (ha.)
06 575-29020.046	DL 234, LD 39, Nootka	51.38
06 575-29020.051	DL 235, LD 39, Nootka	61.29
06 575-29020.066	DL 596, LD 39, Nootka, except plan 25219 & VIP 52448	11.78
06 575-29020.076	DL 608, LD 39, Nootka	15.78
06 784-29020.015	DL 59, LD 39, Nootka	161.07
06 784-29020.020	DL 59A, LD 39, Nootka	32.38
06 784-29020.025	DL 174, LD 39, Nootka, except plan 19933	435.54
06 784-29020.030	DL 1653, DL 175, LD 39, Nootka, except plan 18671 etc.	835.33
06 784-29020.055	DL 441, LD 39, Nootka, except plan 34500	60.93
06 784-29020.200	DL 569, LD 49, Rupert	130.72
Total Hectares		**1796.2**

Three properties were formerly in Managed Forest 20 but have been reclassed to unmanaged forestland because of their purchase by Bowater Inc. These properties are DL 2, 216, and 217. They will be reclassified as Managed Forest 20 if and when an agreement is completed with Bowater Inc.

Appendix VII
Fire Preparedness Plan

FIRE PREPAREDNESS PLAN 2001
WESTERN FOREST PRODUCTS LIMITED, NOOTKA REGION
(GOLD RIVER FOREST OPERATION, NOOTKA CONTRACT ADMINISTRATION, ZEBALLOS FOREST OPERATION)

IN THE EVENT OF A FIRE - FOLLOW THESE PROCEDURES

1). **Call the Office:** **Gold River** **283 – 2221**
Zeballos **761 – 2200**

2). **Call a Manager**:

		Home Phone
Nootka Region	Trevor Boniface	283-9198 or 923-3945
Gold River Forest Operation	Mark Kenny	283-7564 or 897-0323 or 286-2197
Nootka Contract Admin.	Ron Todd	283-2564 or 923-8609 or 286-2603
Zeballos	Layne Thornton	761-4310 or 949-7077

3). **Call a Supervisor:**

Gold River	Chris McAllister	339-7030 (Fire Warden)
	Bill Fraser	283-2402
	Doug Thomson	283-7736
	Jim Muress	283-9018
	Kevin Somerville	283-7389
	Nels Nielsen	283-7559
Nootka Contract Admin.	John Waring	283-7564 or 926-6080 or 286-2411
	Doug Meske	283-7128 or 286-2483
	Dick Cain	283-7486 or 923-1753
Zeballos	Sid Guy	761-4254
	Jason Liard	761-4747

4). **Alert the Personnel Dept. to arrange First Aid and backup crews, if necessary**.

5). **Notify the BC Forest Service Duty Officer:** 1-250-951-4200 (Coastal Fire Centre)
1-800-663-5555 (Emergency)

6). **Call Head Office:** Vic Woods (604) 986-2332 (r) or 880-7826 (cell)
(604) 665-6200 Bill Dumont (604) 924-0146 (r) or 290-6486 (cell)
Paul Bavis (604) 466-2088 (r)

7). **Notify adjoining operations if the fire is near their holdings (see page 23).**

A. AREA COVERED BY THE PLAN

This Fire Preparedness Plan is prepared in accordance with Section 91(2) of the Forest Practices Code Act and will cover Western Forest Products Limited's Nootka Region operations within T.F.L. 19, and active areas within F.L. A19231.

For the purpose of effective implementation of this Fire Preparedness Plan, WFP's operations on the west coast of Vancouver Island will be divided into three operating areas:

1) Gold River Forest Operation: shall cover: TFL 19 Compartments: C, D, E, G, H, J, K, M, N, P, & Q; and FL compartment Z.
2) Zeballos Forest Operation: shall cover: TFL 19 Compartments: I, L, O, X, & Z; and FL compartments: K, M, N, O
3) Nootka Contract Administration: shall cover: TFL 19 Compartments: A, B, F, R, S, T, U, V, & W; and FL compartments: A, B, C, D, E, F, G, H, J, L, & S.

The area covered by this plan is outlined on the attached map (Appendix VI). The map also shows: the proposed active logging & road building areas, and the locations of the weather stations.

B. OCCUPATIONAL RESPONSIBILITIES

1) As noted under Section 92 of the Forest Practices Code Act, WFP will carry out initial fire suppression in accordance with the regulations where a fire occurs in, or within 1 km of the area of operation.

   On T.F.L. 19 the operational area is considered to be the total T.F.L. On the Forest Licence and on Timber Licences the operational areas are considered to be within active cutting permits only. In case of any major fire, WFP will be responsible to utilize its full complement of employees to bring the fire under control.
2) During the fire season (**April 1 to October 31**) inclusive, WFP and its contractors shall, in accordance with the Forest Fire Prevention & Suppression Regulation (FFP&SR) Part 2 maintain in good working order for fire fighting purposes, the proper tools and equipment, to the satisfaction of a Forest Officer or Company representative.

