WEST FRASER MILLS LTD.
BOWRON-COTTONWOOD TREE FARM LICENSE
(TFL 52)
MANAGEMENT PLAN 3

TIMBER SUPPLY ANALYSIS
INFORMATION PACKAGE

Prepared by:
West Fraser Mills Ltd. – Quesnel, B.C.
&
Timberline Forest Inventory Consultants Ltd.

December 20, 2000

Reference: 9941015.3.1

Timberline
Forest Inventory Consultants Ltd.

Timberline
Forest Inventory Consultants Ltd.

our file: 010108_wfm_dp.ltr

January 9, 2001

West Fraser Mills Ltd.
P.O. Box 6000
Quesnel, BC
V2J 3J5

Attention: Al Hunter RPF

Re: *TFL 52 MP 3 Timber Supply Analysis Information Package*

Dear Al:

Enclosed please find the updated Information Package for the TFL 52 MP 3 timber supply analysis. The package has been revised based on feedback from MoF since the submission of the last report 2000.11.08. Changes have been made to the land base netdowns (non-productive, existing and future roads) and methods for assessing landscape level biodiversity. Note that the appendices included in the previous report are still applicable and have not been included here.

As per our discussion, copies have been sent to Dirk Trigg at MoF Cariboo Region, and Qiong Su at Timber Supply Branch. Please forward the additional enclosed copies to Quesnel District MoF (Dennis Asher) and MoELP (Cris Guppy).

The Base Case simulation runs are complete and we will discuss them with MoF Timber Supply Branch prior to completing the remainder of the analysis. Please call if you have any questions or comments regarding the analysis.

Yours truly,

Bill Kuzmuk, R.P.F.
Resource Analysis Forester

BAK/sun

Timberline
Forest Inventory Consultants Ltd.

our file: 010108_mof_dist.ltr

January 9, 2001

Ministry of Forests
Quesnel Forest District
322 Johnston Avenue
Quesnel, BC
V2J 3M5

COPY

Attention: Dennis Asher RPF, Major Tenures Officer

Re: *TFL 52 MP 3 Timber Supply Analysis Information Package*

Dear Mr. Asher:

On behalf of West Fraser Mills of Quesnel, enclosed please find the revised Information Package for the TFL 52 MP 3 timber supply analysis. This report replaces the version provided 2000.11.08. Further discussions with MoF Timber Supply Branch resulted in changes to the land base netdowns (non-productive, existing and future roads) and methods for assessing landscape level biodiversity. Therefore a new copy of the report is being provided. Note that the appendices included in the previous report are still applicable and have not been included here.

The Base Case analysis is underway. After initial results are complete, we will be compare the various landscape level biodiversity scenarios with Timber Supply Branch. Based on this review the Base Case that will be used for the remainder of the analysis will be determined.

Please call if you have any questions or comments regarding the Information Package or any other aspects of the TFL 52 analysis.

Yours truly,

Bill Kuzmuk, R.P.F.
Resource Analysis Forester

BAK/sun

Suite 310 - 1207 Douglas St., Victoria, B.C. V8W 2E7 • Tel: (250) 480-1101 • Fax: (250) 480-1412 • Website: www.timberline.ca

Timberline
Forest Inventory Consultants Ltd.

our file: 010108_mof_reg.ltr

January 9, 2001

Ministry of Forests
Cariboo Forest Region
200 - 640 Borland Street
Williams Lake, BC
V2G 4T1

COPY

Attention: Dirk Trigg RPF, Timber Administration Manager

Re: *TFL 52 MP 3 Timber Supply Analysis Information Package*

Dear Dirk:

On behalf of West Fraser Mills of Quesnel, enclosed please find the revised Information Package for the TFL 52 MP 3 timber supply analysis. This report replaces the version provided 2000.11.08. Further discussions with MoF Timber Supply Branch resulted in changes to the land base netdowns (non-productive, existing and future roads) and methods for assessing landscape level biodiversity. Therefore a new copy of the report is being provided. Note that the appendices included in the previous report are still applicable and have not been included here.

The Base Case analysis is underway. After initial results are complete, we will be compare the various landscape level biodiversity scenarios with Timber Supply Branch. Based on this review the Base Case that will be used for the remainder of the analysis will be determined.

Please call if you have any questions or comments regarding the Information Package or any other aspects of the TFL 52 analysis.

Yours truly,

Bill Kuzmuk, R.P.F.
Resource Analysis Forester

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January 9, 2001

Ministry of Environment Lands & Parks
Quesnel Forest District
322 Johnston Avenue
Quesnel, BC
V2J 3M5

COPY

Attention: Cris Guppy, Forest Ecosystem Specialist

Re: *TFL 52 MP 3 Timber Supply Analysis Information Package*

Dear Cris:

On behalf of West Fraser Mills of Quesnel, enclosed please find the revised Information Package for the TFL 52 MP 3 timber supply analysis. This report replaces the version provided 2000.11.08. Further discussions with MoF Timber Supply Branch resulted in changes to the land base netdowns (non-productive, existing and future roads) and methods for assessing landscape level biodiversity. Therefore a new copy of the report is being provided. Note that the appendices included in the previous report are still applicable and have not been included here.

The Base Case analysis is underway. After initial results are complete, we will be compare the various landscape level biodiversity scenarios with Timber Supply Branch. Based on this review the Base Case that will be used for the remainder of the analysis will be determined.

Please call if you have any questions or comments regarding the Information Package or any other aspects of the TFL 52 analysis.

Yours truly,

Bill Kuzmuk

Bill Kuzmuk, R.P.F.
Resource Analysis Forester

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Timberline
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our file: 010108_mof_tsb.ltr

January 9, 2001

Ministry of Forests
Timber Supply Branch
3rd Floor - 595 Pandora Avenue
Victoria, BC
V8W 3E7

COPY

Attention: Qiong Su RPF, Timber Supply Foresters

Re: *TFL 52 MP 3 Timber Supply Analysis Information Package*

Dear Qiong:

On behalf of West Fraser Mills of Quesnel, enclosed please find the revised Information Package for the TFL 52 MP 3 timber supply analysis. This report replaces the version provided 2000.11.08. Further discussions with various MoF and MoELP staff resulted in additional changes to the land base netdowns (non-productive, existing and future roads) and methods for assessing landscape level biodiversity. Therefore a new copy of the report is being provided. Note that the appendices included in the previous report are still applicable and have not been included here.

The Base Case analysis is underway. After initial results are complete, we will be compare the various landscape level biodiversity scenarios with you. Based on this review the Base Case that will be used for the remainder of the analysis will be determined.

Please call if you have any questions or comments regarding the Information Package or any other aspects of the TFL 52 analysis.

Yours truly,

Bill Kuzmuk, R.P.F.
Resource Analysis Forester

BAK/sun

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APPENDICES

1.0 INTRODUCTION

This Information Package has been prepared on behalf of West Fraser Mills Ltd. (WFM) of Quesnel, B.C. as a source document prior to the completion of the timber supply analysis for the Bowron-Cottonwood Tree Farm License (TFL 52) Management Plan 3 (MP 3). It provides a summary of the inputs and assumptions made in preparing for the analysis.

The analysis process is dynamic 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 3.0, (MoF, February 1998).

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

- Base Case;
- Alternative Landscape Level Biodiversity Emphasis; and
- 20-Year Spatial Feasibility.

Analysis inputs attempt to reflect current management practices for TFL 52 and correspond to the approval date of the Statement of Management Objectives Options and Procedures (SMOOP, 2000.04.20). The Base Case includes management guidelines reflecting Forest Practices Code (FPC) requirements and the Cariboo-Chilcotin Land Used Plan (CCLUP). In some cases recent information has been incorporated into the assumptions based on new information and acceptance by Ministry of Forests (MoF).

Critical Analysis of Schedules for Harvesting (CASH6), Timberline's in-house forest estate simulation model will be used for all analysis simulations. 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 localised resource emphasis areas (REAs), within which forest cover constraints are applied. Or, operational plans can be evaluated by modelling the harvest of mapped cutblocks with adjacency requirements in place. A spatial feasibility analysis will be conducted for comparison to current WFM's 20-Year Harvest Plan.

Upon acceptance by the MoF Timber Supply Analyst, the assumptions and methodologies provided in this Information Package will be used by WFM 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 52. All analysis results will be submitted to the Chief Forester of British Columbia for his allowable annual cut (AAC) determination.

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 3.

3.1 Base Case

The Base Case will include:

- Management activity as defined by historical operations with emphasis on the last 5 years;
- Forest Practices Code (FPC) as it is being interpreted at 2000.05.01;
- Key information from the CCLUP (October 1994), the *Cariboo-Chilcotin Land Use Plan Implementation Report* (CCLUPIR) (June 1999) and the *Biodiversity Conservation Strategy for the Cariboo-Chilcotin Land Use Plan* (July 1996) where this information can be modelled;
- Draft landscape units (LU) and draft biodiversity emphasis to address landscape level biodiversity (1999);
- New vegetation resource inventory (VRI) (2000);
- New terrain resource inventory mapping (TRIM-II) with enhanced stream and road data (1999);
- New terrain stability mapping (TSM) (2000);
- New terrestrial ecosystem mapping (TEM) inventory (2000);
- New operability mapping based on TSM;
- Interim stream and fish/fish habitat inventory (2000);
- Updated landscape and recreation inventories (1999);
- Identified wildlife tree patches (WTP) to address stand level biodiversity;
- Managed stand site index estimates based on the *Potential Site Indices for Major Commercial Tree Species on TFL 52* report (Appendix II);
- Variable Density Yield Predictor (VDYP) natural stand yields and Table Interpolation Program for Stand Yields (TIPSY) managed stand yields as reported *in Yield Table Summary Report West Fraser Mills TFL 52 – Quesnel* (Appendix III);
- Current close utilization standards;
- Basic silviculture on all sites;
- Genetic gains from tree improvement; and
- Incremental silviculture on demonstrated sites.

3.3 Additional Options

3.3.1 Alternative Landscape Level Biodiversity Option

Landscape units and biodiversity emphasis assigned to those units are currently in draft form. Alternative emphasis (low, intermediate and high) will be modelled on specific LUs within TFL 52 to test the impact on timber supply. A review of the existing forest cover requirements for other non-timber interests (wildlife, visually sensitive areas) will be completed. Biodiversity emphasis will be assigned based on both the local importance of the natural disturbance types found within an LU and the level of constraints for other interests.

