Appendix V Timber Supply Analysis Information Package

CANADIAN FOREST PRODUCTS LTD.
NIMPKISH TREE FARM LICENCE 37
MANAGEMENT PLAN #8

TIMBER SUPPLY ANALYSIS
INFORMATION PACKAGE

Prepared by:

Canadian Forest Products Ltd.
&
Timberline Forest Inventory Consultants Ltd.

98.06.01

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File: 9640060

B.C. Ministry of Forests
Timber Supply Branch
3rd Floor – 595 Pandora Street
Victoria, BC
V8W 9C3

Attention: Mike Clarkson, R.P.F.
Timber Supply Analyst

Dear Mike:

Re: TFL 37 MP #8 Timber Supply Analysis Information Package

On behalf of Canadian Forest Products Ltd., please accept the enclosed Information Package for TFL 37. The report has been updated based on comments from various MoF and MoELP staff at and since meeting in Nanaimo, 97.10.12. We trust the information provided in the report is acceptable and will permit Canfor to proceed with the timber supply analysis.

Please call if you have any questions or comments regarding the report.

Sincerely,
Timberline Forest Inventory Consultants Ltd.

Bill Kuzmuk, RPF
Forester, Resource Analysis

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1.0 INTRODUCTION

This Information Package has been prepared on behalf of Canadian Forest Products Ltd. (Canfor) as a source document prior to the completion of the Timber Supply Analysis for TFL 37 Management Plan #8 (MP #8). It serves as a summary of the inputs and assumptions made in preparing for the analysis. The analysis process is a dynamic one and inputs and assumptions may change. Included are inventory and landbase summaries, growth and yield information and management assumptions for timber and non-timber resources related to timber supply. The Information Package follows the suggested format of the Timber Supply Analysis Information Packages for Tree Farm Licences Version 2.0, (MoF, February 1997).

The following options will be analysed for the Timber Supply Analysis Report:

- MoF Base Case;
- Product-Based Silviculture Option;
- Additional Incremental Silviculture Option;
- Vancouver Island Land Use Plan Implementation (VILUP) Option; and
- Recommended Management Option.

Analysis inputs attempt to reflect management practices for TFL 37 and correspond to the approval date of the SMOOP (Statement of Management Objectives Options and Procedures), 97.03.18. Management guidelines reflecting Forest Practices Code (FPC) requirements will be included in the MoF Base Case option. In some cases more recent information has been incorporated into the assumptions based on availability of information and acceptance by MoF.

Analysis of options will use CASH6, Timberline's in-house forest estate simulation model. CASH6 is capable of explicitly simulating integrated resource management by regulating forest cover. Various levels of spatial resolution may be achieved by the use of compact and contiguous resource emphasis areas within which forest cover constraints are applied. This allows an "Integrated Resource Land Base" approach with full contribution to analysis of the non-timber resource values of the entire productive forest.

Upon acceptance by the Timber Supply Analyst, the assumptions and methodology provided in this information package will be used by Canfor to prepare and submit a timber supply analysis to the Timber Supply Analyst and a 20-year plan to the District Manager. A number of alternative harvest flows will be evaluated within the various analyses in order to gain a complete understanding of the factors that influence timber supply on TFL 37. Inputs and assumptions that represent Canfor's intended management regime for TFL 37 will be presented in the Recommended Management Option. All analysis results will be provided to the Chief Forester of British Columbia for his allowable cut determination.

2.0 PROCESS

Following acceptance, this Information Package will be included as an Appendix to the Timber Supply Analysis Report of TFL 37 MP #8.

The contents of this information package reflect inputs from the previous Management & Working Plan (MWP #7) process, from public and resource agency review of MWP #7 and the SMOOP for MP #8 as outlined in the Management Plan Review Strategy.

Forest inventory and landbase information has been collected in a series of recent field projects and associated mapping (GIS) updates. This information is maintained in Canfor's GIS database. This database has been used to prepare summaries for the Information Package and inputs to the timber supply analysis.

Technical details submitted in this Information Package will be reviewed by MoF Timber Supply, Resources Inventory, and Research Branch staff. In addition, Port McNeill Forest District and Vancouver Forest Region staff will evaluate the assumptions in this Package. Some review has already taken place.

The Information Package has been prepared in consultation with the designated MoF Timber Supply Analyst to ensure that all information necessary to evaluate the timber supply situation of TFL 37 is available to the Chief Forester of B.C.

2.1 Missing Data

The following are not included in the current draft of the Information Package:

- Details for the minimum harvest ages related to the Products Based Silviculture option (Section 12.0);
- Additional sensitivity analyses not considered thus far. Descriptions of any additional analyses will be provided in the Timber Supply Analysis Report.

3.0 TIMBER SUPPLY OPTIONS

This section describes the various management options, or scenarios, that will be presented in the Timber Supply Analysis Report.

3.1 MoF Base Case Option

The MoF Base Case option will include:

- Management activity as defined by historical operations with emphasis on the last 5 years;
- Implementation of the Forest Practices Code (FPC) as it is being interpreted at March 1997, including riparian management;
- Recommended Landscape Units (LUs) and weighted average old growth constraints based on MoF guidelines to address landscape level biodiversity;
- A recently updated (97.01.01) forest cover inventory;
- Average Volume Lines (AVLs) for mature (100+ years old) natural stands with acceptable stratification;
- VDYP natural stand yields (NSYTs) for young (36 - 100 years old) natural unmanaged stands and mature stands without AVL-based stratification;
- TIPSY managed stand yields (MSYTs) for all existing (1 – 35 years old) and future managed stands;
- Current close utilisation standards;
- Updated site productivity values from recent TEM mapping and Site Index Biogeoclimatic Ecological Classification (SIBEC) correlation;
- Basic silviculture on all sites;
- Genetic gains from tree improvement;
- Incremental silviculture on demonstrated sites;
- Protected Areas (PAs) from the Vancouver Island Land Use Plan (VILUP);
- Visual quality requirements;
- Consideration for sensitive areas based on recent inventories including wildlife, terrain and recreation;
- Revised operability; and
- Considerations for uneconomic forest stands and forest health.

3.2 Sensitivity Analyses

Sensitivity runs for this option will address any issues that have uncertainty associated with them. Sensitivity analyses are grouped into three basic categories:

- Landbase revisions;
- Growth and yield inputs; and
- Management considerations and forest cover constraints

Table 3.1 lists proposed sensitivity analyses for the MoF Base Case option.

Table 3.1 – MoF Base Case Sensitivity Analyses

Issue	Sensitivity Levels to be Tested
Landbase revisions	remove technically unconventional areas
	remove marginally economic timber types
	include uneconomic mature stands with productive regeneration attributes
Growth and yield inputs	adjust future managed stand yields by +/- 10%
	reduce managed minimum harvest ages by 10 years
	increase and decrease regeneration delay
Management considerations & Forest cover constraints	increase and decrease maximum disturbance constraint in all Resource Emphasis Areas
	Low emphasis biodiversity requirements (old growth) on all LU-BEC/NDTs
	relax green-up requirement in non visually sensitive areas to 2.0 metres and 1.0 metre
	alternative forest cover constraints around 2 goshawk nest sites (Loon Lake & Vernon Ridge)
	alternative forest cover constraints around all 8 goshawk nest sites
	use 20-Year Plan blocks in spatial analysis with CASH6

Section 11.0 provides complete details for each sensitivity analysis for the MoF Base Case option.

3.3 Additional Options

This section provides an overview of the additional options for the timber supply analysis.

3.3.1 Products-Based Silviculture Option

This option reflects input from Canfor staff related to target log sizes and species preferences in order to meet future product expectations. Modification of analysis inputs will include revised silviculture regimes and associated MSYTs. A review of height, diameter, MAI and volume will be considered to ensure that product objectives will be met from future managed stands. Section 12.0 provides details of the revised inputs planned for the Products-Based Silviculture option.

3.3.2 Additional Incremental Silviculture Option

This option will evaluate the timber supply impacts of increasing the level of incremental silviculture on TFL 37. Canfor currently has an extensive programme of spacing, fertilisation, first generation seed orchards and commercial thinning. Gains from second-generation tree improvement combined with spacing and fertilisation will be evaluated in this option. The revised inputs for this option will be conducted on both the MoF Base Case and Product-Based Silviculture options. Section 13.0 provides details of the inputs for this option.

3.3.3 Vancouver Island Land Use Plan (VILUP) Option

The VILUP was recently completed and affects forest management on TFL 37. This option will review the impacts of the various management requirements and landbase designations associated with the Plan. Recommended biodiversity emphasis (old growth) will be assigned to each LU compared with the weighted average old growth requirement used in the MoF Base Case. In addition, there will be a number of sensitivity analyses performed on this option including:

- Addition of uneconomic stands with productive regeneration attributes;
- Impact of new parks within the TFL to the harvest forecast; and
- Revised forest cover constraints in Low Intensity Areas (LIAs), General Forestry Areas (GFAs) and High Intensity Areas (HIAs).

Section 14.0 provides full detail of the revised assumptions associated with the VILUP option.

4.0 MODEL

The proprietary simulation model CASH6 (Critical Analysis by Simulation of Harvesting) Version 6 will be used to develop harvest schedules for all options and sensitivity analyses included in the MP #8 timber supply analysis. The model uses a geographic approach to landbase and inventory in order to adhere as closely as possible to the intent of forest cover constraints on harvesting. Maximum disturbance and minimum old growth retention constraints on forest cover are explicitly implemented.

A variable degree of spatial resolution is available depending on inventory formulation and resource emphasis area definitions. Forest stands in refuges such as environmentally sensitive and inoperable areas that do not contribute to harvest can be included to better model forest structure and disturbance levels.

In their current implementation forest cover constraints require a control area over which to operate. Common sense indicates that the control area for a constraint set should correspond in some way to an element in the landscape. For example, the constraints associated with visual quality objectives are designed to operate on the scene visible from discrete sets of viewpoints. Pseudo-geography may be employed to translate spatial constraints on harvesting into forest cover and static access constraints. The objective is to identify the "natural" constituency for forest cover constraints. CASH6 contains a hierarchical landbase organisation to assist in implementing control areas. Numerous levels of land aggregation are used to define both geographically separate areas and areas of similar management regime. Forest cover constraints can be applied at all levels.

CASH6 will be used to determine harvest schedules that incorporate all integrated resource management considerations. The model has functionality that allows height-based green-up using analysis units yield information.

CASH6 will be employed to model the 20-Year Plan spatial analysis. Proposed cutblocks designed by Canfor staff will be included in the GIS database and blocks will be assessed for adjacency and other forest cover requirements during the simulation process. Harvested areas selected by CASH6 may be viewed on-screen or ported back to the GIS system for hardcopy plotting.

5.0 FOREST INVENTORY

All spatial information is captured and controlled to the Terrain Resource Inventory Mapping (TRIM), North American Datum (NAD) 83 base. The updated TFL 37 inventory includes updated forest cover attributes in a digital and spatial format compatible with the provincial inventory database. 1:15,000 colour photography flown in 1995 was used to delineate stands to MoF forest cover inventory standards. An air and ground observation program supported classification. MoF Vancouver Region staff have reviewed classification procedures and results.

The forest cover inventory is updated for disturbance to 97.01.01. Inventory data has been prepared using Canfor's in-house GIS. Use of GIS ensures that spatial relationships between the various inventory attributes are maintained throughout the analysis process. For example, existing roads will be buffered to provide specific area reductions from the net harvesting landbase. For analysis purposes the inventory will be assigned to 10-year age classes.

6.0 DESCRIPTION OF LAND BASE

This Section describes the TFL 37 landbase and the methodology used to determine the way in which land contributes to the analysis. Some portions of the productive landbase, while not contributing to harvest, may be available to meet other resource needs.

6.1 Timber Harvesting Land Base Determination

Table 6.1 presents the results of the netdown process to identify the timber harvesting or net operable landbase.

Table 6.1 - Timber Harvesting Landbase Determination - MoF Base Case

Land Classification	Total Area[1] (ha)	Net Reduction		Net Remainder	
		Area (ha)	Volume (1000s m^3)	Area (ha)	Volume (1000s m^3)
Total Area	188,745			188,745	77,176
New parks	11,422	11,422	5,348		
Non-prod forest & Non-forest	21,916	21,916	0		
Roads	2,223	1,626	304		
Non-commercial (NCBr)	175	175	0		
Productive Forest	153,607			153,607	71,524
Productive reductions:					
Physically inoperable	17,422	13,132	7,621		
RRZs & RMZ exclusions	5,841	5,053	2,298		
ESAs:					
Wildlife	6,328	5,385	4,396		
Campsites/Recreation	62	37	13		
Avalanche track	8,826	1,663	431		
Soils (Terrain V)	11,697	4,043	2,185		
Soils (Terrain IV)	32,192	2,381	1,264		
Regeneration(colluvium)	5,202	311	208		
NSR	541	480	0		
Wildlife tree patches	1,110	1,021	360		
Uneconomic forest	27,799	17,332	6,527		
Total Reductions		50,838	25,303		
Reduced landbase				102,768	46,221
Additions of NSR				480	0
Current Net Operable Landbase				103,248	46,221
Less future roads (3.5%)		2,168			
Long-term Net Operable Landbase				101,080	46,221

[1] Total area includes all non-park area for a given land classification within TFL 37

6.2 Total Area

The total area of TFL 37 is 188,745 ha including 11,422 ha of new parks. There are 9,253 ha of water, 12,663 ha of non-forest and non-productive forest (including roads) and 153,607 ha of productive forest land. Some of the areas reported above differ from those included in the MWP #7 timber supply analysis. A significant number of revisions and additions have been made to the TFL 37 inventory database over the period of MWP #7. The majority of the differences can be attributed to the following:

- The current inventory database includes a new boundary from Resource and Tenures Branch (provided in digital format);
- Re-inventory of the forest cover to a much smaller polygon size than was used in previous inventories;
- Re-classification of previously non-productive areas as productive based on closer review of forest cover, standing timber and regeneration potential;
- Shift to NAD 83 TRIM base mapping;
- Designation of new parks as part of the VILUP; and
- New BEC inventory which re-classified previously non-productive areas as productive.

6.3 New Parks

The VILUP identified a number of new parks (protected areas) within TFL 37 that will no longer be available for timber harvesting. A list of the new parks and associated netdown areas is summarised in Table 6.2.

Table 6.2 - New Park Reductions

New Park	New Park Reductions		
	Total Area (ha)	Gross Productive	
		Area (ha)	Volume (1000s m^3)
Claude Elliot	210	109	76
Lower Nimpkish	266	193	104
Nimpkish Lake	3,910	3,080	1,943
Schoen Lake	654	650	488
Woss Lake	6,382	4,040	2,737
Total	11,422	8,072	5,348

Some of the parks listed above were established prior to the VILUP. These parks have since been expanded as part of VILUP recommendations. Productive forest areas within the new parks, plus the remainder of Schoen Lake Park will contribute to biodiversity requirements on TFL 37. These requirements include old growth and in some cases stand level biodiversity (WTPs).

6.4 Non-Productive Forest & Non-Forest

All land classified as non-forest or non-productive forest, such as lakes, swamps, rock, alpine, *etc.* is excluded from the timber harvesting landbase. Table 6.3 summarises the non-productive forest and non-forest removed for the timber supply analysis. These areas will not contribute to either the landscape level biodiversity requirements or the annual harvest in the analysis.

Table 6.3 - Non-Productive & Non-Forest Reductions

Classification	Area (ha)
Alpine	7,130
Clearing	2
Gravel bar	56
Gravel pit	83
Lake	7,244
Mud	16
NC	25
NP	1,158
NPBr	1,593
Rock	1,881
River	817
Swamp	1,192
Sand	11
Highway, hydro & railway R/W	707
Total	21,916

6.5 Roads and Trails

6.5.1 Existing Roads and Trails

Existing roads and trails were captured in the GIS database and buffered for the appropriate width and used in the overlay process to identify the area lost permanently from the productive landbase. Landings and other road-related disturbance including gravel pits have been removed as non-productive areas as described in Section 6.4. The TFL 37 re-inventory identified polygons less than 0.1 ha in size thereby capturing these small landbase features.

Road widths are defined as the distance between productive growing sites on either side of a given type of road. In general, the area removed is comprised of the cut slope, ditch and running surface. Fill slopes are assumed to be fully productive so no reduction is made for them.

Road widths were physically measured on various road categories including the railway. Widths were measured from stem to stem on older roads and between areas of plantable ground on new roads. No adjustment or allowance was made for crown closure or edge effects.

Results of the width measurements were compared to the post-harvest site degradation database. This database includes detailed road measurements on 186 cutblocks. All road widths measured during the 1997 survey compared well with this site degradation data. TFL average width from post harvest measurements is 10.2 metre, excluding fill slopes). Table 6.4 summarises the existing road inventory and associated removals for TFL 37.

Table 6.4 – Existing Road & Railway Reductions

Road Classification & R/W Width (m)		Total Length (km)	Total Area (ha)	Area Reduction (ha)
Primary				
actively maintained (AM)	13	193	251	187
Secondary				
actively maintained (AM)	11	585	643	506
semi-permanent deactivated (SD)	10	65	65	50
temporary deactivated (TD)	10	9	9	7
Spur				
actively maintained (AM)	10	434	434	313
semi-permanent deactivated (SD)	9	652	587	429
temporary deactivated (TD)	9	52	47	47
permanent deactivated (PD)	8	65	52	41
not maintained (NM)	8	35	28	21
Railway	11	97	107	23
Total		2,187	2,223	1,626

6.5.2 Future Roads

Future road development will include only secondary and spur roads. Virtually all mainline roads are in place for accessing the TFL. Additional railway development is not expected to take place. A review of all secondary and spur roads and the area of the net operable landbase that has road access is the basis for future road reductions. Future road reductions are summarised below.

Net operable area currently roaded	40,680
Area of roads within net operable landbase	1,621
% of net operable landbase	3.98
% of roads associated with secondary & spur roads	87.1
Non-roaded component of net operable landbase	62,568
Future roads = (0.0398 * 0.871) * 62,568 ha	2,168

These reductions will be assigned in the timber supply analysis modelling to areas without previous harvesting (100+ years old).

6.6 Non-commercial Cover

Land classified as being occupied by non-commercial species is excluded. NCBr exclusions total 175 ha for TFL 37.

6.7 Physically Inoperable

All areas classified as physically inoperable are removed from the landbase. These areas are generally inaccessible or unsafe for falling and are therefore not suitable for harvesting. An internal review of physically inoperable areas was conducted by Canfor and included safety considerations, previous performance and local knowledge. 11,632 ha are excluded at this stage of the netdowns from a total of 17,553 ha classified as physically inoperable on the landbase. Other inoperable areas were excluded under previous netdown steps. Table 6.5 summarises the reductions associated with physically inoperable areas for the MoF Base Case.

Table 6.5 – Physically Inoperable Reductions

Operability Class	Gross Area (ha)		Physically Inoperable Reductions	
	Total	Productive	Area (ha)	Volume (1000s m^3)
Physically inoperable "I"	17,422	13,132	13,132	7,621

6.8 Riparian Reserve & Management Zones (RRZs & RMZs)

FPC stream, lake and wetland classifications were used to establish riparian reserve and management zone widths. All water features were buffered using the appropriate width and used in the overlay process to identify the reserve zones. Table 6.6 summarises the netdowns for RRZs and RMZs on TFL 37.

Table 6.6 - Riparian Reserve Zone Reductions

RRZ Classification & RRZ Width (m)		Gross Area (ha)			RRZ Reductions	
		Length (km)	Total	Productive	Area (ha)	Volume (1000s m^3)
Streams						
S1 (20 – 100 metres)	50	159	1,621	1,499	1,381	482
S2	30	214	1,075	1,030	972	474
S3	20	98	348	332	314	198
Wetlands						
W1	10		177	165	158	62
W2	10		99	87	87	26
W5	10		69	56	56	20
Lakes						
L1	10		472	454	453	319
L2	10		17	15	15	8
RMZs	4 – 60		1,962	1,790	1,617	709
Total			5,841	2,576	5,053	2,298

As noted in Table 6.6 portions of RMZs were excluded to reflect partial cutting requirements. Various basal area retention prescriptions have been assigned to each riparian class. Rather than model partial cutting to represent the basal area retention within RMZs, Canfor will reserve the landbase equivalent. Table 6.7 summarises the basal area retention requirements for each RMZ identified on TFL 37.

Table 6.7 - Riparian Management Zone Reductions

RMZ Classification, RMZ Width (m) & Stream Length (km)			Maximum BA Retention (%)		Reserve Width of RMZ [1](m)	
			Low Intensity Areas (LIAs)	All Others	Low Intensity Areas (LIAs)	All Others
Streams	Width	Length				
S1 (>100 metres)	100	15	60	50	60	50
S1 (20–100 metres)	20	159	60	50	12	10
S2	20	214	60	50	12	10
S3	20	98	60	30	12	6
S4	30	371	64	20	19.2	6
S5	30	372	35	20	10.5	6
S6	20	4,160	15	3	3	0
Wetlands						
W1	40		40	15	16	6
W2	20		50	20	10	4
W3	30		35	5	10.5	0
W4	30		35	5	10.5	0
W5	40		50	20	20	8
Lakes						
L1	40		30	15	12	6
L2	20		40	20	8	4
L3	30		15	5	4.5	0
L4	30		15	5	4.5	0

[1] Any RMZ reserves of 1.5m or less are not part of the landbase reductions.

6.9 Environmentally Sensitive Areas (ESAs)

ESAs are identified based on a number of inventory attributes having special management requirements. In the context of timber supply analysis, management constraints are reflected in the designation of high sensitivity ESAs as non-contributing to harvest. High sensitivity ESA designations exist in the inventory for the following concerns:

- Critical importance to wildlife;
- Designated recreation sites;
- Significant avalanche concerns;
- Actual or potentially sensitive or unstable soils; and
- Severe regeneration problems caused by geo-climatic factors.

A complete summary of areas classified as sensitive on TFL 37 is presented in Table 6.8. Total ESA areas on the TFL are presented as well as the areas that reflect the ESA reductions from the operable landbase. The difference between the two is associated with areas removed for other previous deductions.

Deductions are listed in the order in which they are applied to ESAs in the operable component of the landbase. Note that only one ESA reduction is applied to any given component of the landbase.

Table 6.8 - ESA Distribution & Reductions

ESA Description	Gross Area (ha)		ESA Reductions		
	Total	Productive	% Reduction	Area (ha)	Volume (1000s m^3)
Wildlife					
Deer & Elk range	6,232	4,901	100	5,313	4,338
Goshawk nest sites	96	84	100	72	58
Recreation (campsites)	62	50	100	37	13
Avalanche	8,826	2,739	100	1,663	431
Soils (terrain class V)	11,697	7,964	95	4,043	2,185
Soils (terrain class IV)					
Kilpala	2,835	2,631	26	561	297
Other areas	29,357	25,140	10	1,820	967
Regeneration (colluvium)	5,202	4,368	10	311	208
Total				13,820	8,497

Identified wildlife areas on TFL 37 include 66 deer winter ranges, 3 elk summer ranges, 13 elk winter ranges. These areas, identified between 1973 and 1992, are based on Order in Council (OIC) and more recent updates. In addition, and 8 Queen Charlotte Goshawk nest sites have been located during research studies undertaken by Canfor, MoELP and CWS. Each nest site has been assigned a 12 ha reserve. No Marbled Murrelet nest sites have been identified in any inventories over the past six years, therefore no specific reductions for this species are required for the analysis.

Soils reductions are based on the recent terrain classification exercise. Netdown factors are based on operational performance during MWP #7, embodying current requirements of FPC. Netdown factors applied to stability classes mapped at 1:15,000 scale consider recent experience in the layout of cutblocks, and stability related to amendments to layout and logging plans. The 95% terrain class V netdown reflects the possibility of 5% of these areas making up a small section of a cutblock or road. Otherwise these areas are maintained as forest reserves.

Performance in terrain class IV areas indicates that some cutblock boundary amendments or partial cutting requirements have occurred. Typically revisions to harvesting plans have reduced proposed areas by approximately 10%. Netdown factors for terrain Class IV are based on a review of areas considered Class IV-conservative, Class IV-true and Class IV-recommended.

Questionable areas may have been classified as terrain class IV in order to remain conservative. In particular, areas classified as Class IV require a detailed assessment if the area is included in any proposed future development. Terrain

class IV includes gullies, gully headwalls and areas of concentrated seepage. Kilpala areas are considered more sensitive, typically experiencing more frequent slides, and have therefore been assigned a higher reduction factor than other terrain class IV areas.

Colluvial areas are identified as part of the preliminary terrain classification completed in 1997. Netdown factors applied to colluvial areas are based on recent operational planning and regeneration performance.

6.10 Uneconomic & Low Productivity Forest

Canfor has assigned all unmanaged productive forest stands to a stratum that is based on species composition, age, height and stocking class. The classification also assigns one of the following economic operability types based on stand description and potential for harvest:

- Economic – available for harvest;
- Marginally economic – available for harvest under certain market conditions and where adjacent to economic stands; and
- Uneconomic – not available for harvest, stand value is not expected to offset harvesting costs.

Appendix I provides the strata descriptions and associated economic operability class for all strata identified on TFL 37.

Results of the preliminary ecosystem-mapping project on TFL 37 classified all areas to the site series or composite site series level. This programme included stratification of sites into productivity groups that provide a relative measure of timber producing capability for a piece of land. Any sites identified as non-productive for timber are excluded from the timber harvesting landbase. These areas typically express productivity levels of less than $1.0m^3$/ha/year. Table 6.9 summarises economically inoperable and low productivity sites.

Table 6.9 - Uneconomic & Low Productivity Forest Stands

Leading Species	Gross Productive		Uneconomic Forest Stand Reduction		
	Area (ha)	Volume	Area (ha)	Volume (1000s m^3)	Volume (m^3/ha)
Cottonwood	10	3	6	2	287
Balsam	993	294	234	92	392
Western redcedar	772	266	459	150	326
Douglas-fir	692	134	499	73	147
Lodgepole pine	228	34	167	30	182
Mountain hemlock	6,405	2,033	3,676	1,183	322
Red alder	99	21	43	7	168
Western hemlock	7,567	3,616	4,514	2,085	462
Yellow cedar	11,033	3,907	7,734	2,905	376
Total	27,799	10,281	17,332	6,527	377

6.11 Wildlife Tree Patches

In addition to all previous netdowns to the productive forest, other areas may be required to provide sufficient reserves of productive timber for wildlife across the entire TFL. These small reserves are also referred to as wildlife tree patches (WTPs). Canfor has reviewed all areas removed from the productive forest landbase by mapping the netdown areas in the GIS. All productive forest removals of at least 0.25 ha were then given a 250-metre buffer to reflect half of the maximum acceptable distance between WTPs according to the FPC Biodiversity Guidebook.

Some net operable areas were not included in the buffered zones even though significant reductions have been imposed across the majority of the productive landbase. Additional forest polygons within the net operable forest were then identified as suitable candidates for WTPs to provide a complete distribution of productive forest reserves across the TFL. These stands have been excluded from the timber harvesting landbase to accommodate stand level biodiversity requirements. The distribution of the buffered zones covers virtually all of the productive forest landbase as shown in the map provided in Appendix IV. Table 6.10 summarises the areas excluded specifically as wildlife tree patches.

Table 6.10 – Wildlife Tree Patch Reductions

Productive Landbase Classification	Wildlife Tree Patch Reductions		Productive Area in WTPs (ha)	Productive Area in WTP Buffers (ha)
	Area (ha)	% of Productive Landbase		
Total productive forest	153,607	100	50,539	149,609
Other productive landbase reductions	49,338	32.1	49,338	49,338
Additional WTP removals	1,021	0.7	1,021	1,021
Net operable forest	0	0	0	99,250

After the additional area reductions for specific WTPs, 3,998 ha (3.8%) of net operable landbase are not included within the wildlife tree patch buffer areas. This is insignificant with respect to the total productive forest and the net operable landbase. Canfor will be meeting stand level biodiversity requirements at an operational level.

7.0 INVENTORY ORGANIZATION

In order to reduce the complexity of the forest description for the purposes of timber supply analysis simulation, aggregation of individual forest stands is necessary. However, it is critical that this aggregation does not obscure either the biological differences in forest stand productivity or differences in management objectives and prescriptions. It is important to note that aggregation of the landbase will be consistent in all options and sensitivity analyses. This is to ensure that differences in results reflect differences in management decisions and not inventory aggregation.

Grouping stands into analysis units on the basis of similar species composition, site productivity and silviculture regime captures similarities in growth and response to silvicultural treatments.

Unique management characteristics are modelled by grouping areas into two CASH6 forest cover constraint groups:

- Landscape level biodiversity will be modelled on the VILUP recommended LU and BEC-NDT (Biogeoclimatic Ecological Classification–Natural Disturbance Type) aggregates. Landscape level biodiversity will be modelled using MoF suggested weighted average methods and FPC Biodiversity Guidebook recommended old growth levels. This methodology is outlined in the 97.08.25 correspondence from MoF/MoELP (see Appendix VI). Seral stages will be monitored during analysis simulations but not explicitly enforced.

- Resource emphasis areas (REAs) are aggregates of area with similar non-timber resource concerns. These include visual sensitivity, Goshawk and LIAs, GFAs and HIAs. Maximum disturbance (based on green-up requirements), minimum mature and old growth forest cover constraints will be assigned to each REA forest cover group to address specific resource needs.

REAs will be aggregated within specific geographic areas of the TFL to reflect operational management of the resource. The two forest cover constraint groups overlap each other in the analysis data. Areas will be required to meet all overlapping forest cover constraints before harvesting proceeds.

7.1 Landscape Unit – BEC/NDT

Landscape units for TFL 37 have been recommended by the Vancouver Island Resource Targets Team as part of the ongoing VILUP process. Three LUs are associated with the TFL. BEC/NDT is based on MoF 1:250,000 Biogeoclimatic mapping and NDT definitions provided in the FPC Biodiversity Guidebook. Constraints applied at the broad LU-BEC/NDT level are intended to address biodiversity requirements and ensure that an acceptable distribution of age classes is maintained. Table 7.1 summarises the distribution of LUs and BEC/NDTs on TFL 37.

Table 7.1 – LU - BEC/NDTs

LU – BEC/NDT	Area (ha)		
	Total	Gross Productive[1]	Net Operable
1 Nimpkish - CWHvm/NDT1	40,372	37,254	25,921
3 Nimpkish – CWHxm/NDT2	24,979	20,136	14,894
3 Nimpkish – MHmm/NDT1	12,024	9,283	3,056
Nimpkish total	77,376	66,673	43,871
4 Tsitika – CWHvm/NDT1	4,902	4,651	3,320
5 Tsitika – MHmm/NDT1	4,029	3,526	1,618
Tsitika total	8,931	8,178	4,938
6 Woss-Vernon – CWHvm/NDT1	47,760	44,927	30,590
7 Woss-Vernon – CWHxm/NDT2	28,851	24,121	18,461
8 Woss-Vernon - MHmm/NDT1	25,827	17,781	5,388
TFL 37 Woss-Vernon total	102,439	86,829	54,439
Total	188,745	161,680	103,248

[1] Includes productive forest with acceptable forest cover from the new parks (Table 6.2)

To address landscape level biodiversity, recently designated parks will be included in the assessment of seral stage distributions within the appropriate LU-BEC/NDT. These areas are completely contained within TFL 37's recommended LUs and therefore may factor into the assessment of seral stages for modelling

purposes. These park areas will not contribute to the green-up requirements of any non-Goshawk REAs. These park areas will contribute to the disturbance, mature and old growth forest cover requirements for Goshawk in the simulation runs where Goshawk management is included and Goshawk REAs are within park boundaries.

In addition, the remainder of Schoen Lake Park (Woss-Vernon LU) established prior to VILUP and the reserved forest component of TFL 39 (Tsitika LU) will contribute to mature and old growth seral stage requirements. A more realistic evaluation of landscape level biodiversity targets will be possible by including these areas. As noted for the other park areas above, Schoen Lake Park and TFL 39 areas will not affect disturbance forest cover constraints at the REA level. Table 7.2 summarises the area associated with the original Schoen Lake Park and TFL 39 that will contribute to landscape level forest cover requirements.

Table 7.2 –Additional Tsitika & Woss Vernon LU-BEC/NDTs

LU – BEC/NDT	Area (ha)	
	Gross Productive[1]	Net Operable
TFL 39		
4 Tsitika – CWHvm/NDT1	6,406	0
5 Tsitika – MH/NDT1	2,836	0
TFL 39 total	9,242	0
Tsitika LU total (TFL 37 & TFL 39)		
4 Tsitika – CWHvm/NDT1	11,057	3,320
5 Tsitika – MH/NDT1	6,362	1,618
Tsitika LU total	17,419	4,938
Schoen Lake Park (Original area)		
6 Woss-Vernon – CWHvm/NDT1	4,856	0
8 Woss-Vernon – MH/NDT1	2,257	0
Schoen Lake Park total	7,113	0
Woss-Vernon LU total (TFL 37 & Park)		
6 Woss-Vernon – CWHvm/NDT1	49,783	30,590
7 Woss-Vernon – CWHxm/NDT2	24,121	18,461
8 Woss-Vernon - MH/NDT1	20,038	5,388
Woss-Vernon LU total	93,942	54,439

[1]Gross productive areas for TFL 39 represent productive forest land unavailable for harvest

7.2 Resource Emphasis Areas

The use of forest cover constraints allows management objectives for non-timber resources to be included in timber supply analysis simulations. For forest level modelling purposes, areas requiring the same management regime, that is having the same forest cover constraints, are grouped into REAs. Within an REA, specific forest cover constraints are implemented. REAs defined for the TFL are based on forest management to address timber and non-timber resources. Within each REA, measures are required to protect certain values. REAs are based on

Visual Sensitivity Classes 1 and 2 (equivalent to VQO-R and VQO-PR, respectively), critical Goshawk habitat, LIAs, GFAs and HIAs.

A number of instances of a given REA may occur in different locations throughout the TFL. Some of these are grouped for timber supply modelling because they are managed in this approach operationally. REAs are summarised in Table 7.3. Productive forest stands from new parks may influence the state of the forest with respect to mature and old growth forest cover requirements.

Table 7.3 - Resource Emphasis Areas

Resource Emphasis Area Category	Area (ha)		
	Total[1]	Gross Productive[2]	Net Operable
11 Visual-1	691	564	156
21 Loon-Foraging	240	203	165
22 Klaklakama-Foraging	240	217	193
23 Claude Elliot-Foraging	240	235	201
24 Lukwa-Foraging	240	236	181
25 Rona-Foraging	240	223	175
26 Hoomak-Foraging	240	182	99
27 Nimpkish-Foraging	225	185	124
28 Vernon Ridge-Foraging	240	189	105
Goshawk Foraging total	1905	1670	1243
31 Loon-Fledgling	2150	1985	1702
32 Klaklakama-Fledgling	2151	1856	1559
33 Claude Elliot-Fledgling	1672	1335	649
34 Lukwa-Fledgling	2151	2098	1240
35 Rona-Fledgling	2131	1820	1436
36 Hoomak-Fledgling	2122	1960	1700
37 Vernon Ridge-Fledgling[3]	3549	2972	2191
Goshawk Fledgling total	15926	14026	10477
41 Visual-2	440	308	227
51 Pinder-Atluck-LIA	7024	5984	3537
52 Schoen-Strathcona-LIA	2847	2176	874
53 Tsitika-Woss-LIA	8453	7887	5524
54 Woss-Zeballos-LIA	3643	3112	1638
LIA total	21967	19159	11573
61 Tsitika-GFA	6554	6133	3823
62 Woss-Vernon-GFA	75572	63156	38209
GFA total	82126	69289	42032
71 Nimpkish-HIA	65694	56664	37539
Total	188745	161680	103248

[1] Includes total areas from the new parks (Table 6.2)
[2] Includes productive forest with acceptable forest cover from the new parks (Table 6.2)
[3] Vernon Ridge and Nimpkish net sites post fledgling areas overlap (named Vernon Ridge for analysis)

7.3 Analysis Units

Aggregation of forest stands is necessary to facilitate forest level modelling and reporting. Stands of similar biological (species composition and site productivity), management and silviculture regimes are grouped to reduce complexity. This must be balanced with creating small enough groups to allow accurate modelling of stand yields. It is also important to ensure that analysis units are consistent between various options of the timber supply analysis so that

aggregation methodology is not the reason for differences between analysis results. Three sets of yields and therefore analysis units will be used to model the existing forest on TFL 37 as described in the following sections.

7.3.1 Analysis Units 1 – 75 (Canfor AVLs)

Analysis units 1 – 75 define existing mature stands that will be assigned to Canfor AVLs. These analysis units correspond to the Canfor AVL strata. A list of the AVL volumes and average attributes for each analysis unit (Canfor stratum) are presented in Table 7.4.

Table 7.4 - AVL Analysis Unit Descriptions

AU	Net Area (ha)	Average Inventory Attributes				
		CC	Species Composition	Age	Height	AVL
1	1175	57	Hw77Yc11Ba8Cw4	277	26.9	895
2	1303	61	Hw75Ba10Yc10Cw5	287	31.9	694
3	1602	59	Hw73Ba11Yc10Cw6	293	37.1	899
4	1217	60	Hw74Ba12Yc8Cw6	291	42.0	1093
5	832	60	Hw70Ba15Cw11Yc4	289	47.3	842
6	335	59	Hw74Ba10Cw9Fd7	287	52.4	918
7	526	61	Hw56Ba32Yc9Cw3	273	27.2	812
8	867	61	Hw55Ba32Yc8Cw5	293	32.4	909
9	1648	60	Hw57Ba32Yc7Cw4	296	37.2	888
10	1380	62	Hw58Ba33Yc5Cw4	290	41.5	992
11	1465	61	Hw57Ba34Cw6Yc3	299	44.3	838
12	1307	60	Hw60Ba34Cw5Yc1	296	47.6	1088
13	468	58	Hw59Ba35Cw4Yc2	298	50.8	1042
14	343	56	Hw60Ba36Cw3Fd1	300	54.7	1065
15	217	54	Hw55Ba38Cw5Se2	300	57.9	1192
16	112	60	Hw46Ba29Cw24Yc1	300	46.4	850
17	243	58	Hw43Ba31Yc25Cw1	300	35.8	684
18	2042	59	Hw51Cw33Ba11Yc5	300	33.5	859
19	1014	59	Hw52Cw32Ba13Fd3	300	41.7	957
20	746	59	Hw52Cw33Ba12Fd3	300	46.4	1002
21	210	57	Hw51Cw30Fd10Ba9	300	52.6	1008
22	752	63	Hw57Fd34Cw7Yc2	297	33.7	852
23	527	60	Hw55Fd33Cw10Ba2	302	44.0	927
24	181	59	Hw56Fd33Cw9Ba2	300	55.3	1221
26	1476	57	Hw57Yc30Ba13Cw0	299	26.6	763
27	1483	58	Hw55Yc34Ba10Cw1	300	26.6	605
28	1295	58	Hw55Yc33Ba11Cw1	298	31.9	745
29	1705	59	Hw53Yc33Ba13Cw1	300	36.9	836
30	881	59	Hw53Yc33Ba12Cw2	299	42.5	820
31	74	62	Hw51Yc35Ba12Fd2	220	26.0	493
32	478	61	Hw53Fd26Cw19Yc2	224	25.9	743
33	540	64	Hw53Fd27Cw17Ba3	186	34.9	791
34	286	63	Hw52Fd31Cw16Se1	184	43.5	765
36	499	67	Hw57Fd23Cw18Ba2	134	34.8	704
37	83	69	Hw47Yc28Fd21Ba4	135	27.0	794
39	201	60	Ba75Hw17Cw5Yc3	296	43.5	1079
40	176	53	Ba78Hw16Yc4Cw2	300	53.9	1139
41	372	58	Ba57Hw35Yc7Cw1	269	31.4	808
42	508	59	Ba57Hw35Yc5Cw3	300	37.1	980
43	631	59	Ba59Hw35Cw4Yc2	300	42.1	976
44	963	60	Ba60Hw37Cw2Yc1	298	46.8	1009
45	513	56	Ba62Hw35Cw3Fd0	296	53.4	988

AU	Net Area (ha)	Average Inventory Attributes				
		CC	Species Composition	Age	Height	AVL
46	77	59	Ba45Cw29Hw25Yc1	300	42.8	1149
47	180	67	Ba66Hw31Cw3Yc0	181	39.2	871
48	177	54	Cw77Hw17Ba3Fd3	290	32.8	767
49	285	61	Cw71Hw18Ba8Fd3	300	44.7	1040
50	1322	58	Cw53Hw33Ba8Fd6	289	33.4	764
51	864	61	Cw53Hw35Ba9Yc3	299	41.8	900
52	541	59	Cw52Hw35Ba8Fd5	299	46.4	976
53	214	53	Cw50Hw31Fd14Ba5	300	54.3	974
54	66	60	Cw40Ba31Hw23Yc6	300	40.5	960
55	573	59	Fd55Hw32Cw11Pl2	261	33.6	727
56	231	59	Fd54Hw32Cw14Yc0	264	42.3	879
57	299	59	Fd55Hw31Cw13Yc1	281	47.1	1262
58	358	57	Fd52Hw28Cw19Ba1	293	54.6	1207
60	110	56	Fd60Hw29Cw10Pw1	288	63.4	1199
61	24	58	Fd51Hw33Cw13Ba3	300	69.9	1274
62	79	63	Fd53Hw36Cw7PL4	126	26.2	485
63	142	66	Fd53Hw30Cw16Dr1	130	35.0	758
64	154	62	Fd60Hw27Cw12Pl1	130	44.2	776
65	13	70	Fd58Hw33Cw9	130	51.3	1640
66	26	51	Se63Hw15Fd14Cw8	277	46.7	2049
67	978	33	Yc61Hw35Ba3Cw1	300	19.1	441
69	1491	56	Yc59Hw33Ba6Cw2	298	27.2	453
70	1015	56	Yc56Hw35Ba8Cw1	298	31.1	530
71	507	57	Yc53Hw34Ba11Cw2	300	35.4	578
72	615	60	Yc54Hw32Ba11Cw3	301	37.9	685
73	439	60	Yc51Hw32Ba12Cw5	300	44.2	802
74	268	37	Yc82Hw15Cw2Ba1	299	17.8	285
75	71	56	Yc49Cw26Hw19Ba6	300	35.0	991
Total	43,798					

77 strata were assigned Canfor AVLs as part of the re-inventory. Seven of these strata were excluded from the net operable landbase and are not listed in Table 7.4.

7.3.2 Analysis Units 101 – 118 (VDYP Natural Stand Yields)

Analysis units 101 – 118 describe existing older immature and mature stands that will be assigned to VDYP natural stand yield tables in the analysis. Insufficient plot data was available to develop AVLs for the mature stands in this component of the inventory. Older immature stands (aged 36 – 100 years) are not suited to the AVLs developed for the mature component of the inventory.

A standard approach of aggregating stands into species groups based on inventory type group (ITG) was used. Generally, if an individual ITG represents more than 5% of the net landbase then it becomes a unique species group. Aggregation of other ITGs is based upon similarity in species growth and silvics.

Site index breakpoints for the site classes defined for analysis units 101 – 118 are provided in Table 7.5. These break points are chosen to balance the area in each class while keeping the spread in site index in each class to a minimum. This is of

concern since the relationship between site index and volume is not linear. Table 7.5 summarises the stand attribute definitions for analysis units 101 - 118.