C. COMPANY REGULATIONS

Operations:

a) Powersaws - all fallers carry a small fire extinguisher. One 23 litre backpack can with water is available per two fallers at their lunch area. Spark arresters on saws must be kept in good repair. Each set of fallers will have a portable radio for immediate contact should a fire occur.
b) Logging Machinery - all machinery is equipped as per the Forest Fire Prevention & Suppression Regulation (FFP&SR). Furthermore a tank truck or water tank complete with pump and hose is situated near each side. Where there are two continuous operating machines, one tank truck will serve the two sides. Machinery is kept free of readily combustible debris and a 2 hour fire watch is arranged when the fire danger class is in upper moderate or higher.
c) Welding and Cutting - the area must be well wet down before welding commences. A tank truck and foreman must be present during the entire operation and one must remain for 2 hours on the site after the work is completed. The welder must have a fire extinguisher with him.
d) Blasting - during hazardous weather, blasting will be done before 10:00 hr. or during the least hazardous time of the day. A watch will be maintained for two hours after blasting.
e) Lunch Fires - warm-up and lunch fires are not permitted during the entire fire season.
f) Smoking – during the fire season, smoking is allowed on truck roads only.
g) Hazardous Setting - logging of hazardous settings will be avoided in the fire season. Should logging of high fire hazard areas occur during the summer, then special protection measures will be taken. The responsibility rests with the Resident Engineer for Company and Contract operations.

Fire Equipment Standards

Activity & Machinery	Shovels	Pulaskis	Hand Tank Pumps	Fire Extinquishers
Yarding & Loading				
Grapple Yarder	2	2	4	2
Tower	3	2	4	2
Hoe Forwarding	1	1	1	2
Loader	1	1	1	2
Backspar hoe	1	1	1	2
Road Construction & Hauling				
Hoe/Cat	1	1	1	2
Drill	2	1	2	2
Front End Loader	1	1		2
Gravel or Logging Truck	1	1		2
Grader	1	1		2
Crewcabs/Pickups	1	1	1	1
Shop Truck	1	1	2	2
Falling & Bucking	1	1	1	1
Helicopter Logging	A water bucket, capable of delivering 4,500 litres of water per hour to any place on a worksite, must be kept at a landing spot near the worksite. (section 9 & 9.1 of the FFP&SR)			

Fire Extinguishers:

Where 1 required: UCL rating 1A, 5BC (3 lb dry chemical)
Where 2 required: one with UCL rating 1A, 5BC (3 lb dry chemical)
one with UCL rating 3A, 10BC (10 lb dry chemical)
Shop Trucks (welding): two with UCL rating 3A, 10BC (10 lb dry chemical)

Water Delivery System:

In addition to the FFP&SR Section 10, the following is the WFP standard for water tankers
1 per 10 persons crew & 2 per 11+ persons

i) self powered tank unit minimum 4500 litres
ii) must have a fixed Wajax mark III pump with suction to the bottom of the tank.
iii) pump must be capable of pumping 145 psi through 30 metres of hose and 3/8 inch nozzle.
iv) carry 450 metres of hose.
v) tools required: siamese valve, 2 nozzles, hose wrench, spark plug, spark plug tool, hose washers, & back check valve.

Central Equipment Cache:

As per Section 11 of the Forest Fire Prevention & Suppression Regulation: In addition to any other requirement contained in this Fire Preparedness Plan, or the Forest Fire Prevention and Suppression Regulation, the following table is a list of extra equipment that is to be kept at a central equipment cache where it can be delivered to any place on each worksite that relates to the industrial activity within 2 hours. (for activity risk classification A or B).

Central Equipment Cache

Number of Persons	Portable Pump Units	Shovels	Pulaski Tools	Hand – tank Pumps
1 – 10	0	0	0	0
11 – 20	1	4	4	2
21 – 40	2	6	6	4
41 – 60	3	10	8	6
61 – 80	4	14	10	8
81 – 100	5	20	12	12
101+	6	22	14	14

Company Closure Formulas

i) Weather Stations

Weather stations will be set up by each of the divisions (see map, Appendix VI for approximate locations of weather stations to be used in 2001).

An automated weather station, located at Nesook River near Branch Road N-30, is connected to a computer in the Gold River office. This automated weather station provides continuous weather information and is the primary station used for the Gold River Forest Operation fire hazard calculation for the Nesook operating area.

Manual weather stations are checked daily, and are used to provide more localized fire hazard conditions. Contractors working within Nootka Contract Administration areas, are encouraged to install and operate their own weather stations in locations approved by a Company Representative. Readings must be started and recorded continuously in order to give valid FWI readings. Should the contractor not wish to participate, the Company will use readings from other suitable locations. The Contractor's operations will be governed from those readings.

Recording Time

Readings will be taken daily at 1300 hrs. PDT, seven days a week commencing April 1. During Moderate to Extreme hazards, readings will also be taken at 0800 and 1600 hrs.

Instructions On Taking Weather Readings from Manual Weather Stations
Forest Technology Systems Ltd. Weather station Model WR62

12:00 hrs (noon), 08:00 hrs, & 16:00 hrs:

- set the sample time switch to 12:00, 08:00, or 16:00
- set the date/time thumbwheels to the date you wish to view
- set the sensor select switch to the sensor reading you require
- the display should now read the data recorded at 12:00 noon, 08:00, or 16:00 on the date chosen.