Section 11.0 provides complete details for the revised assumptions associated with the Alternative Biodiversity Emphasis option.

3.3.2 20-Year Spatial Feasibility Option

In this analysis scenario the 20-Year Plan developed by WFM for MP 3 will be tested in a spatial modelling environment. All of the Base Case assumptions will be modelled and cutblocks identified in the 20-Year Plan will be targeted for harvest. Full adjacency and silviculture green-up requirements will be modelled and the results of the 20-year harvest developed in the forest estate model CASH6 will be mapped for evaluation and comparison with the 20-Year Plan.

Section 12.0 provides further details on the assumptions associated with the 20-Year Spatial Feasibility option.

5.0 FOREST INVENTORY

WFM has updated or completed new inventories for the majority of the resources on TFL 52. The timber supply analysis database includes the following new inventories:

- VRI which replaces the old forest cover inventory;
- TEM which enhances existing BEC information to the site series level;
- TSM which replaces old ESA inventories for soils and regeneration;
- TRIM-II with enhanced stream, non-productive and road data;
- Preliminary operability mapping which combines TSM, accessibility and local knowledge;
- Stream & lake classification with fish habitat assessments and accompanying riparian management areas;
- Updated landscape and recreation inventories;
- Draft landscape units from the CCLUP; and
- Potential site index (PSI) information from the study completed in 2000.

This new inventory data will allow a more thorough and accurate review of the timber supply on TFL 52 compared to previous analyses.

All spatial information is captured and controlled to the TRIM-II, NAD (North American Datum) 83 base. The updated TFL 52 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 99.12.01 based on 1999 history, global positioning system (GPS) data and the new VRI completed in 1999. All attributes including age, height and volume have been projected to this date.

Inventory data is maintained in WFM'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. Due to the detailed spatial analysis database, all reductions are assigned to complete polygons with the exception of additional WTP removals (Section 6.12). This approach allows mapping of the netdowns and other aspects of the analysis.

6.2 Total Area

The total area of TFL 52 is 258,866 ha. There are 23,795 ha of non-forest and non-productive forest (including roads) and 235,022 ha of productive forest land. Some of the areas reported above differ from the areas included in the MP 2 timber supply analysis due to new resource inventories. The methods used to identify the area available for harvesting have changed to accommodate the new inventories. The majority of the differences can be attributed to the following:

- New VRI with improved polygon resolution;
- New inoperable classification;
- New stream, wetland and lake classification for identification of riparian areas;
- New WTP, using specific stand identification in the inventory;
- New TEM and PSI study, which identifies low productivity and unmerchantable sites;
- New roads inventory; and
- Deletion of new woodlots within the TFL 52 licence area.

A map of the areas assigned to each land base reduction (netdown) category is provided in Appendix I.

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. Some of the alpine forest is available to meet landscape level biodiversity requirements. New VRI and TRIM-II inventory data is used to identify the non-productive areas. Table 6.2 summarises the non-productive and non-forest area 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	38
Alpine forest	838
Cultivated	51
Lake	1,101
Meadow	401
Non-productive	5,030
NP brush	153
NP burn	6
River	448
Rock	114
Swamp	7,377
Urban	645
NTA (type identity 8)	2
Total	16,203

Table 6.4 – Existing Road Reductions

Road Classification & R/W Width (m)		Total Length (km)	Road Exclusion (ha)
A - Primary	20	347	671
B - Secondary	15	641	928
C - Spur	10	2,108	1,944
D – In-block	6	1,072	620
Buffered roads subtotal		4,078	4,163
VRI Polygon roads			1,029
Total		4,078	5,192

Note that there are many situations where the road buffers overlap at road intersections and where roads run parallel to one another. Therefore the road exclusion area is less than the total of all road lengths multiplied by road width.

All skid trails and remaining landings are rehabilitated and planted after completion of logging. WFM no longer constructs full landings during harvesting operations. It is expected that the trail areas listed in Table 6.4 will be returned to productive contribution, however they have been removed from the THLB for the Base Case analysis.

6.4.2 Future Roads and Landings

Future road development will include only class B and C roads. All primary roads are in place for accessing the TFL. Future road reductions are summarised below.

Net operable area currently roaded	86,814 ha
Area of class B & C roads within net THLB	2,089 ha
% of net operable land base	2.41%
Non-roaded component of net operable land base	102,142
Future roads = (2.41% * 102,142 ha)	2,462 ha

Note that the 2,089 ha of class B and C roads reflect roads within the current THLB. Additional class B and C roads exist in other parts of the TFL, both productive and non-productive types. During the analysis simulations, areas without any previous logging history and/or road development will be reduced to give an overall reduction of 2,462 ha.

Current and future roads on the productive land base will total 7,654 ha. This is approximately 3.3% of the productive land base or 4.1% of the THLB. An additional 426 ha of existing roads are in non-productive types.

Table 6.6 - Riparian Management Zone Basal Area Retention Objectives

RMZ Classification & Stream Length (km)		RMZ Width (m)	Average BA Retention (%)	Reserve Width of RMZ (m)
S1	160	20	50	10.0
S2	492	20	50	10.0
S3	1,125	20	50	10.0
S4	687	30	25	7.5
S5	86	30	25	7.5
S6	5,586	10	10	1.0
L1		30	25	7.5
L3		30	25	7.5
Class A lake		200	100	200
Class B lake		150	90	135
Class C lake		100	80	80
Class E lake		25	50	12.5
W1		40	25	10.0
W3		30	25	7.5
W5		40	25	10.0

S6 streams were not included in the GIS buffering exercise because of the small width of their RMZ. Operationally, WFM is not required to reserve any area adjacent to S6 streams. Table 6.7 summarises Base Case RMZ reductions.

Table 6.7 - Riparian Management Zone Reductions

RMZ Classification & Adjusted Reserve Width (m)		Total Area (ha)	RMZ Reductions	
			Area (ha)	Volume [1] (1000m3)
S1	10.0	296	229	56
S2	10.0	848	525	130
S3	10.0	2,182	1,596	341
S4	7.5	847	692	136
S5	7.5	110	88	14
S6	1.0	1,117	0	0
L3	7.5	57	32	6
Class A lake	200	115	108	43
Class B lake	135	312	256	53
Class C lake	80	529	388	100
Class E lake	12.5	20	12	1
W1	10.0	1,158	1,097	259
W3	7.5	351	330	71
W5	10.0	27	27	7
Total		7,994	5,380	1,217

[1] Coniferous volume component.

Table 6.9 – Inoperable Forest Reductions

Leading Species	Gross Productive		Inoperable Forest Reduction		
	Area (ha)	Volume[1] (1000s m³)	Area (ha)	Volume [1] (1000s m³)	Volume [1] (m³/ha)
NSR	41	0	39	0	0
Aspen	121	4	89	3	39
Birch	22	0	22	1	12
Cottonwood	14	1	10	1	26
Balsam	1,345	195	1,158	167	145
Douglas-fir	62	18	50	15	304
Lodgepole pine	1,074	236	938	206	219
Spruce	1,510	408	1,211	328	271
Total	4,189	862	3,518	721	205

[1] Coniferous volume component.

6.8 Low Productivity Stands

Sites may have low productivity either because of inherent site factors (nutrient availability, aspect, excessive moisture, etc), or because they are incompletely occupied by commercial tree species. Long development periods may enable stands classified as low productivity to achieve merchantable volumes. Sites that are currently occupied by unmerchantable stands may be productive with other species, or following silvicultural treatments.

All stands that have been harvested and returned to full stocking are not considered in the low site reductions. It is assumed that these sites were capable of producing merchantable timber in the past and should therefore produce merchantable timber in the future.

Young stands (< 30 years old) are assigned a site index (SI50) value in the new VRI. Older stands have been assigned SI50 with VDYPbatch, based on age and height attributes from the VRI. This SI50 estimate is used to evaluate the long-term timber growing potential of the site.

Minimum SI50 values are based on the requirement of approximately 120m3/ha at age 150 years. This is generally an operational minimum for WFM; less than 4% of the volume in the 5-Year FDP comes from stands with less than 120m3/ha of coniferous volume. A review of both existing natural stand and future managed stand volumes was completed to determine the minimum SI50 values.

Table 6.10 lists the minimum SI50 values for each species present on TFL 52 and summarises the reductions for low productivity sites. These minimum values are consistent with those proposed for the Quesnel TSA TSR-II timber supply analysis.

utilization" (balsam IU). These areas were partially harvested during the 1960s and have low stocking levels and volume.

Similar to the deciduous reductions, non-merchantable removals are based on stands not achieving a minimum coniferous volume of 120m³/ha by age 150. Any stands currently older than 150 years that do not have 120m³/ha of coniferous volume are excluded as summarised in Table 6.12.

Table 6.12 – Non-Merchantable Stand Reductions

Leading Species	Gross Productive		Non-Merchantable Reduction		
	Area (ha)	Volume (1000s m³)	Area (ha)	Volume [1] (1000s m³)	Volume [1] (m³/ha)
Balsam	5,997	271	3,954	159	40
Douglas-fir	76	1	76	0	6
Lodgepole pine	357	14	279	11	39
Spruce	1,520	46	1,009	17	17
Total	7,950	332	5,318	188	35

[1] Coniferous volume component.

6.11 Preservation VQO

Sugarloaf Mountain is classified as being visually significant in the landscape and recreation inventory. This area is excluded from any harvesting activity. Other visually sensitive areas will be modelled with forest cover constraints that will limit the amount of harvesting that may occur during a period of time. Table 6.13 summarises the area and volume removed from the THLB to address this VQO preservation (VQO-P) area.

Table 6.13 – VQO-Preservation Reductions

Leading Species	Gross Productive		VQO-Preservation Reduction		
	Area (ha)	Volume (1000s m³)	Area (ha)	Volume [1] (1000s m³)	Volume [1] (m³/ha)
Douglas-fir	31	10	31	10	323
Lodgepole pine	45	11	45	11	254
Total	76	21	76	21	283

[1] Coniferous volume component.

