Division BRITISH COLUMBIA Division

220 Cranbrook Street North
P.O. Box 4600
Cranbrook, B.C. V1C 4J7

Téléphone : (250) 426-6241
Télécopieur / Fax : (250) 426-7055

April 25, 2007

File: TFL14 Timber Supply Analysis Information Package

B.C. Ministry of Forests
Forest Analysis Branch
Box 9512 Stn. Prov. Government
Victoria, BC V8W 9C3

Attention: Bud Koch, RPF
Senior Analyst – TFL s

Dear Sirs:

Re: TFL 14 Timber Supply Analysis Information Package – Version 2.1

Enclosed for your acceptance is version 2.1 of our Timber Supply Analysis Information Package related to the Management Plan 9 process for TFL 14. This version incorporates changes made after receiving comments and suggestions from government staff. No written public comments were received.

A "compendium" of the comments we received is also enclosed. Changes made as a result of the comments received have been incorporated in the revised Information Package, or otherwise, brief notes have been provided in the "compendium" describing our rationale for keeping to the February 14th 2007 version of the Information Package.

Please also note that Tembec has not submitted a Draft Management Plan 9 and will be seeking an extension of Management Plan 8.

Yours truly,

D.P.C.Brown, RPF, Divisional Forester,
Tembec Forest Resource Management
Western Canada –BC Division

Copy:

Qiong Su, Timber Supply Analyst (assigned to TFL 14 MP#9)

TFL 14 – SPILLIMACHEEN

MANAGEMENT PLAN No. 9

TIMBER SUPPLY ANALYSIS INFORMATION PACKAGE

Version 2.1

April 25, 2007

Prepared for

Paul Frasca, RPF and Dave Brown, RPF

Tembec Industries Inc.

Prepared by

Reg Davis, RPF and Cam Brown, RPF

Forsite Consulting Ltd.

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1.0 Introduction

This Information Package has been prepared by Forsite Consultants Ltd. and Tembec Enterprises Inc. (Tembec) as a source document prior to the completion of the Timber Supply Analysis for TFL 14 Management Plan No. 9. This document follows the format suggested in the Guide for Tree Farm Licence Management Plans (20 month) and Calendar Year Reports (March 2001) and has been revised to incorporate Ministry of Forests and Range comments provided during their reviews February 14, 2007- April 16, 2007). Tembec did not receive any formal comments during the advertised public review period.

In reference to Management Plan 9, it should be noted that due to the pending changes to the 'management planning requirements' for Tree Farm Licences across the province, and discussions with government, Tembec had not planned on submitting a Draft Management Plan 9 normally associated with the Timber Supply Information Package and Analysis. The company is currently preparing a request to extend the current Management Plan 8.

The purpose of this information package is to:

- provide a detailed account of the land base, growth and yield, and management assumptions related to timber supply that the chief forester must consider under the Forest Act when determining an allowable annual cut (AAC) for the TFL and how these will be applied and modeled in the timber supply analysis;
- provide the evidentiary basis for the information used in the analysis.

The timber supply analysis will focus on a base case scenario and two additional option scenarios:

- Current management (Base Case), to meet requirements under the Forest and Range Practices Act (FRPA) and other current policy and legislative requirements; and
- A Sustainable Forest Management Plan (SFMP) Option based on forest management associated with attaining certification under Forest Stewardship Council (FSC) standards;
- A Mountain Pine Beetle (MPB) Option exploring a worst case scenario.

Following acceptance of this information package by Ministry of Forests (MoF) staff the timber supply analyses will be completed and documented in a Timber Supply Analysis Report. A Twenty Year Plan (20YP) will also be produced to illustrate the feasibility of the wood supply predicted by the timber supply model.

2.0 Process

The February 14th 2007 document facilitated a review by government staff of the assumptions, inputs and methods that Tembec intends to use when completing the timber supply analysis associated with the TFL #14 Management Plan #9. As part of the review process:

- Prior to completing this document, Tembec staff consulted with Ministry staff at Branch and Region offices regarding the schedule for completing the MP #9. Scheduling was agreed to with the Ministry of Forests staff (Reg Brick, Timber Tenures Forester, Mile Djukic, Regional Timber Forester, and Bud Koch, Senior TFL Timber Supply Analyst).
- Spatial data files (digital and or hard-copy version maps) will be made available for review to Rocky Mountain Forest District staff (Gary Dolynchuk and Mike Black).
- This version 2.1 has incorporated the appropriate comments received during the February 14- April 16 public and government reviews.

Major background information used to prepare this Information Package includes:

- *Crestrook Forest Industries Limited, TFL 14 – Spillimacheen Tree Farm License Management Plan No. 8, Timber Supply Analysis Report and 20-Year Spatial Feasibility. Amended Version.* March 2000.
- *Kootenay/Boundary Higher Level Plan Order (2002, and updates)*
- *Forest and Range Practices Act and Regulations* (MoF, 2002), and
- *Forest Stewardship Council (Regional Certification Standards for British Columbia* (2005)
- *Tembec 2006 Forest Stewardship Plan* (2006)

See the References section for an extensive list of information consulted when preparing this document.

3.0 Timber Supply Forecasts

This section provides a summary of the harvest forecasts that will be provided in the timber supply analysis phase. Details within each of the options are covered in subsequent sections.

3.1 Base Case Option

The Base Case Option is based on current management practices within TFL 14. This is defined by operational management practices, characteristics of and natural resource values found on the landbase, current silviculture practices, and estimates of present and future growth of forest stands.

Current management includes:

- Tembec's operational performance over the last 5 years;
- Management to meet the requirements of the Forest and Range Practices Act (FRPA), the Kootenay Boundary Higher Level Plan, and other locally relevant legislation and policy;
- Management for non-timber resources, including visual quality objectives; identified wildlife; ungulate winter range (UWR); fish habitat, domestic water supply; and others.

Some of the more significant landbase inventories include complete mapping of:

- forest cover inventory, updated to September 2006 for depletions, and projected to end of growing season 2006;
- operability mapping, with updates in 2006;
- terrain stability mapping; and
- archaeology overview assessment mapping (AOA).

Silviculture practices, harvesting methods and projections of current and future stand yields include:

- Definition of the operating landbase and, conversely, of non-operating areas defined by problem forest types and non-merchantable stands,
- Close utilization standards, and Ministry standard estimates of decay waste and breakage factors (DWB) and operational adjustment factors (OAF),
- Estimates of natural stand yields based on the MoF's Variable Density Yield Projection (VDYP) software;
- Adjustments to inventory ages, heights, and volumes for stands >40 years old based on the results of the 2000 TFL 14 Inventory Audit Adjustment Project (or enhanced inventory audit adjustment project);
- Estimates of managed stand yields based on the MoF Research Branch's Table Interpolation of Stand Yields (TIPSY) software;
- Adjustments to the site index estimates for managed stands, based on terrestrial ecosystem mapping (TEM) and site index correlations to these ecosystems using SIBEC data;
- Basic silviculture practices;
- Partial cutting within visually sensitive areas, including estimates of partial-cutting stand yields estimated using WinTIPSY;
- Empirically estimated regeneration delay values; and
- Genetic gains from improved seed in a portion of the spruce, pine, fir and larch plantations.

3.2 Sensitivity Analyses

Sensitivity runs are used to test the uncertainty inherent in the data and management assumptions and are performed by modifying one input and examining the impact that change has on the model outputs. The sensitivity runs provide a picture of what factors in the Base Case are most influential, in relative terms, to the outputs. Table 1 is a list of the proposed sensitivity analyses.

Table 1 Base Case sensitivity analyses.

Parameter Adjusted	Definition
Natural stand yields	Natural stand yields +/- 10%
Managed stand yields	Managed stand yields +/- 10%
Regeneration delay	Regeneration delay +2 / -1 years
Minimum harvest age (MHA)	Base case values +/- 10 years
MHA (volume criteria only)	New values based on minimum volume criteria only
MHA (MAI criteria only)	New values based on attaining maximum mean annual increment only
Timber harvesting landbase	Increase/decrease landbase by 10%
Site Index – no SIBEC adjustment	Managed stand yields with no SIBEC SI adjustment
Genetic gains	Managed stand yields without genetic gains

3.3 Alternate harvest flows over time

The harvest flow is the estimated rate of harvest for each period (10 years/period) over a long term planning horizon (250 years or more). There are many possible harvest flows with different starting harvest levels, and with different rates of declining and/or increasing harvests between periods. For example, it is possible to 'trade off' the mid- or long-term harvest for short-term harvest, or vice versa. A number of harvest flows will be produced for the Base Case option (Table 2). These provide a picture of the trade-offs that were inherent in developing the recommended harvest flow.

Table 2 Alternate Base Case harvest flows

Alternate Harvest Flow	Key parameters
Maximum starting harvest level	Highest possible starting level with a maximum decline per decade not to exceed 10% of the previous decade.
Maintain current AAC	Maintain, for as long as possible, the current AAC without any decline. Maintain the mid-term harvest level, if possible, above the long term sustained yield.
Non-declining even flow.	Maximum harvest level with no decline in harvest in any period.

3.4 Other options

Other options are used to quantify the impacts of pursuing management directions that are significantly different than the Base Case. Table 3 summarizes the options that will be examined.

Table 3 Management Options

Option	Key management parameters
Sustainable Forest Management Plan Option (SFMP - FSC)	**Sustainable Forest Management Plan Option (SFMP - FSC)** – FSC requirements are added to the base case requirements. These practices include landbase reductions (reserves) for HCVF Endangered Forests, ecosystem representation, and high value avalanche tracks; full targets for old growth within low emphasis biodiversity landscape units; and an alternate riparian reserve strategy, and additional area under visual management.
Mountain Pine Beetle Option (MPB)	**Mountain Pine Beetle Option** - Assume catastrophic MPB attack levels as forecast by Ministry of Forest staff (Eng et al, 2005). The intent is to explore a worst-case scenario where almost all Pl volume is lost in a very short time frame. The goal would be to capture as much of the attacked pine as possible under an AAC uplift before it becomes uneconomic to salvage, and then, reduce the harvest to a long term sustainable level.

4.0 Model

Forest Planning Studio (FPS) version 6.0.2.0 will be used to complete the timber supply analysis. FPS was developed by Dr. John Nelson at the University of British Columbia (UBC) and is a spatially explicit forest estate simulation model. All events in the model are directly linked to stand level polygons or harvest units and thus allow tracking of individual stand attributes and spatial relationships through time. Each polygon belongs to a specific stand type (Analysis Unit) and has attributes such as age, harvest system, and land base status (THLB or Non THLB). Results are typically aggregated for reporting at higher levels (i.e. harvest flow for the entire unit).

A wide range of constraints can be modeled on the land base: harvest exclusion, spatial adjacency/maximum cutblock size, maximum disturbance/young seral, minimum mature/old seral, and equivalent clearcut area (ECA) limits. Constraints are applied to groups of polygons (cliques) and harvest is restricted if a constraint is not satisfied. A single polygon can belong to many overlapping cliques and each of them must be satisfied in order to allow harvest of the polygon. Where a mature or old cover constraint is not met, harvesting may still occur if there are any eligible stands remaining after the oldest stands are reserved to meet the constraint.

Harvest is implemented using a set of priorities to queue stands for harvest. In each period, the model harvests the highest priority eligible stands until it reaches the harvest target or exhausts the list of opportunities. Harvest can be implemented in single years, multiple year periods or a combination of these. Where periods are used, the midpoint of the period is typically used as the point where harvest opportunity is evaluated because it is a good balance between the start of the period (pessimistic) and the end of the period (optimistic).

The spatial harvest allocation model outputs from the model for the Base Case management option will be used as the basis for the 20 Year Plan.

5.0 Current Inventories

5.1 Forest Cover Inventory

The forest cover inventory is a key component of the analyses. The forest cover for TFL 14 was created in 1986, and regular updates of the inventory have been completed since then. The inventory currently exists in FIP-rollover status. Updates are made for fires and logging, along with re-projection of the inventory attributes (ages, heights, etc.) and re-labeling of the forest cover maps.

> The forest cover .. *"mapping is on TRIM controlled North American Datum (NAD) 83 1:20,000 BCGS base maps. … (It) .. dates from 1986 with air photo interpretation, and reference data collected from 1968 to 1998. Major photographic coverage was in 1984. Data acquisition and storage was to MoF standards of the day. As with all inventories of similar vintage, inventory attributes were class-based and when converted to discrete values class midpoints were used."*
>
> (Source: TFL 14 MP#8 Information Package, 2000a)

The forest inventory attributes (age, height, volume etc) have been re-projected to the end of the growing season (December) 2006 and updated for logging and fire disturbances to September 2006 (+/-).

The inventory (height, age, volume) has been adjusted based on an enhanced inventory audit project as described below. Site index estimates for managed stands have been updated using SIBEC correlations (section 8.1.2.1).

A Ministry of Forests Inventory Audit on TFL 14 (MoF, 1994) found significant bias in the volumes estimated by the forest cover inventory. Following that, Timberline (2000) enhanced the audit adjustment by adding a significant number of field samples, to develop factors to adjust the age, height and volume estimates for natural stands. Inventory Branch reviewed that project and the statistics were re-worked to MoF specifications and the project appears to be approved (C. Mulvihill, 2007). This project is best referred to as an inventory audit enhancement project and appears to be equivalent to a VRI Phase 2 project (C. Mulvihill, 2007).

The height, age and volume adjustment factors are listed in Table 4. Site index adjustment occurs indirectly as a result of changing the stand ages and heights. Overall, the adjustment increased heights, decreased ages, increased volumes, and indirectly increased site indices. Across the target population, the net effect of all adjustments was a 21% increase in merchantable volume.

Table 4 VRI Phase 2 adjustment factors for stand >40 yrs old

Leading species and site class group	Height multiplier	Age multiplier	Volume multiplier
Bl-Good/Medium	1.1076	0.9108	1.1597
Bl-Poor	1.0378	0.9173	1.1141
Fd-Good/Medium	0.9670	0.7993	1.0860
Fd-Poor	1.1959	0.8039	1.2556
Pd-Good	1.0237	0.8625	1.1659
Pl-Medium	1.1049	0.9553	1.0874
Pl-Good	1.3160	0.9898	1.0051
S-Good	0.9166	0.8765	1.1978
S-Medium	0.9228	0.9014	1.1010
S-Poor	1.0809	0.8678	1.2194

The adjustments were applied within this analysis to natural stands >40 yrs old using the following methodology:

- Stands over 40 years old were selected.
- Stands were assigned to adjustment strata based on leading species and site class (good, medium, poor and low) as defined by the site class thresholds at that time (Ministry of Forest, 1999);

- The age and height adjustments were applied to the existing inventory age and height;
- The adjusted age and height numbers, along with the volume adjustment factors, were input to VDYP to derive a new site index for the stand, along with new stand volumes and yield curves.

5.2 Forest Resource Inventories

Other resource inventories are also used in the modeling process. These are summarized in Table 5. Their use is briefly described after the table.

Table 5 Resource inventories

Data file	Source	Inventory	Comments / Source
Car2005	HLPO	Caribou management zones	Obtained from the Higher Level Plan Order ftp site.
Rip_FPC	Tembec	Riparian Buffers – FRPA	FRPA/FPC effective width buffers for lakes, wetlands, streams.
Rip_FSC	Tembec	Riparian Buffers - FSC	FSC effective width buffers for lakes, wetlands, streams.
Tfl_aoi	Tembec	Project's Area of Interest	Modified TFL boundary by adding the remainder of LU I34 (Bugaboo Park extension).
Tfl_avB	Tembec	Avalanche Path habitat inventory	50m buffers around avalanche paths with high or moderate habitat value.
TFL_bec3	Tembec	BEC - TFL and Bugaboo	TEM derived BEC with the Bugaboo portion added using provincial BEC (modified)
Tfl_beo	HLPO	BEO - TFL and Bugaboo	Invermere BEO from HLPO website data, as per F.Wilmer, ILMB.
Tfl_blk	Tembec	TFL blocks.	Extract from Tembec TFM database, circa Dec14 2006
Tfl_dev	Forsite	Development zones.	Development zones; used to estimate current RTLs for estimating future RTL reductions.
Tfl_dws	Tembec	CWS & DWS watersheds	DWS and "high sensitivity watersheds".
Tfl_erdz	HLPO	ERDZ	Data from HLPO ftp site.
Tfl_esa	Tembec	Environmentally sensitive areas (ESAs)	ESA extracted from old forest cover data; polygons may no longer match current forest cover.
Tfl_fc3	Tembec	Forest Cover - TFL 14 and Bugaboo I34	Updated TFL forest cover data; as of Dec18_2006.
Tfl_hcvf	Tembec	High Conservation Value Forests	TFL HCVF map; circa Dec11 2006.
Tfl_ldB	Tembec	Landings - classified by area	Landings - circular buffer based on landing area; circa Dec11 2006.
Tfl_lu2	HLPO	Landscape units	Kootenay Spatial Data Partnership (KSDP) landscape units.
Tfl_mrch	Tembec	Merchantability classes.	Merchantability classes.
tfl_ogma	Tembec	Old Growth Management Areas	Tembec spatially deployed old seral OGMAs (including full old targets mapped in low BEO)
Tfl_oper	Tembec	Operability	Tembec operability; circa Dec11 2006.
tfl_own	Tembec	TFL ownership	Tembec-maintained TFL ownership.
Tfl_pcel	Tembec	TFL planning cells	Tembec data; circa Dec 14 2006.
Tfl_psB	Tembec	Permanent sample plots	50m buffers around PSP locations.
Tfl_rdB	Tembec	Road buffers – existing and future	Road buffers; used for RTL landbase reductions.
Tfl_res	Tembec	WTP's and other block-associated reserves	Extract from TFM; circa Dec14 2006
Tfl_rtl	Tembec	TFL roads and landings.	Extract from FMS; circa Dec14_2006; Used to form road and landing buffers.
tfl_slp	Forsite	Slope Classes	TFL slope classes; 0-45; 45-80; 80+ %
Tfl_str	Tembec	TFL classified streams; wetlands; lakes.	TFL stream data; Circa Dec11_2006; Classified values (such as S2) for lakes, wetlands and streams.
Tfl_tem	Tembec	Terrestrial Ecosystem Mapping (TEM) inventory	Used for SIBEC-adjusted site index and ecosystem representation-type reserves.
Tfl_tsil	Tembec	Terrain stability	Terrain data; standardized to U, P, S convention (and a "no data" class)
Tfl_TUM	Tembec	TFL total chance plan.	Total chance plan; circa 1999; some boundaries conflict with blocks developed since 1999 and with the current forest cover.
Tfl_UWR	MoE	Ungulate winter range (UWR)	TFL ungulate winter range, equivalent to the Invermere UWR (GAR

			Order); methodology approved by P. Holmes, MoE.
Tfl_vqo	Tembec	VQO's	Ministry of Forests', approved by District Manager on March 15 2003.

This data has been made available for review to the staff of government ministries/branches of MoF, MoE and ILMB. The inventories which most impact the landbase reductions or the forest requirements are described below in more detail.

Ownership

The ownership data includes both Schedule A and B lands. Ownership has been regularly updated by Tembec staff and is considered to be the best available information to determine the outer boundary of the TFL as it captures numerous changes made over time, using the best available sources.

The last major change was a removal from the TFL for the Bugaboo Provincial Park extension. The exact location of the boundary dividing the extension and the TFL has never been wholly resolved to the precision say, of a legal survey. Our estimate of the gross area of the park addition is 10,903 hectares (ha) which is close to a previous estimate of 10,930 ha made by the Land Use Coordination Office (LUCO). It should be noted that this difference of 27 ha may be due to a difference in the boundary separating the extension from the TFL (the NE edge of the extension) and/or due to any differences in the heights of land that were used to enclose the area in question.

Despite not receiving a definitive boundary from government, Tembec's adopted boundary has been consistently applied over the past five+ years. Where inaccuracies occur there is little no effect on the productive forest or implications to the timbers supply modeling.

Landscape Units

Landscape Units divide the TFL into four geographic areas, one of which (I34) includes the Bugaboo Park extension previously removed from the TFL. As management of old seral forest is based on LU boundaries, for the purposes of modeling biodiversity only, the Bugaboo Park extension area within LU I34 was added back into the model landbase.

Digital Terrain Model

The original data was TRIM data. Tembec produced a TIN and point elevation coverage which was sent to Forsite, who used the points to interpolate a hydrologically correct surface grid using ArcInfo's topogrid tool. The DEM was used in defining problem forest types, forest analysis units and caribou zones.

Level D Terrain Stability

Terrain classification is complete for the entire TFL. It is a composite of several projects completed during the period 1996 to 2000. All these projects met RIC standard methodology.

Environmentally Sensitive Areas

Environmentally sensitive sites and areas of significant value for other resource uses were originally delineated within the forest cover inventory as Environmentally Sensitive Areas (ESA's). ESA's are a broad classification of areas that indicate sensitivity for unstable soils (E1s), forest regeneration problems (E1p), snow avalanche risk (E1a), and high water values (E1h). ESA classification was originally part of the forest cover map. Later (in mid- to late-80's) the ESA polygons were copied from the forest cover to a separate map. The content of the ESA map is essentially unchanged from the original forest cover map.

Recreation Inventories

The recreation features inventory (RFI), resource opportunity spectrum (ROS) inventory, and recreation site inventory were completed for the TFL in 1996/97. These inventories do not impact the timber supply analysis.

Visual landscape inventory (VLI)

Tembec's original VQO mapping was replaced by VQO mapping approved by the District Manager in March, 2003. Visual Quality Objective (VQO) classes are used in the timber supply analysis. VQO classes were examined by the MoF and Tembec staff in 2000 and it was agreed that Tembec could re-

classify the PR-type VQO polygons according to the predominant tree species within each polygon: a modification (M) VQO class is assigned where pine is the predominant tree species throughout the polygon; else the VQO class is partial retention (PR).

Ungulate Winter Range

The UWR inventory is currently managed under a Section 7 notice. However, agreement has been made with the Ministry of Environment staff to manage the UWR on the TFL under the same requirements as the UWR U-4-008 Order for Invermere TSA, established on February 10 2005 under the Government Actions Regulation (GAR). This is consistent with Tembec's results and strategies in their approved Forest Stewardship Plan (FSP).

The UWR data in this analysis is derived from the original UWR dataset that was used to develop the Invermere TSA UWR (GAR) Order, and its associated map (Ketchison et. al, 2000)

Roads and landings inventory

The TFL 14 road inventory includes road classes and an estimate of each road's width. This inventory is an in-house Tembec database that has been maintained separately from the fc1 and TRIM road inventory. The road and landing inventories were used to estimate existing and future roads, trails and landings (RTL) landbase reductions.

Stream, wetland and lake inventory

Streams were originally classified in 2001 as a FRBC-funded project (Edeburn et al., 2001). The stream, wetland and lake inventories now contain both the Forest Stewardship Council (FSC) and the Forest and Range Practices Act (FRPA) riparian classifications. These classes have been used to estimate the riparian netdowns.

High Conservation Value Forest (HCVF) inventory

An HCVF map has been compiled as part of Tembec's FSC certification process. The original mapping and management report was completed in 2000 (Tembec, 2000). Landbase reductions for the endangered forest-type HCVFs are based on the HCVF inventory.

Terrestrial Ecosystem Mapping inventory

The TEM inventory is the basis of the BEC map (for modeling biodiversity objectives), SIBEC site correlations and the Ecosystem Representation Strategy. This inventory was completed in April 1999 by J.M.J. Holdings of Nelson, B.C.

6.0 Description of the Land Base

There are three major landbase classifications of interest in the analysis: gross, productive and timber harvesting landbase. The total area of TFL 14 and the area modeled are provided in Table 6.

Table 6 Total area of TFL 14

Geographic Area	Gross Area (ha)
TFL (*)	150,304
Bugaboo Park (extension)	10,903
Total Area modeled	161,207

Note: (*) Excludes the area in Bugaboo Park, includes all the non-productive area.

The productive landbase contributes to landscape level objectives for biodiversity and non-timber resource management. The productive land base excludes water, non-forest and non-productive types. The timber harvesting land base (THLB) is that portion of the productive landbase where timber harvesting occurs. It excludes areas that are inoperable or uneconomic for timber harvesting; areas set aside for other resources; or areas otherwise off-limits to timber harvesting. Estimates are made for both existing and future reductions to the THLB.

Table 7 presents the reductions (area and volume) to the gross area of TFL 14 to arrive at the Timber Harvesting Land Base (THLB), the area available for timber harvesting. The statistics include an additional area of productive forest land outside the TFL to allow complete coverage of landscape unit I34 for purposes of analyzing biodiversity management. No timber harvesting is allowed in the additional area.

Table 7 Timber Harvesting Land Base Determination

	Area (ha) Schedule A	Area (ha) Schedule B	Area (ha) Bugaboo Park (*)	Area (ha) Total	Net merch volume+ Schedule A	Net merch volume+ Schedule B	Net merch volume+ Total
Total land base	138	150172	10900	161210	18	13212	13230
Reductions							
Water	0	1414	69	1483	0	0	0
Non-forest, non-productive forest	19	77266	8110	85396	0	0	0
Non-commercial brush	0	177	53	230	0	0	0
Roads, trails, landings	3	1715	7	1724	0	232	232
Total productive land base (*)	**115**	**69,601**	**2,662**	**72,378**	**18**	**12,980**	**12,998**
Reductions							
Bugaboo Park - LU I34 (**)	0	0	2662	2662	0	0	0
Inoperable	0	9859	0	9859	0	2040	2040
Unstable terrain	0	1069	0	1069	0	274	274
Environmentally sensitive	0	413	0	413	0	60	60
Non-merchantable	50	1863	0	1913	0	82	82
Riparian Reserves	1	1842	0	1843	0	465	465
Wild life tree patches	0	1764	0	1764	0	543	543
Block reserves							
PSP reserves	0	33	0	33	0	7	7
Total Reductions	51	16844	2662	19556	0	3471	3471
Current Timber Harvesting Land Base	**65**	**52,757**	**0**	**52,822**	**18**	**9,509**	**9,527**
Future WTPs	1	580	0	581			
Future roads and trails	1	997	0	998			
Net long-term Timber Harvesting Land Base	**63**	**51,190**	**0**	**51,253**			

Note:
1. All totals are subject to rounding.
2. (*) Some Bugaboo Park area has been added for biodiversity modeling on the productive landbase. Totals below (**) do not include any of this Park area.
Note that any overlaps between net-downs are removed in Table 7. Any overlap will accrue to the first (highest) category in the table. In subsequent sections the same netdown categories are discussed in more detail and both the gross and the non-overlapping areas are tabulated. The gross areas in subsequent tables may be greater than those in Table 7

(+) Volumes are thousands (000 m^3).

6.1.1 Age Class distribution

Summaries of the age class distribution and total TFL 14 area are provided in Table 8, and Figure 1 and Figure 2 . Site index for the contributing and timber harvesting land base is depicted in Figure 3.

Table 8 TFL 14 Age class distribution

Age Range	Productive Total (ha)	Operable (ha)	Timber harvesting Land base (ha)
0	1,126	1,122	1,100
1-20	8,590	8,561	8,331
21-40	6,514	6,407	6,055
41-60	5,887	5,357	4,896
61-80	11,601	10,100	9,013
80-100	9,460	8,431	7,478
101-120	9,549	8,180	6,913
121-140	3,251	2,476	1,740
141-250	15,687	8,840	7,189
251+	715	383	106
Totals	72,378	59,857	52,822

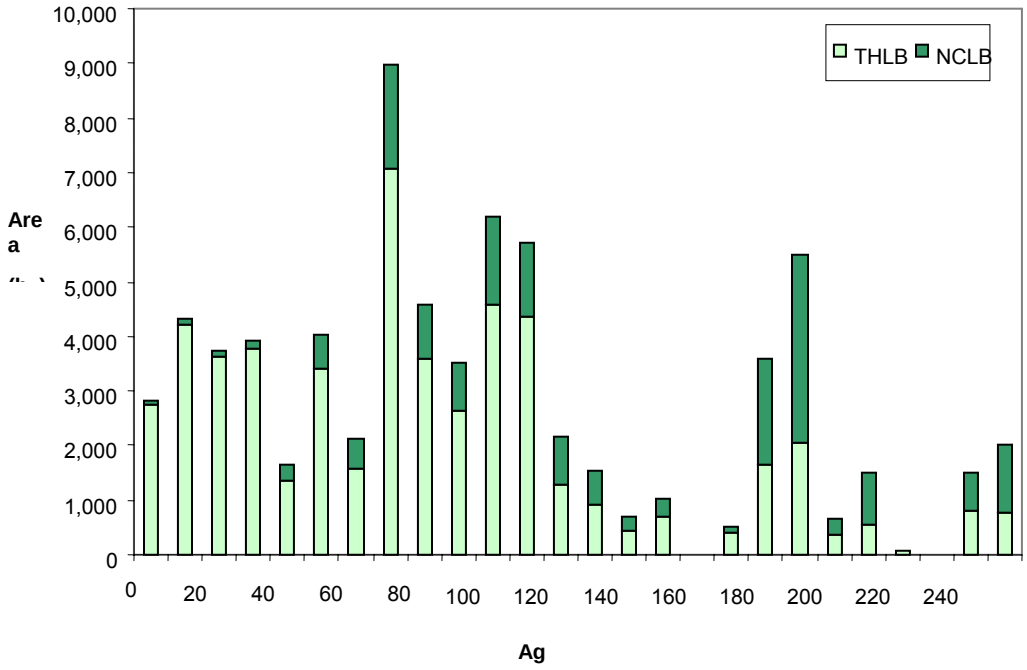

Figure 1 Age class distribution of non-contributing (NHLB) and timber harvesting landbase (THLB)

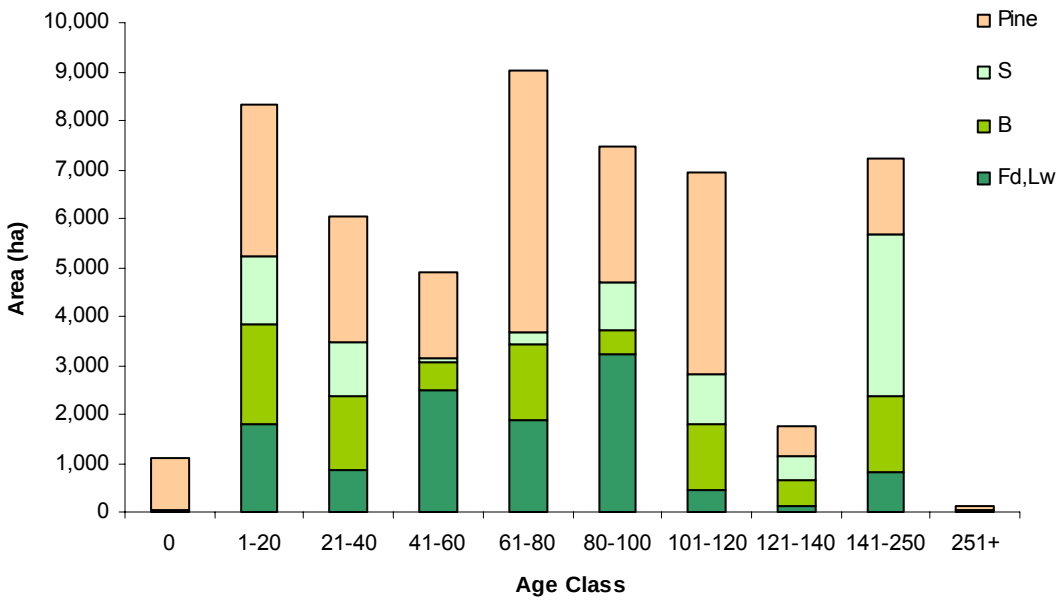

Figure 2 Age class distribution by species group for timber harvesting landbase (THLB)

Pl leading stands cover 43% of the TFL's THLB area, while Sx/BL covers 35% and Fd/Lw leading stands cover 22%.