Hourly (The recorder retains hourly data for the previous 24 hour period at any time)

- set the sample time switch to hourly
- set the date/time thumbwheels to the hour you wish to check (i.e. for 10pm dial in at 22)
- set the sensor select switch to the sensor reading you require the display should now read the data recorded at the time chosen on the previous day.

Note: Wind speed is updated every 10 minutes. Allow 20 minutes from station start up to record the wind speed on date/time '00'.

ii) Weather Forecast Services

Canadian Public Weather Forecasts are received by WFP at the Gold River and Zeballos offices daily at 0700 and 1430 hrs. Localized forecasts may also be received by calling one of the numbers below.

Port Hardy Airport	949-7147
Vancouver Airport	664-9032
Gold River	283-2652

iii) The Canadian Forest Fire Weather Index

The Canadian FWI will be used to determine the Fire Danger Class for both the TFL and FL areas. Restrictions on forest activities will be based on the Fire Danger Class Ratings as per the Forest Fire Prevention & Suppression Regulation (attached).

Watchman Requirements

Hazard Level	Workdays	Weekends & Shutdowns
Upper Moderate	1 hour aerial patrol after the last crew has stopped work. Office coverage until 1 hour after last crew has stopped work	Company Duty Roster in effect. Aerial Fire patrols will be initiated after lightning Storms have passed over and the Possibility of lightning strike is high.
High & Extreme	2 consecutive patrols of 1 hour each after last crew has stopped work. Office coverage until the completion of the fire patrols.	

AERIAL FIRE PATROLS

Procedures:

- Fire patrol scheduling will be set by the office (Fire Warden).
- Follow a designated flight route which observes every active site (falling, road construction, yarding)
- Check every active site for smoke, particularly:
  - Where active falling has most recently occurred
  - Where active road construction has occurred (especially blasting)
  - Where active logging has occurred (especially tail blocks)
- Also observe anything unusual, such as camper activity.
- Concentrate on spotting during the flight.
- Report any unusual activities to the Fire Warden.
- Monitor the WFP Gold River radio frequency at all times.

In Case of Fire:

- Notify office: Exact Location of smoke/fire, Size of fire, Rate of spread, Location of water sources, General surroundings and hazards, and Threat to life or property.
- Determine resources required: People, Equipment, Water Bombers, etc.
- Immediate Response: If possible, find a safe location to be dropped off and have the helicopter bucket the fire. Do not fan the fire with the helicopter
- Stay on radio until the Fire Boss takes over command.

Company Policy (Aerial Patrols):

- Bring proper equipment: Hardhat, hi vis vest, portable radio, work boots, sunglasses, map.
- Passengers only allowed under following conditions:
  - At own risk (subject to being dropped off anywhere, and anytime)
  - Maximum of 2 passengers.
  - Minimum age 16, & must be healthy.
  - Pre-authorization is required.
  - Patrol person must personally know the passenger and will be responsible for the passenger.

Recreation Use:

The Ministry of Forests Head Bay Forest Service Road will be open at all times except during closures as imposed by the B.C. Forest Service.

The Gold River Mainline, and the Nimpkish Mainline, are open to the public on a 24-hour basis. Antler Lake area is also open at all times to the public. Other roads may be closed to the public during hazardous conditions, however, roads into non-operating areas will remain open during hunting season.

Campsites (maintained by WFP)

Cougar Creek	47 units
Conuma River	8 units
Leiner River	6 units
Muchalat Lake	37 units
Zeballos	7 units
Fair Harbour	10 units
Gold River Municipal *(maintained by the Lions Club)*	20 units

Picnic Sites
Big Bend (Gold River)
Antler Lake
Star Lake
Upana Caves
Tahsis - West Bay

Signs, informing the public of the fire hazard, will be posted at campsites and picnic areas during high or extreme fire hazard situations. Campers will be informed, in person, of any provincial (or regional) campfire bans imposed by the Ministry of Forests.

Open fires are restricted only during high and extreme fire hazards (Danger Class IV & V).

Firewood Cutting:

Firewood cutting is not permitted when the fire hazard is moderate, high, or extreme.

D. PREVENTION

Weekend Duty Schedule

Persons listed on the Weekend Duty Roster for Gold River and Zeballos have the following responsibilities:

Persons On Duty:

- Are in charge of weekend patrols, initial attack crews, and will organise water tanker coverage for the weekend.
- Will carry a pager and a radio at all times.
- Will arrange a helicopter (if required) for fire patrols.
- Must find a replacement person and indicate the change on the posted duty roster if they wish to swap weekend duty days.
- Will remain in the Gold River or Zeballos area.
- Will organise patrols (ground & aerial if required) and will follow pre-set routes and follow aerial fire patrol procedures.
- Will, in the event of fire, provide initial attack, assess action required, and contact backup person for support.
- During Extreme Fire Hazard conditions, the on duty person shall carry a pager at all times during the week preceding his weekend duty schedule.