Table 7.5 - VDYP NSYT Analysis Unit Descriptions

Analysis Unit	Net Area (ha)	Inv Type Group	SI50 Range	Avg. SI50	CC	Species Composition
101 Fd/Other-G	220	1,23,28,29,30	> 34.9	37	64	Fd88 Hw9 Se2 Pw1
102 Fd/Other-M	177	1,23,28,29,30	27-34.9	31	46	Fd87 Hw6 Pw4 Cw3
103 Fd/Other-P	64	1,23,28,29,30	< 27	21	28	Fd86 Hw9 Pl5 Cw0
104 FdHw/Cw-G	1,485	2,3,5,8	> 32.9	36	67	Fd60 Hw31 Cw6 Dr3
105 FdHw/Cw-M	1,719	2,3,5,8	27-32.9	30	63	Fd61 Hw30 Cw8 Dr1
106 FdHw/Cw-P	414	2,3,5,8	< 27	21	53	Fd57 Hw29 Cw12 Pl2
107 Cw-G	159	9,10,11	> 22.9	25	65	Cw48 Hw 32 Fd15
108 Cw-M	284	9,10,11	15-22.9	18	53	Cw60 Hw 33 Fd4
109 Cw-P	398	9,10,11	< 15	10	56	Cw53 Hw 30 Fd9
110 Hw/HwCw-G	2,668	12,14,16,17	> 28.9	32	77	Hw85 Cw8 Bl4 Fd3
111 Hw/HwCw-M	1,343	12,14,16,17	23 –28.9	25	69	Hw68 Cw21 Fd9 Bl2
112 Hw/HwCw-P	782	12,14,16,17	< 23	17	57	Hw63 Cw25 Fd9 Yc3
113 HwFd/Ba-G	3,259	13,15,18,19	> 29.9	32	70	Hw64 Fd24 Bl7 Cw5
114 HwFd/Ba-M	1,888	13,15,18,19	25-29.9	27	69	Hw65 Fd22 Bl8 Cw5
115 HwFd/Ba-P	1,171	13,15,18,19	< 25	20	62	Hw64 Fd17 Bl14 Cw5
116 Decid-G	220	35,37,38	>29.9	31	64	Dr79 Hw12 Fd6 Se3
117 Decid-M	238	35,37,38	25-29.9	27	70	Dr79 Hw14 Fd4 Cw3
118 Decid-P	99	35,37,38	< 25	22	72	Dr86 Hw7 Fd4 Cw3
Total	16,588					

7.3.3 Analysis Units 201 – 208 (Existing Managed Stands)

Analysis units 201 – 208 define existing managed stands. These stands have been managed since establishment and will be modelled with TIPSY managed stand yield tables. All existing stands (both natural and managed) will regenerate to managed stand yields developed with TIPSY (different from AUs 201- 208 above).

Existing managed stand yields (AUs 201 – 208) are aggregates of over 3,200 base TIPSY yield tables produced for this component of the TFL 37 inventory. The aggregation process was based on culmination volume, age, quadratic mean diameter and height. Stand descriptions were not considered in the aggregation process. Therefore analysis units 201 – 208 do not have specific attributes that were used to generate the TIPSY yield tables. A list of the areas associated with each of the existing managed stand yield tables is provided in Table 7.6.

Table 7.6 - Existing Managed Stand Analysis Units

Existing Managed Stand AU	Aggregated MSYT ID	Net Area (ha)
201	C01	0
202	C02	9,402
203	C03	867
204	C04	277
205	C05	19
206	C06	23,516
207	C07	6,071
208	C08	2,232
Total		42,384

Note that the aggregate MSYT C01 does not have any net operable area assigned to it because it represents low productivity areas occupied by second growth on TFL 37.

7.3.4 Analysis Units 301 – 312 (Future Managed Stands)

Analysis units 301 – 312 define future managed stand yields for an area after initial harvest takes place in the analysis simulation. Similar to existing managed stand yields, an initial group of 48 TIPSY yield tables were produced and then aggregated based on culmination volume, age, quadratic mean diameter and height. The original 48 yield tables are based on Canfor silviculture regimes. Table 7.7 summarises the area associated with each managed stand yield analysis unit for the future forest.

Table 7.7 –Future Managed Stand Analysis Units

Future Managed Stand AU	Aggregated MSYT ID	Net Area (ha)
301	R01	0
302	R02	0
303	R03	156
304	R04	55
305	R05	11,318
306	R06	394
307	R07	312
308	R08	39,214
309	R09	363
310	R10	9,968
311	R11	2,362
312	R12	39,107
Total		103,248

Note that the aggregate MSYTs R01 and R02 do not have any net operable area assigned to them as they represent low productivity areas that are not likely to contribute to the long-term timber supply on TFL 37.

7.4 Age Class Distribution

Tables 7.8 and 7.9 summarise the distribution of area and volume (net decay, waste and breakage (DWB)) by age class (age in 10s) for the gross productive, gross productive operable and net operable (timber harvesting) components of the TFL 37 forest inventory. All ages are projected to 96.12.31.

Table 7.8 - Area by Age Class

Age in 10s	Area by Age Classification[1] (ha)		
	Gross Productive	Gross Prod. Operable	Net Operable[2]
NSR	523	502	480
1 - 10	14205	14076	13035
11 - 20	13745	13632	12418
21 - 30	15223	14921	13332
31 - 40	7925	7704	6506
41 - 50	6671	6491	5566
51 - 60	2488	2387	2026
61 - 70	4569	4256	3766
71 - 80	1129	1060	968
81 - 90	206	193	154
91 - 100	756	714	471
101 - 110	313	295	157
111 - 120	260	260	101
121 - 130	985	880	305
131 - 140	1412	1325	733
141 - 150	524	495	372
151 - 160	432	384	297
161 - 170	74	74	66
171 - 180	502	448	366
181 - 190	21	21	15
191 - 200	1513	1318	726
201 - 210	679	645	420
211 - 220	17	17	16
221 - 230	190	189	145
231 - 240	52	49	25
241 - 250	0	0	0
251 +	79113	68135	40781
Total	153607	140475	102768

[1] Areas are exclusive of NP, NF, NCBr and roads (type identity 5, 6, 8) and new parks
[2] Based on MoF Base Case netdowns

Figure 7.1 provides a graphic display of the age class distribution for the gross productive and net operable components of the current TFL 37 landbase.

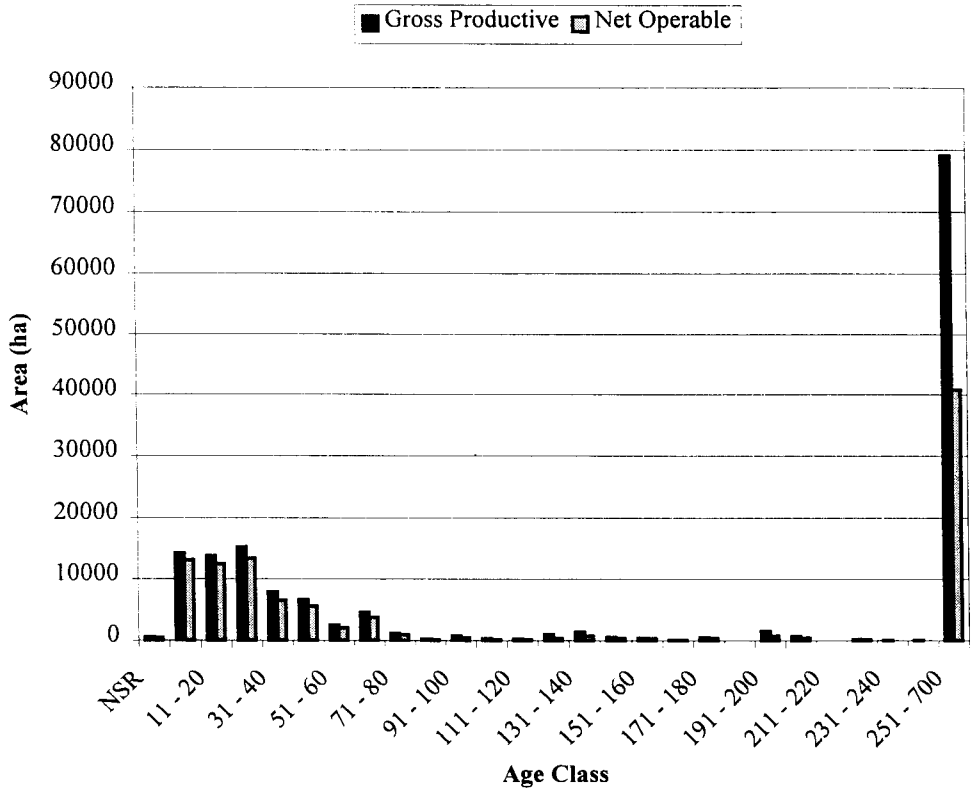

Figure 7.1 – Productive Area Age Class Distribution

Volumes presented in Table 7.9 are based on either Canfor AVL (AUs 1 – 75), VDYP Version 6.4 for other natural stands (AUs 101 – 118) and TIPSY MSYT volumes for all existing managed stands (AUs 201 – 208). These sources provide a volume estimate that will be virtually the same as the initial inventory volume in the timber supply analysis.

Table 7.9 - Volume by Age Class

Age Class	Volume by Age Classification[1] (1000s of m^3)		
	Gross Productive	Gross Prod. Operable	Net Operable[2]
NSR	0	0	0
1 - 10	0	1	1
11 - 20	45	343	316
21 - 30	1239	1490	1388
31 - 40	1800	1534	1357
41 - 50	2346	2300	2033
51 - 60	1055	1038	938
61 - 70	2396	2335	2134
71 - 80	683	667	622
81 - 90	138	135	113
91 - 100	422	403	298
101 - 110	213	208	143
111 - 120	137	136	84
121 - 130	441	404	230
131 - 140	825	778	523
141 - 150	381	360	293
151 - 160	311	279	238
161 - 170	61	61	55
171 - 180	381	343	291
181 - 190	21	20	15
191 - 200	981	913	575
201 - 210	517	492	337
211 - 220	13	13	12
221 - 230	173	171	134
231 - 240	43	41	20
241 - 250	0	0	0
251 +	56580	49439	34069
Total	71202	63903	46221

[1] Volumes are based on TIPSY, VDYP and Canfor AVLs
[2] Based on MoF Base Case netdowns

8.0 GROWTH AND YIELD

This section outlines the methodologies used to develop yield tables that will be included in the timber supply analysis and the volume information that is reported in this Information Package. Growth and yield modelling will be modified compared with techniques employed in support of MWP #7. Key changes are as follows:

- Revised forest cover inventory data;
- Use of SIBEC-based site index values for existing and future managed stand yield tables;
- Use of true managed stand yield tables (TIPSY) incorporating updated stand attribute and treatment data for both existing and future managed stands;
- Revised mature AVLs using updated sampling data; and
- Use of VDYP natural stand yield tables for older immature and mature that do not have associated AVLs.

8.1 Site Index

The most recent MoF site index curves embedded in VDYP Version 6.4 have been used to assign existing site index (SI50) to forest stands that do not have an associated AVL. Inventory age and height are used as inputs for developing natural stand SI50 values. This site value has been used to assign stands to the appropriate analysis unit (VDYP AUs 101 – 118) for modelling.

SI50 assignment for existing and future managed stands is based on the ongoing TEM project and preliminary ecosystem mapping completed for TFL 37. This study included field verification of ecosystem attributes and assigned SI50 for each site based on leading species and site series. For this component of the inventory SI50 values are also based on the latest MoF site index curves. All sites on the TFL use the SIBEC SI50 for assignment to a regeneration yield table. Table 8.1 lists the site index curve reference for each species in VDYP Version 6.4 found on TFL 37.

Table 8.1 - Source of Site Index Equations

Species	Site Index Reference
Amabilis fir	Kurucz (1982)
Western redcedar	Kurucz (1985)
Yellow cedar	Kurucz (1985)
Red alder	Harrington & Curtis (1986)
Coastal Douglas-fir	Bruce (1981)
Western hemlock	Wiley (1978)
Lodgepole pine	Goudie (1984)
Western white pine	Curtis, Diaz & Clendenen (1990)
Sitka spruce	Goudie (1987)

Analysis unit site index is derived as the area-weighted average of the polygon site indices in that analysis unit (pooled species group and site class). Existing polygons associated with VDYP yield tables, analysis units 101 – 118 are assigned to site classes good (G), medium (M) and poor (P). These classes are not related to the old MoF G, M, and P classification.

AVL stratification was based on field surveys and volumes compiled specifically for those stands assigned to a given AVL stratum. Therefore no specific site classification applies to these yields.

Similarly, the managed stand yield tables that will be used in the timber supply analysis are aggregates of many base TIPSY managed stand yield tables. Therefore it is not possible to report site index values for the final yield tables.

8.2 Utilisation Levels

Standard close utilisation levels will be used in the development of the yield tables as documented in Table 8.2.

Table 8.2 - Utilisation Levels

Stand Types	Utilisation		
	Minimum DBH (cm)	Stump Height (cm)	Top DIB (cm)
Managed stands (TIPSY)	12.5	30.0	10.0
Natural stands (VDYP)	17.5	30.0	10.0
Natural stands (AVL)	17.5	30.0	15.0

The indicated level is the utilisation level applied operationally with the exception of natural stands for VDYP. Canfor harvests all mature natural stands to a 15.0cm top. VDYP does not compile volumes to this utilisation level so the default of 10.0cm has been used.

8.3 Decay, Waste and Breakage (DWB)

VDYP generated volumes (for both current polygon volumes and VDYP yield tables) are net DWB using forest inventory zone (FIZ) B and loss factors for special cruise 347 (TFL 37). Similarly, AVL volumes were compiled using MoF accepted decay waste and breakage for TFL 37.

8.4 Operational Adjustment Factors

Deductions for DWB are inherent in VDYP forecasts based on the DWB factors for the assigned FIZ and PSYU. TIPSY incorporates operational adjustment factors (OAFs) to adjust gross volumes:

- OAF1 – for unmapped stand openings, 10% for all TIPSY yield tables; and

- OAF2 – for age-related losses in volume, 5% for all TIPSY yield tables.

Rationale for OAFs is provided in the report on managed stand development included in Appendix III.

8.5 Volume Deductions

Volume deductions are made by reducing stand volume if a component of a stand is unmerchantable but the remainder of the stand is large enough, and of acceptable quality, to be merchantable. For the purposes of this analysis, all stand volumes are reduced by the DWB factors included in VDYP and AVL volumes for existing stands presented in this report. Deciduous volumes are included in all yield tables as Canfor utilises the minor component that deciduous represents.

8.6 Yields for Unmanaged Stands

8.6.1 Current Inventory Volumes

Volumes reported in this information package are derived from similar sources as the yields that will be used in the timber supply analysis:

- Mature forest stands assigned to Canfor strata 1 – 77 (analysis units 1 – 75) use the Canfor AVLs for reporting current inventory volumes in the Information Package. These volumes were developed from a bank of more than 1,500 cruise plots for the stands assigned to strata 1 - 77. These are the same AVL volumes that will be used to model the existing growth of some of the mature natural stands during the timber supply analysis.
- Other mature and unmanaged immature stands were assigned standing volumes with VDYP Version 6.4 (BATCHPROCESS). These stands did not have sufficient data to develop an acceptable AVL. Appropriate decay, waste and breakage factors and utilisation were included in the development of these polygon volumes.
- Immature managed stands (1 – 35 years old) that will be modelled on TIPSY managed stand yields in the timber supply analysis have used the same TIPSY volumes for summaries in this report.

8.6.2 Yield Tables for Unmanaged Stands

8.6.2.1 Canfor Average Volume Lines

Canfor's AVLs are the product of thousands of inventory and cruise plots gathered for mature and overmature stands across the TFL. The following is a description of the process used to produce the AVLs for this analysis:

- Plots used in developing the AVLs have been collected over the past 20 years, predominantly since the late 1980s;
- The plots are well distributed both geographically and across all elevations;
- Only plots reflecting standing inventory have been used, *ie.* plots are removed from the AVL database when the stand(s) they represent have been harvested;

- Stratification into the AVL strata was based on species composition, stocking class, age range, and height range;
- Some minor variations in the aggregation procedures were included to accommodate available plot distributions and local growing conditions;
- Each stratum included between 4 and 79 plots;
- All plots have been compiled using MoF accepted appraisal standards for decay, waste and breakage;
- All plots were compiled to 17.5cm DBH, 15.0cm top and 30.0cm stump;
- A total of 77 AVLs were developed.

8.6.2.2 VDYP Natural Stand Yield Tables

Inventory type group and SI50 were used to define analysis units for the older immature and mature component of the inventory that has not been assigned to a Canfor AVL. Table 7.4, Section 7.3.1 summarises the definitions for each analysis unit in this subset of the inventory.

The VDYP existing stand yields at the analysis unit level were developed with the following methods:

- Each polygon in the net landbase was assigned to an analysis unit on the basis of inventory type group and site index.
- Area-weighted average species composition, crown closure and site index were extracted for each analysis unit.
- These attributes, in addition to DWB factors associated with forest inventory zone B and special cruise 347 were used to drive VDYP.
- Yields are compiled to 17.5cm dbh, 10.0cm top and 30.0cm stump.

Inputs to VDYP are presented in Table 7.4. Yield tables developed with VDYP that will be used in modelling the existing natural forest are presented in Appendix II. A summary of minimum harvest age attributes based on culmination of MAI and/or minimum volume requirements for the VDYP yield tables are presented in Table 10.4.

8.7 Yields for Managed Stands

8.7.1 Silviculture Management Regimes

The following section describes the regeneration strategy and associated analysis unit to which each site will be assigned after harvest during the timber supply analysis. Planting is assumed to be the regeneration method on all future harvested areas in keeping with silviculture activities on the TFL. Regeneration delays are not inherent in the yield tables, but are assigned in forest estate modelling. Operational regeneration plans are based on the site series for an area. All regeneration assignments in the timber supply analysis are also based on site series classification. Table 8.3 describes the regeneration strategies planned for MP #8.

Table 8.3 – Regeneration Strategies & Analysis Units by BEC & Elevation

Future MSYT AU & ID	BEC Category	Species Composition	Density[1]	Treatment[2]	Net Area
301 R01	CWHvm1-02	Fd100	700	T	0
	CWHxm2-02	Fd100	600	T	0
	CWHxm2-11	Cw100	500	T	0
	MHmm1-02	Hm60 Yc40	500	T	0
	MHmm1-07	Yc60 Ba40	1100	T	0
	MHmm1-09	Yc100	600	T	0
302 R02	CWHvm1-13	Cw100	500	T	0
	CWHvm2-10	Yc100	500	T	0
303 R03	MHmm1-07	Yc60 Ba40	1100	T	14
	CWHvm1-12	Yc50 Cw40 Hw10	700	T	73
	CWHvm2-11	Yc60 Cw40	700	T	68
	All				155
304 R04	CWHxm2-01s	Fd60 Cw20 Hw20	2000	T F JS	55
305 R05	CWHvm1-01s	Hw80 Cw20	1000	T F	813
	CWHvm1-06s	Hw60 Ba20 Cw20	1000	T F	148
	CWHvm1-11	Cw100	500	T	17
	CWHvm2-02	Pl60 Fd40	500	T	0
	CWHvm2-06-p	Yc50 Hw30 Ba20	1100	T	194
	CWHvm2-06s	Yc50 Hw30 Ba20	1100	T	20
	CWHxm2-10	Dr100	800	None	192
	MHmm1-01	Ba60 Yc40	1100	T	8,974
	MHmm1-01-p	Ba60 Yc40	1100	T	526
	MHmm1-03	Ba60 Yc40	1100	T	134
	MHmm1-05	Yc60 Ba40	1100	T	299
	All				11,317
306 R06	CWHxm2-12	Cw100	700	T	394
307 R07	CWHvm1-14	Cw100	600	T	312
308 R08	CWHvm1-01 (<550m)	Fd60 Cw20 Hw20	2000	T F JS	15,234
	CWHvm1-05 (<300m)	Fd60 Cw20 Hw20	2000	T JS	712
	CWHxm2-01	Fd60 Cw20 Hw20	2000	T F JS	17,914
	CWHxm2-05	Fd60 Cw40	2000	T JS	2,905
	CWHxm2-07	Fd60 Cw40	1800	T JS	2,161
	CWHxm2-08	Fd60 Cw40	1800	T JS	288
	All				39,214
309 R09	CWHvm2-09	Yc60 Cw40	700	T	363
310 R10	CWHvm1-06-p	Hw60 Ba20 Cw20	2000	T JS	146
	CWHvm2-01-p	Hw50 Yc30 Ba20	1100	T	409
	CWHvm2-01s	Hw50 Yc30 Ba20	1100	T	202
	CWHvm2-03	Cw60 Hw20 Fd20	1100	T	6,616
	CWHvm2-05	Ba60 Yc40	1100	T	590
	CWHvm2-06	Yc50 Hw30 Ba20	1100	T	1,219
	CWHvm2-07	Ba60 Yc40	1100	T	500
	CWHxm2-06-p	Hw60 Cw40	2000	T JS	286
	All				9,969
311 R11	CWHvm1-01-p	Hw80 Cw20	1000	T F	754
	CWHvm1-04	Fd60 Cw20 Hw20	800	T	18
	CWHvm1-07	Cw50 Hw30 Ba20	2000	T JS	1,570
	CWHvm2-04	Hw70 Yc30	900	T	20
	All				2,362

312 R12	CWHvm1-01 (>550m)	Hw80 Cw20	1300	T F	3,519
	CWHvm1-03	Fd60 Cw20 Hw20	1200	T F	7,381
	CWHvm1-05 (>300m)	Hw50 Ba 30 Cw20	1300	T F	931
	CWHvm1-06	Hw60 Ba20 Cw20	2000	T JS	1,029
	CWHvm1-09	Cw50 Hw30 Ba20	2000	T JS	35
	CWHvm2-01	Hw50 Yc30 Ba20	1100	T	17,181
	CWHxm2-01-p	Fd60 Cw20 Hw20	2000	T F JS	1,854
	CWHxm2-03	Fd80 Cw20	1300	T F	6,812
	CWHxm2-06	Hw60 Cw40	2000	T JS	363
	All				39,105
Total					103,248

1 includes ingress
2 Treatments – T = tree improvement; F = fertilisation; JS = juvenile spacing

Note that some of the silviculture regimes outlined in Table 8.3 are not included in the timber harvesting landbase due to netdown requirements.

8.7.2 Aggregated Yield Tables for Managed Stands

All stands regenerated since the establishment of TFL 37 in 1961 (both natural and planted) will be assigned to managed stand yields for the analysis. This reflects the silviculture history of the licence. Canfor has maintained recommended stocking standards on these areas. Immature stands older than 35 years will be assigned to the appropriate VDYP tables.

Managed stand yields for both the existing and future forest were developed using TIPSY. TIPSY incorporates the following inputs to derive a yield table for each analysis unit:

- Leading species;
- Initial density - based on current stocking objectives, including ingress;
- Treatments;
- Site index;
- Operational adjustment factors (OAF1 10%, OAF2 5%); and
- Regeneration delay - 0 (delays are incorporated in forest level analysis).

A complete report of the process used to develop the TIPSY managed stand yield tables is included in Appendix V.

8.7.2.1 Existing Managed Stand Yield Tables

Existing managed stand yield tables (assigned to stands 1 – 35 years old) have been generated using actual inventory attributes and silviculture history information. These stands are assigned to analysis units 201 – 208. Over 3,200 base yield tables were produced in developing this set of yields. Aggregation produced eight yield tables to be used in the analysis to model the growth of existing managed stands. Appendix III-a provides a list of the TIPSY yield tables

for existing managed stands. Table 10.5 summarises the minimum harvest age attributes for the existing managed stand yield tables.

8.7.2.2 Future Managed Stand Yield Tables

Future managed stand yield tables are based on Canfor's silviculture strategies and expectations for stand descriptions. Analysis units 301 – 312 defined these yields. After harvest in the timber supply analysis all sites will regenerate to one of these future managed stand yield tables.

A similar approach to that described for existing managed stand yields was taken in developing future managed stand yields. 48 base tables were produced for this component of the managed stand yield table program. These 48 tables have been aggregated into 12 final yield tables for use in the analysis. Note that two of these final 12 yield tables have no net area assigned to them; these two tables represent low productivity areas on the TFL that were excluded in the netdown process.

The guidelines for assigning individual sites to future managed stand yield tables are provided in Table 8.3. Appendix III-b provides a full list of the TIPSY yield tables for future managed stands. Table 10.6 summarises the minimum harvest age attributes for the future managed stand yield tables.

8.7.3 Regeneration Delay

Silviculture prescriptions and past performance indicate a regeneration delay of 1 year. Some areas have regeneration in place within the same year as harvesting. For the timber supply analysis all harvested areas will be assigned a regeneration delay of one year.

8.8 Silviculture History

8.8.1 Existing Managed Immature Stands

A summary of area and analysis unit assignment for the existing managed immature inventory is provided in Table 8.4. This component of the inventory includes all stands established since the TFL was awarded in 1961 (35 years old and younger).

Table 8.4 – Existing Immature Managed Stands

Existing Managed Stand AU	Aggregated TIPSY MSYT ID	Net Area by Age Class (ha)		
		1 – 20 years	21 – 35 years	Total
202	C02	7,204	2,198	9,402
203	C03	724	143	867
204	C04	112	165	277
205	C05	19	0	19
206	C06	17,383	6,133	23,516
207	C07	0	6,071	6,071
208	C08	10	2,221	2,231
Total		25,452	16,931	42,383

8.8.2 Non-Satisfactorily Restocked

The recent forest re-inventory identified 480 ha of potentially non-satisfactorily restocked (NSR) lands on TFL 37 that were not previously recognised. During the period of MP #8, these areas will be assessed on the ground and regenerated according to the strategies outlined in Table 8.3. Table 8.5 summarises the regeneration plans for the NSR that will be modelled in the timber supply analysis.

Table 8.5 – NSR Regeneration Strategy

Future Managed Stand AU	Aggregated TIPSY MSYT ID	BEC Classification	Net Area (ha)
303	R03	MHmm1-07	15
305	R05	CWHvm1-01s	1
		MHmm1-01	57
		MHmm1-03	29
		MHmm1-05	1
306	R06	CWHxm2-12	2
308	R08	CWHvm1-01	29
		CWHvm1-05	1
		CWHxm2-01	37
		CWHxm2-05	7
309	R09	CWHvm2-09	6
310	R10	CWHvm2-03	48
		CWHvm2-05	4
		CWHvm2-06	2
311	R11	CWHvm1-07	3
		CWHvm2-04	3
312	R12	CWHvm1-01	2
		CWHvm1-03	12
		CWHvm1-05	4
		CWHvm1-06	1
		CWHvm2-01	186
		CWHxm2-03	30
Total			480

9.0 NON-RECOVERABLE LOSSES

Fire, insects, disease and other natural factors can cause catastrophic losses of whole stands of trees. Over the long-term the probability of losses to natural causes can be predicted. Where losses occur in merchantable stands some of the dead or dying timber may be salvageable. When modelling the timber supply, the non-recoverable losses (NRLs) are added to the desired harvest target and then subtracted from the forecast upon completion of the modelling exercise to determine the net timber harvest. Table 9.1 summarises the estimated NRLs for TFL 37.

Table 9.1 - Annual Non-Recoverable Losses

Category	Hazard	Losses to Hazards (m^3/year)		
		Gross	Salvage	Net Loss
Fire[1]	Man-caused	11,200	9,100	2,100
	Natural	40	0	40
Wind[2]	Windfall	25,000	23,975	1,025
Total		36,240	33,075	3,165

[1] Source: TFL 37 Annual Reports 1961 – 1996

[2] Source: Average salvage 1992 – 1996; estimated windfall @ 40 ha/year and 625m^3/ha

10.0 INTEGRATED RESOURCE MANAGEMENT

10.1 Forest Resource Inventories

This section documents the status of all non-timber resource inventories. Approximate dates of completion and approvals are presented in Table 10.1.

Table 10.1 - Non-Timber Resource Inventory Status

Inventory Category	Date of Completion/Update	Date of Acceptance [1]
Preliminary Terrain Mapping	June, 1997	August, 1997
Preliminary Ecosystem Mapping	June, 1997	August, 1997
Biogeoclimatic Classification	August, 1997	From MoF 1:250,000 maps
Deer & Elk ranges	July, 1997	Originally OIC, further updates reviewed by MoELP
Goshawk Management Areas	June, 1997	Reviewed by MoELP, August, 1997
Recreation	January, 1995	July, 1996
Landscape Units [2]	July, 1997 (recommended)	Expected spring, 1998
Landscape (Visual)	August, 1997	Reviewed by MoF, August, 1997
Operability (economic, physical, technical)	January, 1998	Reviewed by MoF, January, 1998
Stream Classification	August, 1997	Accepted for December 1996 FDP

1 Acceptance for use in the timber supply analysis

2 Draft LUs accepted by the MoF/MoELP are expected by spring, 1998

10.1.1 Preliminary Terrain Mapping

A terrain classification project covering the entire TFL is underway. Preliminary mapping was completed in June 1997 and will be used for this analysis. This classification project included assessments for sensitive soils (terrain class IV and V).

10.1.2 Preliminary Terrestrial Ecosystem Mapping (TEM)

A terrestrial ecosystem-mapping project covering the entire TFL is currently underway. Preliminary ecosystem mapping was completed in June 1997 and used for this analysis. The ecological map outlines polygons with biogeoclimatic subzone/variant, site series (or complexes) and special modifiers of importance to TFL 37 (slope, soil depth and bedrock (eg. limestone)). These attributes are linked to the TFL 37 GIS database for use in strategic and operational planning.

The methods used in this inventory were:

- Gather preliminary information and conduct an initial field reconnaissance;
- Delineate site series polygons or composites onto photos;
- Verify and adjust the delineated photos based on field observations; and
- Develop ecosystem attributes for each polygon.

The preliminary ecosystem mapping was used in the SIBEC project (see Appendix (V) and for developing the managed stand yield tables for the timber supply analysis.

10.1.3 Recreation and Landscape

Recreation and Landscape inventories are complete to MoF standards for the entire TFL area. An updated Visual Landscape Inventory (VLI) was completed in 1997. The VLI was completed to new MoF Visual Landscape Inventory process standards. Visual sensitivity classes defined in the Landscape inventory have been used to identify REAs in which visual management will be emphasised.

10.1.4 Landscape Units

Landscape units for TFL 37 were recommended by the Vancouver Island Resource Targets Team, as part of the VILUP. These areas are intended to be broad contiguous areas over which objectives related to natural resources are to be met. For the purposes of this analysis, landscape level biodiversity targets will be assigned at the LU level (in combination with BEC/NDT). The recommended LUs are expected to reach "draft" stage of acceptance from MoF and MoELP by the spring of 1998.

10.1.5 Roads Classification

TFL 37 is unique in that it includes a railway system for transporting logs across the TFL. The road and railway inventory for TFL 37 was captured digitally from the TRIM base and updated to January 1997. This was completed in August, 1997. Road widths were confirmed in a joint Canfor-MoF survey completed in 1997.

10.1.6 Streams, Lakes and Wetlands Classification

The creek classification was initially based on Canfor's 1981 creek classification completed by the staff fish biologist using local knowledge. This information was updated to Fish Forestry Guideline Standards and was further updated to FPC standards in June 1997. Classification to FPC standards allows identification of riparian reserve and management zones (RRZs and RMZs) for the timber supply analysis.

Many of the FPC updates were based on local knowledge of the TRIM creeks. As this digital coverage did not provide sufficient detail, S3 and S4 creeks were classified as S5 or S6. This deficiency does not affect forest level analysis. Canfor intends to initiate a fish habitat inventory in 1998 and reclassify all creeks. Operationally, creeks are classified based on field data.

Wetlands and lakes were classified using GIS queries on lakes and wetland size as per the FPC Riparian Management Area Guidebook.

10.1.7 Cultural and Heritage Values

An Archaeological Overview Assessment was recently completed for the Port McNeill Forest District. As part of this Assessment, culturally sensitive areas were identified. Most of the sensitive areas identified on TFL 37 are within or adjacent to existing landbase reserves.

As part of their planning process, Canfor uses the Assessment information along with site-specific cultural assessments to determine if any modifications to harvesting plans are required in order to preserve significant values. In partnership with the 'Namgis Band, local native representatives conduct the site-specific assessments. To date no significant modifications to harvesting plans have been necessary to protect cultural values. Therefore, no additional considerations are required in the analysis to address cultural and heritage values.

10.2 Forest Cover Requirements

The analysis will apply "cover class constraints" to model landscape level biodiversity, wildlife habitat guidelines, green-up and visual quality objectives. Cover class constraints place maximum and minimum limits on the amount of

young second growth and/or old growth found in zones of the net operable landbase.

Timberline's proprietary simulation model CASH6 has the option of using a pseudo-geographic or full spatial approach to modelling constraints, giving considerable flexibility depending on structure of data and analysis objective. This allows the analysis to mirror, as closely as possible, the intent of forest cover constraints on harvesting in operations.

Maximum depletion and minimum old growth constraints on forest cover are explicitly implemented. Productive forest stands such as ESAs which have been excluded from the timber harvesting landbase may be included to better model forest structure and disturbance levels. These non-harvesting areas are referred to as "non-contributing forest".

Any number of forest cover groups may be used to aggregate forest stands for the purpose of modelling forest cover constraints. In the case of TFL 37, one forest cover group will be created to model Goshawk Foraging Areas and this will be overlapped with landscape level biodiversity requirements for LU-BEC/NDT.

There are three forest cover constraint classes available for modelling within each forest cover group:

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

The use of forest cover constraints as described above improves forest management modelling by ensuring that the non-timber resources are given appropriate consideration.

Forest cover constraints to be applied to the forest cover groups representing REAs are presented in Table 10.2.

Table 10.2 – REA Forest Cover Constraints

Resource Emphasis Area Category	Forest Cover Constraint		
	Maximum Disturbance	Minimum Mature Retention	Minimum Old growth Retention
Visual-1 (VQO-R)	3% < 6.5 metres	n/a	n/a
Goshawk Foraging	25% < 3 metres	n/a	n/a
Goshawk Post-Fledgling	25% < 3 metres	n/a	n/a
Visual-2 (VQO-PR)	13% < 6.5 metres	n/a	n/a
LIAs	25% < 3 metres	n/a	n/a
GFAs	25% < 3 metres	n/a	n/a
HIAs	25% < 3 metres	n/a	n/a

Minimum mature and old growth retention requirements are not applicable in the MoF Base Case. In many cases resource categories overlap a given piece of the TFL 37 landbase. The assignment to a final REA was based on the constraints that will be applied in the analysis. The most constraining type takes priority in assigning areas to an REA. The order of REAs in Table 10.2 is the same as the rationale for assignment (*ie.* Visual Class 1 is highest priority, HIAs are lowest priority).

Both Goshawk REAs will allow non-contributing forest areas to affect all three forest cover constraint types. Mature and old growth retention constraints will be assigned to the Goshawk REAs in sensitivity analyses. Other REAs include only a disturbance constraint and this constraint is intended to model green-up requirements. Therefore the adjacency constraints will not be influenced by non-contributing forest in these non-Goshawk REAs.

Areas with insufficient mature or old growth forest to meet the prescribed forest cover constraints may still be able to contribute to the periodic harvest. A component of the forest is put into a reserve with the expectation that this forest will eventually overcome the mature or old growth deficiency. If there are still residual forest stands older than minimum harvest age in addition to this reserve component, harvesting may continue in the REA.

10.2.1 Forest Cover Objectives – Rationale

Forest cover constraints for REAs listed in Table 10.2 are based on a number of sources that are discussed in the following sections.

10.2.1.1 Visual Sensitivity Classes

Visual quality is based on the recent Visual Landscape Inventory (VLI) for TFL 37. The inventory used the new MoF Visual Landscape Inventory process (VLP)

released in June 1997. VLP standards focus on cutblock design, harvesting methods and public perception.

The inventory identified Visual Sensitivity Classes that correspond with VQOs used in past landscape inventories for the TFL. As noted in Table 10.2, Class 1 is equivalent to VQO- retention and Class 2 is comparable to VQO- partial retention. Classes 3, 4 and 5 have similar green-up and adjacency requirements to LIAs, GFAs and HIAs on the TFL and therefore do not have to be modelled separately.

REA disturbance limits were determined by applying current and realistic TFL 37 forestry practices/conditions to the new VLP standards, then stating the disturbance limits in a form consistent with previous VLP limits. The VLI considered the entire visible area within a visual sensitivity polygon and therefore accounted for dispersion and influence from the non-timber harvesting landbase. Visual Sensitivity Classes 1 and 2 areas require 6.5 metre green-up. This green-up requirement was determined after analysis of TFL 37 cutblocks for:

- State of visually effective green-up (VEG);
- Tree heights;
- Slope;
- Aspect; and
- BEC subzone and variant.

Cutblocks included in the analysis were within two years of VEG and represent a reasonable cross-section of TFL 37. The analysis determined the average height of dominant/co-dominant trees to be 6.5 metres, with a range of 5.7 metres to 7.8 metres. VEG was assumed to be achieved when signs of previous harvesting (logging slash, spur roads, etc.) were not visible.

10.2.1.2 Goshawk Areas

According to the latest draft Goshawk Management Guidebook, Goshawk foraging areas are approximately 240 ha areas surrounding a goshawk nest site. This is equivalent to a radius of 875 metres around the nest. Post-Fledgling Areas encompass 2400 ha and are equivalent to a radius of 2765 metres from the nest site.

10.2.1.3 Low Intensity Areas

Low intensity areas (LIAs) are intended to have less industrial forestry activity compared with other general (GFAs) areas within TFL 37. These areas were identified as part of the VILUP. Modelling forest cover constraints for LIAs are similar to GFAs. However, additional riparian constraints have been assigned to streams in LIAs. Canfor will model these areas separately in order to understand the importance of LIAs in providing annual harvesting opportunities.

10.2.1.4 General Forestry Areas & High Intensity Areas

GFAs and HIAs are the residual areas on TFL 37 that are primarily intended for industrial forestry opportunities. HIAs are only applicable to the (recommended) Nimpkish LU. Areas have been excluded from GFAs and HIAs in consideration of FPC requirements, wildlife, *etc.* during the netdown process. Various analysis options and sensitivity analyses will evaluate different forest cover constraints within these two REA types.

10.2.1.5 Adjacent Cutblock Green-up

Silvicultural green-up is required on all areas of the TFL prior to harvesting adjacent areas. For the majority of the landbase 3 metre green-up is the rule. Sensitivity analysis will determine the impact of 2 metre and 1 metre green-up in non-visually sensitive areas of the TFL.

10.2.1.6 Landscape Level Biodiversity

The Vancouver Island Resource Targets Team recommended Landscape Units for TFL 37 as well as the biodiversity emphasis for each unit, as part of the VILUP. These units, along with the appropriate BEC/NDT designation, will be used to model landscape level biodiversity in the MoF Base Case.

MoF/MoELP correspondence "Achieving Acceptable Biodiversity Timber Impacts" (97.08.25) and "Incorporating Biodiversity and Landscape Units in the Timber Supply Review" (97.12.01) were used to develop landscape level old growth requirements for TFL 37 (see Appendix VI). Table 10.3 summarises the forest cover constraints that will be modelled for each LU-BEC/NDT in order to achieve the desired old growth level in the forest. It should be noted that this approach to modelling old growth does not represent current management on TFL 37. MoF have stated this is a mandatory modelling input.

Table 10.3 – LU-BEC/NDT Old growth Requirements – MoF Base Case

LU – BEC/NDT	Minimum Old growth – Based on 45%-45%-10% Weighted Average (% > 250 years)
1 Nimpkish – CWHvm/NDT1	13.6
2 Nimpkish – CWHxm/NDT2	9.4
3 Nimpkish – MH/NDT1	19.9
4 Tsitika – CWHvm/NDT1	13.6
5 Tsitika – MH/NDT1	19.9
6 Woss-Vernon – CWHvm/NDT1	13.6
7 Woss-Vernon – CWHxm/NDT2	9.4
8 Woss-Vernon - MH/NDT1	19.9

As stated in the MoF/MoELP correspondence, early and mature+old seral stage requirements are not required for the NDTs present on TFL 37. Old growth

percentages listed in Table 10.3 are based on a review of Biodiversity Guidebook minimums for low intermediate and high provided for each BEC/NDT. These minimums are weighted 45% low, 45% intermediate and 10% high to arrive at the figures in Table 10.3.

10.2.1.7 Reductions to Reflect Volume Retention in Cutblocks

Volume is retained in cutblocks by means of a number of landbase removals outlined in Section 6 of this report. In addition, Canfor engineers and biologists have identified specific areas within the net landbase that should be reserved as wildlife trees patches and old growth reserves.

Productive forest landbase reductions occur all across the landbase as noted in the map provided in Appendix IV. This map provides a graphic representation of the productive forest that is reserved from harvesting across TFL 37. Each productive forest area excluded from timber harvesting measuring at least 0.25 ha in size was "buffered" with a 250-metre radius. A review of the "non-buffered areas" within the timber harvesting landbase was made and additional reserves were identified to ensure that all productive forest reserves were not more than 250 metres apart. The Biodiversity Guidebook indicates that the maximum acceptable distance between productive forest or wildlife tree reserves is 500 metres. Reserve areas for each REA are summarised in Table 7.3.

Riparian reserve zones (RRZs) and riparian management zones (RMZs) have been addressed by imposing landbase netdowns. Section 6.8 and Tables 6.6 and 6.7 outline the details of these reductions. Canfor will manage these areas by reserving a component of the RMZ adjacent to the existing RRZ. The remainder of the RMZ will be included in harvesting as per the prescription for the overall cutblock.

10.2.1.8 Management for Identified Wildlife

Canfor was the first forest company in BC to hire a staff biologist. From 1973 to 1992 the focus of the wildlife program was Colombian Black-tailed Deer inventory and research. In 1992 the focus shifted to non-game species such as small mammals and forest birds. Since 1992 Canfor has completed 18 research projects on TFL 37. More recently, inventories and research have been carried out on the following red and blue listed species:

- Marbled Murrelet;
- Queen Charlotte Goshawk;
- Northern Pygmy-Owl;
- Western Screech-Owl (blue listed in 1995, no longer listed);
- Bald Eagle (blue listed in 1990, now yellow listed);
- Great Blue Heron;
- Hutton's Vireo (blue listed in 1993, no longer listed);

- Keen's Long-eared Myotis; and
- Townsend's Big-eared Bat.

Canfor's research on red and blue listed species has been supplemented by MoELP and CWS projects on TFL 37 including:

- Queen Charlotte Goshawk;
- White-tailed Ptarmigan;
- Roosevelt elk; and
- Marten and Ermine.

Management requirements for Marbled Murrelet and Queen Charlotte Goshawk may have some impact on forest level planning. Canfor has mapped each goshawk nest in the GIS and will model wildlife habitat impacts.

Marbled Murrelet surveys were designed for watershed inventories and not for locating nesting sites. Since no nesting sites are known on TFL 37, specific modelling of Murrelet will not be included in this analysis. In addition, the June 1997 Draft Identified Wildlife Management Strategy indicates that Marbled Murrelet management will be achieved by meeting landscape level biodiversity old growth targets. Therefore no additional forest cover requirements are needed to address Marbled Murrelet.

Eight Queen Charlotte Goshawk nest sites have been located and each of these is surrounded by a 12 ha reserve area to minimise activity around nesting birds. In addition, goshawk foraging and post-fledgling areas have been identified as REAs requiring forest cover constraints to ensure that sufficient mature and old forests are maintained around nest sites. Management guidelines have not been finalised but possible alternatives will be evaluated in sensitivity analysis.

In addition, Roosevelt Elk and Columbia Blacktailed Deer require special management on TFL 37. 82 individual areas ranging in size from 1 to 330 ha have been excluded from the timber harvesting landbase in consideration of deer winter range (66 areas), elk summer range (3 areas) and elk winter range (13 areas). These productive forest reserves total 4,901 ha on TFL 37.