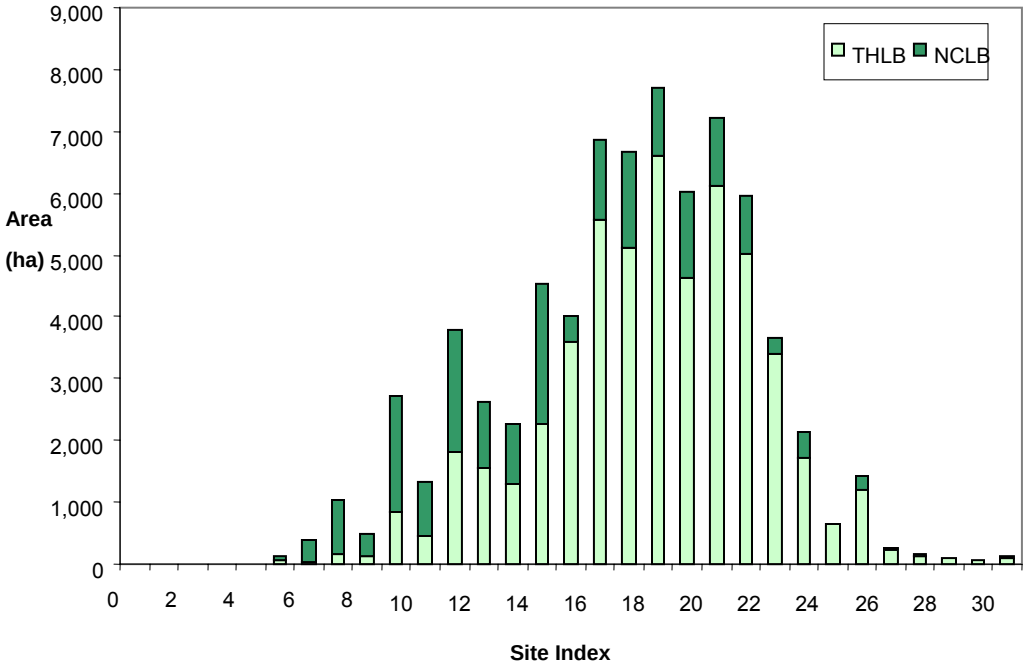

Figure 3 Site index for non-contributing (NCLB) and timber harvesting landbase (THLB) – pre SIBEC.

The average site index, based on the forest inventory, for the THLB is 17.6 m.

6.2 Non-productive and non-forest area

Non-productive forest land is not capable of producing a merchantable stand within a reasonable length of time. This includes alpine forest, non-productive land covered with commercial species, deciduous and/or coniferous".

Non-forest areas are "not primarily intended for growing or supporting forest. This includes alpine, rock, slide, non-productive burn, non-productive brush, swamp or muskeg, cultivated, cleared, urban, open range, wild hay meadow, clay bank, gravel bar, and other categories." (MoF, 2007).

These stands are identified in the forest inventory database as [type identity = 6]. All non-productive and non-forest stands are removed from the THLB. As well, these stands do not contribute to meeting the requirements for biodiversity or other non-timber resources (see the Resource Management sections).

Table 9 Non-productive and non-forest area

Description	Reduction Area
Water	**1,483**
NTA	99
Alpine	61,132
Rock	1,057
Clay	0
Alpine Forest	12,973
NPBr	4,667
NP Forest	4,093
Swamp	1,113
Clearing	26
Urban	235
Total (non-water)	**85,396**

6.3 Non-commercial cover

Non-commercial cover is any "*Productive forest land covered with non-commercial tree species or non-commercial brush*." (MoF, 2007) This is identified in the forest cover database as [type identity = 5]. All non-commercial stands are removed from the THLB. As well, these stands do not contribute to meeting the biodiversity or other non-timber resource requirements (section 10.0).

Operationally, when an area is harvested any within-block NCBr is treated along with the block, as well as any NCBr adjacent to the block, but there is no active program to search out and treat NCBr.

Table 10 Non-commercial Cover

Category	Total Area (ha)	Reduction Area (ha)
Non-commercial	229	230

6.4 Roads trails and landings

A small proportion of the roads may be large enough to be typed as non-forest polygons on the forest cover map. However, these classified roads, trails and landings are usually lumped with other non-forest types such as urban polygons. Classified roads, trails and landings are, therefore, a portion of the non-forest reductions in Table 7.

6.5 Unclassified roads, trails and landings

Most of the roads, trails and landings (RTL) are too narrow to be typed out in the forest inventory map. These are referred to as unclassified. The landbase reduction for unclassified RTLs was performed by

determining an average disturbance width for each class of road and then buffering the roads in the GIS. The road widths and landbase netdowns are summarized in Table 11.

Table 11 Reductions for unclassified roads, trails, and landings

(1) Road Type	(2) Road Width (m)	(3) Reduction (%)	Road Length (km)	Number Of Landings	Gross area (ha)	Effective reduction area (ha)
Highway	20	100	14.3	-	12.8	12.3
Mainline	18	100	81.0	-	139.2	74.1
Logging	10	100	1,396.2	-	1294.4	1246.5
Trail	4	100	269.6	-	90.0	85.2
Landings	-	100	-	1799	309.4	306.2
Totals	**-**		**1761.1**	**-**	**1845.7**	**1724.4**

Width is total buffer width, e.g. highway is 10m each side of the centreline.
"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

6.6 Inoperable / inaccessible

Areas that are not available for timber harvesting due to physical, silvicultural and regeneration difficulties, and economic inaccessibility are classified as "inoperable". Only two classes exist in the TFL inventory: inoperable (denoted as "I") and operable (denoted as "A").

Table 12 Inoperable land base

Classification	Productive Forest Area (ha)	Effective Reduction (ha)
A	59,857	0
I	12,521	9,859

"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

6.7 Unstable terrain and environmentally sensitive areas

Environmentally Sensitive Areas (ESA's) are a broad classification of areas that indicate sensitivity for unstable soils (E1s), forest regeneration problems (E1p), snow avalanche risk (E1a), and high water values (E1h). The ESA classification was originally part of the forest cover map. The ESA polygons were copied from the forest cover to a separate map, and the map is essentially unchanged from the original forest cover data.

ESA soils mapping has been replaced with Terrain Stability mapping, which has been completed for the whole TFL. This terrain mapping is a composite of several projects, all of which utilized RIC standards. Terrain stability mapping provides a better estimate of unstable soils than the Es1 mapping. In other cases, the ESA cover is used to identify landbase netdowns (Table 13).

The landbase reduction for unstable terrain was based on the profile of unstable (class U) and potentially unstable (class P) in the harvest. Tembec is closely harvesting the profile of both unstable and potentially unstable classes. The profile of U types in the harvest is 1.64% compared to 1.75 in the productive forest, and the profile of P types in the harvest is 8.85% versus 10.48% in the productive forest.

Assuming that the profile of U and P in the harvested areas is representative of the U and P in the non-harvested stands, then harvesting has avoided a portion of both the U and P classes: the percentage avoided of class U is (1.75-1.64) or 0.11%, and the avoided area of class P is (10.48-8.85) or 1.63%. The total avoided percent is 1.74%. This represents the estimate of the landbase that will not be harvested over the long term due to avoiding a portion of both the U and P types.

However, rather than removing a small proportion of each of the two classes, and to facilitate the spatial analysis, we have removed all of the U class (1.75%). This is a slightly higher reduction than the estimated reduction for the U and P classes combined (1.74%).

Table 13 Environmentally sensitive sites

Description		Productive Forest Area (ha)	Effective Reduction (ha)
Unstable terrain [1]	TSIL U	1,745	1,069
Total (terrain)			1069
ESA Avalanche	ESA A	64	20
ESA regeneration[2]	ESA P	5,523	392
Total (ESA)			413

1 - 100% of the unstable areas were removed, 0% of the potentially unstable areas were removed (roughly consistent with field practices).
2 - Excludes successful plantations.
"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

6.8 Non-merchantable / Problem forest types

Non-merchantable forest types are stands that contain tree species not currently utilized, or timber of low quality, small size and/or low volume, or steep topography, or low stocking. In TFL 14 the deciduous-leading (hardwood) stands are not considered economically viable. White pine- and whitebark pine-leading stands are not harvested for conservation purposes. These non-merchantable stands were excluded from the timber harvesting land base (Table 14).

Table 14 Non-merchantable or problem forest types

Class	Leading Species	Inventory Type Groups	Site index Or volume (m^3)	Stock-ing	Age (years)	Slope (%)	Productive area reduction (ha)	Effective area reduction (ha)
Deciduous	Deciduous	35-42	n/a	n/a	n/a	n/a	1,062	480
Whitebark and white pine	Pa, Pw		n/a		n/a	n/a	1,807	600
Low Volume[2]	all	1-34	<100 m^3		100+	n/a	360	176
Low Volume[2] on Steep Slopes	all	1-34	<130m^3		100+	> 45%	563	110
Low Productivity[3]	Pine	28-31	≤ 9.0		≤ 100	n/a	554	447
	Fir	1-8, 27, 32	≤ 12.5				11	10
	Cedar	9-11	≤ 10.0				0	0
	Balsam	12-20	≤ 10.0				59	54
	Spruce	21-26	≤10.0				0	0
Low Productivity on Steep Slopes[3]	Pine	28-31	≤ 10.0				96	26
	Fir	1-8, 27, 32	≤ 13.0			>45%	2	0
	Cedar	9-11	≤ 11.0				55	9
	Balsam	12-20	≤ 11.0				0	0
	Spruce	21-26	≤11.0				0	0
Stocking class 3	Pine	28-31		SC=3		> 45%	1,188	0
Stocking class 4	Pine	28-31	n/a	SC=4	>80	> 45%	313	2
Total							6,071	1,913

The site index (inventory audit adjusted site index) limit is based on achieving 100 m^3/ha at 100 years.
[2] Volumes are coniferous stand volumes excluding any deciduous volume.
[3] Not applied where stands have logging history.
"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

Site class is "*The measure of the relative productive capacity of a site for a particular crop or stand, generally based on tree height at a given age*" (MoF 2007). Low site netdowns are embedded within the

problem forest types (above). They are stands that grow so slowly that they are not deemed to be suitable for forest production. Table 15 provides estimates of the stand diameter and volumes at the upper limits of the low site classes.

Table 15 Low site problem forest types –diameter and volumes at threshold site index

Leading Species	Slope (%)	SI Upper Limit	Diameter at breast Height (cm) at upper limit of low site	Volume/ha at upper limit of Low site (m3/ha)
Pine	<45	≤ 9.0	18.0	90.7
Fir		≤ 12.5	26.9	79.6
Cedar		≤ 10.0	23.2	96.3
Balsam		≤ 10.0	24.1	102.4
Spruce		<10.0	24.0	95.3
Pine	>45	≤ 10.0	18.7	112.4
Fir		≤ 13.0	27.3	89.1
Cedar		≤ 11.0	24.8	119.5
Balsam		≤ 11.0	25.2	123.3
Spruce		≤ 11.0	25.0	121.2

Notes: Upper limit dbh and volume are at a reference age of 100 years.
Volume is coniferous volume only (*)
"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

Note that Table 14 is a cut-off value for including/excluding stands in the THLB, and Table 15 is the volume and diameter expected at the same site index values at a reference age=100. If one varies the reference age in Table 15 then one can derive the same numbers presented in Table 14. And, if the threshold values in Table 14 change then the minimum merchantability criteria will force the harvest ages to rise or fall accordingly.

6.9 Riparian reserves and management zones – streams

Riparian reserve strategies were implemented in the model by establishing effective reserve buffers around the riparian features inventories (streams, wetlands, lakes) using a GIS.

The riparian reductions were based on Forest and Range Practices Regulation (FRPR) defaults. To implement this as a landbase net-down, an effective reserve width is determined by adding the effective retention width for the default management zone width to the reserve buffer and assuming it is a (100%) reserve-type buffer (Table 16).

Table 16 Riparian reserve zones – streams

Riparian Class	Riparian Reserve Zone (metres)	Riparian management Zone (metres)	Retention Level (% basal area)	Effective Reserve Width (metres)	Productive area (ha)	Effective area reduction (ha)
S1b	50	20	20	54	912	891
S2	30	20	20	34	206	177
S3	20	20	20	24	356	334
S4	0	30	10	3	196	187
S5	0	30	10	3	82	65
S6	0	20	--	0	0	0
Total					1,752	1,653

Notes: Based on FRPR Sec 47 to 51.
"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

6.10 Riparian reserves and management zones – wetlands and lakes

The reserves and management zones for wetlands and lakes were handled the same way as the streams (above). Reductions for the Base Case Option are listed in Table 17.

Table 17 Riparian reserve zones – wetlands and lakes

Riparian Class*	Riparian Reserve Zone (metres)	Riparian Management Zone (metres)	Retention Level (% basal area)	Effective Reserve Width (metres)	Productive area (ha)	Effective area reduction (ha)
L1b	10	0	10	10	25	25
L3	0	30	10	3	9	9
W1	10	40	10	14	135	105
W3	0	30	10	3	40	34
W5	10	40	10	14	25	17
Total					233	190

Notes: Based on FRPR Sec 47 to 51
* No other lake or wetland classes occur in the TFL.
"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

6.11 Wildlife Tree Patches

Reserves for existing wildlife tree patches and other cutblock-level, mapped reserves are tallied in Table 18. These areas are the mapped WTPs and other reserves. During the modelling runs they will be set to no-harvest status, and treated as operable NCLB.

Table 18 Wildlife tree patches and block-level reserves

Class	Productive area (ha)	Effective reduction area (ha)
WTP and other reserves	1,972	1,764

"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

6.12 Permanent sample plots

The landbase reduction for an assumed 50-meter reserve around each permanent growth and yield sample plot (PSP) is provided in Table 19.

Table 19 Permanent sample plot reductions

PSP Plots (#)	Productive Area (ha)	Effective Reduction Area (ha)
51	35	33

"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

6.13 Cultural heritage resource reductions

Archaelogical Overview (AOA) mapping has been completed for all of TFL 14. As development proceeds, detailed archaeological impact assessments (AIA) are completed. To date, the areas reserved from forestry activities for protection of heritage resources at the site-specific level have been very small (less than 1 ha total). That reduction does not significantly impact the timber supply analysis.

6.14 Wildlife Habitat Areas (WHA's)

"The term "Identified Wildlife" refers to those Species at Risk and Regionally Important Wildlife that the Minister of Water, Land and Air Protection, designates as requiring special management attention under the Forest and Range Practices Act" (MoE/MoF 1999). Wildlife Habitat Areas are being established by

government for specific species, and when established would be considered as THLB reductions in this analysis. There are no known Wildlife Habitat Areas within TFL14 as of December, 2006.

6.15 Future Land Base Reductions

6.15.1 Future wildlife tree patches

Future wildlife tree patches are estimated to cover and area equivalent to 1.1 % of the THLB (see section 10.1.5.3)

6.15.2 Future roads, trails and landings

All existing, permanent roads, trails and landings (RTL) are mapped in Tembec's road database. As well, a number of future RTLs are mapped. However, the "future" RTLs in the "present" database comprises only a portion of the final estimate of RTLs. All the roads, trails and landings were buffered using a GIS, and the buffered-road data is the basis of the RTL calculations. Not all future RTLs were mapped, so an additional reduction was made to compensate for the missing RTLs (see the more detailed description, below, with numbers). The final estimate of the percent of the landbase that will be covered by RTLs after the THLB is fully developed is 5%. An additional site-productivity loss due to dispersed, non-permanent, rehabilitated roads and trails is assumed to be included as "voids" within the OAFs.

The detailed sequence was:

- The objective is to estimate RTL reductions on the THLB, however the operable forested is used as the basis for calculations because RTLs are not considered to be within the THLB, and so the percentage of RTLs within the THLB is always zero (0);
- The operable forested stands were mapped into development areas. The areas varied from "almost totally developed by the existing road system" to "only partially developed";
- All the existing and proposed roads in the database were buffered, as per the RTL reductions above, to determine the percentage of roads, trails and landings within each development area that is taken up by roads, which are already mapped (Table 20, column 2).
- The highest percentage of roads, trails and landings was 4.74% in zone 4. This area is considered to be almost totally, fully developed using ground-based harvesting methods (column 5).
- 5.0 % was estimated as the eventual, maximum RTL percentage that will exist after full development of the road system in development zone 4. Thus, the eventual area of roads, trails and landings within the operable, forested landbase is estimated to be 3,083 ha (i.e. 5% x 61,668 ha (column 6)).
- The current area of RTLs is 1,920 ha. This leaves 1,163 ha to be constructed in the future (column 7). 1,163 ha also equates to 1.886% of the CFLB landbase. Assuming that the equivalent reduction of 1.886% on the CFLB will apply to the future THLB, the additional, future reduction for permanent access-type RTLs in the THLB is 998 ha (Table 7).
- The equivalent reduction for future RTLs is applied in the model as a 1.886 percent reduction to all the future, managed stand yield curves.

Of note, the 5% figure will overestimate the future RTL percentage in the non-ground-based harvesting areas (cable, long-line, aerial). Those areas comprise 24% of the landbase (sec 10.2.2). We did not factor that in, i.e. we did not reduce the 5.0% number for those areas where 5% may be high.

This procedure provides an estimate for the permanent access-type RTL netdown.

Finally, the in-block site disturbance is assumed to be within allowable limits and therefore well within the 'voids' that are modeled in the TIPSY yields (as part of the OAF1).

Table 20 Estimate of future roads, trails, and landings

(1) Development Zone	(2) Existing RTL (ha)	(3) Non-RTL (ha)	(4) Operable, forested (ha)	(5) Existing And Planned RTL (%)	(6) Estimated Eventual RTL (% / ha)	(7) Additional RTL to be added (ha / %)
1	222	8,895	9,116	2.43		
2	3	85	88	2.91		
3	562	14,429	14,991	3.75		
4	239	4,799	5,038	4.74		
5	379	12,213	12,592	3.01		
6	217	5,311	5,528	3.93		
7	36	853	889	4.05		
8	77	1,924	2,001	3.87		
9	186	11,240	11,426	1.62		
Total	1,920	59,749	61,668	--	**5.0% / 3083**	**1163 / 1.886%**

Notes:
All statistics are based on the operable, productive forest.
(Column 4) Development zone 4 is almost fully developed at this time.
(Column 6) Maximum future RTL percentage is assumed to reach 5.00% in the long term.
(Column 7) This percentage (1.886) will be applied to all the future stand yield tables.

6.16 Area additions

No area is added to the landbase during the modelling (such as for reversions of Timber Licences).

7.0 Inventory Aggregation

7.1 Analysis Units

To reduce the complexity and volume of information in the timber supply analysis, individual stands are aggregated into 'analysis units' (AU). Groups are largely based on dominant tree species (inventory type group), timber growing capability (site index) and silvicultural management regimes. For example, all fir/larch stands on moderate growing sites with a clearcut silviculture regime may be grouped into a single analysis unit. Each analysis unit has at least one associated yield table that provides the model with the net merchantable volume that is available for harvest at different stand ages.

Several sets of analysis units were created to reflect forest management practices on the THLB:

Existing non-harvested, natural stands (100 series – 29,900 ha of THLB)

These are stands with no history of forest management in the past (i.e. harvest/planting/spacing); or stands, which were, harvested in the past under intermediate utilization (IU) standards (see analysis unit 170 and 270). Most of these stands are >=30 years old today but some younger stand created through natural disturbances are also included. Once harvested, these stands move onto the 200 series as future managed stands (clearcut).

Future managed stands (200 series – same area as 100 series)

These analysis units are the same as the 100 series analysis units after being harvested. The 200 and 600 series analysis units (see below) undergo the full benefits of forest management practices, such as better initial stocking and planting of stock with higher genetic gains.

Existing Partial-harvest stands (300 series – 100 ha of THLB)

These stands are within the scenic areas that have already begun a multi-pass cutting cycle for visual management.

Future Partial-harvest stands (400 series – 4,500 ha of THLB)

These stands are within the scenic areas and will, in the future, go through a multi-pass cutting cycle for visual objective management.

Existing clearcut, managed stands (500 series – 12,000 ha of THLB)

These are previously logged stands, or stands with a record of planting or spacing in the forest inventory file (not including the IU stands). Forest management has had some positive impact on the establishment and growth of these stand compared to natural stands, but not as much as stands logged from today forward. Most of these stands are less than 30 years old today. Once harvested, these stands move onto the 600 series and realize the full benefits of current regeneration practices, such as volume gains from the use of select seed.

Future existing-managed stands (600 series – same area as 500 series)

These analysis units are the same as the 500 series analysis units after being harvested.

Non-contributing stands (800 series – 0 ha of THLB, 24,500 ha of NCLB)

These are the stands in the non-contributing land base (NCLB). They track along their own yield curve, undergo disturbances, but do not experience any harvesting. They contribute to biodiversity and other resource requirements.

These broad groups are further sub-divided by criteria which include

- leading species and site index, (to differentiate the regeneration and growth characteristics),
- over and under age 140 (to differentiate based on the impact of site index adjustments),

- slope class (to separate conventional versus cable harvesting systems).

Classification thresholds for defining analysis units were determined by balancing the competing objectives of using the fewest number of analysis units (to reduce unnecessary complexity), that are significantly different (in terms of biology, growth characteristics, etc), while trying to maintain reasonable-sized areas (hectares) of each analysis unit. The common species and site index thresholds chosen for the clearcut-based analysis units are listed in Table 21.

Table 21 Analysis unit species and site index classification thresholds

Leading Species	Site Group	Site Index Breakpoints
Douglas-fir	1	>=23
	2	>=19 and <23
	3	<19
True fir	1	>=19
	2	>=16 and <19
	3	<16
Spruce	1	>=19
	2	>=16 and <19
	3	<16
Pine	1	>=21
	2	>=17 and <21
	3	<17

8.0 Growth and Yield

This section describes the information/data sources, assumptions, and methods for generating growth and yield estimates for the stand groupings (i.e. the analysis units) described in section 7.1.

8.1 Site Index

Estimates of site productivity are required to predict the rate of growth that will occur on each site throughout the TFL. The height of a "site" tree at age 50 (measured at breast height) is one measure of site productivity and is commonly referred to as "site index".

8.1.1 Site curves

The standard, MoF site index curves are utilized throughout this analysis.

Table 22 Standard MoF site index curves

Species	Source
Douglas Fir (Fdi) + (Pw, Py, Lw)	Thrower and Goudie (1992)
Lodgepole Pine (Pl)	Nigh (1999)
Western Red Cedar (Cw)	Kurucz (1985)
Western Hemlock (Hw)	Nigh (1998)
White Spruce (Sw) + (Se, Sx, Bl)	Nigh (1997)

8.1.2 Site index adjustments

In order to address perceived biases in inventory site indices, Tembec carried out several projects aimed at correlating ecosystems with site productivity measurements (SIBEC program). Two projects were completed to develop localized SIBEC correlations (Timberline 1999, 2002). As a result, stands now have several site index estimates available for yield modeling. These are: the original forest inventory site index, an enhanced inventory audit site index, and a SIBEC estimated site index . Ideally, ground

measurements such as growth intercept data would be used for estimating site index, but they are largely unavailable at this time.

Site index sources were applied to the following stands:

- Natural stands less than 40 years of age used their original inventory site index (note: stands <30 years old with logging history are considered to be managed stands in this analysis).
- Natural stands over 40 years of age and intermediate utilization (IU) logged stands used site indexes derived from the enhanced inventory audit project. The project provided adjustment factors for stand ages and heights for stands over 40 years old. Stands <40 years old were not sampled in the enhanced inventory audit project and therefore are not eligible for age and height adjustments.
- Existing managed and future managed stands used SIBEC adjusted site indexes.

8.1.2.1 SIBEC adjusted site index values

Tembec completed a Terrestrial Ecosystem Mapping (TEM) inventory project in 1999. The TEM mapping will be combined with local, ecologically based productivity estimates of site index. These site index correlations to biogeoclimatic ecosystem classification (BEC) site series are referred to as "SIBEC adjustments".

The TEM inventory was reviewed and approved for use in the Management Plan (MP) #8 timber supply analysis that included SIBEC adjusted SI's. However, in order to include it in the MP9 base case, the TEM must now meet accuracy standards that were not in place at the time of MP8. Thus, the TEM inventory is currently undergoing a formal accuracy assessment as required by Forest Analysis and Inventory Branch (MoF). Completion of the accuracy assessment is planned for completion prior to the submission of the timber supply analysis results.

Under the assumption that the TEM will meet required accuracy levels, the SIBEC site indexes that have been used in the Base Case Option are provided in Table 23. A weighted SIBEC site index for each forest polygon was calculated using the following methodology (*):

- SIBEC estimates for site index were gathered from the Provincial SIBEC database, and from the 2002 Timberline TFL14 SIBEC project report. SIBEC-based estimates for any site series were included (in order of intended preference) only if: a) seven or more samples existed in the Tembec database, or b) seven or more samples existed in the Provincial database, or c) a valid site index estimate existed in the Provincial database (the number of samples is unknown), or d) four to six samples existed in the Tembec database. Due to the 100% overlap between type "d" (Tembec 4-6 samples) and types "a", "b" and "c", no type "d" estimates were used in this analysis.
- If no SIBEC estimate was available (i.e. <4 samples), then the forest cover data provided the site index estimate [either a) the original site index for stands less than 40 years old, or b) the enhanced inventory audit adjusted site index for stands over 40 years of age.]
- The TEM and Forest Cover spatial data was overlaid in a GIS to a coverage that included the TEM and Forest Cover information (TEM/FC). Each resultant polygon was then assigned a SIBEC site index based on its leading species and TEM ecosystems where possible; otherwise the SI value residing in the inventory was used.
- An area-weighted average site index for each FC polygon was then calculated. These site index values are used (after pooling and weighting within each AU) in the managed stand analysis unit yield curves.

(*) This methodology was referred to Research Branch staff (G. Nigh, 2007, and S. Mah, 2007) and based on their advice we made adjustments to the methods that we originally used in Version 1 of the Information Package.