Persons on Back Up (Gold River Only):

- Will be available for assisting "On Duty" person and for office coverage if required.
- Will carry a pager at all times.
- Will record weather readings and maintain radio contact with ground or aerial patrols.
- Will follow instructions from the ON DUTY person at all times. It is the responsibility of the backup person to phone other key company personnel and office assistance personnel if a fire is reported.
- The main phone can be forwarded to your work area during office coverage, but must be forwarded back to 2800 at end of day in order for the fire "mailbox" to be activated if necessary.
- Will, in the event of fire, notify the manager or designate, notify key company personnel, arrange for fire fighting crews, and notify the Ministry of Forests.

Pager System (Gold River Forest Operation):

1) Pick up pager Friday night, drop off Monday morning. Remember to charge or swap batteries and test pager prior to use.

2) If someone calls in to report a fire when the office is closed, the call will go to a mailbox. Once the call is in the mailbox, it will activate the pager to let you know there is a message.

3) **WHEN PAGER GOES OFF**: **Dial 283-2800** - when asked for **mailbox number -** punch **1000#**
- when asked for **password -** punch **123456#**

4) DO NOT DELETE THE MESSAGE.

5) Make radio or phone contact immediately to call for additional help.

LIST OF KEY COMPANY PERSONNEL & STAFF EMPLOYEES:

Note: Persons listed below and on the following pages with an asteriks (*) are certified firefighters as defined in the Forest Practices Code Section 91 (1)(b)(ii) and the Forest Fire Prevention & Suppression Regulation section 29 (2).

Key Company Personnel

	Occupation	Business Phone	Residence Phone
Head Office (Vancouver)		**(604 – 665)**	
Vic Woods	V.P. & General Manager	6213	(604) 986-2332 or 880-7826 (cell)
Bill Dumont	Chief Forester	6224	(604) 924-0146 or 290-6486 (cell)
Paul Bavis	Mgr Tbr. Supply/Planning	6222	(604) 466-2088
Nootka Region		**(283)**	
Trevor Boniface*	Regional Manager	2857	283-9198 or 923-3945 or 949-3902(auto)
Murray Watkinson	Regional Forester	2803	283-7418
Bob Craven*	Regional Engineer	2811	283-2564 or 923-6340
Larry Henkelman	Mgr. Timber Appraisal	2846	283-7289
Gold River Forest Operation		**(283)**	
Mark Kenny	Operations Manager	2802	283-7564 or 897-0323 or 203-0799 (cel)
Bill Fraser*	Dry Sort/Hauling Foreman	2221	283-2402
Chris McAllister*	Bullbucker, Fire Warden	2221	339-7030
Doug Thomson	Woods Foreman	2221	283-7736
Jim Muress	Grade Foreman	2221	283-9018
Kevin Kay	Master Mechanic	2840	283-7547
Kevin Somerville*	Resident Engineer	2835	283-7389
Nels Nielsen*	Resident Forester	2845	283-7559
Nootka Contract Administration		**(283)**	
Ron Todd	Operations Manager	2809	283-2564 or 923-8609 or 286-2603
John Waring*	Sen. Operations Engineer	2826	283-7564 or 926-6080 or 286-2411
Doug Meske*	Sen. Operations Engineer	2825	283-7128 or 286-2483
Dick Cain*	Resident Forester	2820	283-7489 or 923-1753
Graham Hues*	Sen. Operations Forester	2817	283-7564 or 923-8226
Zeballos Forest Operation		**(761)**	
Layne Thornton*	Operations Manager	2200	761-4310 or 923-8191
Sid Guy*	Woods Foreman	2216	761-4254 or 286-2751 (auto tel)
Terry Anonson*	Bullbucker/Grade Foreman	2200	761-4239 or 286-2754 (auto tel)
Doug Terrie*	Master Mechanic	2220	761-4441 or 923-0528
Jason Liard	Resident Engineer	2214	761-4747 or 286-2713 (auto tel)
Darren Dean	Operations Forester	2212	761-4411 or 923-8191

List of Certified Fire Fighters

In addition to the personal listed on the pages above, the following personal are certified fire fighters as defined in the Forest Practices Code Act of B.C. section 91 (1) (b) (ii) and the Forest Fire Prevention & Suppression Regulation section 29 (2).

WFP- Gold River Forest Operation

Brown, Rick	Fawbert, Wayne	Hovenden, F.	Love, Terry	Munro, Jim
Buchannon, Al	Frame, Robin	Jones, Ken	Mangles, John	Pederson, Ingram
Burkell, Daryl	Godin, Jean	Kramp, Deryk	Marinus, Hub	Robertson, Jim
Card, Clint	Helina, Tom	Kreeger, Jerry	Mellis, Alex	Vandale, Craig
Card, Ray	Henderson, Mark	MacLeod, Dan	Morrison, Lorne	Wilson, Wayne

F. Beban Logging

Brayden, Ross	Frank, Art	MacKenzie, R.	Meredith, R.	Stephenson, Rick
Brost, G.	Hayward, R.	MacMillan, D.	O'Neil, Mark	Taylor, Larry
Cumming, J.	Kennedy, Greg	Mangles, W.	Peterson, E.	
Edwards, D.	LaRose, Don	McBride, Doug	Reddy, Noel	
Erickson, R.	Leigh, Frank	McKay, Dan	Reynolds, R.	