Table 6.14 – Wildlife Tree Patch Reductions

BEC Label	WTP Forest Reduction		
	Area (ha)	Volume [1] (1000s m³)	Volume [1] (m³/ha)
ESSFwc3	101	21	206
ESSFwk1	537	127	266
SBSdw1	1	0	209
SBSmw	362	85	235
SBSwk1	472	126	267
Total	1,473	359	243

[1] Coniferous volume component.

7.0 INVENTORY ORGANISATION

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 modelling 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 current forest management to address timber and non-timber resources.

Unique management characteristics are modelled 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 modelled using draft biodiversity emphasis and FPC requirements for mature and old growth forest.
- REAs (resource emphasis areas) are aggregates of area with similar non-timber resource concerns. These include visually sensitive areas, 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.

Table 7.1 – LU-BEC/NDTs (continued)

LU-BEC/NDT & Analysis ID	Draft Biodiversity Emphasis	Total Area (ha)		Gross Productive Area[1] (ha)		Net Operable Area (ha)	
		Bowron Park	TFL 52	Bowron Park	TFL 52	Bowron Park	TFL 52
42 Indianpoint ESSFwk1-1	Low	2,438	2,401	611	2,358		2,037
47 Indianpoint SBSwk1-2		4,678	10,825	3,807	9,547		8,575
Indianpoint LU total		7,115	13,226	4,419	11,905		10,612
51 Jack of Clubs ESSFwc3-1	Low		7,066		6,748		3,936
52 Jack of Clubs ESSFwk1-1			10,967		10,322		8,587
57 Jack of Clubs SBSwk1-2			2,380		1,885		1,437
Jack of Clubs LU total			20,413		18,955		13,960
62 Lightning ESSFwk1-1	Low		3,638		3,443		3,261
66 Lightning SBSmw-3			2,403		1,961		1,721
67 Lightning SBSwk1-2			10,099		9,300		7,960
Lightning LU total			16,139		14,705		12,942
71 Swift ESSFwc3-1	Low		7,510		7,182		3,072
72 Swift ESSFwk1-1			11,742		11,286		10,242
77 Swift SBSwk1-2			7,963		6,889		6,207
Swift LU total			27,215		25,357		19,521
82 Umiti ESSFwk1-1	Intermediate		3,473		3,366		3,254
86 Umiti SBSmw-3			30,179		27,576		22,811
87 Umiti SBSwk1-2			6,110		5,768		5,370
Umiti LU total			39,763		36,709		31,435
92 Victoria ESSFwk1-1	High		8,448		8,262		6,857
96 Victoria SBSmw-3			21,482		18,532		15,919
97 Victoria SBSwk1-2			18,362		16,780		14,869
Victoria LU total			48,292		43,574		37,645
102 Willow ESSFwk1-1	Low		6,177		6,057		3,261
107 Willow SBSwk1-2			13,790		12,407		1,721
Willow LU total			19,966		18,463		7,960
Total		47,202	258,866	31,760	237,423		188,956

[1] Includes appropriate alpine forest areas.

Minor areas of certain LU-BEC/NDTs were combined with similar, larger areas for the analysis. These include areas classified as ESSFwcp3, ESSFwc3, ICHwk4, SBSdw1 and SBSmh.

Mature and old growth requirements will be assigned to each LU-BEC/NDT for the timber supply analysis. Productive forest within draft LUs in Bowron Lake Provincial Park will contribute to seral stage objectives. MoF completed an abbreviated inventory for these park areas in order to assign them to the appropriate LU-BEC/NDT. Details of landscape level biodiversity requirements are provided in Section 9.3.

Table 7.2 – Level 1 Landscape Unit-Resource Emphasis Areas (Visuals & IRM) (cont.)

LU – REA & Analysis ID	Area (ha)		
	Total	Gross Productive	Net Operable
13 Antler-VQO-M	4,120	3,491	2,144
23 Big Valley-VQO-M	1,011	914	771
33 Bowron-VQO-M	228	219	214
43 Indianpoint-VQO-M	204	204	200
53 Jack of Clubs-VQO-M	1,919	1,631	1,065
63 Lightning-VQO-M	1,106	1,078	1,014
73 Swift-VQO-M	347	306	208
83 Umiti-VQO-M	1,941	1,820	1,714
93 Victoria-VQO-M	259	256	185
103 Willow-VQO-M	794	784	743
VQO-M total	11,929	10,703	8,259
14 Antler-IRM	24,734	22,520	19,149
24 Big Valley-IRM	15,846	14,915	12,767
34 Bowron-IRM	4,224	3,964	3,588
44 Indianpoint-IRM	11,430	10,144	9,027
54 Jack of Clubs IRM	9,298	8,673	7,335
64 Lightning-IRM	13,866	12,539	10,934
74 Swift-IRM	19,311	17,848	16,471
84 Umiti-IRM	36,409	33,572	28,681
94 Victoria-IRM	45,454	40,793	35,447
104 Willow-IRM	17,092	15,680	13,765
IRM total	197,666	180,646	157,164

7.3 CCLUP Special Resource Development Zone

The CCLUP requires that 30% of the Quesnel Highlands Special Resource Development Zone (QHSRDZ) be maintained in "backcountry recreation condition". For the analysis, it is assumed that forested and alpine areas that will have limited or no harvesting qualify for this condition. Table 7.4 summarises the current state of the QHSRDZ with respect to backcountry recreation condition.

Table 7.4 – QHSRDZ Backcountry Recreation Status

Land Classification	Area (ha & % of Total QHSRDZ)		
	Total	Gross Productive[1]	Net Operable
Caribou	26,643 (30.9)	23,997 (27.8)	4,771 (5.5)
VQO retention	3,554 (4.2)	3,249 (3.8)	2,754 (3.2)
Total backcountry	30,197 (35.1)	27,246 (31.6)	7,525 (8.7)
Non-backcountry	55,715 (64.9)	51,164 (59.4)	43,791 (50.8)
QHSRDZ Total	86,166 (100.0)	78,410 (91.0)	51,316 (59.6)

[1] Includes appropriate alpine forest areas.

As shown in Table 7.4, the 30% target for backcountry recreation is surpassed within the productive forest component of the areas, which will have no harvesting or very limited harvesting over the long-term. There are additional lands classified as non-productive (alpine meadow, treed swamp, *etc.*) which meet the definition of backcountry recreation. Given the current status of non-harvesting areas, it is likely that CCLUP backcountry recreation targets for the TFL 52 portion of the QHSRDZ will be fulfilled, and no additional constraints will be required for the timber supply analysis.

7.4 Analysis Units

As noted in Section 7.0, typical aggregation of forest stands into analysis units has not been carried out for this analysis. For the MP 3 analysis individual yield tables were produced for each "resultant polygon" (forest cover polygon combined with BEC variant). Existing natural stand yield tables and future managed stand yield tables were then produced for each resultant polygon. These polygon-level or base yield table pairs were then clustered (into analysis units) using a statistical review based on species, site productivity (SI50), yield table shape, culmination age, and culmination volume. The yield table pairs were always kept in the same cluster.

A minimum of 1 ha for each yield aggregate was established to reduce the number of yield tables and to avoid modelling unrealistically small areas in the analysis. After initial

Table 7.5 – Area Distribution by Age Class

Age Class (10s)	Productive Forest Area (ha)		
	Non-THLB	THLB	Total
NSR	364	4481	4844
1	1314	33745	35059
2	583	12683	13266
3	610	5247	5856
4	926	1571	2497
5	1134	2068	3203
6	1008	1759	2767
7	2423	8139	10562
8	2448	6356	8804
9	4106	12716	16822
10	3079	8233	11312
11	1633	7615	9248
12	2333	8723	11056
13	1662	8634	10296
14	2735	3890	6625
15	2878	7948	10826
16	1706	5940	7646
17	1876	7978	9854
18	2803	12483	15286
19	2054	8558	10612
20	4657	12776	17432
21	374	1746	2120
22	1406	1879	3285
23	502	1957	2459
24	167	610	777
25	372	857	1229
26	96	198	294
27	84	34	118
28	115	23	138
29	46	36	82
30+	574	73	647
Total	46,066	188,956	235,023

THLB = Timber Harvesting Land Base

Table 7.6 – Volume Distribution by Age Class

Age Class (10s)	Productive Volume (1000s m3)		
	Non-THLB	THLB	Total
NSR	8	31	39
1	0	0	0
2	0	1	1
3	2	35	36
4	5	34	39
5	21	102	123
6	40	184	224
7	153	1262	1415
8	213	1125	1338
9	481	2450	2931
10	396	1679	2075
11	258	1726	1985
12	377	2348	2725
13	370	2522	2892
14	454	990	1443
15	510	2082	2592
16	416	1772	2189
17	491	2489	2980
18	761	4023	4784
19	580	2789	3369
20	1169	4215	5384
21	111	578	689
22	347	610	957
23	148	626	775
24	44	203	247
25	96	301	398
26	27	60	87
27	23	10	33
28	21	8	29
29	9	11	20
30+	145	26	171
Total	7,678	34,291	41,969

THLB = Timber Harvesting Land Base

Table 8.1 - Default Crown Closure for Stands Under 50 Years

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

8.3 Utilization Levels

Utilization levels that were used in the development of all polygon volumes and yield tables (VDYP natural and TIPSY managed) are documented in Table 8.2.

Table 8.2 - 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

8.4 Decay, Waste and Breakage

Volumes generated with VDYP for both forest cover polygons and analysis unit yield tables are net of decay, waste and breakage (DWB) based on forest inventory zone (FIZ) I and public sustained yield unit (PSYU) 477. PSYU 477 is specific to TFL 52 and provides localised DWB factors for balsam, western redcedar, hemlock and spruce. These local factors are the same as those for the Cottonwood PSYU (122). The recent inventory audit for TFL 52 indicates that volume estimates from VDYP are lower than volumes measured on the ground. A sensitivity analysis will determine the timber supply impact of this underestimation.

