APPENDIX 5 Timber Supply Analysis Information Package

Item	Submitted	Approved
Timber Supply Analysis (Information) Package	July 7, 1999	July 26, 1999

BRITISH COLUMBIA

File: 19710-40/33

July 26, 1999

Jeff Lipsett, R.P.F.
Corporate Forestry Superintendent
Federated Co-operatives Limited
Box 70
Canoe, British Columbia V0E 1K0

Dear Jeff Lipsett:

Re: Information Package for Management Plan No. 8 - Tree Farm Licence (TFL) 33

Thank you for your revised Timber Supply Analysis Information Package (IP) for TFL 33 (dated 25 June 99) submitted 7 July 1999. The earlier draft dated 25 March 1999 was extensively reviewed by myself, Ministry of Forest (MoF) District staff, and the MELP Forest Ecosystem Specialist. Comments were submitted to Bill Kuzmuk of Timberline Forest Inventory Consultants Ltd. for consideration in the revised IP.

I have reviewed the revised IP for modifications and have received feedback from MoF District and Regional staff. As the Ministry of Forest timber supply analyst responsible for reviewing this IP, I accept the Information Package for use in the timber supply analysis with the notes and conditions on the attached pages.

Yours truly,

Jeff Stone, R.P.F.
Timber Supply Forester

Attachment: 4 pages

pc: Ron Beals, Salmon Arm Forest District
Jeff Morgan, MELP, Salmon Arm Forest District
Clark Roadhouse, Kamloops Forest Region
Bud Koch, Timber Supply Branch
Bill Kuzmuk, Timberline Forest Inventory Consultants Ltd.

Ministry of Forests
Timber Supply Branch
Location:
595 Pandora, 3rd floor
Victoria BC
Mailing Address:
PO Box 9512, Stn. Prov. Govt.
Victoria BC V8W 9C2
Tel: 250-356-5947
Fax: 250-953-3838

Notes and Conditions on Acceptance of Information Package for Management Plan No. 8 - Tree Farm Licence (TFL) 33

1. *Pg 16 Sec 7.1 and Pg 42 Sec 9.2.1.5*: The utilization of non timber harvesting land base (non-THLB) from the non-TFL lands in the Anstey landscape unit has raised some questions as it deviates from methodology used in other timber supply analyses. Ministry of Forest District staff indicate that it is reasonable, based on the Landscape Unit Planning Guide, that old seral requirements be met on the whole landscape unit and not separately within management units in the landscape unit. However, no specific guidelines are in place on how to account and distribute requirements among management units.

   For timber supply analysis, it is desired that current practices be reflected in the model assumptions and its base case. However, it is also important that the base case presented to the Chief Forester for an AAC determination enable the Chief Forester to understand the underlying sensitivities of the data. The use of any practice (or interpretation of) in the timber supply analysis does not infer operational acceptance.

   The modelling methodology in the IP proposes that all old non-THLB in the landscape unit be combined and a single percent contribution from THLB be calculated that applies both to the TSA and TFL lands. However, due to the separate nature of the TSA and TFL timber supply analyses and data files, the IP proposes using only the currently calculated percent based on the total LU timber harvesting land base reduced for the current old non-THLB contribution (i.e., assumes this amount remains static although in actuality it will change with time). This methodology initially benefits the management unit that has proportionately less old non-THLB.

   The data documented in the IP is derived from 2 sources. Total productive forest areas are from tables provided by Jeff Morgan from a 28 September 1998 memo from District Manager Ron Racine. However, the current old non-THLB areas are from the document dated 5 October 1998 Salmon Arm Landscape Units as found in IP Appendix IV and similarly in tables provided by Okanagan TSA timber supply analyst Ted McRae (pers. comm. 23 June 1999).

   A further limitation of the analysis is that within the timber supply model CASH6 a change of constraints in the future is not possible. Due to this inability, the IP presents 45-45-10 constraints that do not include an acceptable 1/3 draw down on the low emphasis.

   Based on the above, **I recommend that for the analysis that:**

   a) **the appropriate areas of productive land base and old non-THLB in the TSA be determined**. Failing this, the most conservative numbers of the above 3 sources (i.e., which results in a higher contribution percent) be used. In the

analysis report, a summary of the contributions and shortfalls (areas and percents) from the TSA and TFL old non-THLB and THLB lands by variant should be presented. Future changes in the non-TFL non-THLB land base should also be documented.

b) **the choice of whether to use non-TFL lands or not in the base case be based upon an preliminary look at how the choice influences the presentation of other sensitivity analyses.** It is desirable that the Chief Forester be aware where constraints are limiting and that choices in the base case enable the sensitivity and critical issues analyses to be present fairly in the analysis report.

2. *Pg 14 Sec. 6.9* In the Landscape Unit Planning Guide it states that (pg 13) "... non-productive land, such as alpine, swamps, grasslands, avalanche chutes, and non-productive forest and non-commercial brush do not contribute to meeting old growth and wildlife tree requirements ..." However, it also states (pg 20 Note 2 of Table 2.5) that "There are various classes of non-productive areas, two of the classes have tree species associated with them and may be appropriate to contribute to old-growth requirements. The two classes are the Alpine forest (with species) and non-productive forest (with species). There are some inventory typing problems where occasionally some areas have been misclassified, therefore, these areas should be examined for their suitability, and should be included ...".

   I do not believe based on the above that it is appropriate to enable all Alpine Forest (with species) to contribute to the old growth. The above note indicates that some verification of the suitability should be conducted. As the licencee had conducted a recent review of current air photography for non-productive classification (resulting in an increased in productive lands), it might be assumed that areas remaining labeled as non-productive are truly non-productive and that stand information in the data file indicating a reasonable forested state may be inaccurate.

   Thus, **I recommend that for the timber supply analysis:**

   a) **no non-productive areas classified as "alpine forest" and "non-productive" forest with tree species be included in the base case**
   b) **a critical issues analyses may be completed that considers the inclusion of these areas but rather than including all these lands an appropriate cut off based on stand characteristics be determined.** An average crown closure of 28% suggests that a proportion of these areas could have low crown closures that might be inappropriate to be considered as old growth.

3. *Pg 14 (Sec 6.9):* The inclusion of 7.4 additional ha in the Wildlife Tree Patch (WTP) reduction to account for management zones for S6 is acceptable. I do not agree that all previously removed productive areas are suitable for immediate WTP reductions (i.e., can include young stands). However, given modelling limitations I accept the approach used for the analysis. Additionally, for the analysis report it would be

desirable to provide a comparison of the generalized 9% requirement to the percent determined based on actual harvested figures for each variant.

4. *Pg 19 (Sec. 7.3.1):* The statement "old growth stands may have site index adjustments ..." is not appropriate given a later statement (pg 27 Sec. 8.1.1) that OGSI is not applied due to small applicable area
5. *Pg 39 (Sec. 9.1.9)*: The District has not recognized the operability mapping submitted in December 1998 and conditions on which the operability was based. The District indicates areas over 70% slope should be classified as inoperable as in current practice. Unless it can be shown otherwise, **I recommend that a 70% slope be used as the cutoff for inoperable rather than using 80%.**
6. *Pg 41 (Sec. 9.2.1.1):* The methodology for deriving disturbance VQO's in MoF 1993. Procedures for Factoring Recreation Resources into Timber Supply Analyses) has been replaced by MoF 1998. Procedures for Factoring Visual Resources into Timber Supply Analyses (REC-029). However, the use of the former is acceptable given the initiation date of this management plan process. Also see note point 8.
7. *Pg 49 (Sec. 9.3.7):* The alternative flow forecasts or the process to follow are mentioned but not stated specifically enough to determine what you are going to present. In the timber supply analysis report several alternative flow forecasts should be presented that will assist the Chief Forester to assess short-, medium-, and long-term tradeoffs.
8. *Pg 51 (Table 10.1):* Under "Decreased Disturbance" for 1-VQO-R, the condition 5 m, I believe, should be 6 m (i.e., years did not change). The 1% base case disturbance, as you are aware, is at the small end of the range for VQO-R whereas the other calculated values fell near the mid-points (mid-point for VQO-R is 3%). As this is the value that you have calculated, I assume that it is appropriate but you should confirm this. Additionally, for sensitivity purposes, I suggest that the increased disturbance for categories 6, 7, 8, and 9 be increased above the base case (e.g., 40-45%). Clark Roadhouse of the Kamloops Forest Region notes that Table 9.2 may be more constraining that the draft Okanagan LRMP but the current table is appropriate (but questioning the low 1% VQO-R) and changes would require further discussion with district and region landscape staff.
9. *Pg 51 (Table 10.1) and Pg 41 (Table 9.2)* Deer winter range, per the Okanagan Timber Harvesting Guidelines, is constrained to 5 ha blocks with 300 m buffers. This equals a 20% maximum disturbance rather than a 35% as stated**. I recommend that 20% maximum disturbance be used and that +-10 percentage points be used to look at the sensitivity.**
10. *Pg 52 (Table 10.5) and Pg 42 (Table 9.3):* There is a discrepancy in the area and percent requirements reported**. In the timber supply analysis report please report the values used.**
11. *Pg 53 (Sec. 11) and Pg58 (Sec. 12):* These options on the LRMP and Incremental Treatments provide additional insights on overall potential future management (versus current management). However, their use for information is restricted given that several changes from the base case are lumped together and no proposed sensitivities around the individual components are present.

12. Pg 54 (Sec. 11.5.4): The mechanics of the "Cluster-planting" option are unclear and whether this differs from the regeneration delay option. If this statement infers a separate option and that no change to volumes occurs (i.e., significant forage increase will require volume effects) I suggest dropping this option.

FEDERATED CO-OPERATIVES LTD.
SICAMOUS TREE FARM LICENCE 33
MANAGEMENT PLAN #8

TIMBER SUPPLY ANALYSIS
INFORMATION PACKAGE

Prepared by:
Federated Co-operatives Ltd.
&
Timberline Forest Inventory Consultants Ltd.
June 25, 1999

Reference: 9841006.2.1

Timberline
Forest Inventory Consultants

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APPENDICES

1.0 INTRODUCTION

This Information Package has been prepared on behalf of Federated Co-operatives Ltd. (FCL) as a source document prior to the completion of the Timber Supply Analysis for the Sicamous Tree Farm License (TFL 33) Management Plan #8 (MP #8). It provides a summary of the inputs and assumptions made in preparing for the analysis.

The analysis process is a dynamic one and inputs and assumptions may change. Included are inventory and land base summaries, growth and yield information and management assumptions for timber and non-timber resources related to timber supply. The Information Package follows the suggested format of the *Timber Supply Analysis Information Packages for Tree Farm Licences* Version 2.0, (MoF, February 1997).

The following options will be analyzed and reported in the Timber Supply Analysis Report:

- Base Case;
- Okanagan-Shuswap LRMP (Land and Resource Management Plan); and
- Additional Incremental Silviculture.

Analysis inputs attempt to reflect management practices for TFL 33 and correspond to the approval date of the *SMOOP* (Statement of Management Objectives Options and Procedures), 99.03.01. Management guidelines reflecting Forest Practices Code (FPC) requirements will be included in the Base Case. In some cases more recent information has been incorporated into the assumptions based on availability of information and acceptance by MoF.

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

Upon acceptance by the Ministry of Forests (MoF) Timber Supply Analyst, the assumptions and methodology provided in the Information Package will be used by FCL to prepare and submit a timber supply analysis to the MoF. Alternative harvest flows will be evaluated within the various analysis options in order to gain a complete understanding of the factors that influence timber supply on TFL 33. All analysis results will be provided to the Chief Forester of British Columbia for his allowable cut determination.

2.0 PROCESS

Following acceptance, the Information Package will be included as an Appendix to the Timber Supply Analysis Report of TFL 33 MP #8.

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

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

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

The Information Package has been prepared in consultation with the designated MoF Timber Supply Analyst to ensure that all information necessary to evaluate the timber supply status on TFL 33 is available to the Chief Forester of B.C.

2.1 Missing Data

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

- Additional sensitivity analyses not considered to date.

3.0 TIMBER SUPPLY OPTIONS

This section describes the various management options, or scenarios, that will be evaluated in the timber supply analysis for MP #8.

3.1 Base Case

The Base Case option will include:

- Management activity as defined by historical operations with emphasis on the last 5 years;
- Implementation of the FPC (Forest Practices Code) as it is being interpreted at 99.03.01;
- OKTSHG (*Okanagan Timber Supply Area Timber Harvesting Guidelines*) MoF (February 1992);
- Draft LUs (Landscape Units) and weighted average old growth constraints based on MoF guidelines to address landscape level biodiversity;
- A recently updated (98.01.01) forest cover inventory;
- VDYP NSYTs (natural stand yield tables) for natural unmanaged stands;
- TIPSY MSYTs (managed stand yield tables) for all existing and future managed stands;
- Current close utilization standards;
- Basic silviculture on all sites;
- Genetic gains from tree improvement;
- Incremental silviculture on demonstrated sites;
- Visual quality requirements based on the 1995 MoF VQO inventory; and
- Consideration for sensitive areas based on recent inventories including wildlife and terrain.

3.2 Sensitivity Analyses

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

- Growth and yield inputs; and
- Management considerations and forest cover constraints.

Table 3.1 lists proposed sensitivity analyses for the Base Case.

Table 3.1 –Base Case Sensitivity Analyses

Issue	Sensitivity Levels to be Tested
Growth and yield inputs	adjust all natural stand yields by +/- 10%
	adjust all managed stand yields by +/- 10%
	Increase and decrease managed stand minimum harvest ages by 10 years
	increase and decrease regeneration delay
Management considerations & forest cover constraints	low emphasis biodiversity requirements (old growth) on all LU-BEC/NDTs
	exclude influence of non-TFL forest in modeling biodiversity
	full biodiversity (early, mature, old) seral stage requirements based on low and intermediate emphasis
	increase and decrease green-up requirement in VQOs and IRM REAs
	increase and decrease disturbance limits in all REAs
	reduce green-up ages by 20% for all REAs

Section 10.0 provides complete details for each sensitivity analysis for the Base Case. In addition to the specific sensitivity analyses listed in Table 3.1, alternative harvest flows will be evaluated for the Base Case (Section 9.3.7).

3.3 Additional Options

3.3.1 Okanagan-Shuswap LRMP Option

The Okanagan-Shuswap LRMP is currently in draft form. Upon completion it will form the basis for management of forest land in the catchment area, including TFL 33. To fully understand the implications of the LRMP, this option will evaluate the impacts on timber supply of the proposed management. Although all management guidelines may not be available at the time of analysis, the following will be reviewed in this option:

- Wildlife management beyond current management, including caribou and grizzly bear requirements;
- Alternative riparian management and methods for determining WTPs;
- Revised visual quality objectives; and
- Other items that may impact on Base Case management and timber supply.

Section 11.0 provides complete details for the revised assumptions associated with the Okanagan-Shuswap LRMP option.

3.3.2 Additional Incremental Silviculture Option

This option will evaluate the timber supply impacts of increasing the level of incremental silviculture on TFL 33. FCL currently has a programme of fertilization, and receives planting stock produced from improved seed for spruce, lodgepole pine and larch (first generation from original parents). Further improvements in planting stock are expected in the near future for all species planted on TFL 33, with the exception of western white pine. An evaluation of gains from additional tree improvement (best selection from first generation) in combination with additional stand treatments will be undertaken in this option.

Section 12.0 provides full detail of the revised assumptions associated with the Additional Incremental Silviculture option.

4.0 MODEL

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

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

Multiple levels of forest cover constraints will be applied in the analysis simulations. This will ensure those areas with overlapping resource concerns will be addressed during all periods of analysis. Many VQO areas overlap with wildlife habitat; forest cover constraints associated with both non-timber resources will be modeled simultaneously.

CASH6 can specify various harvest rules such as oldest first or maximize productivity of regeneration. It does not model relative oldest first. Harvest profile requirements for various species or specific harvesting systems (conventional logging vs. helicopter) may also be included in the modeling assumptions.

5.0 FOREST INVENTORY

All spatial information is captured and controlled to the TRIM (Terrain Resource Inventory Mapping), NAD (North American Datum) 83 base. The updated TFL 33 inventory includes updated forest cover attributes in a digital and spatial format compatible with the provincial inventory database.

The forest cover inventory is updated for disturbance to 98.12.31 based on 1997 photography and manual updates for 1998. All attributes including age, height and volume have been projected to this date. The original TFL 33 inventory was completed in 1977. Subsequent photo and manual updates for harvesting, silviculture and other disturbance were undertaken in 1990, 1992 and 1994, prior to the current set of inventory revisions.

Inventory data has been prepared using FCL's in-house GIS. Use of GIS ensures that spatial relationships between the various inventory attributes are maintained throughout the analysis process. For example, existing roads are buffered to provide specific area reductions from the net harvesting land base. For analysis purposes the inventory will be assigned to 10-year age classes.

6.0 LAND BASE CLASSIFICATION

This Section describes the TFL 33 land base and the methodology used to determine the way in which land contributes to the analysis. Some portions of the productive land base, while not contributing to harvest, may be available to meet other resource needs.