Hayes Forest Services

Amstutzs, Dan	Goodridge, H.	McMillan, Mike	Newbaurer, Rick	Rein, Paul
Churchill, Barry	Halvorsen, Al	Morrissey, Tom	Paulsen, Bert	Russell, Tom
Daoust, Don	Halvorsen, All	Munro, Dennis	Pletti, Dan	Rye, Dennis
Geary, Pat		Munro, J.	Price, Lance	Spelay, Blaine

Onion Lake Logging

Babin, R.	Eliason, Rob	McGhie, Doug	Ramsay, H.	Westbrook, W.
Choquette, Steve	Everett, Ron	Masters, R.	Rowsell, Derek	Wilson, B.
Crowhurst, John	Lum, Tammy	Noye, Bill	Westbrook, Gary	

Friell Lake Logging

Bailey, K.	Carson, Brian	Hennessey, Don	McMillan, Hugh	Schinkewitz, G.
Barton, H.	Cook, John	Hennessey, Lee	Murcheson, S.	Smith, Rick
Bowker, Brian	Donovan, Ken	Jensen, Lars	Rocheleau, P.	Smith, Rod
Bowker, Bruce	Hanson, Randy	Laakmann, W.	Schinkewitz, D.	

Russell& Lilly Ltd.

Collins, Frank	Hunuchuk, Randy	Moeskau, Keith	Roberston, Ken	Russell, Rob
Gibson, Bill	Large, Dave	Nasichuk, Jim	Rogers, Dennis	White, Frank
Hargreaves, Larry	Lind, Eric	Puglas, Tom	Russell, Don	
Hargreaves, Mike	Moeskau, Glennis	Read, Laurence	Russell, K.	

Spirit Lake Timber Ltd.

Behan, N.	Crowhurst, Doug	Pridge, Dave	Rogers, Jim	Tinga, R.
Cox, Leland	Fitzgerald, J.	Pridge, Lou	Shorman, Todd	Wheeldon, Jim

Westside Road Building				
Duyvewaardt, R.	Fisher, D.	Reese, D.	Rosborough, Rob	Stetaford, P.
Elgie, Jim				

RainForestree.				
Benedict, M.	Guss, A.	Kasper, Marta	Spence, D.	Yateman, J.
Frank, D.	Kasper, Derek	Read, C.	Whyte, A.	Parker, Lee

Mt. Leighton Forestry Services		
Bob Curr	Hudson Savey	Ed Mark

Upland Excavating			
Bruneau, R.	Darkin, D.	Lukey, J.	Tacmauski, G.
Chepyha, John	Green, R.	Pierce, D.	

TMR Enterprises Ltd.			
Comey, R.	Henri, Ed	Rudolph, Monte	Sankey, R.
Flynn, Andy	Lewis, Dave	Rudolph, Todd	

Queensway	Haynes, Wendell

RG Mecredy Forest Consulting Ltd.	Blueschke, P.	Mecredy, Ron

Ridinger and Cooke Log Scaling	Cooke, T.	Ingram, L.	Petzold, Ed	Tracy, Bob

Calverly For. Services				
Calverly, Pete	Martin, T.	Saarela, B.	Thompson, D.	Wall, T.

Ministry of Forest Contacts

EMERGENCY NUMBER:
1-800-663-5555

Coastal Fire Centre (Parksville):

Address: 665 Allsbrook Road, Errington, B.C. V9P 2T3
Fire Calls: **(250) 951-4200**
General Enquires: 951-4222 or 4201 Fax: (250) 951-0823

Key Personnel:	Office Phone	Pager #	Cell Phone
Phil Taudin-Chabot (Mgr)	951-4208		
Jim Kirby	951-4217	741-9681	755-9265
Darrell Orosz	951-4216	741-9687	755-5625
Brent Anderson	951-4218	954-6154	954-8229
Dan Morrison (Weather)	951-4206 (Fax: 954-0264)		
Bonnie Lefebre	951-4207	954-6574	954-9192
Sue Hing	951-4215		
Jan Cameron	951-4209	755-8252	951-8961
Debbie Hawkes	951-4214	755-8249	951-8962

Quinsam Fire Base (Campbell River):

General Enquires: **286-7560 or 286-7645** **Fax: 286-7561**

Key Personnel:			
Terry Preston	286-6532	741-9729	287-6750
Barry Alexander	286-9714	741-9731	287-6641
Rob Fraser	286-3795	741-9675	203-1135
Clint Parker	286-7579	830-6471	203-1136

Campbell River District Office:

Office **286-9300**

Note: When reporting a fire to the MOF, the 1-800 number is the best number to call since the receptionist/dispatcher will automatically record: your name, time & date, location, and any other pertinent information supplied to them. This documentation may be important later to prove due diligence. The receptionists at any of the other numbers listed above, may not necessarily record all the information supplied to them.