8.8 Regeneration Scheme and Regeneration Delay

WFM has developed a set of silviculture regimes based on BEC site series. The individual regimes describe species composition, stand density, and potential treatments. A complete list of the silviculture regimes is provided in the Yield Table Summary report (Appendix III of the Yield Table report provided in Appendix III of this Information Package). All sites are planted, the majority to lodgepole pine or interior spruce, with minor components of Douglas-fir or balsam.

Regeneration on harvested areas is carried out 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 winter, planted in spring or summer of the same year). The two-year delay is based on a review of over 9,000 ha of logging on TFL 52 since 1995, which indicates an average delay of 1.68 years.

8.9 Yield Tables for Managed Stands

All existing stands age 20 years or less, and all future stands will be assigned to TIPSY managed stand yield tables in the analysis. A review of the history attributes for these young stands indicates that these stands have been managed since establishment.

The following information is input to TIPSY during the development of the MSYTs:

- Species composition;
- Initial planting density;
- Treatment, *eg.* 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 (both levels were compiled for all yield tables with the appropriate level selected for analysis);
- OAF1 (variable), OAF2 of 5% for all species;
- Initial stocking based on WFM silviculture regimes; and
- Regeneration type – all planted on TFL 52.

The Yield Table Summary report (Appendix III) summarises the methods used in developing the TIPSY MSYTs for both existing and future stands.

Since 1998 all spruce planting stock has been grown with Class A seed. By 2005 all pine and Douglas-fir will be planted with Class A seed. The inventory of Class A seed for spruce is over 900,000. Improved seed is expected to provide volume gains of 8% for spruce and 5% for pine and Douglas-fir. Therefore all future managed stands have been adjusted to reflect the expected gains. Although some areas planted to date have used improved seedlings from Class A seed, no adjustments were made to the existing MSYTs.

a MSYT is based on the same silviculture regimes that are used for all other stands on the TFL (Appendix III - Yield Table Summary report,).

Table 8.4 summarises the assignment of NSR lands to future MSYT analysis units.

Table 8.4 – Existing NSR Regeneration Assumptions

Regeneration Analysis Unit #	Species-SI50	THLB NSR Areas (ha)		
		Current NSR	Backlog NSR	Total NSR
301	PLSXAT-11.6	3	0	3
302	PLSX-12.7	3	0	3
303	PLSX-16.4	474	0	474
304	PLSX-19.4	765	0	765
305	PLSXAT-21.1	404	0	404
306	PLSXAT-25.4	23	0	23
307	SXPLBL-12.8	17	1	18
308	SXPL-16.6	114	0	114
309	SXPL-17.9	63	0	63
310	SXPL-22.1	9	0	9
312	PLSX-17.1	0	72	72
313	PLSX-20.4	0	6	6
314	SXPL-19.4	1	0	1
315	SXPL-21.2	2	0	2
323	PLSXAT-18.6	2	0	2
332	PLSXAT-22.7	5	0	5
338	PLSX-19.9	1	12	13
343	PLSXAT-21.9	0	25	25
348	PLSX-16.4	81	0	81
349	PLSX-19.2	89	22	111
350	PLSXAT-21.0	27	0	27
352	SXPLBL-12.9	2	0	2
357	SXPL-18.7	1	0	1
358	SXPL-21.3	9	0	9
363	PLSXAT-19.5	0	7	7
364	PLSXAT-21.9	5	0	5
370	SXPL-21.9	23	0	23
372	PLSX-16.8	58	3	62
373	PLSX-19.9	6	4	10
374	PLSXAT-22.3	7	7	14
376	SXPLBL-13.7	6	0	6
383	PLSXAT-19.7	0	7	7
389	PLSXAT-22.7	5	0	5
395	PLSXAT-20.6	2	0	2
396	PL-18.3	3	0	3
397	PLSXAT-21.9	2	0	2
400	PLSXAT-23.0	0	18	18
404	PLSXAT-22.9	0	24	24
407	PLSXAT-22.9	0	2	2
420	PLSXAT-20.0	1	0	1
432	PLSX-13.4	5	0	5
434	PLSX-19.9	0	0	0

9.0 INTEGRATED RESOURCE MANAGEMENT

9.1 Forest Resource Inventories

This section documents the status of all non-timber resource inventories on TFL 52. Dates of completion and acceptance for use in the timber supply analysis are presented in Table 9.1.

Table 9.1 – TFL 52 MP 3 Non-Timber Inventories

Inventory	Date	Source	Approval Agency
Terrestrial ecosystem (TEM)	2000	New inventory	MoELP - Williams Lake
Terrain stability (TSM)	1999	New inventory	MoF - Williams Lake
TRIM-II (with enhanced stream information)	1999	Update of TRIM-I	Geographic Data BC - Victoria
Operability	2000	New inventory	MoF Quesnel
Caribou	2000	MoELP habitat inventory	MoELP, MoF, CCLUP Caribou Committee
Deer	1993	Deer winter range from MoELP	MoELP – Williams Lake
Fish/Fish habitat	2000	New inventory	MoELP – Williams Lake
Riparian	2000	Based on new TRIM-II	MoF Quesnel
Landscape & recreation	1999	Updated 1995 TFL 52 inventories	MoF Quesnel
Draft landscape units	1998	Draft LUs from CCLUP	MoF Quesnel
Roads	1999	New inventory based on TRIM-II	MoF Quesnel

9.1.1 Terrestrial Ecosystem Mapping (TEM)

The new TEM inventory provides BEC to the site series level with identification of site modifying factors of topography, moisture and soils, as well as vegetation structural stage. This information has been extensively used in the PSI study and associated yield table development.

9.1.2 Terrain Stability Mapping (TSM)

TSM was a multi-year project completed in 2000. Two levels of mapping were completed – Level D on the plateau portion of the TFL and Level C in the mountain areas. Level C is the more detailed mapping of these two categories and included more ground verification of polygons than Level D. The TSM identified potentially unstable areas that require more detailed assessment to ensure that any proposed development is appropriate.

The new TRIM-II incorporates the results of a comprehensive air photo review to identify small watercourses or potential streams that did not show on the TRIM-I maps. The purpose of doing this exercise was to identify on the base maps potential streams that field crews need to verify in order to ensure compliance with the FPC. For the purposes of the timber supply analysis, these potential streams were assigned to non-fish bearing classes.

Riparian areas were generated in the GIS based on the FPC Riparian Guidebook, MoF regulations and CCLUP localised requirements for classified lakes. Enhanced TRIM-II inventory data was the basis for assigning riparian buffers. Excluded portions of RMZ areas were based on the basal area retention guidelines in the Riparian Guidebook.

9.1.9 Landscape & Recreation

In 1995 a new visual landscape inventory was completed and visual quality objectives established for identified polygons in TFL 52. This approved inventory and VQO classification has been used for digital terrain modelling of cutblocks within visually sensitive areas. In 1999 the Recreation Opportunity Spectrum and 1994 Recreation Features Inventory were revised and updated to current standards.

The Wells-Barkerville area adjacent to TFL 52 is a significant historic/cultural and tourist area. Visual quality objectives have been included to accommodate the non-timber requirements of this area. Other cultural sites within the TFL are mainly related to historic mining activities. WFM addresses these sites operationally, however the analysis does not require any specific modelling inputs to account for them.

9.1.10 Landscape Units

Draft landscape units have been designated for the Cariboo Forest Region. Although they are not yet approved, it is appropriate to use them for the timber supply analysis. TFL 52 includes two complete LUs and eight partial LUs. Productive forest from Bowron Lake Provincial Park will be included in the appropriate LU-BEC/NDT groups defined for the Indianpoint and Bowron LUs. These park areas will contribute to landscape level biodiversity requirements (mature and mature+old) during the timber supply analysis.

9.1.11 Roads Classification

The new TRIM-II inventory was enhanced for existing roads on TFL 52. During the GIS data preparation all roads were classified to allow identification of the non-productive portion (road line features were buffered to the appropriate width). Additional road areas are identified in the VRI using the appropriate "landcover1" attribute.

9.2 REA Forest Cover Requirements

The analysis will include forest cover constraints to model landscape level biodiversity guidelines, green-up, maximum disturbance and old forest requirements. Forest cover constraints place maximum and minimum limits on the amount of young second growth

Each of the forest cover constraints listed above will be assigned individually to each LU-REA combination on the TFL. This provides a more localised view of the constraints. The MP 2 analysis used the WFM operating areas as the interim LU definitions.

Deer WR minimum retention age is based on the average time taken to achieve 20 metres in height. Caribou modified harvest areas will be modelled with partial harvest methods (Section 8.10) to address old forest requirements related to lichen production. In addition, a maximum disturbance constraint is applied to caribou REAs to maintain an acceptable level of harvesting in each zone. Caribou conventional harvest areas are assigned a maximum disturbance constraint only.

In many cases different resource categories overlap a given piece of the TFL 52 land base. Multiple constraints for different resource emphasis will be assigned in modelling with CASH6. This will ensure that all resource concerns will be addressed in the timber supply analysis. The exception to this rule is for caribou modified harvest areas that overlap with VQO REAs. In this case the VQO constraints will not apply to the caribou areas. It is assumed that the selection harvesting management in the caribou modified REAs will address any visual concerns.

9.2.1 REA 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 operational guidelines for maintaining viewscapes. CCLUP guidelines and MoF methods (Quesnel TSA TSR-II) for establishing VQO constraints have been considered in developing the constraints for TFL 52. Operational 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 VQOs on the TFL.

9.2.1.2 IRM Areas

IRM areas include all of the residual productive areas on TFL 52 that have no specific visual or wildlife concerns. These REAs will meet FPC and CCLUP requirements. Areas have been excluded from IRM REAs to address riparian, inoperable, *etc.* during the land base classification (netdown) process. Various sensitivity analyses will evaluate the timber supply impacts of modelling alternative forest cover constraints within the IRM REA.

9.2.1.3 Deer Winter Range

Typically a selection silviculture system would be used to model MDWR. The Quesnel TSA TSR-II Data Package states that partial harvesting will be modelled in leading Douglas-fir stands (> 40%) within MDWR areas. Approximately 100 ha (THLB) of Douglas-fir leading stands are in the MDWR within an overall productive land base of over

9.2.1.7 Recreation

Recreation opportunities on the TFL are mainly associated with hiking, fishing, hunting, snowmobiling and landscape values. Forest cover constraints associated with visually sensitive areas, wildlife habitat and landscape level biodiversity will accommodate these non-timber interests. In addition, WFM manages operations to ensure that recreation opportunities are maintained. There will be no forest cover constraints assigned to address specific management of these issues in the analysis.