Table 23 SIBEC Assignment of Site Index – TFL14 and provincial estimates

Site Series Species	TFL Samples	TFL SI SIBEC	SI Chosen	Prov SI SIBEC	Prov Samples	SIBEC Choice
ESSFdk 01 Bl			15	15	unk	Provincial 1st
ESSFdk 01 Fd			18	18	unk	Provincial 1st
ESSFdk 01 Lw			18	18	unk	Provincial 1st
ESSFdk 01 Pl			19.8	19.8	11	Provincial 2nd
ESSFdk 01 Sx			15	15	unk	Provincial 1st
ESSFdk 02 Bl			12	12	unk	Provincial 1st
ESSFdk 02 Fd			15	15	unk	Provincial 1st
ESSFdk 02 Lw			15	15	unk	Provincial 1st
ESSFdk 02 Pl			15	15	unk	Provincial 1st
ESSFdk 02 Sx			12	12	unk	Provincial 1st
ESSFdk 03 Bl	7	19	18.6	14.3	16	TFL 7+
ESSFdk 03 Pl	7	18	18	16.3	15	TFL 7+
ESSFdk 03 Sx	7	19	18.6	14.7	14	TFL 7+
ESSFdk 04 Bl	7	17	16.8	14.4	20	TFL 7+
ESSFdk 04 Fd			17.3	17.3	10	Provincial 2nd
ESSFdk 04 Lw			18	18	unk	Provincial 1st
ESSFdk 04 Pa			15	15	unk	Provincial 1st
ESSFdk 04 Pl	7	20	19.8	17.8	17	TFL 7+
ESSFdk 04 Sx	7	16	15.9	14.3	21	TFL 7+
ESSFdk 05 Bl			12	12	unk	Provincial 1st
ESSFdk 05 Pl			18	18	unk	Provincial 1st
ESSFdk 05 Sx			15	15	unk	Provincial 1st
ESSFdk 06 Bl			12	12	unk	Provincial 1st
ESSFdk 06 Pl			15	15	unk	Provincial 1st
ESSFdk 06 Sx			15	15	unk	Provincial 1st
ESSFwm 00 Bl	8	20	19.7		0	TFL 7+
ESSFwm 00 Pl	10	18	18.3		0	TFL 7+
ESSFwm 00 Sx	8	20	19.6		0	TFL 7+
ESSFwm 01 Bl			12	12	unk	Provincial 1st
ESSFwm 01 Pl			18	18	unk	Provincial 1st
ESSFwm 01 Sx			15	15	unk	Provincial 1st
ESSFwm 02 Bl			12	12	unk	Provincial 1st
ESSFwm 02 Pl			15	15	unk	Provincial 1st
ESSFwm 02 Sx			15	15	unk	Provincial 1st
ESSFwm 03 Bl			12	12	unk	Provincial 1st
ESSFwm 03 Fd			18	18	unk	Provincial 1st
ESSFwm 03 Hw			15	15	unk	Provincial 1st
ESSFwm 03 Lw			18	18	unk	Provincial 1st
ESSFwm 03 Pl			18	18	unk	Provincial 1st
ESSFwm 03 Pw			18	18	unk	Provincial 1st
ESSFwm 03 Sx			15	15	unk	Provincial 1st
ESSFwm 04 Bl			15	15	unk	Provincial 1st
ESSFwm 04 Pl			18	18	unk	Provincial 1st
ESSFwm 04 Sx			18	18	unk	Provincial 1st
ICHmk1 01 Bl			16.5	16.5	10	Provincial 2nd
ICHmk1 01 Cw			15	15	unk	Provincial 1st
ICHmk1 01 Fd		19	20.4	20.4	18	Provincial 2nd
ICHmk1 01 Lw			21	21	unk	Provincial 1st
ICHmk1 01 Pl			19.3	19.3	7	Provincial 2nd
ICHmk1 01 Sx			19.4	19.4	12	Provincial 2nd
ICHmk1 02 Fd			15	15	unk	Provincial 1st

Site Series Species	TFL Samples	TFL SI SIBEC	SI Chosen	Prov SI SIBEC	Prov Samples	SIBEC Choice
ICHmk1 02 Pl			18	18	unk	Provincial 1st
ICHmk1 02 Py			15	15	unk	Provincial 1st
ICHmk1 03 Bl			15	15	unk	Provincial 1st
ICHmk1 03 Fd			18	18	unk	Provincial 1st
ICHmk1 03 Lw			21	21	unk	Provincial 1st
ICHmk1 03 Pl			21	21	unk	Provincial 1st
ICHmk1 03 Py			18	18	unk	Provincial 1st
ICHmk1 03 Sx			18	18	unk	Provincial 1st
ICHmk1 04 Bl			18	18	unk	Provincial 1st
ICHmk1 04 Cw			12	12	unk	Provincial 1st
ICHmk1 04 Fd			22.6	22.6	11	Provincial 2nd
ICHmk1 04 Lw			21	21	unk	Provincial 1st
ICHmk1 04 Pl			20.5	20.5	16	Provincial 2nd
ICHmk1 04 Sx			18	18	unk	Provincial 1st
ICHmk1 05 Bl			21	21	unk	Provincial 1st
ICHmk1 05 Cw			18	18	unk	Provincial 1st
ICHmk1 05 Fd		21	21	21	unk	Provincial 1st
ICHmk1 05 Lw			24	24	unk	Provincial 1st
ICHmk1 05 Pl			21	21	unk	Provincial 1st
ICHmk1 05 Sx		21	21	21	unk	Provincial 1st
ICHmk1 06 Bl			21	21	unk	Provincial 1st
ICHmk1 06 Cw			18	18	unk	Provincial 1st
ICHmk1 06 Fd			24	24	unk	Provincial 1st
ICHmk1 06 Lw			24	24	unk	Provincial 1st
ICHmk1 06 Pl			24	24	unk	Provincial 1st
ICHmk1 06 Sx			21	21	unk	Provincial 1st
ICHmk1 07 Bl			18	18	unk	Provincial 1st
ICHmk1 07 Cw			15	15	unk	Provincial 1st
ICHmk1 07 Pl			21	21	unk	Provincial 1st
ICHmk1 07 Sx			18	18	unk	Provincial 1st
ICHmw1 01 Bl	4	20	18	18	unk	Provincial 1st
ICHmw1 01 Cw			18	18	unk	Provincial 1st
ICHmw1 01 Fd	7	23	22.8	24	7	TFL 7+
ICHmw1 01 Hw			18	18	unk	Provincial 1st
ICHmw1 01 Pl	8	22	21.5	24	unk	TFL 7+
ICHmw1 01 Pw			24	24	unk	Provincial 1st
ICHmw1 01 Sx	5	24	21	21	unk	Provincial 1st
ICHmw1 02 Bl			15	15	unk	Provincial 1st
ICHmw1 02 Cw			12	12	unk	Provincial 1st
ICHmw1 02 Fd			18	18	unk	Provincial 1st
ICHmw1 02 Hw			12	12	unk	Provincial 1st
ICHmw1 02 Pl			18	18	unk	Provincial 1st
ICHmw1 02 Pw			18	18	unk	Provincial 1st
ICHmw1 02 Sx			15	15	unk	Provincial 1st
ICHmw1 03 Bl			18	18	unk	Provincial 1st
ICHmw1 03 Cw			15	15	unk	Provincial 1st
ICHmw1 03 Fd			21	21	unk	Provincial 1st
ICHmw1 03 Hw			15	15	unk	Provincial 1st
ICHmw1 03 Pl			21	21	unk	Provincial 1st
ICHmw1 03 Pw			21	21	unk	Provincial 1st
ICHmw1 03 Sx			18	18	unk	Provincial 1st
ICHmw1 04 Bl			18	18	unk	Provincial 1st
ICHmw1 04 Cw			15	15	unk	Provincial 1st

Site Series Species	TFL Samples	TFL SI SIBEC	SI Chosen	Prov SI SIBEC	Prov Samples	SIBEC Choice
ICHmw1 04 Fd			21	21	unk	Provincial 1st
ICHmw1 04 Hw			15	15	unk	Provincial 1st
ICHmw1 04 Pl			21	21	unk	Provincial 1st
ICHmw1 04 Pw			21	21	unk	Provincial 1st
ICHmw1 04 Sx			18	18	unk	Provincial 1st
ICHmw1 05 Bl		22	21	21	unk	Provincial 1st
ICHmw1 05 Cw			18	18	unk	Provincial 1st
ICHmw1 05 Fd			24	24	unk	Provincial 1st
ICHmw1 05 Hw			18	18	unk	Provincial 1st
ICHmw1 05 Pl			24	24	unk	Provincial 1st
ICHmw1 05 Pw			24	24	unk	Provincial 1st
ICHmw1 05 Sx		24	21	21	unk	Provincial 1st
ICHmw1 06 Bl			21	21	unk	Provincial 1st
ICHmw1 06 Cw			18	18	unk	Provincial 1st
ICHmw1 06 Fd			24	24	unk	Provincial 1st
ICHmw1 06 Hw			18	18	unk	Provincial 1st
ICHmw1 06 Pl			24	24	unk	Provincial 1st
ICHmw1 06 Pw			21	21	unk	Provincial 1st
ICHmw1 06 Sx			21	21	unk	Provincial 1st
ICHmw1 07 Bl			18	18	unk	Provincial 1st
ICHmw1 07 Cw			15	15	unk	Provincial 1st
ICHmw1 07 Hw			15	15	unk	Provincial 1st
ICHmw1 07 Pl			21	21	unk	Provincial 1st
ICHmw1 07 Sx			18	18	unk	Provincial 1st
IDFdm2 01 Fd	11	21	21	19.3	14	TFL 7+
IDFdm2 01 Lw			18	18	unk	Provincial 1st
IDFdm2 01 Pl	10	20	20.1	19.9	10	TFL 7+
IDFdm2 01 Py			18	18	unk	Provincial 1st
IDFdm2 03 Fd		15	15	15	unk	Provincial 1st
IDFdm2 03 Lw			15	15	unk	Provincial 1st
IDFdm2 03 Pl			15	15	unk	Provincial 1st
IDFdm2 03 Py			15	15	unk	Provincial 1st
IDFdm2 04 Fd	9	22	21.5	20.8	8	TFL 7+
IDFdm2 04 Lw			18	18	unk	Provincial 1st
IDFdm2 04 Pl	6	22	21.7	21.7	7	Provincial 2nd
IDFdm2 04 Py			18	18	unk	Provincial 1st
IDFdm2 04 Sx		21	18	18	unk	Provincial 1st
IDFdm2 05 Fd		22	21	21	unk	Provincial 1st
IDFdm2 05 Lw			21	21	unk	Provincial 1st
IDFdm2 05 Pl			21	21	unk	Provincial 1st
IDFdm2 05 Sx	4	22	21	21	unk	Provincial 1st
IDFdm2 07 Fd			18	18	unk	Provincial 1st
IDFdm2 07 Pl			18	18	unk	Provincial 1st
IDFdm2 07 Sx			15	15	unk	Provincial 1st
MSdk 01 Bl	7	19	18.5	18	9	TFL 7+
MSdk 01 Fd	10	21	21.3	20.2	15	TFL 7+
MSdk 01 Lw			18.8	18.8	7	Provincial 2nd
MSdk 01 Pl	10	21	21.1	21.5	10	TFL 7+
MSdk 01 Sx	10	21	20.8	19.9	13	TFL 7+
MSdk 03 At			19.5	19.5	7	Provincial 2nd
MSdk 03 Bl			12	12	unk	Provincial 1st
MSdk 03 Fd		19	18.5	18.5	10	Provincial 2nd
MSdk 03 Lw			18	18	unk	Provincial 1st

Site Series Species	TFL Samples	TFL SI SIBEC	SI Chosen	Prov SI SIBEC	Prov Samples	SIBEC Choice
MSdk 03 Pl		18	16.8	16.8	9	Provincial 2nd
MSdk 03 Sx			15	15	unk	Provincial 1st
MSdk 04 Bl	7	22	22.1	18.4	7	TFL 7+
MSdk 04 Fd	19	19	18.5	19	31	TFL 7+
MSdk 04 Lw			16.4	16.4	10	Provincial 2nd
MSdk 04 Pl	11	18	18	18.1	18	TFL 7+
MSdk 04 Sx	7	28	27.9	22.7	7	TFL 7+
MSdk 05 Bl			15	15	unk	Provincial 1st
MSdk 05 Fd		21	17.3	17.3	7	Provincial 2nd
MSdk 05 Lw			21.2	21.2	7	Provincial 2nd
MSdk 05 Pl		20	19.6	19.6	7	Provincial 2nd
MSdk 05 Sx	4	23	22.4	22.4	7	Provincial 2nd
MSdk 06 Bl			15	15	unk	Provincial 1st
MSdk 06 Fd			18	18	unk	Provincial 1st
MSdk 06 Pl			15	15	unk	Provincial 1st
MSdk 06 Sx	4	25	18	18	unk	Provincial 1st

Notes:
All Provincial SIBEC SI estimates are considered to be valid estimates, regardless of being first or second approximation ("Provincial 1st" or "Provincial 2nd".
TFL SIBEC SI values are only considered to be valid if TFL samples are >= 4 (even if a TFL SIBEC SI value is shown).

Overall, the SIBEC adjustment increases the average site index on the THLB from 17.5 to 19.3 (+1.8 meters). This level of productivity will be realized once all of the THLB has been converted to managed stands. The effect of the SIBEC adjustments on the average site index is reduced by the previous adjustments from the enhanced inventory audit project, which raised the forest cover SI average from 15.4 to 17.5 (Table 24).

Table 24 SIBEC and VRI phase 2 site index results

Forest Inventory	Inventory Adjusted SI	SIBEC SI
15.4	17.5	19.3

In summary, the site index source used to derive analysis unit volumes is assigned as per Table 25.

Table 25 Volume and site index adjustments

Stand Type	Stand Age (years) (*)	Site Index Source	Volume Estimate Source (Software)
Natural stands	< 40	Forest cover estimate (*)	VDYP
Natural stands	41 to 140	Enhanced inventory audit (*)	VDYP
Managed, existing	1 to 30	SIBEC estimate (*)	TIPSY
Managed stands, future	Any	SIBEC estimate	TIPSY

Notes:
(*) Site index, volume, age and height values are after the inventory audit adjustment factors are applied. These site index and volume estimates are used to define land base netdowns and analysis unit assignments.

8.2 Utilization level

Utilization levels define the maximum height of stumps that may be left on harvested areas, the minimum top diameter (inside bark), and the minimum diameter at breast height (dbh) of stems that must be removed from harvested areas. These factors (Table 26) are used when calculating the merchantable stand volume in the analysis.

Table 26 Utilization levels

Species	Utilization		
	Minimum dbh	Maximum stump height	Minimum top dib
Pl	12.5	30	10
All others	17.5	30	10

dbh = diameter at breast height. Dib = diameter inside bark.

8.3 Decay, waste and breakage for natural stands

Decay, waste and breakage factors are applied to natural stand yield tables to obtain net harvest volumes per hectare. This analysis used the standard values incorporated into the Variable Density Yield Prediction (VDYP) model, which are based on species, age, Forest Inventory Zone (FIZ) G, and Public Sustained Yield Unit (PSYU) or Special Cruise (SC) number 314.

8.4 Operational adjustment factors for managed stands

8.4.1 Standard Operational Adjustment Factors

Operational Adjustment Factors (OAFs) were applied in order to adjust potential yields generated by the TIPSY growth and yield model down to net operational volumes. This included reductions for such factors as gaps in stand stocking, decay/waste/breakage, and endemic forest health losses.

There were two types of OAFs used in the TIPSY model. OAF 1 is a constant percentage reduction to account for openings in stands, distribution of stems or clumping, endemic pests and diseases, and other risks to potential yield. OAF 2 is an increasing percentage reduction that can be applied to account for decay, waste and breakage. OAF 2 is applied after OAF 1 and increases linearly over time from 0 percent at age 0 to the specified percentage at 100 years of age.

The OAF1 and OAF2 value used in this analysis were the provincial defaults of 15% and 5%, respectively.

8.4.2 Armillaria Operational Adjustment Factor

The TFL forestry staff has observed Armillaria in the TFL, mostly within the ICH biogeoclimatic subzone. This matches researchers' observations that DRA thrives in the ICH, but survives poorly in the adjacent, drier and wetter BEC zones (Stearns-Smith et al, 2004). An armillaria operational adjustment factor (OAF-DRA) was adopted for this analysis using equivalent assumptions to those used by Stearns-Smith et al (2004) in the Arrow TSA.

An Armillaria severity class of "Low" was chosen based on the evidence that Fd mortality within stands appears to be below 20%, the threshold that denotes "Med" severity, as per Table 27.

Table 27 DRA-OAFs by severity class, reference age 100 (Stearns-Smith, et. Al. 2004)

Severity class	Growth Loss	Mortality Loss	OAF-DRA
Low	.88	.80	.704
Med	.90	.60	.540
High	.93	.40	.372

The OAF-DRA we used is .704 (at reference age=100years). This is of similar magnitude to the DRA OAF of 0.71 developed for the KLFD TSR2 (Norris, 2000.)

It was assumed that current practices include managing for DRA, such as by selecting less-susceptible tree species, and therefore the proportions of Fd within the analysis units will remain constant over time. The proportion of [Fd] within each [AU] in the [ICH BEC zone] was determined (Table 28), and an AU-specific OAF for each AU was incorporated into the TIPSY yield tables.

Table 28 Armillaria Operational Adjustment Factors (OAF-DRA)

Analysis Unit	[A] Proportion In ICH	[B] Proportion Fd	[C] Fd OAF-DRA	[D] DRA Reduction	[E] DRA Reduction	[F] Final OAF-DRA
202	0.007	0.350	0.704	0.296	0.0007	0.999
203	0.016	0.400	0.704	0.296	0.0019	0.998
207	0.001	0.000	0.704	0.296	0	1.0
208	0.004	0.000	0.704	0.296	0	1.0
210	0.016	0.150	0.704	0.296	0.0007	0.999
211	0.005	0.150	0.704	0.296	0.0002	1.0
221	0.006	0.000	0.704	0.296	0	1.0
233	0.003	0.350	0.704	0.296	0.0003	1.0
241	0.002	0.150	0.704	0.296	0.0003	1.0
407	0.337	0.150	0.704	0.296	0.0150	0.985
417	0.478	0.350	0.704	0.296	0.0505	0.950
601	0.177	0.350	0.704	0.296	0.0183	0.982
602	0.012	0.000	0.704	0.296	0	1.0
603	0.010	0.000	0.704	0.296	0	1.0
604	0.070	0.150	0.704	0.296	0.0031	0.997

Notes: Only the analysis units with an Fd component are considered. Column E = A x B x D. Columns [C] and [F] are OAF values in TIPSY format (a value of 0.900 implies a 10% volume reduction). Where the final OAF is 1.000 when rounded to three decimal places, then no OAF-DRA is applied and is specified as 1.0 in column F.

8.5 Volume reductions

All deciduous stands are netted out of the THLB, and the deciduous component is netted out of coniferous leading stands (Table 29)

Table 29 Volume reductions

Stand type	Definition	Volume reduction
Deciduous	ITG = 35 to 42	100%
Deciduous component of coniferous leading stands	Other ITGs	100% of the deciduous volume; 0% of coniferous volume
Pa or Pw	Other ITGs	Pa and Pw leading stands removed from THLB, and Pa and Pw volume is removed from other stands.

Note: ITG = Inventory Type Group

8.6 Yield table development

Stands are grouped into analysis units primarily based on similar species, site index value, slope class (indicates harvest method) and silviculture method. A yield table is developed for each analysis unit.

8.7 Yield tables for natural stands

Yield tables for natural stands were derived using Batch VDYP software (ver 6.6d, 1999) that used the inputs of species, age, height, site index, and crown closure. Inputs come directly from the forest inventory.

An exception is crown closure for young stands. The VDYP batch process uses a file called DEFAULTS.dat that specifies 50 yrs as the cutoff for when "crown closure is accurately defining for computing volumes/diameters". (VDYP manual 1.0, pg 95) Below this age, default CC values are used (Table 30) and then are adjusted linearly by a ratio of the age/50 within the VDYP software. Crown closure values are not updated in the inventory update process and younger stands with low crown closures will cause VDYP to generate sub potential yield curves for these polygons - which then get averaged in the aggregation process. Hence, the crown closure expected for a mature stand must be used in the creation of aggregated timber supply yields.

Table 30 Default Crown Closure for Stands Under 50 Years

Leading Species	Default Crown Closure
Douglas-fir	48
Larch	54
Cedar, Hemlock	51
True fir	42
Spruce	46
Pine	50

Yield Curve Generation

The sequence of developing the yield curves was:

- All natural stands were selected,
- Forest age and height values were modified according to the enhanced inventory audit factors, if appropriate (i.e. stands over 40 years old),
- Each stand's species, age, height, and crown closure were input to VDYP,
- VDYP generated a site index value and volume estimates for each stand,
- The site index from VDYP was used to assign the stand to an analysis unit (AU), and/or the site index and volume were used to assign the stand to a netdown type.
- After netdowns and AU assignment, yield curves were generated for each stand using the adjusted site index and the enhanced inventory audit project volume adjustment factor, if appropriate.
- An AU yield curve was calculated by area-weighting the volume estimates at each time step (i.e. at time=10 years, 20 years, etc) from each stand curve.
- Percentage reductions were applied to future managed stand yield curves for future wildlife tree patches and future RTLs, but not to natural stand yield curves.

Natural stand analysis unit yield curves are included as Appendix A. The site index values for the clearcut analysis units are in Table 31. The site index values for the NCLB analysis units are in Table 32.

Table 31 Site index assignments for clearcut stands

AU	Species	Site Group	Age	Slope	Area (ha)	Natural Site Index	Regenerate To AU #	SIBEC Site Index
101	Fd, Lw	1	<=140	<=45%	364	25.0	201	20.8
102	Fd, Lw	2			2,159	21.1	202	20.5
103	Fd, Lw	3			1,365	17.4	203	20.1
104	Bl, Cw, Hw	1			852	20.9	204	19.2
105	Bl, Cw, Hw	2			707	17.6	205	18.6
106	Bl, Cw, Hw	3			1,632	12.7	206	18.6
107	S	1			905	20.4	207	18.9
108	S	2			749	17.3	208	19.2
109	S	3			971	14.1	209	18.8
110	Pine	1			3,856	22.4	210	20.0
111	Pine	2			5,435	19.5	211	19.5
112	Pine	3			2,993	15.9	212	19.5
115	Fd, Lw	All	> 140		473	16.2	215	19.6
118	Bl, Cw, Hw	All			1,008	11.2	218	18.0
120	S	1,2			439	18.1	220	19.4
121	S	3			1,967	13.2	221	19.1
123	Pine	2			871	19.5	223	19.2
124	Pine	3			503	14.1	224	19.2
133	Fd, Lw	All	<=140	> 45%	533	19.8	233	19.6
136	Bl, Cw, Hw	All			974	15.8	236	18.9
139	S	All			285	16.5	239	18.8
140	Pine	1			186	22.5	240	19.8
141	Pine	2			820	19.2	241	19.1
142	Pine	3			630	16.1	242	18.9
145	Fd, Lw	All	> 140		135	15.0	245	18.6
148	Bl, Cw, Hw	All			543	11.4	248	18.0
151	S	All			805	13.9	251	19.1
154	Pine	All			229	16.9	254	19.1
170	All	All	All	All	950	9.1	270	18.5

Table 32 Site index assignments for non-contributing landbase (NCLB) stands

AU	Notes	Species	Site Group	Age	Slope	Area (ha)	Natural Site Index	Regenerates To AU #
801	NCLB conif	Conif	All	n/a	n/a	19,041	14.3	801
802	NCLB Decid	Decid	All	n/a	n/a	515	17.5	802

8.7.1 Existing timber volume check

The total forest volume was estimated based on the yield curves, and compared to the volume estimated in the forest inventory (after correction for age, height and volume). Table 33 is a comparison of the two estimates. The volumes are for THLB stands in the THLB only, and are net of deciduous-leading and Decid/Pa/Pw component volumes.

Table 33 Timber Volume Check

Stand Type	Inventory Polygon volume ('000 m3)	Yield table (AU) volume ('000 m3)	Percent (%) Difference
Natural Stands – THLB	9,266	9,443	1.9

8.8 Yield tables for managed stands

This section summarizes the inputs used in the TIPSY growth and yield model for the managed stand analysis units (200 series). Partial harvest analysis units and yield curves are discussed in section 8.8.6. Natural stands (100 series) move onto matching 200 series analysis units after harvest. When existing managed stands (500 series) are harvested, they move onto the future managed stand AU's (600 series). These are identical to the 500 series but reflect the genetic gains for future managed stands.

8.8.1 Silviculture management regimes

Both clearcut and partial cut systems are utilized within TFL 14. Almost all harvesting is followed by planting. Most of the partial cutting within the TFL is employed within the VQO management areas. Partial harvesting is discussed in section 8.8.6.

Average, historical regeneration practices were reflected in the existing managed stand AU inputs (500 series) while current regeneration practices are reflected in the future managed stand AU inputs

8.8.2 Regeneration delay

Regeneration delay is the time between harvesting and the time when a new stand is initiated. The delay incorporates both the time taken to establish a stand, and the age of seedling stock planted, if applicable. For this analysis, regeneration delay was estimated based on the TFL's silviculture records for the existing managed stands.

Existing managed stands.

For existing managed stands, regeneration delay was addressed through the use of actual stand age in the forest inventory file. This age represents the actual age of the stand and not the time since harvesting. For example, a stand may have been harvested 15 years ago but the current stand age is 12 – this implies a 3 year regeneration delay. The use of actual ages eliminated the need to estimate an average regeneration delay for these stands.

Future managed Stands

For planted sites, current practices were estimated from a summary of the last 10 years of blocks declared free growing. The summary indicated that the average planting delay for blocks was 2.2 years. No advanced regeneration blocks were included in the summary. After accounting for one year old planting stock, the average regeneration delay is 1.2 years. A regeneration delay of 2 years was chosen for the future, managed stand yield curves to account for any possible plantation failures. Regeneration delays for future managed stands were input into TISPY and are therefore imbedded in the published yield curves.

8.8.3 Stand rehabilitation

Given the priority on managing mountain pine beetle (MPB) infested stands, there is no stand rehabilitation is occurring in the TFL. No rehabilitation of problem forest types or non merchantable types was modeled.

8.8.4 Genetic improvement

As required by the Chief Forester's Standards for Seed Use (Nov 23, 2006), the TFL uses select seed for regeneration purposes when reasonable gains are projected. This section describes the yield

adjustments used in this analysis to account for the use of select seed (i.e., orchard & select provenance seed with a known genetic gain as measured by Genetic Worth [GW]).

Seed planning units (SPU's) geographically delineate the appropriate area of seedling use for stock coming from particular seed orchards. Each SPU also has defined elevation range for seedlings. The select seed SPU's that occur within the TFL are listed in Table 34.

Table 34 Seed Planning Units in TFL 14 (Class A seed)

Species	Class A Seed Planning Zone	SPU	Min Elev (m)	Max Elev (m)
Douglas-fir	East Kootenay (EK)	FDI EK ALL	700	1400
Western Larch	East Kootenay (EK)	LW EK ALL	800	1500
Lodgepole Pine	East Kootenay (EK)	PLI EK LOW	800	1500
Interior Spruce	East Kootenay (EK)	SX EK ALL	750	1700

The statistics on the historical use of select seed for all the tables in this section was obtained from the Ministry of Forests Seed Planning & Registry system (SPAR), as summarized by L. McAuley (2006). This information was used to derive current practice estimates of net genetic gain (Net GW) at the species level (Table 35). This table illustrates the weighted average GW for each species for the last 3 years [A], the percent select seed use for each species in the TFL [B], and the Net GW for each species [C]. The Net GW was calculated by multiplying [A] x [B].

Table 35 GW Calculation of net genetic worth by species in TFL 14

	Wt Avg GW by Species (Class A) [A]					% Class A of Total Seedlings Planted [B]					Net GW by Species [C]			
Year	Fd	Lw	Pl	Sx		Fd	Lw	Pl	Sx		Fd	Lw	Pl	Sx
2006	0	13	3	27		0	97	82	53		0.0	12.6	2.5	14.3
2005	0	12	3	21		0	92	48	99		0.0	11.0	1.4	20.8
2004	0	9	3	23		0	100	74	92		0.0	9.0	2.2	21.2
3 yr Avg	0.0	11.3	3.0	23.7		0.0	96.3	68.0	81.3		**0.0**	**10.9**	**2.0**	**18.8**
30 Yr Avg	0.0	1.1	0.3	2.4		0.0	9.6	6.8	8.1		**0.0**	**1.1**	**0.2**	**1.9**

The 30 years average gains shown are suitable for use in generating existing managed stands yields as they reflect a watered down gain associated with many years of planting seed with no gains. Genetic gains of 0% would be applied to Fd, 1.1% to Lw, 0.2% for Pl and 1.9% for Sx for the existing managed stands.

Increased gains are projected for these SPU's within 10 years and the planning horizon for this analysis is > 250 years. Thus, it is reasonable to use the projected gains for use in the base case as it will result in an overestimate for only the first decade, and then realistic or conservative estimates for the remaining 24 decades.

Future projected gains are estimated as per Table 36. The estimated, future effective genetic worth for each SPU is provided in column [B] while the availability to meet SPU seed needs is provided in column [C]. The projected GW to be achieved (column D) is the product [B] and [C]. It is assumed that seed from the SPU is eligible for use where that species is planted in the TFL.

Table 36 Seed planning units (Class A seed) genetic worth and seed availability

SPU	% of Seed Use Eligible to come from SPU	Min Elev (m)	Max Elev (m)	Projected Future Genetic Worth in 2016 [B]	Projected Availability In2016 [C]	Projected Genetic Worth Achieved In 2016 [D]
FDI EK ALL	100%	700	1400	20	70	**14**
LW EK ALL	100%	800	1500	16	100	**16**
PLI EK LOW	100%	800	1500	15	47 (*)	**7.1**
SX EK ALL	100%	750	1700	28	90	**25.2**

Values obtained from "Breeding and orchard production" reports (L. McAuley, MoF, 2006)
(*) Average availability of 4% in 2016 and 89% in 2025

The application of this data by AU in the timber supply model is summarized as Table 37, and is included in the TIPSY inputs tables (Table 41).

In summary, the 30-year historical average from Table 35 was applied when modeling existing managed stands because this best corresponds with the criteria used to define these stands. When generating the AU yields in TIPSY for these stands, larch will have a 1% GW applied while spruce will have a 2% GW applied. Future managed stands will have the 2016 Net GW's for Fd (14%), Lw (16%), Pl (7.1%), and Sx (25.2%). No change in genetic gains was scheduled during the planning horizon.

Genetic gains (Table 37) will be incorporated into the growth and yield curves through TIPSY model functionality. When a species identified in Table 37 is included in a managed stand AU, its associated Net GW will be input into TIPSY. This Net GW reflects the genetic gain associated with all seedlings of a given species planted in a typical year. Where surrogate species were used in TIPSY, the GW employed is prorated to reflect the relative GW's of the original species (i.e. Sx used for Bl but Sx GW not applied to Bl proportion).