TO REGISTER A BURN CALL:

1-888-797-1717

Prevention Duties & Responsibilities

a) **Supervision:**

1) All fire prevention and fire suppression will be supervised by the Manager or a designate.

b) **Designated Fire Warden:**

1) Will supervise the fire safety program
2) Maintain the fire equipment. Equipment and pumps stored at the camp should be tested once per month. Pumps kept in readiness at logging sides must be started regularly during hazardous weather.
3) Arrange for additional men required for patrol.
4) Co-ordinate all fire equipment when combating fires and during slash burning.
5) Ensure that weather stations are situated in the proper location to reflect the hazards in the working area.
6) Ensure that fire prevention and fire fighting tools are on hand in the right locations at all times in accordance with the Forest Fire Prevention & Suppression Regulation.
7) Ensure that the weather readings are taken correctly and phoned in daily.
8) Ensure that the right actions are taken according to the appropriate hazard ratings - i.e. fire watch, early shift, closure if necessary.
9) Initiate fire drills in all locations.

c) **Fire Drills:**

1) A fire drill will be held on all company and contract operations at least once a month. The purpose is to acquaint each crew member with his responsibility, the chain of command, as well as the use and location of fire equipment. When yarding equipment is moved to a new setting, it is important to undertake the fire drill immediately after the move. The hooktender will become familiar with the sources of water and the fire attack plans for each new locality.

2) When hazardous conditions force discontinuance of operations, one or two hours early, then this time can be used to advantage by holding a fire drill.

3) All operations could be asked to conduct a spot fire drill at any time during the fire season.

d**)** **Fire Fighting Equipment**

1) It will be the duty of the foremen at all operations, to see that all fire equipment on machinery and in the main tool cache is up to standard at all times. A check will be made at least once per month by the designated Fire Warden. Contractors will ensure that fire equipment, the tool cache and weather stations are maintained throughout fire season.
2) The foremen in all the areas will be notified of the check with comments pertaining to the fire equipment standards.

E. SUPPRESSION

Western Forest Products Limited (WFP) is a proponent of early discovery, prompt action, and immediate suppression, and therefore, endorses the 10:00 hrs. concept (i.e, when a fire is discovered, the objective is to have it under control before 10:00 hrs. the following day).

The procedures described below apply to all operations in case of a fire.

Report of Fires

- It is the responsibility of the woods foreman or supervisor to inform the Manager of his designate immediately upon the report of a fire.
- Logging shall cease immediately if an operational fire occurs. The Manager or Woods Foreman shall assume the responsibility of supervising fire fighting. Where necessary, he shall use all available manpower.
- The Ministry of Forests Quinsam Fire Base, will be immediately notified of the outbreak of any fire.
- All fires shall be reported to WFP's Vancouver Head Office (Vic Woods or Bill Dumont). In the event of simultaneous fires in more than one division, the allocation of resources is the responsibility of Vic Woods or Bill Dumont.

Fire Suppression Staff Responsibilities & Duties

Operations Manager or designate

Takes overall charge of the suppression action and directs immediate supervisors. Liaison with: the Ministry of Forests, Head Office, neighbouring companies, the press, and the public.

Woods Foreman

Proceed to the fire and assume direction of the suppression action. Size up and report the requirements to the Manager or designate. Note the origin of the fire. Decide if equipment will need to be moved, if air support is required, and provide overall supervision of field activities.

Fire Warden

Distribute equipment and maintain accurate records of deployment. Help the Woods Foreman in assessing the size of the fire, equipment and manpower required. Clean and repair the equipment as required. Keep the tool cache in an orderly, easily accessible fashion.

Office Staff

Keep an accurate log, with times of pertinent facts. Notify the Manager, or designate or Woods Foreman of details of the fire and provide an accurate map reference. Call additional manpower if required and arrange transportation of crews. Should crews be kept late, meals must be ordered and families notified. Maintain contact with the weather office as requested for forecast updates.

Bullbucker

As requested, organize fallers, their equipment and transportation.

Shop Foreman

Carry out maintenance and repair on the fire fighting equipment. If necessary, arrange shifts to provide continual coverage. Send crews to ready slip-on-tanks for fire trucks for transport to the site.

Road Foreman

Direct the movement of grade department equipment as required. Supervise the construction of fire guards and access roads to water supplies.

Engineers & Foresters

Assist the Manager or designate and Woods Foreman in determining local water supplies, firebreaks, potential problem areas. Direct crews and set up equipment where required.

Fire Suppression Job Safety Breakdown

- Be equipped with: caulk boots, hard hat, long sleeved non-synthetic clothing, gloves, & eye/ear protection where required.
- Be thoroughly informed of fire behaviour.
- Know where the fire is at all times.
- Know where your escape routes are at all times.
- Do not cross the head of a fire unless there is a way out.
- Be in the clear during water drops (bird dog will indicate path).
- If caught in a water drop:
  - lie flat, face down with head towards incoming drop (hard hat on).
  - place all hand tools safely behind your feet while laying down.
  - remain down until after the water drop.
- Always work with a partner and know where your partner is at all times.
- Keep clear of burning or burned snags.
- Use caution when stepping on burned logs (they roll).
- Beware of rolling material on steep side hills.
- Keep well spaced from other workers when working with hand tools.
- Do not operate pumps in excess of pressure needed.