9.3 Landscape Level Biodiversity

The BEC/NDT classification has been assigned based on WFM's BEC classification and FPC definitions for NDT. As outlined in the Biodiversity Guidebook, each LU-BEC/NDT (to the variant level) will be modelled individually for "mature+old" and "old growth" constraints. Early seral stage constraints are not required for the Base Case analysis. Table 9.3 summarises the mature+old and old growth constraints (landscape level biodiversity requirements) from the Biodiversity Guidebook.

Table 9.3 – FPC Biodiversity Guidebook Landscape Level Biodiversity Requirements

NDT & BEC Label	Draft Biodiversity Emphasis	Mature + Old Requirement (% > years)	Old Growth Requirement (% > years)
NDT 1			
ESSF	L	19% > 120	19% > 250
ESSF	I	36% > 120	19% > 250
ESSF	H	54% > 120	28% > 250
NDT 2			
ICH	L	15% > 100	9% > 250
SBSwk1 (mountain)	L	15% > 100	9% > 250
SBSwk1 (mountain)	I	31% > 100	9% > 250
SBSwk1 (mountain)	H	46% > 100	13% > 250
NDT 3			
SBS (other)	L	11% > 100	11% > 140
SBS (other)	I	23% > 100	11% > 140
SBS (other)	H	34% > 100	16% > 140

As outlined in the Biodiversity Conservation Strategy for the CCLUP (Table, page 35), adjustments are used to give a revised estimate of the old growth area within each BEC/NDT combination. These factors cannot be modeled directly in the timber supply analysis. However, they indicate that the old growth percentages in the Biodiversity Guidebook may not be appropriate for the Cariboo Region, including TFL 52.

Therefore old growth constraints will be monitored in the Base Case analysis. Old growth status will be reviewed, post-simulation, for each period of the Base Case, with and without the CCLUP adjustment factors. Mature and old growth constraints will be enforced in all LU-BEC/NDTs, as there is no provision for adjusting these constraints. It is expected that the old growth requirements will not impact the timber supply, based on the adjustment factors and the contribution from non-THLB forest.

9.4 Timber Harvesting

9.4.1 Minimum Merchantability Standards

Minimum merchantability is assessed for each aggregate yield table based on volume and/or age of culmination of MAI (mean annual increment). 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 120m^3/ha is used to assign minimum harvest age. These areas will support higher volume stands of timber after harvest and regeneration to a managed stand condition.

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 7.4.1 and 8.7 is provided in Appendix IV.

Minimum harvest age attributes for the existing MSYTs described in Sections 7.4.2 and 8.9 are provided in Appendix V. Methods used to determine minimum harvest age for the existing MSYTs are similar to those described for determining minimum harvest age for NSYTs.

Minimum merchantability attributes for the future MSYTs defined in Sections 7.4.3 and 8.9 are summarised in Appendix VI. As with other yield tables, minimum harvest age is based on volume, diamater and/or culmination of MAI.

It should be noted 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 Appendices IV, V and VI. This delay will result in long-term harvest levels below the theoretical Long Run Sustained Yield (LRSY), which is based on harvesting all stands at culmination age.

9.4.2 Operability

Operability is based on existing information for terrain stability, accessibility and slope. A review by WFM planning staff that included this mapping and air-photo information was completed to provide the final operability map for TFL 52. Section 6.7 summarises the operability reductions to the THLB.

In addition, the 20-Year Spatial Feasibility option will target cutblocks included in WFM's current 5-Year and 20-Year plans.

9.4.6 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 approximate the inventory of mature species as follows:

- Interior spruce - 49%;
- Lodgepole pine - 31%;
- Balsam - 18%; and
- Douglas-fir - 2%.

As part of the Base Case analysis, a review of the species composition of the first 20 years of harvesting will be completed. In addition, the 20-Year Spatial Feasibility option will target harvesting in blocks designated in the 5 and 20-Year Plans.

9.4.7 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;
- Increase or decrease the periodic harvest rate in acceptable steps during the periods when possible or required to meet all objectives associated with the various resources on TFL 52; and
- Achieve an essentially even-flow of timber as close to the long-term sustainable level as possible with consideration for forest cover requirements.

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 52.

It is important to note that the Deacon Creek proposed Goal-2 PAS will be harvested in the near future. An outbreak of mountain pine beetle has prompted this action. Therefore it will not be a candidate area for protection at this time. However, for the analysis, the Deacon Creek area provides a suitable representation of the size and timber types that will likely be chosen as an alternative Goal-2 PAS in future.

10.1.3 Addition of Older Low Site Areas

Some of the areas excluded as low site productivity stands may have incorrect site index assignments based on their current age and height. Areas with SI50 < 7.0 were excluded from the Base Case THLB. Table 10.3 summarises the mature areas, which have more than the minimum 120 m3/ha of coniferous volume that will be included in the THLB for this sensitivity.

Table 10.3 – Additional Mature Low Site Stands

Leading Species	Average Low Site Stand Attributes			
	Area (ha)	SI50	Age	Conifer Volume (m3/ha)
Balsam	334	6.7	211	127
Spruce	1,283	6.1	252	208
Total	1,617	6.2	244	194

10.1.4 Adjust THLB

In this sensitivity analysis the THLB will be increased and decreased by 10%. Productive forest areas outside the THLB will be adjusted upwards or downwards to maintain the correct total productive land base for the TFL.

10.2 Growth and Yield

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

10.2.1 Adjust Natural Stand Volumes – Based on MoF Inventory Audit

The MoF Inventory Audit indicates that the natural stand volumes generated with VDYP are underestimated by as much as 15%. This sensitivity analysis will increase the volume for those stands affected by this underestimation. Minimum harvest ages will remain the same as those used in the Base Case.

Table 10.3 – 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	5% < 3m	10% < 3m	1% < 3m
2 - VQO-PR	15% < 3m	25% < 3m	5% < 3m
3 – VQO-M	25% < 3m	35% < 3m	15% < 3m
4 – General IRM	35% < 3m	40% < 3m	30% < 3m
REA level 2 (wildlife)			
6 – Deer WR	15% < 3m	20% < 3m	10% < 3m
7 – Caribou Modified	30% < 20 yrs	35% < 20 yrs	20% < 20 yrs
8 – Caribou Conventional	35% < 3m	40% < 3m	30% < 3m

10.3.2 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 two separate scenarios as follows:

- 2 metres in VQO and General IRM REAs; and
- 4 metres in VQO and General IRM REAs.

11.0 ALTERNATIVE LANDSCAPE LEVEL BIODIVERSITY OPTION

In this analysis option a number of alternative approaches to modelling landscape level biodiversity will be evaluated. The Base Case models mature and mature+old growth requirements based on the draft landscape units and associated biodiversity emphasis. In this sequence of analyses the following alternative biodiversity requirements will be modelled on each LU-BEC/NDT:

- Remove the influence of the Bowron Lake Provincial Park forest area from the old and mature+old requirement (model TFL 52 as a stand-alone area);
- Include early seral stage requirements for draft LU and biodiversity emphasis;
- Use unadjusted FPC Biodiversity Guidebook old growth requirements by LU-BEC/NDT and draft emphasis;
- Use low-intermediate-high requirements weighted 45%-45%-10% on the draft LU-BEC/NDTs established for the Base Case; and
- Alternative emphasis on the draft LUs as noted in Table 11.1.

12.0 20-YEAR SPATIAL FEASIBILITY OPTION

This option will evaluate the timber supply impacts of modelling WFM's current 5-Year and 20-Year plans. The Base Case assumptions will be included for THLB, growth and yield and management requirements (forest cover constraints). This option will allow WFM to compare the 20-year harvest developed by CASH6 with the mapping plans they have produced.

12.1 Cutblock Design

WFM planning staff and their consultants developed cutblock locations. All FPC and current CCLUP guidelines were considered during this exercise, which included map and air-photo review as well as local knowledge.

Areas that were not assigned to cutblocks during the 20-Year Plan mapping exercise have been "blocked" using GIS. All areas within the productive forest land base are now part of a cutblock, although some of these will never be eligible for harvest because of exclusions for riparian, inoperable, caribou, *etc.*

12.2 CASH6 Modelling

This option will include full spatial referencing for selection of harvest cutblocks. All of the Base Case forest cover constraints for VQOs, wildlife and biodiversity will be considered during the assessment of harvest eligibility. In addition, each of the harvest candidate's neighbouring cutblocks will be reviewed for silviculture green-up. For the analysis silviculture green-up will be 3 metres.

The following conditions must be met for harvest of the candidate block to proceed:

- All neighbouring blocks are at least 3 metres in height;
- None of the forest cover constraints will be violated by harvesting the candidate; and
- All of the stands within the cutblock are older than minimum harvest age.

If any of these conditions is not met then the cutblock will not be harvested until a later time.

The 5-Year and 20-Year cutblocks will be targeted for harvest during modelling. This target assignment will be based on each five year quarter of WFM's 20-Year Plan. If the harvest objective is not met using these target cutblocks then the model will choose other blocks that are not part of either Plan in order to satisfy the harvest objective.

Results of the 20-Year spatial feasibility harvest will be mapped to show the distribution of the harvest and whether the model harvested the WFM cutblocks during the same period as indicated in the 20-Year Plan.

APPENDIX I – Base Case Land Base Classification (Netdown) Map

APPENDIX II – Potential Site Indices for Commercial Tree Species on TFL 52 (JS Thrower Report)

Potential Site Indices for Major Commercial Tree Species on TFL 52

FINAL REPORT

Prepared for

Earl Spielman, RPF
West Fraser Mills Ltd.
Quesnel, BC

Project: WFQ-101-018

March 15, 2000

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

Executive Summary

Potential site index (PSI) estimates were developed for lodgepole pine (Pl), interior spruce (Sx), subalpine fir (Bl), and Douglas-fir (Fdi) for the forested ecosystems on TFL 52. The intent is to use these PSI estimates to generate managed stand yield tables (MSYTs) for the upcoming timber supply analysis for Management Plan 3.