Table 37 Summary of genetic worth used for modelling with each species

Species	Existing, Managed Stands Genetic Worth	Future Managed Stands, Genetic Worth
Fd	0	14
Lw	1.1	16
Pl	0.2	7.1
Sx	1.9	25.2

8.8.5 Planting Density

Values of 2400 sph for Pl and Fd leading analysis units, and 1600 sph for S and Bl leading units were derived from a combination of the TFL silviculture records and staff experience. These densities are considered to reflect the number of stems competing to be crop trees and are between well spaced and total stocking densities.

8.8.6 Modelling Partial Cut Stands

Partial cutting is largely employed within the scenic management areas in TFL 14. A great variety of partial cutting systems and removal rates have been used on the TFL over the last 30 years. Partial cut stands have undergone harvest intensities varying from single trees to almost total removal of the overstory on the first cut. Some stands are now scheduled for a second entry, again of varying intensities. A summary of the last two years of harvest broken down by silviculture system is provided in Table 38.

Table 38 Recent volume of harvesting on TFL 14 according to silviculture system.

Silviculture System	Volume cut in 2005 (m3)	Volume cut in 2006 (m3)	Total	Percent
IMCUT	9,750	4,022	13,772	4.62
SHELT	6,067	438	6,505	2.18
CCRES	116,451	121,512	237,963	79.79
CLEAR	19,393	20,596	39,989	13.41
Totals	153,666	148,574	298,229	100.00

For simplicity, the modeling of partial cutting is broken into two regimes. The first is existing partial cut stands (referred to in this analysis as "shelterwood stands") which are assumed to undergo one further removal cut before becoming a clearcut. Future partial cut stands will be treated as a three pass - group selection regime, equivalent to a small patch-cut regime. Partial cutting stands are broken into two species groups: pine-leading and non-pine leading stands. Both undergo the same harvest and silviculture cycles, resulting in parallel sets of analysis units: AU 302 and 404 to 407 for pine-leading; and AU 312 and 414 to 417 for non-pine leading stands. These two regimes are discussed below.

Shelterwood stands (AU 302, 312)

The historic partial cutting was simplified to a "shelterwood" system because the harvest intensity was most similar to a shelterwood. The modeling of the cutting cycle was simplified to the following sequence:

- Stands are assumed to have already had an initial harvest entry that removed 50% of the overstory. The remaining overstory is represented, for example, as AU 302 (the AU numbers in the examples will be for pine-leading stands, AU 302's equivalent non-pine leading number is AU 312).
- AU 302 is eligible for a final harvest entry after 20 years, and it will then be represented as AU 407. The stand is regenerated by planting at this time. All volume is harvested in this final entry, except an estimated 2% residual stand volume that remains for various factors, mostly associated with areas that are isolated when retaining advanced regeneration. The volume is lost and is not included in future yield curves.
- The age of the stand after harvest is set to zero (0). No advanced regeneration is assumed, although in many cases some portion of the block will have advanced regeneration that can be saved. Regeneration is assumed to always be achieved by planting. Analysis Unit 407 is a three-pass, partial cut harvest regime with 1/3 removal each harvest entry. AU 407 continually cycles back to itself after each harvest entry.

Inputs to the yield curves for partial cut stands are in section 8.8.7.

Patch cut stands (AU 404-407, 414-417)

Future partial harvesting practices in the TFL are modeled as a group selection regime (or small patch cuts) rather than the "shelterwood" system, above. This will be modeled using the following cutting sequence:

- Non-harvested stands are represented as AU 404 (again, examples are for pine-leading stands.) The yield curve is based on a natural stand (VDYP) yield curve.
- The stand undergoes an initial harvest of 33% of its volume. The small, harvested patches are then planted. The stand is now represented as AU 405 which is identical to 404, but required for tracking purposes in the model. The regeneration is based on a managed stand (TIPSY) yield curve. The stand's age in the model after this first cut is the age of the overstory.
- The stand is eligible for a second harvest after another 30 years. This entry removes another 33% of the original stand, and the harvested portion is again planted. The stand is now represented as AU 406. This is the same stand as AU 404, but required for tracking purposes in the model. The stand's age in the model is still the age of the overstory. The age of the regeneration that was established after the first cut is not tracked in the model, but is assumed to

be 28 years (30 years minus the 2 year regen delay). Two years after this second harvest another regeneration layer is assumed to be established with [age=0].

- The stand is eligible for a third harvest entry after another 30 years. This entry removes the remaining volume associated with the original, natural stand. The harvested portion is again planted. The stand is now represented as AU 407. After a 2 year regen delay, the three cohorts within the stand are all on managed stand (TIPSY) yield curves, each at a different age (ages=0, 30, 60). The stand age that is tracked in the model is always taken from the oldest cohort (60 years). The yield curve for each cohort is assumed to be 1/3 of the yield curve values for AU 407 as it is presented in the Appendices.
- The stand continually cycles as AU 407, with the stand eligible for an entry that removes 1/3 of the volume when the oldest cohort reaches an age of 90 years.

After having undergone complete harvest cycles the shelterwood and the patch cut stands will all be tracking along the AU 407 yield curve (AU 417 for non-pine stands). This is summarized in Table 39. The site index assignments for these AUs are provided in Table 40.

Table 39 Analysis Units - partial cut – cutting sequence

Harvest History	Leading Species	Regime	AU Pre 1st Cut	AU Post 1st cut	AU Post 2nd cut	AU Post 3rd cut
Previous Partial Cut	Pine	Pl – "Shelterwood"	N/A	302	407	N/A
	NonPine	Non Pl – "Shelterwood"	N/A	312	417	N/A
No Previous Harvest	Pine	Pl - Patch cut	404	405	406	407
	Non Pine	Non Pl - Patch cut	414	415	416	417

Notes: All partial harvesting (shelterwood or patch cut) occurs in scenic management areas.

Table 40 Site index assignments for existing partial cut stands

AU	Leading Species	Description	Area (ha)	Site Index	Moves To AU #	SIBEC SI
302	Pine	Pl – "Shelterwood" pre 2nd cut	112	19.9	407	20.3
312	Non-Pine	Non-Pl – "Shelterwood" pre 2nd cut	1,034	20.5	417	21.0
404	Pine	Pl - Patch cut pre 1st cut	1,467	19.9	407	20.3
414	Non-Pine	Non-Pl - Patch cut 1st cut	2,831	20.5	417	21.0

8.8.7 TIPSY managed stand yield table inputs

Existing and future managed yield curves will be derived using the BatchTIPSY (ver 3.2) software with the following inputs.

Table 41 Inputs (to TIPSY) for Future Managed Stand Yield Curves

Managed Stand AU	Planted Species Composition	Site Index	OAF1	OAF2	OAF DRA	Regen Delay	Utilization Level	Initial Density	Select Seed Gains
201 - Fd	Fd 35, Lw 30, Pli 20, Sx15	20.8	15	5	0.2	2	17.5	2,400	7.1-25.2 (*)
202 - Fd	Fd 35, Lw 30, Pli 25, Sx10	20.5			0.5	2	17.5	2,400	7.1-25.2 (*)
203 - Fd	Fd 40, Lw 30, Pli 30	20.1			0	2	17.5	2,400	7.1-25.2 (*)
204 - Bl	Sx 50, Pli 50	19.2	15	5	0	2	17.5	1,600	7.1-25.2 (*)
205 - Bl	Sx 50, Pli 50	18.6				2	17.5	1,600	7.1-25.2 (*)
206 - Bl	Sx 50, Pli 50	18.6				2	17.5	1,600	7.1-25.2 (*)
207 - Se	Sx 50, Pli 50	18.9	15	5	0	2	17.5	1,600	7.1-25.2 (*)
208 - Se	Sx 50, Pli 50	19.2				2	17.5	1,600	7.1-25.2 (*)
209 - Se	Sx 50, Pli 50	18.8				2	17.5	1,600	7.1-25.2 (*)
210 - Pl	Pli 50, Lw 20, SX 15 Fd 15	20.0	15	5	0.2	2	12.5	2,400	7.1-25.2 (*)
211 - Pl	Pli 50, Lw 20, SX 15, Fd 15	19.5			0	2	12.5	2,400	7.1-25.2 (*)
212 - Pl	Pli70, Sx 30	19.5			0	2	12.5	2,400	7.1-25.2 (*)
215 - Fd	Fd 35, Lw 30, Pli 25, Sx10	19.6	15	5	0	2	17.5	2,400	7.1-25.2 (*)
218 - Bl	Sx 50, Pli 50	18.0	15	5	0	2	17.5	1,600	7.1-25.2 (*)
220- Se	Sx 50, Pli 50	19.4	15	5	0	2	17.5	1,600	7.1-25.2 (*)
221- Se	Sx 50, Pli 50	19.1				2	17.5	1,600	7.1-25.2 (*)
223 – Pl	Pli 50, Lw 20, Sx 15, Fd 15	19.2	15	5	0	2	12.5	2,400	7.1-25.2 (*)
224 – Pl	Pli70, Sx 30	19.2				2	12.5	2,400	7.1-25.2 (*)
233 - Fd	Fd 35, Lw 30, Pli 25, Sx10	19.6	15	5	0.1	2	17.5	2,400	7.1-25.2 (*)
236 - Bl	Sx 50, Pli 50	18.9	15	5	0	2	17.5	1,600	7.1-25.2 (*)
239 - Se	Sx 50, Pli 50	18.8	15	5	0	2	17.5	1,600	7.1-25.2 (*)
240 - Pl	Pli 50, Lw 20, Sx 15, Fd 15	19.8	15	5	0	2	12.5	2,400	7.1-25.2 (*)
241 - Pl	Pli 50, Lw 20, Sx 15, Fd 15	19.1				2	12.5	2,400	7.1-25.2 (*)
242 - Pl	Pli70, Sx 30	18.9				2	12.5	2,400	7.1-25.2 (*)
245 - Fd	Fd 40, Lw 30, Pli 30	18.6	15	5	0	2	17.5	2,400	7.1-25.2 (*)
248 - Bl	Sx 50, Pli 50	18.0	15	5	0	2	17.5	1,600	7.1-25.2 (*)
251 - Se	Sx 50, Pli 50	19.1	15	5	0	2	17.5	1,600	7.1-25.2 (*)
254 - Pl	Pli70, Sx 30	19.1	15	5	0	2	12.5	2,400	7.1-25.2 (*)
270 - IU	Pli 50, Lw 20, Sx 15, Fd 15	18.5	15	5	0	2	12.5	2,400	7.1-25.2 (*)
601 - Fd	Fd 35, Lw 30, Pli 25, Sx10	20.2	15	5	4.4	2	17.5	2,400	7.1-25.2 (*)
602 - Bl	Sx 50, Pli 50	18.4	15	5	0	2	17.5	1,600	7.1-25.2 (*)
603 - Se	Sx 50, Pli 50	19.3	15	5	0	2	17.5	1,600	7.1-25.2 (*)
604 – Pl	Pli 50, Lw 20, SX 15, Fd 15	19.4	15	5	0.7	2	12.5	2,400	7.1-25.2 (*)

(*) = GW range, see genetic worth section for each species.

Table 42 Inputs (to TIPSY) for Existing Managed Stand Yield Curves

Managed Stand AU	Planted Species Composition	Site Index	OAF1	OAF2	OAF DRA	Regen Delay	Utilization Level	Initial Density	Select Seed Gains
501 – Fd	F56,L17,Pl13,S13	20.2	15	5	4.4	n/a	20.1	2,400	0 – 1.9 (*)
502 - Bl	B 58, Pli 21,Sx20,Fd16	28.4	15	5	0	n/a	18.5	1,600	0 – 1.9 (*)
503 - Se	S62,B21,Pl17	19.4	15	5	0	n/a	19.4	1,600	0 – 1.9 (*)
504 – Pl	Pl 72, B 10, Fd 9, Sx 9	19.4	15	5	0.7	n/a	19.4	2,400	0 – 1.9 (*)

(*) = GW range, see genetic worth section for each species.

Table 43 Inputs (to TIPSY) for Partial Cut Managed Stand Yield Curves

Managed Stand AU	Planted Species Composition	Site Index	OAF1	OAF2	OAF DRA	Regen Delay	Utilization Level	Initial Density	Select Seed Gains
407 – Pine Partial cut	Pli 50, Lw 20, SX 15, Fd 15	20.3	15	5	3.6	2	12.5	2,400	7.1-25.2 (*)
417 – Non-pine Partial cut	Fd 35, Lw 30, Pli 20, Sx15	21.0	15	5	11.8	2	17.5	2,400	7.1-25.2 (*)

(*) = GW range, see genetic worth section for each species.

8.9 Silviculture history

8.9.1 Existing managed stands

Existing managed stands are defined as those stands currently <=30 yrs old with a logging history plus any older stands with a record of planting or spacing in the forest inventory file. The 30-year figure corresponds to the time when fairly intensive silvicultural management started on the TFL.

Both future managed stands and existing managed stand yield curves were determined using TIPSY. Inputs for the existing managed stands are in Table 42.

8.9.2 Backlog and current non-stocked area (NSR)

Backlog NSR is any area not yet fully stocked that was denuded prior to 1987 when basic silviculture became the obligation of licensees. No backlog NSR exists in TFL 14. All existing NSR areas are considered current NSR.

9.0 Protection

9.1 Unsalvaged losses

The purpose of this section is to quantify the average annual volume of timber that, in the future, will be damaged or killed on the THLB and will not be salvaged or accounted for by other factors. These losses are due to a number of factors that cause tree mortality, including insects, disease, blowdown, snowpress, wildfires, etc. This factor is meant to capture catastrophic natural events like the fires that occurred in the Invermere area in 2003. Endemic pest losses are dealt with through factors applied in the growth and yield models as noted below:

> **TIPSY**: Operational Adjustment Factors reduce the gross volumes to account for losses toward maturity such as decay, and endemic forest health issues like minor infestations.
>
> **VDYP**: The model predicts actual average yields from appropriate inventory ground plots. Endemic losses are inherently recognized in the model data.

Given the small area of the TFL and the limited amount of local data most of the unsalvaged losses are estimated by prorating the non-recoverable loss (NRL) numbers from the Invermere TSA TSR3 timber supply analysis. Prorating was based on the area of THLB. Tree Farm Licence 14's timber harvesting landbase is approximately 20% of the Invermere TSA's (Table 44).

The exception is the estimate of mountain pine beetle (MPB) NRLs. The TFL staff believes they are containing the present MPB outbreak through aggressive management, and they are salvaging the majority of the beetle-attacked timber. However, they are still experiencing volume losses associated with the fall and burn program.

They estimated a new MPB NRL by starting with the prorated, Invermere TSR3 estimate (3,542 m3/yr). That number was felt to be too high as it should directly translate into an area of attack that would be easily visible on the yearly, detailed MPB flights. Such is not the case; there simply isn't that area of visible, MPB-attacked stands. Large attacks that cover whole stands (and the subsequent stand-sized, unsalvaged areas of MPB mortality) are not evident in the TFL. Rather, these stands are being promptly harvested. Hence, they are salvaged and cannot be included in the NRL statistics.

The 3,542 number was used as an estimate of the dispersed, single and small-group attacks that are being addressed through the fall and burn program. The ratio of MPB-attacked (salvaged volume : lost or NRL volume due to felling and burning) in that program is estimated as (72% : 28%). The 28% loss proportion was applied to the total estimate of 3,542 m3/yr to arrive at a new estimate of 992 m3./yr (Table 44).

Table 44 Unsalvaged losses

Description	Invermere TSR3 unsalvaged Losses on THLB (m3/yr)	TFL14 unsalvaged Losses on THLB (m3/yr)
Mountain pine beetle	15,673	992
Spruce bark beetle	38	9
Douglas-fir bark beetle	307	69
Balsam bark beetle	302	68
Dwarf mistletoe	1,763	398
Catastrophic blowdown / snowpress (mature stands)	330	75
Non catastrophic in-block blowdown / snowpress (adjacent to logged stands)	5	1
Non catastrophic blowdown / snowpress (immediately adjacent to roads)	27	6
Wildfires	5,882	1,329
Total	**24,327**	**2,947**

10.0 Integrated Resource Management

The resource management zones were introduced in section 6.0. This section describes the forest cover requirements that are associated with those management zones.

10.1 Non-timber forest resource management

10.1.1 Forest Cover Requirements

Forest cover requirements are applied within the timber supply model to accommodate the timber and non-timber resource objectives. These requirements maintain appropriate levels of specific forest types that are needed to satisfy the objectives for wildlife habitat, visual quality, biological diversity, etc. Forest cover requirements are used by the model to limit harvesting within the THLB.

These requirements are typically expressed as:

- a maximum amount of forest that can be younger than age X (or shorter than height Y);
- a minimum amount of forest that must be older than age W (or taller than height Z);

Forest cover requirements may be overlapping. The model will evaluate each requirement independently to ensure that the harvesting of a specific area does not violate any one of the requirements. Table 45 summarizes the management zones that occur in TFL 14. The details of specific forest cover requirements follow.

Table 45 Resource emphasis areas

Name	Criteria used to delineate zone/group	Rationale/comments
High Biodiversity Emphasis Option (BEO) Areas	CFLB within BEO / LU / BEC	Designated by the HLPO (Oct 2002). Requirements exist to maintain old and mature forest for biodiversity. When retained old and/or mature stands for biodiversity – connectivity corridors and grizzly habitat areas were given a high priority. Within the Low BEO areas, old seral targets start at 1/3 full targets.
Intermediate BEO Areas	CFLB within BEO / LU / BEC	
Low BEO Areas	CFLB within BEO / LU / BEC	
Caribou Management zones	CFLB forest; no "protected" ownership; below 80% slope; by caribou zones	Designated by HLPO Objective 3 (Variance 04) Requirements exist to maintain old and mature forest habitats.
Riparian Areas	Reserve widths around classified streams, lakes and wetlands.	Reserve zones are based on FSC default reserve widths and retention.
Domestic or Sensitive Watersheds	CFLB within each watershed	KBLUP-IS. Water quality, quantity and timing of flow are to be maintained.
Ungulate Winter Range (UWR)	CFLB within each LU by habitat class	Management practices equivalent to the Invermere TSA GAR Order U-4-008 for UWR.
Visual landscapes	CFLB within each VQO polygon	Visual Quality Objectives defined by the District Manager (March, 2003)
Integrated Resource Management (IRM)	THLB excepting the ERDZ zone (below)	Designated by the HLPO (Oct 2002). Specifies a min green-up.
Enhanced Resource Development Zone (ERDZ)	THLB within ERDZ	Designated by the HLPO (Oct 2002). Specifies a relaxed green-up requirement.
High Conservation Value Forests (HCVF)	CFLB within each HCVF	Proposed management practices adopted under FSC.
Ecosystem Representation	CFLB; target hectares of Specified ecosystem site series	Proposed management practices adopted under FSC.

Table 46 Resource emphasis areas – modeling constraints

Name	Crown Forested Area (ha)	THLB Area (ha)	Forest resource requirements.
High Biodiversity Emphasis Option (BEO) Areas	0	0	Old seral: no harvest within spatial OGMAs for first rotation; maintain the required old seral percentage for the 2nd , 3rd, etc. rotations. Spatial OGMAs will be reduced from 3/3 old (mapped) to 1/3 old (modeled in the first rotation) in the low BEO areas.
Intermediate BEO Areas	21,473	18,398	
Low BEO Areas	50,903	34,422	
Caribou Management zones	206	2	Zone 1, priority 1,2: No harvest Zone 6: min 70% > 140 years old Zone 8: min 30% > 140 years old Zone 8: min 10% > 250 years old
Riparian Areas	1,986	0	Reserves around classified streams, lakes and wetlands.
Domestic or Sensitive Watersheds	7,511	5,914	Max 30% Equivalent Clearcut Area (ECA).
Ungulate Winter Range (UWR)	27,737	24,470	MF - dry: min 10% > 100 years MF – dry: min 10% >100 years MF – trans: min 10% >60 years MF – trans: min 10% >100 years; S,F leading MF – mesic: min 10% >60 years MF – mesic: min 20% >100 years; S,F leading MF – moist: min 20% >60 years MF – wet: min 30% >60 years
Visual landscapes	12,177	9,832	Maximum of X% < visual greenup age of Y, applied within each VQO polygon.
Integrated Resource Management	28,189	28,189	Maximum of 33% < 12 years within LU/IRM zone
Enhanced Resource Development Zone (ERDZ)	24,633	24,633	Maximum of 33%<2 yr within LU/ERDZ zone

10.1.1.1 Green-up / Maximum disturbance

The HLPO contains green-up requirements that require a logged block to achieve a specific condition called green-up before adjacent areas can be logged. Green-up refers to the average height of the regenerating forest reaching a specified target. Green-up requirements can often be waived if licensees manage for patch size distributions specified in the HLPO and detailed in the Landscape Unit Planning Guide (MoF/MoE 1999). Modeling of adjacent cut-block green-up requirements was accomplished using forest level objectives, as opposed to block specific objectives, because this is consistent with the operational flexibility afforded by patch size management. Green-up requirements and the area of application are provided in Table 47.

Table 47 Green-up requirements by management zone

Management Zone	Green-up Requirement	Modeled Green-up Constraint	Area to which it applies
HLPO ERDZ Timber Zone	successful regeneration (stocked)	max 33% < 2 yr within LU/ERDZ	THLB area inside the HLPO mapped ERDZ timber zone
Integrated Resource Management Zone	2.5 m tall trees	Max 33%<13 years within LU/IRM	THLB not in ERDZ zone

Age to green-up was determined by calculating a weighted average stand type for each of the zones and then evaluating the age/height relationship for the stand in SiteTools. The IRM zone was Pl leading with

an average site index of 16.8 – giving an 11 year greenup period. A 2 year regeneration delay is then added to this value.

10.1.2 Visual Resources

In this analysis, forest cover requirements aimed at meeting these objectives were applied so that the amount of younger stands that can occur in visually sensitive areas was limited. The following procedure was used to model the visual quality objectives:

All VQO polygons had maximum planimetric percent disturbance values assigned based on VQO, visual absorption capability, and viewing distance from main corridors/towns (values provided in Table 48). The viewpoints/corridors are from Highway 95, immediately to the east of the TFL.

Table 48 Visually sensitive areas: Maximum planimetric disturbance %'s

VQO	<1 km View Distance			1-5 km View Distance			5-12 km View Distance			>12 km
AA	Low VAC*	Mod VAC	High VAC	Low VAC*	Mod VAC	High VAC	Low VAC*	Mod VAC	High VAC	All VAC's
Partial Retention	10%	12.5%	15%	12.5%	15%	17.5%	15%	20%	25%	25%
Modification	15%	17.5%	20%	17.5%	20%	22.5%	20%	25%	33%	33%

Notes: Only VQO classes of Modification and Partial Retention occur within the TFL.

VQO polygons each had an area weighted average slope assigned and a "visually effective greenup" (VEG) height calculated according to Table 49 extracted from Procedures for Factoring Visual Resources into Timber Supply Analyses (MoF 1998).

Table 49 Tree heights required for meeting visually effective green-up by percent slope

	Slope Class (%)											
	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-45	46-50	51-55	56-60	60+
Tree Height (m)	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.3	8.5

Each VQO polygon had the resulting forest cover objective applied to its crown forested area in the model. For example, a VQO of Retention in the foreground with a VAC of High and an average slope of 32% would have the following objective: No more than 7.5% of the crown forested area in the VQO polygon can be less than 6m tall.

The maximum disturbance percentages outlined in Table 48 were developed for use in the East Kootenay's by MoF District and Regional staff (Invermere TSR3, Cranbrook TSR3). They were believed to reflect current management in the TSA and reflect the use of good visual design during the development of cutting permits. The visually effective green-up heights for each polygon were translated into green-up ages for use during modeling. Age to green-up was calculated in Site Tools using a weighted average stand type for all VQO polygons. Visually effective greenup ages ranges from 5 to 17 years, based on an Fd stand with a site index of 20.1.

The above visual requirements pertain to clearcut harvesting, which is employed within the modification (M) VQO areas. In the case of partial cutting, which is employed within the partial retention VQO class (PR), Table 50 is more applicable. This table provides the most likely existing visual condition (EVC) given a basal area removal rate (MoF, 1997, 1998, 2003a). The existing "shelterwood" harvest stands, which are represented as stands with a 50% volume removal, are expected to meet the retention EVC. Then they undergo the final removal cut and fall under the clearcut requirements above.

The three-pass, future "partial" harvest analysis units should always meet or exceed the partial retention (PR) VQO objective throughout their entire cutting cycle since the stand entries remove 33% and 67% volume removal rates in the first two passes, respectively. Once these stands enter their third pass and onwards, they will always have 1/3 of the stand with 58+-year-old regeneration, and another 1/3 of the stand with 28+-year-old regeneration. These partial cut stands, therefore, effectively escape from a forest requirement, although they have much lower (1/3+/-) volume-per-hectare harvest removal rate compared to clearcut stands.

Table 50 Estimated probabilities of EVC classes for selected basal area removed (%)

Basal Area Removed	M (%)	PR (%)	R (%)	Most Probable EVC	Maximum Probability (%)
5	0	0.3	99.7	R	99.7
10	0	0.5	99.5	R	99.5
15	0	0.9	99.1	R	99.1
20	0	1.6	98.4	R	98.4
25	0.1	2.9	97.1	R	97.1
30	0.1	5.2	94.7	R	94.7
35	0.3	9.2	90.6	R	90.6
40	0.5	15.6	83.9	R	83.9
45	0.9	25.4	73.8	R	73.8
50	1.6	38.1	60.3	R	60.3
55	2.9	52.0	45.1	PR	52.0
60	5.3	63.9	30.8	PR	63.9
65	9.4	71.3	19.4	PR	71.3
70	16.0	72.5	11.5	PR	72.5
75	26.1	67.3	6.6	PR	67.3
80	39.5	56.8	3.7	PR	56.8
85	54.7	43.3	2.0	M	54.7
90	69.1	29.8	1.1	M	69.1
95	80.5	18.9	0.6	M	80.5

Notes: Probabilities are given as percentages. Table from Ministry of Forests (1997)

10.1.3 Recreation resources

Forest cover retention within the important recreation areas in the TFL was addressed primarily through the netdown process associated with the riparian areas around the streams and lakes.

10.1.4 Wildlife

10.1.4.1 Ungulate winter range

TFL 14 ungulate winter range is currently being managed under a Section 7 notice, which is in the process of being turned into a GAR Order. The forest requirements are expected to be identical to the present Invermere TSA UWR GAR Order. As per the recommendation by MoE staff (P. Holmes, 2007) the Invermere GAR wording forms the basis of the results and strategies in Tembec's approved FSP. The forest requirements in the FSP are provided in Table 51.

Table 51 Ungulate winter range requirements

Habitat type	Ungulate Species	Landscape and Stand Level Forest Cover Retention Requirements	Definitions that pertain to Forest Cover Requirements
Open Range	Elk, bighorn sheep, mule deer, white-tailed deer, mountain goat	Stocking standards: 5-75 sph	n/a (none in TFL)
Open Forest	Elk, bighorn sheep, mule deer, white-tailed deer, mountain goat	Stocking standards: 76-400 sph	n/a (none in TFL)
Managed Forest (dry)	Elk, bighorn sheep, mule deer, white-tailed deer	Min 10% Mature cover	>100 years cc GE 20%; or layer1 age > 100 years
Managed Forest (transitional)	Moose, elk, mule deer, white-tailed deer	Min 10% snow interception cover	>60 years and evergreen cc min 40%
		Min 10% mature cover	>100 years, Fd or Sx leading and cc min 40%
Managed Forest (mesic)	Elk, mule deer	Min 10% snow interception cover	>60 years and evergreen cc min 40%
		Min 20% mature cover	>100 years, Fd or Sx leading and cc min 40%
Managed Forest (Moist)	Moose	Min 20% snow interception cover	>60 years and evergreen cc min 40%
Managed Forest (Wet)	Moose	Min 30% snow interception cover	>60 years and evergreen cc min 40%
Avalanche tracks (*)	Moose, elk	50 m of forest cover adjacent to high value habitat within avalanche tracks	>60 years old

Notes:
cc = evergreen crown closure; all confers except larch counted at full relative cc; larch and decid species at 50% of their cc (cited, but not used in modeling).
(*) no GAR-mapping of avalanche tracks, managed in the Base Case Option through the deployment of OGMAs.

10.1.4.2 Identified wildlife

No Wildlife Habitat Areas (WHAs) have been made know in TFL 14 as of December 2006. The impacts of future WHA's has been budgeted at a 1% AAC impact by provincial policy. This 1% has not been implemented in the analysis.

10.1.4.3 Caribou

Section 3 of the Kootenay Boundary Higher Level Plan Order specifies caribou habitat management guidelines to be applied in a number of zones within mapped caribou habitat. The forest cover requirements associated with these caribou zones are listed in Table 52. Only a few hectares of THLB are covered by these requirements. The caribou habitat mapping at the time of the MP8 timbers supply analysis did not overlap the THLB at all.

Table 52 HLPO caribou forest cover requirement

Caribou Mngt. Zone	Zone Priority	Leading tree species	Minimum Forest retention	Min. Basal Area Remaining	Minimum Forest age class	Notes
1	1,2	Pl, Fd, or Lw	100%	--	--	Previously harvested stands require future decisions
6	2	All	Min 70%	--	8	
8	2	All	Min 30%	--	8	
		All	Min 10%	--	9	
8	2	All	20% Partial cut	70	7	(*)

Notes:
Caribou requirements are listed for only those caribou zones that fall within TFL 14; Map 3.1; Central Selkirk herd.
(*) not modeled.