10.2.1.9 Recreation

Recreation opportunities on the TFL are mainly associated with campsites that have been reserved from the net landbase and karst opportunities that are managed at the site-specific level operationally. Consequently, there will be no forest cover constraints assigned to these areas in the analysis.

10.2.1.10 Higher Level Plans

The VILUP is now regarded as a higher level plan for the area assigned to TFL 37. New parks and LIAs have been established as part of the Plan. Recommended LUs and biodiversity emphasis are under continuing review. The three month public review period associated with this document will continue until 98.02.28, at which time the Plan is expected to become "draft". Assumptions associated with these aspects of the Plan will be included in the timber supply analysis.

10.3 Timber Harvesting

10.3.1 Minimum Merchantability Standards

Minimum merchantability is assessed for each yield table based on volume, diameter and/or age at which culmination of mean annual increment (MAI) is reached. From this assessment the minimum age required for harvesting has been determined for each analysis unit yield table. For the MoF Base Case culmination of MAI and volume been used as the basis for setting minimum harvest age.

Minimum harvest age for all AVLs is set at 100 years, the youngest age of any stand associated with any AVL. These stands are predominantly age class 8 & 9 (141 – 250 years or 251+ years) and are therefore much older than the default minimum harvest age of 100 years.

Culmination age for NSYTs and MSYTs was assigned to the age when volume less DWB is maximised to one decimal place (i.e. further increases in MAI would be less than 0.05 m^3/ha/year). This is a reasonable approach to avoid excessively high culmination ages resulting from small increases in MAI. The majority of NSYTs and MSYTs use culmination age to set minimum harvest age. For some NSYTs that represent sites with marginal timber, a minimum volume of 250m^3/ha is used to assign minimum harvest age. These areas will support much better stands of timber after harvest and regeneration.

A summary of the minimum harvest age attributes for the NSYTs described in Sections 7.3.2 and 8.6.2.2 is presented in Table 10.4.

Table 10.4 – Minimum Harvest Age Attributes for NSYTs

NSYT AU	Net Area (ha)	Minimum Harvest Age Attributes				
		Age	Volume	MAI	Height	Diameter
101 Fd/Other-G	220	70	733	10.47	42.70	40.40
102 Fd/Other-M	177	70	527	7.53	35.60	37.00
103 Fd/Other-P	64	90	349	3.88	28.00	35.30
104 FdHw/Cw-G	1,485	60	671	11.18	37.10	34.80
105 FdHw/Cw-M	1,719	70	613	8.76	34.30	34.60
106 FdHw/Cw-P	414	80	388	4.86	26.30	31.00
107 Cw-G	159	90	569	6.32	34.30	39.40
108 Cw-M	284	100	398	3.98	27.00	35.50
109 Cw-P	398	140	255	1.55	19.40	32.60
110 Hw/HwCw-G	2,668	60	615	10.25	34.30	36.80
111 Hw/HwCw-M	1,343	80	564	7.05	33.10	37.10
112 Hw/HwCw-P	782	90	351	3.90	25.00	31.90
113 HwFd/Ba-G	3,259	60	640	10.67	34.80	35.70
114 HwFd/Ba-M	1,888	70	587	8.38	32.50	35.10
115 HwFd/Ba-P	1,171	80	427	5.33	26.50	31.90
116 Decid-G	220	40	295	7.37	30.10	31.50
117 Decid-M	238	40	241	6.03	25.40	29.20
118 Decid-P	99	50	201	4.03	22.40	29.20
Total Area	16,588					

Minimum harvest age attributes for the existing MSYTs described in Sections 7.3.3 and 8.7.2.1 are summarised in Table 10.5. Culmination of MAI was used to determine minimum harvest age for the existing managed stand yield tables.

Table 10.5 – Minimum Harvest Age Attributes for Existing MSYTs

Existing MSYT AU	Aggregated MSYT ID	Net Area (ha)	Minimum Harvest Age Attributes				
			Age	Volume	MAI	Diameter	Height
201	C01	0	200	54	0.27	12.7	11.9
202	C02	9,402	100	705	7.05	32.5	32.9
203	C03	867	130	362	2.78	25.5	23.6
204	C04	277	150	393	2.62	28.0	25.9
205	C05	19	60	615	10.25	30.0	31.9
206	C06	23,516	70	865	12.35	36.7	37.8
207	C07	6,071	80	958	11.98	46.0	43.4
208	C08	2,232	100	920	9.20	42.9	40.3
Total		42,384					

Table 10.6 presents the minimum merchantability attributes for the future forest managed stand yield tables defined in Sections 7.3.4 and 8.7.2.2. As with other managed stand yield tables, minimum harvest age is based on culmination of MAI.

Table 10.6 – Minimum Harvest Age Attributes for Future MSYTs

Future MSYT AU	Aggregated MSYT ID	Net Area (ha)	Minimum Harvest Age Attributes				
			Age	Volume	MAI	Diameter	Height
301	R01	0	180	102	0.57	21.9	16.4
302	R02	0	140	392	2.80	37.9	25.8
303	R03	156	140	442	3.16	33.6	26.0
304	R04	55	90	495	5.50	27.1	28.5
305	R05	11,318	130	397	3.05	25.9	24.2
306	R06	394	100	1077	10.77	45.5	38.3
307	R07	312	110	954	8.67	46.6	36.4
308	R08	39,214	70	1037	14.82	39.7	41.8
309	R09	363	110	675	6.14	38.7	30.8
310	R10	9,968	100	802	8.02	33.2	33.7
311	R11	2,362	90	948	10.53	36.8	37.2
312	R12	39,107	70	822	11.75	33.4	36.1
Total		103,248					

It should be recognised that the application of forest cover constraints in some LU-BEC/NDTs and REAs might delay stand entry well beyond the minimum ages provided in Tables 10.4, 10.5 and 10.6. This delay will result in long-term harvest levels below the theoretical Long Run Sustained Yield (LRSY), which is based on harvesting all stands at culmination age.

10.3.2 Operability

The operability classification includes three categories:

- Physical - areas that are considered unsafe for falling have been identified as physically inoperable on the TFL. These areas are excluded from the timber harvesting landbase, as they are unlikely to contribute to long-term timber supply.
- Technical – areas that are technically limiting with conventional systems and require aerial systems or skylines with supports. These "unconventional systems" are now commonly used on TFL 37 and therefore are included in the timber harvesting landbase.
- Economic – as described in Section 6.10, Canfor's mature timber stratification includes economic operability classes. "Uneconomic" stands have been excluded from the net landbase due to poor value or site potential. "Marginally economic" and "economic" have been included in the timber harvesting landbase. Many marginal stands were excluded as part of other netdown steps.

10.3.3 Initial Harvest Rate

The initial harvest rate for the MoF Base Case and other options will be the current AAC for TFL 37 plus non-recoverable losses. The harvest rate is broken down as follows:

- Canfor – 1,024,816m^3/year
- SBFEP – 43,184m^3/year
- Total harvest – 1,068,000m^3/year
- Non-recoverable losses – 3,165m^3/year

Therefore, the initial annual harvest target will be 1,071,165m^3/year for the MoF Base Case.

10.3.4 Harvest Rules

Harvest rules are included in the simulation model to rank stands for harvest. The general rule is oldest first. With this rule in place older stands are queued for harvest ahead of younger stands. Harvest rules interact with forest cover constraints to determine the actual order of harvesting within the model. If a higher ranked stand is constrained within a forest cover group then the model will select the next highest-ranking stand that is eligible for harvest.

Alternative harvest rules will be explored including:

- Maximise existing stand volume; and
- Maximise regeneration increment.

10.3.5 Harvest Profile

At present the harvest profile is based mainly on seasonal harvesting requirements. During the first 20 years of the MoF Base Case, the annual harvest will be distributed between summer and winter harvesting areas as follows:

- Summer harvest - 52%; and
- Winter/transition – 48%

In CASH6 analysis units are aggregated into profile groups for modelling. A range of +/-10% will be used for profiling in the timber supply analysis.

Commercial thinning has been carried out on TFL 37 for over 15 years. The average annual commercial thinning harvest over the past five years was 9,710m^3 from an area of 78 ha. Given the small proportion of the total harvest that commercial thinning represents, it will not be explicitly modelled in the timber supply analysis.

10.3.6 Harvest Flow Objectives

In all phases of the analysis the harvest flow objectives will be to:

- Sustain the current harvest level for as long as possible;
- Decrease the periodic harvest rate in acceptable steps during the periods when declines are required to meet all objectives associated with the various resources on TFL 37;
- Achieve an essentially even-flow of timber at or above the long-term sustainable level with consideration for forest cover requirements; and
- Take advantage of opportunities to increase the harvest rate by implementing management programmes while maintaining the requirements of non-timber resources.

A number of alternative harvest flows will be evaluated for the MoF Base Case in order to gain a complete understanding of the factors that influence timber supply on TFL 37.

11.0 SENSITIVITY ANALYSIS

This section provides detailed descriptions of the sensitivity analyses that will be performed on the MoF Base Case. The sensitivities attempt to reflect alternative management or potential changes to mandated forest practices.

11.1 Landbase Revisions

Three landbase revisions will be made to the netdowns described in Section 6.1. All forest areas removed from the timber harvesting landbase in the following sensitivities will still contribute to forest cover constraints and landscape level biodiversity requirements where appropriate.

11.1.1 Remove Technically Unconventional Areas

This scenario will evaluate the impact of removing on timber supply of all areas requiring unconventional harvesting methods from the timber harvesting landbase. 6,998 ha of mature forest requiring unconventional harvesting methods will be excluded from the timber harvesting landbase. This reduction represents 5,512,000m^3 of timber. It is assumed that these areas will not be available for timber supply at any time. The revised current net operable landbase is 96,250 ha and the long-term net operable landbase is 94,322 ha.

11.1.2 Remove Marginally Economic Stands

Marginally economic stands are defined as being available for harvest under certain market conditions and adjacent to economic stands. In this sensitivity analysis the impacts on timber supply of removing 8,493 ha of marginally economic mature stands from the timber harvesting landbase will be explored. This reduction results in the exclusion of 4,801,000m^3 of timber. The revised

current net operable landbase is 94,755 ha and the long-term net operable landbase is 92,879 ha.

11.1.3 Include Uneconomic Stands with Productive Regeneration Attributes

Economic operability classification was based on the attributes of the existing mature forest. A review of these uneconomic stands indicates that there is potential for much improved timber production under current silviculture regimes outlined in Section 8.7.1. This scenario will evaluate the impact on timber supply of adding back in a component of the "uneconomic" inventory that will regenerate to a productive growth type.

In this sensitivity any stands excluded as uneconomic (Section 6.10) will be added to the timber harvesting landbase if they are associated with an acceptable future managed stand regime based on the productivity assignment. 3,169 ha and 917,000 m^3 of uneconomic mature stands will be included in the timber harvesting landbase for this scenario. The revised current net operable landbase is 106,417 ha and the long-term net operable landbase is 104,136 ha. Table 11.1 summarises the additional area by Canfor AVL and VDYP existing analysis unit.

Table 11.1 – Additional Uneconomic Area by Existing VDYP & AVL AU

Existing AU (VDYP or AVL)	Net Area (ha)	Volume (1000s m^3)
Canfor AVL		
25	819	193
35	413	162
38	260	75
68	1,001	376
76	27	9
77	8	4
VDYP NSYT		
103	16	1
106	63	10
108	2	1
109	247	39
112	182	28
115	124	16
116	7	2
Total	3,169	917

Table 11.2 summarises the additional area by future (regeneration) analysis unit and TIPSY managed stand yield table.

Table 11.2 – Additional Uneconomic Area by Future MSYT

Future MSYT AU	Aggregated MSYT ID	Net Area (ha)
303	R03	24
304	R04	1
305	R05	1,157
306	R06	16
307	R07	10
308	R08	221
309	R09	32
310	R10	678
311	R11	10
312	R12	1,021
Total		3,169

11.2 Growth and Yield

A number of alternative growth and yield inputs will be used in individual sensitivity analyses to evaluate their impact on timber supply.

11.2.1 Reduced Minimum Harvest Age

Minimum harvest ages for existing and future managed stands will be reduced by 10 years to test the impact on timber supply.

11.2.2 Future Stand Volumes

In this sensitivity analysis managed stand yields associated with the future forest (AUs 301 – 312) will be increased and decreased by 10% to test the impact on timber supply. This will evaluate the impact on timber supply of potentially incorrect estimates of future managed stand yields.

11.2.3 Regeneration Delay

Regeneration delay will be increased to 2 years and reduced to 0 years in this series of analyses.

11.3 Forest Cover Constraints

11.3.1 Resource Emphasis Area Maximum Disturbance

Maximum disturbance within REAs will be increased and decreased as noted in Table 11.3.

Table 11.3 – REA Disturbance Sensitivity Analyses

Resource Emphasis Category	MoF Base Case Disturbance	Sensitivity Analysis Disturbance	
		Increase Disturbance	Decrease Disturbance
Visual-1 (VQO-R)	3% < 6.5 metres	13% < 6.5 metres	0% < 6.5 metres
Goshawk Foraging	25% < 3 metres	33% < 3 metres	20% < 3 metres
Goshawk Post-Fledgling	25% < 3 metres	33% < 3 metres	20% < 3 metres
Visual-2 (VQO-PR)	13% < 6.5 metres	25% < 6.5 metres	3% < 6.5 metres
LIAs	25% < 3 metres	33% < 3 metres	20% < 3 metres
GFAs	25% < 3 metres	33% < 3 metres	20% < 3 metres
HIAs	25% < 3 metres	33% < 3 metres	20% < 3 metres

33% maximum disturbance simulates a 3-pass system while a 20% maximum disturbance simulates a 5-pass system of harvesting.

11.3.2 Alternative Green-up Requirements

In addition to the adjustments made to maximum disturbance outlined in Table 11.3, green-up requirements will be revised in all non-visually sensitive REAs as follows:

- Nimpkish HIA 1.0 metre, all others 3.0 metres;
- Nimpkish HIA 1.0 metre, all others 2.0 metres; and
- All non-visual REAs 1.0 metre.

All others includes Goshawk Foraging, Goshawk Post-Fledgling, LIAs, Tsitika GFA and Woss-Vernon GFA.

11.3.3 Alternative Goshawk Management

Alternative forest cover constraints will be used in modelling draft management guidelines for Queen Charlotte Goshawk as presented in Table 11.4.

Table 11.4 – Alternative Goshawk Management Forest Cover Constraints

Resource Emphasis Area Category	Forest Cover Constraint		
	Maximum Disturbance (% < 40 years)	Minimum Mature (% > 80 years)	Minimum Old growth (% > 250 years)
Goshawk Foraging	20	60	20
Goshawk Post-Fledgling	20	60	20

In one of the Alternative Goshawk Management sensitivity runs the alternative forest cover constraints listed in Table 11.4 will be assigned only to Loon Lake & Vernon Ridge nest sites. A second sensitivity run will apply the alternative

constraints to all foraging and post-fledgling REAs surrounding all eight nest sites identified on TFL 37.

Both Goshawk Foraging and Post-Fledgling REAs will allow non-contributing forest areas to affect all three forest cover constraint types. Areas with insufficient mature or old growth forest to meet the prescribed forest cover constraints may still be able to contribute to the periodic harvest. A component of the forest is put into a reserve with the expectation that this forest will eventually make up the mature or old growth deficiency. If there are forest stands older than minimum harvest age in excess of this reserve component harvesting may continue in the REA.

11.3.4 Landscape Level Biodiversity

The MoF Base Case models a weighted-average old growth on the recommended LU-BEC/NDTs for TFL 37. This average is based on 45% low emphasis, 45% intermediate emphasis and 10% high emphasis from the Biodiversity Guidebook for the appropriate BEC/NDT. In this group of sensitivity analyses alternative old growth requirements will be modelled on each recommended LU-BEC/NDT. All LU-BEC/NDTs will be modelled as low emphasis. Recommended biodiversity emphasis will be evaluated in the VILUP option of the analysis. Table 11.5 summarises the alternative old growth requirements for this sensitivity analyses.

Table 11.5 – Alternative LU-BEC/NDT Old growth Requirements

LU – BEC/NDT	Minimum Old Growth (% > 250 years)	
	MoF Base Case 45%-45%-10% Weighted Average	All Low Emphasis
1 Nimpkish - CWHvm/NDT1	13.6	13
2 Nimpkish – CWHxm/NDT2	9.4	9
3 Nimpkish – MH/NDT1	19.9	19
4 Tsitika – CWHvm/NDT1	13.6	13
5 Tsitika – MH/NDT1	19.9	19
6 Woss-Vernon – CWHvm/NDT1	13.6	13
7 Woss-Vernon – CWHxm/NDT2	9.4	9
8 Woss-Vernon - MH/NDT1	19.9	19

11.3.5 20-Year Harvest Plan

Canfor engineers have outlined approximate locations for cutblocks within the available mature forest on TFL 37. These cutblock boundaries will be included in the GIS database used for preparing analysis inputs. An additional sensitivity run will be completed that uses these actual cutblock locations to drive the first 20 years of the analysis harvest. CASH6 will model the harvest simulation in true

spatial format and provide map output of the results. Harvest of Canfor cutblocks will be determined by CASH6 based on available timber and forest cover constraints included as inputs to the simulation.

CASH6 will incorporate all forest cover constraints outlined for the MoF Base Case in the spatial analysis of the 20-Year Plan.

12.0 PRODUCTS BASED SILVICULTURE OPTION

This option includes modified silviculture regimes and minimum harvest ages for future managed stands based on target log sizes and species preferences outlined by Canfor staff. These targets are based on future product expectations. A review of height and diameter as well as common attributes (MAI and volume) have been considered to ensure that product objectives will be met from future managed stands.

Tables12.1 and 12.2 summarise the updated minimum harvest age attributes for existing and future managed stand yields, respectively, to meet alternative target log sizes from those outlined for the MoF Base Case.

Table 12.1 – Target Harvest Attributes for Existing TIPSY MSYTs
Products-Based Silviculture Option

Existing MSYT AU	Aggregated MSYT ID	Net Area (ha)	Minimum Harvest Age Attributes				
			Age	Volume	MAI	Diameter	Height
201	C01	0	200	54	0.27	12.7	11.9
202	C02	9,402	90	626	6.96	31.0	31.0
203	C03	867	130	362	2.78	25.5	23.6
204	C04	277	140	361	2.58	27.1	25.0
205	C05	19	60	615	10.25	30.0	31.9
206	C06	23,516	65	794	12.20	35.1	36.0
207	C07	6,071	70	821	11.73	41.9	40.1
208	C08	2,232	85	763	8.96	39.0	36.8
Total		42,384					

Table 12.2 – Target Harvest Attributes for Future TIPSY MSYTs Products-Based Silviculture Option

Future MSYT AU	Aggregated MSYT ID	Net Area (ha)	Minimum Harvest Age Attributes				
			Age	Volume	MAI	Diameter	Height
301	R01	0	180	102	0.57	21.9	16.4
302	R02	0	140	392	2.80	37.9	25.8
303	R03	156	130	405	3.12	32.6	25.1
304	R04	55	90	495	5.50	27.1	28.5
305	R05	11,318	129	393	3.05	25.9	24.1
306	R06	394	75	751	10.00	39.8	32.1
307	R07	312	80	643	8.04	40.6	30.2
308	R08	39,214	61	899	14.74	35.8	38.3
309	R09	363	100	608	6.08	37.2	29.2
310	R10	9,968	91	723	7.95	31.7	31.9
311	R11	2,362	77	793	10.29	33.8	33.9
312	R12	39,107	69	8.08	11.72	33.0	35.8
Total		103,248					

13.0 ADDITIONAL INCREMENTAL SILVICULTURE OPTION

This option will evaluate the timber supply impacts of increasing the level of incremental silviculture on TFL 37. Canfor currently has an extensive programme of spacing, fertilisation, first generation seed orchards and commercial thinning. Gains from second-generation tree improvement combined with spacing and fertilisation will be evaluated in this option. The revised inputs for this option will be conducted on both the MoF Base Case and Product-Based Silviculture options.

13.1 Future Managed Stand Yield Tables

New managed stand yield tables were developed for this option. Unlike other options, yield tables developed for this option were not aggregated in the same manner as MSYTs for the MoF Base Case. A total of 64 enhanced managed stand yield tables were produced for the following groups of site types:

- 48 yield tables represent the site types on the TFL with additional tree improvement;
- 16 additional yield tables include spacing and/or fertilisation treatments in combination with tree improvement;
- Enhanced managed stand yield tables will be assigned to analysis units 401 – 464.

As noted in the MoF Base Case, some of the site types/silviculture regimes are not represented in the net landbase. A full listing of the enhanced managed stand yield tables is provided in Appendix III-c. Table 13.1 summarises the minimum harvest age attributes associated with the enhanced managed stand yield tables.

Table 13.1 – Minimum Harvest Age Attributes for Future Enhanced MSYTs Additional Incremental Silviculture Option

Future MSYT AU	Aggregated MSYT ID	Net Area (ha)	Minimum Harvest Age Attributes				
			Age	Volume	MAI	Diameter	Height
Tree Improvement							
401	E01	3,519	80	930	11.63	33.0	37.3
402	E02	0	150	109	0.73	25.7	18.3
403	E03	0	150	33	0.22	15.9	13.1
404	E04	0	120	52	0.43	17.0	14.4
405	E05	931	70	830	11.86	33.0	38.0
406	E06	813	130	414	3.18	27.0	25.2
407	E07	148	130	433	3.33	25.0	25.2
408	E08	146	90	770	8.56	30.0	32.7
409	E09	754	80	930	11.63	35.0	36.1
410	E10	1,029	70	1043	14.90	35.0	38.2
411	E11	55	90	565	6.28	27.0	30.3
412	E12	18	90	870	9.67	38.0	38.4
413	E13	1,854	70	777	11.10	31.0	35.6
414	E14	7,381	60	858	14.30	33.0	37.5
415	E15	15,234	60	937	15.62	34.0	39.4
416	E16	17,914	60	984	16.40	36.0	40.6
417	E17	712	60	1111	18.52	39.0	43.9
418	E18	6,812	70	878	12.54	34.0	39.2
419	E19	410	100	741	7.41	31.0	32.2
420	E20	202	100	821	8.21	32.0	33.9
421	E21	20	90	887	9.86	35.0	35.3
422	E22	17,181	90	981	10.90	35.0	36.9
423	E23	0	200	200	1.00	30.0	21.4
424	E24	526	110	332	3.02	24.0	22.3
425	E25	9,108	110	332	3.02	24.0	22.3
426	E26	286	90	784	8.71	30.0	32.8
427	E27	590	90	723	8.03	30.0	31.6
428	E28	500	100	905	9.05	33.0	35.4
429	E29	363	80	998	12.48	33.0	37.0
430	E30	2,161	60	1050	17.50	35.0	41.4
431	E31	2,905	60	1136	18.93	39.0	43.8
432	E32	288	60	1211	20.18	42.0	46.1
433	E33	215	120	478	3.98	27.0	26.1
434	E34	1,219	90	760	8.44	31.0	32.3
435	E35	1,570	80	975	12.19	33.0	36.4
436	E36	35	70	968	13.83	33.0	36.1
437	E37	14	170	230	1.35	22.0	19.4
438	E38	299	110	424	3.85	26.0	24.7
439	E39	6,616	100	855	8.55	33.0	34.9
440	E40	73	110	327	2.97	30.0	23.0
441	E41	0	250	2	0.01	9.28	8.7
442	E42	0	250	140	0.56	25.4	18.0

Future MSYT AU	Aggregated MSYT ID	Net Area (ha)	Minimum Harvest Age Attributes				
			Age	Volume	MAI	Diameter	Height
443	E43	209	120	269	2.24	27.0	20.6
444	E44	0	140	383	2.74	37.5	25.7
445	E45	68	120	411	3.43	33.0	25.1
446	E46	363	100	667	6.67	38.0	30.5
447	E47	312	110	944	8.58	46.0	36.3
448	E48	394	90	1046	11.62	44.0	37.6
Tree Improvement total		103,248					
Tree Imp+Spacing total							
449	E49	3,519	80	915	11.44	36.0	37.3
450	E50	931	70	1088	15.54	39.0	39.3
451	E51	1,029	70	1034	14.77	37.0	38.2
452	E52	15,234	60	934	15.57	37.0	39.4
453	E53	17,914	60	983	16.38	38.0	40.6
454	E54	712	60	1114	18.57	42.0	43.9
455	E55	363	80	984	12.30	37.0	37.0
456	E56	2,161	60	1051	17.52	40.0	41.4
457	E57	2,905	60	1143	19.05	42.0	43.8
458	E58	288	60	1227	20.45	46.0	46.1
Tree Imp+Spacing total		45,056					
Tree Imp+Fertilisation							
462	E62	6,812	70	878	12.54	34.0	39.2
Tree Imp+Fert+Spacing							
463	E63	15,234	60	934	15.57	37.0	39.4
464	E64	17,914	60	983	16.38	38.0	40.6
Tree Imp+Fert+Spacing total		33,148					

In this scenario all future stands will be included in tree improvement programs. Only specific components of the future forest will be treated with spacing and/or fertilisation.

14.0 VANCOUVER ISLAND LAND USE PLAN OPTION

This option will evaluate the impacts of the decisions made as part of the VILUP implementation process. The landbase will be the same as that defined for the MoF Base Case. Landscape level biodiversity will be based on the recommended biodiversity emphasis provided for the VILUP. Table 14.1 summarises the old growth requirement for each LU-BEC/NDT.

Table 14.1 –LU-BEC/NDT Old growth Requirements

LU – BEC/NDT	Recommended Biodiversity Emphasis	Minimum Old Growth (% > 250 years)
1 Nimpkish - CWHvm/NDT1	Low	13
2 Nimpkish – CWHxm/NDT2	Low	9
3 Nimpkish – MH/NDT1	Low	19
4 Tsitika – CWHvm/NDT1	High	19
5 Tsitika – MH/NDT1	High	28
6 Woss-Vernon – CWHvm/NDT1	Intermediate	13
7 Woss-Vernon – CWHxm/NDT2	Intermediate	9
8 Woss-Vernon - MH/NDT1	Intermediate	19

14.1 Sensitivity Analysis

14.1.1 Landbase Revisions

Landbase sensitivity analysis for the VILUP option will evaluate two revisions to the area available for timber harvesting:

- Addition of uneconomic stands with productive regeneration attributes; and
- Addition of parks excluded under the VILUP.

Section 11.1.3 summarises the additional area associated with uneconomic stands. Park area additions will add back recently established parks that were excluded in the MoF Base Case. This includes 4,543 ha of productive land and 3,613,000m^3 of merchantable timber. All park areas included in this scenario have been subjected to the same series of netdown criteria for riparian, ESAs, etc. as outlined in the MoF Base Case. Table 14.2 summaries the additional area by existing analysis unit that will be added to the timber harvesting landbase for this sensitivity.

Table 14.2 – Additional Park Area by Existing AVL, NSYT & MSYT AU

Existing AU	Additional Park Net Area (ha)	Volume (1000s m^3)
Canfor AVLs		
1	325	291
2	127	88
3	140	126
4	147	161
5	67	56
6	23	21
7	123	100
8	117	107
9	162	144
10	40	40
11	61	51
12	95	104
13	22	23
14	1	1

Existing AU	Additional Park Net Area (ha)	Volume (1000s m^3)
15	72	85
16	18	15
17	7	5
18	381	328
19	190	182
20	100	100
21	10	11
22	76	65
23	21	20
24	30	37
26	104	79
27	167	101
28	31	23
29	17	14
30	28	22
32	46	34
34	9	7
36	29	20
39	24	25
40	21	24
41	41	33
42	60	59
43	86	84
44	63	64
45	22	21
46	42	48
47	8	7
48	2	2
50	193	147
51	37	34
52	25	24
54	5	5
55	92	67
56	25	22
57	36	45
58	33	39
62	7	3
63	4	3
64	2	1
67	43	19
69	9	4
72	5	4
AVL subtotal	3674	3248
NSYTs		
104	39	30
105	10	4
107	1	1
108	24	7
109	45	13
110	101	59
111	81	40
112	28	9
113	143	103

Existing AU	Additional Park Net Area (ha)	Volume (1000s m^3)
114	54	29
115	131	41
116	22	9
117	28	8
NSYT subtotal	706	355
MSYTs		
202	19	1
203	1	0
204	1	1
206	78	1
207	33	4
208	31	3
MSYT subtotal	163	10
Total	4543	3613

Table 14.2 summarises the additional area by future (regeneration) analysis unit and MSYT ID.

Table 14.2 – Additional Uneconomic Area by Future MSYT

Future MSYT AU	Aggregated MSYT ID	Additional Park Net Area (ha)
303	303	3
305	305	538
306	306	4
307	307	14
308	308	1351
309	309	1
310	310	451
311	311	135
312	312	2048
Total		4543

14.1.2 Forest Cover Constraints

Additional sensitivity analyses will be conducted on this option. Sensitivity will evaluate the impacts of green-up requirements in non-visually sensitive areas will be reviewed using modifications listed below:

- Nimpkish HIA 1.0 metre, all others 3.0 metres;
- Nimpkish HIA 1.0 metre, all others 2.0 metres; and
- All non-visual REAs 1.0 metre.

Appendix I – AVL Descriptions

Stratum	Species	Age Range	Age Clas	CC	Ht Range	Areas	Operability	Net m3/ha	Total Height	Tally Plots	Count Plots
1	H+	141-300+	8&9	40+	20-29	2,769	E	895	32.8	7	1
2	H(BY)	300+	9	40+	30-34	2,242	E	694	31.5	14	0
3	H(BCY)	300+	9	40+	35-39	2,744	E	899	36.5	20	6
4	H(BC)	300+	9	40+	40-44	2,168	E	1093	39.9	20	1
5	H(BC)	300+	9	40+	45-49	1,312	E	842	46.1	16	4
6	H(BC)	300+	9	40+	50+	533	E	918	45.5	21	7
7	HB(YC)	141-300+	8&9	40+	20-29	1,061	M	812	31.0	7	2
8	HB(YC)	141-300+	8&9	40+	30-34	1,405	E	909	35.7	15	4
9	HB(Y)	141-300+	8&9	40+	35-39	2,480	E	888	38.6	14	9
10	HB(Y)	141-300+	8&9	40+	40-42	1,834	E	992	39.5	30	17
11	HB(CY)	300+	9	40+	43-45	2,016	E	838	42.4	53	20
12	HB(C)	300+	9	40+	46-49	1,828	E	1088	46.4	41	21
13	HB	300+	9	40+	50-52	615	E	1042	49.7	20	14
14	HB	300+	9	40+	53-56	441	E	1065	46.1	20	12
15	HB(C)	300+	9	40+	57+	359	E	1192	48.4	12	4
16	HBC	300+	9	40+	43-53	161	E	850	42.1	7	5
17	HBY	300+	9	40+	30-45	294	E	684	37.3	20	6
18	HC(BY)	300+	9	40+	25-39	3,803	E	859	34.2	12	2
19	HC(B)	300+	9	40+	40-44	1,771	E	957	42.2	14	1
20	HC(FB)	300+	9	40+	45-49	1,290	E	1002	43.2	21	4
21	HC(FB)	300+	9	40+	50+	336	E	1008	45.4	11	5
22	HF(C)	300+	9	40+	27-39	1,532	E	852	35.5	11	2
23	HF(C)	300+	9	40+	40-49	1,003	E	927	37.9	15	8
24	HF(C)	300+	9	10+	50+	318	E	1221	51.3	18	
25	Open HmY(B)	300+	9	-49	16-30	5,919	U	236	24.1	10	1
26	Closed HmY(B)	300+	9	50+	16-35	3,205	M	763	30.1	12	5
27	HY(B)	300+	9	50+	20-29	2,865	M	605	28.9	6	2
28	HY(B)	300+	9	40+	30-34	2,019	E	745	32.5	18	7
29	HY(BC)	300+	9	40+	35-39	2,453	E	836	37.4	23	12
30	HY(BC)	300+	9	40+	40-52	1,158	E	820	40.3	16	4
31	HYB	141-250	8	50+	20-29	146	M	493	20.3	3	3
32	HF or HC	141-250	8	40+	20-29	888	E	743	29.8	5	1
33	HF or HC	141-250	8	40+	30-39	758	E	791	36.1	15	2
34	HF or HC	141-250	8	40+	40+	387	E	765	37.7	13	
35	H+	121-140	7	40+	20-29	625	U	393	25.2	4	2
36	H+	121-140	7	40+	30-39	654	E	704	32.3	15	8
37	HYF	121-140	7	40+	20-36	124	E	794	25.5	5	5
38	H+	101-120	6	40+	18-39	311	U	290	22.2	6	5
39	B(H)	300+	9	40+	38-49	301	E	1079	45.7	10	3
40	B(H)	300+	9	40+	50-62	230	E	1139	49.1	9	1
41	BH(Y)	300+	9	40+	20-34	666	M	808	39.8	16	9
42	BH(Y)	300+	9	40+	35-39	749	E	980	39.0	14	12
43	BH(YC)	300+	9	40+	40-44	906	E	976	42.0	16	9
44	BH(C)	300+	9	40+	45-49	1,282	E	1009	46.0	54	25
45	BH(C)	300+	9	40+	50+	675	E	988	46.8	34	11
46	BCH(Y)	300+	9	40+	37-51	145	E	1149	47.7	3	2
47	BH(F)	141-250	8	40+	35-45	255	E	871	36.4	5	3
48	C(HBY)	300+	9	40+	23-39	326	E	767	37.8	13	3
49	C(HBF)	300+	9	40+	40-54	444	E	1040	42.4	16	7
50	CH(FB)	141-300+	8&9	40+	25-39	2,232	E	764	37.0	14	1
51	CH(BF)	141-300+	8&9	40+	40-44	1,361	E	900	36.8	19	10
52	CH(BF)	141-300+	8&9	40+	45-49	906	E	976	42.0	33	15
53	CH(B)	300+	9	40+	50+	401	E	974	47.8	8	5
54	CHB	300+	9	40+	35-52	111	E	960	40.4	6	1
55	FH or FC	141-300+	8&9	40+	24-39	1,232	E	727	34.3	10	
56	FH or FC	141-300+	8&9	40+	40-44	509	E	879	39.5	8	
57	FH or FC	141-300+	8&9	40+	45-49	559	E	1262	47.3	16	5
58	FH or FC	141-300+	8&9	40+	50-59	641	E	1207	44.9	9	5
60	FH or FC	300+	9	40+	60-69	153	E	1199	51.8	5	
61	FH or FC	300+	9	40+	70+	52	E	1274	62.5	6	1
62	FH or FC	121-140	7	50+	20-29	118	M	485	35.4	3	
63	FH or FC	121-140	7	50+	30-39	194	E	758	37.3	6	4
64	FH or FC	121-140	7	50+	40-49	173	E	776	39.2	13	9
65	FH or FC	121-140	7	50+	50+	16	E	1640	44.7	3	3
66	S	300+	9	40+	50+	83	E	2049	51.4	3	
67	Open HmY or H	300+	9	-49	15-29	5,853	M	441	29.9	8	1
68	Closed HmY or H	300+	9	50+	15-24	2,343	U	376	25.1	13	2
69	YH or Hm	300+	9	50+	25-29	2,700	M	453	26.7	18	1
70	YH(B)	300+	9	40+	30-33	1,624	M	530	30.1	20	9
71	YH(B)	300+	9	40+	34-36	888	E	578	31.6	24	11
72	YH(B)	300+	9	40+	37-39	945	E	685	34.8	21	11
73	YH(BC)	300+	9	40+	40+	602	E	802	37.3	23	10
74	YC(H)	300+	9	-49	15-29	1,816	M	285	29.1	8	
75	YC(HB)	300+	9	40+	30+	90	E	991	36.5	6	
76	Pl+	121-140	7	40+	15-30	99	U	350	26.3	6	2
77	D(HF)	61+	3&4	40+	20-35	28	U	470	31.4	3	5

Stratum	Species	Age Range	Age Clas	CC	Ht Range	Areas	Operability	Net m3/ha	Total Height	Tally Plots	Count Plots
101	H/HB	141+		40+	-14	12	U				
102	H/HB	141+		40+	15-19	74	U				
103	H/HB	101-140		40+	-14	4	U				
104	H/HB	101-140		40+	15-19	15	U				
105	HC/HF	251+		40+	-14	10	U				
106	HC/HF	251+		40+	15-19	4	U				
107	HF/HC	251+		40+	20-26	99	M				
108	HC/HF	101-140		40+	-14	2	U				
109	HC/HF	101-140		40+	15-19	70	U				
110	Hw/Y	121+		40+	-15	26	U				
111	HmB/HmY	121+		40+	-15	25	U				
112	B/BH	121+		40+	-14	20	U				
113	B/BH	121+		40+	15-19	24	U				
114	BHm	121+		40+	-19	2	U				
116	C/CH	141+		40+	-14	8	U				
117	C/CH	141+		40+	15-19	194	U				
118	C/CH	141+		40+	20-24	536	M				
120	C/CH	121-140		40+	-19	69	U				
121	C/CH	121-140		40+	20-24	56	M				
123	CF	141+		40+	-19	5	U				
124	CF	141+		40+	20-24	25	M				
126	CF	121-140		40+	-24	9	M				
129	F/FH/FC	141+		40+	-19	13	U				
130	F/FH/FC	141+		40+	20-23	73	E				
131	F/FH/FC	101-140		40+	-14	5	U				
132	F/FH/FC	101-140		40+	15-19	19	U				
137	Y/YH	121+		40+	-14	27	U				
138	Y/YHm	121+		40+	-14	34	U				
139	YC	121+		40+	15-19	38	U				
140	AC+	141+		40+	30+	10	U				

Stratum	Species	Age Range	Age Clas	CC	Ht Range	Areas	Operability	Net m3/ha	Total Height	Tally Plots	Count Plots
201	H/HB	141+		-39	-14	97	U				
202	H/HB	141+		-39	15-19	171	U				
203	H/HB	141+		-39	20-29	549	U				
204	H/HB	141+		-39	30-39	262	U				
205	H/HB	141+		-39	40-49	149	M				
206	H/HB	141+		-39	50+	13	M				
207	H/HB	101-140		-39	-14	7	U				
208	H/HB	101-140		-39	15-19	10	U				
209	HC/HF	141+		-39	-14	11	U				
210	HC/HF	141+		-39	15-19	28	U				
211	HC/HF	141+		-39	20-29	79	U				
212	HC/HF	141+		-39	30-39	41	E				
213	HC/HF	141+		-39	40-49	145	M				
214	HC/HF	141+		-39	50+	23	M				
216	HC/HF	101-140		-39	-19	1	U				
217	HC/HF	101-140		-39	20-29	8	U				
218	HY	141+		-39	-15	162	U				
219	HY	121-140		-39	-15	19	U				
222	HPI	141+		-39	-15	4	U				
223	HPI	141+		-39	16-20	29	U				
224	HPI	121-140		-39	-15	7	U				
225	HPI	121-140		-39	16-20	12	U				
227	HD/HA	141+		-39	-39	13	U				
228	HD/HA	141+		-39	40+	21	M				
229	Hm/HmB	141+		-39	-15	152	U				
230	Hm/HmB	121-140		-39	-15	27	U				
231	HmY	141+		-39	-15	366	U				
232	HmY	121-140		-39	-15	28	U				
233	B/BH	141+		-39	-15	68	U				
234	B/BH	141+		-39	16-19	5	U				
235	B/BH	141+		-39	20-29	21	U				
236	B/BH	141+		-39	30-39	9	E				
237	B/BH	141+		-39	40+	25	M				
239	B/BH	121-140		-39	-15	39	U				
240	B/BH	121-140		-39	16-19	2	U				
241	C/CH	141+		-39	-14	8	U				
242	C/CH	141+		-39	15-19	45	U				
243	C/CH	141+		-39	20-29	127	U				
244	C/CH	141+		-39	30-39	107	E				
245	C/CH	141+		-39	40-49	142	M				
246	C/CH	141+		-39	50+	18	M				
247	C/CH	121-140		-39	-14	4	U				
249	C/CH	121-140		-39	15-29	4	U				
250	C/CH	121-140		-39	30+	4	E				
251	CF	141+		-39	-14	2	U				
252	CF	141+		-39	15-19	5	U				
253	CF	141+		-39	20-29	1	U				
255	CF	141+		-39	30+	6	E				
257	CPI	141+		-39	-19	13	U				
259	CD/CA	141+		-39	-29	2	U				
260	CD/CA	141+		-39	30-39	8	E				
261	CD/CA	141+		-39	40+	9	M				
263	F/FH/FC	141+		-39	-19	18	U				
264	F/FH/FC	141+		-39	20-29	37	U				
265	F/FH/FC	141+		-39	30-39	158	E				
266	F/FH/FC	141+		-39	40-49	84	M				
267	F/FH/FC	141+		-39	50+	15	M				
270	F/FH/FC	121-140		-39	-29	20	U				
272	FPI	141+		-39	-19	11	U				
273	FPI	141+		-39	20-29	8	U				
274	FPI	141+		-39	30+	3	E				
277	FPI	121-140		-39	15-29	3	U				
278	YH/YB	141+		-39	-14	255	U				
279	Y/Hm	141+		-39	-14	625	U				
280	Y/YC/YPI	141+		-39	-14	492	U				
281	PI+	141+		-39	-14	19	U				
282	PI+	141+		-39	15-20	12	U				
283	PI+	121-140		-39	-14	27	U				
284	PI+	121-140		-39	15-19	10	U				
285	PI+	121-140		-39	20-29	1	U				
286	S+	141+		-39	40+	8	M				

Appendix II
VDYP Natural Stand Yield Tables

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
101 Fd/Other-G	10	3.4	0.0	0	0.0
	20	12.6	22.4	2	0.1
	30	21.1	24.8	185	6.2
	40	28.1	28.7	350	8.7
	50	33.9	32.6	494	9.9
	60	38.7	36.5	621	10.3
	** 70	42.7	40.4	733	10.5
	80	46.2	44.3	834	10.4
	90	49.2	48.2	921	10.2
	100	51.8	52.1	998	10.0
	110	54.2	56.1	1,065	9.7
	120	56.2	60.0	1,127	9.4
	130	58.1	63.6	1,176	9.0
	140	59.8	67.2	1,217	8.7
	150	61.3	70.6	1,250	8.3
	160	62.7	73.8	1,275	8.0
	170	64.0	77.0	1,292	7.6
	180	65.2	80.0	1,300	7.2
	190	66.3	83.3	1,318	6.9
	200	67.3	86.5	1,335	6.7
	210	68.3	89.8	1,353	6.4
	220	69.2	93.1	1,370	6.2
	230	70.0	96.4	1,386	6.0
	240	70.8	99.7	1,402	5.8
	250	71.5	103.0	1,417	5.7
	260	72.2	103.2	1,418	5.5
	270	72.9	103.4	1,419	5.3
	280	73.5	103.6	1,420	5.1
	290	74.1	103.7	1,420	4.9
	300	74.7	103.9	1,421	4.7
	310	75.2	104.1	1,421	4.6
	320	75.7	104.2	1,421	4.4
	330	76.2	104.4	1,421	4.3
	340	76.7	104.6	1,421	4.2
	350	77.1	104.7	1,422	4.1