Note that volumes reported in the tables throughout this report are the merchantable component (net DWB) and have been reduced for any deciduous component.

6.1 Timber Harvesting Land Base Determination

Table 6.1 presents the results of the land base classification process to identify the timber harvesting or net operable land base.

Table 6.1 - Timber Harvesting Land Base Determination - Base Case

Land Classification	Total Area[1] (ha)	Net Reduction		Net Remainder	
		Area (ha)	Volume (m3)	Area (ha)	Volume (m3)
Total Area	8,366			8,366	1,651,345
Non-prod forest & Non-forest	533	513	27,803		
Roads & landings		175	15,934		
Productive Forest				7,678	1,607,608
Productive reductions:					
RRZs & RMZ exclusions	62	54	15,888		
ESA - soils	570	126	21,040		
Deciduous	166	152	2,543		
Uneconomic forest	101	101	12,702		
Wildlife Tree Patches		266	50,409		
Total Reductions		699	102,582		
Reduced land base				6,979	1,505,026
Current Net Operable Land base					
NSR				93	
Immature				3,039	191,318
Mature				3,847	1,313,708
Less future reductions					
Roads		89			
Landings		102			
Long-term Net Operable Land base				6,788	1,505,026

[1] Total area within a classification category prior to any reductions.

6.2 Total Area

The total area of TFL 33 is 8,366 ha. There are 688 ha of non-forest and non-productive forest (including roads) and 7,678 ha of productive forest land. Some of the areas reported above differ from those included in the MWP #7 timber supply analysis. A number of changes have been made to the TFL 33 inventory database over the period of MWP #7 and to the methods used to identify the area available for harvesting. The majority of the differences can be attributed to the following:

- Re-classification of previously non-productive areas as productive based on closer review of forest cover, standing timber and regeneration potential; and
- New riparian classification.

6.3 Non-Productive Forest & Non-Forest

All land classified as non-forest or non-productive forest, such as lakes, swamps, rock, *etc.* is excluded from the timber harvesting land base. After completion of the MoF inventory audit for TFL 33, all non-productive areas were reviewed with current air photos. Some re-classification took place as a result of this review. Table 6.2 summarizes the non-productive forest and non-forest removed for the timber supply analysis. These areas will not contribute to any forest cover requirements or the annual harvest in the analysis.

Table 6.2 - Non-Productive & Non-Forest Reductions

Classification	Area (ha)
Alpine	139
Alpine forest	281
Lake	1
Non-productive	20
River	14
Swamp	4
Urban	54
Total	513

Non-productive areas classified as "alpine forest" and "non-productive" which have tree species included in the inventory label will be included in the assessment of biodiversity (seral stages). This is based on the *MoF Landscape Unit Planning Guide* (March 1999). These non-productive areas will not be considered for forest cover constraints related to visual quality or wildlife habitat. Table 6.3 summarizes the average attributes of the non-productive forest types that will be considered available to meet biodiversity objectives.

Table 6.3 – Non-Productive Forest Types Available for Biodiversity Consideration

NP Descriptor	Leading Species	Average SI50	Average CC	Area (ha)
Alpine forest (AF)	Balsam	14.7	28	278
NP forest	Douglas-fir	15.3	25	4
Total				282

6.4 Roads, Trails and Landings

6.4.1 *Existing Roads, Trails and Landings*

Existing roads and trails were captured in the GIS database and buffered for the appropriate width and used in the overlay process to identify the area lost permanently from the productive land base. Other road-related disturbance including gravel pits have been removed as non-productive areas as described in Section 6.3.

Road widths are defined as the distance between productive growing sites on either side of a given type of road. In general, the area removed is comprised of the fill slope, ditch and running surface.

Road widths were physically measured on various road categories. Widths were measured from stem to stem on older roads and between areas of plantable ground on new roads. No adjustment or allowance was made for crown closure or edge effects. Table 6.4 summarizes the existing road inventory and associated removals for TFL 33.

Table 6.4 – Existing Road & Railway Reductions

Road Classification & R/W Width (m)		Total Length (km)	Total Area (ha)
Primary			
actively maintained (AM)	13	24.1	31.3
Secondary			
actively maintained (AM)	13	34.8	45.1
semi-permanent deactivated (SD)	13	2.4	3.3
Spur			
semi-permanent deactivated (SD)	10	28.6	28.6
permanent deactivated (PD)	10	3.3	3.3
not maintained (NM)	10	25.5	25.5
Total		119.6	137.1

Approximately 0.2 ha of landing area is required for every 10 ha of harvesting on TFL 33. Therefore all areas identified as having disturbance by logging were reduced by 2% to reflect non-productive landing areas. The total existing landing area is 37.6 ha based on 1,880 ha of logged areas.

6.4.2 Future Roads and Landings

Future road development will include only spur roads. All mainline and secondary roads are in place for accessing the TFL. A review of all spur roads and the area of the net operable land base that has road access are the basis for future road reductions. Future road reductions are summarized below.

Net operable area currently roaded	2,543
Area of spur roads within net operable land base	51
% of net operable land base	2.0
Non-roaded component of net operable land base	4,436
Future roads = 2.0% * 4,436ha	89

Future landing reductions are based on the same assumptions used for existing landings described in Section 6.4.1. The area with no disturbance history (5,099 ha) will be reduced by 2% (102 ha) during forest estate modeling to account for future productive land losses to landings in the future. All future roads, trails and landing reductions total 191 ha.

6.5 Riparian Reserve & Management Zones (RRZs & RMZs)

A fish habitat classification (FHAP – Fish Habitat Assessment Procedure) was completed for TFL 33 during 1997. The stream classification was completed for approximately 10% of all streams, however this 10% represents the majority (95%) of fish-bearing component of all streams on the TFL. Remaining streams were estimated using gradient requirements in the GIS.

To address riparian management guidelines an estimate of stream classification has been used on the unclassified streams. FCL worked closely with MoELP during the classification of unclassified streams.

RRZs (riparian reserve zones) and RMZs (riparian management zones), based on FPC guidelines, have been assigned to all stream features. All water features were buffered using the appropriate width in the GIS data preparation phase. Table 6.5 summarizes the netdowns for RRZs and RMZs on TFL 33.

Table 6.5 - Riparian Area Reductions

Riparian Classification & Width (m)		Gross Area (ha)			RRZ Reductions	
		Length (km)	Total	Productive	Area (ha)	Volume (m^3)
RRZs						
S2	30	0.34	2	2	2	615
S3	20	1.02	4	4	4	1,890
Subtotal		1.36	6	6	6	2,505
RMZs						
S2	20	0.34	1	1	1	247
S3	20	1.02	1	1	1	594
S5	30	39.33	54	46	46	12,541
Subtotal		40.69	56	48	48	13,383
Total			62	54	54	15,888

Queest Creek serves as the northern boundary for TFL 33. Therefore only the southern riparian area associated with this creek is included in the summary above. This is the reason for some of the total riparian areas appearing to be less than the product of (total length X riparian width).

As noted in Table 6.5 portions of RMZs were excluded to reflect partial cutting requirements. Various basal area retention prescriptions have been assigned to each riparian class. Rather than model partial cutting to represent the basal area retention within RMZs, FCL will reserve the land base equivalent. Table 6.6 summarizes the basal area retention requirements for each RMZ identified on TFL 33.

Table 6.6 - Riparian Management Zone Reductions

RMZ Classification	Width (m)	Length (km)	Average BA Retention (%)	Reserve Width of RMZ [1](m)
S2	20	0.34	50	10.0
S3	20	1.02	30	6.0
S5	30	39.33	25	7.5
S6	20	36.91	5	1.0

[1] S6 RMZ reserves are not part of the riparian land base reductions due to the narrow width of the RMZ.

S6 streams were not included in the GIS buffering exercise because of the small area they represent. However, a landbase reduction equivalent to the S6 reserves (7.4 ha) was included in the WTP removals (Section 6.9).

6.6 Environmentally Sensitive Areas (ESAs)

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

A complete summary of areas classified as sensitive on TFL 33 is presented in Table 6.7. Total ESA areas on the TFL are presented as well as the areas that reflect the ESA reductions from the productive forest land base. The difference between the two is associated with areas removed for other previous deductions.

Table 6.7 - ESA Soils Distribution & Reduction

ESA Description	Gross Area (ha)		ESA Reductions		
	Total	Productive	% Reduction	Area (ha)	Volume (m^3)
Soils	570	129	100	126	21,040

Soils reductions are based on the most recent ESA soils information. Netdown factors are based on operational performance during MWP #7, embodying current requirements of FPC. Netdown factors applied to ESAs consider recent experience in the layout of cutblocks, and stability related to amendments to layout and logging plans.

Significant wildlife and hydrologic areas are no longer addressed with ESA netdowns. Forest cover objectives for important wildlife species (deer and caribou) will be addressed by including forest cover constraints in the timber supply analysis. Grizzly bear management will be addressed in the LRMP option using stand-level treatments. Riparian netdowns are also intended to address some wildlife requirements.

Recreation and visual concerns are addressed by imposing forest cover constraints in the analysis on areas identified in the most recent scenic areas (VQO) inventory for the District.

6.7 Deciduous

None of the deciduous stands are harvested on TFL 33. FCL does not have any plans to include any measurable component of the deciduous inventory in the annual harvest in the near future. Deciduous reductions are summarized in Table 6.8.

Table 6.8 – Deciduous Forest Reductions

Leading Species	Gross Productive		Uneconomic & Low Productivity Reduction		
	Area (ha)	Volume (m^3)	Area (ha)	Volume (m^3)	Volume [1] (m^3/ha)
Aspen	2	0	2	0	0
Birch	159	2,542	150	2,543	17
Total	161	2,542	152	2,543	17

[1] Coniferous volume component of deciduous-leading stands.

6.8 Uneconomic & Low Productivity Forest

FCL requires a minimum conifer volume of 200m^3/ha for harvest consideration. A review of net conifer volume at 200 years of age is the basis for this minimum volume requirement. The majority of the TFL inventory is below 200 years of age. In the timber supply analysis for MP #7 the minimum volume requirement was 150m^3/ha. FCL believes that this lower volume limit is unrealistic given harvesting costs and product requirements, and is currently using 200m^3/ha as the minimum requirement.

For the timber supply analysis, polygon volumes for existing natural and future managed stands were reviewed. Minimum SI50 (site index at 50 years) requirements to achieve 200m^3/ha were determined for each of the leading species present on TFL 33. Review of managed stand requirements provided information on the potential from a given site under management. Also some sites receive a SI50 adjustment with species conversion and/or genetic gains site index adjustment (see Section 8.1.1). The minimum SI50 values for each species are listed in Table 6.9.

Table 6.9 - Uneconomic & Low Productivity Forest Stands

Leading Species	Minimum SI50	Gross Productive		Uneconomic & Low Productivity Reduction		
		Area (ha)	Volume (m^3)	Area (ha)	Volume (m^3)	Volume (m^3/ha)
Balsam	9.0	4	120	4	120	28
Western redcedar	11.0	10	2,074	10	2,074	206
Douglas-fir	12.0	83	9,907	83	9,899	119
Western hemlock	9.0	1	213	1	213	205
Western larch	12.0	3	396	3	396	163
Lodgepole pine	9.0	0	0	0	0	0
Interior spruce	8.5	0	0	0	0	0
Total		101	12,710	101	12,702	126

6.9 Wildlife Tree Patches

In addition to all previous removals from the productive forest, other areas may be required to provide sufficient reserves of productive timber for wildlife on the TFL. These small reserves are referred to as WTPs (wildlife tree patches).

FCL is currently required to reserve 9% of the productive forest area within all designated harvesting areas, based on Salmon Arm Forest District requirements. It is also the percentage requirement from Table 20-A of the Biodiversity Guidebook. 30% of the available forest landbase has been harvested, and subsequently restocked. 90% of the productive forest is available for harvest.

In addition to all previous netdowns, a percentage reduction is made to all net operable areas to ensure the 9% WTP target is met. All areas removed from the timber harvesting landbase prior to the WTP step are distributed across the TFL and are suitable as WTPs when harvesting takes place adjacent to the excluded areas.

An additional 7.4ha of productive forest is removed from the timber harvesting landbase during this phase of the netdown process. This reflects S6 RMZ reserves not included in the riparian exclusions described in Section 6.3.

Table 6.10 summarizes the percentage of area to be excluded specifically as WTPs within each BEC category.

Table 6.10 – Wildlife Tree Patch Reductions

BEC Category (subzone)	Productive Forest (ha)	Productive Forest Reductions (prior to WTP removals)		WTP Reduction		Productive Forest Reductions (including WTP removals)
		Area (ha)	%	Area (ha)	%	Area (ha)
ESSFwc	1,505	50	3.3	87	5.7	137 (9.1%)
ICHmw	3,734	291	7.8	50	1.2	341 (9.1%)
ICHwk	2,438	93	3.8	129	5.2	222 (9.1%)
Total	7,678	433	5.6	266	3.4	700 (9.1%)

The additional 0.1% removal is attributed to S6 RMZ reserve areas.

7.0 INVENTORY ORGANIZATION

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

The use of forest cover constraints allows management objectives for non-timber resources to be included in timber supply analysis simulations. For forest level modeling purposes, areas requiring the same management regime, that is having the same forest cover constraints, are assigned to a common land base aggregate. Within each land base aggregate, specific forest cover constraints are implemented. Aggregates defined for the TFL are based on forest management to address timber and non-timber resources.

Unique management characteristics are modeled by grouping areas into two CASH6 forest cover constraint categories:

- LU and BEC-NDT (Biogeoclimatic Ecological Classification–Natural Disturbance Type) aggregates are used for assigning landscape level biodiversity objectives. Landscape level biodiversity will be modeled using MoF suggested weighted average methods and FPC Biodiversity Guidebook recommended old growth levels. This methodology is outlined in the 97.08.25 correspondence from MoF/MoELP (Appendix III). Early and mature+old seral stages will be monitored during in the Base Case but not explicitly enforced.
- REAs (resource emphasis areas) are aggregates of area with similar non-timber resource concerns. These include visually sensitive, wildlife habitat, and general IRM areas. Maximum disturbance (based on green-up requirements), minimum mature and old growth forest cover constraints will be assigned to each REA forest cover group to address specific resource needs.

Two levels of REAs will be assigned to the landbase to allow modeling of overlapping forest cover constraints (visual quality and wildlife habitat). In addition, landscape level biodiversity forest cover constraint will also be assigned. Areas will be required to meet all overlapping forest cover constraints, or have the ability to meet constraints in the future, before harvesting is allowed to proceed.

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

The following sections describe the various land base aggregates used in the analysis to model forest cover constraints, and for yield assignments. Only productive forest areas (including parks or other crown reserves) are included in the analysis data set.

7.1 LU-BEC/NDTs

As recommended by the Okanagan-Shuswap LRMP, TFL 33 has been included in the Anstey LU (landscape unit). This is the only LU associated with the TFL. BEC/NDT is based on MoF 1:250,000 Biogeoclimatic mapping and NDT definitions provided in the FPC Biodiversity Guidebook. Table 7.1 summarizes the distribution of LUs and BEC/NDTs on TFL 33. Areas from the entire LU are also included, as this is how the old growth requirements will be evaluated in the analysis.

Table 7.1 – LU-BEC/NDTs

LU – BEC/NDT & Analysis ID #	Area (ha)					
	Total		Gross Productive		Net Operable	
	All LU	TFL 33	All LU	TFL 33[1]	All LU	TFL 33
1 Anstey-ESSFwc2/NDT1	n/a	1,999	11,289	1,783	7,719	1,368
2 Anstey-ICHwk1/NDT1	n/a	2,532	8,787	2,438	7,171	2,217
3 Anstey-ICHmw2/NDT2	n/a	2,144	2,602	2,084	2,323	1,877
4 Anstey-ICHmw3/NDT3	n/a	1,691	15,965	1,655	11,858	1,518
Total	n/a	8,366	38,643	7,960	29,071	6,979

[1] Includes eligible alpine forest and np-forest areas.

Areas for the remainder of the Anstey LU are from the Salmon Arm District Landscape Units Biodiversity summary, 98.10.05 (Appendix IV), with more recent areas from MoELP. Some of the areas for TFL 33 listed in Table 7.1 are different from those in the summary in Appendix IV because of the new inventory database.

Given the relatively small area of the total LU that TFL 33 represents, old growth requirements will be based on the entire LU for each BEC/NDT. The analysis inventory database will not include area from outside TFL 33. Instead, old growth requirements will be adjusted to reflect contribution from the non-timber harvesting landbase on the remainder of the Anstey LU. If the old growth requirement is met from outside the net operable land base, including parks, then it will not be necessary to model that constraint in the timber supply analysis. Details of landscape level biodiversity requirements are provided in Section 9.2.1.5.

For BEC/NDTs that have insufficient old growth in non-harvesting areas the old growth requirement will be pro-rated. This pro-rating will be based on the contribution required from the gross productive forest.

7.2 Resource Emphasis Areas

The use of forest cover constraints allows management objectives for non-timber resources to be included in timber supply analysis simulations. In forest level modeling, areas requiring the same management regime, that is having the same forest cover constraints, are grouped into REAs. Within an REA, specific forest cover constraints are implemented.