10.1.4.4 Grizzly bear \ avalanche path

Section 5 of the HLPO identifies important grizzly bear habitat (avalanche tracks, den sites, etc.) as high priority areas when allocating old and mature forest retention targets. Tembec's Sustainable Forest Management Plan includes an Avalanche Path Strategy, which includes "*buffers of between 50-100 meters minimum on high and moderate class avalanche paths*" for grizzlies and ungulates (primarily moose and elk). Avalanche path mapping has been completed in TFL 14. Avalanche paths were used to prioritize the placement of OGMAs, which are modeled in the Base Case Option. No further requirements are modeled in the Base Case Option. Additional avalanche path reserves are modeled in the Sustained Forest Management Plan Option (Section 11.0).

10.1.5 Biodiversity

The Landscape Unit Planning Guide (LUPG), released in March 1999, provides background direction and guidance on biodiversity management. The LUPG dictates that biodiversity be managed at both the landscape and stand levels. The primary mechanism for landscape-level management is retention of old and mature seral forest. Stand-level biodiversity is protected through retention of wildlife trees and wildlife patches. The following sections outline how retention of old and mature forest and wildlife trees/patches was be modeled.

10.1.5.1 Landscape level biodiversity

Sections 1 and 2 of the Kootenay Boundary Higher Level Plan Order specify the amount of old and mature forest that must be maintained within each BEC variant inside each Landscape Unit (LU). Landscape units have been legally established along with Biodiversity Emphasis Option (BEO) assignments that guide the level of old/mature forest in each landscape unit.

Landscape Unit I34 overlaps portions of both the Bugaboo Park Recreation Area and TFL 14. For the purposes of this analysis the productive forest area within all of LU I34 (with portions in both Bugaboo Park and TFL 14) is included in the analysis. LU/BEC BEO assignments are listed in Table 53. Old and mature requirements for BEC/BEO combinations are provided in Table 54.

Table 53 LU/BEC BEO Assignments

Name	LU	BEO	BEC
Bobbie Burns	I34	L	ESSFdk
			ESSFdku
			ESSFwm
			ESSFwmu
			MSdk
Lower Spillimacheen	I35	L	ESSFdk
			ESSFdku
			ICHmk1
			IDFdm2
		I	MSdk
Upper Spillimacheen	I37	L	ESSFdk
			ESSFdku
			ESSFwm
			ESSFwmu
			MSdk
Twelve Mile	I38	I	ESSFdk
			ESSFwm
			ESSFwmu
			ICHmk1
			ICHmw1
			IDFdm2
			MSdk

Table 54 Old and mature forest cover requirements for landscape level biodiversity objectives

BEC Zone	NDT	Mature Age (yrs)	Old Age (yrs)	Mature+Old Seral Req			Old Seral Requirements				
				Low	Inter	High	Low * 1st Rot	Low * 2nd Rot	Low * 3rd Rot	Inter	High
ESSFwm, wmu	1	> 120	> 250	19	36	54	6.3	12.6	19	19	28
ICHmw1	2	> 100	> 250	15	31	46	3.0	6.0	9	9	13
ESSFdk, dku	3	> 120	> 140	14	23	34	4.7	9.3	14	14	21
ICHmk1	3	> 100	> 140	14	23	34	4.7	9.3	14	14	21
MSdk	3	> 100	> 140	14	26	39	4.7	9.3	14	14	21
IDFdm2	4	> 100	> 250	17	34	51	4.3	8.7	13	13	19

* Old seral requirements in Low BEO areas start at 1/3 old for first 80 years, 2/3 old for the next 80 years, and full old beyond for the Base Case (FRPA).

The target amount of old seral retention was calculated for each LU/BEO/BEC variant combination, and old seral retention areas have been spatially identified and mapped as old growth management areas (OGMA). Within the low biodiversity emphasis (BEO) areas the full requirements for old seral has been mapped, not just the 1/3 drawdown that is required in the Higher Level Plan Order for the first rotation (assumed to be 80 years). We selected the required target ha of old (which is 1/3 of the full target in Low BEO, and the full target in Intermediate BEO) from the current OGMAs. These were ordered by their proportion of NCLB vs THLB, and then OGMAs were chosen with priority on the ones with the highest proportion of NCLB. We chose whole OGMAs, up to or slightly above the target hectares.

The selected OGMAs are modelled by restricting them from being harvested for the first rotation (80 years), then they are released and percentage targets applied for retention of old seral thereafter. In the case of Low BEO units, 1/3 of the mapped, full target (3/3) OGMAs were chosen, and the percentage targets increase each rotation (each 80 years) up to the full targets by the third rotation, at years=161+.

10.1.5.2 Disturbance of areas above the operability line

As crown forested stands in the non-THLB contribute toward several forest cover objectives (for example, landscape level biodiversity), it is important that the age class distributions in these stands remain consistent with natural processes. By implementing disturbance in these stands, a more natural age class distribution can be maintained in the model and a more realistic contribution toward seral goals ensured. To achieve this, a constant area was disturbed annually in each LU/NDT combination. The amount of disturbance in each LU/NDT combination is based on the BEC variants present and their associated natural disturbance intervals and old seral definitions as outlined in the Biodiversity Guidebook (September 1995) and Table 55.

Using the negative exponential equation, the proportion of the forest that would typically occur as old seral forest can be calculated based on the disturbance interval (% area old = exp(-[old age / interval]). Using this % area in old, the calculation of an effective rotation age associated with this seral distribution was possible (Effective rotation age = interval / (1 – proportion old)). The effective rotation age can then be used to define an annual area of disturbance. For example, ESSF variants in NDT3 have a disturbance interval of 150 yrs and an old definition of 140 yrs. This translates into a typical age class distribution where 39% of the area is “old” (>140 yrs) and the oldest stands are around 230 years. Thus 1/230th of the area needs to be disturbed each year to maintain this age class distribution.

The Base Case includes:

- Annual disturbance of the inoperable, contributing Non-THLB area in each LU/NDT combination, as per Table 56. The selection of the stands to be disturbed was determined by random selection.
- The application of an old seral stage requirement to maintain a minimum amount of old consistent with the % old targets.

This method is a slight simplification of Option 4 in ‘Modeling Options for Disturbance Outside the THLB - Working Paper’ (MoF, June 2003). Modeling of disturbance at the LU/BEC variant level was simplified to the LU/NDT level in order to minimize the number of modeled zones while ensuring that each zone would have a single, old seral age.

Table 55 Calculation of area to be disturbed annually in forested non-THLB by BEC/NDT

BEC	NDT	"OLD" Defn (yrs)	Effective Rotation Age (yrs)	Disturbance (proportion per year) [A]	Contributing Non-THLB Area (ha) [B]	Annual Area Disturbed By BEC [A} x [B]
ESSFdk	3	150	247	0.0040	4129	16.7
ESSFdku	3	150	247	0.0040	1385	5.6
ESSFwm	2	200	280	0.0036	4209	15.0
ESSFwmu	2	200	280	0.0036	1820	6.5
IDFdm2	4	250	395	0.0025	272	0.7
MSdk	3	150	247	0.0040	616	2.5
Totals					12431	47

Table 56 Area of disturbance applied to CFLB in each LU

LU	Disturbance Applied (ha)
I34	28.1
I35	4.7
I37	13.3
I38	0.9

The disturbance is implemented in the model using a random uniform probability. Each NDT is ‘turned over’ once during a period equal to its effective rotation age, and then once again over the next effective rotation age, etc. There is no guarantee that any particular portion of the landbase will actually be

disturbed in any one year. Across the NCLB, approximately ~47 ha is disturbed each year (0.37%), resulting in an average 'turning over' of the landbase every ~270 years.

10.1.5.3 Wildlife tree retention

Wildlife tree retention is one of the primary methods to address stand level biodiversity objectives. Section 3.2 and Appendix 3 of the Landscape Unit Planning Guide (March 1999) describe the process for determining wildlife tree retention requirements at the BEC sub-zone level in order to establish LU objectives. On May 15, 2000, the Assistant Deputy Ministers of Forests and Environment, Lands and Parks approved changes to Section 3.2 of the Landscape Unit Planning Guide. Detailed policy on management of wildlife trees is provided in the document Provincial Wildlife Tree Policy and Management Recommendations (MoF/WLAP, February, 2000).

Tembec commissioned a WTP analysis of the TFL as part of developing their results and strategies in the TFL's Forest Stewardship Plan (FSP). The FSP and its WTP strategies have recently been approved. For reference, the summary table from the GIS WTP assessment is provided in Appendix E.

The analysis showed that the required WTP percentages were being met, on an area basis, within all the landscape units. Much of the landbase has existing stands that are netted out for other purposes, but those stands still meet the intent of WTPs. On average, it was found that an additional 5.8 percent of the THLB was being set aside to meet the full, landscape-level WTP requirements. The spatial distribution of the WTPs was also examined and it was determined that a portion (21%) of the landbase required additional retention to meet the spatial distribution requirement ….

> "*no areas within any cut-block should be more than 500m from existing mature stands slated for long term retention* … (where necessary) *retention should be implemented using a patch of at least 0.25 ha or dispersed retention*" (paraphrased, Forsite, 2006).

In theory, only 0.25% of the 21% is required to meet that spatial requirement (i.e. 0.25 ha WTP each 500m apart). However, we assumed that a further 5.3% retention might be required, rather than the 0.25% minimum and we applied that percentage to the 21% of the THLB to arrive at an estimated, area-equivalent, future WTP reduction of 581 hectares. That future WTP area is applied to the future, managed stand yield curves as a 1.1% reduction.

Table 57 Future Wildlife tree retention requirements (%'s) for TFL 14

THLB (ha) [A]	Proportion THLB needing WTPs to meet spacing Req. [B]	Avg Gross WTP Retention Req. [C]	Equivalent area of THLB retention required (ha) [A] x [B] x [C]	Equivalent retention proportion (%) [B] x [C]
52,822	21%	5.3%	581	1.1%

10.1.5.4 Coarse Woody Debris

Management of Coarse Woody Debris (CWD) is another important factor in the management of stand level biodiversity. As per provincial policy, it was assumed that CWD objectives are managed operationally while meeting the harvest utilization standards.

10.1.5.5 Patch size objectives

Patch size management has been adopted in the TFL in an effort to more closely mimic natural disturbance patterns and minimize fragmentation of the land base. Patch size management attempts to achieve the patch size distributions specified in the Landscape Unit Planning Guide (MoF/MoE 1999), and is an alternative to cut block adjacency green-up objectives. As stated in Section 10.1.1.1, cutblock green-up requirements (adjacency) are not modeled directly in this analysis because landscape level forest cover objectives are used to approximate these requirements. As patch management is also a spatial issue beyond the resolution of this timber supply analysis, the same landscape level objectives were used to approximate patch management requirements. In the opinion of the authors, spatial analyses completed in previous projects have confirmed that these landscape level forest cover

objectives are consistent with the flexibility associated with patch size management and the operational application of green-up requirements.

10.1.5.6 Connectivity

The HLPO objectives for connectivity were included in the OGMA and MMA mapping (section10.1.5.1). Stands were considered high priority when allocating old and mature forest retention areas. No further modeling was done for connectivity objectives.

10.1.6 Watersheds

10.1.6.1 Domestic watershed

ECA and hydrologic green-up

Watershed management is commonly modeled by a maximum area of stands below a certain age threshold, or maximum Equivalent Clearcut Area (ECA). Dave Toews, the hydrologist who completed the last, full assessment of the TFL noted:

> *"Most hydrologic impacts of logging are associated with major storms and floods. The principle of limiting ECA relates to limiting an increase in floods."* (Toews, 2003)

Watershed management will be modeling using a 30% ECA limit (Equivalent Clearcut Area), based on the recovery factors in Table 58. The IWAP Guidebook ECA recovery curve, the last TFL 14 Hydrologist Report (Toews, 2003) and the approach taken in the adjacent Invermere TSA were considered when adopting this methodology.

Table 58 Forest cover requirements for watersheds

Watershed type	Forest cover objectives	Area of application	Comments
Domestic or sensitive watershed	max 30% ECA	Crown forest area within each LU by watershed type	0-3m ht = 100% ECA >3-5m ht = 75% ECA >5-7m ht = 50% ECA >7-9m ht = 25% ECA >9-12m ht = 10% ECA >12m ht = 0% ECA

There are no ECA thresholds specified in the hydrologic assessment report (Toews, 2003). Rather, the hydrologist prefers a watershed-specific assessment. The only mention of a "high" ECA (38.3%) was accompanied by the statement:

> *"At least one of the smaller streams had a high ECA; however, I did not see evidence of any deleterious effects."*

This, and the experience of the authors, fits with our ECA threshold of 30%.

ECA recovery curve

The adjacent, Invermere TSR3 timber supply analysis assumed a much simpler approach than Table 58: an 'all or nothing' value. Stands <6m were 100% disturbed while those >=6m were 0% disturbed. So 6m is meant to be some average (halfway) recovery point - thus 12m would be logical if the half way point to full recovery is 6m. The authors have worked with hydrologists on a number of projects and the 12m threshold (with full recovery, rather than the 90% recovery in the IWAP Guidebook) seemed reasonable to those hydrologists. In some case hydrologists have said that managed stands could potentially recover to more than 100%, compared to natural stands, as they often have less voids (as reflected in higher yields in TIPSY).

10.1.7 Lakeshore, wetland and riparian management zones

In general, riparian management was predominately addressed through a netdown process that reflected both the reserve and management zones (Section 6.10).

10.2 Timber Harvesting

10.2.1 Minimum harvesting age / merchantability standards

For this analysis, minimum harvestable ages were defined by the following criteria:

- minimum volume per hectare (150 m3/ha, or 120m3/ha for Pl on slopes <45%), and
- minimum piece size (25 cm mean DBH, or 20cm mean DBH for Pl on slopes < 45%), and
- the age at which 95% of the culmination of the mean annual increment (CMAI) is achieved (Table 59).

The merchantability criteria were determined by starting with those from the last analysis. We compared the old criteria to the latest, adjacent Invermere TSR3 criteria, and the TFL Forester assessed them based on his experience. In the end, some of the past criteria were deemed to be too low by the TFL Forester, such as the minimum volume/ha for pine, and these were raised. The only changes made were to increase the limits, making the current merchantability criteria more stringent than those used in the last analysis

In order for the stand within the timber supply model to be considered for harvesting, it must achieve an age where the criteria described above are achieved. This ensures that the timber supply model is harvesting stands that meet reasonable economic criteria, and emulate what is generally current practice by forest licensees. Note that these are minimum criteria, not the actual ages at which stands are forecast for harvest. Some stands may be harvested at the minimum thresholds to meet forest-level objectives while other stands may be not be harvested until well past there "optimal" timber production ages due to management objectives for other resource values, such as requirements for the retention of older forest or ungulate winter range. The minimum harvest age to be utilized for each analysis unit is defined in Table 60 and Table 61 . Minimum expected harvest volume and overstory stand diameter are provided in Table 62 for partial cut stands.

Our methodology of producing MHA numbers produces estimates to the nearest year (e.g. 56). We felt these MHA numbers should be rounded up to the next higher, 5 year increment to better reflect the uncertainty inherent in the estimates.

Table 59 Minimum merchantability rules

Species	Slope	Site Grouping	Minimum Volume (m3/ha)	Minimum DBH (cm)	Percent of Culmination
Pine	<= 45 %	all	120	20	95
	> 45 %	1 and 2	150	25	95
	> 45 %	3	150	25	95
Other species	<= 45 %	all	150	25	95
	> 45 %	1 and 2	150	25	95
	> 45 %	3	150	25	95

Table 60 Minimum Merchantability - Clearcut Stands

Description	AU Nat	Age to Reach			MHA		AU Man	Age to Reach			MHA
		Min DBH	Min Vol	95% MAI				Min DBH	Min Vol	95% MAI	
F, <=140,<=45%	101	77	50	77	80		201	59	40	59	60
F, <=140,<=45%	102	87	50	87	90		202	60	40	60	60
F, <=140,<=45%	103	100	60	100	100		203	64	50	64	65
B, <=140,<=45%	104	67	50	67	70		204	57	40	57	60
B, <=140,<=45%	105	75	60	75	75		205	59	40	59	60
B, <=140,<=45%	106	99	70	99	100		206	59	40	59	60
S, <=140,<=45%	107	60	60	79	80		207	58	40	58	60
S, <=140,<=45%	108	88	60	88	90		208	57	40	57	60
S, <=140,<=45%	109	104	80	104	105		209	58	40	58	60
P, <=140,<=45%	110	50	50	55	55		210	49	30	49	50
P, <=140,<=45%	111	50	50	62	65		211	50	30	50	50
P, <=140,<=45%	112	70	70	78	80		212	48	30	48	50
F, >140,<=45%	115	104	60	104	105		215	64	50	64	65
B, >140,<=45%	118	118	90	118	120		218	60	40	60	60
S, >140,<=45%	120	82	60	82	85		220	56	40	56	60
S, >140,<=45%	121	110	80	110	110		221	57	40	57	60
Pl, >140,<=45%	123	50	50	60	60		223	51	30	51	55
Pl, >140,<=45%	124	70	70	86	90		224	49	30	49	50
Fd, <=140,>45%	133	90	60	90	90		233	64	50	64	65
B, <=140, >45%	136	78	60	78	80		236	58	40	58	60
S, <=140, >45%	139	90	70	90	90		239	58	40	58	60
Pl, <=140, >45%	140	80	80	55	80		240	50	50	49	50
Pl, <=140, >45%	141	90	90	63	90		241	50	50	52	55
Pl, <=140, >45%	142	110	110	77	110		242	50	40	50	50
Fd, >140, >45%	145	108	70	108	110		245	69	50	69	70
B, >140, >45%	148	115	90	112	115		248	60	40	60	60
S, >140, >45%	151	102	80	102	105		251	57	40	57	60
Pl, >140, >45%	154	100	100	68	100		254	50	40	50	50
I.U. Logged	170	165	100	136	165		270	50	50	54	55

Table 61 Minimum Merchantability – Existing Managed Stands

Description	AU Nat	Age to Reach			MHA		AU Man	Age to Reach			MHA
		Min DBH	Min Vol	95% MAI				Min DBH	Min Vol	95% MAI	
Fd - leading	501	71	50	71	75		601	50	50	60	60
Bl – leading	502	71	50	71	75		602	59	40	59	60
Se – leading	503	66	40	66	70		603	56	40	56	60
Pl – leading	504	50	50	52	55		604	50	50	50	50

Table 62 Harvest characteristics for each cut - Partial Cut Stands

Description	AU	Stand entry	Minimum Age (yrs)	Harvest volume (m3)	Harvest diameter (cm)
Pl – Shelterwood natural stand	302	2	70	105	23
Non-Pl – Shelterwood natural stand	312	2	70	84	27
Pl - Patch cut – natural stand.	404	1	60	57	21
	405	2	90	91	25
	406	3	120	115	29
Pl - Patch cut – managed stand.	407	Any	90	126	34
Non-Pl - Patch cut – natural stand.	414	1	60	42	25
	415	2	90	80	32
	416	3	120	108	38
Non-Pl - Patch cut – managed stand.	417	Any	90	121	37

10.2.2 Operability / harvest systems

Operability

An operability line delineates the operable and inoperable area of TFL14. Areas above the operability line (class= I in TFL, N in Bugaboo) have been removed from the THLB. Areas below the operability line include both cable and conventional harvesting, and are not differentiated in the operability database.

The operability mapping existed prior to the MP8 analysis (6+ years ago). The last major update was during the MP8 analysis when the “economic operability” and “physical operability” maps were combined into one map. Some reductions in operable landbase were made in 2005 after site-specific, field checks were made, specifically for regeneration and merchantability characteristics.

Very little harvesting occurs above the operability line.

Harvest systems

Harvesting in TFL 14 is dominated by ground-based harvest systems, with some helicopter, longline and cable systems also used. Non-ground-based systems are generally employed on steeper slopes, where ground-based methods become impractical. Stands designated for non-ground-based systems are distinguished by slopes greater than 45% in this analysis. These stands have higher minimum merchantability thresholds in recognition of the higher costs when working on steeper slopes. These stands have higher site index thresholds for low site stands, longer rotations to allow more time for trees to attain a merchantable size, and higher minimum stand volumes. Table 63 summarizes the harvest profile (2001-2006) and the estimated harvest profile of the TFL, based on the total chance plan map.

It should be noted that the current focus on harvesting pine stands has moved the harvest to lower elevations and shifted the harvest profile from the cable, longline and helicopter stands to the ground-based harvest stands.

Table 63 Harvest methods

Harvest system	Harvest profile 2001-2006 (%)	Total chance harvest plan profile (%)
Cable	13.6	20.7
Ground	84.7	75.6
LongLine	0.6	2.0
Heli	1.1	1.7
Totals	100.0	100.0

10.2.3 Initial Harvest Rate

The Base Case Option harvest forecast will use 162,947 as the initial harvest rate, based on:

160 000 m3/yr [A] + **2,947** m3/yr [B] = **162,947** /yr [C]

Where: [A] = current AAC, [B] = unsalvaged losses, [C] = initial harvest rate.

10.2.4 Harvest rules

Harvest rules have the objective of influencing the model so the harvest profile in the model will reasonably match the harvest profile seen on-the-ground. Licensees don't necessarily follow an "oldest-first" harvest priority. Numerous pressures influence forest operations and the harvest profile may vary greatly between 5-year periods. The more notable examples are the recent bark beetle infestations and fires.

To reflect the current concentration on harvest within the MPB stands, the harvest priority rules in Table 64 were adopted for the Base Case scenarios. While MPB stands are the top priority for harvesting in TFL 14, the beetle is still considered to be under control. A Mountain Pine Beetle (MPB) Option will be modeled to assess the potentially radical change in harvest pattern that may occur under a severe, uncontrolled MPB infestation.

Table 64 Harvest priority rules

Harvest priority	Description
Approved CPs	Blocks under Cutting Permit (CP)
Susceptible beetle stands	Mature lodgepole pine leading stands
Partial cutting stands	Stands that are due for the next pass.
Oldest first	The oldest stands available in the THLB after ensuring all forest cover requirements have been met.

10.2.5 Harvest profile

No specific harvest profile was modeled, although pine-leading stands are expected to dominate due to a priority placed on harvesting pine-leading stands before other species (above).

10.2.6 Silviculture Systems

TFL 14 silviculture systems are predominately clearcut with reserves, with partial cutting employed to a minor extent. Partial cutting is largely concentrated within the visual landscapes. To a limited extent partial cutting is used within pine-salvage stands.

For both clearcut and partial cut methods, planting is by far the predominant method of regeneration. No natural regeneration was modeled in this analysis.

Table 65 Silviculture systems

Silviculture system	Locations NNN = Eligible Analysis units	Productive Area (ha)	Timber Harvesting Land base Area (ha)	% Removal of overstory.	# of Entries	Time Between Entries (yrs)
Clearcut with reserves	All non-scenic areas. Non PC AU's	66,930	47,433	100	1	-
Existing partial cut stands (shelterwood")	Scenic areas; AU=302,312	5,445	5,445	50 48	3	- (1^{st}) 20 (2^{nd})
Future partial cut stands ("partial cut")	Scenic areas; AU=404-406, 414-416			33 33 33	3	- (1^{st}) 33 (2^{nd}) 33 (3^{rd})
Future partial cut with managed stand overstory.	Combination of the above areas: AU = 407, 417			33		33

10.2.7 Harvest flow objectives

Except for the sensitivity analyses where alternate harvest flow objectives are examined, the objectives for harvest flow in the Base Case Option are:

- Initially, start at the current AAC,
- Maintain the current AAC for as long as possible (the intent is that the mid-term harvest level will not be reduced to below the LTSY level), and
- If necessary, reduce the harvest flow at a maximum rate of 10% in any one decade,
- If necessary, minimize the length of any fall-down period,
- When possible, increase the harvest flow at a maximum rate of 10% per decade, and
- Reach a stable, long-term harvest flow rate associated with a (flat line) total inventory.

Modeling will be performed for at least 300 years, using 10-year periods, and reporting will be for the first 250 years. In the case of the 20 Year Plan modeling, we will break the first two periods into four five-year-periods, and report on each five-year period.

11.0 Other Options

As a minimum, two additional Options will be examined: a Sustainable Forest Management Plan Option (SFMP - FSC), and a Mountain Pine Beetle Option (MPB).

11.1 Sustainable Forest Management Plan Option (SFMP - FSC)

This option is designed to show the timber supply implications of adopting management practices associated with certification under the Forest Stewardship Council (FSC) standards. The differences between the Base Case (FRPA) and this option are:

- * Riparian reserve zones: The effective width reserves are based on the FSC default reserve widths and management zone retention. Significant increases in retention area are required over the FRPA defaults for some stream/lake/wetland classifications.
- * High Conservation Value Forests (HCVF) of endangered forest status are removed from the THLB.
- * Rare and Uncommon ecosystems as defined in the East Kootenay Ecosystem Representation Analysis (R Wells) are removed from the THLB.
- * Reserves around Avalanche tracks not captured in the OGMAs are removed from the THLB
- Additional visual restrictions are modelled around some of the larger lakes in the TFL.
- OGMAs are implemented to full targets in the low BEO areas, starting in the first rotation, instead of starting at 1/3-target levels and increasing to full targets by the end of three rotations.

(*) = modeled as THLB reductions

11.1.1 Riparian reserve zones

The riparian reductions are based on the FSC methodology for riparian reserves (FSC, 2005). The method uses target areas of reserves for each Riparian Assessment Unit (watershed-based units) rather than assuming pre-defined widths around given stream classes. A target reserve area is deployed at the operational level as variable-width reserve and management zones. These are to be based, in the field, on site-specific conditions. Details are fully described in a draft Riparian Assessment report (Forsite and Apex Geoscience, 2006).

To implement this as a landbase net-down, an effective reserve width is determined by adding the reduction for the FSC default management zone width to the reserve buffer and assuming it is one (100%) reserve-type. The default and effective widths from FSC standards are included in Table 66 (streams) and Table 67 (lakes and wetlands).

Table 66 Riparian reserve zones – streams

Riparian Class	Stream length	Default Reserve width (m)	Default Management zone width (m)	Reduction per cent (%)	Effective Reserve Width (m)	Productive Reduction Area (ha)	Effective Reduction Area (ha)
S1		30m	40	65	56	945	923
S2		30m	40	65	56	349	299
S3		30m	20	65	43	667	623
S4		30m	20	65	43	2,936	2,806
S5a		20m	20	65	33	170	138
S6a		20m	20	65	33	99	77
S5b		0	15	30	4.5	721	661
S6b		0	15	10	1.5	522	375
Totals						6,409	5,902

Source: Table 1 of the riparian assessment report (Forsite and Apex, 2006)
"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

Table 67 Riparian reserve zones – wetlands and lakes

Riparian class	Default Reserve width (m)	Default Management zone width (m)	Reduction per cent (%)	Effective Reserve Width (m)	Productive Reduction (ha)	Effective Reduction (ha)
L1-L4	20	15	20	24.5	117	113
W1-W5	15	15	20	19.5	325	251
Total					442	364

"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

Riparian reserve strategies were implemented in the model by establishing effective reserve buffers around the riparian features inventories (streams, wetlands, lakes) using a GIS. The Base Case Option (FRPA-based) and the Sustainable Forest Management Plan Option (FSC-based) each had different riparian buffer maps.

11.1.2 High conservation value forests

Tembec has adopted a High Conservation Value Forests (HCVF) Strategy as part of FSC certification. Designation of High Conservation Value Forest areas ensures that specific ecological and cultural values are identified and that those values are considered in the management practices that are applied in those areas. In the context of Timber Supply modeling however, the Endangered Forest (HCVF-EF) class is the only class that precludes harvesting and therefore requires land-base reductions (Table 68).

Table 68 Exclusions for high conservation value forests

Class	Productive Reduction (ha)	Effective Reduction (ha)
HCVF (Endangered forest)	4,386	685

"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

11.1.3 Rare and uncommon ecosystems and avalanche tracks

As part of FSC certification, Tembec has adopted an Ecosystem Representation strategy. The objective of ecosystem representation is "*To ensure that ecologically distinct habitat types are represented in an unmanaged state in Tembec's operating area to sustain lesser known species and ecological functions.*" (Brown, SFMP, 2005). This strategy is still evolving. At this time it identifies a number of at-risk habitats (ecogroups) that are to be reserved from harvesting (except for required road or trail crossings where no other practicable option exists). These are:

- Rare ecosystem types, defined as < 1000 ha in the East Kootenay Conservation Project (EKCP).
- Uncommon, small and less represented ecosystem types. Defined as < 2000 ha in the EKCP and < 50% representation within the non-harvesting landbase (NHLB).

Section 5 of the HLPO identifies important grizzly bear habitat (avalanche tracks, denning sites, etc.) as high priority areas when allocating old and mature forest retention targets. Tembec's Sustainable Forest Management Plan includes an Avalanche Path Strategy, which includes "buffers of between 50-100 meters minimum on high and moderate class avalanche paths" for grizzlies and ungulates (primarily moose and elk).

Avalanche path mapping has been completed in TFL 14. Management of avalanche paths has been modeled by creating fixed-width buffers around the high and medium class avalanche paths, and setting these aside as THLB reductions

The Sustainable Forest Management Plan Option includes landbase reductions for these special habitats (ecogroups and avalanche path reserves) as per Table 69.