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
102 Fd/Other-M	10	2.5	0.0	0	0.0
	20	10.1	0.0	0	0.0
	30	17.4	23.7	100	3.3
	40	23.3	27.0	231	5.8
	50	28.2	30.3	343	6.9
	60	32.2	33.7	441	7.4
	** 70	35.6	37.0	527	7.5
	80	38.4	40.3	603	7.5
	90	40.9	43.7	669	7.4
	100	43.0	47.0	728	7.3
	110	44.9	50.3	781	7.1
	120	46.6	53.6	829	6.9
	130	48.1	56.6	866	6.7
	140	49.4	59.5	895	6.4
	150	50.7	62.3	918	6.1
	160	51.8	65.0	935	5.8
	170	52.8	67.5	944	5.6
	180	53.7	69.9	948	5.3
	190	54.6	72.5	959	5.0
	200	55.4	75.1	970	4.9
	210	56.1	77.8	982	4.7
	220	56.8	80.5	993	4.5
	230	57.5	83.1	1,003	4.4
	240	58.1	85.8	1,014	4.2
	250	58.7	88.5	1,024	4.1
	260	59.2	88.6	1,024	3.9
	270	59.7	88.7	1,024	3.8
	280	60.2	88.8	1,024	3.7
	290	60.6	88.9	1,024	3.5
	300	61.1	89.1	1,024	3.4
	310	61.5	89.2	1,024	3.3
	320	61.9	89.3	1,024	3.2
	330	62.2	89.4	1,023	3.1
	340	62.6	89.5	1,023	3.0
	350	62.9	89.6	1,023	2.9

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
103 Fd/Other-P	10	1.5	0.0	0	0.0
	20	6.7	0.0	0	0.0
	30	11.7	22.3	1	0.0
	40	15.8	24.0	67	1.7
	50	19.2	26.2	140	2.8
	60	22.0	28.5	203	3.4
	70	24.3	30.8	258	3.7
	80	26.3	33.0	307	3.8
	** 90	28.0	35.3	349	3.9
	100	29.4	37.5	387	3.9
	110	30.7	39.7	421	3.8
	120	31.8	42.0	452	3.8
	130	32.8	43.9	475	3.7
	140	33.8	45.7	493	3.5
	150	34.6	47.4	507	3.4
	160	35.3	49.0	517	3.2
	170	36.0	50.5	521	3.1
	180	36.6	51.9	522	2.9
	190	37.2	53.5	526	2.8
	200	37.7	55.1	532	2.7
	210	38.2	56.7	537	2.6
	220	38.7	58.3	542	2.5
	230	39.1	60.0	547	2.4
	240	39.5	61.6	552	2.3
	250	39.9	63.2	556	2.2
	260	40.2	63.3	557	2.1
	270	40.6	63.4	557	2.1
	280	40.9	63.5	558	2.0
	290	41.2	63.6	558	1.9
	300	41.5	63.7	558	1.9
	310	41.7	63.8	558	1.8
	320	42.0	63.9	559	1.7
	330	42.2	64.0	559	1.7
	340	42.5	64.1	559	1.6
	350	42.7	64.2	559	1.6

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
104 FdHw/Cw-G	10	3.2	0.0	0	0.0
	20	12.0	22.0	2	0.1
	30	20.2	24.5	204	6.8
	40	27.0	28.0	386	9.6
	50	32.5	31.5	539	10.8
	** 60	37.1	34.8	671	11.2
	70	41.0	38.0	783	11.2
	80	44.3	41.2	881	11.0
	90	47.2	44.2	964	10.7
	100	49.7	47.3	1,037	10.4
	110	51.9	50.3	1,100	10.0
	120	53.9	53.3	1,156	9.6
	130	55.7	56.1	1,203	9.3
	140	57.3	58.8	1,242	8.9
	150	58.7	61.4	1,274	8.5
	160	60.1	63.8	1,298	8.1
	170	61.3	66.2	1,315	7.7
	180	62.4	68.4	1,325	7.4
	190	63.4	70.8	1,342	7.1
	200	64.4	73.2	1,359	6.8
	210	65.3	75.6	1,375	6.5
	220	66.2	78.0	1,391	6.3
	230	66.9	80.4	1,406	6.1
	240	67.7	82.9	1,420	5.9
	250	68.4	85.3	1,434	5.7
	260	69.0	85.6	1,435	5.5
	270	69.7	85.9	1,436	5.3
	280	70.2	86.2	1,436	5.1
	290	70.8	86.5	1,437	5.0
	300	71.3	86.8	1,437	4.8
	310	71.8	87.1	1,437	4.6
	320	72.3	87.4	1,437	4.5
	330	72.8	87.6	1,437	4.4
	340	73.2	87.9	1,437	4.2
	350	73.6	88.2	1,436	4.1

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
105 FdHw/Cw-M	10	2.3	0.0	0	0.0
	20	9.7	0.0	0	0.0
	30	16.7	23.2	121	4.0
	40	22.4	26.2	277	6.9
	50	27.1	29.1	407	8.1
	60	31.0	31.9	518	8.6
	** 70	34.3	34.6	614	8.8
	80	37.0	37.3	697	8.7
	90	39.4	40.0	768	8.5
	100	41.4	42.6	830	8.3
	110	43.3	45.2	885	8.0
	120	44.9	47.7	934	7.8
	130	46.3	50.1	973	7.5
	140	47.6	52.3	1,005	7.2
	150	48.8	54.4	1,030	6.9
	160	49.8	56.4	1,049	6.6
	170	50.8	58.4	1,061	6.2
	180	51.7	60.2	1,068	5.9
	190	52.5	62.1	1,081	5.7
	200	53.3	64.0	1,094	5.5
	210	54.0	66.0	1,107	5.3
	220	54.7	68.0	1,119	5.1
	230	55.3	69.9	1,130	4.9
	240	55.9	71.9	1,141	4.8
	250	56.4	73.9	1,151	4.6
	260	56.9	74.1	1,153	4.4
	270	57.4	74.4	1,154	4.3
	280	57.8	74.7	1,155	4.1
	290	58.3	74.9	1,155	4.0
	300	58.7	75.2	1,156	3.9
	310	59.1	75.4	1,156	3.7
	320	59.4	75.7	1,157	3.6
	330	59.8	75.9	1,157	3.5
	340	60.1	76.2	1,157	3.4
	350	60.5	76.4	1,157	3.3

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
106 FdHw/Cw-P	10	1.5	0.0	0	0.0
	20	6.7	0.0	0	0.0
	30	11.7	21.7	6	0.2
	40	15.8	23.2	100	2.5
	50	19.2	25.2	189	3.8
	60	22.0	27.2	265	4.4
	70	24.3	29.1	331	4.7
	** 80	26.3	31.0	389	4.9
	90	28.0	32.8	438	4.9
	100	29.4	34.6	481	4.8
	110	30.7	36.4	520	4.7
	120	31.8	38.2	554	4.6
	130	32.8	39.9	582	4.5
	140	33.8	41.3	605	4.3
	150	34.6	42.7	623	4.2
	160	35.3	44.0	636	4.0
	170	36.0	45.2	644	3.8
	180	36.6	46.3	649	3.6
	190	37.2	47.5	658	3.5
	200	37.7	48.8	667	3.3
	210	38.2	50.0	675	3.2
	220	38.7	51.3	683	3.1
	230	39.1	52.5	691	3.0
	240	39.5	53.8	698	2.9
	250	39.9	55.1	705	2.8
	260	40.2	55.3	706	2.7
	270	40.6	55.5	707	2.6
	280	40.9	55.7	708	2.5
	290	41.2	55.9	709	2.4
	300	41.5	56.1	710	2.4
	310	41.7	56.3	710	2.3
	320	42.0	56.4	711	2.2
	330	42.2	56.6	711	2.2
	340	42.5	56.8	712	2.1
	350	42.7	57.0	712	2.0

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
107 Cw-G	10	1.6	0.0	0	0.0
	20	7.5	0.0	0	0.0
	30	13.1	22.1	48	1.6
	40	17.9	24.6	154	3.8
	50	22.1	27.5	252	5.0
	60	25.8	30.5	344	5.7
	70	29.0	33.5	425	6.1
	80	31.8	36.4	501	6.3
	** 90	34.3	39.4	569	6.3
	100	36.5	42.4	632	6.3
	110	38.5	45.5	690	6.3
	120	40.2	48.5	739	6.2
	130	41.8	51.5	786	6.0
	140	43.2	54.1	828	5.9
	150	44.5	56.6	864	5.8
	160	45.7	58.9	895	5.6
	170	46.7	61.1	921	5.4
	180	47.7	63.1	947	5.3
	190	48.5	65.0	973	5.1
	200	49.3	67.0	997	5.0
	210	50.0	69.1	1,021	4.9
	220	50.9	71.5	1,050	4.8
	230	51.8	73.8	1,079	4.7
	240	52.6	76.2	1,106	4.6
	250	53.3	78.6	1,133	4.5
	260	54.0	79.0	1,136	4.4
	270	54.7	79.5	1,139	4.2
	280	55.4	79.9	1,141	4.1
	290	56.0	80.3	1,144	3.9
	300	56.5	80.7	1,146	3.8
	310	57.1	81.1	1,148	3.7
	320	57.6	81.5	1,149	3.6
	330	58.1	81.9	1,151	3.5
	340	58.6	82.3	1,152	3.4
	350	59.1	82.7	1,153	3.3

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
108 Cw-M	10	1.3	0.0	0	0.0
	20	5.2	0.0	0	0.0
	30	9.3	0.0	0	0.0
	40	12.9	22.4	55	1.4
	50	16.0	24.4	125	2.5
	60	18.9	26.6	190	3.2
	70	21.3	28.8	248	3.5
	80	23.4	31.0	303	3.8
	90	25.3	33.2	352	3.9
	** 100	27.0	35.5	398	4.0
	110	28.5	37.8	441	4.0
	120	29.9	40.1	476	4.0
	130	31.1	42.4	510	3.9
	140	32.2	44.4	541	3.9
	150	33.2	46.2	568	3.8
	160	34.1	47.9	591	3.7
	170	34.9	49.5	610	3.6
	180	35.6	50.9	631	3.5
	190	36.3	52.1	651	3.4
	200	36.9	53.6	670	3.4
	210	37.5	55.0	688	3.3
	220	38.1	56.7	710	3.2
	230	38.8	58.5	732	3.2
	240	39.4	60.2	753	3.1
	250	40.0	61.9	773	3.1
	260	40.6	62.2	776	3.0
	270	41.1	62.6	778	2.9
	280	41.6	62.9	780	2.8
	290	42.0	63.2	781	2.7
	300	42.5	63.5	783	2.6
	310	42.9	63.8	784	2.5
	320	43.3	64.1	785	2.5
	330	43.7	64.4	786	2.4
	340	44.1	64.7	787	2.3
	350	44.5	65.0	788	2.3

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
109 Cw-P	10	1.1	0.0	0	0.0
	20	2.9	0.0	0	0.0
	30	5.1	0.0	0	0.0
	40	7.1	0.0	0	0.0
	50	8.8	20.5	3	0.1
	60	10.4	21.6	21	0.4
	70	11.7	22.9	49	0.7
	80	12.9	23.9	78	1.0
	90	14.0	25.0	107	1.2
	100	14.9	26.2	134	1.3
	110	15.8	27.4	159	1.4
	120	16.5	28.6	181	1.5
	130	17.2	29.7	200	1.5
	** 140	17.9	30.6	218	1.6
	150	18.4	31.4	233	1.6
	160	18.9	32.1	245	1.5
	170	19.4	32.6	255	1.5
	180	19.8	33.1	266	1.5
	190	20.2	33.4	277	1.5
	200	20.6	34.0	286	1.4
	210	20.9	34.5	296	1.4
	220	21.3	35.2	307	1.4
	230	21.6	35.9	318	1.4
	240	22.0	36.7	328	1.4
	250	22.3	37.4	338	1.4
	260	22.6	37.6	340	1.3
	270	22.9	37.7	342	1.3
	280	23.2	37.9	344	1.2
	290	23.5	38.0	346	1.2
	300	23.8	38.2	348	1.2
	310	24.0	38.4	349	1.1
	320	24.2	38.5	351	1.1
	330	24.5	38.7	352	1.1
	340	24.7	38.8	353	1.0
	350	24.9	39.0	355	1.0

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
110 Hw/HwCw-G	10	4.3	0.0	0	0.0
	20	11.7	22.2	35	1.7
	30	18.9	25.9	214	7.1
	40	24.9	29.7	369	9.2
	50	30.0	33.3	502	10.0
	** 60	34.3	36.8	615	10.3
	70	38.0	40.2	713	10.2
	80	41.2	43.3	798	10.0
	90	44.0	46.4	869	9.7
	100	46.4	49.3	929	9.3
	110	48.6	52.1	982	8.9
	120	50.6	54.8	1,026	8.6
	130	52.3	57.3	1,070	8.2
	140	53.9	59.8	1,110	7.9
	150	55.3	62.1	1,146	7.6
	160	56.6	64.3	1,177	7.4
	170	57.8	66.5	1,204	7.1
	180	58.9	68.5	1,230	6.8
	190	59.9	70.6	1,253	6.6
	200	60.8	72.5	1,274	6.4
	210	61.7	74.5	1,293	6.2
	220	62.5	76.4	1,311	6.0
	230	63.3	78.3	1,327	5.8
	240	64.0	80.2	1,341	5.6
	250	64.6	82.0	1,354	5.4
	260	65.2	83.4	1,362	5.2
	270	65.8	84.7	1,368	5.1
	280	66.4	86.1	1,374	4.9
	290	66.9	87.4	1,378	4.8
	300	67.4	88.7	1,382	4.6
	310	67.8	89.9	1,385	4.5
	320	68.3	91.2	1,388	4.3
	330	68.7	92.4	1,390	4.2
	340	69.1	93.7	1,391	4.1
	350	69.4	94.9	1,392	4.0

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
111 Hw/HwCw-M	10	3.0	0.0	0	0.0
	20	8.4	0.0	0	0.0
	30	14.1	23.1	87	2.9
	40	19.1	25.9	207	5.2
	50	23.4	28.7	313	6.3
	60	27.1	31.6	407	6.8
	70	30.3	34.3	490	7.0
	** 80	33.1	37.1	564	7.1
	90	35.6	39.7	628	7.0
	100	37.9	42.4	685	6.8
	110	39.8	44.9	735	6.7
	120	41.6	47.5	778	6.5
	130	43.2	49.9	820	6.3
	140	44.7	52.2	858	6.1
	150	46.0	54.4	892	5.9
	160	47.3	56.5	921	5.8
	170	48.4	58.4	947	5.6
	180	49.4	60.3	971	5.4
	190	50.4	62.2	994	5.2
	200	51.3	64.1	1,016	5.1
	210	52.1	65.9	1,036	4.9
	220	52.9	67.8	1,055	4.8
	230	53.6	69.7	1,073	4.7
	240	54.3	71.5	1,089	4.5
	250	54.9	73.3	1,105	4.4
	260	55.5	74.3	1,111	4.3
	270	56.1	75.2	1,116	4.1
	280	56.6	76.1	1,120	4.0
	290	57.1	77.0	1,124	3.9
	300	57.6	77.9	1,128	3.8
	310	58.1	78.8	1,130	3.6
	320	58.5	79.7	1,133	3.5
	330	58.9	80.5	1,135	3.4
	340	59.3	81.4	1,136	3.3
	350	59.7	82.2	1,138	3.3

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
112 Hw/HwCw-P	10	2.1	0.0	0	0.0
	20	5.3	0.0	0	0.0
	30	9.1	0.0	0	0.0
	40	12.6	22.7	51	1.3
	50	15.7	24.4	124	2.5
	60	18.4	26.3	189	3.2
	70	20.8	28.2	249	3.6
	80	23.0	30.0	303	3.8
	** 90	25.0	31.9	351	3.9
	100	26.7	33.8	394	3.9
	110	28.3	35.7	433	3.9
	120	29.7	37.6	467	3.9
	130	31.1	39.5	500	3.8
	140	32.3	41.1	529	3.8
	150	33.4	42.8	555	3.7
	160	34.4	44.3	579	3.6
	170	35.3	45.7	599	3.5
	180	36.2	47.1	618	3.4
	190	37.0	48.4	637	3.4
	200	37.8	49.8	655	3.3
	210	38.5	51.2	672	3.2
	220	39.2	52.7	688	3.1
	230	39.8	54.1	703	3.1
	240	40.4	55.5	717	3.0
	250	41.0	56.9	731	2.9
	260	41.5	57.5	735	2.8
	270	42.0	58.2	740	2.7
	280	42.5	58.8	744	2.7
	290	42.9	59.4	747	2.6
	300	43.3	60.1	750	2.5
	310	43.7	60.7	752	2.4
	320	44.1	61.3	755	2.4
	330	44.5	61.9	757	2.3
	340	44.8	62.5	758	2.2
	350	45.2	63.1	760	2.2

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
113 HwFd/Ba-G	10	4.4	0.0	0	0.0
	20	11.9	22.1	27	1.4
	30	19.2	25.3	213	7.1
	40	25.3	28.8	377	9.4
	50	30.4	32.3	518	10.4
	** 60	34.8	35.7	640	10.7
	70	38.5	39.0	746	10.7
	80	41.7	42.1	839	10.5
	90	44.5	45.2	917	10.2
	100	46.9	48.2	985	9.9
	110	49.1	51.1	1,044	9.5
	120	51.1	53.9	1,095	9.1
	130	52.8	56.6	1,143	8.8
	140	54.4	59.1	1,185	8.5
	150	55.8	61.5	1,221	8.1
	160	57.1	63.9	1,252	7.8
	170	58.3	66.1	1,278	7.5
	180	59.4	68.3	1,300	7.2
	190	60.4	70.5	1,323	7.0
	200	61.4	72.6	1,344	6.7
	210	62.2	74.8	1,363	6.5
	220	63.1	76.9	1,381	6.3
	230	63.8	79.0	1,397	6.1
	240	64.5	81.1	1,412	5.9
	250	65.2	83.1	1,426	5.7
	260	65.8	84.2	1,431	5.5
	270	66.4	85.2	1,436	5.3
	280	66.9	86.1	1,440	5.1
	290	67.4	87.1	1,444	5.0
	300	67.9	88.1	1,447	4.8
	310	68.4	89.0	1,449	4.7
	320	68.8	89.9	1,451	4.5
	330	69.2	90.9	1,452	4.4
	340	69.6	91.8	1,453	4.3
	350	70.0	92.7	1,453	4.2

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
114 HwFd/Ba-M	10	3.3	0.0	0	0.0
	20	9.3	19.1	0	0.0
	30	15.4	23.6	122	4.1
	40	20.7	26.5	262	6.6
	50	25.3	29.5	385	7.7
	60	29.2	32.3	493	8.2
	** 70	32.5	35.1	587	8.4
	80	35.5	37.8	670	8.4
	90	38.1	40.5	742	8.2
	100	40.4	43.1	804	8.0
	110	42.4	45.6	859	7.8
	120	44.3	48.1	907	7.6
	130	45.9	50.5	951	7.3
	140	47.4	52.7	991	7.1
	150	48.8	54.9	1,025	6.8
	160	50.1	56.9	1,055	6.6
	170	51.2	58.9	1,081	6.4
	180	52.3	60.9	1,102	6.1
	190	53.3	62.8	1,125	5.9
	200	54.2	64.7	1,145	5.7
	210	55.0	66.6	1,164	5.5
	220	55.8	68.5	1,181	5.4
	230	56.5	70.4	1,198	5.2
	240	57.2	72.3	1,212	5.1
	250	57.9	74.1	1,226	4.9
	260	58.5	75.1	1,232	4.7
	270	59.1	76.0	1,238	4.6
	280	59.6	76.9	1,242	4.4
	290	60.1	77.8	1,246	4.3
	300	60.6	78.7	1,250	4.2
	310	61.0	79.6	1,253	4.0
	320	61.5	80.4	1,255	3.9
	330	61.9	81.3	1,257	3.8
	340	62.3	82.1	1,259	3.7
	350	62.7	83.0	1,260	3.6

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
115 HwFd/Ba-P	10	2.3	0.0	0	0.0
	20	6.2	0.0	0	0.0
	30	10.7	21.9	17	0.6
	40	14.7	23.7	114	2.8
	50	18.2	25.7	207	4.1
	60	21.3	27.8	289	4.8
	70	24.1	29.9	361	5.2
	** 80	26.5	31.9	427	5.3
	90	28.6	33.9	483	5.4
	100	30.6	35.9	534	5.3
	110	32.3	37.8	578	5.3
	120	33.9	39.7	618	5.1
	130	35.3	41.5	655	5.0
	140	36.6	43.3	689	4.9
	150	37.8	44.9	719	4.8
	160	39.0	46.5	746	4.7
	170	40.0	48.1	769	4.5
	180	40.9	49.6	789	4.4
	190	41.8	51.1	810	4.3
	200	42.6	52.6	828	4.1
	210	43.4	54.1	846	4.0
	220	44.1	55.6	862	3.9
	230	44.8	57.1	877	3.8
	240	45.4	58.6	890	3.7
	250	46.0	60.1	903	3.6
	260	46.6	60.8	909	3.5
	270	47.1	61.6	915	3.4
	280	47.6	62.3	919	3.3
	290	48.1	63.0	924	3.2
	300	48.5	63.7	927	3.1
	310	48.9	64.4	931	3.0
	320	49.3	65.1	934	2.9
	330	49.7	65.8	936	2.8
	340	50.1	66.5	938	2.8
	350	50.4	67.2	940	2.7

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
116 Decid-G	10	14.0	22.4	12	1.2
	20	22.4	25.7	119	6.0
	30	27.3	28.7	223	7.4
	** 40	30.1	31.5	295	7.4
	50	31.7	34.5	341	6.8
	60	32.7	37.2	367	6.1
	70	33.3	37.8	384	5.5
	80	33.6	38.4	399	5.0
	90	33.8	39.0	412	4.6
	100	34.0	39.6	424	4.2
	110	34.0	40.1	434	3.9
	120	34.1	40.6	443	3.7
	130	34.1	41.1	451	3.5
	140	34.1	41.6	458	3.3
	150	34.1	42.1	464	3.1
	160	34.1	42.5	469	2.9
	170	34.1	42.9	473	2.8
	180	34.1	43.3	477	2.6
	190	34.1	43.7	480	2.5
	200	34.1	44.1	483	2.4
	210	34.1	44.5	486	2.3
	220	34.1	44.9	489	2.2
	230	34.1	45.3	492	2.1
	240	34.1	45.6	494	2.1
	250	34.1	46.0	496	2.0
	260	34.1	46.2	498	1.9
	270	34.1	46.4	499	1.8
	280	34.1	46.6	500	1.8
	290	34.1	46.8	501	1.7
	300	34.1	47.0	502	1.7
	310	34.1	47.2	503	1.6
	320	34.1	47.4	503	1.6
	330	34.1	47.6	504	1.5
	340	34.1	47.8	504	1.5
	350	34.1	48.0	505	1.4

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
117 Decid-M	10	10.7	0.0	0	0.0
	20	17.8	24.3	68	3.4
	30	22.4	26.4	169	5.6
	** 40	25.4	29.2	241	6.0
	50	27.3	31.8	293	5.9
	60	28.6	34.4	332	5.5
	70	29.4	35.0	349	5.0
	80	30.0	35.6	364	4.6
	90	30.3	36.2	378	4.2
	100	30.6	36.7	391	3.9
	110	30.7	37.3	402	3.7
	120	30.9	37.8	412	3.4
	130	30.9	38.3	422	3.2
	140	31.0	38.8	430	3.1
	150	31.0	39.3	437	2.9
	160	31.0	39.7	443	2.8
	170	31.0	40.2	448	2.6
	180	31.0	40.6	453	2.5
	190	31.0	40.9	458	2.4
	200	31.0	41.4	463	2.3
	210	31.0	41.7	467	2.2
	220	31.0	42.2	472	2.1
	230	31.1	42.6	476	2.1
	240	31.1	43.0	480	2.0
	250	31.1	43.4	483	1.9
	260	31.1	43.6	485	1.9
	270	31.1	43.8	486	1.8
	280	31.1	44.0	488	1.7
	290	31.1	44.2	489	1.7
	300	31.1	44.3	490	1.6
	310	31.1	44.5	491	1.6
	320	31.1	44.7	492	1.5
	330	31.1	44.9	493	1.5
	340	31.1	45.1	494	1.5
	350	31.1	45.3	494	1.4

** - indicates minimum harvest age, based on culmination of MAI

VDYP Natural Stand AU	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
118 Decid-P	10	7.8	0.0	0	0.0
	20	13.4	22.5	25	1.2
	30	17.4	24.7	93	3.1
	40	20.3	26.8	156	3.9
	** 50	22.4	29.2	202	4.0
	60	23.9	31.4	237	4.0
	70	25.1	31.8	246	3.5
	80	25.9	32.1	253	3.2
	90	26.5	32.4	261	2.9
	100	26.9	32.8	268	2.7
	110	27.2	33.1	274	2.5
	120	27.5	33.4	280	2.3
	130	27.7	33.7	285	2.2
	140	27.8	34.0	289	2.1
	150	27.9	34.3	293	2.0
	160	28.0	34.5	296	1.9
	170	28.0	34.8	299	1.8
	180	28.0	35.0	301	1.7
	190	28.1	35.2	304	1.6
	200	28.1	35.4	307	1.5
	210	28.1	35.7	309	1.5
	220	28.1	35.9	311	1.4
	230	28.1	36.1	314	1.4
	240	28.1	36.4	316	1.3
	250	28.1	36.6	318	1.3
	260	28.1	36.7	319	1.2
	270	28.1	36.8	320	1.2
	280	28.1	36.9	320	1.1
	290	28.1	37.0	321	1.1
	300	28.1	37.1	322	1.1
	310	28.1	37.1	322	1.0
	320	28.1	37.2	323	1.0
	330	28.1	37.3	323	1.0
	340	28.1	37.4	323	1.0
	350	28.1	37.5	324	0.9

** - indicates minimum harvest age, based on culmination of MAI

Appendix III-a
TIPSY Existing Managed Stand Yield Tables

Existing Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
201	C01	10	1.4	0.6	0	0.0
		20	2.4	0.8	0	0.0
		30	3.5	1.8	0	0.0
		40	4.5	2.7	0	0.0
		50	5.3	3.6	0	0.0
		60	6.1	4.7	1	0.0
		70	6.8	5.6	2	0.0
		80	7.4	6.4	4	0.0
		90	8.0	7.2	7	0.1
		100	8.5	8.0	11	0.1
		110	9.0	8.7	14	0.1
		120	9.4	9.3	18	0.2
		130	9.8	9.9	23	0.2
		140	10.2	10.4	28	0.2
		150	10.5	10.9	33	0.2
		160	10.8	11.3	37	0.2
		170	11.1	11.8	41	0.2
		180	11.4	12.1	46	0.3
		190	11.7	12.4	50	0.3
		** 200	11.9	12.7	54	0.3
		210	12.1	13.0	57	0.3
		220	12.4	13.3	61	0.3
		230	12.6	13.5	65	0.3
		240	12.8	13.8	68	0.3
		250	12.9	14.0	71	0.3
202	C02	10	2.9	1.5	0	0.0
		20	7.8	7.2	4	0.2
		30	12.7	14.1	52	1.7
		40	17.0	19.1	145	3.6
		50	20.6	22.5	246	4.9
		60	23.8	25.2	348	5.8
		70	26.5	27.4	447	6.4
		80	28.9	29.3	539	6.7
		90	31.0	31.0	626	7.0
		** 100	32.9	32.5	705	7.1
		110	34.6	34.0	776	7.1
		120	36.1	35.4	839	7.0
		130	37.5	36.7	896	6.9
		140	38.7	38.0	949	6.8
		150	39.9	39.1	997	6.6
		160	40.9	40.2	1,040	6.5
		170	41.9	41.3	1,079	6.3
		180	42.8	42.2	1,113	6.2
		190	43.6	43.2	1,143	6.0
		200	44.3	44.1	1,170	5.9
		210	45.0	44.9	1,196	5.7
		220	45.7	45.7	1,220	5.5
		230	46.3	46.5	1,242	5.4
		240	46.9	47.2	1,261	5.3
		250	47.5	48.0	1,279	5.1

** - indicates minimum harvest age, based on culmination of MAI

Existing Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
203	C03	10	1.9	1.0	0	0.0
		20	4.4	2.9	0	0.0
		30	7.3	6.4	2	0.1
		40	9.8	10.3	13	0.3
		50	12.1	13.6	41	0.8
		60	14.2	16.6	85	1.4
		70	16.0	18.7	129	1.8
		80	17.6	20.4	172	2.2
		90	19.1	21.7	214	2.4
		100	20.4	22.8	254	2.5
		110	21.5	23.9	292	2.7
		120	22.6	24.7	327	2.7
		** 130	23.6	25.5	362	2.8
		140	24.5	26.3	393	2.8
		150	25.3	26.9	423	2.8
		160	26.1	27.5	449	2.8
		170	26.8	28.0	473	2.8
		180	27.4	28.5	496	2.8
		190	28.0	29.0	518	2.7
		200	28.6	29.5	539	2.7
		210	29.1	29.9	558	2.7
		220	29.7	30.3	578	2.6
		230	30.2	30.7	597	2.6
		240	30.6	31.1	614	2.6
		250	31.1	31.5	630	2.5
204	C04	10	1.8	0.4	0	0.0
		20	4.2	2.0	0	0.0
		30	7.0	5.0	1	0.0
		40	9.7	8.6	7	0.2
		50	12.0	11.9	26	0.5
		60	14.2	15.0	61	1.0
		70	16.1	17.5	100	1.4
		80	17.7	19.5	142	1.8
		90	19.3	21.3	183	2.0
		100	20.7	22.8	222	2.2
		110	21.9	24.0	259	2.4
		120	23.0	25.1	295	2.5
		130	24.1	26.2	329	2.5
		140	25.0	27.1	361	2.6
		** 150	25.9	28.0	393	2.6
		160	26.7	28.7	422	2.6
		170	27.5	29.5	450	2.6
		180	28.2	30.1	475	2.6
		190	28.8	30.7	498	2.6
		200	29.4	31.3	519	2.6
		210	30.0	31.8	539	2.6
		220	30.6	32.3	558	2.5
		230	31.1	32.8	577	2.5
		240	31.6	33.3	595	2.5
		250	32.0	33.7	611	2.4

** - indicates minimum harvest age, based on culmination of MAI

Existing Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
205	C05	10	2.7	3.3	2	0.2
		20	10.3	14.0	75	3.8
		30	17.4	20.1	221	7.4
		40	23.3	23.7	357	8.9
		50	28.1	27.1	508	10.2
		** 60	31.9	30.0	615	10.2
		70	35.0	32.5	703	10.0
		80	37.5	34.9	781	9.8
		90	39.8	37.6	841	9.3
		100	41.7	40.1	890	8.9
		110	43.5	43.1	919	8.4
		120	45.0	46.2	943	7.9
		130	46.4	48.3	971	7.5
		140	47.6	51.1	981	7.0
		150	48.6	52.8	1,000	6.7
		160	49.7	54.1	1,018	6.4
		170	50.6	55.3	1,033	6.1
		180	51.4	57.4	1,030	5.7
		190	52.2	58.4	1,036	5.5
		200	53.0	59.4	1,042	5.2
		210	53.6	60.3	1,048	5.0
		220	54.3	61.3	1,046	4.8
		230	54.8	62.0	1,048	4.6
		240	55.4	62.7	1,046	4.4
		250	55.9	63.4	1,043	4.2
206	C06	10	4.4	3.5	1	0.1
		20	12.1	14.3	51	2.6
		30	19.2	21.8	204	6.8
		40	25.1	26.5	380	9.5
		50	30.1	30.3	558	11.2
		60	34.2	33.6	723	12.0
		** 70	37.8	36.7	865	12.4
		80	40.9	39.9	987	12.3
		90	43.5	43.2	1,092	12.1
		100	45.9	46.4	1,178	11.8
		110	48.0	49.2	1,255	11.4
		120	49.8	51.8	1,322	11.0
		130	51.4	54.0	1,380	10.6
		140	52.9	55.9	1,429	10.2
		150	54.0	57.4	1,465	9.8
		160	55.1	58.8	1,498	9.4
		170	55.9	59.8	1,523	9.0
		180	56.6	60.8	1,546	8.6
		190	57.3	61.6	1,568	8.3
		200	57.9	62.3	1,586	7.9
		210	58.5	62.9	1,602	7.6
		220	58.9	63.5	1,615	7.3
		230	59.3	63.9	1,626	7.1
		240	59.7	64.4	1,634	6.8
		250	60.0	64.7	1,640	6.6

** - indicates minimum harvest age, based on culmination of MAI

Existing Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
207	C07	10	3.6	1.2	0	0.0
		20	11.9	10.7	18	0.9
		30	19.8	20.4	142	4.7
		40	26.4	27.2	307	7.7
		50	31.8	32.9	486	9.7
		60	36.3	37.6	662	11.0
		70	40.1	42.0	821	11.7
		** 80	43.4	46.0	958	12.0
		90	46.3	49.9	1,078	12.0
		100	48.8	53.7	1,176	11.8
		110	51.0	56.9	1,260	11.5
		120	53.0	59.8	1,336	11.1
		130	54.7	62.0	1,399	10.8
		140	56.1	64.0	1,449	10.4
		150	57.3	65.6	1,487	9.9
		160	58.2	66.8	1,517	9.5
		170	58.8	67.6	1,535	9.0
		180	59.3	68.3	1,552	8.6
		190	59.8	68.9	1,568	8.3
		200	60.2	69.4	1,581	7.9
		210	60.6	69.8	1,590	7.6
		220	60.9	70.2	1,598	7.3
		230	61.2	70.5	1,604	7.0
		240	61.4	70.6	1,606	6.7
		250	61.5	70.8	1,607	6.4
208	C08	10	2.7	0.4	0	0.0
		20	9.2	7.0	4	0.2
		30	15.6	15.6	66	2.2
		40	21.0	22.1	183	4.6
		50	25.5	27.1	316	6.3
		60	29.4	31.2	454	7.6
		70	32.7	34.6	581	8.3
		80	35.6	37.6	706	8.8
		90	38.1	40.3	819	9.1
		** 100	40.3	42.9	920	9.2
		110	42.2	45.3	1,011	9.2
		120	44.0	47.5	1,092	9.1
		130	45.6	49.5	1,164	9.0
		140	47.0	51.4	1,227	8.8
		150	48.3	53.1	1,282	8.5
		160	49.5	54.7	1,332	8.3
		170	50.6	56.0	1,376	8.1
		180	51.6	57.3	1,416	7.9
		190	52.5	58.4	1,453	7.6
		200	53.3	59.5	1,485	7.4
		210	54.1	60.5	1,513	7.2
		220	54.9	61.4	1,541	7.0
		230	55.5	62.3	1,565	6.8
		240	56.2	63.1	1,587	6.6
		250	56.8	63.8	1,607	6.4

** - indicates minimum harvest age, based on culmination of MAI

Appendix III-b
TIPSY Future Managed Stand Yield Tables

Future Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
301	R01	10	1.6	0.8	0	0.0
		20	3.0	1.3	0	0.0
		30	4.7	3.3	0	0.0
		40	6.1	4.8	0	0.0
		50	7.5	7.4	1	0.0
		60	8.7	9.2	3	0.0
		70	9.7	11.0	8	0.1
		80	10.7	12.5	15	0.2
		90	11.5	13.9	22	0.2
		100	12.2	15.2	31	0.3
		110	13.0	16.4	41	0.4
		120	13.6	17.6	51	0.4
		130	14.2	18.5	61	0.5
		140	14.7	19.4	70	0.5
		150	15.2	20.1	79	0.5
		160	15.6	20.8	87	0.5
		170	16.1	21.3	94	0.6
		** 180	16.4	21.9	102	0.6
		190	16.8	22.4	109	0.6
		200	17.1	22.8	116	0.6
		210	17.5	23.2	122	0.6
		220	17.8	23.6	129	0.6
		230	18.1	24.0	135	0.6
		240	18.4	24.4	140	0.6
		250	18.6	24.7	146	0.6
302	R02	10	1.5	0.0	0	0.0
		20	4.8	3.2	0	0.0
		30	7.9	8.2	2	0.1
		40	10.7	13.1	14	0.4
		50	13.2	17.8	42	0.8
		60	15.4	21.9	80	1.3
		70	17.3	25.2	122	1.7
		80	18.9	28.0	168	2.1
		90	20.4	30.4	214	2.4
		100	21.8	32.3	253	2.5
		110	23.0	33.9	287	2.6
		120	24.0	35.2	318	2.6
		130	25.0	36.6	357	2.7
		** 140	25.9	37.8	392	2.8
		150	26.7	38.9	423	2.8
		160	27.4	39.9	452	2.8
		170	28.0	40.7	480	2.8
		180	28.6	41.4	504	2.8
		190	29.1	42.1	525	2.8
		200	29.6	42.6	544	2.7
		210	30.1	43.2	562	2.7
		220	30.6	43.8	581	2.6
		230	31.2	44.3	599	2.6
		240	31.7	44.8	616	2.6
		250	32.1	45.3	631	2.5

** - indicates minimum harvest age, based on culmination of MAI

Future Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
303	R03	10	1.5	0.6	0	0.0
		20	4.8	3.2	0	0.0
		30	7.9	8.1	2	0.1
		40	10.7	12.7	19	0.5
		50	13.2	17.0	54	1.1
		60	15.4	20.7	101	1.7
		70	17.3	23.4	150	2.1
		80	19.0	25.7	201	2.5
		90	20.5	27.7	252	2.8
		100	21.8	29.2	295	2.9
		110	23.0	30.4	331	3.0
		120	24.1	31.5	365	3.0
		130	25.1	32.6	405	3.1
		** 140	26.0	33.6	442	3.2
		150	26.8	34.5	475	3.2
		160	27.5	35.3	505	3.2
		170	28.1	35.9	533	3.1
		180	28.7	36.6	557	3.1
		190	29.3	37.0	579	3.0
		200	29.8	37.5	599	3.0
		210	30.3	38.0	616	2.9
		220	30.8	38.4	635	2.9
		230	31.4	38.9	653	2.8
		240	31.8	39.3	669	2.8
		250	32.3	39.7	683	2.7
304	R04	10	2.5	1.1	0	0.0
		20	7.4	6.8	1	0.0
		30	12.1	13.0	39	1.3
		40	16.0	17.2	119	3.0
		50	19.4	20.2	206	4.1
		60	22.2	22.3	283	4.7
		70	24.6	24.1	355	5.1
		80	26.6	25.6	428	5.4
		** 90	28.5	27.1	495	5.5
		100	30.0	28.3	551	5.5
		110	31.5	29.4	603	5.5
		120	32.8	30.4	652	5.4
		130	33.9	31.3	696	5.4
		140	34.9	32.2	734	5.2
		150	35.8	33.1	768	5.1
		160	36.7	33.8	798	5.0
		170	37.5	34.5	825	4.9
		180	38.2	35.3	849	4.7
		190	38.9	35.9	871	4.6
		200	39.5	36.5	891	4.5
		210	40.0	37.0	910	4.3
		220	40.6	37.6	928	4.2
		230	41.1	38.2	945	4.1
		240	41.6	38.8	961	4.0
		250	42.1	39.2	976	3.9

** - indicates minimum harvest age, based on culmination of MAI

Future Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
305	R05	10	2.0	1.1	0	0.0
		20	4.6	3.1	0	0.0
		30	7.5	7.0	2	0.1
		40	10.1	11.0	17	0.4
		50	12.4	14.4	50	1.0
		60	14.6	17.4	100	1.7
		70	16.4	19.4	149	2.1
		80	18.1	21.0	196	2.5
		90	19.6	22.2	242	2.7
		100	21.0	23.4	285	2.9
		110	22.2	24.4	325	3.0
		120	23.2	25.1	361	3.0
		** 130	24.2	25.9	397	3.1
		140	25.2	26.6	430	3.1
		150	26.0	27.3	462	3.1
		160	26.8	27.8	490	3.1
		170	27.5	28.4	516	3.0
		180	28.2	28.9	540	3.0
		190	28.8	29.4	563	3.0
		200	29.4	29.8	585	2.9
		210	29.9	30.2	606	2.9
		220	30.5	30.6	627	2.8
		230	31.0	31.0	646	2.8
		240	31.5	31.4	664	2.8
		250	31.9	31.8	680	2.7
306	R06	10	2.9	0.8	0	0.0
		20	9.2	9.9	5	0.2
		30	14.7	19.7	86	2.9
		40	19.6	26.6	227	5.7
		50	23.8	31.3	369	7.4
		60	27.6	35.6	538	9.0
		70	30.7	38.6	687	9.8
		80	33.6	41.1	814	10.2
		90	36.1	43.5	962	10.7
		** 100	38.3	45.5	1,077	10.8
		110	40.3	47.3	1,184	10.8
		120	42.1	49.0	1,282	10.7
		130	43.7	50.5	1,367	10.5
		140	45.1	51.9	1,444	10.3
		150	46.4	53.3	1,524	10.2
		160	47.6	54.6	1,594	10.0
		170	48.7	55.7	1,651	9.7
		180	49.6	56.6	1,699	9.4
		190	50.5	57.5	1,740	9.2
		200	51.2	58.2	1,777	8.9
		210	52.0	58.9	1,815	8.6
		220	52.9	59.7	1,859	8.5
		230	53.8	60.4	1,901	8.3
		240	54.6	61.2	1,942	8.1
		250	55.4	62.0	1,981	7.9

** - indicates minimum harvest age, based on culmination of MAI

Future Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
307	R07	10	2.4	0.0	0	0.0
		20	8.1	8.4	2	0.1
		30	13.1	17.2	48	1.6
		40	17.5	24.6	146	3.6
		50	21.3	30.3	273	5.5
		60	24.8	34.2	389	6.5
		70	27.7	37.8	522	7.5
		80	30.3	40.6	643	8.0
		90	32.6	42.6	738	8.2
		100	34.6	44.7	850	8.5
		** 110	36.5	46.6	954	8.7
		120	38.1	48.0	1,036	8.6
		130	39.6	49.3	1,112	8.6
		140	40.9	50.7	1,182	8.4
		150	42.1	51.8	1,244	8.3
		160	43.1	52.8	1,299	8.1
		170	44.1	53.6	1,348	7.9
		180	45.0	54.4	1,392	7.7
		190	45.8	55.2	1,436	7.6
		200	46.5	56.0	1,476	7.4
		210	47.2	56.7	1,516	7.2
		220	48.1	57.6	1,561	7.1
		230	48.9	58.4	1,598	6.9
		240	49.6	59.0	1,632	6.8
		250	50.3	59.7	1,663	6.7
308	R08	10	4.9	4.1	1	0.1
		20	13.6	15.4	85	4.3
		30	21.4	22.1	283	9.4
		40	27.9	26.9	495	12.4
		50	33.3	31.2	697	13.9
		60	37.9	35.4	884	14.7
		** 70	41.8	39.7	1,037	14.8
		80	45.2	44.4	1,169	14.6
		90	48.1	48.8	1,284	14.3
		100	50.7	52.9	1,379	13.8
		110	52.9	55.9	1,468	13.3
		120	54.9	58.6	1,543	12.9
		130	56.5	60.7	1,603	12.3
		140	58.0	62.6	1,654	11.8
		150	59.0	63.8	1,692	11.3
		160	59.8	64.7	1,719	10.7
		170	60.3	65.3	1,733	10.2
		180	60.7	65.7	1,744	9.7
		190	61.0	66.0	1,754	9.2
		200	61.3	66.3	1,762	8.8
		210	61.6	66.5	1,767	8.4
		220	61.8	66.8	1,772	8.1
		230	61.9	66.9	1,774	7.7
		240	62.1	67.1	1,774	7.4
		250	62.2	67.2	1,774	7.1