REAs defined for the TFL are based on forest management to address timber and non-timber resources. Within each REA, measures are required to protect certain values. REAs are based on VQOs retention (R), partial retention (PR), and modification (M), Deer WR (deer winter range), caribou habitat, potential grizzly bear habitat and general IRM (integrated resource management) areas.

A number of instances of a given REA may occur in different locations throughout the TFL. Some of these are grouped for timber supply modeling because they are managed using this approach operationally. REAs are summarized in Table 7.2. Productive forest stands from outside the net operable land base may influence the state of the forest with respect to forest cover requirements for specific REAs.

Table 7.2 - Resource Emphasis Areas

Resource Emphasis Area Category & Analysis ID #	Area (ha)		
	Total	Gross Productive	Net Operable
REA level 1 (visuals, IRM):			
1 – VQO-R	847	830	724
2 – VQO-PR	4,133	4,010	3,687
3 – VQO-PR/Grizzly	205	203	191
4 – VQO-M	682	648	575
5 – VQO-M/Grizzly	158	156	138
9 – General IRM	763	721	643
Non-visual	1,577	1,110	1,021
Total	8,366	7,678	6,979

Table 7.2 - Resource Emphasis Areas (cont.)

Resource Emphasis Area Category & Analysis ID #	Area (ha)		
	Total	Gross Productive	Net Operable
REA level 2 (wildlife habitat):			
6 – Deer WR	3,091	3,010	2,774
7 – Caribou-Early Winter	883	819	750
8 – Caribou-Late Winter	1,011	590	541
Non-wildlife	3,381	3,258	2,914
Total	8,366	7,678	6,979

There is no overlap of different visually sensitive areas; similarly, there is no overlap of any of the wildlife habitat REAs. IRM areas represent the residual land on TFL 33 that has no specific visual or wildlife resource attributes. Grizzly bear habitat areas have been segregated in order to model alternative management on these areas in the LRMP option.

Details of the inventories used to define the REAs in Table 7.2 are provided in Section 9.1. Forest cover constraint information is summarized in Section 9.2.

7.3 Analysis Units

Aggregation of forest stands is necessary to facilitate forest level modeling and reporting. Stands with similar biological (species composition and site productivity), management and silviculture regimes are grouped to reduce complexity. This must be balanced with creating small enough groups to allow accurate modeling of stand yields. It is also important to ensure that analysis units are consistent between various options of the timber supply analysis so that aggregation methodology does not cause differences between analysis results.

7.3.1 VDYP Natural Stand Analysis Units (1 – 24 & 101 - 117)

Analysis units 1 - 24 describe existing older immature and mature stands that will be assigned to VDYP NSYTs (natural stand yield tables) in the analysis. Analysis units 101 – 117 are similar NSYTs designated for grizzly bear management in the LRMP option. A conventional approach of aggregating stands into species groups based on ITG (inventory type group) was used. Generally, if an individual ITG represents more than 5% of the net

land base then it becomes a unique species group. Aggregation of other ITGs is based upon similarity in species growth and silvics.

Site index breakpoints for the site classes defined for the NSYT analysis units are provided in Table 7.3. These break points are chosen to balance the area in each class while keeping the spread in site index in each class to a minimum. This is of concern since the relationship between site index and volume is not linear.

Old growth stands may have site index adjustments when they are assigned to their regeneration analysis units as described in Section 8.1.1. Table 7.3 summarizes the stand attribute definitions for analysis units 1 – 24 and 101 – 117

Table 7.3 - VDYP Natural Stand Analysis Unit Descriptions

Analysis Unit	Net Area (ha)	ITG	SI50 Range	Average Stand Attributes		
				SI50	CC	Species Composition
Non-Grizzly Bear						
1 Fd-G	44	1, 8	> 19	19.5	68	Fd99 Cw1
2 Fd-M	211	1, 8	17 - 19	17.9	56	Fd100
3 Fd-P	68	1, 8	< 17	13.5	59	Fd98 Hw1Ep1
4 FdCw-G	481	2 - 6	> 19	20.7	82	Fd63 Cw18 Se12 Hw7
5 FdCw-M	775	2 - 6	17 - 19	18.1	74	Fd71 Cw20 Hw5 Pl4
6 FdCw-P	150	2 - 6	< 17	14.5	65	Fd66 Hw17 Cw12 Pl5
7 CwHw-G	189	9 - 11	> 17	19.2	75	Cw60 Fd30 Hw8 Ep2
8 CwHw-M	379	9 - 11	15 - 17	15.5	74	Cw60 Hw19 Fd13 Pw8
9 CwHw-P	430	9 - 11	< 15	13.6	73	Cw60 Hw24 Fd11 Ep5
10 HwCw-G	144	12 - 17	> 16	17.5	65	Hw54 Cw20 Fd16 Se10
11 HwCw-M	325	12 - 17	13 - 16	13.9	80	Hw54 Cw23 Fd20 Se3
12 HwCw-P	198	12 - 17	< 13	10.6	64	Hw68 Cw18 Se9 Pw5
13 BlSe-G	121	18 - 20	> 19	18.2	62	Bl71 Se28 Hw1
14 BlSe-M	350	18 - 20	15 - 19	14.9	66	Bl74 Se22 Cw4
15 BlSe-P	93	18 - 20	< 15	11.3	44	Bl75 Se25
16 SeBl-G	163	21 - 26	> 19	20.6	46	Se50 Bl47 Fd3
17 SeBl-M	129	21 - 26	15 - 19	17.2	59	Se58 Bl41 Fd1
18 SeBl-P	40	21 - 26	< 15	12.0	53	Se67 Bl27 Cw5 Pw1
19 PlFd-G	82	28 - 31	> 16	17.0	51	Pl60 Fd25 Se12 Cw3
20 PlFd-M	35	28 - 31	13 - 16	13.8	60	Pl70 Fd30
21 PlFd-P	68	28 - 31	< 13	10.4	50	Pl65 Fd24 Se11
22 LwFd-G	224	7, 27, 33, 34	> 17	17.7	58	Lw69 Fd18 At7 Pl6
23 LwFd-M	93	7, 27, 33, 34	15 - 17	15.7	68	Fd56 Pw21 Hw12 Lw11
24 LwFd-P	23	7, 27, 33, 34	< 15	13.2	70	Fd40 Pw33 Se14 Lw13
Subtotal	4,812					

Table 7.3 - VDYP Natural Stand Analysis Unit Descriptions (cont.)

Analysis Unit	Net Area (ha)	ITG	SI50 Range	Average Stand Attributes		
				SI50	CC	Species Composition
Grizzly Bear						
101 Fd(griz)-G	11	1, 8	> 19	19.6	48	Fd90 Cw10
102 Fd(griz)-M	16	1, 8	17 - 19	17.5	34	Fd100
103 Fd(griz)-P	21	1, 8	< 17	14.4	66	Fd94 Hw6
107 CwHw(griz)-G	12	9 - 11	> 17	18.4	59	Cw53 Fd30 Hw17
108 CwHw(griz)-M	33	9 - 11	15 - 17	16.4	80	Cw59 Hw34 Fd4 Pw3
109 CwHw(griz)-P	59	9 - 11	< 15	13.9	74	Cw60 Hw28 Fd11 Se1
110 HwCw(griz)-G	15	12 - 17	> 16	16.9	51	Hw56 Bl22 Se11 Pw11
111 HwCw(griz)-M	19	12 - 17	13 - 16	14.2	70	Hw50 Cw40 Fd10
113 BlSe(griz)-G	14	18 - 20	> 19	18.9	42	Bl51 Se28 Hw15 Cw6
114 BlSe(griz)-M	94	18 - 20	15 - 19	15.1	65	Bl71 Se24 Hw3 Fd2
115 BlSe(griz)-P	26	18 - 20	< 15	13.3	58	Bl68 Se14 Fd11 Cw7
117 SeBl(griz)-M	8	21 – 26	15 – 19	15.6	70	Se60 Bl40
Subtotal	329					
NSYT Total	5,141					

The "(griz)" label on analysis units 101 – 117 indicates stands that they have been designated as grizzly bear habitat area.

7.3.2 TIPSY Existing Managed Stand Analysis Units (201 – 220 & 301 – 317)

Analysis units 201 - 220 define existing managed stands that have not received any incremental silviculture treatments (juvenile spacing and fertilization). AUs 301 – 317 define existing managed stands that have been spaced and fertilized.

Existing managed stands are those areas established since 1965 (33 years of age and younger). This represents the time that FCL has held the licence for TFL 33. All of the existing managed stands have been managed since establishment and will be modeled with TIPSY MSYTs (managed stand yield tables). A review of management activities (site prep, planting, brushing/weeding, juvenile spacing, fertilization) for all stands 33 years and at indicateds that these stands have had some form of stand management at and/or since establishment.

All existing stands (both natural and managed) will regenerate to managed stand yields developed with TIPSY (different from AUs 201 - 317 above). A list of the average stand descriptions and areas associated with each existing managed stand yield analysis unit is provided in Table 7.4.

Table 7.4 – TIPSY Existing Managed Stand Analysis Units

Analysis Unit	Net Area (ha)	ITG	SI50 Range	Average Stand Attributes		
				SI50	Density [1]	Species Composition
Non Incremental AUs						
204 FdCw-G	176	1 - 8, 27, 33, 34	> 19	20.6	1,264	Fd60 Cw19 Hw16 Pl5
205 FdCw-M	128	1 - 8, 27, 33, 34	17 - 19	17.3	1,130	Fd57 Cw20 Pl14 Pl9
206 FdCw-P	96	1 - 8, 27, 33, 34	< 17	12.6	1,291	Fd52 Pl26 Pl12 Lw10
210 HwSe-G	85	9 - 17	> 16	19.1	1,136	Hw34 Cw27 Se22 Fd17
211 HwSe-M	5	9 - 17	13 - 16	16.0	1,160	Hw60 Pw20 Fd20
212 HwSe-P	19	9 - 17	< 13	10.0	1,100	Hw40 Cw40 Fd10 Pl10
216 SeBl-G	51	18 - 26	> 19	23.3	1,218	Se83 Pl10 Bl7
217 SeBl-M	722	18 - 26	15 - 19	15.8	1,118	Se77 Bl14 Hw5 Cw4
218 SeBl-P	16	18 - 26	< 15	12.0	1,133	Se100
219 PlFd-G	111	28 - 31	> 16	18.9	1,254	Pl58 Fd29 Se9 Lw4
220 PlFd-M	168	28 - 31	13 - 16	16.0	1,121	Pl55 Se22 Fd18 Cw5
Subtotal	1,576					
Incremental AUs						
304 FdCw(fert)-G	100	1 - 8, 27, 33, 34	> 19	20.0	1,165	Fd84 Se6 Hw5 Cw5
305 FdCw(fert)-M	31	1 - 8, 27, 33, 34	17 - 19	17.0	1,227	Fd55 Cw25 Se13 Hw7
317 SeBl(fert)-M	39	21 - 26	15 - 19	16.8	1,192	Se75 Bl13 Fd8 Hw4
Subtotal	170					
Total	1,746					

[1] Current stand density, TIPSY input density was set to 1500

The "(fert)" label in the description of AUs 304 – 317 indicates that fertilization has been carried on these stands. These stands were fertilized in 1997 as part of FCL's incremental silviculture programme. A total of 16 stands were fertilized.

7.3.3 TIPSY Future Managed Stands Analysis Units (401 – 717)

Analysis units 401 - 717 describe future managed stands that areas will be assigned to after initial harvest takes place in the analysis simulation. These areas will be modeled with TIPSY yield tables, based on the prescribed stand descriptions from FCL silviculture plans. Future managed stands AUs are aggregated into four groups:

- AUs 401 – 424 are the regeneration types for existing natural stands in AUs 1 – 24;
- AUs 501 – 517 are the regeneration types for existing natural stands in AUs 101 – 117;
- AUs 601 – 620 are the regeneration types for existing managed stands in AUs 201 – 220; and
- AUs 701 – 717 are the regeneration types for existing managed stands in AUs 301 – 317.

Table 7.5 summarizes the stand descriptions and area associated with each managed stand analysis unit for the future forest.

Table 7.5 – TIPSY Future Managed Stand Analysis Units

Future Analysis Unit	Net Area (ha)	Existing SI50	Species Composition & (Adjusted SI50)		
Non-Grizzly NSYTs:					
401 FdPlLw-G	44	19.5	Fd35 (19.5)	Pl35 (20.1)	Lw30 (19.8)
402 FdPlLw-M	211	17.9	Fd35 (17.9)	Pl35 (18.5)	Lw30 (18.2)
403 FdPlLw-P	68	13.5	Fd35 (13.5)	Pl35 (13.9)	Lw30 (13.7)
404 FdPlLw-G	481	20.7	Fd35 (20.7)	Pl35 (21.3)	Lw30 (21.0)
405 FdPlLw-M	775	18.1	Fd35 (18.1)	Pl35 (18.7)	Lw30 (18.4)
406 FdPlLw-P	150	14.5	Fd35 (14.5)	Pl35 (15.0)	Lw30 (14.8)
407 PlFdSe-G	189	19.2	Pl35 (19.7)	Fd35 (19.2)	Se30 (19.6)
408 PlFdSe-M	379	15.5	Pl35 (16.0)	Fd35 (15.5)	Se30 (15.8)
409 PlFdSe-P	430	13.6	Pl35 (14.0)	Fd35 (13.6)	Se30 (13.9)
410 PlFdSe-G	144	17.5	Pl35 (18.1)	Fd35 (17.6)	Se30 (17.9)
411 PlFdSe-M	325	13.9	Pl35 (14.4)	Fd35 (13.9)	Se30 (14.3)
412 PlFdSe-P	198	10.6	Pl35 (11.0)	Fd35 (10.6)	Se30 (10.9)
413 Se-G	121	18.2	Se100 (19.6)		
414 Se-M	350	14.9	Se100 (15.6)		
415 Se-P	93	11.3	Se100 (11.4)		
416 Se-G	163	20.6	Se100 (21.0)		
417 Se-M	129	17.2	Se100 (17.5)		
418 Se-P	40	12.0	Se100 (12.3)		
419 FdPlLw-G	82	17.0	Fd35 (17.0)	Pl35 (17.5)	Lw30 (17.3)
420 FdPlLw-M	35	13.8	Fd35 (13.8)	Pl35 (14.2)	Lw30 (14.0)
421 FdPlLw-P	68	10.4	Fd35 (10.4)	Pl35 (10.7)	Lw30 (10.6)
422 FdPlLw-G	224	17.7	Fd35 (17.7)	Pl35 (18.2)	Lw30 (18.0)
423 FdPlLw-M	93	15.7	Fd35 (15.7)	Pl35 (16.2)	Lw30 (15.9)
424 FdPlLw-P	23	13.2	Fd35 (13.2)	Pl35 (13.6)	Lw30 (13.4)
Subtotal	4,812				
Grizzly NSYTs:					
501 FdPlLw(griz)-G	11	19.6	Fd35 (19.6)	Pl35 (20.2)	Lw30 (19.9)
502 FdPlLw(griz)-M	16	17.5	Fd35 (17.5)	Pl35 (18.0)	Lw30 (17.8)
503 FdPlLw(griz)-P	21	14.4	Fd35 (14.4)	Pl35 (14.8)	Lw30 (14.6)
507 PlFdSe(griz)-G	12	18.4	Pl35 (19.0)	Fd35 (18.4)	Se30 (18.8)
508 PlFdSe(griz)-M	33	16.4	Pl35 (16.9)	Fd35 (16.4)	Se30 (16.8)
509 PlFdSe(griz)-P	59	13.9	Pl35 (14.3)	Fd35 (13.9)	Se30 (14.1)
510 PlFdSe(griz)-G	15	16.9	Pl35 (17.4)	Fd35 (16.9)	Se30 (17.2)
511 PlFdSe(griz)-M	19	14.2	Pl35 (14.6)	Fd35 (14.2)	Se30 (14.5)
513 Se(griz)-G	14	18.9	Se100 (20.0)		
514 Se(griz)-M	94	15.1	Se100 (15.9)		
515 Se(griz)-P	26	13.3	Se100 (13.7)		
517 Se(griz)-M	8	15.6	Se100 (15.9)		
Subtotal	329				

Table 7.5 – TIPSY Future Managed Stand Analysis Units (cont.)