IN THE EVENT OF BEING SURROUNDED BY FIRE:

- DON'T PANIC - Work fast but do not run.
- Call (Radio) for Immediate Assistance.
- Keep hand tools with you at all times.
- Investigate possibilities of jumping through the burning edge of the fire from unburned to already burned area. Place hat or coat over face when jumping through the fire.
- Locate an area free of debris and dig a trench - lie face down, breathing through dampened clothing. Keep low until smoke clears.
- If possible, locate water or a swamp and submerge yourself.
- Remain with your partner.

PROCEDURES FOR CALLING WATER BOMBERS

1. Authorized person (or delegate) **must** call the MOF Fire Centre for authorization to dispatch water bombers. (Authorized persons are: Trevor Boniface, Mark Kenny, Ron Todd, & Layne Thornton).
2. Water bomber can be put on standby
3. Upon authorization from MOF the water bomber may be called in.
4. Vic Woods or Bill Dumont **must** be contacted immediately (if available).

Checklist for Calling MOF Water Bombers

STATE CLEARLY:

COMPANY NAME_____

CALLERS NAME_____

PHONE NUMBER_____

LOCATION OF THE FIRE:

a. Geographic (ie. drainage, direction & distance from nearest town/camp, or BCFS map grid)

_____

_____

b. Physical (ie. topography, elevation, aspect)

_____

_____

WEATHER CONDITIONS: (ie. visibility, ceiling level, wind direction & speed)

_____

_____

EQUIPMENT REQUESTED: (ie. Water bomber, Helicopter, Alert, Call out)

_____

_____

BURNING CONDITIONS OF THE FIRE:

(ie. species, standing timber or F&B, lightning strike, adjacent area, potential damage)

_____

_____

APPROXIMATE SIZE & RATE OF SPREAD:_____

ACTION BEING TAKEN:_____

NAME OF FIRE BOSS: _____

RADIO FREQUENCY TO USE: (ie. Company, Contractor)

APPENDIX I
List of Available Helicopters in the Area:

Company	Location	Contact Person	Phone Number	Available Helicopters
V.I.H.	Gold River	Morris McNalley Ian Wood	283-7616	1 Bell 206L 1 Bell 206B
	Campbell River	Office	926-3133	1 Bell 206L 2 Bell 206B
	Port McNeill	Office	956-8234	2 Astar
	Port Hardy	Office	949-6605	1 Bell 206B 1 Twinstar
Long Beach	Campbell River	Office	286-8863	1 Astar
West Coast Helicopters	Port McNeill	Office	956-2244	2 Astar 1 Bell 206B

APPENDIX II
List of Adjoining Operations:

Company	Location	Contact Person	Occupation	Contact Number
Canadian Forest Products Ltd.	Woss (Coast Logging Div.)	Office Wayne Green John Holmes	 General Manager Mgr Logging Div.	281-2300 956-3692 (h) 923-8439 (h)
TimberWest	Campbell River (Oyster River Division)	Office Al Aagaard Paul Berg	 Fire Warden Op. Supervisor	830-2800 286-2048 (cell) or 203-1119 (fire) 830-2803 (o) or 286-2529 (cell)
Interfor	Tofino Campbell River	Office Office		725-4444 286-5000
Coulsen Logging	Port Alberni	Office Bob Howie	 Mgr (For/Eng)	723-8118 752-6087
Eldred River Logging	Mooyah Bay	Stan Uzzell		287-2118

APPENDIX III
Radio Frequencies:

Company	Location	Transmit	Receive
Western Forest Products	Gold River (Direct) Gold River (Repeater) Heli (Gold River)	152.450 153.110 164.760 (tone 100)	152.450 152.450 162.195
	Zeballos (Direct) Zeballos (Repeater)	152.420 153.200	152.420 152.420
	Mooyah Mountain	153.005	152.285
Frank Beban Logging	Gold River Jacklay	168.690 171.390	168.690 171.390
Friell Lake Logging	Houston, Silverado	170.520	170.520
Hayes Forest Services Ltd.	Plumper Harbour (direct) Plumper Harbour (repeater)	151.925 152.885 (tone 151.4)	151.925 151.925
Onion Lake Logging Ltd.	Kendrick	152.180	152.180
Russell & Lilly Ltd.	East Tahsis, Head Bay	151.115	151.115
Spirit Lake Timber Ltd.	Head Bay, Hisnit	152.240	152.240

APPENDIX IV

COMMUNITY PHONE NUMBERS

EMERGENCY: Police, Ambulance, Village Fire Departments: 911

	Non Emergency Numbers			
	Hospital	RCMP	Fire Dept.	Ambulance
Gold River	283 - 2626	283 – 2227	283 - 2522	1-800-461-9911
Tahsis	934 - 6322	934 – 6363		1-800-461-9911
Zeballos	761 - 4274	956 – 4441 (collect)	761 - 4255	1-800-461-9911
Campbell River	287 - 7111	286-6221	286 - 6226	1-800-461-9911