** - indicates minimum harvest age, based on culmination of MAI

Future Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
309	R09	10	1.9	0.7	0	0.0
		20	6.6	5.6	1	0.0
		30	10.8	12.9	20	0.7
		40	14.6	19.4	83	2.1
		50	17.9	24.2	167	3.3
		60	20.8	28.2	268	4.5
		70	23.3	30.8	348	5.0
		80	25.5	33.3	437	5.5
		90	27.5	35.5	526	5.8
		100	29.3	37.2	608	6.1
		** 110	30.8	38.7	675	6.1
		120	32.2	39.8	730	6.1
		130	33.5	41.0	788	6.1
		140	34.6	42.1	852	6.1
		150	35.7	43.2	908	6.1
		160	36.6	44.0	954	6.0
		170	37.4	44.7	993	5.8
		180	38.2	45.4	1,027	5.7
		190	38.9	46.0	1,057	5.6
		200	39.5	46.6	1,086	5.4
		210	40.1	47.2	1,114	5.3
		220	40.9	47.8	1,148	5.2
		230	41.5	48.5	1,179	5.1
		240	42.2	49.2	1,207	5.0
		250	42.8	49.8	1,233	4.9
310	R10	10	2.7	1.4	0	0.0
		20	8.0	7.8	3	0.1
		30	13.0	14.9	60	2.0
		40	17.3	19.9	173	4.3
		50	21.1	23.4	295	5.9
		60	24.3	25.8	403	6.7
		70	27.1	28.0	518	7.4
		80	29.6	30.0	624	7.8
		90	31.7	31.6	715	7.9
		** 100	33.7	33.2	802	8.0
		110	35.4	34.7	886	8.1
		120	37.0	36.2	955	8.0
		130	38.4	37.6	1,017	7.8
		140	39.7	38.9	1,075	7.7
		150	40.8	40.0	1,128	7.5
		160	41.8	41.1	1,175	7.3
		170	42.8	42.2	1,216	7.2
		180	43.7	43.1	1,250	6.9
		190	44.5	44.1	1,281	6.7
		200	45.2	45.0	1,311	6.6
		210	45.9	45.8	1,341	6.4
		220	46.6	46.7	1,373	6.2
		230	47.3	47.6	1,402	6.1
		240	48.0	48.4	1,428	5.9
		250	48.6	49.1	1,450	5.8

** - indicates minimum harvest age, based on culmination of MAI

Future Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
311	R11	10	3.8	2.4	0	0.0
		20	9.9	10.9	14	0.7
		30	15.8	18.8	122	4.1
		40	20.8	23.4	265	6.6
		50	25.1	26.8	412	8.2
		60	28.8	29.7	564	9.4
		70	32.0	32.2	702	10.0
		80	34.8	34.5	832	10.4
		** 90	37.2	36.8	948	10.5
		100	39.4	38.9	1,044	10.4
		110	41.4	40.9	1,136	10.3
		120	43.1	42.8	1,222	10.2
		130	44.7	44.6	1,296	10.0
		140	46.1	46.3	1,360	9.7
		150	47.5	47.9	1,415	9.4
		160	48.6	49.3	1,465	9.2
		170	49.7	50.7	1,513	8.9
		180	50.7	51.9	1,554	8.6
		190	51.6	53.0	1,592	8.4
		200	52.4	53.9	1,623	8.1
		210	53.2	54.9	1,653	7.9
		220	54.0	55.7	1,683	7.7
		230	54.8	56.6	1,713	7.4
		240	55.5	57.4	1,741	7.3
		250	56.1	58.2	1,767	7.1
312	R12	10	3.7	3.1	1	0.1
		20	11.1	12.8	53	2.7
		30	18.0	19.4	205	6.8
		40	23.8	23.5	368	9.2
		50	28.6	27.0	534	10.7
		60	32.6	30.2	686	11.4
		** 70	36.1	33.4	822	11.7
		80	39.1	36.6	938	11.7
		90	41.7	39.9	1,039	11.5
		100	44.1	43.1	1,125	11.3
		110	46.1	46.2	1,199	10.9
		120	47.9	48.9	1,266	10.6
		130	49.6	51.1	1,329	10.2
		140	51.1	53.1	1,382	9.9
		150	52.4	54.9	1,428	9.5
		160	53.6	56.5	1,469	9.2
		170	54.8	57.9	1,506	8.9
		180	55.7	59.1	1,536	8.5
		190	56.5	60.2	1,561	8.2
		200	57.3	61.1	1,583	7.9
		210	58.0	62.0	1,602	7.6
		220	58.7	62.8	1,621	7.4
		230	59.3	63.6	1,639	7.1
		240	59.8	64.2	1,651	6.9
		250	60.3	64.7	1,663	6.7

** - indicates minimum harvest age, based on culmination of MAI

Appendix III-c
TIPSY Enhanced Future Managed Stand Yield Tables

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
401	E01	10	4.4	2.0	0	0.0
		20	11.1	11.0	28	1.4
		30	17.4	18.0	174	5.8
		40	22.7	22.0	333	8.3
		50	27.2	25.0	506	10.1
		60	31.1	28.0	655	10.9
		70	34.4	30.0	806	11.5
		** 80	37.3	33.0	930	11.6
		90	39.8	35.0	1,028	11.4
		100	42.0	38.0	1,125	11.3
		110	44.0	40.0	1,218	11.1
		120	45.8	43.0	1,296	10.8
		130	47.4	45.0	1,353	10.4
		140	48.9	47.0	1,409	10.1
		150	50.2	48.0	1,465	9.8
		160	51.4	50.0	1,513	9.5
		170	52.5	52.0	1,551	9.1
		180	53.6	53.0	1,585	8.8
		190	54.5	54.0	1,620	8.5
		200	55.4	56.0	1,653	8.3
		210	56.2	57.0	1,684	8.0
		220	57.0	58.0	1,711	7.8
		230	57.7	59.0	1,733	7.5
		240	58.3	59.0	1,753	7.3
		250	59.0	60.0	1,768	7.1
402	E02	10	1.6	0.7	0	0.0
		20	3.9	3.1	0	0.0
		30	6.1	6.2	0	0.0
		40	8.1	9.7	2	0.1
		50	9.8	12.9	11	0.2
		60	11.3	15.4	22	0.4
		70	12.5	17.6	34	0.5
		80	13.6	19.5	46	0.6
		90	14.6	20.8	56	0.6
		100	15.4	21.8	65	0.7
		110	16.1	22.7	74	0.7
		120	16.8	23.5	83	0.7
		130	17.4	24.3	92	0.7
		140	17.9	25.1	101	0.7
		** 150	18.3	25.7	109	0.7
		160	18.8	26.3	117	0.7
		170	19.2	26.8	124	0.7
		180	19.5	27.2	129	0.7
		190	19.8	27.5	134	0.7
		200	20.1	27.8	138	0.7
		210	20.4	28.0	142	0.7
		220	20.6	28.3	146	0.7
		230	20.9	28.6	149	0.7
		240	21.1	28.8	152	0.6
		250	21.3	29.0	155	0.6

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
403	E03	10	1.4	1.0	0	0.0
		20	3.5	2.5	0	0.0
		30	5.3	4.5	0	0.0
		40	6.7	6.2	0	0.0
		50	7.8	7.8	0	0.0
		60	8.7	8.9	0	0.0
		70	9.5	10.2	4	0.1
		80	10.2	11.5	9	0.1
		90	10.8	12.4	14	0.2
		100	11.3	13.3	18	0.2
		110	11.7	14.0	21	0.2
		120	12.1	14.5	24	0.2
		130	12.5	15.0	28	0.2
		140	12.8	15.5	31	0.2
		** 150	13.1	15.9	33	0.2
		160	13.4	16.2	36	0.2
		170	13.6	16.6	38	0.2
		180	13.9	16.8	40	0.2
		190	14.1	17.1	42	0.2
		200	14.3	17.3	44	0.2
		210	14.5	17.6	45	0.2
		220	14.7	17.8	47	0.2
		230	14.8	18.0	48	0.2
		240	15.0	18.2	50	0.2
		250	15.1	18.4	51	0.2
404	E04	10	1.5	1.0	0	0.0
		20	3.9	3.0	0	0.0
		30	6.0	5.1	0	0.0
		40	7.7	7.6	0	0.0
		50	9.1	9.3	1	0.0
		60	10.2	11.4	11	0.2
		70	11.2	12.9	19	0.3
		80	12.0	14.2	26	0.3
		90	12.7	15.0	34	0.4
		100	13.4	15.8	41	0.4
		110	13.9	16.5	46	0.4
		** 120	14.4	17.0	52	0.4
		130	14.9	17.5	56	0.4
		140	15.3	18.0	62	0.4
		150	15.6	18.5	68	0.5
		160	16.0	18.9	73	0.5
		170	16.3	19.2	78	0.5
		180	16.5	19.6	83	0.5
		190	16.8	20.0	87	0.5
		200	17.1	20.3	91	0.5
		210	17.3	20.6	94	0.5
		220	17.5	20.9	98	0.4
		230	17.7	21.1	101	0.4
		240	17.9	21.3	104	0.4
		250	18.1	21.5	106	0.4

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
405	E05	10	4.2	2.0	0	0.0
		20	12.3	13.0	42	2.1
		30	19.5	19.0	202	6.7
		40	25.4	23.0	371	9.3
		50	30.4	27.0	547	10.9
		60	34.5	30.0	695	11.6
		** 70	38.0	33.0	830	11.9
		80	41.0	35.0	941	11.8
		90	43.6	39.0	1,035	11.5
		100	45.9	42.0	1,122	11.2
		110	47.9	45.0	1,190	10.8
		120	49.7	48.0	1,251	10.4
		130	51.4	51.0	1,304	10.0
		140	52.8	53.0	1,356	9.7
		150	54.1	55.0	1,401	9.3
		160	55.3	57.0	1,441	9.0
		170	56.4	59.0	1,475	8.7
		180	57.4	60.0	1,508	8.4
		190	58.4	61.0	1,536	8.1
		200	59.2	62.0	1,556	7.8
		210	60.0	63.0	1,580	7.5
		220	60.8	64.0	1,602	7.3
		230	60.8	64.0	1,602	7.0
		240	60.8	64.0	1,602	6.7
		250	60.8	64.0	1,602	6.4
406	E06	10	2.2	1.0	0	0.0
		20	4.7	2.0	0	0.0
		30	7.7	6.0	2	0.1
		40	10.4	11.0	18	0.5
		50	12.8	15.0	55	1.1
		60	15.0	18.0	104	1.7
		70	17.0	20.0	154	2.2
		80	18.7	22.0	201	2.5
		90	20.3	23.0	249	2.8
		100	21.7	24.0	294	2.9
		110	23.0	25.0	333	3.0
		120	24.1	26.0	374	3.1
		** 130	25.2	27.0	414	3.2
		140	26.2	27.0	451	3.2
		150	27.1	28.0	484	3.2
		160	27.9	29.0	514	3.2
		170	28.7	29.0	545	3.2
		180	29.4	30.0	571	3.2
		190	30.1	30.0	597	3.1
		200	30.7	31.0	621	3.1
		210	31.3	31.0	647	3.1
		220	31.9	31.0	669	3.0
		230	32.4	32.0	690	3.0
		240	32.9	32.0	708	3.0
		250	33.4	32.0	725	2.9

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
407	E07	10	2.2	1.0	0	0.0
		20	4.7	2.0	0	0.0
		30	7.7	6.0	2	0.1
		40	10.4	11.0	20	0.5
		50	12.8	14.0	60	1.2
		60	15.0	17.0	114	1.9
		70	17.0	19.0	167	2.4
		80	18.7	20.0	217	2.7
		90	20.3	22.0	265	2.9
		100	21.7	23.0	311	3.1
		110	23.0	23.0	352	3.2
		120	24.1	24.0	393	3.3
		** 130	25.2	25.0	433	3.3
		140	26.2	26.0	471	3.4
		150	27.1	26.0	505	3.4
		160	27.9	27.0	533	3.3
		170	28.7	27.0	561	3.3
		180	29.4	28.0	587	3.3
		190	30.1	28.0	612	3.2
		200	30.7	29.0	637	3.2
		210	31.3	29.0	661	3.1
		220	31.9	30.0	686	3.1
		230	32.4	30.0	705	3.1
		240	32.9	30.0	721	3.0
		250	33.4	31.0	738	3.0
408	E08	10	3.3	1.0	0	0.0
		20	8.3	7.0	3	0.2
		30	13.3	15.0	71	2.4
		40	17.7	20.0	192	4.8
		50	21.5	22.0	314	6.3
		60	24.9	25.0	434	7.2
		70	27.8	27.0	557	8.0
		80	30.4	28.0	665	8.3
		** 90	32.7	30.0	770	8.6
		100	34.7	32.0	863	8.6
		110	36.5	33.0	948	8.6
		120	38.2	35.0	1,015	8.5
		130	39.7	36.0	1,076	8.3
		140	41.1	38.0	1,139	8.1
		150	42.3	39.0	1,198	8.0
		160	43.4	40.0	1,252	7.8
		170	44.5	42.0	1,300	7.6
		180	45.4	43.0	1,335	7.4
		190	46.3	44.0	1,366	7.2
		200	47.2	45.0	1,396	7.0
		210	47.9	45.0	1,421	6.8
		220	48.7	46.0	1,456	6.6
		230	49.4	47.0	1,482	6.4
		240	50.1	48.0	1,509	6.3
		250	50.7	49.0	1,532	6.1

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
409	E09	10	4.2	2.0	0	0.0
		20	10.5	11.0	19	1.0
		30	16.5	20.0	145	4.8
		40	21.6	24.0	302	7.6
		50	26.0	27.0	468	9.4
		60	29.9	30.0	629	10.5
		70	33.2	32.0	788	11.3
		** 80	36.1	35.0	930	11.6
		90	38.6	37.0	1,043	11.6
		100	40.9	39.0	1,154	11.5
		110	42.9	41.0	1,258	11.4
		120	44.7	43.0	1,352	11.3
		130	46.4	45.0	1,423	10.9
		140	47.8	46.0	1,486	10.6
		150	49.2	48.0	1,548	10.3
		160	50.4	49.0	1,608	10.1
		170	51.5	51.0	1,658	9.8
		180	52.6	52.0	1,697	9.4
		190	53.5	53.0	1,734	9.1
		200	54.4	54.0	1,772	8.9
		210	55.2	55.0	1,808	8.6
		220	56.1	56.0	1,844	8.4
		230	56.8	56.0	1,878	8.2
		240	57.5	57.0	1,903	7.9
		250	58.2	57.0	1,926	7.7
410	E10	10	5.3	3.0	0	0.0
		20	12.9	14.0	61	3.1
		30	19.7	21.0	256	8.5
		40	25.5	25.0	466	11.7
		50	30.4	29.0	680	13.6
		60	34.6	32.0	879	14.7
		** 70	38.2	35.0	1,043	14.9
		80	41.4	38.0	1,196	15.0
		90	44.1	41.0	1,338	14.9
		100	46.6	44.0	1,453	14.5
		110	48.7	46.0	1,549	14.1
		120	50.7	49.0	1,648	13.7
		130	52.4	51.0	1,724	13.3
		140	54.0	52.0	1,794	12.8
		150	55.4	54.0	1,861	12.4
		160	56.7	55.0	1,928	12.1
		170	57.9	57.0	1,983	11.7
		180	58.9	58.0	2,029	11.3
		190	59.9	59.0	2,076	10.9
		200	60.8	60.0	2,118	10.6
		210	61.7	60.0	2,164	10.3
		220	62.6	61.0	2,206	10.0
		230	63.0	61.0	2,227	9.9
		240	63.0	61.0	2,227	9.9
		250	63.0	61.0	2,227	9.9

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
411	E11	10	2.6	1.0	0	0.0
		20	7.9	7.0	1	0.1
		30	12.9	14.0	52	1.7
		40	17.1	18.0	146	3.7
		50	20.7	21.0	241	4.8
		60	23.6	23.0	323	5.4
		70	26.2	25.0	409	5.8
		80	28.4	26.0	494	6.2
		** 90	30.3	27.0	565	6.3
		100	32.0	29.0	626	6.3
		110	33.5	30.0	684	6.2
		120	34.8	31.0	735	6.1
		130	36.0	32.0	782	6.0
		140	37.1	33.0	822	5.9
		150	38.1	33.0	856	5.7
		160	39.0	34.0	887	5.5
		170	39.8	35.0	916	5.4
		180	40.6	36.0	942	5.2
		190	41.3	37.0	964	5.1
		200	41.9	37.0	987	4.9
		210	42.5	38.0	1,006	4.8
		220	43.1	39.0	1,026	4.7
		230	43.7	39.0	1,045	4.5
		240	44.2	40.0	1,061	4.4
		250	44.7	40.0	1,074	4.3
412	E12	10	3.6	1.0	0	0.0
		20	10.5	11.0	16	0.8
		30	16.8	20.0	116	3.9
		40	22.1	26.0	249	6.2
		50	26.5	29.0	390	7.8
		60	30.2	32.0	531	8.9
		70	33.3	34.0	651	9.3
		80	36.0	36.0	765	9.6
		** 90	38.4	38.0	870	9.7
		100	40.5	40.0	956	9.6
		110	42.3	42.0	1,033	9.4
		120	44.0	43.0	1,106	9.2
		130	45.5	45.0	1,168	9.0
		140	46.8	46.0	1,219	8.7
		150	48.0	48.0	1,267	8.4
		160	49.1	49.0	1,309	8.2
		170	50.1	50.0	1,342	7.9
		180	51.0	52.0	1,374	7.6
		190	51.9	53.0	1,400	7.4
		200	52.6	54.0	1,426	7.1
		210	53.4	55.0	1,449	6.9
		220	54.1	56.0	1,469	6.7
		230	54.8	57.0	1,492	6.5
		240	55.4	58.0	1,514	6.3
		250	56.0	59.0	1,531	6.1

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
413	E13	10	4.0	2.0	0	0.0
		20	11.4	12.0	29	1.5
		30	18.0	19.0	172	5.7
		40	23.6	23.0	325	8.1
		50	28.3	26.0	496	9.9
		60	32.2	29.0	637	10.6
		** 70	35.6	31.0	777	11.1
		80	38.4	34.0	891	11.1
		90	40.9	36.0	989	11.0
		100	43.2	39.0	1,075	10.8
		110	45.1	41.0	1,156	10.5
		120	46.9	44.0	1,225	10.2
		130	48.4	46.0	1,278	9.8
		140	49.8	48.0	1,328	9.5
		150	51.1	50.0	1,377	9.2
		160	52.3	52.0	1,417	8.9
		170	53.3	53.0	1,455	8.6
		180	54.3	55.0	1,486	8.3
		190	55.2	56.0	1,513	8.0
		200	56.0	57.0	1,542	7.7
		210	56.8	58.0	1,570	7.5
		220	57.6	59.0	1,595	7.3
		230	58.3	60.0	1,620	7.0
		240	59.0	61.0	1,640	6.8
		250	59.6	62.0	1,654	6.6
414	E14	10	5.1	3.0	0	0.0
		20	13.7	15.0	70	3.5
		30	21.3	21.0	264	8.8
		40	27.7	26.0	473	11.8
		50	33.0	29.0	670	13.4
		** 60	37.5	33.0	858	14.3
		70	41.3	37.0	1,006	14.4
		80	44.6	41.0	1,143	14.3
		90	47.4	45.0	1,254	13.9
		100	50.0	49.0	1,353	13.5
		110	52.2	52.0	1,437	13.1
		120	54.2	55.0	1,517	12.6
		130	56.0	57.0	1,585	12.2
		140	57.6	59.0	1,642	11.7
		150	59.1	61.0	1,695	11.3
		160	59.7	61.0	1,717	11.1
		170	59.7	61.0	1,717	11.1
		180	59.7	61.0	1,717	11.1
		190	59.7	61.0	1,717	11.1
		200	59.7	61.0	1,717	11.1
		210	59.7	61.0	1,717	11.1
		220	59.7	61.0	1,717	11.1
		230	59.7	61.0	1,717	11.1
		240	59.7	61.0	1,717	11.1
		250	59.7	61.0	1,717	11.1

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
415	E15	10	5.5	3.0	0	0.0
		20	14.6	15.0	89	4.5
		30	22.5	21.0	302	10.1
		40	29.2	26.0	536	13.4
		50	34.7	30.0	745	14.9
		** 60	39.4	34.0	937	15.6
		70	43.3	39.0	1,093	15.6
		80	46.8	44.0	1,233	15.4
		90	49.7	48.0	1,345	14.9
		100	52.4	52.0	1,449	14.5
		110	54.7	55.0	1,546	14.1
		120	56.8	58.0	1,626	13.6
		130	58.7	60.0	1,692	13.0
		140	58.7	60.0	1,692	13.0
		150	58.7	60.0	1,692	13.0
		160	58.7	60.0	1,692	13.0
		170	58.7	60.0	1,692	13.0
		180	58.7	60.0	1,692	13.0
		190	58.7	60.0	1,692	13.0
		200	58.7	60.0	1,692	13.0
		210	58.7	60.0	1,692	13.0
		220	58.7	60.0	1,692	13.0
		230	58.7	60.0	1,692	13.0
		240	58.7	60.0	1,692	13.0
		250	58.7	60.0	1,692	13.0
416	E16	10	5.9	4.0	0	0.0
		20	15.2	16.0	99	5.0
		30	23.3	23.0	320	10.7
		40	30.1	27.0	566	14.2
		50	35.8	31.0	792	15.8
		** 60	40.6	36.0	984	16.4
		70	44.7	41.0	1,148	16.4
		80	48.2	46.0	1,290	16.1
		90	51.3	51.0	1,407	15.6
		100	54.0	54.0	1,515	15.2
		110	56.4	57.0	1,613	14.7
		120	58.5	60.0	1,686	14.1
		130	58.5	60.0	1,686	14.1
		140	58.5	60.0	1,686	14.1
		150	58.5	60.0	1,686	14.1
		160	58.5	60.0	1,686	14.1
		170	58.5	60.0	1,686	14.1
		180	58.5	60.0	1,686	14.1
		190	58.5	60.0	1,686	14.1
		200	58.5	60.0	1,686	14.1
		210	58.5	60.0	1,686	14.1
		220	58.5	60.0	1,686	14.1
		230	58.5	60.0	1,686	14.1
		240	58.5	60.0	1,686	14.1
		250	58.5	60.0	1,686	14.1

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
417	E17	10	6.7	5.0	1	0.1
		20	16.8	17.0	143	7.2
		30	25.5	23.0	396	13.2
		40	32.7	28.0	664	16.6
		50	38.8	34.0	910	18.2
		** 60	43.9	39.0	1,111	18.5
		70	48.2	46.0	1,284	18.3
		80	52.0	52.0	1,428	17.9
		90	55.3	56.0	1,564	17.4
		100	58.2	59.0	1,664	16.6
		110	58.2	59.0	1,664	16.6
		120	58.2	59.0	1,664	16.6
		130	58.2	59.0	1,664	16.6
		140	58.2	59.0	1,664	16.6
		150	58.2	59.0	1,664	16.6
		160	58.2	59.0	1,664	16.6
		170	58.2	59.0	1,664	16.6
		180	58.2	59.0	1,664	16.6
		190	58.2	59.0	1,664	16.6
		200	58.2	59.0	1,664	16.6
		210	58.2	59.0	1,664	16.6
		220	58.2	59.0	1,664	16.6
		230	58.2	59.0	1,664	16.6
		240	58.2	59.0	1,664	16.6
		250	58.2	59.0	1,664	16.6
418	E18	10	4.4	2.0	0	0.0
		20	12.8	13.0	51	2.6
		30	20.2	20.0	223	7.4
		40	26.3	24.0	402	10.1
		50	31.4	27.0	580	11.6
		60	35.6	30.0	738	12.3
		** 70	39.2	34.0	878	12.5
		80	42.3	37.0	988	12.4
		90	45.0	40.0	1,092	12.1
		100	47.4	44.0	1,175	11.8
		110	49.5	48.0	1,246	11.3
		120	51.4	51.0	1,311	10.9
		130	53.0	54.0	1,368	10.5
		140	54.5	56.0	1,423	10.2
		150	55.9	58.0	1,468	9.8
		160	57.1	60.0	1,512	9.4
		170	58.3	61.0	1,546	9.1
		180	59.3	62.0	1,573	8.7
		190	60.3	63.0	1,599	8.4
		200	60.7	64.0	1,613	8.3
		210	60.7	64.0	1,613	8.3
		220	60.7	64.0	1,613	8.3
		230	60.7	64.0	1,613	8.3
		240	60.7	64.0	1,613	8.3
		250	60.7	64.0	1,613	8.3

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
419	E19	10	2.9	1.0	0	0.0
		20	7.5	6.0	2	0.1
		30	12.1	13.0	41	1.4
		40	16.2	19.0	145	3.6
		50	19.8	22.0	251	5.0
		60	22.9	24.0	357	6.0
		70	25.6	26.0	463	6.6
		80	28.1	28.0	563	7.0
		90	30.2	29.0	655	7.3
		** 100	32.2	31.0	741	7.4
		110	33.9	32.0	820	7.5
		120	35.5	33.0	893	7.4
		130	36.9	35.0	954	7.3
		140	38.2	36.0	1,008	7.2
		150	39.4	37.0	1,060	7.1
		160	40.5	38.0	1,107	6.9
		170	41.4	39.0	1,151	6.8
		180	42.4	40.0	1,192	6.6
		190	43.2	41.0	1,229	6.5
		200	44.0	42.0	1,265	6.3
		210	44.7	42.0	1,292	6.2
		220	45.5	43.0	1,316	6.0
		230	46.1	44.0	1,339	5.8
		240	46.8	45.0	1,360	5.7
		250	47.4	45.0	1,381	5.5
420	E20	10	3.1	1.0	0	0.0
		20	8.0	7.0	3	0.2
		30	12.9	15.0	60	2.0
		40	17.2	20.0	172	4.3
		50	20.9	23.0	290	5.8
		60	24.2	25.0	404	6.7
		70	27.1	27.0	523	7.5
		80	29.6	29.0	628	7.9
		90	31.9	30.0	732	8.1
		** 100	33.9	32.0	821	8.2
		110	35.7	33.0	910	8.3
		120	37.3	35.0	979	8.2
		130	38.8	36.0	1,040	8.0
		140	40.1	38.0	1,101	7.9
		150	41.3	39.0	1,154	7.7
		160	42.4	40.0	1,210	7.6
		170	43.5	41.0	1,259	7.4
		180	44.4	42.0	1,304	7.2
		190	45.3	43.0	1,332	7.0
		200	46.1	44.0	1,358	6.8
		210	46.8	45.0	1,385	6.6
		220	47.6	46.0	1,413	6.4
		230	48.3	46.0	1,440	6.3
		240	49.0	47.0	1,468	6.1
		250	49.6	48.0	1,492	6.0

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
421	E21	10	3.5	1.0	0	0.0
		20	9.2	9.0	6	0.3
		30	14.6	18.0	92	3.1
		40	19.4	23.0	222	5.6
		50	23.5	27.0	356	7.1
		60	27.1	29.0	503	8.4
		70	30.2	32.0	637	9.1
		80	32.9	34.0	764	9.6
		** 90	35.3	35.0	887	9.9
		100	37.5	37.0	987	9.9
		110	39.4	39.0	1,078	9.8
		120	41.2	41.0	1,167	9.7
		130	42.7	42.0	1,244	9.6
		140	44.1	44.0	1,316	9.4
		150	45.4	45.0	1,373	9.2
		160	46.6	46.0	1,425	8.9
		170	47.7	47.0	1,474	8.7
		180	48.7	48.0	1,520	8.4
		190	49.6	49.0	1,561	8.2
		200	50.4	50.0	1,600	8.0
		210	51.2	51.0	1,630	7.8
		220	52.0	52.0	1,662	7.6
		230	52.8	52.0	1,691	7.4
		240	53.5	53.0	1,718	7.2
		250	54.1	54.0	1,742	7.0
422	E22	10	3.8	2.0	0	0.0
		20	9.8	10.0	13	0.7
		30	15.5	18.0	125	4.2
		40	20.4	23.0	274	6.9
		50	24.7	25.0	428	8.6
		60	28.4	28.0	583	9.7
		70	31.6	30.0	726	10.4
		80	34.4	32.0	858	10.7
		** 90	36.9	35.0	981	10.9
		100	39.1	37.0	1,079	10.8
		110	41.1	39.0	1,172	10.7
		120	42.9	41.0	1,262	10.5
		130	44.5	42.0	1,345	10.3
		140	46.0	44.0	1,405	10.0
		150	47.3	45.0	1,460	9.7
		160	48.5	47.0	1,514	9.5
		170	49.6	48.0	1,564	9.2
		180	50.6	49.0	1,608	8.9
		190	51.5	50.0	1,644	8.7
		200	52.4	51.0	1,676	8.4
		210	53.2	52.0	1,707	8.1
		220	54.0	53.0	1,740	7.9
		230	54.8	54.0	1,770	7.7
		240	55.5	54.0	1,799	7.5
		250	56.2	55.0	1,830	7.3

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
423	E23	10	1.8	1.0	0	0.0
		20	3.4	1.0	0	0.0
		30	5.4	3.0	0	0.0
		40	7.2	6.0	1	0.0
		50	8.9	9.0	3	0.1
		60	10.4	12.0	11	0.2
		70	11.7	14.0	20	0.3
		80	12.9	16.0	34	0.4
		90	14.0	19.0	51	0.6
		100	15.0	20.0	65	0.7
		110	15.9	22.0	81	0.7
		120	16.7	23.0	96	0.8
		130	17.5	24.0	111	0.9
		140	18.2	25.0	126	0.9
		150	18.8	26.0	140	0.9
		160	19.4	27.0	153	1.0
		170	19.9	28.0	166	1.0
		180	20.4	29.0	179	1.0
		190	20.9	29.0	189	1.0
		** 200	21.4	30.0	200	1.0
		210	21.8	30.0	210	1.0
		220	22.2	31.0	220	1.0
		230	22.6	31.0	230	1.0
		240	22.9	32.0	241	1.0
		250	23.3	32.0	252	1.0
424	E24	10	2.0	1.0	0	0.0
		20	4.6	2.0	0	0.0
		30	7.5	6.0	2	0.1
		40	10.2	10.0	17	0.4
		50	12.5	14.0	51	1.0
		60	14.7	17.0	101	1.7
		70	16.5	19.0	152	2.2
		80	18.2	21.0	199	2.5
		90	19.7	22.0	245	2.7
		100	21.1	23.0	290	2.9
		** 110	22.3	24.0	332	3.0
		120	23.4	25.0	365	3.0
		130	24.4	25.0	404	3.1
		140	25.4	26.0	436	3.1
		150	26.2	27.0	470	3.1
		160	27.0	27.0	499	3.1
		170	27.7	28.0	526	3.1
		180	28.4	28.0	548	3.0
		190	29.0	29.0	572	3.0
		200	29.6	29.0	595	3.0
		210	30.1	30.0	614	2.9
		220	30.7	30.0	636	2.9
		230	31.2	30.0	657	2.9
		240	31.7	31.0	673	2.8
		250	32.2	31.0	691	2.8

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
425	E25	10	2.0	1.0	0	0.0
		20	4.6	2.0	0	0.0
		30	7.5	6.0	2	0.1
		40	10.2	10.0	17	0.4
		50	12.5	14.0	51	1.0
		60	14.7	17.0	101	1.7
		70	16.5	19.0	152	2.2
		80	18.2	21.0	199	2.5
		90	19.7	22.0	245	2.7
		100	21.1	23.0	290	2.9
		** 110	22.3	24.0	332	3.0
		120	23.4	25.0	365	3.0
		130	24.4	25.0	404	3.1
		140	25.4	26.0	436	3.1
		150	26.2	27.0	470	3.1
		160	27.0	27.0	499	3.1
		170	27.7	28.0	526	3.1
		180	28.4	28.0	548	3.0
		190	29.0	29.0	572	3.0
		200	29.6	29.0	595	3.0
		210	30.1	30.0	614	2.9
		220	30.7	30.0	636	2.9
		230	31.2	30.0	657	2.9
		240	31.7	31.0	673	2.8
		250	32.2	31.0	691	2.8
426	E26	10	3.1	1.0	0	0.0
		20	8.3	7.0	3	0.2
		30	13.3	15.0	76	2.5
		40	17.8	19.0	199	5.0
		50	21.6	22.0	330	6.6
		60	25.0	24.0	451	7.5
		70	27.9	26.0	574	8.2
		80	30.5	28.0	688	8.6
		** 90	32.8	30.0	784	8.7
		100	34.9	31.0	882	8.8
		110	36.7	33.0	968	8.8
		120	38.3	35.0	1,040	8.7
		130	39.8	36.0	1,104	8.5
		140	41.2	37.0	1,167	8.3
		150	42.4	39.0	1,223	8.2
		160	43.5	40.0	1,278	8.0
		170	44.6	41.0	1,321	7.8
		180	45.5	42.0	1,358	7.5
		190	46.4	43.0	1,391	7.3
		200	47.2	44.0	1,420	7.1
		210	47.9	45.0	1,456	6.9
		220	48.7	46.0	1,488	6.8
		230	49.5	47.0	1,521	6.6
		240	50.1	47.0	1,547	6.4
		250	50.8	48.0	1,569	6.3

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
427	E27	10	3.0	1.0	0	0.0
		20	7.9	7.0	3	0.2
		30	12.7	14.0	55	1.8
		40	17.0	20.0	169	4.2
		50	20.7	23.0	287	5.7
		60	24.0	25.0	401	6.7
		70	26.8	27.0	518	7.4
		80	29.4	29.0	622	7.8
		** 90	31.6	30.0	723	8.0
		100	33.6	32.0	809	8.1
		110	35.4	33.0	898	8.2
		120	37.0	35.0	969	8.1
		130	38.4	36.0	1,035	8.0
		140	39.8	37.0	1,092	7.8
		150	41.0	39.0	1,149	7.7
		160	42.1	40.0	1,199	7.5
		170	43.1	41.0	1,250	7.4
		180	44.0	42.0	1,289	7.2
		190	44.8	43.0	1,322	7.0
		200	45.6	43.0	1,348	6.7
		210	46.4	44.0	1,374	6.5
		220	47.1	45.0	1,403	6.4
		230	47.9	46.0	1,435	6.2
		240	48.5	47.0	1,460	6.1
		250	49.2	47.0	1,488	6.0
428	E28	10	3.2	1.0	0	0.0
		20	8.5	8.0	3	0.2
		30	13.6	16.0	76	2.5
		40	18.1	21.0	199	5.0
		50	22.0	24.0	332	6.6
		60	25.4	26.0	458	7.6
		70	28.4	28.0	584	8.3
		80	31.0	30.0	700	8.8
		90	33.3	32.0	804	8.9
		** 100	35.4	33.0	905	9.1
		110	37.3	35.0	992	9.0
		120	38.9	37.0	1,064	8.9
		130	40.4	38.0	1,135	8.7
		140	41.8	39.0	1,200	8.6
		150	43.1	41.0	1,264	8.4
		160	44.2	42.0	1,315	8.2
		170	45.2	43.0	1,355	8.0
		180	46.2	44.0	1,391	7.7
		190	47.1	45.0	1,426	7.5
		200	47.9	46.0	1,461	7.3
		210	48.6	47.0	1,493	7.1
		220	49.4	48.0	1,529	7.0
		230	50.2	49.0	1,556	6.8
		240	50.9	50.0	1,582	6.6
		250	51.5	50.0	1,603	6.4

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
429	E29	10	4.1	2.0	0	0.0
		20	10.7	11.0	25	1.3
		30	16.9	18.0	175	5.8
		40	22.1	22.0	352	8.8
		50	26.7	25.0	528	10.6
		60	30.6	28.0	699	11.7
		70	34.0	31.0	853	12.2
		** 80	37.0	33.0	998	12.5
		90	39.6	36.0	1,115	12.4
		100	41.9	38.0	1,231	12.3
		110	44.0	41.0	1,336	12.1
		120	45.8	43.0	1,425	11.9
		130	47.5	44.0	1,502	11.6
		140	49.0	46.0	1,573	11.2
		150	50.4	48.0	1,643	11.0
		160	51.6	49.0	1,696	10.6
		170	52.8	50.0	1,745	10.3
		180	53.8	51.0	1,791	9.9
		190	54.8	52.0	1,834	9.7
		200	55.6	53.0	1,871	9.4
		210	56.5	54.0	1,914	9.1
		220	57.3	54.0	1,950	8.9
		230	58.1	55.0	1,983	8.6
		240	58.9	55.0	2,014	8.4
		250	59.6	56.0	2,043	8.2
430	E30	10	5.9	4.0	0	0.0
		20	15.4	15.0	117	5.9
		30	23.7	21.0	350	11.7
		40	30.6	26.0	608	15.2
		50	36.5	30.0	846	16.9
		** 60	41.4	35.0	1,050	17.5
		70	45.7	40.0	1,227	17.5
		80	49.3	46.0	1,381	17.3
		90	52.5	51.0	1,517	16.9
		100	55.4	54.0	1,646	16.5
		110	57.9	56.0	1,758	16.0
		120	60.1	58.0	1,850	15.4
		130	60.1	58.0	1,850	15.4
		140	60.1	58.0	1,850	15.4
		150	60.1	58.0	1,850	15.4
		160	60.1	58.0	1,850	15.4
		170	60.1	58.0	1,850	15.4
		180	60.1	58.0	1,850	15.4
		190	60.1	58.0	1,850	15.4
		200	60.1	58.0	1,850	15.4
		210	60.1	58.0	1,850	15.4
		220	60.1	58.0	1,850	15.4
		230	60.1	58.0	1,850	15.4
		240	60.1	58.0	1,850	15.4
		250	60.1	58.0	1,850	15.4

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
431	E31	10	6.5	5.0	1	0.1
		20	16.5	17.0	138	6.9
		30	25.1	23.0	390	13.0
		40	32.4	29.0	664	16.6
		50	38.6	34.0	923	18.5
		** 60	43.8	39.0	1,136	18.9
		70	48.2	46.0	1,321	18.9
		80	52.1	51.0	1,482	18.5
		90	55.5	55.0	1,629	18.1
		100	58.5	58.0	1,753	17.5
		110	58.5	58.0	1,753	15.9
		120	58.5	58.0	1,753	14.6
		130	58.5	58.0	1,753	13.5
		140	58.5	58.0	1,753	12.5
		150	58.5	58.0	1,753	11.7
		160	58.5	58.0	1,753	11.0
		170	58.5	58.0	1,753	10.3
		180	58.5	58.0	1,753	9.7
		190	58.5	58.0	1,753	9.2
		200	58.5	58.0	1,753	8.8
		210	58.5	58.0	1,753	8.3
		220	58.5	58.0	1,753	8.0
		230	58.5	58.0	1,753	7.6
		240	58.5	58.0	1,753	7.3
		250	58.5	58.0	1,753	7.0
432	E32	10	7.1	5.0	1	0.1
		20	17.6	17.0	173	8.7
		30	26.6	23.0	446	14.9
		40	34.2	28.0	731	18.3
		50	40.7	34.0	996	19.9
		** 60	46.1	42.0	1,211	20.2
		70	50.8	48.0	1,408	20.1
		80	54.9	53.0	1,582	19.8
		90	56.8	55.0	1,647	18.3
		100	56.8	55.0	1,647	16.5
		110	56.8	55.0	1,647	15.0
		120	56.8	55.0	1,647	13.7
		130	56.8	55.0	1,647	12.7
		140	56.8	55.0	1,647	11.8
		150	56.8	55.0	1,647	11.0
		160	56.8	55.0	1,647	10.3
		170	56.8	55.0	1,647	9.7
		180	56.8	55.0	1,647	9.2
		190	56.8	55.0	1,647	8.7
		200	56.8	55.0	1,647	8.2
		210	56.8	55.0	1,647	7.8
		220	56.8	55.0	1,647	7.5
		230	56.8	55.0	1,647	7.2
		240	56.8	55.0	1,647	6.9
		250	56.8	55.0	1,647	6.6

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
433	E33	10	2.1	1.0	0	0.0
		20	5.2	3.0	0	0.0
		30	8.5	8.0	3	0.1
		40	11.5	13.0	32	0.8
		50	14.1	17.0	91	1.8
		60	16.5	19.0	154	2.6
		70	18.6	21.0	214	3.1
		80	20.4	23.0	276	3.5
		90	22.1	24.0	332	3.7
		100	23.6	25.0	382	3.8
		110	24.9	26.0	429	3.9
		** 120	26.1	27.0	478	4.0
		130	27.2	28.0	521	4.0
		140	28.3	28.0	559	4.0
		150	29.2	29.0	598	4.0
		160	30.0	30.0	632	4.0
		170	30.8	30.0	664	3.9
		180	31.5	31.0	694	3.9
		190	32.2	31.0	720	3.8
		200	32.8	31.0	740	3.7
		210	33.4	32.0	761	3.6
		220	34.0	32.0	784	3.6
		230	34.5	33.0	801	3.5
		240	35.1	33.0	818	3.4
		250	35.6	34.0	835	3.3
434	E34	10	2.9	1.0	0	0.0
		20	8.1	7.0	3	0.2
		30	13.0	15.0	64	2.1
		40	17.4	20.0	182	4.6
		50	21.2	23.0	308	6.2
		60	24.5	26.0	423	7.1
		70	27.4	28.0	546	7.8
		80	30.0	30.0	658	8.2
		** 90	32.3	31.0	760	8.4
		100	34.3	33.0	853	8.5
		110	36.1	34.0	941	8.6
		120	37.7	36.0	1,014	8.4
		130	39.2	37.0	1,081	8.3
		140	40.5	38.0	1,142	8.2
		150	41.8	40.0	1,201	8.0
		160	42.9	41.0	1,254	7.8
		170	43.9	42.0	1,302	7.7
		180	44.8	43.0	1,336	7.4
		190	45.6	44.0	1,366	7.2
		200	46.4	44.0	1,398	7.0
		210	47.2	45.0	1,429	6.8
		220	47.9	46.0	1,465	6.7
		230	48.7	47.0	1,494	6.5
		240	49.4	48.0	1,523	6.3
		250	50.0	49.0	1,549	6.2

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
435	E35	10	3.9	2.0	0	0.0
		20	10.4	11.0	21	1.1
		30	16.5	19.0	160	5.3
		40	21.7	23.0	332	8.3
		50	26.2	26.0	503	10.1
		60	30.1	29.0	676	11.3
		70	33.4	31.0	824	11.8
		** 80	36.4	33.0	975	12.2
		90	39.0	36.0	1,095	12.2
		100	41.3	38.0	1,209	12.1
		110	43.3	40.0	1,312	11.9
		120	45.2	42.0	1,405	11.7
		130	46.8	44.0	1,482	11.4
		140	48.3	46.0	1,557	11.1
		150	49.7	47.0	1,623	10.8
		160	50.9	49.0	1,679	10.5
		170	52.1	50.0	1,728	10.2
		180	53.1	51.0	1,771	9.8
		190	54.0	52.0	1,815	9.6
		200	54.9	52.0	1,852	9.3
		210	55.7	53.0	1,896	9.0
		220	56.6	54.0	1,937	8.8
		230	57.4	55.0	1,973	8.6
		240	58.2	55.0	2,003	8.3
		250	58.9	56.0	2,032	8.1
436	E36	10	4.4	2.0	0	0.0
		20	11.6	13.0	37	1.9
		30	18.1	20.0	209	7.0
		40	23.7	24.0	403	10.1
		50	28.5	28.0	604	12.1
		60	32.6	30.0	789	13.2
		** 70	36.1	33.0	968	13.8
		80	39.3	36.0	1,114	13.9
		90	42.0	39.0	1,253	13.9
		100	44.4	42.0	1,380	13.8
		110	46.6	44.0	1,485	13.5
		120	48.5	46.0	1,583	13.2
		130	50.3	48.0	1,672	12.9
		140	51.8	50.0	1,744	12.5
		150	53.2	51.0	1,813	12.1
		160	54.5	52.0	1,874	11.7
		170	55.7	53.0	1,937	11.4
		180	56.8	54.0	1,992	11.1
		190	57.7	55.0	2,037	10.7
		200	58.6	55.0	2,075	10.4
		210	59.5	56.0	2,117	10.1
		220	60.4	57.0	2,162	9.8
		230	61.3	57.0	2,205	9.6
		240	62.0	58.0	2,249	9.4
		250	62.8	58.0	2,287	9.1