Future Analysis Unit	Net Area (ha)	Existing SI50	Species Composition & (Adjusted SI50)		
Non-Incremental MSYTs:					
604 FdPlLw-G	176	20.6	Fd35 (20.6)	Pl35 (21.2)	Lw30 (20.9)
605 FdPlLw-M	128	17.3	Fd35 (17.3)	Pl35 (17.8)	Lw30 (17.5)
606 FdPlLw-P	96	12.6	Fd35 (12.6)	Pl35 (13.0)	Lw30 (12.8)
610 PlFdSe-G	85	19.1	Pl35 (19.7)	Fd35 (19.1)	Se30 (19.4)
611 PlFdSe-M	5	16.0	Pl35 (16.5)	Fd35 (16.0)	Se30 (16.3)
612 PlFdSe-P	19	10.0	Pl35 (10.3)	Fd35 (10.0)	Se30 (10.2)
616 Se-G	50	23.3	Se100 (23.8)		
617 Se-M	722	15.8	Se100 (16.1)		
618 Se-P	16	12.0	Se100 (12.2)		
619 FdPlLw-G	111	18.9	Fd35 (18.9)	Pl35 (19.5)	Lw30 (19.2)
620 FdPlLw-M	168	16.0	Fd35 (16.0)	Pl35 (16.5)	Lw30 (16.2)
Subtotal	1,576				
Incremental MSYTs:					
704 FdPlLw(fert)-G	100	20.0	Fd35 (20.0)	Pl35 (20.6)	Lw30 (20.3)
705 FdPlLw(fert)-M	31	17.0	Fd35 (17.0)	Pl35 (17.5)	Lw30 (17.3)
717 Se(fert)-M	39	16.8	Se100 (17.1)		
Subtotal	170				
Total (less NSR)	6,887				

Site index values for the future managed stands are adjusted to account for gains from improved planting stock. Estimates of genetic gain are provided by individual species, therefore the managed stand yield tables are developed from up to three base TIPSY yield tables. Section 8.9 describes the adjustments to SI50 to reflect genetic gains in planting stock.

7.4 Age Class Distributions

Table 7.6 summarizes the distribution of area by age class (age in 10s) for the gross productive and net operable components of the inventory. All ages are projected to December 31 1998.

Table 7.6 – Area Distribution by Age Class

Age Class (10's)	MoF Age Class	Productive Forest Area (ha)		
		Non-THLB	THLB	Total
0	0	2	93	95
1 - 10	1	115	592	707
11 - 20		54	867	921
21 - 30	2	19	254	273
31 - 40		7	115	122
41 - 50	3	10	169	179
51 - 60		2	43	45
61 - 70	4	121	641	762
71 - 80		57	9	66
81 - 90	5	3	15	18
91 - 100		2	39	41
101 - 110	6	23	171	194
111 - 120		13	160	173
121 - 130	7	29	352	381
131 - 140		23	687	710
141 - 150		18	363	381
151 - 160	8	69	1,010	1,079
161 - 170		32	579	611
171 - 180		21	126	147
181 - 190		11	8	19
191 - 200		19	376	395
201 - 210		3	24	27
211 - 220		33	181	214
221 - 230		0	0	0
231 - 240		0	0	0
241 - 250		0	0	0
251 - 260		0	0	0
261 - 270	9	7	104	111
271 - 280		0	4	4
Total		699	6,979	7,678

THLB = Timber Harvesting Land Base

Figure 7.1 summarizes the current age class distribution graphically. Productive Non-THLB refers to the productive forest area that was removed from the timber harvesting land base (THLB) during the netdown process. This forest area is still available to accommodate non-timber interests such as old growth.

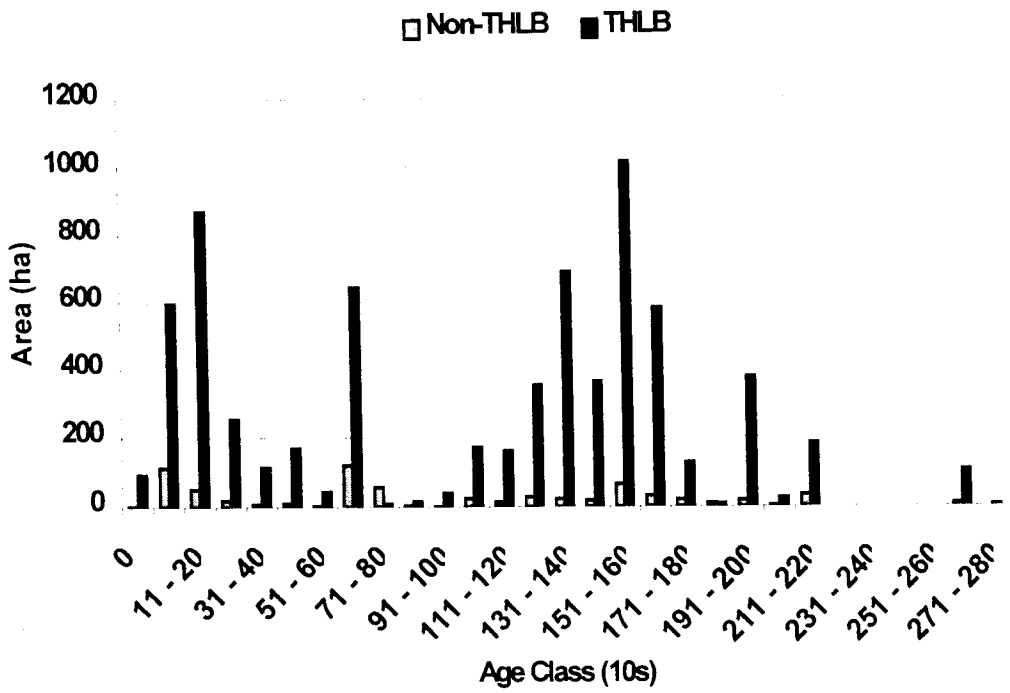

Figure 7.1 – Current Age Class Distribution

Table 7.7 provides the volume distribution (net DWB (decay, waste and breakage)) by age class for the gross productive and net operable components of the inventory. Managed stands will use volumes developed with TIPSY in the analysis simulations. However all polygon volumes provided in this report were developed with VDYPbatch version 6.4. Details of the various inputs for VDYP are provided in section 8 (utilization, loss factors, deciduous exclusions, *etc.*). All volumes are projected to December 1998.

Table 7.7 – Volume Distribution by Age Class

Age Class (10's)	MoF Age Class	Productive Forest Volume (m^3)		
		Non-THLB	THLB	Total
0	0	0	0	0
1 - 10	1	0	0	0
11 - 20		0	0	0
21 - 30	2	0	21	21
31 - 40		25	342	367
41 - 50	3	747	12,870	13,617
51 - 60		248	4,823	5,071
61 - 70	4	12,554	67,876	80,431
71 - 80		2,440	1,254	3,694
81 - 90	5	272	3,463	3,735
91 - 100		205	8,410	8,615
101 - 110	6	2,668	40,021	42,689
111 - 120		4,816	58,877	63,693
121 - 130	7	6,521	91,205	97,726
131 - 140		8,240	216,826	225,066
141 - 150	8	5,875	133,187	139,062
151 - 160		21,038	370,348	391,387
161 - 170		11,312	195,116	206,428
171 - 180		4,534	39,697	44,231
181 - 190		2,339	2,280	4,620
191 - 200		7,004	136,470	143,474
201 - 210		936	11,725	12,662
211 - 220		7,941	68,304	76,245
221 - 230		0	0	0
231 - 240		0	0	0
241 - 250		0	0	0
251 - 260	9	0	0	0
261 - 270		2,833	39,831	42,664
271 - 280		30	2,079	2,109
Total		102,582	1,505,026	1,607,608

8.0 GROWTH AND YIELD

Yield tables for stands of natural origin were prepared using the MoF program VDYPbatch (Variable Density Yield Prediction version 6.4). These natural stand yield tables are used to model the growth of existing natural stands defined in Section 7.3.1.

Managed stand yields have been prepared for stands regenerated and conforming to minimum stocking standards. These managed stand yield tables were created using BatchTIPSY (Table Interpolation Program for Stand Yields, version 2 beta 5) (TIPSY). All existing managed stands described in Section 7.3.2, and future managed stands described in Section 7.3.3, will be modeled using TIPSY yield tables.

8.1 Site Index

The forest cover inventory assigns site index to all stands less than 30 years of age. For stands 30 years of age and older, site index numbers are assigned using the inventory age and height based on current MoF site curves. They are therefore consistently base age 50 years.

Analysis unit site index is derived as the area-weighted average of the polygon site indices in that analysis unit (pooled species group and site index range). Polygons are assigned to site classes good, medium and poor. This classification is based on site index break points listed in Tables 7.3, 7.4 and 7.5. These break points are chosen to balance the area in each class while keeping the spread in site index in each class to a minimum. This is of concern since the relationship between site index and volume is not linear. These site classes are not to be confused with historic MoF G, M and P.

8.1.1 Site Index for Regenerated Stands

Site index of regeneration may be adjusted for two reasons:

- Species conversion;
- Genetic gains related to improved seed.

OGSI (old growth site index) adjustments are not included in the analysis because of the small area of the TFL that is affected by such an adjustment. Species conversion adjustments are applied to sites that are regenerated with a different species from that which occupied the site prior to harvest. The adjustment equations used are from the MoF

report *Site Index Conversion Equations for Mixed Species Stands* (MoF Research Branch, 1995). Table 8.1 summarizes the conversion equations used for the TFL 33 analysis.

Table 8.1 – Species Conversion Adjustment Equations

Original Species	Regeneration Species	Species Conversion Adjustment Equation
Balsam	Interior spruce	$SI50_{Se} = -1.95 + 1.16 * SI50_{Bl}$

FCL participates in the interior seed orchard program and will continue to plant areas with seedlings sown with genetically improved seed. FCL expects to replant all harvested areas with improved stock within six years for all of the major species included in their silviculture plans (Fd, Lw, Pl, Se). Site index adjustments are included in the analysis unit yield tables for each eligible species based on the information summarized in Table 8.2.

Table 8.2 – Genetic Gains Adjustments

Leading Species	Percent Genetic Gain (& Percent SI50 Increase)	
	Current (1st generation production from parents)	Future (best selection from 1st generation) [1]
Spruce	4 (2.0)	10 (5.0) by 2001
Lodgepole pine	6 (3.0)	10 (5.0) by 2005
Western larch	3 (1.5)	5 (2.5) by 2001
Douglas-fir	0	26 (13.0) by 2005

[1] Future genetic gains are applied in the Additional Incremental Silviculture Option.

MoF (Skimikin Seed Orchard) provided genetic gain estimates for both current seed production and seed expected to be available within six years. Gains are stated as percentage increases in stand volume at rotation age (80 years for spruce, 60 years for other species).

For the timber supply analysis these percentage gains were converted to SI50 adjustments. The accepted conversion is to increase managed stand SI50 by one half of the percentage volume gain. For example, if the volume-based genetic gain specified for spruce is 4%, SI50 is increased by 2%. This approach allows changes in height and diameter growth of managed stands to be considered in other aspects of the analysis – forest cover constraints and products-based minimum harvest ages.

Future genetic gains are reduced slightly to reflect the delay in availability of the improved planting stock. Based on an average minimum harvest age of 90 years, the number of years from present (1999) to year of availability (2001 – 2005), the SI50 percent adjustment was reduced by 2% to 6%.

Site index is recalculated for stands which are subject to species conversion and/or genetic gains at regeneration. The species conversion adjustment will be applied first. This approach will be included in all analysis scenarios. Table 8.8 provides a list of managed stand SI50 associated with all adjustments, by analysis unit.

8.2 Crown Closure

Crown closure is a major driving input for NSYT development. VDYP analysis unit crown closure values are area-weighted averages of the crown closure attribute of stands assigned to that analysis unit. Stands less than 50 years of age are assigned default crown closure values (taken from VDYP documentation) provided in Table 8.3.

Table 8.3 - Default Crown Closure for Stands Under 50 Years

Leading Species	Default Crown Closure
Balsam	42
Western redcedar	51
Douglas-fir	48
Hemlock	51
Larch	54
Lodgepole pine	50
Western white pine	55
Spruce	46
Cottonwood	61
Aspen	52
Birch	61

8.3 Utilization Levels

Utilization levels that will be used in the development of all polygon volumes and yield tables (VDYP natural and TIPSY managed) are documented in Table 8.4.

Table 8.4 - Utilization Levels

Stand Types	Utilization		
	Minimum DBH (cm)	Stump Height (cm)	Top DIB (cm)
Pine	12.5	30	10.0
All other species	17.5	30	10.0

Operationally, FCL is only required to harvest existing mature western redcedar to a 15.0cm top. However the models used to develop yield tables and stand volumes for this analysis are unable to input this top diameter. Therefore redcedar will use the 10.0cm top diameter in the analysis.

8.4 Decay, Waste and Breakage

VDYP-generated volumes (both analysis yield tables and current polygon volumes) are net DWB using appropriate FIZ (forest inventory zone) G and PSYU (public sustained yield unit or special cruise) 339. Special cruise 339 uses local factors for cedar and hemlock, based on the Eagle PSYU (150).

8.5 Operational Adjustment Factors

The following TIPSY OAFs (operational adjustment factors) will be used in the development of managed stand yields:

- OAF1 of 15% to address unmapped stand openings; and
- OAF2 of 5% to address age-related losses.

Root rot issues are being addressed operationally by stumping infected sites after harvest and regenerating sites with mixed species plantations.

8.6 Volume Exclusions for Mixed Species Stands

Volumes reported in this Information Package have been reduced for the non-merchantable (deciduous) component. Similarly, all deciduous volume is excluded from the analysis unit yield tables based on the species percentage deciduous represent. All coniferous species are merchantable provided the site productivity associated with the stand meets minimum requirements.

8.7 Yield Tables for Natural Stands

Volumes provided in this report are based on individual polygon estimates developed with the MoF program VDYP. For analysis modeling, VDYP will be used for predicting existing natural stand yields at the analysis unit level.

The procedure used to generate VDYP natural stand yield tables is:

- Assign each polygon in the net land base to an analysis unit on the basis of inventory type group and site index, as well as factors discussed in Section 7.3.1;
- Compile area-weighted average site index, crown closure and species composition attributes for each analysis unit (stands between 34 and 50 years have default values for crown closure);
- Use these attributes, in addition to DWB factors associated with FIZ G and PSYU 339 to drive VDYP; and
- Compile yields to 12.5 cm dbh, 10.0 cm top and 30.0 cm stump for pine or 17.5 cm dbh for all other species.

Yield tables are reduced by the deciduous component before use in forest estate modeling based on the species compositions in Tables 7.3 and 8.5. Inputs used to develop the VDYP natural stand yield tables are presented in Table 8.5.

Table 8.5 – VDYP Inputs - Existing Natural Stand Analysis Units

Analysis Unit	Net Area (ha)	Average Stand Attributes		
		SI50	CC	Species Composition
Non-Grizzly NSYTs:				
1 Fd-G	44	19.5	68	Fd99 Cw1
2 Fd-M	211	17.9	56	Fd100
3 Fd-P	68	13.5	59	Fd98 Hw1 Ep1
4 FdCw-G	481	20.7	82	Fd63 Cw18 Se12 Hw7
5 FdCw-M	775	18.1	74	Fd71 Cw20 Hw5 Pl4
6 FdCw-P	150	14.5	65	Fd66 Hw17 Cw12 Pl5
7 CwHw-G	189	19.2	75	Cw60 Fd30 Hw8 Ep2
8 CwHw-M	379	15.5	74	Cw60 Hw19 Fd13 Pw8
9 CwHw-P	430	13.6	73	Cw60 Hw24 Fd11 Ep5
10 HwCw-G	144	17.5	65	Hw54 Cw20 Fd16 Se10
11 HwCw-M	325	13.9	80	Hw54 Cw23 Fd20 Se3
12 HwCw-P	198	10.6	64	Hw68 Cw18 Se9 Pw5
13 BlSe-G	121	18.2	62	Bl71 Se28 Hw1
14 BlSe-M	350	14.9	66	Bl74 Se22 Cw4
15 BlSe-P	93	11.3	44	Bl75 Se25
16 SeBl-G	163	20.6	46	Se50 Bl47 Fd3
17 SeBl-M	129	17.2	59	Se58 Bl41 Fd1
18 SeBl-P	40	12.0	53	Se67 Bl27 Cw5 Pw1
19 PlFd-G	82	17.0	51	Pl60 Fd25 Se12 Cw3
20 PlFd-M	35	13.8	60	Pl70 Fd30
21 PlFd-P	68	10.4	50	Pl65 Fd24 Se11
22 LwFd-G	224	17.7	58	Lw69 Fd18 At7 Pl6
23 LwFd-M	93	15.7	68	Fd56 Pw21 Hw12 Lw11
24 LwFd-P	23	13.2	70	Fd40 Pw33 Se14 Lw13
Subtotal	4,812			

Table 8.5 – VDYP Inputs - Existing Natural Stand Analysis Units (cont.)