Table 69 Exclusions for ecosystem representation and avalanche paths

Location (eg zone)	Description	Productive Reduction (ha)	Effective Reduction (ha)
Ecosystem representation	Rare, and uncommon ecotypes with total area less than 2000 ha	1,088	409
Avalanche path buffers (*)	50m reserve around avalanche paths with high and moderate value habitat	44	11
		1,132	420

Note: (*) Except for current Cutting Permits.
"Effective reduction" is the area netted out after all previous netdowns are removed; sometimes referred to as the "non-overlapping netdown".

11.1.4 Old growth management areas

The required area of old seral retention was calculated for each LU/BEO/BEC variant combination and old seral retention areas have been spatially identified and mapped as old growth management areas (OGMAs). Within the low biodiversity emphasis (BEO) areas the full requirement for old seral has been mapped, not just the 1/3 drawdown required in the Higher Level Plan Order for the first rotation (80 years). In this Option the full target of old seral (OGMAs) will be reserved from harvest for the first rotation, then the OGMAs will be freed up and the full (3/3) seral requirement will be modeled from that point forward [year=81+].

11.2 Mountain Pine Beetle Option

This option examines the impacts assuming catastrophic infestation of mountain pine beetle (MPB). It includes an uplift in AAC to capture the majority of impacted pine volume; high mortality of pine with both salvaged and unsalvaged pine volumes; and a possible decline in mid term harvest volume once the epidemic is over. The assumptions in this Option are based on the Base Case Option, with additional MPB-related assumptions adopted from the Mountain Pine Beetle Initiative Modeling Project by M. Eng. Et al. (2005, 2006). In many cases our assumptions are simplifications of those used in the M. Eng et al project.

11.2.1 Attack Priority

In both the NCLB and THLB the pine is attacked in a priority order based on the pine volume (m3) and the proportion of pine volume (m3/ha) in each stand. As pine volume increases and/or the pine proportion increases, and if the stand age is > 60 years, then it is more likely that the stand will be attacked. The spatial spread of the MPB is not modeled.

11.2.2 Attack volume

The M. Eng. Et al project estimated that 80%+ of the pine volume in the province will be killed, barring some agent like cold weather ending the epidemic. The volume of pine attacked and killed follows a rising, then falling curve. We approximate this curve as three 5-year attack periods, as in Table 70.

Table 70 Percent pine volume killed during the first four 5-year periods of the MPB epidemic.

Period (5 years/period)	Pine volume killed over 20 years (% total, M.Eng et al.)	Pine volume killed in the model (% of total pine volume)
1	25	25
2	40	40
3	20	27
4	7	0

The modeling is simplified by assuming that the estimated volume of pine killed (total volume of Pl on the landscape times the percentage killed in Table 70) is translated to a stand volume. If 100,000 m3 of pine is to be killed in one period, then we will model this as as 100,000 m3 of stand volume killed (with priority on pine-volume stands).

11.2.3 Salvage Volume

Within each 5-year period an attempt is made to salvage the volume that is attacked within the THLB. The salvage harvest is prioritized for stands that have over 40% pine content. A 20% AAC uplift is assumed, from the current AAC of 160,000 m3/yr to 192,000 m3/yr. If the volume of attacked wood is greater than the uplift volume then the extra volume is assumed to be lost, and not recovered later.

11.2.4 Regen Delays

Stands that are salvaged are assumed to be reforested within 2 years. Non-salvaged stands are subject to a 10-year regeneration delay. All stands in the NCLB are not salvaged. Some stands in the THLB may not be salvaged.

11.3 20 Year Plan

The model outputs from the Base Case Option will be used to spatially locate the harvest pattern required to meet the first 20 years of harvest predicted in the Base Case Option.

Table 71 Land Base Comparisons – Base Case and Tembec Management Options

	SFMP - FSC Option		Base Case Option
	Area (ha) Total		Area (ha) Total
Total land base	161,210		161,210
Reductions			
Water	1,483		1,483
Non-forest, non-productive forest	85,396		85,396
Non-commercial brush	230		230
Roads, trails, landings	1,724		1,724
Total productive land base (*)	72,378		72,378
Reductions			
Bugaboo Park - LU I34 (**)	2,662		2,662
Inoperable	9,859		9,859
Unstable terrain	1,069		1,069
Environmentally sensitive	413		413
Non-merchantable	1,913		1,913
Riparian Reserves	6,266		1,843
Wild life tree patches	1,450		1,764
Block reserves			
PSP reserves	30		33
HCVF	685		
Av. Path / Eco Rep	420		
Total Reductions	24,767		19,556
Current THLB	47,610		52,822
Future WTPs	524		581
Future roads and trails	900		998
Net long-term timber harvesting land base	46,196		51,253

Note: All totals are subject to rounding.
(*) Bugaboo area has been added for biodiversity modeling the productive landbase. Totals below (**) do not include any Park area. All overlaps between net-downs are removed in this table. Any overlap will accrue to the first (highest) category in the table.

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APPENDIX A. NATURAL STAND (VDYP) YIELD TABLES

<insert tables after this page>

Natural FL SIGrp 1-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
101	0	0	0	0.0
101	10	0	0	0.0
101	20	0	2	0.0
101	30	27	21	0.9
101	40	83	22	2.1
101	50	138	24	2.8
101	60	192	27	3.2
101	70	244	29	3.5
101	80	292	31	3.7
101	90	338	33	3.8
101	100	380	35	3.8
101	110	415	38	3.8
101	120	446	40	3.7
101	130	473	42	3.6
101	140	496	44	3.5
101	150	516	46	3.4
101	160	534	48	3.3
101	170	550	50	3.2
101	180	563	52	3.1
101	190	575	53	3.0
101	200	587	55	2.9
101	210	598	57	2.8
101	220	609	59	2.8
101	230	620	61	2.7
101	240	630	63	2.6
101	250	639	65	2.6
101	260	639	65	2.5
101	270	639	65	2.4
101	280	638	65	2.3
101	290	638	65	2.2
101	300	638	65	2.1
101	310	637	65	2.1
101	320	637	65	2.0
101	330	636	65	1.9
101	340	634	66	1.9
101	350	633	66	1.8

Natural FL SIGrp 2-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
102	0	0	0	0.0
102	10	0	0	0.0
102	20	0	1	0.0
102	30	7	14	0.2
102	40	49	22	1.2
102	50	94	23	1.9
102	60	138	25	2.3
102	70	181	27	2.6
102	80	222	29	2.8
102	90	261	31	2.9
102	100	297	33	3.0
102	110	331	35	3.0
102	120	360	37	3.0
102	130	386	39	3.0
102	140	407	41	2.9
102	150	426	43	2.8
102	160	442	44	2.8
102	170	456	46	2.7
102	180	469	48	2.6
102	190	480	49	2.5
102	200	491	51	2.5
102	210	502	53	2.4
102	220	512	55	2.3
102	230	522	56	2.3
102	240	531	58	2.2
102	250	540	60	2.2
102	260	540	60	2.1
102	270	540	60	2.0
102	280	540	60	1.9
102	290	540	60	1.9
102	300	540	60	1.8
102	310	540	60	1.7
102	320	539	60	1.7
102	330	539	60	1.6
102	340	538	60	1.6
102	350	538	61	1.5

Natural FL SIGrp 3-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
103	0	0	0	0.0
103	10	0	0	0.0
103	20	0	0	0.0
103	30	0	2	0.0
103	40	16	20	0.4
103	50	48	22	1.0
103	60	82	24	1.4
103	70	114	25	1.6
103	80	145	27	1.8
103	90	175	29	1.9
103	100	204	31	2.0
103	110	232	32	2.1
103	120	257	34	2.1
103	130	280	36	2.2
103	140	299	37	2.1
103	150	315	39	2.1
103	160	329	40	2.1
103	170	341	41	2.0
103	180	351	43	2.0
103	190	360	44	1.9
103	200	370	46	1.9
103	210	379	47	1.8
103	220	387	49	1.8
103	230	395	50	1.7
103	240	403	51	1.7
103	250	410	53	1.6
103	260	411	53	1.6
103	270	411	53	1.5
103	280	411	53	1.5
103	290	412	53	1.4
103	300	412	53	1.4
103	310	412	53	1.3
103	320	412	53	1.3
103	330	412	54	1.2
103	340	412	54	1.2
103	350	412	54	1.2

Natural B SIGrp 1-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
104	0	0	0	0.0
104	10	0	0	0.0
104	20	0	0	0.0
104	30	26	21	0.9
104	40	84	22	2.1
104	50	139	24	2.8
104	60	191	26	3.2
104	70	239	28	3.4
104	80	281	30	3.5
104	90	316	32	3.5
104	100	348	34	3.5
104	110	376	36	3.4
104	120	401	38	3.3
104	130	429	40	3.3
104	140	454	41	3.2
104	150	477	43	3.2
104	160	499	44	3.1
104	170	519	46	3.1
104	180	537	47	3.0
104	190	555	48	2.9
104	200	571	50	2.9
104	210	587	51	2.8
104	220	603	53	2.7
104	230	617	54	2.7
104	240	631	56	2.6
104	250	644	57	2.6
104	260	647	58	2.5
104	270	649	58	2.4
104	280	650	58	2.3
104	290	652	59	2.2
104	300	654	59	2.2
104	310	655	59	2.1
104	320	656	60	2.1
104	330	657	60	2.0
104	340	658	60	1.9
104	350	659	61	1.9

Natural B SIGrp 2-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
105	0	0	0	0.0
105	10	0	0	0.0
105	20	0	0	0.0
105	30	9	20	0.3
105	40	47	21	1.2
105	50	96	23	1.9
105	60	141	25	2.4
105	70	186	26	2.7
105	80	225	28	2.8
105	90	258	30	2.9
105	100	288	32	2.9
105	110	316	33	2.9
105	120	340	35	2.8
105	130	367	37	2.8
105	140	391	38	2.8
105	150	414	40	2.8
105	160	434	41	2.7
105	170	453	42	2.7
105	180	471	43	2.6
105	190	487	45	2.6
105	200	503	46	2.5
105	210	518	47	2.5
105	220	533	49	2.4
105	230	547	50	2.4
105	240	561	51	2.3
105	250	573	53	2.3
105	260	576	53	2.2
105	270	579	53	2.1
105	280	581	54	2.1
105	290	583	54	2.0
105	300	585	54	2.0
105	310	587	55	1.9
105	320	589	55	1.8
105	330	591	55	1.8
105	340	592	56	1.7
105	350	594	56	1.7

Natural B SIGrp 3-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
106	0	0	0	0.0
106	10	0	0	0.0
106	20	0	0	0.0
106	30	0	0	0.0
106	40	5	14	0.1
106	50	26	21	0.5
106	60	55	22	0.9
106	70	89	24	1.3
106	80	116	25	1.5
106	90	140	26	1.6
106	100	162	28	1.6
106	110	182	29	1.7
106	120	200	30	1.7
106	130	220	32	1.7
106	140	238	33	1.7
106	150	255	34	1.7
106	160	270	35	1.7
106	170	285	36	1.7
106	180	299	37	1.7
106	190	312	38	1.6
106	200	324	39	1.6
106	210	337	40	1.6
106	220	348	41	1.6
106	230	359	43	1.6
106	240	370	44	1.5
106	250	380	45	1.5
106	260	383	45	1.5
106	270	385	45	1.4
106	280	387	46	1.4
106	290	389	46	1.3
106	300	391	46	1.3
106	310	393	47	1.3
106	320	395	47	1.2
106	330	396	47	1.2
106	340	398	48	1.2
106	350	399	48	1.1

Natural S SIGrp 1-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
107	0	0	0	0.0
107	10	0	0	0.0
107	20	0	0	0.0
107	30	0	8	0.0
107	40	23	20	0.6
107	50	98	23	2.0
107	60	168	25	2.8
107	70	230	27	3.3
107	80	283	28	3.5
107	90	330	30	3.7
107	100	369	32	3.7
107	110	404	33	3.7
107	120	434	35	3.6
107	130	461	37	3.5
107	140	482	38	3.4
107	150	501	39	3.3
107	160	516	40	3.2
107	170	530	41	3.1
107	180	541	42	3.0
107	190	550	43	2.9
107	200	558	43	2.8
107	210	566	44	2.7
107	220	573	45	2.6
107	230	580	46	2.5
107	240	586	47	2.4
107	250	591	48	2.4
107	260	594	48	2.3
107	270	597	49	2.2
107	280	600	50	2.1
107	290	602	50	2.1
107	300	604	51	2.0
107	310	605	52	2.0
107	320	607	52	1.9
107	330	608	53	1.8
107	340	609	54	1.8
107	350	610	54	1.7

Natural S SIGrp 2-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
108	0	0	0	0.0
108	10	0	0	0.0
108	20	0	0	0.0
108	30	0	1	0.0
108	40	6	18	0.2
108	50	46	22	0.9
108	60	103	23	1.7
108	70	155	25	2.2
108	80	201	27	2.5
108	90	241	28	2.7
108	100	276	30	2.8
108	110	307	32	2.8
108	120	333	33	2.8
108	130	358	35	2.8
108	140	379	36	2.7
108	150	397	37	2.6
108	160	413	38	2.6
108	170	426	39	2.5
108	180	438	40	2.4
108	190	447	40	2.4
108	200	457	41	2.3
108	210	465	42	2.2
108	220	473	43	2.2
108	230	480	44	2.1
108	240	487	45	2.0
108	250	492	46	2.0
108	260	496	46	1.9
108	270	498	47	1.8
108	280	501	47	1.8
108	290	503	48	1.7
108	300	505	48	1.7
108	310	506	49	1.6
108	320	508	50	1.6
108	330	509	50	1.5
108	340	510	51	1.5
108	350	511	51	1.5

Natural S SIGrp 3-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
109	0	0	0	0.0
109	10	0	0	0.0
109	20	0	0	0.0
109	30	0	0	0.0
109	40	1	9	0.0
109	50	9	19	0.2
109	60	46	22	0.8
109	70	92	23	1.3
109	80	133	25	1.7
109	90	170	26	1.9
109	100	203	28	2.0
109	110	233	29	2.1
109	120	258	31	2.2
109	130	283	32	2.2
109	140	305	33	2.2
109	150	323	34	2.2
109	160	340	35	2.1
109	170	355	36	2.1
109	180	367	37	2.0
109	190	379	38	2.0
109	200	389	39	1.9
109	210	399	40	1.9
109	220	408	40	1.9
109	230	416	41	1.8
109	240	424	42	1.8
109	250	430	43	1.7
109	260	434	44	1.7
109	270	438	44	1.6
109	280	441	45	1.6
109	290	444	45	1.5
109	300	446	46	1.5
109	310	448	46	1.4
109	320	450	47	1.4
109	330	452	47	1.4
109	340	453	48	1.3
109	350	454	49	1.3

Natural Pine SIGrp 1-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
110	0	0	0	0.0
110	10	0	0	0.0
110	20	0	2	0.0
110	30	57	16	1.9
110	40	127	18	3.2
110	50	188	20	3.8
110	60	241	21	4.0
110	70	287	23	4.1
110	80	328	24	4.1
110	90	364	26	4.0
110	100	397	27	4.0
110	110	427	29	3.9
110	120	455	30	3.8
110	130	481	31	3.7
110	140	498	32	3.6
110	150	512	33	3.4
110	160	521	33	3.3
110	170	526	34	3.1
110	180	528	34	2.9
110	190	526	35	2.8
110	200	529	35	2.6
110	210	533	35	2.5
110	220	536	36	2.4
110	230	540	36	2.3
110	240	543	37	2.3
110	250	547	37	2.2
110	260	549	37	2.1
110	270	552	38	2.0
110	280	554	38	2.0
110	290	556	38	1.9
110	300	559	39	1.9
110	310	560	39	1.8
110	320	562	39	1.8
110	330	564	40	1.7
110	340	565	40	1.7
110	350	567	40	1.6

Natural Pine SIGrp 2-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
111	0	0	0	0.0
111	10	0	0	0.0
111	20	0	3	0.0
111	30	28	16	0.9
111	40	89	17	2.2
111	50	143	19	2.9
111	60	190	20	3.2
111	70	232	21	3.3
111	80	270	23	3.4
111	90	303	24	3.4
111	100	334	25	3.3
111	110	363	27	3.3
111	120	389	28	3.2
111	130	414	29	3.2
111	140	431	30	3.1
111	150	443	31	3.0
111	160	452	31	2.8
111	170	458	32	2.7
111	180	460	32	2.6
111	190	458	33	2.4
111	200	460	33	2.3
111	210	464	33	2.2
111	220	467	34	2.1
111	230	470	34	2.0
111	240	473	35	2.0
111	250	476	35	1.9
111	260	479	35	1.8
111	270	481	35	1.8
111	280	484	36	1.7
111	290	486	36	1.7
111	300	488	36	1.6
111	310	489	37	1.6
111	320	491	37	1.5
111	330	492	37	1.5
111	340	494	38	1.5
111	350	495	38	1.4

Natural Pine SIGrp 3-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
112	0	0	0	0.0
112	10	0	0	0.0
112	20	0	2	0.0
112	30	1	4	0.0
112	40	36	15	0.9
112	50	75	17	1.5
112	60	110	18	1.8
112	70	142	20	2.0
112	80	171	21	2.1
112	90	198	22	2.2
112	100	222	23	2.2
112	110	245	24	2.2
112	120	266	25	2.2
112	130	287	26	2.2
112	140	300	27	2.1
112	150	311	28	2.1
112	160	319	28	2.0
112	170	324	29	1.9
112	180	326	30	1.8
112	190	325	30	1.7
112	200	328	30	1.6
112	210	330	31	1.6
112	220	333	31	1.5
112	230	336	32	1.5
112	240	339	32	1.4
112	250	341	33	1.4
112	260	343	33	1.3
112	270	345	33	1.3
112	280	347	34	1.2
112	290	349	34	1.2
112	300	350	34	1.2
112	310	351	34	1.1
112	320	353	35	1.1
112	330	354	35	1.1
112	340	354	35	1.0
112	350	355	35	1.0

Natural FL SIGrp 123 <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
115	0	0	0	0.0
115	10	0	0	0.0
115	20	0	0	0.0
115	30	0	2	0.0
115	40	11	14	0.3
115	50	38	21	0.8
115	60	68	23	1.1
115	70	98	25	1.4
115	80	127	27	1.6
115	90	155	29	1.7
115	100	182	31	1.8
115	110	208	32	1.9
115	120	231	34	1.9
115	130	252	36	1.9
115	140	271	37	1.9
115	150	289	39	1.9
115	160	304	41	1.9
115	170	318	42	1.9
115	180	330	43	1.8
115	190	342	45	1.8
115	200	353	47	1.8
115	210	364	48	1.7
115	220	374	50	1.7
115	230	383	51	1.7
115	240	392	53	1.6
115	250	400	55	1.6
115	260	401	55	1.5
115	270	401	55	1.5
115	280	401	55	1.4
115	290	402	55	1.4
115	300	402	55	1.3
115	310	402	55	1.3
115	320	403	55	1.3
115	330	403	55	1.2
115	340	403	55	1.2
115	350	403	55	1.2

Natural B SIGrp 123 >140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
118	0	0	0	0.0
118	10	0	0	0.0
118	20	0	0	0.0
118	30	0	0	0.0
118	40	2	6	0.1
118	50	11	19	0.2
118	60	31	21	0.5
118	70	59	23	0.8
118	80	83	24	1.0
118	90	104	25	1.2
118	100	124	26	1.2
118	110	141	27	1.3
118	120	158	28	1.3
118	130	175	29	1.3
118	140	191	31	1.4
118	150	206	31	1.4
118	160	220	32	1.4
118	170	234	33	1.4
118	180	246	34	1.4
118	190	258	35	1.4
118	200	270	36	1.4
118	210	281	37	1.3
118	220	292	38	1.3
118	230	302	39	1.3
118	240	312	40	1.3
118	250	322	41	1.3
118	260	324	41	1.2
118	270	326	41	1.2
118	280	329	42	1.2
118	290	331	42	1.1
118	300	333	42	1.1
118	310	335	43	1.1
118	320	336	43	1.1
118	330	338	43	1.0
118	340	339	43	1.0
118	350	341	44	1.0

Natural S SIGrp 12- >140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
120	0	0	0	0.0
120	10	0	0	0.0
120	20	0	0	0.0
120	30	0	4	0.0
120	40	14	19	0.4
120	50	64	22	1.3
120	60	127	24	2.1
120	70	183	26	2.6
120	80	231	28	2.9
120	90	271	30	3.0
120	100	306	31	3.1
120	110	336	33	3.1
120	120	361	35	3.0
120	130	384	36	3.0
120	140	404	38	2.9
120	150	422	39	2.8
120	160	437	40	2.7
120	170	451	41	2.7
120	180	463	42	2.6
120	190	473	42	2.5
120	200	483	43	2.4
120	210	491	44	2.3
120	220	499	45	2.3
120	230	505	46	2.2
120	240	511	47	2.1
120	250	516	48	2.1
120	260	519	49	2.0
120	270	522	49	1.9
120	280	524	50	1.9
120	290	526	51	1.8
120	300	528	52	1.8
120	310	529	52	1.7
120	320	530	53	1.7
120	330	531	54	1.6
120	340	532	54	1.6
120	350	532	55	1.5

Natural S SIGrp 3-- >140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
121	0	0	0	0.0
121	10	0	0	0.0
121	20	0	0	0.0
121	30	0	0	0.0
121	40	1	5	0.0
121	50	8	17	0.2
121	60	37	21	0.6
121	70	76	23	1.1
121	80	116	25	1.5
121	90	152	26	1.7
121	100	185	27	1.9
121	110	214	29	1.9
121	120	240	30	2.0
121	130	264	32	2.0
121	140	286	33	2.0
121	150	305	34	2.0
121	160	322	35	2.0
121	170	338	36	2.0
121	180	352	37	2.0
121	190	364	38	1.9
121	200	376	39	1.9
121	210	386	39	1.8
121	220	396	40	1.8
121	230	405	41	1.8
121	240	413	42	1.7
121	250	420	43	1.7
121	260	424	44	1.6
121	270	428	44	1.6
121	280	432	45	1.5
121	290	435	45	1.5
121	300	438	46	1.5
121	310	440	47	1.4
121	320	442	47	1.4
121	330	444	48	1.3
121	340	446	49	1.3
121	350	447	49	1.3

Natural Pine SIGrp 12- >140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
123	0	0	0	0.0
123	10	0	0	0.0
123	20	1	8	0.1
123	30	28	16	0.9
123	40	88	18	2.2
123	50	140	19	2.8
123	60	185	21	3.1
123	70	224	22	3.2
123	80	259	23	3.2
123	90	289	25	3.2
123	100	317	26	3.2
123	110	342	27	3.1
123	120	365	28	3.0
123	130	388	30	3.0
123	140	403	30	2.9
123	150	415	31	2.8
123	160	423	32	2.6
123	170	429	32	2.5
123	180	432	33	2.4
123	190	431	33	2.3
123	200	434	33	2.2
123	210	438	34	2.1
123	220	441	34	2.0
123	230	444	35	1.9
123	240	448	35	1.9
123	250	451	35	1.8
123	260	453	36	1.7
123	270	456	36	1.7
123	280	458	36	1.6
123	290	460	37	1.6
123	300	461	37	1.5
123	310	463	37	1.5
123	320	465	37	1.5
123	330	466	38	1.4
123	340	467	38	1.4
123	350	468	38	1.3

Natural Pine SIGrp 3-- >140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
124	0	0	0	0.0
124	10	0	0	0.0
124	20	0	4	0.0
124	30	1	6	0.0
124	40	27	12	0.7
124	50	58	16	1.2
124	60	92	18	1.5
124	70	123	19	1.8
124	80	152	20	1.9
124	90	179	21	2.0
124	100	203	22	2.0
124	110	226	23	2.1
124	120	247	24	2.1
124	130	268	25	2.1
124	140	282	26	2.0
124	150	293	27	2.0
124	160	302	27	1.9
124	170	307	28	1.8
124	180	310	28	1.7
124	190	310	28	1.6
124	200	313	29	1.6
124	210	316	29	1.5
124	220	320	30	1.5
124	230	323	30	1.4
124	240	326	31	1.4
124	250	329	31	1.3
124	260	331	31	1.3
124	270	333	32	1.2
124	280	335	32	1.2
124	290	337	32	1.2
124	300	338	33	1.1
124	310	340	33	1.1
124	320	341	33	1.1
124	330	342	34	1.0
124	340	343	34	1.0
124	350	344	34	1.0

Natural FL SIGrp 123 <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
133	0	0	0	0.0
133	10	0	0	0.0
133	20	0	1	0.0
133	30	6	9	0.2
133	40	39	21	1.0
133	50	82	23	1.6
133	60	124	25	2.1
133	70	165	26	2.4
133	80	205	28	2.6
133	90	242	30	2.7
133	100	278	32	2.8
133	110	311	34	2.8
133	120	340	36	2.8
133	130	366	38	2.8
133	140	387	39	2.8
133	150	406	41	2.7
133	160	423	43	2.6
133	170	437	44	2.6
133	180	450	46	2.5
133	190	461	47	2.4
133	200	472	49	2.4
133	210	483	50	2.3
133	220	494	52	2.2
133	230	503	54	2.2
133	240	513	55	2.1
133	250	522	57	2.1
133	260	522	57	2.0
133	270	523	57	1.9
133	280	523	57	1.9
133	290	523	57	1.8
133	300	523	57	1.7
133	310	523	58	1.7
133	320	523	58	1.6
133	330	523	58	1.6
133	340	523	58	1.5
133	350	523	58	1.5

Natural B SIGrp 123 <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
136	0	0	0	0.0
136	10	0	0	0.0
136	20	0	0	0.0
136	30	8	10	0.3
136	40	35	18	0.9
136	50	72	22	1.4
136	60	111	24	1.9
136	70	151	25	2.2
136	80	185	27	2.3
136	90	214	28	2.4
136	100	241	30	2.4
136	110	265	31	2.4
136	120	286	33	2.4
136	130	310	34	2.4
136	140	331	36	2.4
136	150	351	37	2.3
136	160	370	38	2.3
136	170	387	39	2.3
136	180	403	41	2.2
136	190	419	42	2.2
136	200	434	43	2.2
136	210	448	44	2.1
136	220	461	45	2.1
136	230	475	47	2.1
136	240	487	48	2.0
136	250	499	49	2.0
136	260	501	49	1.9
136	270	504	50	1.9
136	280	506	50	1.8
136	290	508	50	1.8
136	300	510	51	1.7
136	310	511	51	1.6
136	320	513	51	1.6
136	330	514	52	1.6
136	340	516	52	1.5
136	350	517	52	1.5

Natural S SIGrp 123 <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
139	0	0	0	0.0
139	10	0	0	0.0
139	20	0	0	0.0
139	30	0	2	0.0
139	40	7	14	0.2
139	50	42	20	0.8
139	60	93	23	1.6
139	70	145	25	2.1
139	80	192	26	2.4
139	90	232	28	2.6
139	100	268	29	2.7
139	110	299	31	2.7
139	120	326	32	2.7
139	130	352	34	2.7
139	140	374	35	2.7
139	150	393	36	2.6
139	160	409	37	2.6
139	170	423	38	2.5
139	180	436	39	2.4
139	190	446	40	2.3
139	200	456	40	2.3
139	210	466	41	2.2
139	220	474	42	2.2
139	230	482	43	2.1
139	240	489	44	2.0
139	250	495	45	2.0
139	260	499	45	1.9
139	270	502	46	1.9
139	280	505	46	1.8
139	290	508	47	1.8
139	300	510	48	1.7
139	310	512	48	1.7
139	320	514	49	1.6
139	330	515	49	1.6
139	340	517	50	1.5
139	350	518	50	1.5

Natural Pine SIGrp 1-- <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
140	0	0	0	0.0
140	10	0	0	0.0
140	20	0	3	0.0
140	30	62	16	2.1
140	40	135	18	3.4
140	50	199	20	4.0
140	60	254	21	4.2
140	70	303	23	4.3
140	80	346	24	4.3
140	90	384	26	4.3
140	100	419	27	4.2
140	110	450	28	4.1
140	120	480	30	4.0
140	130	507	31	3.9
140	140	525	32	3.8
140	150	539	33	3.6
140	160	549	33	3.4
140	170	554	34	3.3
140	180	556	34	3.1
140	190	553	34	2.9
140	200	556	35	2.8
140	210	559	35	2.7
140	220	563	35	2.6
140	230	566	36	2.5
140	240	570	36	2.4
140	250	573	37	2.3
140	260	576	37	2.2
140	270	579	37	2.1
140	280	581	38	2.1
140	290	583	38	2.0
140	300	585	38	2.0
140	310	587	39	1.9
140	320	589	39	1.8
140	330	591	39	1.8
140	340	593	39	1.7
140	350	594	40	1.7

Natural Pine SIGrp 2-- <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
141	0	0	0	0.0
141	10	0	0	0.0
141	20	0	4	0.0
141	30	25	16	0.8
141	40	84	17	2.1
141	50	136	19	2.7
141	60	182	20	3.0
141	70	222	21	3.2
141	80	258	23	3.2
141	90	291	24	3.2
141	100	320	25	3.2
141	110	347	26	3.2
141	120	372	28	3.1
141	130	395	29	3.0
141	140	411	30	2.9
141	150	424	31	2.8
141	160	432	31	2.7
141	170	438	32	2.6
141	180	440	32	2.4
141	190	439	33	2.3
141	200	442	33	2.2
141	210	445	33	2.1
141	220	448	34	2.0
141	230	452	34	2.0
141	240	455	35	1.9
141	250	458	35	1.8
141	260	460	35	1.8
141	270	463	36	1.7
141	280	465	36	1.7
141	290	467	36	1.6
141	300	468	36	1.6
141	310	470	37	1.5
141	320	472	37	1.5
141	330	473	37	1.4
141	340	474	38	1.4
141	350	475	38	1.4