Preliminary PSI estimates were developed for the target species and site series on the TFL to provide a basis for subsequent adjustments. Final PSI estimates were developed using four different methods: 1) statistical adjustments of Pl and Sx in the SBSwk1 and SBSmw using data from random sampling on the TFL; 2) unadjusted preliminary PSI for the minor subzones of the TFL; 3) Ministry of Forests (MOF) site index conversion equations for Bl and Fdi; and 4) elevation models for the ESSF subzones.

The statistical adjustments increased the preliminary PSI of Pl and Sx in the SBSmw by 7.0% and 8.2% respectively. The adjusted estimates resulted in an area-weighted average PSI of 24.4 m for Pl and 22.6 m for Sx for the SBSmw.

In the SBSwk1, preliminary PSI estimates were decreased by 3.1% for Pl and 3.0% for Sx following the statistical adjustments. The adjusted estimates resulted in an area-weighted average PSI of 20.3 m for Pl and 18.6 m for Sx for the SBSwk1.

MOF site index conversion equations resulted in an area-weighted average PSI of 22.7 m for Bl and 21.8 m for Fdi in the SBSmw, and 19.1 m and 18.1 m, respectively, in the SBSwk1. Adjusted Sx PSI estimates were used to generate Bl PSI and adjusted Pl PSIs were used for Fdi.

The elevation models used for the ESSF subzones generated a final average PSI of 14.6 m for Pl, 12.7 m for Sx, and 12.4 m for Bl in the ESSFwc3 and 16.9 m, 15.0 m, and 14.8 m, respectively, in the ESSFwk1.

The final PSI estimates should be used to generate MSYTs for the upcoming timber supply analysis as they better reflect growth in PHR stands than site index estimates from the current forest cover inventory. However, these estimates should be monitored and updated as new information becomes available.

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1. INTRODUCTION

1.1 BACKGROUND

Site index is the most important variable for predicting the growth and yield of existing and future post-harvest regenerated (PHR) stands with the models commonly used in BC. Large errors in predicted future growth can occur if site indices do not adequately reflect actual tree and stand growth. Accordingly, it is important that the site indices used for PHR stands in timber supply adequately reflect expected growth.

The problem in many areas of BC is that site indices estimated from natural stands do not adequately reflect the growth observed in PHR stands. This problem is most severe in lodgepole pine (Pl) stands where height growth repression has occurred because of high densities that regenerate after wildfire. Potential site index (PSI) under-estimation also occurs in older spruce (Sx) stands due to undetected height loss in older trees and from using curves that use height growth patterns in young spruce stands to predict growth rates of older stands.

The problem on Tree Farm Licence (TFL) 52 is that the current forest inventory gives estimates of site that were largely estimated from repressed Pl stands and old Sx stands. The site indices in the inventory may under-estimate the growth expected in post harvest and regenerated (PHR) stands for 75% of the productive forest landbase (PFLB) (Appendix I). The Provincial Chief Forester identified this problem in the last timber supply analysis report and stated the need for more reliable site productivity estimates. Accordingly, West Fraser Mills Ltd. initiated this project to help address this problem and provide more reliable site index estimates for PHR stands in the upcoming timber supply analysis.

1.2 PROJECT OBJECTIVES

The main objective of this project was to:

> *Develop reliable estimates of PSI for the major commercial tree species in PHR stands and the major ecosystems on TFL 52.*

The target species were Pl and Sx; secondary species were sub-alpine fir (Bl) and Douglas-fir (Fdi). The intent was to develop PSI estimates to use with other inventory and silviculture information to generate managed stand yield tables (MSYTs) for the Management Plan 3 timber supply analysis.

1.3 TERMS OF REFERENCE

This project was completed for West Fraser, Quesnel Division. The project coordinator for West Fraser was Earl Spielman, *RPF*. Tara McCormick, *BSc*, was project manager for J.S. Thrower & Associates Ltd.

available information and expertise to develop reliable estimates for the local conditions on TFL 52.

Preliminary PSI estimates were applied to each eco-polygon (based on Terrestrial Ecosystem Map [TEM] completed by GEOWEST Environmental Consultants) for the primary target species (Pl and Sx) in the PFLB. Average PSI estimates were computed for each polygon using the PSI for each species weighted by the proportionate area of each site series. The preliminary estimates resulted in an average PSI of 19.4 m for Pl and 17.6 m for Sx in the PFLB (Table 2).

2.3 Field Sampling

2.3.1 Objective

The objective was to measure actual tree growth and estimate PSI from a representative sample of stands and ecological conditions in the TFL. The field estimates would then be compared to the preliminary estimates and a ratio computed reflecting the difference between the two. This ratio would then be used to adjust all preliminary PSI estimates for the target population.

2.3.2 Sample Population

The sample population was all Pl-leading stands 15-80 years and Sx-leading stands 18-80 years in all subzones in the TFL (except the ESSFwc3)(35,873 ha).[2] This area included stand conditions where PSI could be estimated from ground measurements of tree height and age for Pl and Sx. Minimum sampling age was 10 years above breast height.

Site index observations were collected in the SBSmw, SBSwk1, and ESSFwk1 for Pl, Sx, Bl, and Fdi. However, statistical adjustments will not be made in the ESSFwk1 and for secondary species (Bl and Fdi) because of a limited number of observations.[3] Therefore, only SBSmw and SBSwk1 observations are reported. The plot distribution in these two subzones is representative of the area ratio of the two sampled subzones in the PFLB (Figure 1).

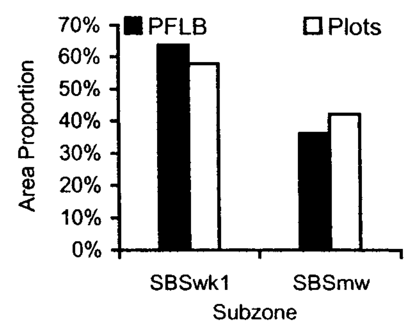

Figure 1. Area distribution of subzones in the PFLB and the selected sample.

2.3.3 Sample Size and Allocation

One hundred sample locations were selected from a list of polygons sorted by mapsheet, BEC subzone, elevation, site index class, and site series. This ensured that samples were distributed

[2] Area summary based on forest cover from February 16, 1999.

[3] A high rejection rate in the ESSFwk1 (44% rejection) resulted in few observations. Plots were rejected due to: the presence of Sx or Bl residuals, exceeding maximum age criteria, and absence of suitable top height trees for site index estimation.

were upgraded to SIBEC standards with the allocated time and budget. Access notes and GPS coordinates can be used to relocate plots in the future for possible upgrade to SIBEC standards (Appendix III).

2.4 Final PSI Estimates

2.4.1 Statistical Adjustment of Preliminary PSI Estimates

The preliminary PSI estimates for each eco-polygon in the SBSmw and SBSwk1 were adjusted using the ratios developed to reflect the relationships between the preliminary PSI estimates and the field estimates. Different ratios were tested and one selected for adjustment by species and subzone. The coefficients of the model were estimated using weighted least squares without intercept, where the predictor variable (average estimated site index for each cluster) was weighted by the area in the cluster where site index was estimated. All ratio statistics are independent of the number of site trees in the cluster.

2.4.2 Unadjusted Preliminary PSI Estimates

Statistical adjustments were not applied to the PSI estimates in the ICHmk3, ICHwk4, SBSdw1, and SBSmh because these minor subzones had limited sampling opportunities. Hence, the unadjusted preliminary estimates will be used in the timber supply analysis for these subzones (1.4% of the PFLB)(Appendix II).

2.4.3 Site Index Conversion Equations

The PSI estimates for Bl and Fdi were developed using the MOF site index conversion equations[7] and the adjusted Pl and Sx PSI estimates. Sx was used to estimate Bl, and Pl was used for Fdi.

2.4.4 Elevation Model

Statistical adjustments were not applied to the PSI estimates in the ESSFwk1 and ESSFwc3 due to a lack of sampling opportunities in high elevation areas. However, an elevation model, based on expert opinion, provided PSI estimates for these subzones.

[7] Nigh, Gordon, D. 1997. Revised growth intercept models for lodgepole pine: comparing northern and southern models. Extension Note #11. BC Ministry of Forests, Research Branch, Victoria, BC.

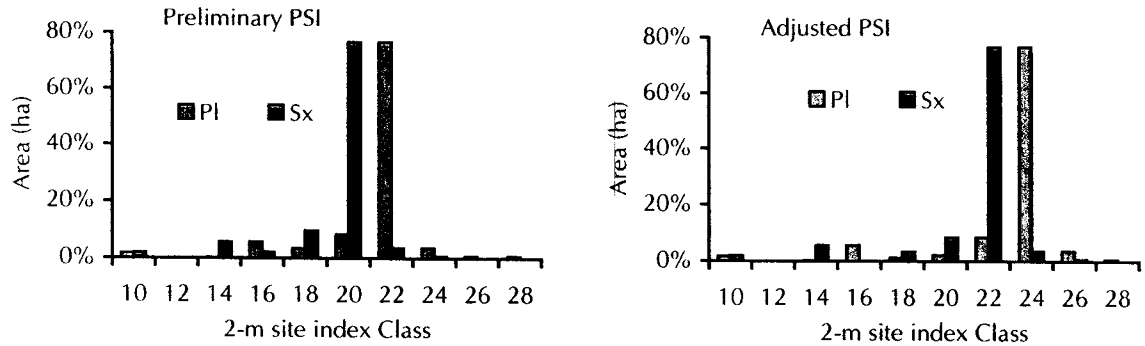

Figure 3. Area distribution of Pl and Sx preliminary and adjusted site indices in the SBSmw.

Table 5. Sample size, and ratio statistics.