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
437	E37	10	1.6	1.0	0	0.0
		20	3.3	1.0	0	0.0
		30	5.3	3.0	0	0.0
		40	7.2	6.0	2	0.1
		50	8.8	8.0	4	0.1
		60	10.3	11.0	18	0.3
		70	11.6	13.0	32	0.5
		80	12.7	14.0	54	0.7
		90	13.8	16.0	79	0.9
		100	14.7	17.0	104	1.0
		110	15.6	18.0	124	1.1
		120	16.4	19.0	146	1.2
		130	17.1	20.0	165	1.3
		140	17.8	20.0	183	1.3
		150	18.4	21.0	197	1.3
		160	18.9	22.0	214	1.3
		** 170	19.4	22.0	230	1.4
		180	19.9	22.0	242	1.3
		190	20.3	23.0	256	1.3
		200	20.7	23.0	268	1.3
		210	21.1	23.0	280	1.3
		220	21.5	24.0	291	1.3
		230	21.9	24.0	303	1.3
		240	22.2	24.0	313	1.3
		250	22.6	24.0	325	1.3
438	E38	10	1.9	1.0	0	0.0
		20	5.1	3.0	0	0.0
		30	8.4	8.0	3	0.1
		40	11.4	12.0	31	0.8
		50	14.1	16.0	89	1.8
		60	16.4	19.0	152	2.5
		70	18.5	21.0	211	3.0
		80	20.3	23.0	275	3.4
		90	21.9	24.0	332	3.7
		100	23.4	25.0	378	3.8
		** 110	24.7	26.0	424	3.9
		120	25.9	27.0	472	3.9
		130	27.0	28.0	515	4.0
		140	28.0	28.0	554	4.0
		150	28.9	29.0	589	3.9
		160	29.8	30.0	627	3.9
		170	30.5	30.0	658	3.9
		180	31.2	31.0	685	3.8
		190	31.8	31.0	707	3.7
		200	32.4	31.0	729	3.6
		210	33.0	32.0	752	3.6
		220	33.6	32.0	769	3.5
		230	34.1	33.0	788	3.4
		240	34.7	33.0	806	3.4
		250	35.2	33.0	823	3.3

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
439	E39	10	2.7	1.0	0	0.0
		20	8.4	8.0	3	0.2
		30	13.6	15.0	73	2.4
		40	18.1	21.0	193	4.8
		50	21.9	24.0	320	6.4
		60	25.3	26.0	439	7.3
		70	28.2	28.0	560	8.0
		80	30.7	30.0	667	8.3
		90	32.9	32.0	753	8.4
		** 100	34.9	33.0	855	8.6
		110	36.6	34.0	936	8.5
		120	38.2	36.0	1,005	8.4
		130	39.6	37.0	1,068	8.2
		140	40.9	38.0	1,129	8.1
		150	42.1	39.0	1,183	7.9
		160	43.1	40.0	1,227	7.7
		170	44.1	42.0	1,266	7.4
		180	45.0	42.0	1,302	7.2
		190	45.7	43.0	1,335	7.0
		200	46.5	44.0	1,367	6.8
		210	47.2	45.0	1,399	6.7
		220	47.9	46.0	1,430	6.5
		230	48.7	46.0	1,457	6.3
		240	49.3	47.0	1,482	6.2
		250	50.0	48.0	1,505	6.0
440	E40	10	1.6	1.0	0	0.0
		20	4.7	2.0	0	0.0
		30	7.9	7.0	2	0.1
		40	10.7	12.0	18	0.5
		50	13.1	17.0	53	1.1
		60	15.3	21.0	98	1.6
		70	17.2	23.0	147	2.1
		80	18.9	26.0	198	2.5
		90	20.4	28.0	247	2.7
		100	21.8	29.0	291	2.9
		** 110	23.0	30.0	327	3.0
		120	24.0	31.0	362	3.0
		130	25.0	32.0	399	3.1
		140	25.9	33.0	435	3.1
		150	26.7	34.0	468	3.1
		160	27.5	35.0	499	3.1
		170	28.1	36.0	527	3.1
		180	28.7	36.0	550	3.1
		190	29.3	37.0	572	3.0
		200	29.8	37.0	592	3.0
		210	30.3	37.0	612	2.9
		220	30.8	38.0	632	2.9
		230	31.3	38.0	647	2.8
		240	31.8	39.0	664	2.8
		250	32.3	39.0	680	2.7

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
441	E41	10	1.2	0.0	0	0.0
		20	1.9	0.0	0	0.0
		30	2.7	0.0	0	0.0
		40	3.3	1.3	0	0.0
		50	3.9	2.3	0	0.0
		60	4.5	2.9	0	0.0
		70	4.9	3.3	0	0.0
		80	5.4	3.7	0	0.0
		90	5.7	4.0	0	0.0
		100	6.1	4.4	0	0.0
		110	6.3	5.1	0	0.0
		120	6.6	5.7	0	0.0
		130	6.9	6.2	0	0.0
		140	7.1	6.6	0	0.0
		150	7.3	7.0	1	0.0
		160	7.5	7.4	1	0.0
		170	7.6	7.7	1	0.0
		180	7.8	7.8	1	0.0
		190	7.9	8.1	1	0.0
		200	8.0	8.3	1	0.0
		210	8.1	8.5	1	0.0
		220	8.3	8.7	1	0.0
		230	8.4	8.9	1	0.0
		240	8.5	9.2	2	0.0
		** 250	8.7	9.3	2	0.0
442	E42	10	1.3	0.0	0	0.0
		20	2.9	0.0	0	0.0
		30	4.5	3.1	0	0.0
		40	6.1	4.4	0	0.0
		50	7.4	7.4	1	0.0
		60	8.6	9.3	2	0.0
		70	9.7	11.1	8	0.1
		80	10.6	12.7	15	0.2
		90	11.4	14.1	22	0.2
		100	12.1	15.3	29	0.3
		110	12.8	16.7	41	0.4
		120	13.4	17.9	51	0.4
		130	13.9	18.9	60	0.5
		140	14.4	19.7	69	0.5
		150	14.9	20.6	76	0.5
		160	15.3	21.2	84	0.5
		170	15.6	21.8	92	0.5
		180	16.0	22.3	99	0.6
		190	16.3	22.8	105	0.6
		200	16.5	23.3	111	0.6
		210	16.8	23.6	116	0.6
		220	17.1	24.1	122	0.6
		230	17.4	24.5	129	0.6
		240	17.7	25.0	135	0.6
		** 250	18.0	25.4	140	0.6

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
443	E43	10	1.4	1.0	0	0.0
		20	4.1	2.0	0	0.0
		30	6.8	5.0	1	0.0
		40	9.1	9.0	6	0.2
		50	11.3	13.0	25	0.5
		60	13.2	16.0	57	1.0
		70	14.8	19.0	92	1.3
		80	16.2	21.0	131	1.6
		90	17.5	23.0	166	1.8
		100	18.6	24.0	199	2.0
		110	19.7	26.0	236	2.1
		** 120	20.6	27.0	269	2.2
		130	21.4	28.0	294	2.3
		140	22.2	28.0	314	2.2
		150	22.9	29.0	333	2.2
		160	23.5	30.0	353	2.2
		170	24.1	30.0	369	2.2
		180	24.6	31.0	389	2.2
		190	25.0	31.0	405	2.1
		200	25.5	32.0	422	2.1
		210	25.8	32.0	436	2.1
		220	26.3	32.0	453	2.1
		230	26.8	33.0	471	2.0
		240	27.2	33.0	488	2.0
		250	27.6	34.0	501	2.0
444	E44	10	1.5	0.0	0	0.0
		20	4.7	3.2	0	0.0
		30	7.8	8.1	1	0.1
		40	10.6	12.9	13	0.3
		50	13.1	17.6	40	0.8
		60	15.2	21.7	77	1.3
		70	17.1	25.0	119	1.7
		80	18.8	27.8	163	2.0
		90	20.3	30.2	209	2.3
		100	21.6	32.2	248	2.5
		110	22.8	33.6	281	2.6
		120	23.8	34.9	311	2.6
		130	24.8	36.3	348	2.7
		** 140	25.7	37.5	383	2.7
		150	26.5	38.7	414	2.8
		160	27.2	39.6	443	2.8
		170	27.8	40.4	469	2.8
		180	28.4	41.1	492	2.7
		190	28.9	41.8	514	2.7
		200	29.4	42.4	533	2.7
		210	29.9	43.0	552	2.6
		220	30.4	43.5	571	2.6
		230	31.0	44.1	588	2.6
		240	31.4	44.6	604	2.5
		250	31.9	45.1	619	2.5

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
445	E45	10	1.5	1.0	0	0.0
		20	4.9	3.0	0	0.0
		30	8.3	8.0	3	0.1
		40	11.2	13.0	23	0.6
		50	13.8	18.0	67	1.3
		60	16.1	22.0	118	2.0
		70	18.1	25.0	172	2.5
		80	19.8	27.0	232	2.9
		90	21.4	29.0	284	3.2
		100	22.8	30.0	325	3.3
		110	24.0	32.0	363	3.3
		** 120	25.1	33.0	411	3.4
		130	26.2	34.0	455	3.5
		140	27.1	35.0	493	3.5
		150	27.9	36.0	528	3.5
		160	28.6	37.0	560	3.5
		170	29.3	37.0	587	3.5
		180	29.9	38.0	615	3.4
		190	30.5	38.0	635	3.3
		200	31.0	38.0	649	3.2
		210	31.5	39.0	666	3.2
		220	32.1	39.0	684	3.1
		230	32.6	40.0	704	3.1
		240	33.1	40.0	722	3.0
		250	33.6	40.0	742	3.0
446	E46	10	2.0	1.0	0	0.0
		20	6.9	5.0	1	0.1
		30	11.3	13.0	25	0.8
		40	15.2	21.0	98	2.5
		50	18.7	26.0	195	3.9
		60	21.7	29.0	300	5.0
		70	24.3	32.0	385	5.5
		80	26.6	35.0	490	6.1
		90	28.7	37.0	585	6.5
		** 100	30.5	38.0	667	6.7
		110	32.2	39.0	731	6.6
		120	33.6	40.0	801	6.7
		130	34.9	42.0	876	6.7
		140	36.1	43.0	939	6.7
		150	37.2	43.0	989	6.6
		160	38.2	44.0	1,036	6.5
		170	39.1	45.0	1,078	6.3
		180	39.9	45.0	1,115	6.2
		190	40.6	46.0	1,148	6.0
		200	41.2	47.0	1,178	5.9
		210	41.9	47.0	1,209	5.8
		220	42.6	48.0	1,243	5.7
		230	43.3	48.0	1,276	5.5
		240	44.0	49.0	1,302	5.4
		250	44.6	49.0	1,333	5.3

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
447	E47	10	2.4	1.0	0	0.0
		20	8.0	7.0	2	0.1
		30	13.0	17.0	46	1.5
		40	17.4	25.0	143	3.6
		50	21.2	30.0	270	5.4
		60	24.6	34.0	384	6.4
		70	27.6	38.0	515	7.4
		80	30.1	40.0	635	7.9
		90	32.4	42.0	731	8.1
		100	34.4	44.0	840	8.4
		** 110	36.3	46.0	944	8.6
		120	37.9	47.0	1,026	8.6
		130	39.4	48.0	1,100	8.5
		140	40.7	49.0	1,170	8.4
		150	41.9	50.0	1,233	8.2
		160	42.9	51.0	1,287	8.0
		170	43.9	52.0	1,337	7.9
		180	44.8	52.0	1,380	7.7
		190	45.6	53.0	1,422	7.5
		200	46.3	53.0	1,461	7.3
		210	47.0	54.0	1,500	7.1
		220	47.9	55.0	1,548	7.0
		230	48.7	55.0	1,585	6.9
		240	49.4	56.0	1,618	6.7
		250	50.1	56.0	1,647	6.6
448	E48	10	3.1	1.0	0	0.0
		20	9.7	10.0	10	0.5
		30	15.5	21.0	105	3.5
		40	20.5	28.0	261	6.5
		50	24.9	33.0	417	8.3
		60	28.8	37.0	598	10.0
		70	32.1	39.0	746	10.7
		80	35.0	42.0	904	11.3
		** 90	37.6	44.0	1,046	11.6
		100	39.9	46.0	1,170	11.7
		110	42.0	47.0	1,283	11.7
		120	43.8	49.0	1,384	11.5
		130	45.5	50.0	1,478	11.4
		140	47.0	51.0	1,570	11.2
		150	48.3	52.0	1,650	11.0
		160	49.5	53.0	1,714	10.7
		170	50.6	54.0	1,769	10.4
		180	51.6	55.0	1,815	10.1
		190	52.5	55.0	1,861	9.8
		200	53.3	55.0	1,900	9.5
		210	54.1	56.0	1,942	9.2
		220	55.1	56.0	1,993	9.1
		230	56.0	57.0	2,041	8.9
		240	56.8	57.0	2,086	8.7
		250	57.6	57.0	2,126	8.5

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
449	E49	10	4.4	2.0	0	0.0
		20	11.1	12.0	26	1.3
		30	17.4	20.0	156	5.2
		40	22.7	25.0	306	7.7
		50	27.2	28.0	474	9.5
		60	31.1	31.0	629	10.5
		70	34.4	33.0	782	11.2
		** 80	37.3	36.0	915	11.4
		90	39.8	38.0	1,020	11.3
		100	42.0	41.0	1,125	11.3
		110	44.0	43.0	1,221	11.1
		120	45.8	45.0	1,303	10.9
		130	47.4	47.0	1,363	10.5
		140	48.9	49.0	1,421	10.2
		150	50.2	51.0	1,481	9.9
		160	51.4	52.0	1,534	9.6
		170	52.5	54.0	1,572	9.2
		180	53.6	55.0	1,609	8.9
		190	54.5	56.0	1,641	8.6
		200	55.4	57.0	1,679	8.4
		210	56.2	58.0	1,708	8.1
		220	57.0	59.0	1,738	7.9
		230	57.7	60.0	1,762	7.7
		240	58.3	61.0	1,782	7.4
		250	59.0	61.0	1,797	7.2
450	E50	10	5.5	3.0	0	0.0
		20	13.4	16.0	66	3.3
		30	20.4	23.0	256	8.5
		40	26.3	28.0	476	11.9
		50	31.4	32.0	699	14.0
		60	35.6	35.0	912	15.2
		** 70	39.3	39.0	1,088	15.5
		80	42.5	42.0	1,254	15.7
		90	45.3	45.0	1,403	15.6
		100	47.7	47.0	1,516	15.2
		110	49.9	50.0	1,632	14.8
		120	51.9	52.0	1,727	14.4
		130	53.6	54.0	1,809	13.9
		140	55.2	55.0	1,888	13.5
		150	56.6	57.0	1,961	13.1
		160	57.9	58.0	2,028	12.7
		170	59.1	59.0	2,080	12.2
		180	60.2	60.0	2,130	11.8
		190	61.2	61.0	2,182	11.5
		200	62.1	62.0	2,231	11.2
		210	63.0	62.0	2,278	10.8
		220	63.0	62.0	2,278	10.8
		230	63.0	62.0	2,278	10.8
		240	63.0	62.0	2,278	10.8
		250	63.0	62.0	2,278	10.8

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
451	E51	10	5.3	3.0	0	0.0
		20	12.9	15.0	56	2.8
		30	19.7	23.0	235	7.8
		40	25.5	27.0	442	11.1
		50	30.4	31.0	654	13.1
		60	34.6	34.0	859	14.3
		** 70	38.2	37.0	1,034	14.8
		80	41.4	41.0	1,193	14.9
		90	44.1	43.0	1,340	14.9
		100	46.6	46.0	1,457	14.6
		110	48.7	48.0	1,561	14.2
		120	50.7	51.0	1,662	13.9
		130	52.4	52.0	1,740	13.4
		140	54.0	54.0	1,813	13.0
		150	55.4	56.0	1,886	12.6
		160	56.7	57.0	1,948	12.2
		170	57.9	58.0	2,006	11.8
		180	58.9	59.0	2,053	11.4
		190	59.9	60.0	2,098	11.0
		200	60.8	61.0	2,143	10.7
		210	61.7	61.0	2,188	10.4
		220	62.6	62.0	2,233	10.2
		230	63.0	62.0	2,252	10.0
		240	63.0	62.0	2,252	10.0
		250	63.0	62.0	2,252	10.0
452	E52	10	5.5	3.0	0	0.0
		20	14.6	17.0	81	4.1
		30	22.5	24.0	283	9.4
		40	29.2	29.0	518	13.0
		50	34.7	33.0	734	14.7
		** 60	39.4	37.0	934	15.6
		70	43.3	41.0	1,095	15.6
		80	46.8	46.0	1,243	15.5
		90	49.7	50.0	1,360	15.1
		100	52.4	54.0	1,461	14.6
		110	54.7	57.0	1,560	14.2
		120	56.8	59.0	1,643	13.7
		130	58.7	61.0	1,710	13.2
		140	58.7	61.0	1,710	13.2
		150	58.7	61.0	1,710	13.2
		160	58.7	61.0	1,710	13.2
		170	58.7	61.0	1,710	13.2
		180	58.7	61.0	1,710	13.2
		190	58.7	61.0	1,710	13.2
		200	58.7	61.0	1,710	13.2
		210	58.7	61.0	1,710	13.2
		220	58.7	61.0	1,710	13.2
		230	58.7	61.0	1,710	13.2
		240	58.7	61.0	1,710	13.2
		250	58.7	61.0	1,710	13.2

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
453	E53	10	5.9	4.0	0	0.0
		20	15.2	17.0	93	4.7
		30	23.3	25.0	307	10.2
		40	30.1	30.0	553	13.8
		50	35.8	34.0	782	15.6
		** 60	40.6	38.0	983	16.4
		70	44.7	43.0	1,151	16.4
		80	48.2	48.0	1,300	16.3
		90	51.3	53.0	1,415	15.7
		100	54.0	56.0	1,527	15.3
		110	56.4	59.0	1,627	14.8
		120	58.5	61.0	1,701	14.2
		130	58.5	61.0	1,701	14.2
		140	58.5	61.0	1,701	14.2
		150	58.5	61.0	1,701	14.2
		160	58.5	61.0	1,701	14.2
		170	58.5	61.0	1,701	14.2
		180	58.5	61.0	1,701	14.2
		190	58.5	61.0	1,701	14.2
		200	58.5	61.0	1,701	14.2
		210	58.5	61.0	1,701	14.2
		220	58.5	61.0	1,701	14.2
		230	58.5	61.0	1,701	14.2
		240	58.5	61.0	1,701	14.2
		250	58.5	61.0	1,701	14.2
454	E54	10	6.7	5.0	1	0.1
		20	16.8	19.0	131	6.6
		30	25.5	26.0	375	12.5
		40	32.7	32.0	648	16.2
		50	38.8	37.0	905	18.1
		** 60	43.9	42.0	1,114	18.6
		70	48.2	49.0	1,296	18.5
		80	52.0	54.0	1,443	18.0
		90	55.3	58.0	1,576	17.5
		100	58.2	61.0	1,685	16.9
		110	58.2	61.0	1,685	16.9
		120	58.2	61.0	1,685	16.9
		130	58.2	61.0	1,685	16.9
		140	58.2	61.0	1,685	16.9
		150	58.2	61.0	1,685	16.9
		160	58.2	61.0	1,685	16.9
		170	58.2	61.0	1,685	16.9
		180	58.2	61.0	1,685	16.9
		190	58.2	61.0	1,685	16.9
		200	58.2	61.0	1,685	16.9
		210	58.2	61.0	1,685	16.9
		220	58.2	61.0	1,685	16.9
		230	58.2	61.0	1,685	16.9
		240	58.2	61.0	1,685	16.9
		250	58.2	61.0	1,685	16.9

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
455	E55	10	4.1	2.0	0	0.0
		20	10.7	12.0	23	1.2
		30	16.9	20.0	154	5.1
		40	22.1	25.0	324	8.1
		50	26.7	29.0	500	10.0
		60	30.6	32.0	674	11.2
		70	34.0	34.0	832	11.9
		** 80	37.0	37.0	984	12.3
		90	39.6	39.0	1,109	12.3
		100	41.9	41.0	1,235	12.4
		110	44.0	44.0	1,342	12.2
		120	45.8	46.0	1,433	11.9
		130	47.5	47.0	1,512	11.6
		140	49.0	49.0	1,590	11.4
		150	50.4	50.0	1,658	11.1
		160	51.6	51.0	1,714	10.7
		170	52.8	52.0	1,762	10.4
		180	53.8	53.0	1,811	10.1
		190	54.8	54.0	1,855	9.8
		200	55.6	55.0	1,898	9.5
		210	56.5	56.0	1,937	9.2
		220	57.3	57.0	1,978	9.0
		230	58.1	57.0	2,009	8.7
		240	58.9	58.0	2,038	8.5
		250	59.6	58.0	2,068	8.3
456	E56	10	5.9	4.0	0	0.0
		20	15.4	18.0	102	5.1
		30	23.7	25.0	326	10.9
		40	30.6	31.0	592	14.8
		50	36.5	35.0	833	16.7
		** 60	41.4	40.0	1,051	17.5
		70	45.7	44.0	1,237	17.7
		80	49.3	50.0	1,399	17.5
		90	52.5	54.0	1,538	17.1
		100	55.4	57.0	1,666	16.7
		110	57.9	59.0	1,776	16.1
		120	60.1	61.0	1,874	15.6
		130	60.1	61.0	1,874	15.6
		140	60.1	61.0	1,874	15.6
		150	60.1	61.0	1,874	15.6
		160	60.1	61.0	1,874	15.6
		170	60.1	61.0	1,874	15.6
		180	60.1	61.0	1,874	15.6
		190	60.1	61.0	1,874	15.6
		200	60.1	61.0	1,874	15.6
		210	60.1	61.0	1,874	15.6
		220	60.1	61.0	1,874	15.6
		230	60.1	61.0	1,874	15.6
		240	60.1	61.0	1,874	15.6
		250	60.1	61.0	1,874	15.6

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
457	E57	10	6.5	5.0	1	0.1
		20	16.5	19.0	127	6.4
		30	25.1	26.0	373	12.4
		40	32.4	32.0	654	16.4
		50	38.6	37.0	919	18.4
		** 60	43.8	42.0	1,143	19.1
		70	48.2	48.0	1,331	19.0
		80	52.1	54.0	1,496	18.7
		90	55.5	57.0	1,642	18.2
		100	58.5	60.0	1,772	17.7
		110	58.5	60.0	1,772	17.7
		120	58.5	60.0	1,772	17.7
		130	58.5	60.0	1,772	17.7
		140	58.5	60.0	1,772	17.7
		150	58.5	60.0	1,772	17.7
		160	58.5	60.0	1,772	17.7
		170	58.5	60.0	1,772	17.7
		180	58.5	60.0	1,772	17.7
		190	58.5	60.0	1,772	17.7
		200	58.5	60.0	1,772	17.7
		210	58.5	60.0	1,772	17.7
		220	58.5	60.0	1,772	17.7
		230	58.5	60.0	1,772	17.7
		240	58.5	60.0	1,772	17.7
		250	58.5	60.0	1,772	17.7
458	E58	10	7.1	6.0	1	0.1
		20	17.6	20.0	152	7.6
		30	26.6	27.0	424	14.1
		40	34.2	33.0	719	18.0
		50	40.7	39.0	996	19.9
		** 60	46.1	46.0	1,227	20.5
		70	50.8	52.0	1,424	20.3
		80	54.9	57.0	1,593	19.9
		90	56.8	58.0	1,668	19.6
		100	56.8	58.0	1,668	19.6
		110	56.8	58.0	1,668	19.6
		120	56.8	58.0	1,668	19.6
		130	56.8	58.0	1,668	19.6
		140	56.8	58.0	1,668	19.6
		150	56.8	58.0	1,668	19.6
		160	56.8	58.0	1,668	19.6
		170	56.8	58.0	1,668	19.6
		180	56.8	58.0	1,668	19.6
		190	56.8	58.0	1,668	19.6
		200	56.8	58.0	1,668	19.6
		210	56.8	58.0	1,668	19.6
		220	56.8	58.0	1,668	19.6
		230	56.8	58.0	1,668	19.6
		240	56.8	58.0	1,668	19.6
		250	56.8	58.0	1,668	19.6

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
459	E59	10	5.1	3.0	0	0.0
		20	13.7	15.0	70	3.5
		30	21.3	21.0	264	8.8
		40	27.7	26.0	473	11.8
		50	33.0	29.0	670	13.4
		** 60	37.5	33.0	858	14.3
		70	41.3	37.0	1,006	14.4
		80	44.6	41.0	1,143	14.3
		90	47.4	45.0	1,254	13.9
		100	50.0	49.0	1,353	13.5
		110	52.2	52.0	1,437	13.1
		120	54.2	55.0	1,517	12.6
		130	56.0	57.0	1,585	12.2
		140	57.6	59.0	1,642	11.7
		150	59.1	61.0	1,695	11.3
		160	59.7	61.0	1,717	11.1
		170	59.7	61.0	1,717	11.1
		180	59.7	61.0	1,717	11.1
		190	59.7	61.0	1,717	11.1
		200	59.7	61.0	1,717	11.1
		210	59.7	61.0	1,717	11.1
		220	59.7	61.0	1,717	11.1
		230	59.7	61.0	1,717	11.1
		240	59.7	61.0	1,717	11.1
		250	59.7	61.0	1,717	11.1
460	E60	10	5.5	3.0	0	0.0
		20	14.6	15.0	89	4.5
		30	22.5	21.0	302	10.1
		40	29.2	26.0	536	13.4
		50	34.7	30.0	745	14.9
		** 60	39.4	34.0	937	15.6
		70	43.3	39.0	1,093	15.6
		80	46.8	44.0	1,233	15.4
		90	49.7	48.0	1,345	14.9
		100	52.4	52.0	1,449	14.5
		110	54.7	55.0	1,546	14.1
		120	56.8	58.0	1,626	13.6
		130	58.7	60.0	1,692	13.0
		140	58.7	60.0	1,692	13.0
		150	58.7	60.0	1,692	13.0
		160	58.7	60.0	1,692	13.0
		170	58.7	60.0	1,692	13.0
		180	58.7	60.0	1,692	13.0
		190	58.7	60.0	1,692	13.0
		200	58.7	60.0	1,692	13.0
		210	58.7	60.0	1,692	13.0
		220	58.7	60.0	1,692	13.0
		230	58.7	60.0	1,692	13.0
		240	58.7	60.0	1,692	13.0
		250	58.7	60.0	1,692	13.0

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
461	E61	10	5.9	4.0	0	0.0
		20	15.2	16.0	99	5.0
		30	23.3	23.0	320	10.7
		40	30.1	27.0	566	14.2
		50	35.8	31.0	792	15.8
		** 60	40.6	36.0	984	16.4
		70	44.7	41.0	1,148	16.4
		80	48.2	46.0	1,290	16.1
		90	51.3	51.0	1,407	15.6
		100	54.0	54.0	1,515	15.2
		110	56.4	57.0	1,613	14.7
		120	58.5	60.0	1,686	14.1
		130	58.5	60.0	1,686	14.1
		140	58.5	60.0	1,686	14.1
		150	58.5	60.0	1,686	14.1
		160	58.5	60.0	1,686	14.1
		170	58.5	60.0	1,686	14.1
		180	58.5	60.0	1,686	14.1
		190	58.5	60.0	1,686	14.1
		200	58.5	60.0	1,686	14.1
		210	58.5	60.0	1,686	14.1
		220	58.5	60.0	1,686	14.1
		230	58.5	60.0	1,686	14.1
		240	58.5	60.0	1,686	14.1
		250	58.5	60.0	1,686	14.1
462	E62	10	4.4	2.0	0	0.0
		20	12.8	13.0	51	2.6
		30	20.2	20.0	223	7.4
		40	26.3	24.0	402	10.1
		50	31.4	27.0	580	11.6
		60	35.6	30.0	738	12.3
		** 70	39.2	34.0	878	12.5
		80	42.3	37.0	988	12.4
		90	45.0	40.0	1,092	12.1
		100	47.4	44.0	1,175	11.8
		110	49.5	48.0	1,246	11.3
		120	51.4	51.0	1,311	10.9
		130	53.0	54.0	1,368	10.5
		140	54.5	56.0	1,423	10.2
		150	55.9	58.0	1,468	9.8
		160	57.1	60.0	1,512	9.4
		170	58.3	61.0	1,546	9.1
		180	59.3	62.0	1,573	8.7
		190	60.3	63.0	1,599	8.4
		200	60.7	64.0	1,613	8.3
		210	60.7	64.0	1,613	8.3
		220	60.7	64.0	1,613	8.3
		230	60.7	64.0	1,613	8.3
		240	60.7	64.0	1,613	8.3
		250	60.7	64.0	1,613	8.3

** - indicates minimum harvest age, based on culmination of MAI

Enhanced Managed Stand AU	Aggregated TIPSY MSYT ID	Age	Height (m)	Diameter (cm)	Volume (m^3)	MAI (m^3/ha/year)
463	E63	10	5.5	3.0	0	0.0
		20	14.6	17.0	81	4.1
		30	22.5	24.0	283	9.4
		40	29.2	29.0	518	13.0
		50	34.7	33.0	734	14.7
		** 60	39.4	37.0	934	15.6
		70	43.3	41.0	1,095	15.6
		80	46.8	46.0	1,243	15.5
		90	49.7	50.0	1,360	15.1
		100	52.4	54.0	1,461	14.6
		110	54.7	57.0	1,560	14.2
		120	56.8	59.0	1,643	13.7
		130	58.7	61.0	1,710	13.2
		140	58.7	61.0	1,710	13.2
		150	58.7	61.0	1,710	13.2
		160	58.7	61.0	1,710	13.2
		170	58.7	61.0	1,710	13.2
		180	58.7	61.0	1,710	13.2
		190	58.7	61.0	1,710	13.2
		200	58.7	61.0	1,710	13.2
		210	58.7	61.0	1,710	13.2
		220	58.7	61.0	1,710	13.2
		230	58.7	61.0	1,710	13.2
		240	58.7	61.0	1,710	13.2
		250	58.7	61.0	1,710	13.2
464	E64	10	5.9	4.0	0	0.0
		20	15.2	17.0	93	4.7
		30	23.3	25.0	307	10.2
		40	30.1	30.0	553	13.8
		50	35.8	34.0	782	15.6
		** 60	40.6	38.0	983	16.4
		70	44.7	43.0	1,151	16.4
		80	48.2	48.0	1,300	16.3
		90	51.3	53.0	1,415	15.7
		100	54.0	56.0	1,527	15.3
		110	56.4	59.0	1,627	14.8
		120	58.5	61.0	1,701	14.2
		130	58.5	61.0	1,701	14.2
		140	58.5	61.0	1,701	14.2
		150	58.5	61.0	1,701	14.2
		160	58.5	61.0	1,701	14.2
		170	58.5	61.0	1,701	14.2
		180	58.5	61.0	1,701	14.2
		190	58.5	61.0	1,701	14.2
		200	58.5	61.0	1,701	14.2
		210	58.5	61.0	1,701	14.2
		220	58.5	61.0	1,701	14.2
		230	58.5	61.0	1,701	14.2
		240	58.5	61.0	1,701	14.2
		250	58.5	61.0	1,701	14.2

** - indicates minimum harvest age, based on culmination of MAI

Appendix IV
Stand Level Biodiversity Distribution Map

Appendix V
Managed Stand Yield Tables Development Report
(JS Thrower & Associates)

Managed Stand Yield Tables for
Timber Supply Analysis of TFL 37
Management Plan 8

Prepared for

Canadian Forest Products Ltd.
Woss, B.C.

Project: CFW-011-005

27 November 1997

J.S. Thrower & Associates Ltd. *Consulting Foresters*
Vancouver – Kamloops BC

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1. INTRODUCTION

1.1 TERMS OF REFERENCE

The Managed Stand Yield Tables (MSYTs) presented in this report were prepared for Patrick Bryant, RPF and Al Barber, RPF of Canadian Forest Products Ltd. (Canfor), Woss, B.C. These MSYTs will be included in the timber supply analysis for Management Plan 8 (MP 8) to be completed this fall by Timberline Forest Inventory Consultants Ltd. This report was prepared by Gord Lester, RPF, Guillaume Thérien, Ph.D., and Jim Thrower, Ph.D., RPF.

1.2 BACKGROUND

Canfor manages the Nimpkish Tree Farm (TFL 37) with a long-term strategy, using adaptive management principles to periodically revisit regulatory changes, new resource needs, and information deficiencies. Canfor's objective is to develop a forecast that sustains the harvest level over several rotations. The key to this approach is to make explicit assumptions so they can be measured, monitored, and adjusted for future management strategies. This philosophy guides the development of the MSYTs presented in this report.

The primary purpose of these MSYTs is to predict future wood volume wood available for harvest in post-harvested regenerated (PHR) stands. These tables also provide important links to product objectives, silviculture investments in the landbase, and ecologically based forest management. These MSYTs provide information on growth and yield of specific stands, and guidance to alternative silviculture regimes. Under the adaptive management framework, MSYTs can also be used to re-evaluate product and silviculture regime objectives.

1.3 OBJECTIVES

This report documents the methods, procedures, and assumptions to develop the MSYTs for MP 8 (1999-2003). These MSYTs were developed using BatchTIPSY[1] and the most up-to-date resource inventory information for the TFL including three major projects completed this summer:

1. A Timber Re-inventory (completed by Simon's Reid Collins).
2. Terrestrial Ecosystem Mapping (TEM) where preliminary attributes were assigned to site-series level polygons on the TFL (completed by B.A. Blackwell and Associates Ltd.).
3. A SIBEC project that used the ecological mapping as the basis to estimate the average site index for the major commercial trees species and ecosystems on the TFL (completed by J.S. Thrower and Associates Ltd.).

[1] BatchTIPSY is the batch version of TIPSY (Table Interpolation Program for Stand Yield) developed by the BC Ministry of Forests, Research Branch, Forest Productivity and Decision Support Section. The version used in this project was provided by Albert Nussbaum, October 1, 1997.

2. TFL 37 LANDBASE

2.1 BACKGROUND

The TFL is located in the north-central portion of Vancouver Island, south from Port McNeill along Nimpkish Lake, and southeast to the headwaters of the Nimpkish River toward Gold River (Figure 1). The TFL was awarded to Canfor on December 28, 1960. There have been seven Management & Working Plans for the TFL during this period. The current Management Plan (MP 7) was approved for a 5-year period from January 1, 1993 to December 31, 1998. This plan is still in effect and provides direction for current operations.

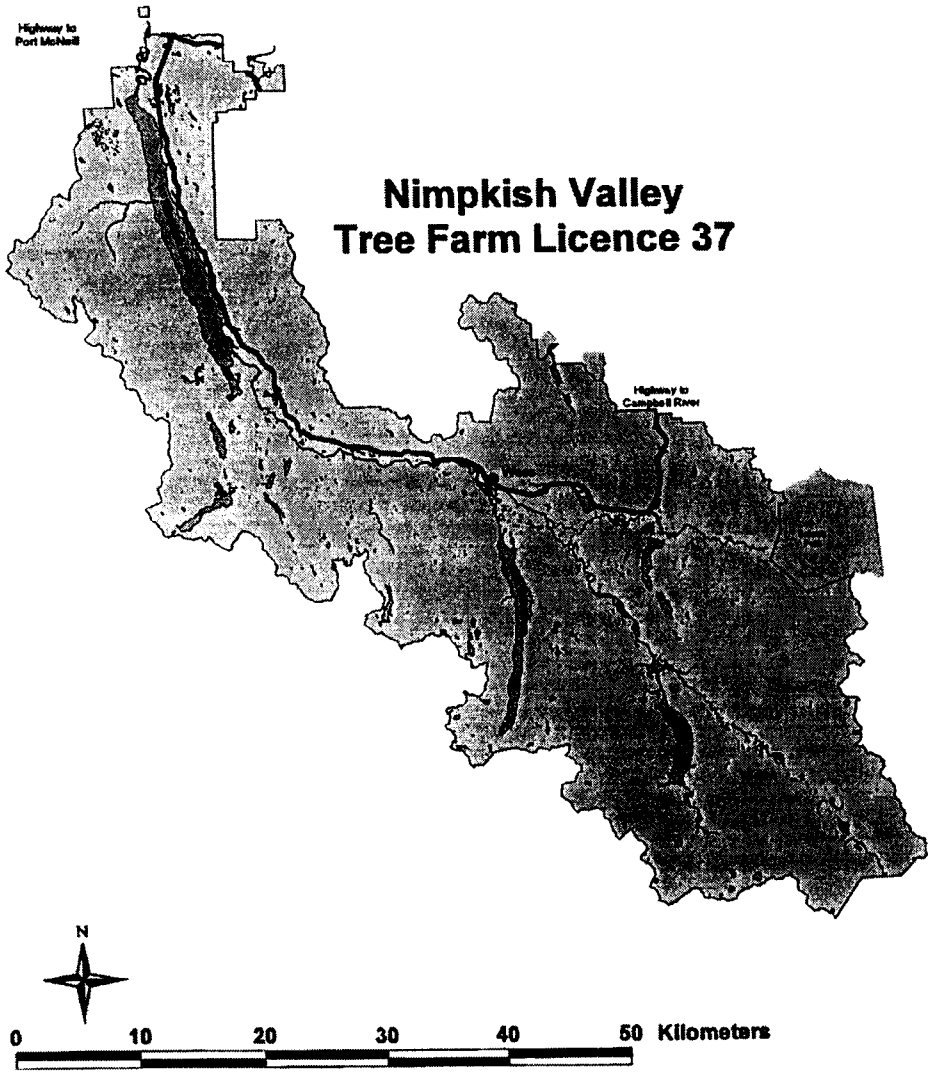

Figure 1. Location of TFL 37 on northern Vancouver Island.

2.2 Forest Cover

About 136,000 ha (72%) of the TFL is classed as productive forestland. Most stands in the productive forest are leading western hemlock (Hw) and Douglas-fir (Fd) with minor proportions of other species (Figure 2). Most of the area in the productive forest is in older age classes (approximately 47% in age class 8 and 9). The species distribution in younger stands (age class 1-4) shows more Fd compared to the Hw dominated age class 9, and more Ba leading areas.

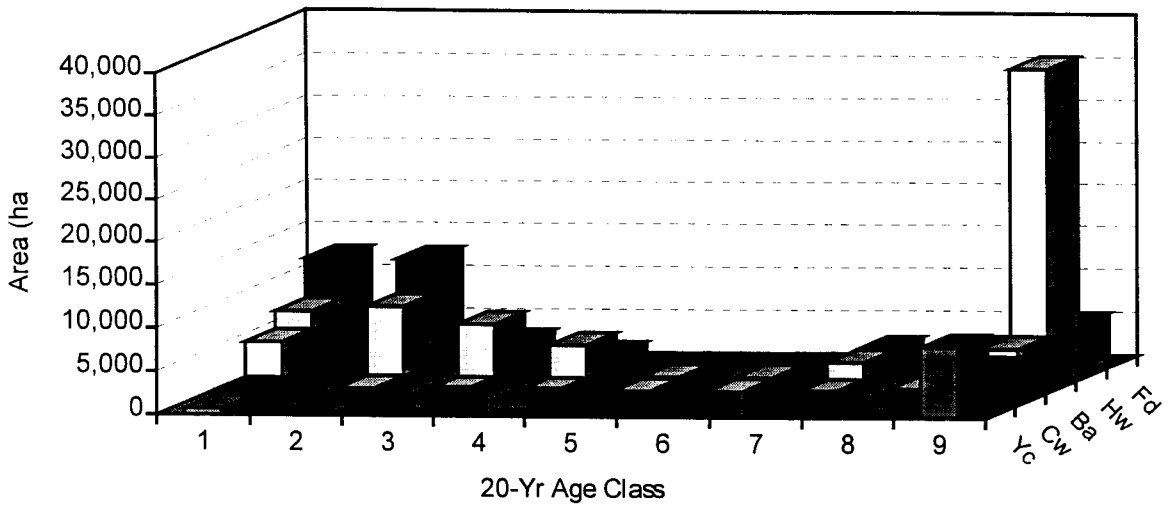

Figure 2. Area (ha) by leading species and age class.

2.3 Ecology of the TFL

Approximately one-third of the TFL is classified as CWHxm along the valley bottoms. An additional one-third of the area is in the CWHvm1 that occurs with increasing elevation up the mountain slopes and in northern areas under the influence of wetter maritime conditions. Approximately one-quarter of the TFL is in the CWHvm2 (higher in elevation than the CWHvm1).[2] The remaining forested area (10%) is in the higher elevation MHmm1 (Figure 3).

[2] The distribution of Biogeoclimatic (BGC) units is based on the 1:250,000 mapping of the area by the Ministry of Forests, Vancouver Forest Region.

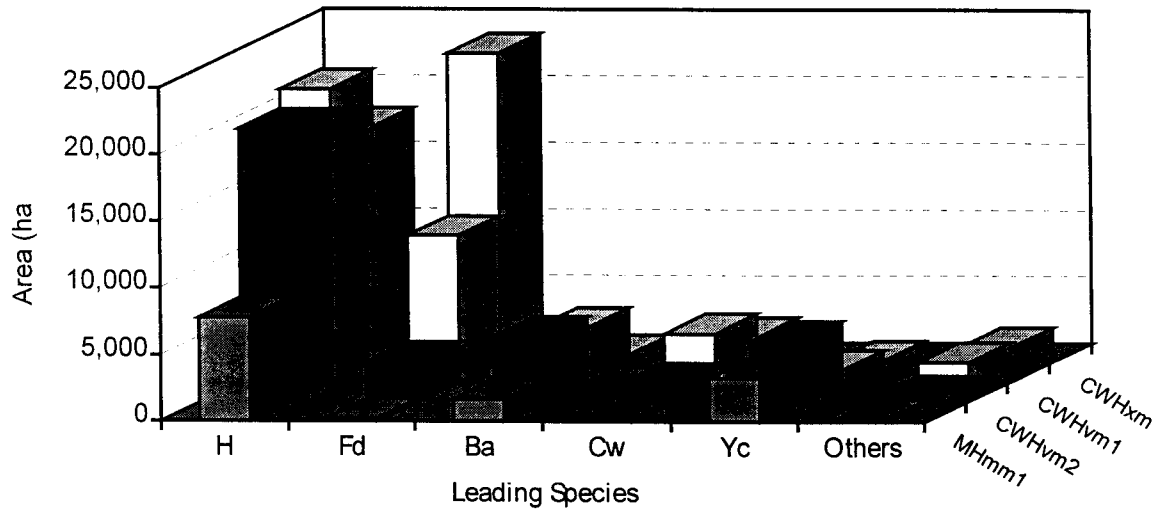

Figure 3. Area (ha) by BGC units and leading species (using the 1:250,000 scale BCFS Vancouver Forest Region ecological map).

Ecosystem mapping of the TFL to TEM standards[3] began in 1996. Completion of mapping site-series level polygons to preliminary attributes was completed in the summer of 1997. The initial stratification of ecosystems used 1:15,000 color air photos. These photos were delineated for terrain polygons by Dr. Terry Lewis (part of a separate terrain-mapping project). The terrain polygons were subsequently enhanced to reflect ecological strata emphasizing site series from the BGC system. Preliminary ecological attributes including approximate site series proportions and site modifiers were assigned based on photo interpretation and reconnaissance information.

2.4 SIBEC AND SITE INDEX

The SIBEC project provided estimates of average site index for Fd, Hw, Hm, Ba, and Cw in PHR stands for most of the productive forest landbase on the TFL.[4] These estimates were developed for three productivity groups (PGs) based on grouping of site-series from the preliminary TEM attributes.