Natural Pine SIGrp 3-- <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
142	0	0	0	0.0
142	10	0	0	0.0
142	20	0	4	0.0
142	30	2	6	0.1
142	40	37	16	0.9
142	50	76	17	1.5
142	60	112	19	1.9
142	70	143	20	2.0
142	80	172	21	2.2
142	90	198	22	2.2
142	100	223	23	2.2
142	110	245	25	2.2
142	120	266	26	2.2
142	130	286	27	2.2
142	140	300	28	2.1
142	150	310	28	2.1
142	160	318	29	2.0
142	170	323	30	1.9
142	180	325	30	1.8
142	190	324	30	1.7
142	200	327	31	1.6
142	210	330	31	1.6
142	220	333	32	1.5
142	230	336	32	1.5
142	240	338	33	1.4
142	250	341	33	1.4
142	260	343	33	1.3
142	270	345	34	1.3
142	280	347	34	1.2
142	290	348	34	1.2
142	300	350	34	1.2
142	310	351	35	1.1
142	320	352	35	1.1
142	330	353	35	1.1
142	340	354	35	1.0
142	350	355	36	1.0

Natural FL SIGrp 123 >140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
145	0	0	0	0.0
145	10	0	0	0.0
145	20	0	0	0.0
145	30	0	1	0.0
145	40	8	9	0.2
145	50	28	17	0.6
145	60	53	22	0.9
145	70	80	24	1.1
145	80	107	26	1.3
145	90	133	28	1.5
145	100	158	30	1.6
145	110	183	31	1.7
145	120	205	33	1.7
145	130	225	34	1.7
145	140	243	36	1.7
145	150	259	37	1.7
145	160	274	39	1.7
145	170	286	40	1.7
145	180	298	41	1.7
145	190	309	43	1.6
145	200	320	44	1.6
145	210	330	46	1.6
145	220	339	47	1.5
145	230	348	49	1.5
145	240	357	50	1.5
145	250	365	52	1.5
145	260	365	52	1.4
145	270	365	52	1.4
145	280	366	52	1.3
145	290	366	52	1.3
145	300	366	52	1.2
145	310	366	52	1.2
145	320	366	52	1.1
145	330	367	52	1.1
145	340	366	52	1.1
145	350	366	52	1.0

Natural B SIGrp 123 >140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
148	0	0	0	0.0
148	10	0	0	0.0
148	20	0	0	0.0
148	30	0	1	0.0
148	40	3	7	0.1
148	50	14	19	0.3
148	60	35	21	0.6
148	70	65	23	0.9
148	80	89	24	1.1
148	90	111	25	1.2
148	100	130	26	1.3
148	110	148	27	1.3
148	120	165	29	1.4
148	130	182	30	1.4
148	140	199	31	1.4
148	150	214	32	1.4
148	160	228	33	1.4
148	170	242	34	1.4
148	180	255	35	1.4
148	190	267	35	1.4
148	200	279	36	1.4
148	210	290	37	1.4
148	220	301	38	1.4
148	230	312	39	1.4
148	240	322	40	1.3
148	250	332	41	1.3
148	260	334	42	1.3
148	270	337	42	1.2
148	280	339	42	1.2
148	290	341	43	1.2
148	300	343	43	1.1
148	310	345	43	1.1
148	320	347	44	1.1
148	330	348	44	1.1
148	340	350	44	1.0
148	350	351	45	1.0

Natural S SIGrp 123 >140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
151	0	0	0	0.0
151	10	0	0	0.0
151	20	0	0	0.0
151	30	0	1	0.0
151	40	3	8	0.1
151	50	20	18	0.4
151	60	54	21	0.9
151	70	95	23	1.4
151	80	136	25	1.7
151	90	172	26	1.9
151	100	203	28	2.0
151	110	232	29	2.1
151	120	257	31	2.1
151	130	280	32	2.2
151	140	301	34	2.2
151	150	320	35	2.1
151	160	337	36	2.1
151	170	352	37	2.1
151	180	366	37	2.0
151	190	378	38	2.0
151	200	389	39	1.9
151	210	400	40	1.9
151	220	409	41	1.9
151	230	417	42	1.8
151	240	425	43	1.8
151	250	433	43	1.7
151	260	437	44	1.7
151	270	440	45	1.6
151	280	443	45	1.6
151	290	446	46	1.5
151	300	449	46	1.5
151	310	451	47	1.5
151	320	453	48	1.4
151	330	454	48	1.4
151	340	456	49	1.3
151	350	457	49	1.3

Natural Pine SIGrp 123 >140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
154	0	0	0	0.0
154	10	0	0	0.0
154	20	1	9	0.1
154	30	16	12	0.5
154	40	57	16	1.4
154	50	101	18	2.0
154	60	140	19	2.3
154	70	176	21	2.5
154	80	207	22	2.6
154	90	235	23	2.6
154	100	261	24	2.6
154	110	284	25	2.6
154	120	306	26	2.6
154	130	326	27	2.5
154	140	341	28	2.4
154	150	352	29	2.3
154	160	361	29	2.3
154	170	366	30	2.2
154	180	369	30	2.1
154	190	369	31	1.9
154	200	372	31	1.9
154	210	376	31	1.8
154	220	379	32	1.7
154	230	382	32	1.7
154	240	385	33	1.6
154	250	388	33	1.6
154	260	390	33	1.5
154	270	392	34	1.5
154	280	394	34	1.4
154	290	396	34	1.4
154	300	398	35	1.3
154	310	399	35	1.3
154	320	400	35	1.3
154	330	401	36	1.2
154	340	402	36	1.2
154	350	403	36	1.2

Ex IU Any species SIGrp 123 Any slope

Analysis Unit	Age	Volume	Diameter	MAI
170	0	0	0	0.0
170	10	0	0	0.0
170	20	0	0	0.0
170	30	0	0	0.0
170	40	0	0	0.0
170	50	3	5	0.1
170	60	9	15	0.2
170	70	22	17	0.3
170	80	39	21	0.5
170	90	55	23	0.6
170	100	70	24	0.7
170	110	84	25	0.8
170	120	97	26	0.8
170	130	110	27	0.8
170	140	123	28	0.9
170	150	134	29	0.9
170	160	145	30	0.9
170	170	155	30	0.9
170	180	164	31	0.9
170	190	173	32	0.9
170	200	182	33	0.9
170	210	190	33	0.9
170	220	198	34	0.9
170	230	206	35	0.9
170	240	213	36	0.9
170	250	220	37	0.9
170	260	222	37	0.9
170	270	224	37	0.8
170	280	225	37	0.8
170	290	227	37	0.8
170	300	228	38	0.8
170	310	229	38	0.7
170	320	230	38	0.7
170	330	231	38	0.7
170	340	232	38	0.7
170	350	233	39	0.7

APPENDIX B. MANAGED STANDS (TIPSY) YIELD TABLES

<insert tables after this page>

Fut Managed FL SIGrp 1-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
201	0	0	0	0.0
201	10	0	0	0.0
201	20	0	0	0.0
201	30	16	17	0.5
201	40	82	22	2.1
201	50	170	26	3.4
201	60	242	29	4.0
201	70	303	32	4.3
201	80	354	34	4.4
201	90	399	37	4.4
201	100	435	38	4.4
201	110	463	40	4.2
201	120	488	41	4.1
201	130	508	42	3.9
201	140	522	43	3.7
201	150	519	43	3.5
201	160	517	43	3.2
201	170	514	43	3.0
201	180	511	43	2.8
201	190	508	43	2.7
201	200	505	43	2.5
201	210	503	43	2.4
201	220	500	43	2.3
201	230	497	43	2.2
201	240	494	43	2.1
201	250	491	43	2.0
201	260	489	43	1.9
201	270	486	43	1.8
201	280	483	43	1.7
201	290	480	43	1.7
201	300	477	43	1.6
201	310	475	43	1.5
201	320	472	43	1.5
201	330	469	43	1.4
201	340	466	43	1.4
201	350	463	43	1.3

Fut Managed FL SIGrp 2-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
202	0	0	0	0.0
202	10	0	0	0.0
202	20	0	0	0.0
202	30	14	17	0.5
202	40	75	21	1.9
202	50	160	25	3.2
202	60	233	29	3.9
202	70	292	31	4.2
202	80	342	34	4.3
202	90	387	36	4.3
202	100	424	38	4.2
202	110	452	39	4.1
202	120	476	40	4.0
202	130	498	41	3.8
202	140	513	42	3.7
202	150	525	43	3.5
202	160	522	43	3.3
202	170	519	43	3.1
202	180	516	43	2.9
202	190	513	43	2.7
202	200	511	43	2.6
202	210	508	43	2.4
202	220	505	43	2.3
202	230	502	43	2.2
202	240	499	43	2.1
202	250	496	43	2.0
202	260	493	43	1.9
202	270	490	43	1.8
202	280	488	43	1.7
202	290	485	43	1.7
202	300	482	43	1.6
202	310	479	43	1.5
202	320	476	43	1.5
202	330	473	43	1.4
202	340	470	43	1.4
202	350	467	43	1.3

Fut Managed FL SIGrp 3-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
203	0	0	0	0.0
203	10	0	0	0.0
203	20	0	0	0.0
203	30	12	17	0.4
203	40	65	21	1.6
203	50	141	24	2.8
203	60	208	27	3.5
203	70	264	30	3.8
203	80	315	33	3.9
203	90	359	35	4.0
203	100	399	37	4.0
203	110	430	38	3.9
203	120	455	39	3.8
203	130	478	40	3.7
203	140	499	41	3.6
203	150	512	42	3.4
203	160	522	43	3.3
203	170	532	43	3.1
203	180	539	44	3.0
203	190	545	44	2.9
203	200	551	44	2.8
203	210	555	45	2.6
203	220	559	45	2.5
203	230	563	46	2.4
203	240	567	46	2.4
203	250	571	46	2.3
203	260	574	46	2.2
203	270	576	47	2.1
203	280	578	47	2.1
203	290	580	47	2.0
203	300	576	47	1.9
203	310	573	47	1.8
203	320	569	47	1.8
203	330	566	47	1.7
203	340	562	47	1.7
203	350	559	47	1.6

Fut Managed B SIGrp 1-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
204	0	0	0	0.0
204	10	0	0	0.0
204	20	0	13	0.0
204	30	17	18	0.6
204	40	103	24	2.6
204	50	197	28	3.9
204	60	278	30	4.6
204	70	344	32	4.9
204	80	385	34	4.8
204	90	416	35	4.6
204	100	439	36	4.4
204	110	457	37	4.2
204	120	467	38	3.9
204	130	470	39	3.6
204	140	473	39	3.4
204	150	475	39	3.2
204	160	476	40	3.0
204	170	476	40	2.8
204	180	476	40	2.6
204	190	473	40	2.5
204	200	470	41	2.4
204	210	467	41	2.2
204	220	465	41	2.1
204	230	462	41	2.0
204	240	459	41	1.9
204	250	457	41	1.8
204	260	454	41	1.7
204	270	452	41	1.7
204	280	449	41	1.6
204	290	446	41	1.5
204	300	444	41	1.5
204	310	441	41	1.4
204	320	438	41	1.4
204	330	436	41	1.3
204	340	433	41	1.3
204	350	431	41	1.2

Fut Managed B SIGrp 2-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
205	0	0	0	0.0
205	10	0	0	0.0
205	20	0	0	0.0
205	30	10	17	0.3
205	40	87	23	2.2
205	50	178	27	3.6
205	60	254	30	4.2
205	70	323	32	4.6
205	80	368	33	4.6
205	90	400	35	4.4
205	100	425	36	4.3
205	110	443	37	4.0
205	120	457	37	3.8
205	130	463	38	3.6
205	140	466	38	3.3
205	150	468	39	3.1
205	160	470	39	2.9
205	170	471	39	2.8
205	180	471	40	2.6
205	190	470	40	2.5
205	200	469	40	2.3
205	210	468	40	2.2
205	220	465	41	2.1
205	230	463	41	2.0
205	240	460	41	1.9
205	250	457	41	1.8
205	260	455	41	1.8
205	270	452	41	1.7
205	280	450	41	1.6
205	290	447	41	1.5
205	300	444	41	1.5
205	310	442	41	1.4
205	320	439	41	1.4
205	330	437	41	1.3
205	340	434	41	1.3
205	350	431	41	1.2

Fut Managed B SIGrp 3-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
206	0	0	0	0.0
206	10	0	0	0.0
206	20	0	0	0.0
206	30	11	17	0.4
206	40	89	23	2.2
206	50	180	27	3.6
206	60	258	30	4.3
206	70	326	32	4.7
206	80	370	33	4.6
206	90	402	35	4.5
206	100	427	36	4.3
206	110	445	37	4.0
206	120	458	37	3.8
206	130	464	38	3.6
206	140	467	39	3.3
206	150	470	39	3.1
206	160	471	39	2.9
206	170	472	40	2.8
206	180	471	40	2.6
206	190	471	40	2.5
206	200	470	40	2.4
206	210	468	40	2.2
206	220	465	41	2.1
206	230	463	41	2.0
206	240	460	41	1.9
206	250	457	41	1.8
206	260	455	41	1.8
206	270	452	41	1.7
206	280	450	41	1.6
206	290	447	41	1.5
206	300	444	41	1.5
206	310	442	41	1.4
206	320	439	41	1.4
206	330	437	41	1.3
206	340	434	41	1.3
206	350	431	41	1.2

Fut Managed S SIGrp 1-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
207	0	0	0	0.0
207	10	0	0	0.0
207	20	0	13	0.0
207	30	14	18	0.5
207	40	95	24	2.4
207	50	187	27	3.7
207	60	266	30	4.4
207	70	333	32	4.8
207	80	377	34	4.7
207	90	409	35	4.5
207	100	432	36	4.3
207	110	450	37	4.1
207	120	463	38	3.9
207	130	468	38	3.6
207	140	470	39	3.4
207	150	472	39	3.1
207	160	473	39	3.0
207	170	474	40	2.8
207	180	474	40	2.6
207	190	472	40	2.5
207	200	471	40	2.4
207	210	468	41	2.2
207	220	465	41	2.1
207	230	463	41	2.0
207	240	460	41	1.9
207	250	457	41	1.8
207	260	455	41	1.8
207	270	452	41	1.7
207	280	450	41	1.6
207	290	447	41	1.5
207	300	444	41	1.5
207	310	442	41	1.4
207	320	439	41	1.4
207	330	437	41	1.3
207	340	434	41	1.3
207	350	431	41	1.2

Fut Managed S SIGrp 2-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
208	0	0	0	0.0
208	10	0	0	0.0
208	20	0	13	0.0
208	30	18	18	0.6
208	40	104	24	2.6
208	50	199	28	4.0
208	60	280	30	4.7
208	70	345	33	4.9
208	80	386	34	4.8
208	90	417	35	4.6
208	100	440	36	4.4
208	110	457	37	4.2
208	120	467	38	3.9
208	130	471	39	3.6
208	140	473	39	3.4
208	150	475	39	3.2
208	160	476	40	3.0
208	170	476	40	2.8
208	180	476	40	2.6
208	190	473	40	2.5
208	200	470	41	2.4
208	210	467	41	2.2
208	220	465	41	2.1
208	230	462	41	2.0
208	240	459	41	1.9
208	250	457	41	1.8
208	260	454	41	1.7
208	270	452	41	1.7
208	280	449	41	1.6
208	290	446	41	1.5
208	300	444	41	1.5
208	310	441	41	1.4
208	320	438	41	1.4
208	330	436	41	1.3
208	340	433	41	1.3
208	350	431	41	1.2

Fut Managed S SIGrp 3-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
209	0	0	0	0.0
209	10	0	0	0.0
209	20	0	13	0.0
209	30	13	18	0.4
209	40	93	24	2.3
209	50	185	27	3.7
209	60	264	30	4.4
209	70	331	32	4.7
209	80	374	34	4.7
209	90	407	35	4.5
209	100	431	36	4.3
209	110	449	37	4.1
209	120	461	38	3.8
209	130	466	38	3.6
209	140	469	39	3.4
209	150	471	39	3.1
209	160	473	39	3.0
209	170	473	40	2.8
209	180	473	40	2.6
209	190	472	40	2.5
209	200	471	40	2.4
209	210	468	41	2.2
209	220	465	41	2.1
209	230	463	41	2.0
209	240	460	41	1.9
209	250	457	41	1.8
209	260	455	41	1.8
209	270	452	41	1.7
209	280	450	41	1.6
209	290	447	41	1.5
209	300	444	41	1.5
209	310	442	41	1.4
209	320	439	41	1.4
209	330	437	41	1.3
209	340	434	41	1.3
209	350	431	41	1.2

Fut Managed Pine SIGrp 1-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
210	0	0	0	0.0
210	10	0	0	0.0
210	20	1	0	0.1
210	30	48	17	1.6
210	40	132	22	3.3
210	50	205	25	4.1
210	60	267	28	4.5
210	70	313	30	4.5
210	80	350	32	4.4
210	90	382	33	4.2
210	100	409	35	4.1
210	110	431	36	3.9
210	120	448	37	3.7
210	130	459	38	3.5
210	140	470	38	3.4
210	150	480	39	3.2
210	160	488	40	3.1
210	170	492	40	2.9
210	180	494	40	2.7
210	190	496	41	2.6
210	200	493	41	2.5
210	210	490	41	2.3
210	220	487	41	2.2
210	230	484	41	2.1
210	240	482	41	2.0
210	250	479	41	1.9
210	260	476	41	1.8
210	270	473	41	1.8
210	280	471	41	1.7
210	290	468	41	1.6
210	300	465	41	1.6
210	310	462	41	1.5
210	320	459	41	1.4
210	330	457	41	1.4
210	340	454	41	1.3
210	350	451	41	1.3

Fut Managed Pine SIGrp 2-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
211	0	0	0	0.0
211	10	0	0	0.0
211	20	1	0	0.1
211	30	42	17	1.4
211	40	123	21	3.1
211	50	194	24	3.9
211	60	254	27	4.2
211	70	302	29	4.3
211	80	338	31	4.2
211	90	369	33	4.1
211	100	396	34	4.0
211	110	418	35	3.8
211	120	436	36	3.6
211	130	449	37	3.5
211	140	459	38	3.3
211	150	468	38	3.1
211	160	476	39	3.0
211	170	483	39	2.8
211	180	488	40	2.7
211	190	491	40	2.6
211	200	492	40	2.5
211	210	489	40	2.3
211	220	487	40	2.2
211	230	484	40	2.1
211	240	481	40	2.0
211	250	478	40	1.9
211	260	476	40	1.8
211	270	473	40	1.8
211	280	470	40	1.7
211	290	467	40	1.6
211	300	465	40	1.6
211	310	462	40	1.5
211	320	459	40	1.4
211	330	457	40	1.4
211	340	454	40	1.3
211	350	451	40	1.3

Fut Managed Pine SIGrp 3-- <= 140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
212	0	0	0	0.0
212	10	0	0	0.0
212	20	2	0	0.1
212	30	51	18	1.7
212	40	146	23	3.7
212	50	228	26	4.6
212	60	294	29	4.9
212	70	344	30	4.9
212	80	373	32	4.7
212	90	396	33	4.4
212	100	416	34	4.2
212	110	430	35	3.9
212	120	440	36	3.7
212	130	446	36	3.4
212	140	450	37	3.2
212	150	454	37	3.0
212	160	456	37	2.9
212	170	457	38	2.7
212	180	458	38	2.5
212	190	457	38	2.4
212	200	455	38	2.3
212	210	452	38	2.2
212	220	450	38	2.0
212	230	447	38	1.9
212	240	445	38	1.9
212	250	442	38	1.8
212	260	440	38	1.7
212	270	437	38	1.6
212	280	435	38	1.6
212	290	432	38	1.5
212	300	430	38	1.4
212	310	427	38	1.4
212	320	425	38	1.3
212	330	422	38	1.3
212	340	420	38	1.2
212	350	417	38	1.2

Fut Managed FL SIGrp 123 >140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
215	0	0	0	0.0
215	10	0	0	0.0
215	20	0	0	0.0
215	30	9	16	0.3
215	40	58	20	1.5
215	50	133	24	2.7
215	60	203	27	3.4
215	70	259	30	3.7
215	80	309	32	3.9
215	90	350	34	3.9
215	100	388	36	3.9
215	110	419	38	3.8
215	120	443	39	3.7
215	130	463	40	3.6
215	140	482	41	3.4
215	150	499	41	3.3
215	160	510	42	3.2
215	170	519	43	3.1
215	180	516	43	2.9
215	190	513	43	2.7
215	200	511	43	2.6
215	210	508	43	2.4
215	220	505	43	2.3
215	230	502	43	2.2
215	240	499	43	2.1
215	250	496	43	2.0
215	260	494	43	1.9
215	270	491	43	1.8
215	280	488	43	1.7
215	290	485	43	1.7
215	300	482	43	1.6
215	310	479	43	1.5
215	320	477	43	1.5
215	330	474	43	1.4
215	340	471	43	1.4
215	350	468	43	1.3

Fut Managed B SIGrp 123 >140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
218	0	0	0	0.0
218	10	0	0	0.0
218	20	0	0	0.0
218	30	7	17	0.2
218	40	76	23	1.9
218	50	164	27	3.3
218	60	238	29	4.0
218	70	307	31	4.4
218	80	354	33	4.4
218	90	387	34	4.3
218	100	412	35	4.1
218	110	431	36	3.9
218	120	446	37	3.7
218	130	455	37	3.5
218	140	459	38	3.3
218	150	463	38	3.1
218	160	464	39	2.9
218	170	466	39	2.7
218	180	466	39	2.6
218	190	466	40	2.5
218	200	465	40	2.3
218	210	463	40	2.2
218	220	462	40	2.1
218	230	460	40	2.0
218	240	459	40	1.9
218	250	457	40	1.8
218	260	454	40	1.7
218	270	452	40	1.7
218	280	449	40	1.6
218	290	446	40	1.5
218	300	444	40	1.5
218	310	441	40	1.4
218	320	438	40	1.4
218	330	436	40	1.3
218	340	433	40	1.3
218	350	431	40	1.2

Fut Managed S SIGrp 12- >140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
220	0	0	0	0.0
220	10	0	0	0.0
220	20	0	13	0.0
220	30	19	18	0.6
220	40	109	24	2.7
220	50	204	28	4.1
220	60	286	31	4.8
220	70	350	33	5.0
220	80	391	34	4.9
220	90	422	35	4.7
220	100	445	36	4.5
220	110	462	37	4.2
220	120	471	38	3.9
220	130	473	39	3.6
220	140	475	39	3.4
220	150	477	40	3.2
220	160	478	40	3.0
220	170	478	40	2.8
220	180	475	40	2.6
220	190	472	41	2.5
220	200	470	41	2.4
220	210	467	41	2.2
220	220	465	41	2.1
220	230	462	41	2.0
220	240	459	41	1.9
220	250	457	41	1.8
220	260	454	41	1.7
220	270	452	41	1.7
220	280	449	41	1.6
220	290	446	41	1.5
220	300	444	41	1.5
220	310	441	41	1.4
220	320	438	41	1.4
220	330	436	41	1.3
220	340	433	41	1.3
220	350	431	41	1.2

Fut Managed S SIGrp 3-- >140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
221	0	0	0	0.0
221	10	0	0	0.0
221	20	0	13	0.0
221	30	17	18	0.6
221	40	103	24	2.6
221	50	196	28	3.9
221	60	278	30	4.6
221	70	343	32	4.9
221	80	384	34	4.8
221	90	415	35	4.6
221	100	439	36	4.4
221	110	456	37	4.1
221	120	466	38	3.9
221	130	470	38	3.6
221	140	472	39	3.4
221	150	474	39	3.2
221	160	476	40	3.0
221	170	476	40	2.8
221	180	475	40	2.6
221	190	473	40	2.5
221	200	470	41	2.4
221	210	467	41	2.2
221	220	465	41	2.1
221	230	462	41	2.0
221	240	459	41	1.9
221	250	457	41	1.8
221	260	454	41	1.7
221	270	452	41	1.7
221	280	449	41	1.6
221	290	446	41	1.5
221	300	444	41	1.5
221	310	441	41	1.4
221	320	438	41	1.4
221	330	436	41	1.3
221	340	433	41	1.3
221	350	431	41	1.2

Fut Managed Pine SIGrp 12- >140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
223	0	0	0	0.0
223	10	0	0	0.0
223	20	1	0	0.1
223	30	37	16	1.2
223	40	116	21	2.9
223	50	187	24	3.7
223	60	246	27	4.1
223	70	294	29	4.2
223	80	330	31	4.1
223	90	361	32	4.0
223	100	388	34	3.9
223	110	410	35	3.7
223	120	428	36	3.6
223	130	442	37	3.4
223	140	452	37	3.2
223	150	461	38	3.1
223	160	470	39	2.9
223	170	476	39	2.8
223	180	482	39	2.7
223	190	485	40	2.6
223	200	489	40	2.4
223	210	490	40	2.3
223	220	490	41	2.2
223	230	487	41	2.1
223	240	485	41	2.0
223	250	482	41	1.9
223	260	479	41	1.8
223	270	476	41	1.8
223	280	474	41	1.7
223	290	471	41	1.6
223	300	468	41	1.6
223	310	465	41	1.5
223	320	463	41	1.4
223	330	460	41	1.4
223	340	457	41	1.3
223	350	454	41	1.3

Fut Managed Pine SIGrp 3-- >140yr <= 45%

Analysis Unit	Age	Volume	Diameter	MAI
224	0	0	0	0.0
224	10	0	0	0.0
224	20	2	0	0.1
224	30	45	17	1.5
224	40	137	22	3.4
224	50	219	26	4.4
224	60	283	28	4.7
224	70	335	30	4.8
224	80	366	32	4.6
224	90	389	33	4.3
224	100	409	34	4.1
224	110	424	35	3.9
224	120	435	35	3.6
224	130	441	36	3.4
224	140	446	36	3.2
224	150	449	37	3.0
224	160	451	37	2.8
224	170	453	37	2.7
224	180	454	38	2.5
224	190	454	38	2.4
224	200	455	38	2.3
224	210	453	38	2.2
224	220	450	38	2.0
224	230	447	38	1.9
224	240	445	38	1.9
224	250	442	38	1.8
224	260	440	38	1.7
224	270	437	38	1.6
224	280	435	38	1.6
224	290	432	38	1.5
224	300	430	38	1.4
224	310	427	38	1.4
224	320	425	38	1.3
224	330	422	38	1.3
224	340	420	38	1.2
224	350	417	38	1.2

Fut Managed FL SIGrp 123 <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
233	0	0	0	0.0
233	10	0	0	0.0
233	20	0	0	0.0
233	30	9	16	0.3
233	40	57	20	1.4
233	50	132	24	2.6
233	60	203	27	3.4
233	70	258	30	3.7
233	80	308	32	3.9
233	90	350	34	3.9
233	100	387	36	3.9
233	110	418	38	3.8
233	120	443	39	3.7
233	130	463	40	3.6
233	140	482	41	3.4
233	150	498	41	3.3
233	160	510	42	3.2
233	170	518	43	3.0
233	180	516	43	2.9
233	190	513	43	2.7
233	200	510	43	2.6
233	210	507	43	2.4
233	220	504	43	2.3
233	230	501	43	2.2
233	240	499	43	2.1
233	250	496	43	2.0
233	260	493	43	1.9
233	270	490	43	1.8
233	280	487	43	1.7
233	290	484	43	1.7
233	300	482	43	1.6
233	310	479	43	1.5
233	320	476	43	1.5
233	330	473	43	1.4
233	340	470	43	1.4
233	350	467	43	1.3

Fut Managed B SIGrp 123 <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
236	0	0	0	0.0
236	10	0	0	0.0
236	20	0	13	0.0
236	30	13	18	0.4
236	40	95	24	2.4
236	50	187	27	3.7
236	60	266	30	4.4
236	70	333	32	4.8
236	80	377	34	4.7
236	90	409	35	4.5
236	100	432	36	4.3
236	110	450	37	4.1
236	120	462	38	3.9
236	130	468	38	3.6
236	140	470	39	3.4
236	150	472	39	3.1
236	160	473	39	3.0
236	170	474	40	2.8
236	180	474	40	2.6
236	190	472	40	2.5
236	200	471	40	2.4
236	210	468	41	2.2
236	220	465	41	2.1
236	230	463	41	2.0
236	240	460	41	1.9
236	250	457	41	1.8
236	260	455	41	1.8
236	270	452	41	1.7
236	280	450	41	1.6
236	290	447	41	1.5
236	300	444	41	1.5
236	310	442	41	1.4
236	320	439	41	1.4
236	330	437	41	1.3
236	340	434	41	1.3
236	350	431	41	1.2

Fut Managed S SIGrp 123 <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
239	0	0	0	0.0
239	10	0	0	0.0
239	20	0	0	0.0
239	30	12	17	0.4
239	40	91	23	2.3
239	50	183	27	3.7
239	60	262	30	4.4
239	70	329	32	4.7
239	80	374	34	4.7
239	90	406	35	4.5
239	100	429	36	4.3
239	110	447	37	4.1
239	120	460	38	3.8
239	130	466	38	3.6
239	140	469	39	3.4
239	150	471	39	3.1
239	160	472	39	3.0
239	170	473	40	2.8
239	180	472	40	2.6
239	190	472	40	2.5
239	200	471	40	2.4
239	210	468	41	2.2
239	220	465	41	2.1
239	230	463	41	2.0
239	240	460	41	1.9
239	250	457	41	1.8
239	260	455	41	1.8
239	270	452	41	1.7
239	280	450	41	1.6
239	290	447	41	1.5
239	300	444	41	1.5
239	310	442	41	1.4
239	320	439	41	1.4
239	330	437	41	1.3
239	340	434	41	1.3
239	350	431	41	1.2