Analysis Unit	Net Area (ha)	Average Stand Attributes		
		SI50	CC	Species Composition
Grizzly NSYTs:				
101 Fd(griz)-G	11	19.6	48	Fd90 Cw10
102 Fd(griz)-M	16	17.5	34	Fd100
103 Fd(griz)-P	21	14.4	66	Fd94 Hw6
107 CwHw(griz)-G	12	18.4	59	Cw53 Fd30 Hw17
108 CwHw(griz)-M	33	16.4	80	Cw59 Hw34 Fd4 Pw3
109 CwHw(griz)-P	59	13.9	74	Cw60 Hw28 Fd11 Se1
110 HwCw(griz)-G	15	16.9	51	Hw56 Bl22 Se11 Pw11
111 HwCw(griz)-M	19	14.2	70	Hw50 Cw40 Fd10
113 BlSe(griz)-G	14	18.9	42	Bl51 Se28 Hw15 Cw6
114 BlSe(griz)-M	94	15.1	65	Bl71 Se24 Hw3 Fd2
115 BlSe(griz)-P	26	13.3	58	Bl68 Se14 Fd11 Cw7
117 SeBl(griz)-M	8	15.6	70	Se60 Bl40
Subtotal	329			
Total	5,141			

8.8 Regeneration Scheme and Regeneration Delay

This section describes the regeneration strategy for TFL 33. Regeneration delays are not inherent in the yield tables, but are assigned during forest level modeling. Table 8.6 describes the regeneration scheme incorporated into the timber supply analysis.

Table 8.6 - Regeneration Strategies

Existing Leading Species	Regen Delay (years)	Regeneration Type & Percent	Species Composition	Initial Density
Fd, Lw, Pl	2	Plant 100%	Fd35 Pl35 Lw30	1500
Cw, Hw	2	Plant 100%	Pl35 Fd35 Se30	1500
Se, Bl	2	Plant 100%	Se100	1500

Regeneration is completed on all areas within two years of harvest completion. Many areas are replanted within one year of harvest. A small percentage is replanted during the same year as harvest (*eg.* harvested in spring, planted in fall of the same year).

8.9 Yield Tables for Managed Stands

All existing stands age 33 or less are assigned to managed stand yield tables. A review of the history attributes for these young stands indicates that some level of management has occurred since establishment.

The following information is considered when preparing inputs for TIPSY:

- Species composition;
- Initial planting density;
- Treatment, *eg.* fertilization, genetic (volume) gains from tree improvement;
- Site index;
- Operational adjustment factors; and
- Regeneration delay - 0 (delays are incorporated in forest level analysis).

Specific inputs to TIPSY, other than species composition and site index are:

- Utilization: 12.5 for pine, 17.5 cm dbh for other species;
- OAF1 of 15%, OAF2 of 5% for all species;
- Initial stocking (1,500 stems/ha) based on FCL silviculture plans and
- Regeneration type – all planted on TFL 33.

Table 8.8 presents the TIPSY inputs used to develop the yield tables for existing managed stands. Balsam is modeled as spruce and larch is modeled as Douglas-fir in TIPSY.

Table 8.8 – TIPSY Inputs - Existing Managed Stand Analysis Units

Analysis Unit	Net Area (ha)	Average Stand Attributes		
		SI50	Density	Species Composition
Non Incremental AUs:				
204 FdCw-G	176	20.6	1,500	Fd60 Cw19 Hw16 Pl5
205 FdCw-M	128	17.3	1,500	Fd57 Cw20 Pl14 Pl9
206 FdCw-P	96	12.6	1,500	Fd52 Pl26 Pl12 Lw10
210 HwSe-G	85	20.9	1,500	Cw37 Hw32 Se18 Fd13
211 HwSe-M	5	16.0	1,500	Hw60 Pw20 Fd20
212 HwSe-P	19	10.0	1,500	Hw40 Cw40 Fd10 Pl10
216 SeBl-G	50	23.3	1,500	Se83 Pl10 Bl7
217 SeBl-M	722	15.8	1,500	Se79 Bl15 Hw3 Cw3
218 SeBl-P	16	12.0	1,500	Se100
219 PlFd-G	111	18.9	1,500	Pl58 Fd29 Se9 Lw4
220 PlFd-M	168	16.0	1,500	Pl55 Se22 Fd18 Cw5
Subtotal	1,576			
Incremental AUs:				
304 FdCw(fert)-G	100	20.0	1,500	Fd84 Se6 Hw5 Cw5
305 FdCw(fert)-M	31	17.0	1,500	Fd55 Cw25 Se13 Hw7
317 SeBl(fert)-M	39	15.8	1,500	Se57 Hw19 Cw15 Fd9
Subtotal	170			
Total	1,746			

An initial density of 1,500 stems/ha was used as the input to TIPSY for the existing MSYTs, which provides a current density similar to that found in the TFL 33 inventory file

(generally 1100 – 1200 stems/ha) for stands of about 14 years of age (the average age of stands assigned to existing MSYTs).

Fertilization was carried out in 1997 on selected Douglas-fir and spruce stands that had been brushed and spaced. An agriculture grade urea and ammonium sulphate (35-0-0-10S) was applied at a rate of 575 kg/ha. Increases of 10m3/ha and 15m3/ha are expected for the spruce and Douglas-fir stands, respectively, compared to the untreated TIPSY managed stand yields.

Table 8.8 provides the regeneration analysis units and the species and site index values that are input to TIPSY for the base future managed stand yield tables. These inputs are based on the preferred strategies presented in Table 8.6. It is assumed that all areas that have undergone incremental treatments to date will continue to be treated in the future. Also included in Table 8.8 is the original analysis unit reference. The minor deciduous component in existing coniferous-leading stands is assumed to regenerate to pure conifer in the future.

Site index is calculated based on adjustments for species conversion and genetic gains where appropriate. To account for different levels of improvement from genetic gains, individual "base" yield tables were produced for each species present in each future managed stand. This allows the appropriate SI50 adjustments to be made to each base yield table. As described in the MoF correspondence *Incorporating Genetic Gains (or Genetic Worth: GW) in Growth and Yield Analysis*, May 1999 (Appendix V), adjustments to volumes were made to each base yield table after age 60 or 80 (spruce) years for attrition of gains. These yield tables were then merged into a single yield table for use in the timber supply analysis using the expected species composition provided in Table 8.6.

Table 8.8 – TIPSY Inputs - Future Managed Stand Analysis Units

Future Analysis Unit	Net Area (ha)	Original Analysis Unit	Existing SI50	Initial Density	Species Composition & (Adjusted SI50)		
Non-Grizzly NSYTs:							
401 FdPlLw-G	44	1	19.5	1,500	Fd35 (19.5)	Pl35 (20.1)	Lw30 (19.8)
402 FdPlLw-M	211	2	17.9	1,500	Fd35 (17.9)	Pl35 (18.5)	Lw30 (18.2)
403 FdPlLw-P	68	3	13.5	1,500	Fd35 (13.5)	Pl35 (13.9)	Lw30 (13.7)
404 FdPlLw-G	481	4	20.7	1,500	Fd35 (20.7)	Pl35 (21.3)	Lw30 (21.0)
405 FdPlLw-M	775	5	18.1	1,500	Fd35 (18.1)	Pl35 (18.7)	Lw30 (18.4)
406 FdPlLw-P	150	6	14.5	1,500	Fd35 (14.5)	Pl35 (15.0)	Lw30 (14.8)
407 PlFdSe-G	189	7	19.2	1,500	Pl35 (19.7)	Fd35 (19.2)	Se30 (19.6)
408 PlFdSe-M	379	8	15.5	1,500	Pl35 (16.0)	Fd35 (15.5)	Se30 (15.8)
409 PlFdSe-P	430	9	13.6	1,500	Pl35 (14.0)	Fd35 (13.6)	Se30 (13.9)
410 PlFdSe-G	144	10	17.5	1,500	Pl35 (18.1)	Fd35 (17.6)	Se30 (17.9)
411 PlFdSe-M	325	11	13.9	1,500	Pl35 (14.4)	Fd35 (13.9)	Se30 (14.3)
412 PlFdSe-P	198	12	10.6	1,500	Pl35 (11.0)	Fd35 (10.6)	Se30 (10.9)
413 Se-G	121	13	18.2	1,500	Se100 (19.6)		
414 Se-M	350	14	14.9	1,500	Se100 (15.6)		
415 Se-P	93	15	11.3	1,500	Se100 (11.4)		
416 Se-G	163	16	20.6	1,500	Se100 (21.0)		
417 Se-M	129	17	17.2	1,500	Se100 (17.5)		
418 Se-P	40	18	12.0	1,500	Se100 (12.3)		

Table 8.8 – TIPSY Inputs - Future Managed Stand Analysis Units (cont.)

Future Analysis Unit	Net Area (ha)	Original Analysis Unit	Existing SI50	Initial Density	Species Composition & (Adjusted SI50)		
Non-Grizzly NSYTs:							
419 FdPlLw-G	82	19	17.0	1,500	Fd35 (17.0)	Pl35 (17.5)	Lw30 (17.3)
420 FdPlLw-M	35	20	13.8	1,500	Fd35 (13.8)	Pl35 (14.2)	Lw30 (14.0)
421 FdPlLw-P	68	21	10.4	1,500	Fd35 (10.4)	Pl35 (10.7)	Lw30 (10.6)
422 FdPlLw-G	224	22	17.7	1,500	Fd35 (17.7)	Pl35 (18.2)	Lw30 (18.0)
423 FdPlLw-M	93	23	15.7	1,500	Fd35 (15.7)	Pl35 (16.2)	Lw30 (15.9)
424 FdPlLw-P	23	24	13.2	1,500	Fd35 (13.2)	Pl35 (13.6)	Lw30 (13.4)
Subtotal	4,812						
Grizzly NSYTs:							
501 FdPlLw(griz)-G	11	101	19.6	1,500	Fd35 (19.6)	Pl35 (20.2)	Lw30 (19.9)
502 FdPlLw(griz)-M	16	102	17.5	1,500	Fd35 (17.5)	Pl35 (18.0)	Lw30 (17.8)
503 FdPlLw(griz)-P	21	103	14.4	1,500	Fd35 (14.4)	Pl35 (14.8)	Lw30 (14.6)
507 PlFdSe(griz)-G	12	107	18.4	1,500	Pl35 (19.0)	Fd35 (18.4)	Se30 (18.8)
508 PlFdSe(griz)-M	33	108	16.4	1,500	Pl35 (16.9)	Fd35 (16.4)	Se30 (16.8)
509 PlFdSe(griz)-P	59	109	13.9	1,500	Pl35 (14.3)	Fd35 (13.9)	Se30 (14.1)
510 PlFdSe(griz)-G	15	110	16.9	1,500	Pl35 (17.4)	Fd35 (16.9)	Se30 (17.2)
511 PlFdSe(griz)-M	19	111	14.2	1,500	Pl35 (14.6)	Fd35 (14.2)	Se30 (14.5)
513 Se(griz)-G	14	113	18.9	1,500	Se100 (20.0)		
514 Se(griz)-M	94	114	15.1	1,500	Se100 (15.9)		
515 Se(griz)-P	26	115	13.3	1,500	Se100 (13.7)		
517 Se(griz)-M	8	117	15.6	1,500	Se100 (15.9)		
Subtotal	329						
Non-Incremental MSYTs:							
604 FdPlLw-G	176	204	20.6	1,500	Fd35 (20.6)	Pl35 (21.2)	Lw30 (20.9)
605 FdPlLw-M	128	205	17.3	1,500	Fd35 (17.3)	Pl35 (17.8)	Lw30 (17.5)
606 FdPlLw-P	96	206	12.6	1,500	Fd35 (12.6)	Pl35 (13.0)	Lw30 (12.8)
610 PlFdSe-G	85	210	19.1	1,500	Pl35 (19.7)	Fd35 (19.1)	Se30 (19.4)
611 PlFdSe-M	5	211	16.0	1,500	Pl35 (16.5)	Fd35 (16.0)	Se30 (16.3)
612 PlFdSe-P	19	212	10.0	1,500	Pl35 (10.3)	Fd35 (10.0)	Se30 (10.2)
616 Se-G	50	216	23.3	1,500	Se100 (23.8)		
617 Se-M	722	217	15.8	1,500	Se100 (16.1)		
618 Se-P	16	218	12.0	1,500	Se100 (12.2)		
619 FdPlLw-G	111	219	18.9	1,500	Fd35 (18.9)	Pl35 (19.5)	Lw30 (19.2)
620 FdPlLw-M	168	220	16.0	1,500	Fd35 (16.0)	Pl35 (16.5)	Lw30 (16.2)
Subtotal	1,576						
Incremental MSYTs:							
704 FdPlLw(fert)-G	100	304	20.0	1,500	Fd35 (20.0)	Pl35 (20.6)	Lw30 (20.3)
705 FdPlLw(fert)-M	31	305	17.0	1,500	Fd35 (17.0)	Pl35 (17.5)	Lw30 (17.3)
717 Se(fert)-M	39	317	16.8	1,500	Se100 (17.1)		
Subtotal	170						
Total (less NSR)	6,887						

8.10 Silviculture Systems

All of the harvesting in the analysis simulations will use even-aged clearcut silviculture systems with varying levels of retention. This approach is based on group selection and clearcutting with reserves used operationally.

8.11 Silviculture History

Existing stands under 34 years of age are assumed to be managed based on modern stocking standards and density controls. This is based on a review of information in the history component of the forest inventory for the TFL. All existing stands assigned to a MSYT have undergone some management at or since establishment. Incremental treatments (spacing and fertilization) have been completed on some areas. These treatments are reflected in the managed stand yield tables developed for the analysis.

8.12 Non-Satisfactorily Restocked (NSR)

NSR regenerates to the appropriate managed stand analysis unit based on the regeneration delay prescribed for the regeneration type, typically 2 years or less.

Due to the uncertainty of the site productivity of the NSR lands, they will regenerate to the "medium" site class of some natural stand (non-grizzly) regeneration species groups. The distribution of NSR to each regeneration species group is based on BEC category to the variant level. FCL uses this BEC information operationally to determine the regeneration type for harvested lands. Table 8.10 summarizes the regeneration assumptions for NSR.

Table 8.10 – Existing NSR Regeneration Assumptions

BEC Unit	Analysis Unit Assignment	NSR Area (ha)	Percent of Total NSR
ICHmw2	405 FdPlLw-M	70	75.3
ICHmw3	405 FdPlLw-M	12	12.9
ICHwk1	408 PlFdSe-M	1	1.0
ESSFwc2	414 Se-M	10	10.8
Total		93	100

9.0 INTEGRATED RESOURCE MANAGEMENT

9.1 Forest Resource Inventories

This section documents the status of all non-timber resource inventories. Dates of completion and acceptance for use in the timber supply analysis are presented in Table 9.1.

Table 9.1 – TFL 33 MP #8 Non-Timber Inventories

Inventory	Date	Source	Approval Agency
Biogeoclimatic Classification	1997	MoF 1:250,000 inventory	MoELP Salmon Arm
Fisheries	1997	FHAP was completed in 1997	MoF Salmon Arm
Riparian	1998	Based on stream classification completed to date	MoELP Salmon Arm
Caribou	1997	MoELP habitat inventory	MoELP Salmon Arm
Deer	1993	Deer winter range mapping from MoELP	MoELP Salmon Arm
Landscape & Recreation	1995 & 1998	Current MoF inventories	MoF Salmon Arm
Landscape Units	1998	Draft LUs from MoF and MoELP	MoF Salmon Arm
ESA (soils)	1981	ESA mapping for TFL 33	MoF Salmon Arm
Roads	1998	FCL road inventory	MoF Salmon Arm

9.1.1 Biogeoclimatic Classification

Biogeoclimatic classification (BEC) is from the standard MoF small-scale inventory. All classification is to the variant level. BEC is used to assign silviculture regimes and NDTs.

9.1.2 Fisheries

Fish stream identification is being carried out under agreement with FRBC. FHAP was completed in 1997. Fisheries information was used in the riparian classification.

9.1.3 Riparian

Formal riparian classification was not completed for the entire TFL prior to assembling the timber supply analysis database. Approximately 10% of the streams were sampled (as

part of the FHAP), focusing on fish-bearing streams. This information, along with local knowledge enabled FCL to complete a riparian classification for analysis purposes. District MoELP staff have reviewed this interim classification and accepted it for use in the analysis.

9.1.4 Caribou Habitat

A new caribou habitat inventory was completed for the LRMP process. Early and late winter caribou habitat areas have been identified on the northeast portion of the TFL. This information has been used to identify caribou REAs, which will be modeled in the LRMP option.

9.1.5 Deer Winter Range

The OKTSHG inventory is presently available and will be used for the timber supply analysis. Deer winter range areas are found between Shuswap Lake and the 600-metre elevation line. A revised deer winter range map is being prepared by MoELP but was unavailable in time for the timber supply analysis.

9.1.6 Grizzly Bear Habitat

No specific inventory coverage was available to identify grizzly bear habitat. Based on draft LRMP guidelines, the ESSFwc2 and ICHwk1 BEC categories are considered important for berry and forage production. A portion of these areas will be modeled with alternative management strategies in the LRMP option to address food production for grizzly bear.

9.1.7 Landscape & Recreation

A new visual landscape inventory was completed for the Salmon Arm Forest District in 1995. This new inventory replaces the visual quality (VQO) information used in the timber supply analysis for MP #7 and will be used for all analysis options.

MoF completed a new recreation inventory in 1998. Recreation management relates mainly to hunting, snowmobiling and landscape values. No specific management criteria will be included in the timber supply analysis to address recreation. Visual quality and wildlife habitat requirements will accommodate these issues on the TFL.