Subzone	Spp	N	Ratio	SE of ratio	CI of ratio (95%)	Avg Prelim PSI (m)	Avg Adj PSI (m)	SE of Adj PSI (m)	CI of Adj PSI (m) (95%)
SBSmw	Pl	27	1.070	0.024	[1.020, 1.120]	22.8	24.4	0.6	[23.3,25.5]
	Sx	24	1.082	0.033	[1.013, 1.151]	20.9	22.6	0.7	[21.2,24.0]
SBSwk1	Pl	18	0.969	0.041	[0.883, 1.056]	20.9	20.3	0.9	[18.4,22.1]
	Sx	23	0.970	0.041	[0.886, 1.055]	19.2	18.6	0.8	[17.0,20.2]

3.1.3 SBSwk1

The statistical adjustments in the SBSwk1 resulted in a decrease to the preliminary PSI estimates of 3.1% for Pl and 3.0% for Sx. The final adjusted estimates are similar to the preliminary estimates (Figure 5). However, since the adjustment ratios were less than one for both Pl and Sx, some of the area for both species has shifted down by one 2-m site index class in the final adjusted estimates.

SBSwk1:

Adjusted Pl SI = 0.969 prelim Pl SI
Adjusted Sx SI = 0.970 prelim Sx SI

The adjusted estimates resulted in an area-weighted average PSI of 20.3 m for Pl and 18.6 m for Sx for the SBSwk1. A 95% sampling error of ±1.8 m was achieved for Pl and ±1.6 m for Sx (Table 5).

3.3 Elevation Model

The elevation model used expert opinion and previous studies to predict the effects of elevation on tree productivity.[8,9] Preliminary PSI estimates were developed for Sx, Bl, and Pl for a reference elevation in the two ESSF subzones (Bl was converted from Sx) (Appendix II). The preliminary estimates were assigned to the TEM polygons in the ESSF, then one of the following formulae was applied to each polygon as a function of elevation, leading species, and subzone (from TEM, forest cover, and TRIM data):

Table 6. Final PSI statistics (m) for the ESSF.

Subzone	Area(ha)	Spp	Avg	Min	Max
ESSFwc3	28,601	Pl	14.6	7.4	19.0
		Sx	12.7	5.4	18.0
		Bl	12.4	5.7	17.0
ESSFwk1	69,132	Pl	16.9	7.4	19.0
		Sx	15.0	6.0	19.0
		Bl	14.8	6.0	18.0

Subzone	Formula
ESSFwk1:	
<= 1,300 m:	PrelimPSI
>1,300 m:	PSI = PrelimPSI – ((Elevation – 1,300 m)/100)
ESSFwc3:	
<= 1,500 m:	Prelim PSI
>1,500 m:	PSI = PrelimPSI – ((Elevation – 1,500 m)/100)

The final average adjusted PSI estimates were 14.6 m for Pl, 12.7 m for Sx, and 12.4 m for Bl in the productive forest of the ESSFwc3, and 16.9, 15.0, and 14.8 m, respectively, in the ESSFwk1 (Table 6).

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[8] Klinka, K., Q. Wang, R. Carter and H. Chen. March 1996. Height growth-elevation relationships in subalpine forests of interior British Columbia. The Forestry Chronicle. Volume 72, No. 2. pp. 193-198.
[9] Klinka, K. and Q. Wang. 1996. Relations between site index of Engelmann spruce, lodgepole pine, and subalpine fir and the measures of site quality in the ESSF zone. 1994-1995 Progress Report submitted to Growth and Yield Section, Inventory Branch, Ministry of Forests, Victoria, BC. 63 pp.

expected to be perfect and polygon labels may contain some error. This is an expected component of mapping forest cover, ecological attributes, and all other forms of mapping.

4.2.5 Different Bias Trends in the Preliminary PSI Estimates

Adjustment ratios were calculated by subzone/species combinations. This implied that the direction and magnitude of the bias associated with the preliminary PSI estimates were constant within a subzone. This assumption might not always be true.

i) SBSmw/05

The SBSmw/05 was assigned a preliminary PSI of 20 m for Pl and 18 m for Sx. However, field estimates showed an average site index of 21.7 m for Pl and 22.2 m for Sx. Preliminary PSIs were based on inferred trends in productivity for a given site series. The 05 site series was assumed to have decreased productivity (less than zonal) due to cold, moist soils indicated by the predominance of *Spirea douglasii* (pink spirea) on these sites. However, field observations and discussions with Ray Coupé suggested that *Spirea douglasii* is not necessarily a strong indicator of poor productivity in TFL 52 and is present on sites without frost effects. Hence, the preliminary PSI for Pl and Sx may have under-estimated actual PSI on this relatively frequent site series.

ii) SBSwk1/03

Field observations suggest that PSI was under-estimated for the SBSwk1/03 site series. Preliminary estimates for Pl and Sx were 15 m and 13 m, respectively. Field averages were 20.6 m for Pl and 16.1 m for Sx. Relatively low PSI estimates were assigned to this site series, which is often characterized by dry, sandy, glacio-fluvial soils with poorer productivity. The average PSI may have been under-estimated for these sites on the TFL, especially those in complexes with 01 sites. This potential under-estimate has a significant impact on the Pl adjustment ratio as two points from SBSwk1/03 sites are above the 95% confidence interval of the observations and are influential points (Figure 4).

4.3 POSSIBLE OVER-ESTIMATES FOR SX

The current MOF growth intercept equations may over-estimate the PSI of Sx in young PHR stands. A reason for this potential over-estimate is the difference in height-growth patterns in the natural stands used to develop the growth intercept equations and the young PHR stands where the equations are applied. Anecdotal evidence suggests that the height-growth pattern of Sx growing in PHR conditions is more linear than in natural stands. This could result in over-estimates of site index when site index prediction equations are based on the more curvilinear natural stands. A brief comparison of the inventory estimates of PSI stands in age classes 3-6 (where good estimates can be assumed) shows the growth intercept-based estimates are only 0.6 m higher. This small difference provides some comfort that potential over-estimates may be small.

5. RECOMMENDATIONS

The major recommendations from this project are:

1. **Use the adjusted PSI estimates in the MP 3 timber supply analysis**
   These new PSI estimates should provide better estimates of growth and yield expected from existing and future PHR stands on the TFL. Thus, we recommend these estimates be used to generate the MSYTs for existing and future PHR stands on the TFL for the timber supply analysis for MP 3.

2. **Frequently update these PSI estimates**
   These PSI estimates should be updated and refined before each subsequent timber supply analysis. This will ensure the most recent and best information is used and incorporated into the planning process. Potential sources of new information of PSI in PHR stands include silviculture surveys, growth and yield monitoring plots, special surveys, and special projects.

3. **Improve PSI estimates in the ESSF**
   There was not enough PHR stand area in the ESSF to estimate PSI on the TFL and develop statistically-based adjustment ratios for these higher elevation areas. The PSI estimates developed using expert opinion and the elevation model should provide reasonable estimates that are an improvement over the inventory estimates. However, we recommend that special studies be completed to further quantify site productivity in these higher elevation areas before the next timber supply analysis for MP 4.

4. **Monitor PHR stand growth and yield**
   There is uncertainty in these PSI estimates resulting from the sampling and site index prediction methods. Thus, we recommend that PHR stands on the TFL be periodically monitored to ensure the PSI estimates and the associated growth and yield continue to adequately represent the actual conditions of the TFL.

Table 9. Age class distribution (ha) by species.

Spp	Age Class 1	2	3	4	5	6	7	8	9	Total (ha)	Total (%)
Sx	26,276	6,200	1,583	2,787	5,374	6,935	3,799	64,363	5,498	122,816	53.3%
Pl	10,662	3,490	707	4,553	12,880	14,850	5,709	10,518	80	63,449	27.5%
Bl	1,210	5,433	652	1,337	2,847	3,210	2,456	16,828	994	34,968	15.2%
Fdi	203	397	15	0	189	178	318	1,015	141	2,455	1.1%
Cw	22							35		56	0.0%
Decid.	1,743	662	807	894	924	1,410	166	77		6,683	2.9%
Total (ha)	40,115	16,183	3,763	9,571	22,213	26,585	12,448	92,836	6,713	230,427	
(%)	17.4%	7.0%	1.6%	4.2%	9.6%	11.5%	5.4%	40.3%	2.9%		

Note: There is 4,703 ha (2%) considered Not Sufficiently Restocked (NSR), for a total PFLB of 235,131 ha.
Shaded area represents area for which site index can be considered accurate in the current inventory.

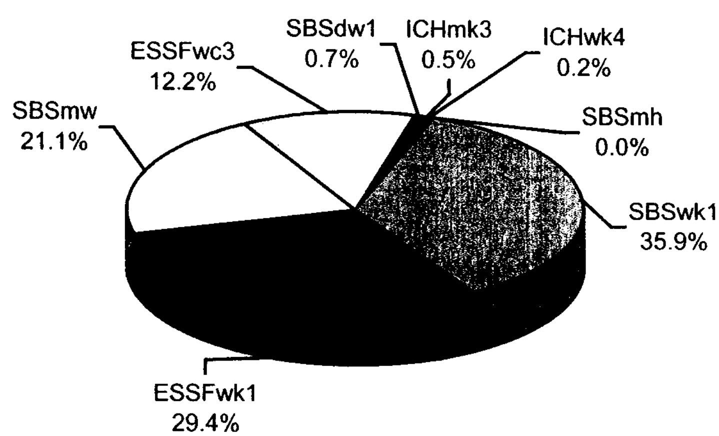

Figure 7. Area distribution (%) by subzone.

8. APPENDIX III – SIA PLOTS SUITABLE FOR SIBEC

Plot/Subplot	Subzone	Site Series[a]	Species	Access
27-1	SBSwk1	04	Fdi	580 m
27-3	SBSwk1	04	Sx	580 m
36-1	SBSwk1	01	Sx	4000 m
50-4	SBSwk1	05	Bl	225 m
51-1	ESSFwk1	01	Sx	1070 m
51-4	ESSFwk1	01	Sx	1070 m
54-4	SBSmw	06	Sx	510 m
70-1	SBSwk1	04	Sx	520 m
75-1	ESSFwk1	01	Pl	1000 m
92-1	SBSmw	01	Fdi	585 m
92-4	SBSmw	01	Fdi	585 m
92-5	SBSmw	01	Pl	585 m
95-1	SBSmw	01	Sx	Heli
95-2	SBSmw	01	Sx	Heli
95-3	SBSmw	01	Sx	Heli
95-4	SBSmw	01	Fdi	Heli

[a] site series classification based on visual estimate only
Access represents distance from tie point.