There were several related approaches used to estimate the site index for all species and areas of interest in the TFL. Estimates for Fd and Hw in the CWHxm and CWHvm1 (60% of the productive forest landbase) were developed using random sampling in each of the three major PGs. The

[3] Standards for Terrestrial Ecosystem Mapping in British Columbia - Review Draft, RIC 1995 and Addenda to Terrestrial Ecosystems Mapping Standards, Cadrin et al. (1996).

[4] J.S. Thrower and Assoc. Ltd. 1997. Canadian Forest Products TFL 37 Site Index-BEC Map Unit Correlations. Final Contract Report to Canadian Forest Products Ltd., 29 August 1997. 32 pp.

average site indexes for Cw and Ba in these areas were estimated using conversion equations developed from samples taken throughout the SIBEC project. The average site index of Hw in the CWHvm2 was estimated from a model based on elevation; the site indices of other species in this area were then estimated using the conversion equations. There were no data available to quantify the growth of PHR stands in the MHmm1, therefore, estimates for all species in this area were based on expert opinion (the MHmm1 is only 10% of the total productive forest landbase, and the operable areas within this is much lower).

2.5 Current Timber Supply Analysis

The timber supply harvest flow for TFL 37 is following a planned stepped decrease in annual allowable cut (AAC) (2% every 5 years) until the projected long run sustained yield (LRSY) is reached in the year 2020, as indicated using the data and assumptions of MP 5 (Figure 4).

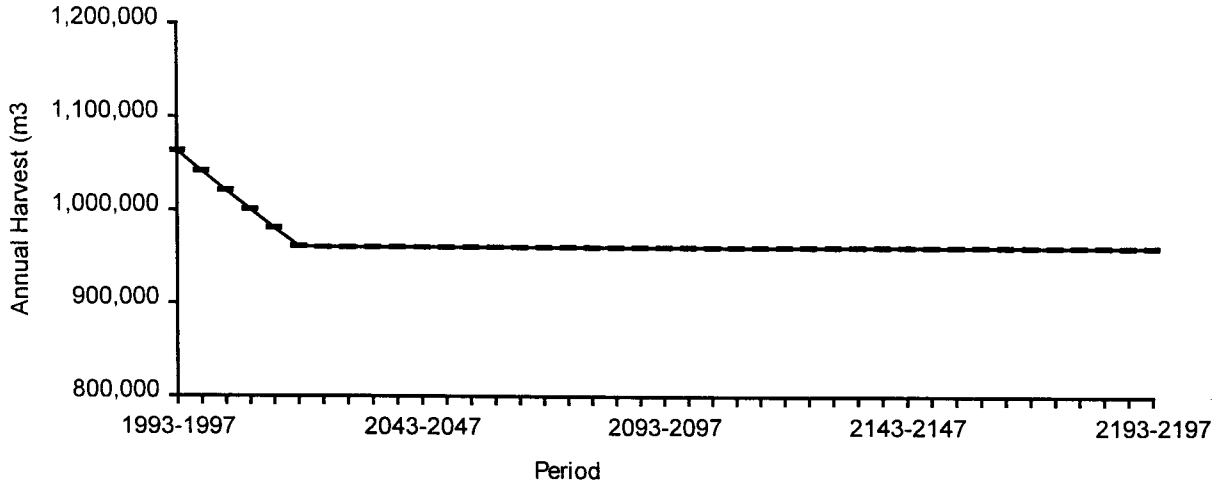

Figure 4. Projected timber flow for TFL 37.

3. TFL 37 SILVICULTURAL PROGRAMS

3.1 OVERVIEW

The MSYTs developed for application in the upcoming timber supply analyses must include PHR stands that currently exist on the TFL, and those stands which will be regenerated after future harvesting (future PHR stands). This section describes three general periods (Eras) of silviculture on the TFL that have resulted in different stand types.

3.1.1 Planting Activity

More than 46,800 ha have been planted on the TFL to date. The area planted has generally followed closely the area harvested (Figure 5). Plans include the planting of all future areas within one year of harvesting.

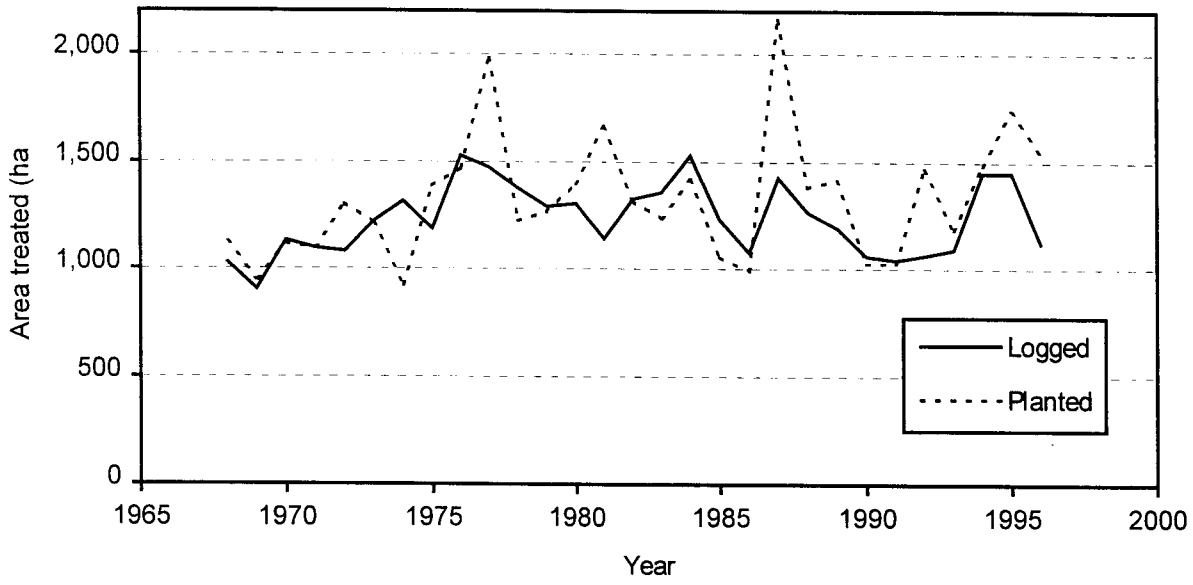

Figure 5. Area (ha) logged and planted from 1965 to 1996.

3.1.2 Genetically Improved Stock

In 1959 tree improvement began for Canadian Forest Products Ltd. when a Douglas-fir "plus" tree program was initiated in the Nimpkish Valley. This program was needed in order to ensure a seed supply for high elevation Douglas-fir. Clone banks were later established in 1964 at Englewood. Future plans were to incorporate these materials into seed orchards and participate in tree improvement programs for other species.

Following this the present 40-acre Sechelt Seed Orchard site was selected in 1969. Twenty acres were cleared in 1970/71 and 1,916 Douglas fir rootstock were then planted. Grafting onto the

rootstock began in 1972 and was completed in 1976. The first permanent Tree Improvement Forester was assigned to the Sechelt Seed Orchard in 1980. Western hemlock and western white pine orchards have since been established.

The aim of Canfor's tree improvement program is to produce or procure the highest value reforestation material to maximize short- and long-term timber supply. Records indicate that approximately one million genetically improved seedlings have been planted on the TFL on approximately 1,150 ha.

To help achieve this goal, Canfor has initiated or is participating in the following programs:

1. Progeny tests of high elevation Douglas-fir orchard.
2. Managing their hemlock orchard to produce only known, high-gain seed, and bulking up through cuttings.
3. Establishing trials comparing hemlock cuttings with seedlings.
4. Establishing a new high-gain hemlock orchard for the future.
5. Establishing and testing their western white pine orchard to obtain better resistance data on progeny.
6. Developing cost-effective techniques to produce large amounts of yellow cedar cuttings through a process of serial cuttings.
7. Participating in trials evaluating spruce weevil resistant Sitka spruce cuttings and emblings.
8. Appointing a member of Tree Improvement Council to develop the long-term direction for the Provincial tree improvement program.

The tree improvement program is now in a state where current orchards are producing seed and the next generation of orchards is being established and on-line to deliver seed of higher genetic worth.

To provide an accurate reflection of seedling and tree performance in TFL 37 it is essential that the MSYTs used on the TFL incorporate the better growth associated with improved stock. Yield predictions, which reflect the expectations of increased seedling survival, reduced time to free growing and a larger MAI can present tangible evidence of the return on investments in tree improvement. Current MSYTs incorporate the best information available for seed to be produced over the next 20-year period. However, further MSYTs may be required to model future increases in genetic gain resulting from the long-term continuance of Canfor's tree improvement program.

The records indicate that approximately one million genetically improved seedlings have been planted on TFL 37 to date. The seedlings were not incorporated into separate MSYTs due to the difficulty of determining the actual sites planted.

3.1.3 *Stand Tending*

Stand tending on the TFL has included spacing, commercial thinning (CT), fertilization, conifer release, and pruning. The most recent activity has been in spacing and pruning; fertilization and conifer release activity has decreased since about 1987 (Figure 6).

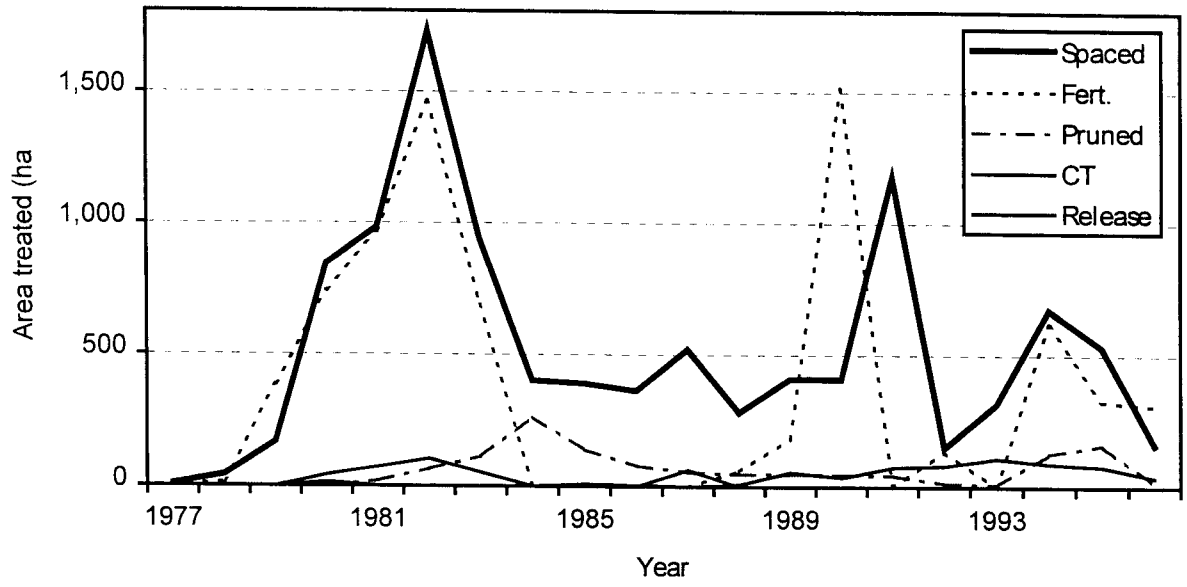

Figure 6. Area (ha) treated from 1977 to 1996.

3.2 SILVICULTURE ERAS

TFL 37 has been managed under different objectives since its inception in 1960. To facilitate the development of MSYTs for stands regenerated under these different management periods, we have used three time periods which we call *Silviculture Eras*. The following subsections describe the assumptions, methodologies, and performance in these three Eras.

3.2.1 *Era 1: 1960-1970 (MP 1-2)*

During the early years after World War II, Canfor and its predecessors identified the need for more aggressive reforestation activities in the Nimpkish Valley. Prior to the award of the TFL in 1960, a total of 1,909 ha (1,644,000 seedlings) had been planted. Annual Reports describe experimental plantations and direct seeding projects as early as 1947.

Reforestation during this first Era was primarily from natural regeneration. However, fill planting was used in some areas to increase stocking and areas of high site quality were planted immediately after slash burning (about 25% of total area). Hw was first planted operationally in 1967. By 1969 planting was primarily a mix of Fd (50%) and Hw (50%). Increases in the planting programs to reduce pre-TFL backlog included about 9.1 million trees planted on 9,600 ha. Management Plans

of the period discussed the desire to encourage mixed-species stands to achieve higher yield and higher resistance to insects. Records indicate only about 334 ha of brushing during this time.

3.2.2 Era 2: 1971-1980 (MP 3-4)

During this second silviculture Era, the reforestation program switched from the focus of planting the pre-TFL backlog to aggressively reforesting areas immediately following harvest. The target, by 1978, was to plant all areas within one year of harvest. The intent was to reduce the 5-year regeneration delay that characterized the previous Era. These efforts and backlog reduction resulted in the planting of an additional 13.3 million trees on 13,258 ha (more area than was harvested). Policy during this period included planting all NSR areas (first logged were first planted). Additional species such as Ba and Cw became available for planting during this period. Stand tending increased during this Era to include 110 ha of brushing, 1,060 ha juvenile spacing, 1,137 ha fertilization, 42 ha of conifer release, and 15 ha of commercial thinning.

3.2.3 Era 3: 1981-1998 (MP 5-7)

Since 1981, the TFL has been managed with a strong understanding of ecological principles. This has helped reduce the site impact of harvesting activities, and increase productivity from proper species selection. Ecosystem-based reforestation started in 1981 following the work of Dr. Karel Klinka. This Era also included intensive research and inventory activities including forest cover, ecological mapping, and permanent sample plot (PSP) programs. A Geographic Information System (GIS) was obtained with digital databases to track silviculture records.

Reforestation policy during this Era evolved to offset the potential reduction in AAC. The silviculture program was planned to have two objectives: 1) to fully regenerate all areas immediately after logging; and 2) to maximize merchantable yield and quality from all areas in the new forest.

The regeneration program reached a steady state during this Era with annual planting of 1.5 million trees. A total of 19.4 million more seedlings were planted on 22,106 ha eliminating all backlog NSR. The silviculture program used the new Treatment Units (a localized BEC-based system) developed by Canfor. Other activities during this Era included full rehabilitation and planting of redundant spur roads, target stocking generally 1,100 stems/ha, and achievement of a regeneration delay in the range of 1 - 3 years.

Stand tending during this last Era has increased steadily to include 9,412 ha of juvenile spacing, 3,762 ha of brushing, 288 ha of conifer release, 1,237 ha of pruning, 6,258 ha of fertilization, and 577 ha of commercial thinning.

4. ASSUMPTIONS AND INPUTS

4.1 Overview

The MSYTs generated to reflect the PHR stands in the TFL were created using BatchTIPSY and the most up-to-date information about the forests and landbase of the TFL. This information included estimates of potential and actual forest productivity as described by the recently completed ecological mapping and SIBEC sampling, the new forest cover inventory, silviculture history of existing stands from the inventory records, and planned treatments for future management on the TFL. The differing characteristics, treatments, and history of the many different existing PHR stands were described by three Eras (described in the previous section), and an additional Era (Era 4) to represent planned future management.

4.2 Definition of Managed Stands

Based on silviculture performance, all PHR stands regenerated after 1960 were considered managed and MSYTs were generated accordingly. Stands on the TFL regenerated under early management have relatively well known conditions that were estimated from silviculture and other records. Most or all of these stands where growth may have been adversely affected by competing vegetation have been treated with spacing or brushing.

This is consistent with the Ministry of Forest's (MOF) recent definition of managed stands: "Managed stands, defined for this exercise, are even-aged and have benefited from activities that encourage stands to reach their growth potential. They have known establishment conditions including species, density, and distribution of stems. Managed stands can be of planted or natural origin but have not experienced repression or over-story competition." [5] Thus the growth of these early managed stands is probably more accurately represented using TIPSY than the average empirical yield portrayed in VDYP.[6]

4.3 Silviculture Eras

Existing PHR stands on the TFL were separated into three Eras to reflect differences in the history of silviculture and management (Table 1). Future managed stands (Era 4) were described according to the planned management and treatments for specific site series. The details of each Era are described in the following subsections.

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[5] Personal Communication with Albert Nussbaum, R.P.F. "Which stands are 'Managed' for Yield Curve Generation and What Model Might be Used?" B.C. Ministry of Forests, Research Branch, Internal Memo dated May 12, 1997. 3 pp. Victoria, B.C.

[6] VDYP is the Variable Density Yield Prediction system developed by the Ministry of Forests, Inventory Branch to estimate average empirical yields for natural stands in B.C.

Table 1. Area (ha) by leading species in the three silviculture Eras for existing PHR stands.

Era	Fd	Hw	Ba	Dr	Cw	Yc	Ss	Hm	Others	Total
1: 1961-1970	7,931	2,852	66	492	69	79	4	55	18	11,565
2: 1971-1980	10,202	4,435	352	691	70	186	18	10	26	15,990
3: 1981-1997	6,507	10,086	3,680	241	443	260	54		29	21,300
Total	24,639	17,372	4,098	1,424	582	524	76	65	74	48,855

4.4 COMMON ELEMENTS

4.4.1 Overview

Some elements in development of the MSYTs were common to all polygons and stands in all Eras. These include the processes to assign site index to the eco-polygons, the method of estimating the species composition of each polygon, utilization standards, the method of accounting for regeneration delay in the tables, and the method to estimate the Operational Adjustment Factors (OAFs) for adjusting the MSYTs.

4.4.2 Site Index

The site indices for the different tree species in the existing and future PHR stands were assigned to all eco-polygons in the TFL using a three-step process.

1. Step 1 - Assign expert-based site index – every eco-polygon was assigned an estimated site index from the expert-based opinions for each of the major species and site series combination.[4]
2. Step 2 - Assign SIBEC site index – every polygon was also assigned the estimated average site index from the SIBEC project (from random sampling averages, species conversion, or conversion equations).[4]
3. Step 3 - Adjust the expert-based estimates – this was done for every eco-polygon to ensure that overall estimates were unbiased and corresponded to the SIBEC estimates for different PGs.

4.4.2.1 Step 1 – Assign Expert-Based Site Index

The first step was to assign site indices for the major species to all eco-polygons using the expert-based estimates (all PGs and all BGC units). Most eco-polygons were complexes with a leading site series containing proportions of minor site series (similar to the forest-cover composition of a mixed species stand). For eco-polygons with a single site series, the site index was assigned based on the leading species. For complex eco-polygons, site index was weighted by the proportional area of each site series. Site indices for rare species and BGC subzones not included in the expert-based estimates were estimated from MOF site-class midpoints from the forest cover inventory.

4.4.2.2 Step 2 – Assign SIBEC Site Index

The second step was to assign the statistically based estimated average site index to every eco-polygon from the SIBEC results. The site index for Fd and Hw in the CWHxm and CWHvm1 was

the PG average estimated from random sampling. The site index for Hw in the CWHvm2 was estimated from the elevation model. Site indices for Cw and Ba in the CWHxm, CWHvm1, and CWHvm2 were estimated from the Hw estimates and the conversion equations. Site indices for other species and BGC subzones were estimated from MOF site-class midpoints from the forest cover inventory.

4.4.2.3 Step 3 – Adjust the Expert-Based Site Index

The third step was to adjust the expert-based polygon-specific estimates using the SIBEC site indices. This was done so the overall average of the expert-based site index estimates was the same as the overall PG average from the SIBEC method. This resulted in overall unbiased estimates of site index for the major species and ecosystems in the TFL. This process maintains among polygon variation needed in forest-level planning, timber supply analyses, and other management purposes. The overall effect of this process is shown in the distribution of site indices for Fd and Hw for the three main PGs for the entire TFL landbase (Figure 7 and Figure 8).

4.4.3 Species Composition

The species composition of all existing PHR stands (Eras 1,2, and 3) was taken from the inventory records and rounded to the nearest 20%. The total was constrained to 100% by adjusting the proportion of minor species. Ba and Hm were considered as Hw, Yc and deciduous as Cw, and Pw as Fd. The species composition for future PHR stands in Era 4 was assigned from silviculture plans (Appendix I).

4.4.4 Utilization Standards

The utilization standard used for all MSYTs was a diameter limit of 12.5 cm, 30-cm stump, and 10-cm top. No deductions were made for decay, waste, and breakage other than what is assumed in the Operational Adjustment Factors.

4.4.5 Regeneration Delay

The regeneration delay reflecting the difference in time between when an area is harvested and subsequently regenerated was not included in the MSYTs. Regeneration delays will be included in the Timber Supply Analysis Phase of this project.

4.4.6 Operational Adjustment Factors (OAFs)

All MSYTs were generated using an OAF1 of 10% and OAF2 of 5%. The OAF1 was reduced from the MOF recommended 15% to reflect new information about the proportion on Non-Productive (NP) area on the TFL that is not netted-out in other processes. The MOF recommended OAF2 (5%) was applied as we do not have information to suggest a different number. These OAFs of 10 and 5% were used for all stands, species, sites, and silviculture Eras.

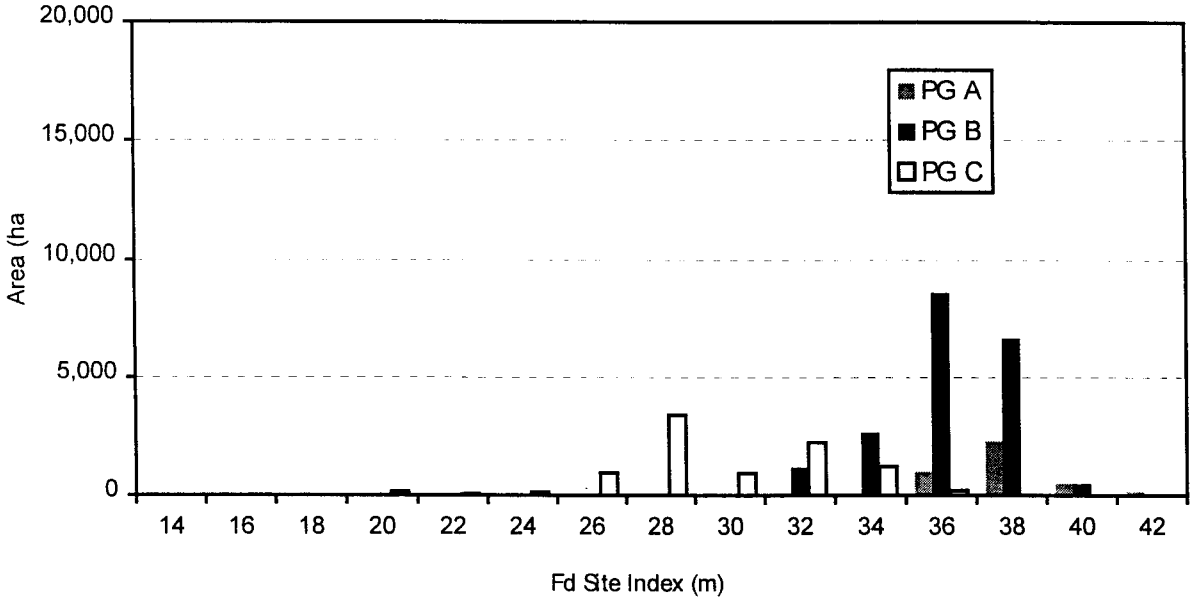

Figure 7. Distribution of area by Fd site index for all potential polygons in the TFL (all BGC units).

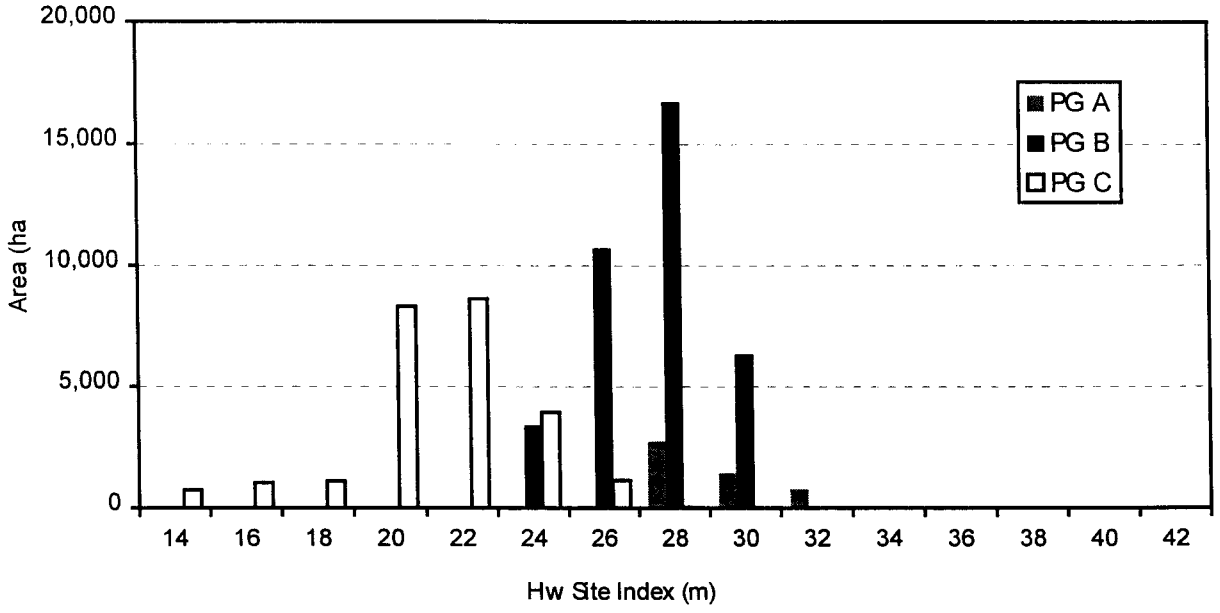

Figure 8. Distribution of area by Hw site index for all potential polygons in the TFL Hw (all BGC units).

The information to support use of a lower OAF1 is the greatly increased amount of area that has been identified and removed from the Productive Forest Landbase. The increased resolution of the new forest cover inventory and the ecological mapping has resulted in exclusion of about 20,000 ha from the Productive Forest Landbase from NP polygons less than 1.5 ha in size. This includes 5,853 ha from the forest cover mapping and 2,423 ha from the ecological mapping (Figure 9). In addition, 11,355 ha of forested area in site series has been removed from forest management (including CWHxm/02/11, CWHvm1/02/13, CWHvm2/02/10, MHmm1/02/07/09) (Appendix II). Collectively, this area is approximately 20,000/155,000 = 13% of the productive forest landbase. Considering potential overlap in these net-downs, the 10% OAF1 is likely a conservative estimate of the amount of NP within polygons that currently is not typed-out.

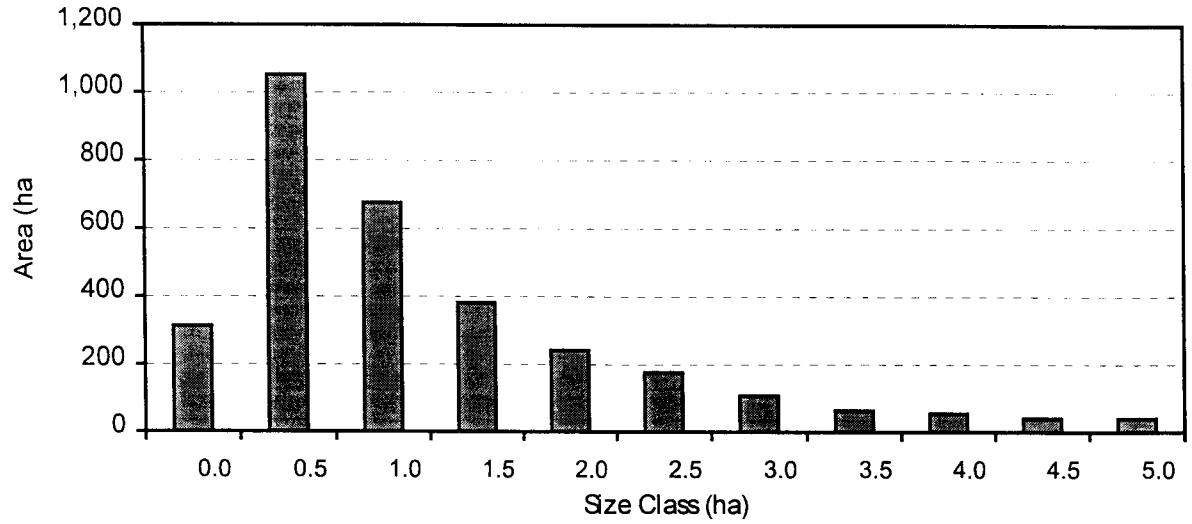

Figure 9. Distribution of non-productive area polygon sizes identified in the ecological mapping.

4.5 SILVICULTURE ERA 1: 1961-1970

4.5.1 Site Index

The site indices for stands in Era 1 were assigned according to the procedures described in the previous section. This resulted in a distribution of site indices that corresponds well to the approximate overall average of about 37 m for Fd and about 29 m for Hw (Figure 10).

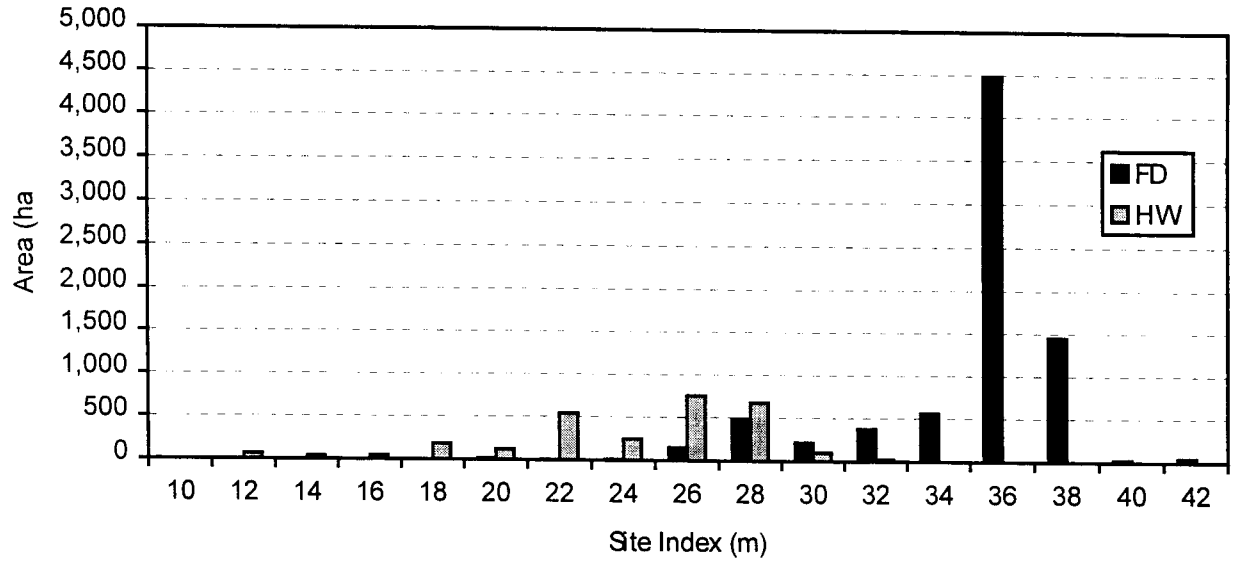

Figure 10. Area (ha) by leading species and site index class in Era 1.

4.5.2 Stand Origin and Density

All stands in the Era 1 were assumed naturally regenerated to 900 stems/ha based on review of the MP standards and survey results.

4.5.3 Silviculture Treatments

Silviculture treatments for stands originating in Era 1 included juvenile spacing and fertilization. The total area of these treatments by year is known from silviculture and MP records, however, the spatial location was not included in these records. To provide the spatial location of these treated areas to generate the MSYTs through a GIS, we approximated the location by assigning the treatments to specific site series and areas where the treatments were known to have occurred. This was confirmed by TFL foresters involved in application of the treatments, which provided a very good approximation of the area and location where the treatments were applied.

Spacing in this Era was assumed to occur in the CWHxm/05, CWHvm1/05 polygons with Hw or Fd leading to a residual density of 800/ha covering 1,002 ha. Fertilization was assumed to occur in the CWHxm/01, CWHxm/03, CWHvm1/01, and CWHvm1/03 Fd leading polygons covering 5,290 ha. Fertilization and spacing did not occur on the same polygon.

4.6 SILVICULTURE ERA 2: 1971-1980

4.6.1 Site Index

The site indices for the stands and eco-polygons in Era 2 (assigned with the same procedure) also resulted in a similar distribution as Era 1 (Figure 10), however, changes in harvesting patterns have resulted in more Hw leading stands in Era 2 (Figure 11).

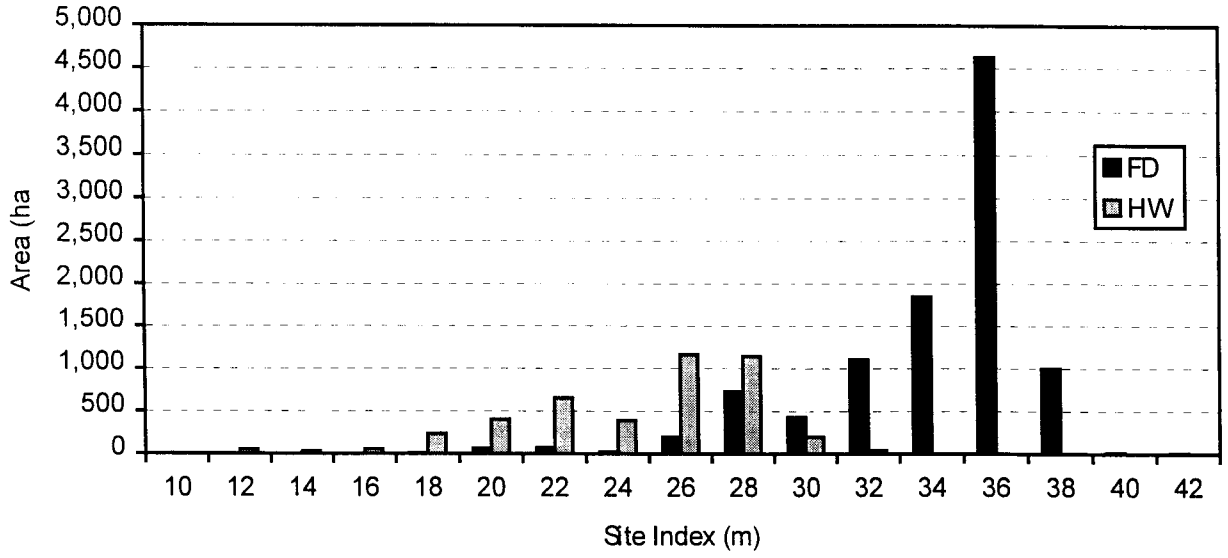

Figure 11. Area (ha) by leading species and site index class in Era 2.

4.6.2 Stand Origin and Density

All stands in the Era 2 were assumed planted to 950/ha and including ingress based on review of the MP standards and survey results.

4.6.3 Silviculture Treatments

Silviculture treatments for stands originating in Era 2 included planting, juvenile spacing, and fertilization. Spaced stands were assumed to have a post-treatment density of 800/ha. The total spaced area of 8,532 ha was distributed among Hw and Fd leading polygons on CWHxm/01/05/06/07 and CWHvm1/01/05/06/07 site series. The 7,209 ha of fertilized areas were distributed among CWHxm/01/03 and CWHvm1/01/03 Fd leading polygons. Fertilized and spaced polygons covered 5,365 ha.

4.7 SILVICULTURE ERA 3: 1981-1996

4.7.1 Site Index

The distribution of site indices for the stands in Era 3 was similar for Fd with an average of about 36 m. However, differences from the former two eras include a higher proportion of Hw, and a significant increase in Ba in PHR stands (Figure 12).

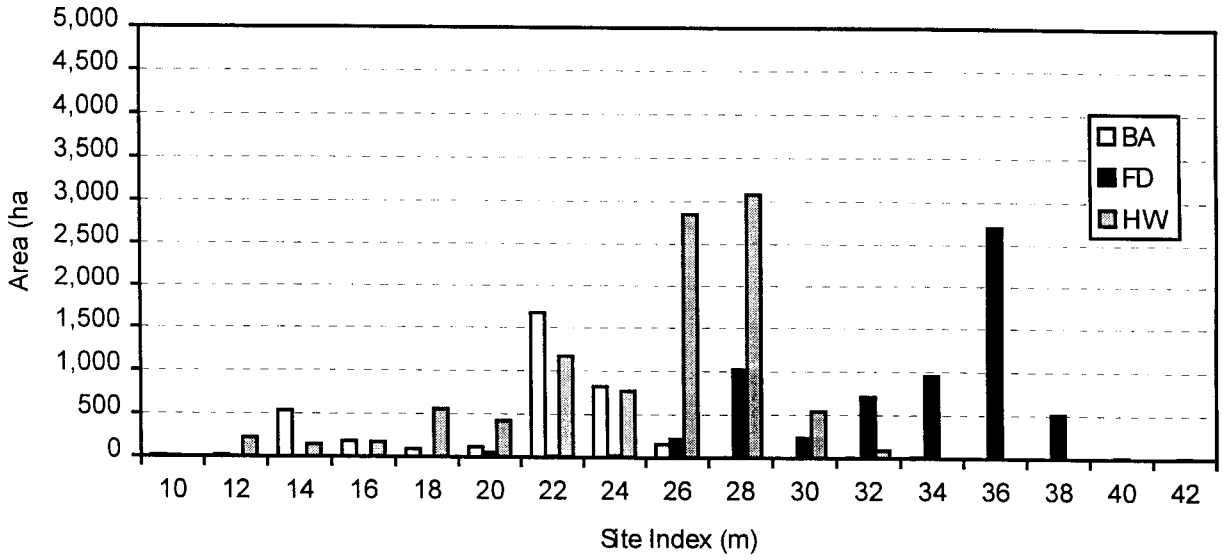

Figure 12. Area (ha) by leading species and site index class in Era 3.

4.7.2 Stand Origin and Density

All stands in Era 3 were assumed planted to a density of 1,100 stems/ha, including ingress.

4.7.3 Silviculture Treatments

Silviculture treatments for stands originating in Era 3 also included juvenile spacing and fertilization. The same method to distribute the known total treated areas was also used. The 8,640 ha of potential spacing was assumed to occur on CWHxm/01/05/06/07, CWHvm1/01/05/06/07 polygons with Hw or Fd leading to a residual density of 800 trees/ha. Fertilization was assumed to occur in the CWHxm/01/03 and CWHvm1/01/03 Fd leading polygons covered 4,752 ha. Polygons assumed fertilized and spaced covered 3,305 ha. Treatments are based on historical achievements and funding levels.

4.8 SILVICULTURE ERA 4: 1997+

4.8.1 Site Index

The site indices for the stands in Era 4 (future PHR stands) were assigned using the same procedures as previous Eras (existing PHR stands). For future stands, Hw will be mostly planted at higher elevations in the CWHvm2 and MHmm1. This will result in lower site index when compared to the CWHxm and CWHvm1. There should be a small increase in Fd site index because of the site productivity changes reflecting the tree improvement program and the increased fertilization program.

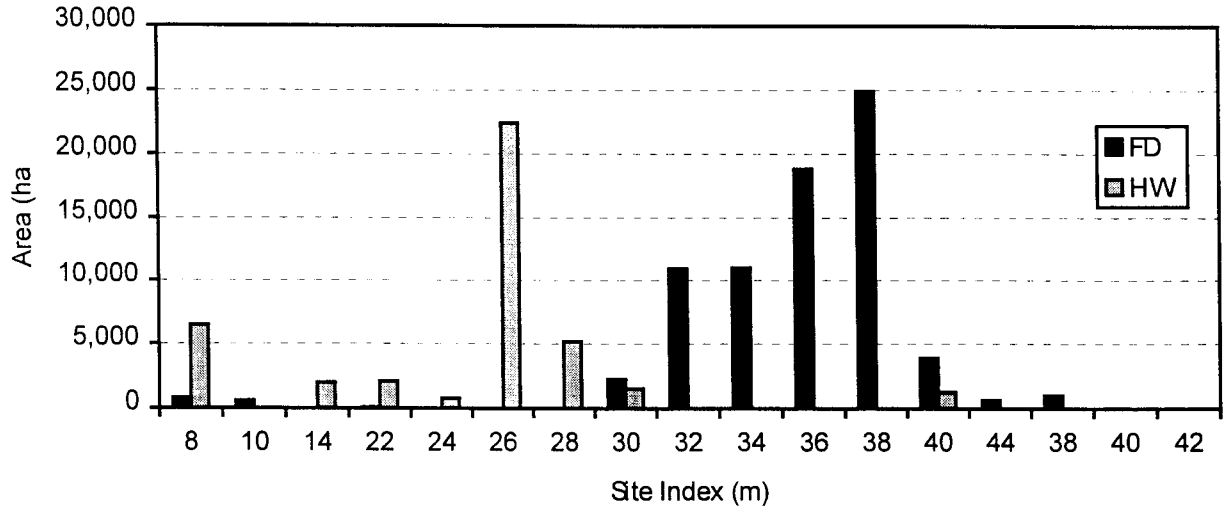

Figure 13. Area (ha) by leading species and site index class in Era 4.

4.8.2 Stand Origin and Density

All future stands are assumed planted. Initial density will vary by site series, ranging from 400/ha on MHmm1/08 to 2,000/ha on polygons with planned spacing (Appendix I).

4.8.3 Species Composition

Species composition will be assigned on a site series basis (Appendix II). Most polygons will be planted with more than one species. Pure stands will generally be limited to low-productivity sites.

4.8.4 Silviculture Treatments

Seedlings to plant future regenerated stands are assumed to come from Canfor's tree improvement program. This improved stock is assumed to have a higher site index approximated as equivalent

to one-half of the expected relative gain in volume at rotation age.[7] For example, a 10% increase in volume is approximated by a 5% increase in site index.

Lower elevation stands (< 700 m) will have assumed site index gains of 4.5% for Fd and Hw, and 1% for Cw, Pw, Ss, and Yc. Higher elevations stands (> 700 m) will have assumed gains of 2.5% for Fd and Hw, and 1% for Yc. The site index for these species in future PHR stands was thus increased by the expected site index gain.

During the next 20 years, the Tree Improvement Program will be in transition between orchard generations. The gains in this analysis are a pro-rated estimate of this 20-year transition period only (Appendix III).

For MSYTs applicable to future PHR stands, spacing was assumed for stands on CWHxm/01/05/06/07/08 and CWHvm2/01/05/06/07/09 to a post-treatment density of 900 /ha. The total area in these site series where spacing is planned to occur is 59,590 ha. Fertilization was assumed to occur on the CWHxm/01/03 and CWHvm1/01/01s/03. Site series where fertilization is planned to occur includes 67,240 ha. Site series where both fertilization and spacing is planned to occur includes 45,280 ha.

Only Fd trees are assumed to respond to fertilization. For fertilized stands, two tables were produced, one for the Fd portion of the stand and one for the non-Fd portion. The MOF Research Branch produced fertilized tables for Fd for the different site index, initial density, treatment, and residual densities in spaced stands. Fertilization was assumed to be 225 kg N ha^{-1}. The fertilized Fd table was then prorated with the non-Fd MSYT based on their respective proportions.

[7] The tree improvement site index gain were provided by Patti Brown, R.P.F., Canfor Tree Improvement Forester, and confirmed by Jack Woods and John King, MOF Research Branch

5. THE MANAGED STAND YIELD TABLES

5.1 INDIVIDUAL MSYTS

A total of 3,248 yield tables were generated for stands in Eras 1, 2, and 3 (existing PHR stands) and 48 MSYTs for stands in Era 4 (future PHR stands). These tables showed an average maximum mean annual increment (MAI) of about 10 m^3/ha/yr, average age of MAI culmination (Age-MAI) of about 90-100 years, and average quadratic mean diameter (DBHq) at Age-MAI of about 35-40 cm (Table 2). An untreated MSYT was also generated for each treated stand to allow for sensitivity analyses. Thus, an additional 2,068 tables (1,992 existing and 76 future stands) were generated (5,240 current and 124 future stands).