9.1.8 Landscape Units

Draft landscape units have been designated for the Salmon Arm Forest District. Although they are not yet approved, it is appropriate to use them for the timber supply analysis based on direction from MoF Timber Supply Branch. TFL 33 lies entirely within the Anstey LU and represents approximately 18% (7,773 ha) of the forested area within the total LU.

9.1.9 ESA Classification

ESA information for soils will be used in the timber supply analysis. Other ESA information related to recreation and wildlife has been replaced by other inventories noted in the previous sections. Inoperable areas on the TFL are based on both ESA-soils and steep (> 80%) slopes.

9.1.10 Roads Classification

FCL staff maintains an inventory of all roads within their GIS database. Road classification enables staff to assign right-of-way widths to each road (Section 6.4) to identify the non-productive area associated with roads.

9.2 Forest Cover Requirements

The analysis will apply "cover class constraints" to model landscape level biodiversity guidelines, green-up, maximum disturbance and old forest requirements. Cover class constraints place maximum and minimum limits on the amount of young second growth and/or old growth found in LU-BEC/NDTs or REAs within the productive land base. Forest stands such as environmentally sensitive areas that do not contribute to harvest can be included to better model forest structure and disturbance levels.

Three forest cover constraint classes will be used for modeling:

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

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

Green up period (associated with 3 – 6 m heights) is derived from the height growth curves. The curves are adjusted for species conversion or genetic gain improvements in the appropriate analysis scenarios. The green up period for each constraint group is the area-weighted average of the time to achieve green-up for the analysis units in that group. Age will be the green-up input used during the simulation modeling. Table 9.2 summarizes the disturbance forest cover constraints for the analysis.

Table 9.2 – REA Forest Cover Constraints

REA	Green-up Requirements			Minimum Retention (% > years)
	Height (m)	Age (years)	Maximum Disturbance (%)	
REA level 1 (visuals, IRM):				
1 - VQO–R	6	22	1	
2 - VQO–PR	5	20	10	
3 – VQO-PR/Grizzly	5	23	10	
4 - VQO–M	5	25	21	
5 – VQO-M/Grizzly	5	28	21	
9 - IRM	3	18	35	
REA level 2 (wildlife):				
6 – Deer WR	3	14	35	40% > 76 years (20m)
7 – Caribou-Early Winter	3	22	35	
8 – Caribou Late Winter	3	24	35	

The disturbance forest cover constraint for the VQO REAs is based on the entire productive forest land base within the REA, but will apply only to the timber harvesting land base in the analysis. Other disturbance constraints apply only to the timber harvesting land base.

Deer WR minimum retention age is based on the average time taken to achieve 20 metres in height. Note that mature and old growth caribou habitat is not specifically managed in the Base Case. Habitat requirements for this species are reviewed in the LRMP option (Section 11.1.2).

In many cases different resource categories overlap a given piece of the TFL 33 land base. Multiple constraints for different resource emphasis will be assigned in modeling with CASH6. This will ensure that all resource concerns will be addressed in the timber supply analysis.

9.2.1 Forest Cover Constraints - Rationale

Forest cover constraints for REAs listed in Table 9.2 are based on a number of sources that are discussed in the following sections.

9.2.1.1 Visual Quality Objectives

Visual quality objectives are based on the MoF OKTSHG and direction from MoF. Standards focus on cutblock design, harvesting methods and public perception. VACs (visual absorption capability), LS (landscape sensitivity) and dispersion were considered in determining the final allowable disturbance percentages listed in Table 9.2 for each VQO REA on the TFL. Methods for deriving the disturbance values for VQOs are summarized in the MoF report *Procedures for Factoring Recreation Resources into Timber Supply Analysis*, 1993 (Appendix VI).

9.2.1.2 Deer Winter Range

The shore of Shuswap Lake and the elevation line of approximately 600 metres bound Deer WR areas. Deer WR objectives include the maintenance of forage production and dispersion of harvesting throughout the WR area. The minimum retention requirements provided in the OKHTG are the basis for this constraint. The entire productive forest within the Deer WR area will be available to meet the retention requirement. Disturbance limits are be based solely on the timber harvesting landbase.

9.2.1.3 IRM Areas

IRM areas are the residual areas on TFL 33 that are intended primarily for industrial forestry opportunities. Areas have been excluded from IRM areas in consideration of FPC requirements, ESAs, *etc.* during the land base classification (netdown) process. Various analysis options and sensitivity analyses will evaluate different forest cover constraints within this REA.

9.2.1.4 Adjacent Cutblock Green-up

Silvicultural green-up is required on all areas of the TFL prior to harvesting adjacent areas. A minimum of 3-metre green-up is the rule. On visually sensitive areas silvicultural green-up is also 3 metres but the overall disturbance limit is related to the 5 – 6 metre requirement. Sensitivity analysis will determine the impact of alternative green-up in both IRM and non-visually sensitive areas of the TFL.

9.2.1.5 Landscape Level Biodiversity

The NDT classification has been assigned based on MoF BEC mapping for the draft Anstey LU, which is the only LU associated with TFL 33. Therefore, BEC/NDT will be the land base aggregate upon which landscape level biodiversity is modeled.

The MoF/MoELP correspondence *Achieving Acceptable Biodiversity Timber Impacts* (97.08.25) and *Incorporating Biodiversity and Landscape Units in the Timber Supply Review* (97.12.01) were used to develop landscape level old growth requirements for TFL 33 (Appendix III). All old growth percentage constraints listed in Table 9.3 are based on a weighted average of 45% low emphasis – 45% intermediate emphasis – 10% high emphasis for each LU-BEC/NDT. As stated in the MoF/MoELP correspondence, early and mature+old seral stage constraints are not required for the NDTs present on TFL 33.

Table 9.3 summarizes the forest area in the total Anstey LU and the area within TFL 33, along with the old growth requirements for the Base Case.

Table 9.3 – Non-TFL 33 Anstey LU-BEC/NDT Forest Area Summary

LU-BEC/NDT & Analysis ID #	Anstey LU Area (ha)	Old Growth Requirement		Non-TFL Reserve Areas ha & (percent of LU)			TFL 33 Old Growth Requirement	
		Percent	Area (ha)	Total Reserve	Current Old Growth	Old Growth in 50 Years	Current	In 50 Years
1 - ESSFwc2/NDT-1	11,289	19.9 > 250	2,247	4,039 (35.8)	620 (5.5)	1,382 (12.2)	14.4 > 250	7.7 > 250
2 - ICHwk1/NDT-1	8,787	13.6 > 250	1,195	1,977 (22.5)	190 (2.2)	925 (10.5)	11.4 > 250	3.1 > 250
3 - ICHmw2/NDT-2	2,602	9.4 > 250	245	496 (19.1)	0 (0.0)	0 (0.0)	9.4 > 250	9.4 > 250
4 - ICHmw3/NDT-3	15,965	14.7 > 140	2,347	4,518 (28.3)	2,050 (12.8)	3,237 (20.3)	1.9 > 140	0.0 > 140

Non-TFL 33 areas listed in Table 9.3 relate to the productive forest; TFL 33 areas include eligible NP areas.

CASH6 will include the "TFL 33 Current Old Growth Requirement" in modeling. The model cannot adjust the old growth constraint during the simulation process. The requirements in 50 years are presented only for demonstration of how the reserve forest is likely to affect the old growth requirement in the future.

The reserve areas from the non-TFL 33 component of the Anstey LU have been considered in determining the old growth requirement for each LU-BEC/NDT. In Table 9.3, "Non-TFL Reserve Areas" are taken from the MoF summary included in Appendix IV and from more recent information provided by MoELP. These areas are not included in the inventory data that will be modeled in the analysis. Only areas that are expected to remain in a reserve state over the long-term were considered in developing the minimum old growth requirements for the TFL. The following is an example of the procedure used to derive the old growth requirements for the timber supply analysis (ESSFwc2/NDT-1):

Total crown forest area:	11,289 ha (1,783 TFL 33, 9,506 TSA)
Old growth requirement (45-45-10 methodology):	19.9% > 250 years (2,247 ha)
Non-TFL reserve forest:	620 ha > 250 years, 4,039 ha total
Percent of non-TFL forest in reserve:	5.5% > 250 years, 35.8% total
Percent of area required to achieve old growth target:	19.9 – 5.5 = 14.4% (current)

The 14.4% old growth requirement will be used during the simulation modeling for the timber supply analysis. All productive forest and eligible NP areas within ESSFwc2/NDT-1 on the TFL will be available to meet this requirement. Over time the model will report the state of the forest with respect to old growth and this will assist FCL in understanding the impact of old growth requirements on timber supply.

If all non-timber harvesting land base reserves in the Anstey LU (outside TFL 33) continue to grow to an old growth age, this component of the forest will satisfy all old growth requirements within 140 years for the all of the BEC/NDTs listed in Table 9.3. There are additional reserve areas within TFL 33 that may contribute to the old growth target once these reserve areas reach the appropriate age.

9.2.1.6 Reductions to Reflect Volume Retention in Cutblocks

Volume is retained in cutblocks by means of a number of land base removals outlined in Section 6 of this report. In addition, a percentage reduction was applied to the net operable land base to accommodate WTP requirements as explained in Section 6.9.

Riparian reserve zones and riparian management zones have been addressed by imposing land base exclusions. Section 6.5 outlines the details of these reductions. FCL will manage these areas by reserving a component of the RMZ adjacent to the existing RRZ. The remainder of the RMZ will be included in harvesting as per the prescription for the overall cutblock.

9.2.1.7 Recreation

Recreation opportunities on the TFL are mainly associated with hunting, snowmobiling and landscape values. Consequently, there will be no forest cover constraints assigned to address specific management of these issues in the analysis.

9.3 Timber Harvesting

9.3.1 Minimum Merchantability Standards

Minimum merchantability is assessed for each yield table based on volume, diameter and/or age at which culmination of MAI (mean annual increment) is achieved. From this assessment the minimum age required for harvesting has been determined for each analysis unit yield table. For the Base Case the majority of NSYTs and MSYTs use culmination age to set minimum harvest age. For some NSYTs that represent sites with marginal timber, a minimum volume of 200m^3/ha is used to assign minimum harvest age. These areas will support higher volume stands of timber after harvest and regeneration.

Culmination age for NSYTs and MSYTs was assigned to the age when volume less DWB is maximized to one decimal place (i.e. further increases in MAI would be less than 0.05 m^3/ha/year). This is a reasonable approach to avoid excessively high culmination ages resulting from small increases in MAI. A summary of the minimum harvest age attributes for the NSYTs described in Sections 7.3.1 and 8.7 is presented in Table 9.4.

Table 9.4 – Minimum Harvest Age Attributes for VDYP NSYTs

NSYT Analysis Unit	Net Area (ha)	Minimum Harvest Age Attributes				
		Age	Volume (m3)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
1 Fd-G	44	100	270	2.7	28.1	32.8
2 Fd-M	211	110	230	2.1	27.2	33.8
3 Fd-P	68	170	200	1.2	25.2	36.7
4 FdCw-G	481	90	347	3.9	28.0	29.2
5 FdCw-M	775	100	295	3.0	26.0	29.7
6 FdCw-P	150	110	196	1.8	21.9	28.4
7 CwHw-G	189	80	258	3.2	23.8	31.1
8 CwHw-M	379	90	214	2.4	20.7	27.8
9 CwHw-P	430	120	197	1.6	21.4	29.7
10 HwCw-G	144	80	237	3.0	22.9	27.3
11 HwCw-M	325	100	210	2.1	21.3	27.0
12 HwCw-P	198	140	209	1.5	20.0	29.3
13 BlSe-G	121	80	221	2.8	22.7	28.1
14 BlSe-M	350	100	206	2.1	21.8	28.3
15 BlSe-P	93	160	200	1.2	22.9	32.3
16 SeBl-G	163	80	226	2.8	25.2	28.7
17 SeBl-M	129	90	218	2.4	23.4	27.7
18 SeBl-P	40	130	211	1.6	23.1	29.7
19 PlFd-G	82	90	213	2.4	21.9	23.3
20 PlFd-M	35	110	201	1.8	20.1	22.7
21 PlFd-P	68	170	193	1.1	19.3	24.4
22 LwFd-G	224	120	214	1.8	28.9	30.7
23 LwFd-M	93	100	199	2.0	22.5	28.7
24 LwFd-P	23	130	204	1.6	21.8	29.3

Table 9.4 – Minimum Harvest Age Attributes for VDYP NSYTs (cont.)

NSYT Analysis Unit	Net Area (ha)	Minimum Harvest Age Attributes				
		Age	Volume (m3)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
101 Fd(griz)-G	11	100	237	2.4	28.2	34.3
102 Fd(griz)-M	16	120	200	1.7	27.8	36.4
103 Fd(griz)-P	21	130	195	1.5	23.8	32.6
107 CwHw(griz)-G	12	80	239	3.0	22.8	30.6
108 CwHw(griz)-M	33	80	224	2.8	20.2	26.6
109 CwHw(griz)-P	59	100	197	2.0	19.7	27.2
110 HwCw(griz)-G	15	80	277	3.5	22.1	27.1
111 HwCw(griz)-M	19	90	196	2.2	20.2	26.5
113 BlSe(griz)-G	14	80	229	2.9	23.6	29.7
114 BlSe(griz)-M	94	90	194	2.2	20.4	26.4
115 BlSe(griz)-P	26	130	212	1.6	23.4	31.6
117 SeBl(griz)-M	8	90	197	2.2	21.5	25.9

Minimum harvest age attributes for the existing MSYTs described in Sections 7.3.2 and 8.9 are provided in Table 9.5. Methods used to determine minimum harvest age for the existing MSYTs are similar to those described for determining minimum harvest age for NSYTs.

Table 9.5 – Minimum Harvest Age Attributes for Existing MSYTs

Existing MSYT AU	Net Area (ha)	Minimum Harvest Age Attributes				
		Age	Volume (m3)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
204 FdCw-G	176	90	381	4.2	27.9	24.9
205 FdCw-M	128	90	259	2.9	23.4	21.8
206 FdCw-P	96	150	192	1.3	22.1	20.2
210 HwSe-G	85	80	368	4.6	25.3	24.6
211 HwSe-M	5	100	342	3.4	26.0	24.1
212 HwSe-P	19	150	207	1.4	19.9	21.0
216 SeBl-G	50	70	413	5.9	27.1	26.3
217 SeBl-M	722	100	345	3.5	24.6	24.4
218 SeBl-P	16	130	318	2.4	23.9	23.9
219 PlFd-G	111	70	251	3.6	21.5	21.4
220 PlFd-M	168	80	225	2.8	19.9	20.8
304 FdCw(fert)-G	100	90	340	3.8	27.4	23.6
305 FdCw(fert)-M	31	100	311	3.1	24.6	22.7
317 SeBl(fert)-M	39	90	332	3.7	24.1	23.8

Table 9.6 presents the minimum merchantability attributes for the future MSYTs defined in Sections 7.3.3 and 8.9. As with other yield tables, minimum harvest age is based on volume, diamater and/or culmination of MAI.

Table 9.6 – Minimum Harvest Age Attributes for Future MSYTs

Future MSYT AU	Net Area (ha)	Minimum Harvest Age Attributes				
		Age	Volume (m3)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
401 FdPlLw-G	44	80	278	3.5	24.7	22.4
402 FdPlLw-M	211	80	229	2.9	22.8	20.9
403 FdPlLw-P	68	120	193	1.6	21.5	20.1
404 FdPlLw-G	481	80	315	3.9	26.2	23.5
405 FdPlLw-M	856	80	235	2.9	23.1	21.1
406 FdPlLw-P	150	110	208	1.9	22.1	20.5
407 PlFdSe-G	189	90	346	3.8	26.2	24.5
408 PlFdSe-M	381	90	230	2.6	21.6	21.2
409 PlFdSe-P	430	110	229	2.1	21.6	21.2
410 PlFdSe-G	144	80	257	3.2	22.6	21.9
411 PlFdSe-M	325	100	212	2.1	20.9	20.8
412 PlFdSe-P	198	150	203	1.4	20.7	20.6
413 Se-G	121	80	370	4.6	25.4	24.9
414 Se-M	359	100	335	3.4	24.4	24.2
415 Se-P	93	130	285	2.2	23.0	23.2
416 Se-G	163	70	350	5.0	24.6	24.4
417 Se-M	129	90	354	3.9	25.0	24.6
418 Se-P	40	110	246	2.2	21.6	22.1
419 FdPlLw-G	82	90	235	2.6	23.1	21.2
420 FdPlLw-M	35	120	203	1.7	21.9	20.4
421 FdPlLw-P	68	200	170	0.8	20.9	19.7
422 FdPlLw-G	224	90	257	2.9	24.0	21.8
423 FdPlLw-M	93	90	195	2.2	21.4	20.0
424 FdPlLw-P	23	130	199	1.5	21.9	20.4
501 FdPlLw(griz)-G	11	80	281	3.5	24.9	22.5
502 FdPlLw(griz)-M	16	90	251	2.8	23.8	21.6
503 FdPlLw(griz)-P	21	110	203	1.8	21.9	20.4
507 PlFdSe(griz)-G	12	80	284	3.6	23.6	22.6
508 PlFdSe(griz)-M	33	90	261	2.9	22.8	22.0
509 PlFdSe(griz)-P	59	100	209	2.1	20.8	20.7
510 PlFdSe(griz)-G	15	90	275	3.1	23.3	22.4
511 PlFdSe(griz)-M	19	100	220	2.2	21.2	21.0
513 Se(griz)-G	14	80	383	4.8	25.9	25.3
514 Se(griz)-M	94	100	346	3.5	24.8	24.5
515 Se(griz)-P	26	110	306	2.8	23.5	23.6
517 Se(griz)-M	8	100	346	3.5	24.8	24.5

Table 9.6 – Minimum Harvest Age Attributes for Future MSYTs (cont.)