Fut Managed Pine SIGrp 1-- <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
240	0	0	0	0.0
240	10	0	0	0.0
240	20	1	0	0.1
240	30	46	17	1.5
240	40	130	21	3.3
240	50	202	25	4.0
240	60	264	28	4.4
240	70	310	30	4.4
240	80	348	32	4.4
240	90	378	33	4.2
240	100	406	35	4.1
240	110	428	36	3.9
240	120	445	37	3.7
240	130	457	38	3.5
240	140	468	38	3.3
240	150	477	39	3.2
240	160	486	39	3.0
240	170	491	40	2.9
240	180	494	40	2.7
240	190	495	41	2.6
240	200	492	41	2.5
240	210	489	41	2.3
240	220	487	41	2.2
240	230	484	41	2.1
240	240	481	41	2.0
240	250	478	41	1.9
240	260	476	41	1.8
240	270	473	41	1.8
240	280	470	41	1.7
240	290	467	41	1.6
240	300	465	41	1.6
240	310	462	41	1.5
240	320	459	41	1.4
240	330	457	41	1.4
240	340	454	41	1.3
240	350	451	41	1.3

Fut Managed Pine SIGrp 2-- <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
241	0	0	0	0.0
241	10	0	0	0.0
241	20	1	0	0.1
241	30	37	16	1.2
241	40	115	21	2.9
241	50	184	24	3.7
241	60	243	27	4.1
241	70	292	29	4.2
241	80	328	31	4.1
241	90	358	32	4.0
241	100	385	34	3.9
241	110	407	35	3.7
241	120	425	36	3.5
241	130	439	37	3.4
241	140	449	37	3.2
241	150	458	38	3.1
241	160	467	38	2.9
241	170	473	39	2.8
241	180	479	39	2.7
241	190	483	40	2.5
241	200	486	40	2.4
241	210	489	40	2.3
241	220	489	41	2.2
241	230	486	41	2.1
241	240	483	41	2.0
241	250	481	41	1.9
241	260	478	41	1.8
241	270	475	41	1.8
241	280	472	41	1.7
241	290	470	41	1.6
241	300	467	41	1.6
241	310	464	41	1.5
241	320	461	41	1.4
241	330	459	41	1.4
241	340	456	41	1.3
241	350	453	41	1.3

Fut Managed Pine SIGrp 3-- <= 140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
242	0	0	0	0.0
242	10	0	0	0.0
242	20	1	0	0.1
242	30	41	17	1.4
242	40	129	22	3.2
242	50	211	25	4.2
242	60	274	28	4.6
242	70	328	30	4.7
242	80	359	31	4.5
242	90	382	32	4.2
242	100	401	33	4.0
242	110	417	34	3.8
242	120	428	35	3.6
242	130	436	35	3.4
242	140	441	36	3.2
242	150	445	36	3.0
242	160	447	37	2.8
242	170	448	37	2.6
242	180	449	37	2.5
242	190	450	37	2.4
242	200	450	38	2.3
242	210	450	38	2.1
242	220	450	38	2.0
242	230	448	38	1.9
242	240	446	38	1.9
242	250	443	38	1.8
242	260	440	38	1.7
242	270	438	38	1.6
242	280	435	38	1.6
242	290	433	38	1.5
242	300	430	38	1.4
242	310	428	38	1.4
242	320	425	38	1.3
242	330	423	38	1.3
242	340	420	38	1.2
242	350	418	38	1.2

Fut Managed FL SIGrp 123 >140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
245	0	0	0	0.0
245	10	0	0	0.0
245	20	0	0	0.0
245	30	4	15	0.1
245	40	38	19	1.0
245	50	96	22	1.9
245	60	162	25	2.7
245	70	214	28	3.1
245	80	259	30	3.2
245	90	299	32	3.3
245	100	335	34	3.4
245	110	368	35	3.3
245	120	395	37	3.3
245	130	419	38	3.2
245	140	437	39	3.1
245	150	453	39	3.0
245	160	468	40	2.9
245	170	481	41	2.8
245	180	492	41	2.7
245	190	501	42	2.6
245	200	508	42	2.5
245	210	514	43	2.4
245	220	518	43	2.4
245	230	522	43	2.3
245	240	524	43	2.2
245	250	526	44	2.1
245	260	528	44	2.0
245	270	529	44	2.0
245	280	531	44	1.9
245	290	533	45	1.8
245	300	530	45	1.8
245	310	527	45	1.7
245	320	524	45	1.6
245	330	521	45	1.6
245	340	517	45	1.5
245	350	514	45	1.5

Fut Managed B SIGrp 123 >140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
248	0	0	0	0.0
248	10	0	0	0.0
248	20	0	0	0.0
248	30	7	17	0.2
248	40	74	23	1.9
248	50	162	26	3.2
248	60	237	29	4.0
248	70	306	31	4.4
248	80	352	33	4.4
248	90	385	34	4.3
248	100	410	35	4.1
248	110	429	36	3.9
248	120	444	37	3.7
248	130	454	37	3.5
248	140	459	38	3.3
248	150	461	38	3.1
248	160	464	39	2.9
248	170	465	39	2.7
248	180	465	39	2.6
248	190	465	40	2.4
248	200	464	40	2.3
248	210	463	40	2.2
248	220	462	40	2.1
248	230	460	40	2.0
248	240	459	40	1.9
248	250	457	40	1.8
248	260	454	40	1.7
248	270	452	40	1.7
248	280	449	40	1.6
248	290	446	40	1.5
248	300	444	40	1.5
248	310	441	40	1.4
248	320	438	40	1.4
248	330	436	40	1.3
248	340	433	40	1.3
248	350	431	40	1.2

Fut Managed S SIGrp 123 >140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
251	0	0	0	0.0
251	10	0	0	0.0
251	20	0	13	0.0
251	30	16	18	0.5
251	40	102	24	2.6
251	50	195	28	3.9
251	60	276	30	4.6
251	70	342	32	4.9
251	80	383	34	4.8
251	90	415	35	4.6
251	100	438	36	4.4
251	110	455	37	4.1
251	120	465	38	3.9
251	130	470	38	3.6
251	140	472	39	3.4
251	150	474	39	3.2
251	160	476	40	3.0
251	170	475	40	2.8
251	180	475	40	2.6
251	190	473	40	2.5
251	200	470	41	2.4
251	210	467	41	2.2
251	220	465	41	2.1
251	230	462	41	2.0
251	240	459	41	1.9
251	250	457	41	1.8
251	260	454	41	1.7
251	270	452	41	1.7
251	280	449	41	1.6
251	290	446	41	1.5
251	300	444	41	1.5
251	310	441	41	1.4
251	320	438	41	1.4
251	330	436	41	1.3
251	340	433	41	1.3
251	350	431	41	1.2

Fut Managed Pine SIGrp 123 >140yr >45%

Analysis Unit	Age	Volume	Diameter	MAI
254	0	0	0	0.0
254	10	0	0	0.0
254	20	2	0	0.1
254	30	43	17	1.4
254	40	134	22	3.4
254	50	215	26	4.3
254	60	280	28	4.7
254	70	333	30	4.8
254	80	363	31	4.5
254	90	387	33	4.3
254	100	407	34	4.1
254	110	422	34	3.8
254	120	433	35	3.6
254	130	439	36	3.4
254	140	444	36	3.2
254	150	448	37	3.0
254	160	450	37	2.8
254	170	451	37	2.7
254	180	452	37	2.5
254	190	453	38	2.4
254	200	453	38	2.3
254	210	453	38	2.2
254	220	451	38	2.1
254	230	448	38	1.9
254	240	446	38	1.9
254	250	443	38	1.8
254	260	440	38	1.7
254	270	438	38	1.6
254	280	435	38	1.6
254	290	433	38	1.5
254	300	430	38	1.4
254	310	428	38	1.4
254	320	425	38	1.3
254	330	423	38	1.3
254	340	420	38	1.2
254	350	418	38	1.2

Fut IU Any species SIGrp 123 Any slope

Analysis Unit	Age	Volume	Diameter	MAI
270	0	0	0	0.0
270	10	0	0	0.0
270	20	1	0	0.1
270	30	31	16	1.0
270	40	103	20	2.6
270	50	171	23	3.4
270	60	228	26	3.8
270	70	277	28	4.0
270	80	313	30	3.9
270	90	343	32	3.8
270	100	367	33	3.7
270	110	390	34	3.5
270	120	408	35	3.4
270	130	423	36	3.3
270	140	435	37	3.1
270	150	444	37	3.0
270	160	451	38	2.8
270	170	458	38	2.7
270	180	464	39	2.6
270	190	469	39	2.5
270	200	472	39	2.4
270	210	475	40	2.3
270	220	477	40	2.2
270	230	479	40	2.1
270	240	480	40	2.0
270	250	481	40	1.9
270	260	479	40	1.8
270	270	476	40	1.8
270	280	473	40	1.7
270	290	470	40	1.6
270	300	468	40	1.6
270	310	465	40	1.5
270	320	462	40	1.4
270	330	459	40	1.4
270	340	457	40	1.3
270	350	454	40	1.3

APPENDIX C. EXISTING MANAGED STANDS (TIPSY) YIELD TABLES

<insert tables after this page>

Exist Man FL SIGrp 123 Any Slope

Analysis Unit	Age	Volume	Diameter	MAI
501	0	0	0	0.0
501	10	0	0	0.0
501	20	0	0	0.0
501	30	4	15	0.1
501	40	37	19	0.9
501	50	103	23	2.1
501	60	177	26	3.0
501	70	238	29	3.4
501	80	293	31	3.7
501	90	338	34	3.8
501	100	382	36	3.8
501	110	419	37	3.8
501	120	451	39	3.8
501	130	474	40	3.6
501	140	498	41	3.6
501	150	519	42	3.5
501	160	534	43	3.3
501	170	548	44	3.2
501	180	558	44	3.1
501	190	568	45	3.0
501	200	575	45	2.9
501	210	583	46	2.8
501	220	579	46	2.6
501	230	576	46	2.5
501	240	573	46	2.4
501	250	570	46	2.3
501	260	566	46	2.2
501	270	563	46	2.1
501	280	560	46	2.0
501	290	557	46	1.9
501	300	553	46	1.8
501	310	550	46	1.8
501	320	547	46	1.7
501	330	544	46	1.6
501	340	540	46	1.6
501	350	537	46	1.5

Exist Man B SI Grp 123 Any Slope

Analysis Unit	Age	Volume	Diameter	MAI
502	0	0	0	0.0
502	10	0	0	0.0
502	20	0	0	0.0
502	30	2	15	0.1
502	40	32	20	0.8
502	50	104	24	2.1
502	60	181	27	3.0
502	70	247	30	3.5
502	80	309	32	3.9
502	90	356	33	4.0
502	100	391	35	3.9
502	110	416	36	3.8
502	120	435	37	3.6
502	130	451	37	3.5
502	140	464	38	3.3
502	150	475	39	3.2
502	160	481	39	3.0
502	170	486	40	2.9
502	180	490	40	2.7
502	190	493	41	2.6
502	200	494	41	2.5
502	210	494	41	2.4
502	220	494	41	2.2
502	230	493	42	2.1
502	240	492	42	2.1
502	250	491	42	2.0
502	260	490	42	1.9
502	270	488	42	1.8
502	280	486	42	1.7
502	290	485	43	1.7
502	300	482	43	1.6
502	310	479	43	1.5
502	320	476	43	1.5
502	330	473	43	1.4
502	340	471	43	1.4
502	350	468	43	1.3

Exist Man S SIGrp 123 Any Slope

Analysis Unit	Age	Volume	Diameter	MAI
503	0	0	0	0.0
503	10	0	0	0.0
503	20	0	0	0.0
503	30	3	16	0.1
503	40	56	22	1.4
503	50	145	26	2.9
503	60	228	29	3.8
503	70	303	31	4.3
503	80	367	34	4.6
503	90	409	35	4.5
503	100	438	36	4.4
503	110	460	37	4.2
503	120	477	38	4.0
503	130	489	39	3.8
503	140	496	39	3.5
503	150	498	40	3.3
503	160	499	40	3.1
503	170	500	41	2.9
503	180	500	41	2.8
503	190	498	41	2.6
503	200	497	42	2.5
503	210	494	42	2.4
503	220	492	42	2.2
503	230	490	42	2.1
503	240	487	42	2.0
503	250	485	43	1.9
503	260	482	43	1.9
503	270	479	43	1.8
503	280	477	43	1.7
503	290	474	43	1.6
503	300	471	43	1.6
503	310	468	43	1.5
503	320	466	43	1.5
503	330	463	43	1.4
503	340	460	43	1.4
503	350	457	43	1.3

Exist Man Pine SIGrp 123 Any Slope

Analysis Unit	Age	Volume	Diameter	MAI
504	0	0	0	0.0
504	10	0	0	0.0
504	20	1	0	0.1
504	30	37	16	1.2
504	40	117	21	2.9
504	50	193	24	3.9
504	60	255	27	4.3
504	70	306	29	4.4
504	80	342	30	4.3
504	90	371	31	4.1
504	100	393	32	3.9
504	110	411	33	3.7
504	120	427	34	3.6
504	130	439	35	3.4
504	140	449	35	3.2
504	150	455	36	3.0
504	160	460	36	2.9
504	170	464	37	2.7
504	180	468	37	2.6
504	190	470	37	2.5
504	200	472	38	2.4
504	210	471	38	2.2
504	220	468	38	2.1
504	230	466	38	2.0
504	240	465	38	1.9
504	250	462	39	1.8
504	260	460	39	1.8
504	270	457	39	1.7
504	280	455	39	1.6
504	290	452	39	1.6
504	300	449	39	1.5
504	310	447	39	1.4
504	320	444	39	1.4
504	330	441	39	1.3
504	340	439	39	1.3
504	350	436	39	1.2

Fut ExistMan FL SlGrp 123 Any slope

Analysis Unit	Age	Volume	Diameter	MAI
601	0	0	0	0.0
601	10	0	0	0.0
601	20	0	0	0.0
601	30	13	17	0.4
601	40	70	21	1.8
601	50	151	25	3.0
601	60	221	28	3.7
601	70	278	31	4.0
601	80	327	33	4.1
601	90	370	35	4.1
601	100	406	37	4.1
601	110	434	38	3.9
601	120	457	40	3.8
601	130	478	41	3.7
601	140	495	42	3.5
601	150	505	42	3.4
601	160	515	43	3.2
601	170	511	43	3.0
601	180	507	43	2.8
601	190	503	43	2.6
601	200	499	43	2.5
601	210	495	43	2.4
601	220	491	43	2.2
601	230	487	43	2.1
601	240	483	43	2.0
601	250	479	43	1.9
601	260	475	43	1.8
601	270	471	43	1.7
601	280	467	43	1.7
601	290	463	43	1.6
601	300	460	43	1.5
601	310	456	43	1.5
601	320	452	43	1.4
601	330	448	43	1.4
601	340	444	43	1.3
601	350	440	43	1.3

Fut ExistMan B SlGrp 123 Any slope

Analysis Unit	Age	Volume	Diameter	MAI
602	0	0	0	0.0
602	10	0	0	0.0
602	20	0	0	0.0
602	30	10	17	0.3
602	40	85	23	2.1
602	50	176	27	3.5
602	60	252	29	4.2
602	70	322	32	4.6
602	80	368	33	4.6
602	90	401	34	4.5
602	100	425	35	4.3
602	110	444	36	4.0
602	120	459	37	3.8
602	130	466	38	3.6
602	140	470	38	3.4
602	150	472	39	3.1
602	160	473	39	3.0
602	170	475	39	2.8
602	180	474	40	2.6
602	190	474	40	2.5
602	200	473	40	2.4
602	210	472	40	2.2
602	220	471	40	2.1
602	230	468	41	2.0
602	240	465	41	1.9
602	250	463	41	1.9
602	260	460	41	1.8
602	270	457	41	1.7
602	280	455	41	1.6
602	290	452	41	1.6
602	300	449	41	1.5
602	310	447	41	1.4
602	320	444	41	1.4
602	330	441	41	1.3
602	340	439	41	1.3
602	350	436	41	1.2

Fut ExistMan S SIGrp 123 Any slope

Analysis Unit	Age	Volume	Diameter	MAI
603	0	0	0	0.0
603	10	0	0	0.0
603	20	0	13	0.0
603	30	19	18	0.6
603	40	109	24	2.7
603	50	204	28	4.1
603	60	288	31	4.8
603	70	352	33	5.0
603	80	394	34	4.9
603	90	425	35	4.7
603	100	448	36	4.5
603	110	466	37	4.2
603	120	474	38	4.0
603	130	477	39	3.7
603	140	480	39	3.4
603	150	482	39	3.2
603	160	483	40	3.0
603	170	483	40	2.8
603	180	481	40	2.7
603	190	478	41	2.5
603	200	475	41	2.4
603	210	472	41	2.2
603	220	470	41	2.1
603	230	467	41	2.0
603	240	465	41	1.9
603	250	462	41	1.8
603	260	459	41	1.8
603	270	457	41	1.7
603	280	454	41	1.6
603	290	451	41	1.6
603	300	449	41	1.5
603	310	446	41	1.4
603	320	443	41	1.4
603	330	441	41	1.3
603	340	438	41	1.3
603	350	436	41	1.2

Fut ExistMan Pine SIGrp 123 Any slope

Analysis Unit	Age	Volume	Diameter	MAI
604	0	0	0	0.0
604	10	0	0	0.0
604	20	1	0	0.1
604	30	41	17	1.4
604	40	122	21	3.1
604	50	193	24	3.9
604	60	254	27	4.2
604	70	302	29	4.3
604	80	339	31	4.2
604	90	369	33	4.1
604	100	396	34	4.0
604	110	419	35	3.8
604	120	436	36	3.6
604	130	450	37	3.5
604	140	460	38	3.3
604	150	469	38	3.1
604	160	477	39	3.0
604	170	484	39	2.8
604	180	489	40	2.7
604	190	493	40	2.6
604	200	493	40	2.5
604	210	494	41	2.4
604	220	491	41	2.2
604	230	488	41	2.1
604	240	485	41	2.0
604	250	482	41	1.9
604	260	479	41	1.8
604	270	477	41	1.8
604	280	474	41	1.7
604	290	471	41	1.6
604	300	468	41	1.6
604	310	465	41	1.5
604	320	462	41	1.4
604	330	459	41	1.4
604	340	456	41	1.3
604	350	453	41	1.3

APPENDIX D. PARTIAL CUT STANDS – ORIGINAL VDYP AND TIPSY YIELD TABLES

These tables are the basis of the partial cutting harvest volumes and diameters. Forest Planning Studio will reference the data from these tables when modelling the harvest of a portion of the total volume during any particular harvest entry.

<insert tables after this page>

Natural (VDYP) Partial Cut Pine SIGrp 123 Any slope

Analysis Unit	Age	Volume	Diameter	MAI
404	0	0	0	0.0
404	10	0	0	0.0
404	20	0	4	0.0
404	30	29	16	1.0
404	40	83	18	2.1
404	50	131	19	2.6
404	60	173	21	2.9
404	70	210	23	3.0
404	80	243	24	3.0
404	90	273	25	3.0
404	100	299	27	3.0
404	110	323	28	2.9
404	120	346	29	2.9
404	130	367	31	2.8
404	140	381	32	2.7
404	150	393	33	2.6
404	160	401	33	2.5
404	170	407	34	2.4
404	180	409	34	2.3
404	190	409	35	2.2
404	200	413	35	2.1
404	210	416	36	2.0
404	220	420	36	1.9
404	230	423	37	1.8
404	240	427	37	1.8
404	250	430	38	1.7
404	260	432	38	1.7
404	270	434	38	1.6
404	280	436	39	1.6
404	290	437	39	1.5
404	300	439	39	1.5
404	310	440	39	1.4
404	320	442	40	1.4
404	330	443	40	1.3
404	340	444	40	1.3
404	350	445	40	1.3

Natural (VDYP) Partial Cut Non-Pine SIGrp 123 Any slope

Analysis Unit	Age	Volume	Diameter	MAI
414	0	0	0	0.0
414	10	0	0	0.0
414	20	0	1	0.0
414	30	9	14	0.3
414	40	43	21	1.1
414	50	85	23	1.7
414	60	126	25	2.1
414	70	166	27	2.4
414	80	204	29	2.6
414	90	239	32	2.7
414	100	271	34	2.7
414	110	300	36	2.7
414	120	325	38	2.7
414	130	348	40	2.7
414	140	369	42	2.6
414	150	387	44	2.6
414	160	404	45	2.5
414	170	418	47	2.5
414	180	432	49	2.4
414	190	445	50	2.3
414	200	457	52	2.3
414	210	469	54	2.2
414	220	480	55	2.2
414	230	491	57	2.1
414	240	502	59	2.1
414	250	512	60	2.0
414	260	512	60	2.0
414	270	512	61	1.9
414	280	513	61	1.8
414	290	513	61	1.8
414	300	513	61	1.7
414	310	513	61	1.7
414	320	513	61	1.6
414	330	513	61	1.6
414	340	513	61	1.5
414	350	513	61	1.5

Managed (TIPSY) Partial Cut Pine SIGrp 123 Any slope

Analysis Unit	Age	Volume	Diameter	MAI
407	0	0	0	0.0
407	10	0	0	0.0
407	20	3	0	0.2
407	30	57	18	1.9
407	40	142	22	3.6
407	50	215	25	4.3
407	60	276	28	4.6
407	70	320	30	4.6
407	80	357	32	4.5
407	90	388	34	4.3
407	100	414	35	4.1
407	110	434	37	3.9
407	120	448	37	3.7
407	130	459	38	3.5
407	140	470	39	3.4
407	150	479	40	3.2
407	160	481	40	3.0
407	170	483	40	2.8
407	180	484	41	2.7
407	190	481	41	2.5
407	200	477	41	2.4
407	210	474	41	2.3
407	220	470	41	2.1
407	230	466	41	2.0
407	240	463	41	1.9
407	250	459	41	1.8
407	260	456	41	1.8
407	270	452	41	1.7
407	280	449	41	1.6
407	290	445	41	1.5
407	300	441	41	1.5
407	310	438	41	1.4
407	320	434	41	1.4
407	330	431	41	1.3
407	340	427	41	1.3
407	350	424	41	1.2

Managed (TIPSY) Partial Cut Non-Pine SIGrp 123 Any slope

Analysis Unit	Age	Volume	Diameter	MAI
417	0	0	0	0.0
417	10	0	0	0.0
417	20	0	0	0.0
417	30	18	18	0.6
417	40	85	22	2.1
417	50	172	26	3.4
417	60	241	29	4.0
417	70	299	32	4.3
417	80	347	35	4.3
417	90	389	37	4.3
417	100	419	39	4.2
417	110	443	40	4.0
417	120	463	41	3.9
417	130	478	42	3.7
417	140	489	43	3.5
417	150	483	43	3.2
417	160	477	43	3.0
417	170	472	43	2.8
417	180	466	43	2.6
417	190	460	43	2.4
417	200	455	43	2.3
417	210	449	43	2.1
417	220	443	43	2.0
417	230	437	43	1.9
417	240	432	43	1.8
417	250	426	43	1.7
417	260	420	43	1.6
417	270	415	43	1.5
417	280	409	43	1.5
417	290	403	43	1.4
417	300	397	43	1.3
417	310	392	43	1.3
417	320	386	43	1.2
417	330	380	43	1.2
417	340	375	43	1.1
417	350	369	43	1.1

APPENDIX E. GIS ANALYSIS OF TFL 14 WTP REQUIREMENTS

			A	B	C [1]	D (B/A)	E (LUPG) [2]	F (A*E)	G [3]	H (F-G) [4]	I (H/B) [5]	G[6]
LU	Lu Name	BEC Variant	CFLB (ha)	THLB (ha)	% Logged no WTP	% Available for harvest	Gross WTP % Required	WTP Area Required (ha)	CFLB Eligible to Contribute (ha)	WTP required in THLB (ha)	% WTP in THLB	Spacing Req Exists
I34	Bobbie Burns	ESSFdk	4,879	3,206	27.2%	65.7%	6.3%	307.1	792.5	0.0	0.0%	Yes
I34	Bobbie Burns	ESSFdkp	1	-	0.0%	0.0%	0.0%	-	0.5	0.0	0.0%	Yes
I34	Bobbie Burns	ESSFdku	535	32	0.0%	5.9%	0.0%	-	404.4	0.0	0.0%	Yes
I34	Bobbie Burns	ESSFwm	8,217	4,043	22.1%	49.2%	4.1%	339.3	2,881.2	0.0	0.0%	Yes
I34	Bobbie Burns	ESSFwmp	9	-	0.0%	0.0%	0.0%	-	8.9	0.0	0.0%	Yes
I34	Bobbie Burns	ESSFwmu	1,049	62	0.0%	5.9%	0.0%	-	809.5	0.0	0.0%	Yes
I34	Bobbie Burns	MS dk	3,185	1,927	18.8%	60.5%	4.9%	157.0	788.2	0.0	0.0%	Yes
I35	Lower Spillimacheen	ESSFdk	1,757	986	24.6%	56.1%	5.1%	89.2	363.8	0.0	0.0%	Yes
I35	Lower Spillimacheen	ESSFdkp	1	-	0.0%	0.0%	0.0%	-	0.8	0.0	0.0%	Yes
I35	Lower Spillimacheen	ESSFdku	148	-	0.0%	0.0%	0.0%	-	125.9	0.0	0.0%	Yes
I35	Lower Spillimacheen	ESSFwm	7	3	0.0%	39.1%	0.9%	0.1	3.8	0.0	0.0%	Yes
I35	Lower Spillimacheen	ICH mk 1	100	73	14.3%	73.5%	5.8%	5.8	19.2	0.0	0.0%	Yes
I35	Lower Spillimacheen	IDF dm 2	8,500	5,911	9.1%	69.5%	4.9%	413.3	1,062.6	0.0	0.0%	Yes
I35	Lower Spillimacheen	MS dk	12,446	8,867	11.6%	71.2%	5.3%	657.7	2,129.1	0.0	0.0%	Yes
I37	Upper Spillimacheen	ESSFdk	7,698	5,058	29.2%	65.7%	6.5%	499.8	1,586.8	0.0	0.0%	Yes
I37	Upper Spillimacheen	ESSFdkp	1	-	0.0%	0.0%	0.0%	-	1.1	0.0	0.0%	Yes
I37	Upper Spillimacheen	ESSFdku	309	7	0.0%	2.4%	0.0%	-	188.2	0.0	0.0%	Yes
I37	Upper Spillimacheen	ESSFwm	10,499	6,506	21.1%	62.0%	5.3%	557.5	3,403.5	0.0	0.0%	Yes
I37	Upper Spillimacheen	ESSFwmp	6	-	0.0%	0.0%	0.0%	-	4.3	0.0	0.0%	Yes
I37	Upper Spillimacheen	ESSFwmu	1,045	105	0.0%	10.1%	0.0%	-	894.9	0.0	0.0%	Yes
I37	Upper Spillimacheen	MS dk	948	703	45.7%	74.1%	9.0%	85.2	174.4	0.0	0.0%	Yes
I38	Twelve Mile	ESSFdk	10	10	0.0%	100.0%	7.0%	0.7	0.0	0.7	7.0%	Yes
I38	Twelve Mile	ESSFdkp	-	-	0.0%	0.0%	0.0%	-	-	0.0	0.0%	Yes
I38	Twelve Mile	ESSFdku	-	-	0.0%	0.0%	0.0%	-	-	0.0	0.0%	Yes
I38	Twelve Mile	ESSFwm	636	305	6.1%	48.0%	2.4%	15.3	261.6	0.0	0.0%	Yes
I38	Twelve Mile	ESSFwmp	-	-	0.0%	0.0%	0.0%	-	-	0.0	0.0%	Yes
I38	Twelve Mile	ESSFwmu	24	-	0.0%	0.0%	0.0%	-	22.5	0.0	0.0%	Yes
I38	Twelve Mile	ICH mk 1	2,429	1,743	17.7%	71.8%	5.9%	144.5	538.0	0.0	0.0%	Yes
I38	Twelve Mile	ICH mw 1	1,849	1,499	3.1%	81.0%	5.4%	100.1	290.5	0.0	0.0%	Yes
I38	Twelve Mile	IDF dm 2	2,640	1,899	3.2%	71.9%	4.5%	119.2	348.6	0.0	0.0%	Yes
I38	Twelve Mile	MS dk	2,684	1,876	4.7%	69.9%	4.5%	119.7	404.8	0.0	0.0%	Yes
		Totals	**71,617**	**44,821**					**17,509.4**			
		Weighted Average			**17.1%**	**65.8%**	**5.3%**					

(1) Percent of landbase that has been logged in the past that does not have WTP retention within it. Assumed to be clearcut blocks logged between 1960 and 1996 (FPC).

(2) As defined in table A3.1 in the Landscape Unit Planning Guide -uses values in colums C and D. [WTP% = (%Avail for Harv/100) + (%Logged No WTP/100) - 3]

(3) This is the portion of the crown forested landbase where harvesting is not expected to occur and the stands are > 15m in hieght and quad mean dbh is >25cm.

(4) This field indicates if any additional retention requirements are needed beyond what is already expected to be retained in the unit (without considering spacing).

(5) This field indicates the percent of THLB to be retained to meet the WTP percent targets (without considering spacing).

(6) Indicates whether there are areas of the THLB that will likley require additional retention to meet the objectives of stand level retention (minimum spacing requirements).

Source: Forsite (2006)