Table 2. Statistics for the individual MSYTs (weighted by area).

Group	Variable	No. Curves	Mean	Minimum	Maximum	Std Dev
Existing Stands	MAI (m^3/ha/yr)	3,248	10.3	0.0	19.4	3.15
	Age-MAI (yrs)	3,248	91.4	10.0	250	26.45
	DBHq (cm)	3,248	38.9	0.0	61.5	6.46
Future Stands	MAI (m^3/ha/yr)	48	10.0	0.0	19.5	4.42
	Age-MAI (yrs)	48	99.5	60.0	250	43.43
	DBHq (cm)	48	35.5	9.1	48.6	4.85

5.2 AGGREGATED MSYTS

Many of the MSYT curves generated were very similar in the shape and magnitude. Thus, the MSYTs generated for individual stands were aggregated into a smaller number of similar curves. This was a subjective process done using a combination of quantitative (cluster analysis) and qualitative methods (visual comparison). The cluster analysis was done SAS® (Version 6.12) considering maximum MAI, the age of culmination, and the average diameter at culmination age. Cluster analysis provides a range of options and does not automatically group similar elements. These different options were analyzed visually to determine final groupings. The aggregated MSYTs are the average of the individual MSYTs in the cluster weighted by their respective area (Table 4).

5.2.1 Existing PHR Stands

This process resulted in eight aggregated MYSTs, three of which represent most of the area (94%) in existing PHR stands (Table 3, Table 4, Figure 14, Appendix IV). Curves C06 and C07 are very similar in volume, however, they have slightly different culmination ages and average diameters. Thus, given the large area represented by these curves (81%), these two curves were not grouped further given the potential large impact of small differences on a large land base.

5.2.2 *Future PHR Stands*

Twelve aggregate curves were generated to reflect the differing characteristics of the planned future PHR stands (Table 3, Table 4, Figure 14, Appendix IV). As with the curves for the existing PHR stands, several of these curves were similar in volume (Figure 14), but somewhat different in the age and average diameter at culmination age (Table 3). This resulted in two of the 12 aggregate curves accounting for 84% of the area (R08 and R12, Table 3).

Table 3. Description of the 20 aggregated MSYTs.

Group	Curve ID	No. of MSYTs	Area (ha)	Area (%)	At Culmination Age			
					MAI (m^3/ha/yr)	Age-MAI (yrs)	DBHq (cm)	Ht (m)
Existing PHR Stands	C01	170	536	0.5%	0.3	250	14.6	12.9
	C02	1,138	11,902	12.6%	7.1	110	35.5	34.6
	C03	59	1,105	1.0%	2.8	150	28.1	25.3
	C04	58	317	0.3%	2.6	170	30.8	27.5
	C05	8	6	0.1%	10.2	60	31.3	31.9
	C06	2,701	25,314	60.2%	12.4	70	38.4	37.8
	C07	662	6,812	21.0%	12.0	80	48.0	43.4
	C08	444	2,617	4.3%	9.2	100	44.8	40.3
Future PHR Stands	R01	12	11,105	3.6%	0.6	230	25.1	18.1
	R02	2	117	0.0%	2.8	160	41.7	27.4
	R03	4	208	0.1%	3.2	150	36.1	26.8
	R04	2	64	0.0%	5.5	100	29.6	30.0
	R05	16	15,929	5.2%	3.1	150	28.5	26.0
	R06	2	589	0.2%	10.8	100	47.5	38.3
	R07	2	539	0.2%	8.7	110	48.7	36.5
	R08	26	30,640	42.4%	14.8	70	41.5	41.8
	R09	2	407	0.1%	6.1	110	40.4	30.8
	R10	16	15,448	5.0%	8.1	110	36.3	35.4
	R11	10	2,491	1.9%	10.5	90	38.4	37.2
	R12	30	72,169	41.3%	11.7	70	34.9	36.1

Table 4. Descriptive statistics for the aggregated MSYTs (weighted by area).

Group	Variable	N	Mean	Minimum	Maximum	Std Dev
Existing PHR Stands	MAI (m^3/ha/yr)	8	10.4	0.3	12.4	2.83
	Age-MAI (yrs)	8	87.3	60.0	250.0	26.91
	DBHq (cm)	8	38.8	14.6	48.0	5.11
Future PHR Stands	MAI (m^3/ha/yr)	12	10.2	0.6	14.8	4.29
	Age-MAI (yrs)	12	95.4	70.0	230.0	46.21
	DBHq (cm)	12	35.2	25.1	48.7	4.73

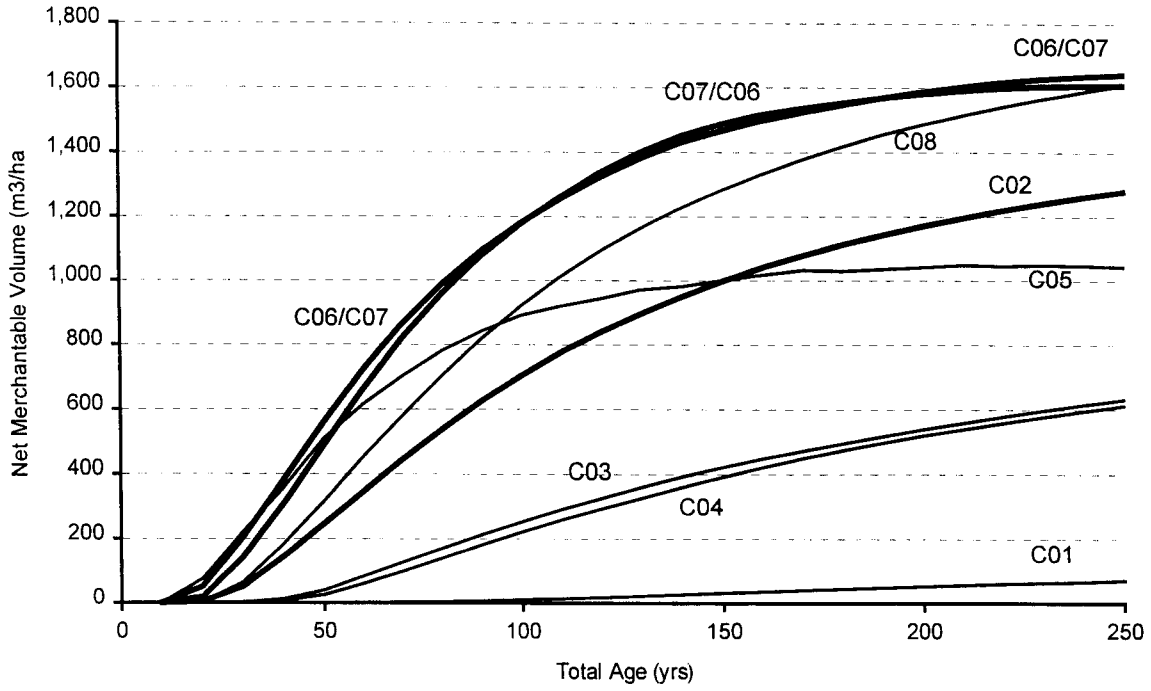

Figure 14. Aggregated MSYTs for existing PHR stands. Bold curves represent the largest proportion of area.

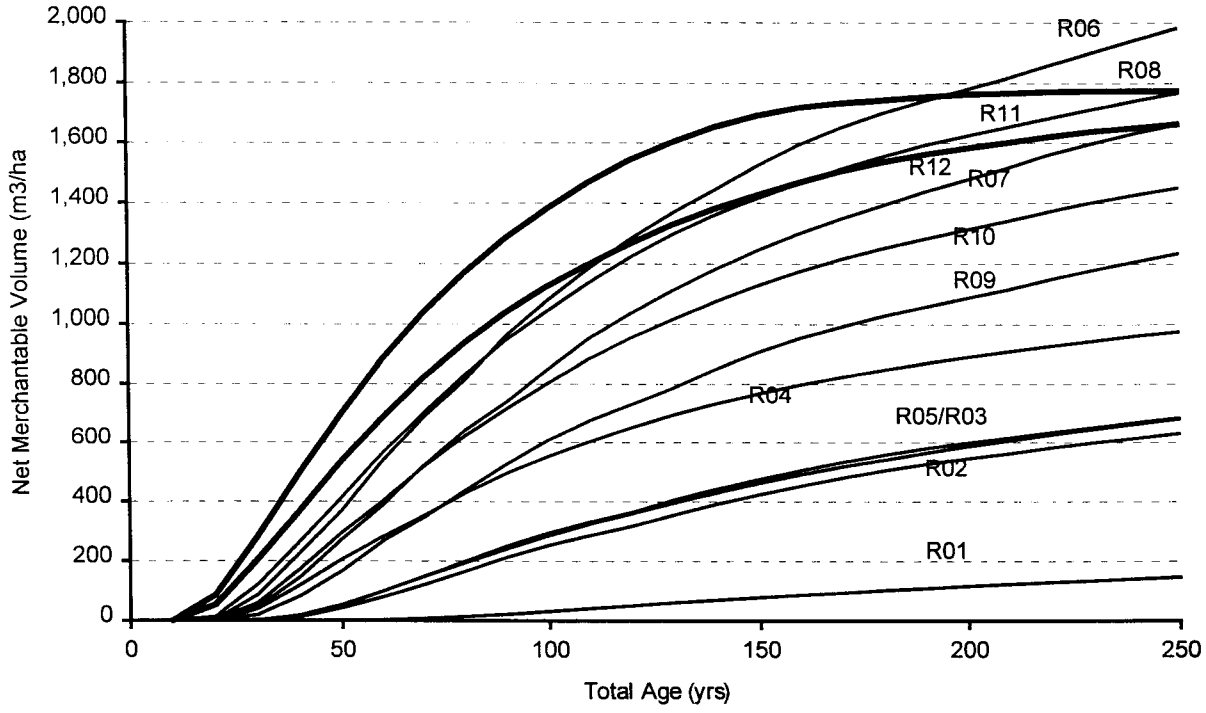

Figure 15. Aggregated MSYTs for future PHR stands. Bold curves represent the largest proportion of area.

APPENDIX I – MODELING ASSUMPTIONS FOR FUTURE PHR STANDS

Subzone	Site Series	Elevation Class	Spp 1 Pct 1	Spp 2 Pct 2	Spp 3 Pct 3	Density (no/ha)	Spacing	Fert.	Residual Density (no/ha)
CWHvm1	01	Below 550 m	Fd 60	Cw 20	Hw 20	1,300	No	No	
CWHvm1	01	Below 550 m	Fd 60	Cw 20	Hw 20	2,000	Yes	No	900
CWHvm1	01	Below 550 m	Fd 60	Cw 20	Hw 20	1,300	No	Yes	
CWHvm1	01	Below 550 m	Fd 60	Cw 20	Hw 20	2,000	Yes	Yes	900
CWHvm1	01	Above 550 m	Hw 80	Cw 20		1,300	No	No	
CWHvm1	01	Above 550 m	Hw 80	Cw 20		2,000	Yes	No	900
CWHvm1	01	Above 550 m	Hw 80	Cw 20		1,300	No	Yes	
CWHvm1	01	Above 550 m	Hw 80	Cw 20		2,000	Yes	Yes	900
CWHvm1	01-poor	All	Hw 80	Cw 20		1,000	No	No	
CWHvm1	01-poor	All	Hw 80	Cw 20		1,000	No	Yes	
CWHvm1	01s	All	Hw 80	Cw 20		1,000	No	No	
CWHvm1	01s	All	Hw 80	Cw 20		1,000	No	Yes	
CWHvm1	02	All	Fd 100			700	No	No	
CWHvm1	03	All	Fd 60	Cw 20	Hw 20	1,200	No	No	
CWHvm1	03	All	Fd 60	Cw 20	Hw 20	1,200	No	Yes	
CWHvm1	04	All	Fd 60	Cw 20	Hw 20	800	No	No	
CWHvm1	05	Below 300 m	Fd 60	Cw 20	Hw 20	1,300	No	No	
CWHvm1	05	Below 300 m	Fd 60	Cw 20	Hw 20	2,000	Yes	No	900
CWHvm1	05	Above 300 m	Hw 50	Ba 30	Cw 20	1,300	No	No	
CWHvm1	05	Above 300 m	Hw 50	Ba 30	Cw 20	2,000	Yes	No	900
CWHvm1	06	All	Hw 60	Ba 20	Cw 20	1,200	No	No	
CWHvm1	06	All	Hw 60	Ba 20	Cw 20	2,000	Yes	No	900
CWHvm1	06-poor	All	Hw 60	Ba 20	Cw 20	1,200	No	No	
CWHvm1	06-poor	All	Hw 60	Ba 20	Cw 20	2,000	Yes	No	900
CWHvm1	06s	All	Hw 60	Ba 20	Cw 20	1,200	No	No	
CWHvm1	06s	All	Hw 60	Ba 20	Cw 20	2,000	Yes	No	900
CWHvm1	07	All	Cw 50	Hw 30	Ba 20	1,200	No	No	
CWHvm1	07	All	Cw 50	Hw 30	Ba 20	2,000	Yes	No	900
CWHvm1	09	All	Cw 50	Hw 30	Ba 20	1,200	No	No	
CWHvm1	09	All	Cw 50	Hw 30	Ba 20	2,000	Yes	No	900
CWHvm1	11	All	Dr 100			800	No	No	
CWHvm1	12	All	Yc 50	Cw 40	Hw 10	700	No	No	
CWHvm1	13	All	Cw 100			500	No	No	
CWHvm1	14	All	Cw 100			600	No	No	
CWHvm2	01	All	Hw 50	Yc 30	Ba 20	1,100	No	No	
CWHvm2	01-poor	All	Hw 50	Yc 30	Ba 20	1,100	No	No	
CWHvm2	01s	All	Hw 50	Yc 30	Ba 20	1,100	No	No	
CWHvm2	02	All	Pl 60	Fd 40		500	No	No	
CWHvm2	03	All	Cw 60	Hw 20	Fd 20	1,100	No	No	
CWHvm2	04	All	Hw 70	Yc 30		900	No	No	
CWHvm2	05	All	Ba 60	Yc 40		1,100	No	No	
CWHvm2	06	All	Yc 50	Hw 30	Ba 20	1,100	No	No	
CWHvm2	06-poor	All	Yc 50	Hw 30	Ba 20	1,100	No	No	
CWHvm2	06s	All	Yc 50	Hw 30	Ba 20	1,100	No	No	
CWHvm2	07	All	Ba 60	Yc 40		1,100	No	No	
CWHvm2	09	All	Yc 60	Cw 40		700	No	No	
CWHvm2	10	All	Yc 100			500	No	No	
CWHvm2	11	All	Yc 60	Cw 40		700	No	No	
CWHxm	01	All	Fd 60	Cw 20	Hw 20	1,200	No	No	

Subzone	Site Series	Elevation Class	Spp 1 Pct 1	Spp 2 Pct 2	Spp 3 Pct 3	Density (no/ha)	Spacing	Fert.	Residual Density (no/ha)
CWHxm	01	All	Fd 60	Cw 20	Hw 20	2,000	Yes	No	900
CWHxm	01	All	Fd 60	Cw 20	Hw 20	1,200	No	Yes	
CWHxm	01	All	Fd 60	Cw 20	Hw 20	2,000	Yes	Yes	900
CWHxm	01-poor	All	Fd 60	Cw 20	Hw 20	1,200	No	No	
CWHxm	01-poor	All	Fd 60	Cw 20	Hw 20	2,000	Yes	No	900
CWHxm	01s	All	Fd 60	Cw 20	Hw 20	1,200	No	No	
CWHxm	01s	All	Fd 60	Cw 20	Hw 20	2,000	Yes	No	900
CWHxm	02	All	Fd 100			600	No	No	
CWHxm	03	All	Fd 80	Cw 20		1,300	No	No	
CWHxm	03	All	Fd 80	Cw 20		1,300	No	Yes	
CWHxm	05	All	Fd 60	Cw 40		1,300	No	No	
CWHxm	05	All	Fd 60	Cw 40		2,000	Yes	No	900
CWHxm	06	All	Hw 60	Cw 40		1,300	No	No	
CWHxm	06	All	Hw 60	Cw 40		2,000	Yes	No	900
CWHxm	06-poor	All	Hw 60	Cw 40		1,300	No	No	
CWHxm	06-poor	All	Hw 60	Cw 40		2,000	Yes	No	900
CWHxm	07	All	Fd 60	Cw 40		1,500	No	No	
CWHxm	07	All	Fd 60	Cw 40		1,800	Yes	No	900
CWHxm	08	All	Fd 60	Cw 40		1,500	No	No	
CWHxm	08	All	Fd 60	Cw 40		1,800	Yes	No	900
CWHxm	10	All	Dr 100			800	No	No	
CWHxm	11	All	Cw 100			500	No	No	
CWHxm	12	All	Cw 100			700	No	No	
MHmm1	01	All	Ba 60	Yc 40		1,100	No	No	
MHmm1	01-poor	All	Ba 60	Yc 40		1,100	No	No	
MHmm1	02	All	Hm 60	Yc 40		500	No	No	
MHmm1	03	All	Ba 60	Yc 40		1,100	No	No	
MHmm1	05	All	Yc 60	Ba 40		1,100	No	No	
MHmm1	07	All	Yc 60	Ba 40		1,100	No	No	
MHmm1	09	All	Yc 100			600	No	No	

APPENDIX II – AREA BY SITE SERIES FOR TFL 37

Table 5. Proportion of area (ha) among site series (total TFL landbase).

Site Series	CWHvm1		CWHvm2		CWHxm2		MHmm1		MHmmp		*Total*	
	ha	%	ha	%	ha	%	ha	%	ha	%	*ha*	*%*
01	23,531	15.2%	21,592	14.0%	21,749	14.1%	12,518	8.1%			*79,390*	*51.3%*
01-poor	834	0.5%	488	0.3%	2,209	1.4%	706	0.5%			*4,237*	*2.7%*
01s	924	0.6%	232	0.1%	64	0.0%					*1,219*	*0.8%*
02	584	0.4%	205	0.1%	775	0.5%	6,435	4.2%			*7,999*	*5.2%*
03	10,998	7.1%	11,176	7.2%	10,039	6.5%	140	0.1%			*32,353*	*20.9%*
04	19	0.0%	21	0.0%							*39*	*0.0%*
05	2,116	1.4%	793	0.5%	3,855	2.5%	493	0.3%			*7,257*	*4.7%*
06	1,512	1.0%	1,505	1.0%	482	0.3%					*3,499*	*2.3%*
06-poor	174	0.1%	230	0.1%	356	0.2%					*760*	*0.5%*
06s	179	0.1%	21	0.0%							*201*	*0.1%*
07	2,452	1.6%	725	0.5%	3,169	2.0%	1,738	1.1%			*8,083*	*5.2%*
08		0.0%			630	0.4%					*630*	*0.4%*
09	95	0.1%	407	0.3%			1,376	0.9%			*1,877*	*1.2%*
10		0.0%	26	0.0%	466	0.3%					*492*	*0.3%*
11	45	0.0%	109	0.1%	197	0.1%					*351*	*0.2%*
12	99	0.1%			589	0.4%					*688*	*0.4%*
13	91	0.1%									*91*	*0.1%*
14	539	0.3%									*539*	*0.3%*
NP	167	0.1%	412	0.3%	147	0.1%	2,409	1.6%	1,900	1.2%	*5,034*	*3.3%*
Total	*44,358*	*28.7%*	*37,940*	*24.5%*	*44,725*	*28.9%*	*25,816*	*16.7%*	*1,900*	*1.2%*	*154,739*	*100.0%*

APPENDIX III – TREE IMPROVEMENT PROGRAM

Table 6. Tree Improvement program.

Elevation	Spp	%Class Availability	%Planting Program	%Gain in SI		Orchard / % Gain / Timing
				Expected	Modeled	
> 700 m						
	Fd	100% A	10	2.9%	2.5%	Orchard #116 pre roguing = 2.5% for first 8 years Orchard #116 rogued upon test results = 8% for following 12 years
	Hw	100% A	32	2.9%	2.5%	Orchard #127/130 pre roguing = 3% for first 12 years Orchard #127/130 rogued upon test results = 10% for following 8 years
	Yc	70% A	28	1.0%	1.0%	Seed and cuttings from wild seed relied on heavily in first 5 years at 0 value Donors worth 2% coming on line, donors worth 10% on line year 15 or so
< 700 m						
	Cw	75% A	33	2.8%	1.0%	Orchard #179 = 20% for 7 years Above rogued = 8% for 4 years
	Fd	100% A	27	4.5%	4.5%	Orchard #115 = 3% for 7 years Orchard #149 = 12% for 13 years
	Hw	100% A	20	4.5%	4.5%	Orchard #133 = 3% for 13 years Orchard #179 = 20% for 7 years
	Pw[8]	90% A 10% B	2	2.0%	1.0%	Orchard 174 open pollinated, Dorena seed, (level of resistance unknown) Texada seedlots also of unknown resistance
	Ss[9]	70% B 30% A	3	1.0%	1.0%	B+ seed/Orchard #157 with only minimal resistance for first 15 years (B= more resistance than Orchard #157) New resistant Orchards beginning in 15 years
	Yc	70% A	1	1.1%	1.0%	Wild seed/cuttings relied on in first 2 years = 0 for 100% Donors worth 2% coming on line at year 3 for 30%, 70% = 0 Donors worth 15% coming on line year 15 for 50% usage and 50% usage still at 2%

[8] Pw, western white pine is susceptible to white pine blister rust. A breeding program has been initiated to develop orchards of rust resistant individuals

[9] Sitka Spruce, is susceptible to spruce leader weevil. A breeding program has been initiated to develop orchards of weevil resistant individuals

APPENDIX IV – BOX PLOTS OF PRESENT AND FUTURE PHR STANDS

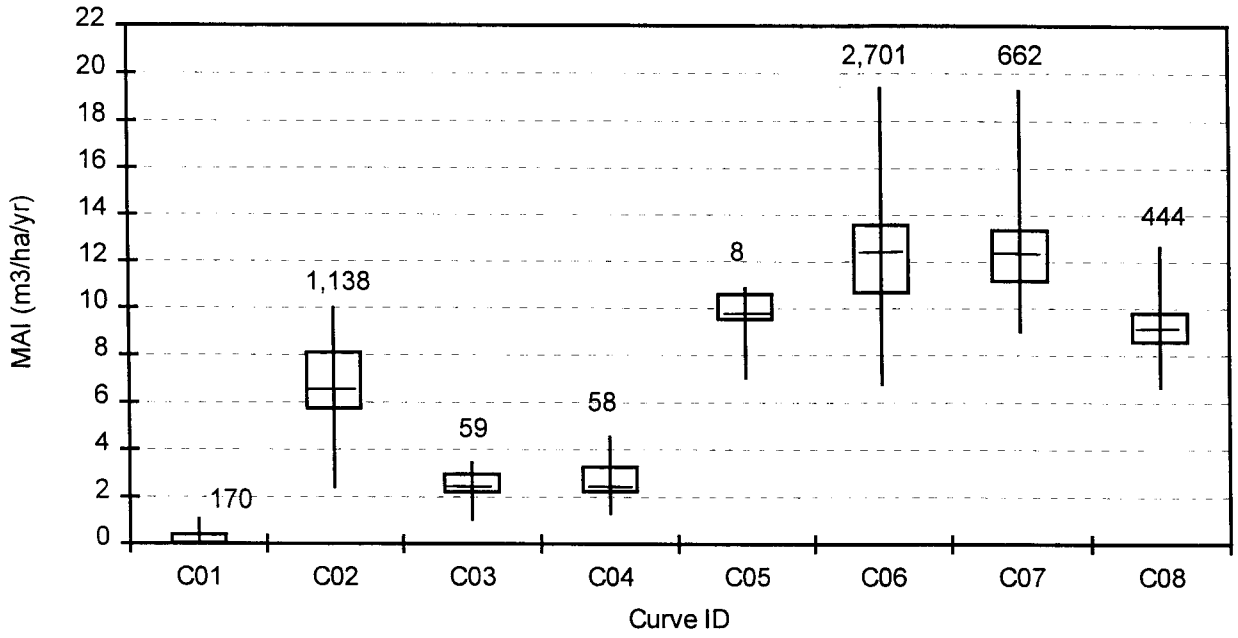

Figure 16. Existing PHR Stands: maximum, 75% quartile, mean, 25% quartile, minimum, and number of tables in each curve.

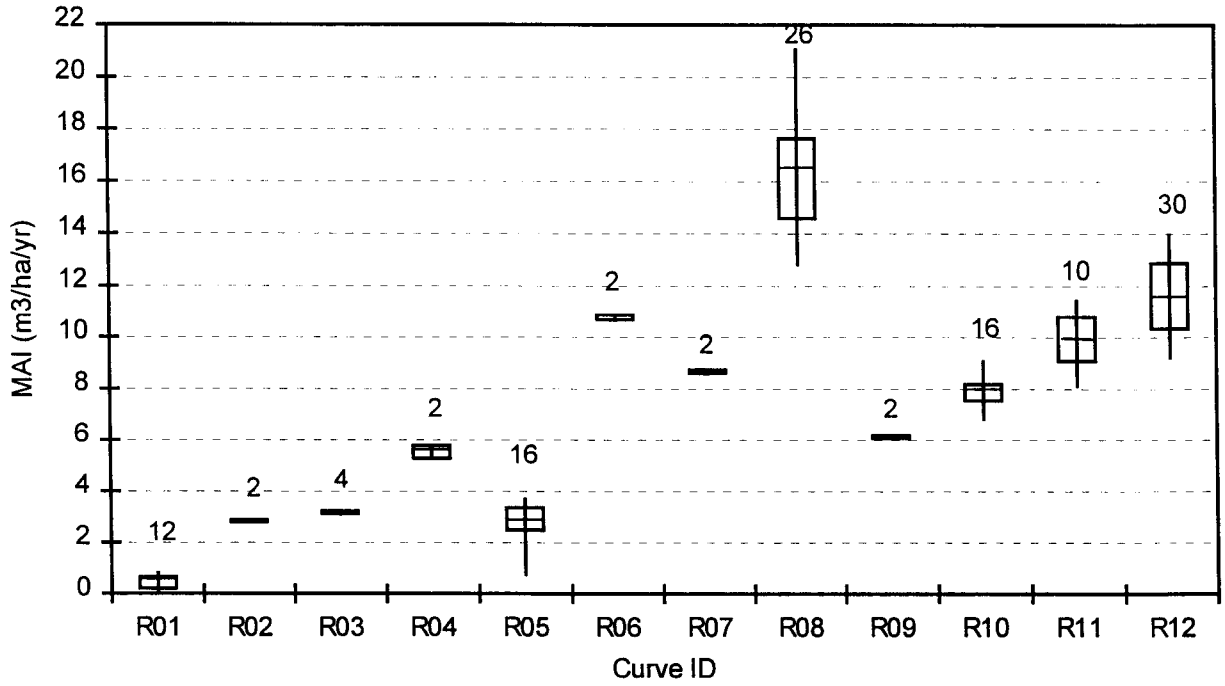

Figure 17. Future PHR Stands: maximum, 75% quartile, mean, 25% quartile, minimum, and number of tables in each curve.

Appendix VI
References

BRITISH COLUMBIA Ministry of Forests

MEMORANDUM

File: 10194-60/BIOD

August 25, 1997

To: Field Operations
Ministry of Forests

Field Operations
Ministry of Environment, Lands and Parks

From: John Allan
Deputy Minister
Ministry of Forests

Cassie Doyle
Deputy Minister
Ministry of Environment, Lands and Parks

Re: Achieving Acceptable Biodiversity Timber Impacts

The purpose of this memorandum is to reaffirm government's objectives regarding balancing biodiversity objectives with impacts on timber supply.

The Biodiversity Guidebook (BGB) was released in August of 1995. An accompanying letter from the deputies of both ministries (attached) noted that, to achieve the level of impact on timber supply acceptable to government, the guidebook should be applied in conjunction with the assumptions used in the Chief Forester's Report *Forest Practices Code Timber Supply Analysis* (the report). That report was not released until February of 1996.

In the elapsed time since their release, it has become clear that there is considerable uncertainty with respect to application of these two documents. It is understood that this problem is caused by the somewhat conflicting messaging in these documents. The purpose of this memorandum is to eliminate this uncertainty. A second purpose is to remind all staff of the importance of applying the objectives of the BGB in conjunction with the assumptions in the report and renewing our commitment to monitoring the assumptions used in the report to determine if target impact levels are being achieved. A third purpose is to provide clarity to timber supply analysts when modelling timber supply.

To begin, it is important that we consider the BGB in the context of other FPC components and broader government initiatives. The BGB is one of the major conservation initiatives of the FPC.

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It calls for the province-wide application of landscape units and special consideration for old forests and wildlife trees. Other FPC initiatives also (or soon will) contribute significantly (e.g., the Riparian Standards and the Identified Wildlife Measures). In the broader context, the Protected Area Strategy, the Timber Supply Review and Higher Level Planning are all contributing to increased environmental stewardship in our provincial forest. It is in this context that we both believe that applying the BGB consistent with the assumptions in the report will achieve a reasonable balance between economic and environmental values and provide an acceptable level of risk to the biological diversity of the province.

We are aware of pressures to revise some of the recommendations in the BGB, including the seral stage distributions. We prefer that no revisions be made at this time. All technical issues that have arisen, or are encountered during application of this guidebook, in conjunction with the assumptions in the report, should be forwarded to the Biodiversity Working Group for resolution.

To achieve maximum conservation value from the BGB, a subset of the Biodiversity Working Group was asked to assess all biodiversity elements and determine those most at risk; this assessment is attached. The elements deemed to be most at risk, old forests and wildlife tree patches, were included in the analysis for the report and merit special consideration in forest management planning.

It is recommended that the following considerations guide the application of the BGB for the foreseeable future:

1. Biodiversity emphasis options

It is clear that failure to achieve that balance of emphasis options recommended in the BGB can have significant impacts on either timber supply or environmental values.

Action:

When establishing emphasis options, use the Chief Forester's policy direction detailed in recently released Chapter 5 of the *Higher Level Plans: Policy and Procedures* document.

2. Contributing versus non-contributing land bases

The report recognizes that satisfying the requirements for wildlife trees and old forests will result in withdrawals from the contributing land base. However, unless carefully managed, these impacts could be incremental to those forecast in the Report. The challenge to resource managers in both agencies is to minimize these impacts on timber supply while maintaining conservation values.

Action:

In all situations, try and capture the desired target areas for wildlife tree patches and old seral requirements from the constrained and non-contributing land base (i.e., areas which do not contribute to the AAC such as inoperable, riparian reserves, wildlife habitat areas, terrain sensitive areas, visually sensitive areas, recreation areas, lake shore management areas). If the

requirements as outlined in the guidebook, including representation, can not come entirely from the constrained and non-contributing land base, withdrawals can be made from the contributing land base. Alternatively, if you are able to meet the requirements entirely from the non-contributing land base, the remainder can be considered eligible for harvesting, subject to meeting other management objectives and constraints.

3. Age class distributions within landscape units

The BGB was written with the intent of achieving the age class distributions within landscape units. However, not all of the biodiversity age class objectives outlined in the BGB were applied in the report due to the significant timber supply impacts that would otherwise occur. It is important to note, however, that the BGB provides flexibility that may reduce timber supply impacts in such a manner that the age class objectives may still be achievable. Therefore, staff are requested to work together to find alternative solutions to timber supply impacts wherever possible. Such solutions could be related to patch size objectives, cut block design, adjacency constraints, green-up and partial cutting. The Biodiversity Working Group will be requested to provide a template for staff to follow when applying this flexibility provided in the BGB.

The following guidance is provided with respect to age class distributions within landscape units until such time as viable alternative approaches are developed and implemented.

Please note that for the purposes of timber supply modelling, analysts are to follow the direction provided in the following points:

3.1 Old seral

The old seral target was viewed as the most critical element for the maintenance of biodiversity. As such, it was assumed that this target would be met across the province. For intermediate and high emphasis options, it was assumed that the old target would be captured immediately. For the low emphasis option, it was assumed that the old forest target would be met by the end of the third rotation.

Action:

<u>For intermediate and high biodiversity emphasis landscape units:</u>

The objective is to achieve the old growth target immediately Where targets cannot be achieved due to historical development, designate old growth management areas that achieve the target. Capture from the available stands the areas most likely to achieve old growth characteristics in the shortest possible time. The balance of the landscape unit is available for harvesting in the short-term, subject to other management objectives and constraints.

Possible future amendments to the *Operational Planning Regulation* may deal with the effect of new or revised higher level plans (HLPs) on silviculture prescriptions. At present, any silviculture prescription approved under a previous HLP or forest development plan (FDP), remains approved under a new or revised higher level plan or FDP as specified in section 12(b) of the Act.

For low biodiversity emphasis landscape units:

The objective is to not draw old growth reserves below the recommended targets before an assessment of harvesting opportunities and conservation values has been completed.[1]

If no alternative harvesting opportunities exist, the old growth reserves can be drawn down to 1/3 of the target in the BGB. The amount of draw down permitted within landscape units will vary on a case by case basis. Develop a recruitment strategy where such draw-downs occur, that will indicate how and where the old growth target will be achieved by the end of the third rotation.

Attached is a process recommended for meeting old seral requirements.

3.2 Combined mature plus old seral category

The combined mature plus old seral requirements, if strictly applied, can result in significant timber supply impacts. We agreed that considerable flexibility would be allowed to avoid timber supply impacts. These requirements were not applied in natural disturbance types (NDTs) 1 and 2 and when applied in NDTs 3 and 4 were found to be non-constraining.[2]

Action:

The objective in NDTs 1 and 2 is to not apply the mature component of the mature plus old requirement within landscape units unless a timber supply analysis demonstrates that applying the component would be non-constraining.

For NDTs 3 and 4, the objective is to apply the mature component of the mature plus old requirement unless a timber supply analysis demonstrates that applying the mature component would be constraining. In such instances, an appropriate level of relaxation should be jointly determined during the development of landscape unit objectives.

3.3 Early Seral

The early seral requirements were not applied. It was assumed that other FPC requirements such as cutblock adjacency, watershed assessments, wildlife habitat management, visual quality objectives, riparian management and green-up should normally address these requirements.

Action:

The objective for all NDTs is to not apply the early seral requirements within landscape units unless a timber supply analysis demonstrates the early seral component would be non-constraining.

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[1] Policy direction for the management of old growth in low emphasis landscape units will soon be provided.

[2] Non-constraining means no impact on projected harvest flows over the entire period of the timber supply analysis, over the Timber Supply Area or TFLs.

5. Connectivity

Connectivity requirements were not considered in the FPC analysis. It was assumed that these objectives could be met by a combination of riparian management areas, landscape unit design[3], choice of silvicultural systems and harvest scheduling[4] as well as stand structure provided by wildlife tree patches.

Action:

The objective is to not have an incremental impact to timber supply due to achieving connectivity objectives.

If you require further clarification on any of the matters discussed in the letter, please contact Ralph Archibald, Ministry of Forests at (250) 387-3541 or Mike Fenger, Ministry of Environment, Lands and Parks at (250) 387-9779.

John Allan
Deputy Minister
Ministry of Forests

Cassie Doyle
Deputy Minister
Ministry of Environment, Lands and Parks

cc: Major license holders

Attachments

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[3] Landscape Unit Design: design of Forest Ecosystem Networks capturing the target old seral requirements and OGMA components, ecosystem representation, forest interior habitat and ecosystem connectivity.

[4] Harvest scheduling, harvest patterning over the long-term.

Recommended process for meeting old seral targets:

Representativeness is to be considered when addressing old seral requirements. The intent is to capture the full ecological array of forests when meeting these requirements.

Action:

The following process is recommended for meeting old seral requirements:

1. Determine your ecosystem stratification for old seral representation (variant, tem, surrogate).

2. Sum the total area in each ecosystem type.

3. Determine the target amount of old seral required for each ecosystem type.

4. Determine the contribution for each ecosystem type by 100% non-contributing and existing 100% constrained areas.

5. Determine the target amount of contributing land base required to meet the target old seral for each ecosystem type.

Note: The target amount of contributing land base (final step above) in conjunction with all other non-contributing land base represents the design tools available for creating the Forest Ecosystem network.[1]

[1] Landscape Unit Design: design of Forest Ecosystem Networks capturing the minimum old seral requirements and OGMA components, ecosystem representation, forest interior habitat and ecosystem connectivity.

December 1, 1997

To: TSR Timber Supply Analysts
TSR Committee

Re: Incorporating Biodiversity and Landscape Units in the Timber Supply Review

The intent of this memo is to specify the procedures for incorporating biodiversity and landscape units into timber supply analysis for the Timber Supply Review.

A joint letter from the Deputy Minister of Forests and the Deputy Minister of Environment, Lands and Parks, "Achieving Acceptable Biodiversity Timber Impacts" was released August, 25, 1997. The deputies' letter specified the process for incorporation of biodiversity into operational planning and the landscape unit planning process. Biodiversity considerations are now a part of forest management and it is important that we determine how best to account for this in the Timber Supply Review (TSR). The procedures attached to this memo are designed to specify how biodiversity management and landscape units will be incorporated into timber supply analysis for TSR. The TSR procedures were developed at provincial timber supply analysts meetings in July and November.

TSR is not a forest management planning process and we do not have the resources to carry-out options analysis for forest management planning. Rather, TSR provides analysis for the chief forester to determine allowable annual cuts. The recurring nature of TSR, as required by the *Forest Act*, provides the means to update and revise AACs as forest management changes. Land and Resource Management Planning, Regional Land Use planning and other planning processes are appropriate vehicles for forest planning and investigation of management options.

For TSR, it is important that we produce the analysis in a timely manner, thus the need for some basic rules for incorporating biodiversity and landscape units in timber supply modeling, and, that we provide the Chief Forester with the relevant information needed to make informed and legally defensible AAC decisions.

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If you have any questions about the procedures, please contact Cassandra Mann, Manager Analysis Section at 356-5953 or e-mail, Cassandra.Mann@gems7.gov.bc.ca.

Gary Townsend
Director
Timber Supply Branch

Attachment: *Timber Supply Review Base Case Modelling Assumptions for Biodiversity and Landscape Units*

cc: Larry Pedersen
Chief Forester

Bronwen Beedle
Deputy Chief Forester

Janna Kumi
Assistant Deputy Minister

Jim Walker, Special Advisor
Land Use Issues

Henry Benskin
Director, Forest Practices Branch

Nancy Wilkin
Director, Habitat Protection

Regional Manager:

Vancouver
Prince Rupert
Prince George
Kamloops
Nelson
Cariboo

Timber Supply Review Base Case Modeling Assumptions for Biodiversity and Landscape Units

Seral Stage Constraints

The following table outlines how the seral stage constraints from the FPC Biodiversity Guidebook (BGB) will be applied in the TSR.

	early seral stage	mature plus old seral stage	old seral stage
NDT 1&2			
base case	off	off [1]	on
sensitivity	turn on and just show results	turn on and just show results	
NDT 3&4			
base case	off	off [1]	on
sensitivity	turn on and just show results	turn on and just show results	

1: In the Nelson Region the mature plus old seral constraint will be applied (on) as timber supply analysis has been completed for that region that shows this constraint can be applied and still meet the targets set out in the Kootenay-Boundary Land Use Plan.

In the above table, *off* means do not apply the constraint in the base case, *on* means apply the constraint. For the sensitivity analysis the intent is to turn the constraint on/off as appropriate and just simply show what happens to the base case harvest forecast. Do not try to smooth out the flow. By simply showing what happens we will be informing the district and MELP staff when the timber supply impacts occur and the severity of the impact from the application of these constraints. The goal is to inform the district if there is an issue in the short-term or maybe this is a longer-term issue and some planning can be done to prevent the impact from occurring. This should help the district staff determine a course of action at the operational level. For example, if the mature plus old is not constraining in the sensitivity, this would provide information to district and MELP staff that there is no overall timber supply impact for the TSA or TFL, and application of the mature plus old seral constraint can proceed in forest development planning.

e table shows the mature plus old as not being applied in NDT 3 and 4. The deputies' letter calls for application of this seral stage constraint in forest development planning if there is no timber supply impact (non-constraining). The definition of non-constraining is "no impact on projected harvest flows over the entire period of the timber supply analysis, over the Timber Supply Area or TFL". From a timber supply modeling perspective this means there will be no difference between a harvest forecast with the constraint turned on and a harvest forecast with the constraint turned off. Based on the analyses of the last TSR, there are not likely to be any management units in which no impact will occur over the next 250 years when the constraint is turned on. Based on this, we will not apply the mature plus old constraint in the base case. As noted above the sensitivity analysis will, however, provide information regarding the operational application of these constraints for district staff.

Low level emphasis and the old seral stage constraints

As per the BGB and the deputies letter, it is possible to initially set the old seral stage constraint to one third of the guidebook value. This reduced constraint should be used whenever applying the full old seral stage constraint will be constraining on timber supply. Constraining on timber supply is defined the same as for application of the mature plus old constraint i.e. "no impact on projected harvest flows over the entire period of the timber supply analysis, over the Timber Supply Area or TFL". Thus, the timber supply picture is to be the same whether the constraint is applied fully or not. Since the result is to be the same, we will initially set the old seral stage requirements to one third of that in the BDG. However, it is required that over the next three rotations this be built back up to the full BDG value. Rotation was defined as 70 years in the FPC timber supply impacts analysis. Thus in order to meet the goal of applying the full guidebook value by 210 years from now the following procedure will be used.

implement constraint at time	old seral cover percent in low emphasis units
0	guidebook * 0.33
70 years	guidebook * 0.67
140 years	guidebook * 1.00

Sensitivity analysis which simply shows the resulting timber supply forecast if the full BDG values are applied at all times will be completed. Once again this will provide district and MELP staff information regarding the actual impact, if any, from utilizing the full constraint.

The Chief Forester is not in a position to formally account for draft landscape unit boundaries or emphasis until legally defined. However, as the landscape unit planning process is scheduled to be completed in the next few years it is important that we do not ignore the fact that landscape units may have an impact on timber supply. Thus, the following method will be used in the TSR. This method incorporates some impacts from having high, intermediate and low emphasis while at the same time not actually assigning each landscape unit its own emphasis. Instead, each individual draft landscape unit will have a weighted constraint applied to it.

The seral stage constraints from the BDG will be weighted based on the target proportions of 10/45/45, high, intermediate and low. The following example includes the reduction to one third of the old seral stage constraint, as explained above.

Example NDT 2: CWH: (Low= 9%; Intermediate = 9%; High = 13%)
calculate the percent old growth requirement to be applied to each unit as follows:

Time 0	13%*0.10	= 1.30
	9% * 0.45	= 4.05
	(9%*0.33)*0.45	= 1.34
		6.7%
Time 70	13%*0.10	= 1.30
	9% * 0.45	= 4.05
	(9%*0.66)*0.45	= 2.67
		8.0%
Time 140	13%*0.10	= 1.30
	9% * 0.45	= 4.05
	9% * 0.45	= 4.05
		9.4%

If there are draft emphasis assignments available, a sensitivity analysis will be run using these draft emphasis. This will allow an assessment of whether the area weighting procedure is reasonable for the management unit being analyzed. In addition, if landscape unit planning is occurring in a management unit that is being analyzed for the TSR, the analysts may provide analysis of 2 or 3 more options around emphasis assignment after completion of the TSR report. The results of this analysis will be sent to the District Manager for use during the landscape unit planning process.

If you have any questions regarding the above procedures please contact Cassandra Mann, Manager Analysis Section, Timber Supply Branch, Victoria at (250) 356-5953 or Cassandra.Mann@gems7.gov.bc.ca.