Future MSYT AU	Net Area (ha)	Minimum Harvest Age Attributes				
		Age	Volume (m3)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
604 FdPlLw-G	176	80	312	3.9	26.1	23.4
605 FdPlLw-M	128	90	243	2.7	23.5	21.4
606 FdPlLw-P	96	150	206	1.4	22.3	20.6
610 PlFdSe-G	85	80	305	3.8	24.4	23.2
611 PlFdSe-M	5	90	247	2.7	22.2	21.6
612 PlFdSe-P	19	170	206	1.2	20.9	20.8
616 Se-G	50	60	358	6.0	24.8	24.6
617 Se-M	722	100	353	3.5	25.0	24.7
618 Se-P	16	130	321	2.5	24.2	24.1
619 FdPlLw-G	111	80	259	3.2	24.0	21.8
620 FdPlLw-M	168	90	204	2.3	21.8	20.3
704 FdPlLw(fert)-G	100	80	308	3.9	25.4	22.9
705 FdPlLw(fert)-M	31	90	250	2.8	23.1	21.2
717 Se(fert)-M	39	90	351	3.9	24.5	24.3

It should be recognized that the application of forest cover constraints in some LU-BEC/NDTs and REAs might delay stand entry well beyond the minimum ages provided in Tables 9.4, 9.5 and 9.6. This delay will result in long-term harvest levels below the theoretical LRSY (Long Run Sustained Yield), which is based on harvesting all stands at culmination age.

9.3.2 Operability

"Operability" is based on existing information for ESA-soils, terrain stability, accessibility and slope. As such there is no "operability" coverage in the TFL 33 data set. However, given the extent of other information and size of the land base, all issues typically associated with operability can be adequately addressed from both operational and strategic perspectives.

9.3.3 Non-Recoverable Losses

Fire, insects, disease, and other natural factors can cause catastrophic losses of whole stands of trees. Over the long term the probability of losses to natural causes can be predicted. Where losses occur in merchantable stands some of the dead or dying timber may be salvageable. When modeling the timber supply, the NRLs (non-recoverable losses) are added to the desired harvest forecast and then subtracted from the forecast upon completion of the modeling exercise. NRLs are based on historical values and recent salvage as summarized in Table 9.7.

Table 9.7 – Non-Recoverable Losses

Cause of Loss	Annual Losses (m^3/yr)		
	Gross Loss	Salvage	Annual Loss
Insects & disease	1,450	1,047	403
Wind Damage	47	0	47
Total	1,497	1,047	450

9.3.4 Initial Harvest Rate

The initial harvest rate for the Base Case and other options will be the current AAC for TFL 33 plus non-recoverable losses. The harvest rate is broken down as follows:

- Federated Co-op – 21,050m^3/year
- SBFEP –1,450m^3/year
- Total harvest – 22,500m^3/year
- Non-recoverable losses - 450m^3/year

Therefore, the initial annual harvest target will be 22,950m^3/year for the Base Case.

9.3.5 Harvest Rules

Harvest rules are included in the simulation model to rank stands for harvest. The general rule is oldest first. With this rule in place older stands are queued for harvest ahead of younger stands. Harvest rules interact with forest cover constraints to determine the actual order of harvesting within the model. If a higher ranked stand is constrained within a forest cover group then the model will select the next highest-ranking stand that is eligible for harvest. These rules are reviewed within each simulation period; the model does not "look-ahead" to future periods to determine the outcome of any harvest decision, as might be done with some optimization forest estate models.

Alternative harvest rules will also be evaluated, including:

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

The "relative oldest first" rule is not available in CASH6.

9.3.6 Harvest Profile

At present the operational harvest profile is based mainly on the general species distribution for the TFL and periodic requirements for specific end products. During the first 20 years of the Base Case simulation, the harvest profile will reflect the inventory of mature species as follows (based on the species groups used to define analysis units):

- Douglas-fir, larch and pine (Fd, FdCw, LwFd, PlFd)- 45%;
- Western redcedar (CwHw) - 26%;
- Western hemlock - 12%;
- Balsam and interior spruce (BlSe, SeBl) - 17%.

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

9.3.7 Harvest Flow Objectives

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

- Sustain the current harvest level for as long as possible;
- Decrease the periodic harvest rate in acceptable steps during the periods when declines are required to meet all objectives associated with the various resources on TFL 33;
- Achieve an essentially even-flow of timber as close to the long-term sustainable level as possible, with consideration for forest cover requirements; and
- Take advantage of opportunities to increase the harvest rate by implementing management programmes while maintaining the requirements of non-timber resources.

A number of alternative harvest flows will be evaluated for the Base Case in order to gain a complete understanding of the factors that influence timber supply on TFL 33.

10.0 SENSITIVITY ANALYSIS

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

10.1 Growth and Yield

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

10.1.1 Adjust Natural Stand Volumes

The NSYT (VDYP) volumes will be increased and decreased by 10% to test the impact on timber supply. Minimum harvest ages will remain the same as those used in the Base Case.

10.1.2 Adjust Managed Stand Volumes

In this sensitivity analysis, managed stand yields associated with the existing and future MSYTs (AUs 201 – 717) will be increased and decreased by 10% to test the impact on timber supply. This will evaluate the impact on timber supply of potentially incorrect estimates of future managed stand yields.

This sensitivity analysis is especially important for Douglas-fir regeneration. FCL believes that the managed stand volumes for Douglas-fir are underestimated compared to actual growth on TFL 33.

10.1.3 Adjust Minimum Harvest Age

Minimum harvest ages for existing and future managed stands will be increased and decreased by 10 years in these sensitivity analyses.

10.1.4 Regeneration Delay

Regeneration delay will be increased to 4 years and reduced to 0 years in this series of analyses. The Base Case regeneration delay is 2 years.

10.2 Forest Cover Constraints

10.2.1 Resource Emphasis Area Maximum Disturbance

Maximum disturbance within REAs will be increased and decreased as noted in Table 10.1.

Table 10.1 – REA Disturbance Sensitivity Analyses

Resource Emphasis Category	Base Case Disturbance	Sensitivity Analysis Disturbance	
		Increase Disturbance	Decrease Disturbance
REA level 1 (visuals, IRM)			
1 - VQO-R	1% < 22 yrs (6m)	10% < 22 yrs (6m)	0% < 22 yrs (5m)
2 - VQO-PR	10% < 20 yrs (5m)	21% < 20 yrs (5m)	1% < 20 yrs (5m)
3 – VQO-PR/Grizzly	10% < 23 yrs (5m)	21% < 23 yrs (5m)	1% < 23 yrs (5m)
4 – VQO-M	21% < 25 yrs (5m)	35% < 25 yrs (5m)	10% < 25 yrs (5m)
5 – VQO-M/Grizzly	21% < 23 yrs (5m)	35% < 23 yrs (5m)	10% < 23 yrs (5m)
9 – IRM	35% < 18 yrs (3 m)	35% < 18 yrs (3m)	25% < 18 yrs (3m)
REA level 2 (wildlife)			
6 – Deer WR	35% < 14 yrs (3m)	35% < 14 yrs (3m)	25% < 14 yrs (3m)
7 – Caribou – Early	35% < 22 yrs (3m)	35% < 22 yrs (3m)	25% < 22 yrs (3m)
8 – Caribou – Late	35% < 24 yrs (3m)	35% < 24 yrs (3m)	25% < 24 yrs (3m)

10.2.2 Alternative Green-up Requirements

In addition to the adjustments made to maximum disturbance outlined in Table 10.1, green-up requirements will be revised in each REA in three separate scenarios as follows:

- 3 metres in VQO REAs and 2 metres in other REAs;
- 6 metres in VQO REAs and 4 metres in other REAs; and
- Reduce the years to Base Case green-up height by 20% for each REA.

The last sensitivity listed above relates to FCL's concern that the years to green-up are considerably higher than what is being noted in young stands.

10.2.3 Landscape Level Biodiversity

The Base Case models old growth requirements using a weighted-average on the recommended LU-BEC/NDTs for TFL 33. This average is based on 45% low emphasis, 45% intermediate emphasis and 10% high emphasis from the Biodiversity Guidebook for the appropriate BEC/NDT.

In this group of sensitivity analyses four alternative biodiversity requirements will be modeled on each recommended LU-BEC/NDT:

- Remove the influence of the non-TFL forest area from the old growth requirement (model TFL 33 as a stand-alone landscape unit);
- Low emphasis old growth;
- Low emphasis for both mature and mature+old growth; and
- Intermediate emphasis for early mature and mature+old seral stage requirements.

Table 10.5 summarizes the sensitivity analyses related to landscape level biodiversity.

Table 10.5 – Alternative LU-BEC/NDT Biodiversity Requirements

LU-BEC/NDT & Analysis ID #	Area (ha)	Base Case Old Growth Requirement (% > 250 years)	Remove Influence of Non-TFL Old Growth (% > years)	Low Emphasis Requirements	
				Mature+Old Low (% > years)	Old Growth Low (% > years)
1 - ESSFwc2/NDT-1	2,366	14.7 > 250	19.9 > 250	13.5 > 120	13.5 > 250
2 - ICHwk1/NDT-1	1,273	11.6 > 250	13.6 > 250	14.8 > 100	10.8 > 250
3 - ICHmw2/NDT-2	284	9.4 > 250	9.4 > 250	15.0 > 100	9.0 > 250
4 - ICHmw3/NDT-3	2,426	2.3 > 140	14.7 > 140	1.2 > 100	1.2 > 140

Note that there is no early seral requirement associated with low emphasis in any of the BEC-NDTs found on TFL 33. The old growth requirements listed in Table 10.5 consider the non-THLB within the Anstey LU outside of TFL 33.

Table 10.6 summarizes the intermediate emphasis biodiversity requirements that will be modeled as part of sensitivity analysis. Again, the percentage targets reflect non-TFL 33 reserve areas from the remainder of the Anstey LU.

Table 10.6 – LU-BEC/NDT Intermediate Emphasis Biodiversity Requirements

LU-BEC/NDT & Analysis ID #	Area (ha)	Intermediate Emphasis Requirements		
		Early (% < years)	Mature+Old (% > years)	Old Growth (% > years)
1 - ESSFwc2/NDT-1	2,366	22 < 40	30.5 > 120	13.5 > 250
2 - ICHwk1/NDT-1	1,273	30 < 40	31.8 > 100	10.8 > 250
3 - ICHmw2/NDT-2	284	36 < 40	31.0 > 100	9.0 > 250
4 - ICHmw3/NDT-3	2,426	46 < 40	10.2 > 100	1.2 > 140

11.0 OKANAGAN-SHUSWAP LRMP OPTION

In this analysis option a number of proposed management guidelines from the Okanagan-Shuswap LRMP will be modeled. These include:

- Wildlife management beyond current management, including caribou winter range and grizzly bear requirements;
- Modified riparian management;
- Modified WTP reductions;
- Alternative visual quality objectives; and
- Other items that may impact on Base Case management and timber supply.

Other analysis inputs and assumptions are the same as those described for the Base Case.

11.1 Timber Harvesting Land Base Determination

The methods used to define reductions for all categories except riparian reserves are the same as in the Base Case. Actual area reductions may be different from the Base Case, however, because of the changes to riparian exclusions. Table 11.1 summarizes the land base classification for the LRMP option.

Table 11.1 - Timber Harvesting Land Base Determination – LRMP Option

Land Classification	Total Area[1] (ha)	Net Reduction		Net Remainder	
		Area (ha)	Volume (m3)	Area (ha)	Volume (m3)
Total Area	8,366			8,366	1,651,345
Non-prod forest & Non-forest	533	513	27,803		
Roads & landings		175	15,934		
Productive Forest				7,678	1,607,608
Productive reductions:					
RRZs & RMZ exclusions	334	299	79,475		
ESA - soils	570	115	19,278		
Deciduous	166	148	2,361		
Uneconomic forest	101	100	12,564		
Wildlife Tree Patches		59	10,189		
Total Reductions		721	123,867		
Reduced land base				6,957	1,483,741
Current Net Operable Land Base					
NSR				92	
Immature				3,072	190,186
Mature				3,794	1,293,555
Less future reductions					
Roads		88			
Landings		101			
Long-term Net Operable Land Base				6,768	1,483,741

[1] Total area within a classification category prior to any reductions.

11.2 Riparian Reserve & Management Zones

LRMP riparian land base reductions are different than those described for the Base Case. Additional RRZs are applied based on the draft LRMP guidelines. Reserve zones have been assigned to S5 and S6 streams for this option, in addition to the S2 and S3 assignments made in the Base Case. RMZs are assigned to the same stream classes as in the Base Case, however the widths of the zones are modified. Table 11.2 summarizes the land base removals for riparian areas based on LRMP guidelines.

Table 11.2 – LRMP Riparian Reserve Zone Reductions

RRZ Classification & RRZ Width (m)		Gross Area (ha)			RRZ Reductions	
		Length (km)	Total	Productive	Area (ha)	Volume (m^3)
RRZs						
S2	20	0.34	1	1	1	394
S3	20	1.02	4	4	4	1,890
S5	20	39.33	143	122	122	33,093
S6	20	40.78	149	140	140	35,341
Subtotal		81.47	297	267	267	70,718
RMZs						
S2	10	0.34	1	1	1	200
S3	6	1.02	1	1	1	561
S5	5	39.33	35	30	30	7,997
Subtotal		40.69	37	32	32	8,758
Total			334	299	299	79,475

Consistent with the approach used in the Base Case, portions of RMZs were excluded to reflect partial cutting requirements. Various basal area retention prescriptions have been assigned to each riparian class. Rather than model partial cutting to represent the basal area retention within RMZs, FCL will reserve the land base equivalent. Table 11.3 summarizes the basal area retention requirements for each RMZ for the LRMP option.

Table 11.3 – LRMP Riparian Management Zone Reductions

RMZ Classification, RMZ Width (m) & Stream Length (km)			Average BA Retention (%)	Reserve Width of RMZ [1](m)
Streams	Width	Length		
S2	20	0.34	50	10.0
S3	20	1.02	30	6.0
S5	20	39.33	25	5.0

11.3 Wildlife Tree Patches

Based on the approach used by MoF for the upcoming Okanagan TSA timber supply analysis (TSR-2), different assumptions will dictate the WTP requirements for the LRMP option. The initial 9% requirement for WTPs will remain. However in addition to land base removals contributing to the overall 9% target, the final land base removals are reduced by 50% to reflect contribution from highly constrained VQO areas. It is assumed that the

WTPs will change position over time as harvesting takes place. Due to the long delays between entries into VQO areas, it is expected that the remaining forest will maintain satisfactory characteristics to meet WTP objectives. Table 11.4 summarizes the WTP requirements used in the LRMP option. Note that S6 reductions were not included in this land base removal as they were accounted for in Section 11.2.

Table 11.4 – LRMP Wildlife Tree Patch Reductions

BEC Category (subzone)	Productive Forest (ha)	Productive Forest Reductions (prior to WTP removals)		WTP Reduction x 50%		Productive Forest Reductions (including WTP removals)
		Area (ha)	%	Area (ha)	%	Area (& percent)
ESSFwc	1,505	107	7.1	28 x 50% = 14 ha	1.0	121 (8.0%)
ICHmw	3,734	424	11.3	0	0	424 (11.3%)
ICHwk	2,438	130	5.3	89 x 50% = 45 ha	1.9	175 (7.2%)
Total	7,678	661	8.6	59	0.8	720 (9.4%)

11.4 Wildlife Management

11.4.1 Grizzly Bear

The LRMP identifies maintaining or enhancing grizzly bear food and forage sources as an objective. TFL 33 has area, based on BEC, that is suitable habitat for grizzly bear. The general approach to enhancing bear forage production is to maintain larger openings in cutblocks and/or delay the establishment of the new crop of commercial trees. LRMP guidelines indicate that a maximum of 10% of the harvested areas within the grizzly bear foraging area should be managed for food production.

A group of analysis units within the ESSFwc2 and ICHwk1 BEC categories have been targeted for grizzly bear management. These analysis units were selected in order to achieve the 10% land base objective. A broad range of species and site productivity categories were included in the grizzly bear analysis units in order to provide representation from all areas of the ESSFwc2 and ICHwk1.

For the LRMP option, designated areas within the grizzly bear BEC units will be modeled using the following methods:

- Regeneration delays of 20 years will be assigned; and
- "Cluster-planting" to maintain desired stocking levels while providing stand openings for food production. FCL has suggested this approach which does not require any variation from the modeling used in the Base Case.