Coast Guard Search & Rescue

Campbell River	287-8612
Comox	339-3613
Emergency	1-800-567-5111

EQUIPMENT & RESOURCES AVAILABLE

Company Name	Camp Name	Resources						
		Number Employees	Excavators & Bulldozers	Water Delivery Systems	Fire Hose Amount & Size	Fire Pumps	Powersaws	Vehicles
Western Forest Products	Gold River Forest Operation	120	5 - 235 hoes 1- D7 Cat 1- D8 Cat	7 - Tank trucks (5,000 - 8,000 l) 1 - Porta Tank (12,000 litres)	12,000 metres (1" & 1 1/2")	18 - Wajax Mk III 4 - Volume Pumps	75 - Husqvarna	24 - 6 man 2- 9 man 1 - 12 man 1- 100 ton lowbed
Western Forest Products	Zeballos Forest Operation	80	1 - D7 Cat 1- Hitachi WH171 exc. 1 Kobelco MD 450 Mark liex 1 John Deere 892 excavator	4 - Tank trucks (5,000 - 8,000 l) 1 - Porta Tank (13,500 litres)	7,900 metres (1 1/2")	3 - Volume Pumps 7 - Wajax Mk III 1 - Initial Attack Unit	12 - Husqvarna 288 34 - Stihl 066	3 - 9 man 12 - 5 man 1 - 12 man 1 - 100 ton lowbed
Frank Beban Logging	Gold River	25	1- D8 Cat 1- 300 Hitachi 1 - 120 Hitachi	3 - Tanker trucks (1,500 gal) 1 - Porta Tank (3,000 gal)	8,000 ft (1 1/2")	4 - Wajax pumps	12 - Stihl 066	8 - 6 man 1 - Ambulance 1 - 100 ton lowbed
Cypress Creek Logging Ltd	Gold River	7	1 - D7 Cat	1 - Tank Unit (4,500 litres)	457 metres (1 1/2")	1- Honda 1 - Wajax Mk III	3 - Husqvarna 394	1 - 12 man van
Lemon Point Logging Ltd	Gold River	6	1 - 528 Skidder	1 - Tank Unit (4,500 litres)	457 metres (1 1/2")	1 - Wajax Mk III	2 - Husqvarna 288	1 - 12 man van
Frank Beban Logging	Jacklah River	30	2- D8 Cats 1 - Rubber tire Case Hoe 1- Moxy	1 - 3,300 litre tanker 1 - 4,400 litre tanker	1,500 metres (1 1/2")	1 - Volume pump 3 - Wajax Mk III	15 - Stihl 066	4 - 5 man 6- pickups 1- 100 ton lowbed 2- Ambulance
Friell Lake Logging Ltd	Houston River Silverado	30	2 - TD25C 2- EX400	1 - 5,500 litre tank trailer 1 - 9,000 litre tank trailer	1,350 metres (1 1/2")	2 - Wajax Mk III 4 - Honda WH20X	6 - Husqvarna 300	8 - 3 man 1 - 60 ton lowbed
Hayes Forest Services Ltd	Plumper Harbour	35	2 - 690 John Deere exc 1 - D8 Cat 1 - Cat 235 excavator	2 - Tanker trucks (4,500 litres)	1,500 metres (1 1/2")	3 - Wajax Mk III 2 - Honda	12 - Husqvarna 394	5 - 5 man 1 - pickup 1 - 100 ton lowbed
Onion Lake Logging Ltd	Kendrick Arm	20	2 - D8 Cats 1 - UH12 Excavator	2 - Tanker trucks (4,500 litres) 1 - 13,000 litre tank	1,500 metres (1 1/2")	6 - Wajax MkIII 1 - Volume Pump 2- Honda	6 - Husqvarna 2100	5 – pickups 2- 5 man 1-100 ton lowbed
Russell & Lilly Ltd	East Tahsis Head Bay	30	1 - D7 Cat 1 - EX300 1 - EX400 1 - D355	1 - Slip on Tank (4,500 litres) 1 - 13,000 litre tanker 1 - 18,000 litre tanker	3,000 metres (1 1/2")	2 - Wajax Mk III 3 - Volume Pumps	12 - Husqvarna	10 - 5 man 2 - 15 man vans 1- 100 ton lowbed
Spirit Lake Timber Ltd	Head Bay Hisnit	18	1 - D9	1 - 4,500 litre tanker 1 - 5,800 litre tanker	1,500 metres (1 1/2")	2 - Wajax Mk III	10 - Stihl 066	3 - 5 man 4 - pickups 1 - 120 ton lowbed
Westside RoadBuilding	Gold River	10	2 - D8 Cats 2 - Excavators 2- Rock Trucks				2 -	2 - 6 man
Upland Excavating	Plumper Harbour	3	1-690 John Deere 1 - 300 Komatsu 1- D7 Cat		1,000 metres (1 1/2")	2- Wajax Mk III	1 - Husqvarna	1 - 5 man crewcab 1 - pickup