11.4.2 Caribou Habitat

Caribou management is expected to provide forest (thermal) cover, forage productivity and lichen availability. These objectives require an increase in the amount of older forest across the habitat polygons. Both early and late winter habitats are found on TFL 33. The suggested requirements for these habitat types are noted below:

- Maintain 40% of the habitat in stands 140 years or older; and
- Of that 40%, maintain 10% in stands 250 years or older.

Areas with slopes greater than 80% are not suitable caribou habitat. These areas are not included in the caribou management REAs.

11.4.3 Visual Quality Objectives

Alternative visual quality objectives have been recommended in the LRMP guidelines. A number of alternative management approaches are listed in the draft guidelines depending on the silviculture system prescribed for the area. FCL generally uses small clearcuts with reserves within the visually sensitive areas of the TFL. The revised forest cover constraints to be modeled in the LRMP option are listed in Table 11.5.

Table 11.5 – LRMP REA Forest Cover Constraints – LRMP Option

REA	Maximum Disturbance (% < years)	Minimum Thermal Retention (% > years)	Minimum Old Growth Retention [1] (% > years)
REA level 1 (visuals, IRM):			
1 - VQO–R	15% < 22 years (6m)		
2 - VQO–PR	25% < 20 years (5m)		
3 – VQO-PR/Grizzly	25% < 23 years (5m)		
4 - VQO–M	30% < 25 years (5m)		
5 – VQO-M/Grizzly	30% < 28 years (5m)		
9 - IRM	35% < 18 years (3m)		
REA level 2 (wildlife):			
6 – Deer WR	35% < 14 years (3m)	40% > 76 years (20m)	
7 – Caribou-Early	35% < 22 years (3m)	40% > 140 years	10% > 250 years
8 – Caribou Late	35% < 24 years (3m)	40% > 140 years	10% > 250 years

[1] This 10% requirement may be a component of the 40% mature requirement.

12.0 ADDITIONAL INCREMENTAL SILVICULTURE OPTION

This option will evaluate the timber supply impacts of increasing the level of incremental silviculture on TFL 33. FCL currently has a programme of fertilization, and uses planting stock sown from first generation seed (production from original parents). An evaluation of additonal tree improvement will be reviewed with and without additional stand treatments (spacing and fertilization) will be included in this option.

12.1 Additional Tree Improvement

FCL currently gets tree seedlings produced from first generation seed. As part of this analysis scenario, improvements associated with best selection seed from first generation parents will be evaluated. Estimates of final tree improvement (volume) were developed using the same methods as used in the Base Case (SI50 increases based on one half of the potential genetic worth). Table 8.2 provides the gains expected from the future genetically improved planting stock.

Genetic gains were assigned to the individual managed stand yield tables prior to aggregating into a single analysis unit yield table, similar to the Base Case. In addition, the attrition of genetic gain was accounted for using recent MoF guidelines (Appendix V). Table 12.1 summarizes the TIPSY inputs for the future managed stand yield tables developed for this scenario. Existing managed stands are the same as for the Base Case.

Table 12.1 – TIPSY Inputs - Incremental Silviculture Future Managed Stand Analysis Units

Future Analysis Unit	Net Area (ha)	Existing SI50	Initial Density	Species Composition (& Adjusted SI50)		
401 FdPlLw-G	44	19.5	1,500	Fd35 (21.9)	Pl35 (20.4)	Lw30 (20.0)
402 FdPlLw-M	211	17.9	1,500	Fd35 (20.1)	Pl35 (18.8)	Lw30 (18.4)
403 FdPlLw-P	68	13.5	1,500	Fd35 (15.1)	Pl35 (14.1)	Lw30 (13.8)
404 FdPlLw-G	481	20.7	1,500	Fd35 (23.2)	Pl35 (21.7)	Lw30 (21.2)
405 FdPlLw-M	856	18.1	1,500	Fd35 (20.3)	Pl35 (19.0)	Lw30 (18.6)
406 FdPlLw-P	150	14.5	1,500	Fd35 (16.3)	Pl35 (15.2)	Lw30 (14.9)
407 PlFdSe-G	189	19.1	1,500	Pl35 (20.1)	Fd35 (21.5)	Se30 (20.1)
408 PlFdSe-M	381	15.5	1,500	Pl35 (16.3)	Fd35 (17.4)	Se30 (16.3)
409 PlFdSe-P	430	13.6	1,500	Pl35 (14.2)	Fd35 (15.2)	Se30 (14.3)
410 PlFdSe-G	144	17.5	1,500	Pl35 (18.4)	Fd35 (19.7)	Se30 (18.5)
411 PlFdSe-M	325	14.0	1,500	Pl35 (14.6)	Fd35 (15.6)	Se30 (14.6)
412 PlFdSe-P	198	10.6	1,500	Pl35 (11.2)	Fd35 (11.9)	Se30 (11.2)
413 Se-G	121	19.2	1,500	Se100 (20.1)		
414 Se-M	359	15.3	1,500	Se100 (16.1)		
415 Se-P	93	11.2	1,500	Se100 (11.8)		
416 Se-G	163	20.6	1,500	Se100 (21.7)		
417 Se-M	129	19.4	1,500	Se100 (18.0)		
418 Se-P	40	15.5	1,500	Se100 (12.6)		

Table 12.1 – TIPSY Inputs - Incremental Silviculture Future Managed Stand Analysis Units (cont.)

Future Analysis Unit	Net Area (ha)	Existing SI50	Initial Density	Species Composition (& Adjusted SI50)		
419 FdPlLw-G	82	17.5	1,500	Fd35 (19.1)	Pl35 (17.8)	Lw30 (17.4)
420 FdPlLw-M	35	13.8	1,500	Fd35 (15.5)	Pl35 (14.5)	Lw30 (14.1)
421 FdPlLw-P	68	10.4	1,500	Fd35 (11.7)	Pl35 (10.9)	Lw30 (10.7)
422 FdPlLw-G	224	17.7	1,500	Fd35 (19.8)	Pl35 (18.5)	Lw30 (18.1)
423 FdPlLw-M	93	15.7	1,500	Fd35 (17.6)	Pl35 (16.4)	Lw30 (16.1)
424 FdPlLw-P	23	13.2	1,500	Fd35 (14.8)	Pl35 (13.8)	Lw30 (13.5)
501 FdPlLw(griz)-G	11	19.6	1,500	Fd35 (22.0)	Pl35 (20.5)	Lw30 (20.1)
502 FdPlLw(griz)-M	16	17.5	1,500	Fd35 (19.7)	Pl35 (18.4)	Lw30 (18.0)
503 FdPlLw(griz)-P	21	14.4	1,500	Fd35 (16.1)	Pl35 (15.1)	Lw30 (14.7)
507 PlFdSe(griz)-G	12	18.4	1,500	Pl35 (19.3)	Fd35 (20.7)	Se30 (19.3)
508 PlFdSe(griz)-M	33	16.4	1,500	Pl35 (17.2)	Fd35 (18.4)	Se30 (17.2)
509 PlFdSe(griz)-P	59	13.9	1,500	Pl35 (14.6)	Fd35 (15.6)	Se30 (14.6)
510 PlFdSe(griz)-G	15	16.9	1,500	Pl35 (17.7)	Fd35 (18.9)	Se30 (17.7)
511 PlFdSe(griz)-M	19	14.2	1,500	Pl35 (14.9)	Fd35 (15.9)	Se30 (14.9)
513 Se(griz)-G	14	20.0	1,500	Se100 (21.0)		
514 Se(griz)-M	94	15.6	1,500	Se100 (16.4)		
515 Se(griz)-P	26	13.4	1,500	Se100 (14.1)		
517 Se(griz)-M	8	20.5	1,500	Se100 (16.4)		
604 FdPlLw-G	176	20.4	1,500	Fd35 (23.1)	Pl35 (21.5)	Lw30 (21.1)
605 FdPlLw-M	128	17.2	1,500	Fd35 (19.3)	Pl35 (18.1)	Lw30 (17.7)
606 FdPlLw-P	96	12.6	1,500	Fd35 (14.2)	Pl35 (13.2)	Lw30 (12.9)
610 PlFdSe-G	85	19.1	1,500	Pl35 (20.0)	Fd35 (21.4)	Se30 (20.0)
611 PlFdSe-M	5	16.0	1,500	Pl35 (16.8)	Fd35 (17.9)	Se30 (16.8)
612 PlFdSe-P	19	10.0	1,500	Pl35 (10.5)	Fd35 (11.2)	Se30 (10.5)
616 Se-G	50	23.3	1,500	Se100 (24.5)		
617 Se-M	722	15.8	1,500	Se100 (16.5)		
618 Se-P	16	12.0	1,500	Se100 (12.6)		
619 FdPlLw-G	111	18.9	1,500	Fd35 (21.2)	Pl35 (19.8)	Lw30 (19.4)
620 FdPlLw-M	168	16.0	1,500	Fd35 (17.9)	Pl35 (16.8)	Lw30 (16.4)
704 FdPlLw(fert)-G	100	20.0	1,500	Fd35 (22.4)	Pl35 (20.9)	Lw30 (20.5)
705 FdPlLw(fert)-M	31	17.0	1,500	Fd35 (19.1)	Pl35 (17.8)	Lw30 (17.4)
717 Se(fert)-M	39	15.8	1,500	Se100 (17.6)		

Table 12.2 summarizes the minimum harvest age attributes for the Incremental Silviculture option managed stand yield tables (with additional tree improvement only).

Table 12.2 – Minimum Harvest Age Attributes for Future MSYTs - Incremental Silviculture

Future MSYT AU	Net Area (ha)	Minimum Harvest Age Attributes				
		Age	Volume (m3)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
401 FdPlLw-G	44	80	306	3.8	26.1	23.4
402 FdPlLw-M	211	80	255	3.2	24.0	21.8
403 FdPlLw-P	68	120	208	1.7	22.6	20.8
404 FdPlLw-G	481	70	297	4.2	25.5	23.0
405 FdPlLw-M	856	80	261	3.3	24.3	22.0
406 FdPlLw-P	150	100	204	2.0	22.1	20.5
407 PlFdSe-G	189	80	339	4.2	25.9	24.3
408 PlFdSe-M	381	90	255	2.8	22.8	22.0
409 PlFdSe-P	430	100	219	2.2	21.5	21.1
410 PlFdSe-G	144	80	287	3.6	23.9	22.8
411 PlFdSe-M	325	100	232	2.3	21.9	21.5
412 PlFdSe-P	198	140	201	1.4	21.0	20.9

Table 12.2 – Minimum Harvest Age Attributes for Future MSYTs - Incremental Silviculture (cont.)

Future MSYT AU	Net Area (ha)	Minimum Harvest Age Attributes				
		Age	Volume (m3)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
413 Se-G	121	80	386	4.8	26.0	25.4
414 Se-M	359	100	349	3.5	25.0	24.7
415 Se-P	93	130	298	2.3	23.6	23.6
416 Se-G	163	70	372	5.3	25.4	25.0
417 Se-M	129	90	369	4.1	25.6	25.1
418 Se-P	40	120	296	2.5	23.4	23.5
419 FdPlLw-G	82	90	259	2.9	24.4	22.0
420 FdPlLw-M	35	110	201	1.8	22.1	20.6
421 FdPlLw-P	68	200	179	0.9	22.0	20.4
422 FdPlLw-G	224	80	245	3.1	23.6	21.5
423 FdPlLw-M	93	90	215	2.4	22.5	20.8
424 FdPlLw-P	23	120	198	1.7	22.1	20.5
501 FdPlLw(griz)-G	11	80	309	3.9	26.2	23.5
502 FdPlLw(griz)-M	16	80	242	3.0	23.5	21.5
503 FdPlLw(griz)-P	21	100	199	2.0	21.9	20.4
507 PlFdSe(griz)-G	12	80	315	3.9	25.0	23.6
508 PlFdSe(griz)-M	33	90	286	3.2	24.0	22.9
509 PlFdSe(griz)-P	59	100	232	2.3	21.9	21.5
510 PlFdSe(griz)-G	15	80	261	3.3	23.0	22.1
511 PlFdSe(griz)-M	19	100	241	2.4	22.4	21.7
513 Se(griz)-G	14	80	409	5.1	27.0	26.1
514 Se(griz)-M	94	100	359	3.6	25.4	24.9
515 Se(griz)-P	26	110	318	2.9	24.0	24.0
517 Se(griz)-M	8	100	359	3.6	25.4	24.9
604 FdPlLw-G	176	80	342	4.3	27.4	24.5
605 FdPlLw-M	128	90	267	3.0	24.7	22.3
606 FdPlLw-P	96	140	208	1.5	22.8	20.9
610 PlFdSe-G	85	80	336	4.2	25.8	24.2
611 PlFdSe-M	5	90	272	3.0	23.5	22.4
612 PlFdSe-P	19	160	206	1.3	21.4	21.1
616 Se-G	50	60	379	6.3	25.6	25.1
617 Se-M	722	100	363	3.6	25.5	25.0
618 Se-P	16	120	296	2.5	23.4	23.5
619 FdPlLw-G	111	80	287	3.6	25.3	22.8
620 FdPlLw-M	168	90	225	2.5	23.0	21.0
704 FdPlLw(fert)-G	100	80	337	4.2	26.7	23.9
705 FdPlLw(fert)-M	31	80	239	3.0	22.8	20.9
717 Se(fert)-M	39	90	366	4.1	25.1	24.7

12.2 Spacing & Fertilization Treatments

Additional stands will be included in the fertilization program in these scenarios. The improvements to volume at rotation age will be the same as those used in the Base Case, 15m3/ha. Two scenarios will be completed for this component of the option:

- Space and fertilize all Douglas-fir good sites (SI50 > 18.0) stands, *Good Site Treatment* scenario; and

- Space and fertilize all Douglas-fir good and medium site (SI50 > 15.0) stands *Good & Medium Site Treatment* scenario.

Table 12.3 summarizes the revised minimum harvest age attributes for future managed stands included in the Good Site Treatment scenario.

Table 12.3 –Minimum Harvest Age Attributes for Future MSYTs – Good Site Treatments

Future MSYT AU	Net Area (ha)	Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
401 FdPlLw-G	44	80	321	4.0	26.1	23.4
402 FdPlLw-M	211	80	270	3.4	24.0	21.8
404 FdPlLw-G	481	70	312	4.5	25.5	23.0
405 FdPlLw-M	856	80	276	3.4	24.3	22.0
419 FdPlLw-G	82	90	274	3.0	24.4	22.0
422 FdPlLw-G	224	80	260	3.3	23.6	21.5
501 FdPlLw(griz)-G	11	80	324	4.1	26.2	23.5
502 FdPlLw(griz)-M	16	80	257	3.2	23.5	21.5
604 FdPlLw-G	176	80	357	4.5	27.4	24.5
605 FdPlLw-M	128	90	282	3.1	24.7	22.3
619 FdPlLw-G	111	80	302	3.8	25.3	22.8

Table 12.4 summarizes the revised minimum harvest age attributes for future managed stands included in the Good & Medium Site Treatment scenario.

Table 12.4 –Minimum Harvest Age Attributes for Future MSYTs – Good & Medium Site Treatments

Future MSYT AU	Net Area (ha)	Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
401 FdPlLw-G	44	80	321	4.0	26.1	23.4
402 FdPlLw-M	211	80	270	3.4	24.0	21.8
403 FdPlLw-P	68	120	223	1.9	22.6	20.8
404 FdPlLw-G	481	70	312	4.5	25.5	23.0
405 FdPlLw-M	856	80	276	3.4	24.3	22.0
406 FdPlLw-P	150	100	219	2.2	22.1	20.5
419 FdPlLw-G	82	90	274	3.0	24.4	22.0
420 FdPlLw-M	35	110	216	2.0	22.1	20.6
422 FdPlLw-G	224	80	260	3.3	23.6	21.5
423 FdPlLw-M	93	90	230	2.6	22.5	20.8
501 FdPlLw(griz)-G	11	80	324	4.1	26.2	23.5
502 FdPlLw(griz)-M	16	80	257	3.2	23.5	21.5
503 FdPlLw(griz)-P	21	100	214	2.1	21.9	20.4
604 FdPlLw-G	176	80	357	4.5	27.4	24.5
605 FdPlLw-M	128	90	282	3.1	24.7	22.3
619 FdPlLw-G	111	80	302	3.8	25.3	22.8
620 FdPlLw-M	168	90	240	2.7	23.0	21.0

APPENDIX I – VDYP Natural Stand Yields

APPENDIX II-A – Existing TIPSY Managed Stand Yields

APPENDIX II-B – Future TIPSY Managed Stand Yields – Base Case

APPENDIX II-C – Future TIPSY Managed Stand Yields – Incremental Silviculture

APPENDIX III – MoF Correspondence for Achieving Biodiversity

APPENDIX IV – Salmon Arm District Draft Landscape Unit Areas

APPENDIX V – MoF Genetic Gains Correspondence

APPENDIX VI – MoF Report for Factoring Recreation into Analysis