APPENDIX III – Yield Table Summary Report, West Fraser Mills TFL 52 (JS Thrower Report)

Yield Table Summary Report
West Fraser Mills TFL 52 - Quesnel

Prepared for

Earl Spielman, RPF
West Fraser Mills Ltd.
Quesnel, BC

Project: WFQ-101-017

May 4, 2000

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

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1. INTRODUCTION

1.1 Terms of Reference

These yield tables for TFL 52 were prepared for Earl Spielman, *RPF* of West Fraser Mills Ltd. (West Fraser), Quesnel, BC. These tables will be used for the TFL 52 timber supply analysis for management plan (MP) 3 that will be completed by Timberline Forest Inventory Consultants (TFIC). These tables were prepared by Guillaume Thérien, *PhD.*

1.2 Objectives

The purpose of this report is to: 1) document the inputs for these yield tables; 2) summarize the output from these tables; and 3) provide information for West Fraser to review to ensure the yield tables reflect the intended application and conditions of the TFL.

1.3 Overview

Natural stand yield tables (NSYTs) were developed using *Batch VDYP* (version 6.0a) and the forest-cover information from the 1999 TFL re-inventory (Appendix I). The managed stand yield tables (MSYTs) were developed using *Batch TIPSY* (version 2.5r) and included:

1) Improved estimates of potential site index (PSI) for post-harvest regenerated (PHR) stands using the results of the recently completed site index adjustment (SIA) project and Terrestrial Ecosystem Map (TEM).
2) Silviculture regimes for future PHR stands developed by West Fraser.
3) Impacts of planting improved stock in future PHR stands (yield increase).
4) Improved estimates of OAF1 using information from the TEM.
5) Considerations of the potential impact of the spruce weevil (no change, see Appendix II).

1.4 Stakeholders

The stakeholders involved in developing these tables are:

West Fraser	Earl Spielman - coordinating the technical aspects of the TFL including growth and yield, inventory, and the TEM. Al Hunter - TFL Forester responsible for the MP.
MOF	Albert Nussbaum (Research Branch) - yield table approval.
CFS	Rene Alfaro - helped develop approaches to including weevil effects in the MSYTs.

TFIC Bill Kuzmuk - timber supply analysis.

JST Guillaume Thérien - yield tables.
Jim Thrower - interface with West Fraser and project direction.
Ron Zayac - GIS support to generate the data, maps, etc.

1.5 Yield Table Inputs - Overview

Three types of yield tables were generated for TFL 52:

1) Existing natural stands (age class 2 or older)
2) Existing PHR stands (age class 1).
3) Future PHR stands (entire landbase, including NSR areas).

The yield tables were generated for all polygons resulting from an overlay of the new forest cover and TEM polygons. The large number of yield tables were aggregated to reduce the total number of tables. Yields were generated for all species at 12.5 cm+ and 17.5 cm+ utilization limits.

Table 1. Summary of yield table inputs, data sources, models and outputs.

	Existing Natural Stands	Existing PHR Stands	Future Stands (all PHR)
Inputs			
Modeling Unit	Mapsheet/Polygon	TEM polygons	TEM polygons
Model	Batch VDYP (6.0a)	Batch TIPSY (2.5r)	Batch TIPSY (2.5r)
Age Class	2+	1	All
Area	193,937 ha	46,154 ha (excluding 447 ha NP area)	233,693 ha (excluding 8,750 ha NP area)
Proportion of PFLB	80%	19%	99%
Stand Description	1999 Re-inventory	Silviculture Regimes	Silviculture Regimes
Site Index	1999 Re-inventory (15.1 m average - all spp)	PSI from SIA (19.7 m average - all spp)	PSI from SIA (18.8 m average - all spp)
OAF1	N/A	7.5% + NP area in subzone (11% on average)	7.5% + NP area in subzone (11% on average)
Tree Improvement	N/A	N/A	Pl and Fdi +5% for volume; Sx +8% for volume
Outputs			
Average MAI	2.1 m^3/ha/yr	5.0 m^3/ha/yr	4.8 m^3/ha/yr
Average Culm Age	119 yrs	73 yrs	79 yrs

2. EXISTING NATURAL STANDS

2.1 Description

Existing natural stands are stands greater than 20 years of age. Forest cover information was based on the 1999 TFL re-inventory. The modeling unit was mapsheet, polygon, and subzone. The inventory database included 24,563 records covering 193,937 ha. Most polygons were less than 10 ha and the largest polygon was 300 ha (Figure 1).

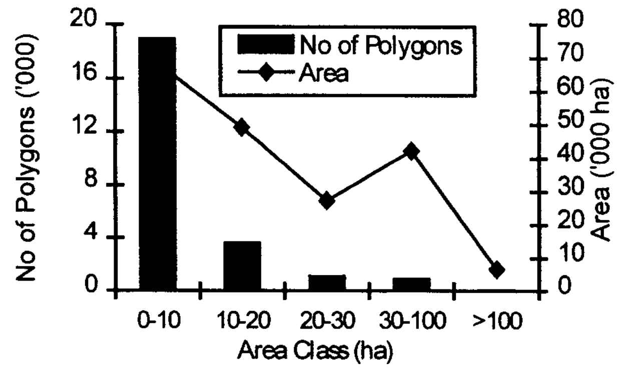


Figure 1. Distribution of polygons for existing natural stands by area class.

2.2 Site Index, Species Composition, & Stand Density

The inputs for VDYP for the NSYTs were taken from the 1999 TFL re-inventory database. The site index of the existing natural stands averaged 15.1-m for all species combined[1] (15.2 m for Sx, 11.5 m for Bl, and 18.7 m for Pl). Most area was in the 10-20 m site index class (all species) (Figure 2). Stand density for VDYP is represented by

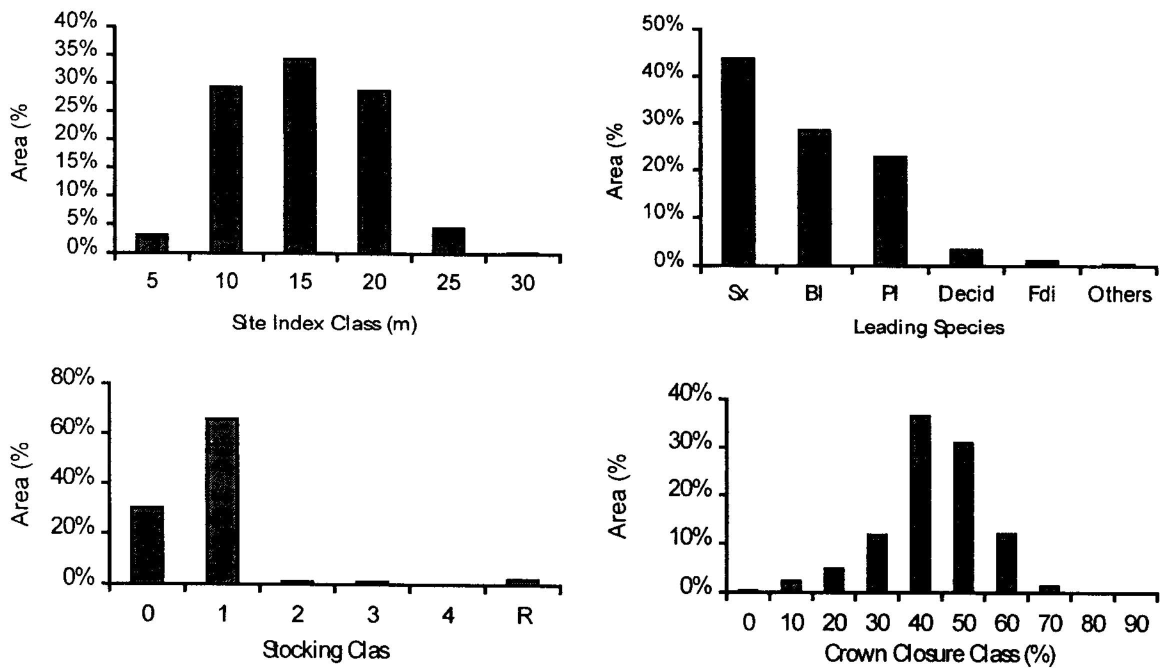


Figure 2. Area distribution for existing natural stands (site index, species, stocking class, and crown closure).

[1] The area-weighted average site index (all species) in MP 2 was 14.4-m for natural stands. This was computed from tables 20-23 in the MP 2 data package based on the old TFL inventory.

crown closure that averaged about 43% in the existing natural stands (Figure 2).

2.3 Balsam IU Stands

No special consideration was given to adjust growth and yield estimates for the approximately 10,000 ha of balsam IU (intermediate utilization) stands on the TFL. These partially-cut stands generally have lower stocking and a different vertical structure than undisturbed stands of similar origin. These differences and their growth and yield impacts should be adequately accounted for by using VDYP with the new forest-cover attributes. These IU stands were extensively cruised in 1995, 1996, 1998 and 1999 and this information was used to update the inventory for these areas.

2.4 CCLUP

No issues or activities were identified relating to implementing the CCLUP that will affect the development of the NSYTs. However, further development of the timber supply analysis base case and alternate scenarios may result in the need to generate different NSYTs to reflect modified cutting in VQO, Cariboo habitat, watershed, or riparian areas.

3. EXISTING PHR STANDS

3.1 Description

Existing PHR stands were all stands 1-20 years of age (age class 1). The polygons to generate the MSYTs were defined by the existing forest cover and the TEM coverage was used to assign the appropriate silviculture regime that describes stand conditions. PSI was assigned using the TEM and TRIM to modify predictions in the ESSF using elevation. The modeling unit was biogeoclimatic site series and PSI.

3.2 Silviculture Regimes

Silviculture regimes were developed by West Fraser to describe the conditions of existing and future PHR stands (Appendix III). These regimes were developed by site series and describe species composition, stand density, and treatments. These regimes represent current activity, which is also expected to represent future PHR stands. A regeneration delay of two years was assumed on all sites. Regeneration delay is applied in the timber supply analysis process and was not included in the MSYTs.

3.3 Potential Site Index

The PSI of each eco-polygon was assigned using the results of the recently completed SIA project.[2] The overall average PSI for existing PHR stands (all species) was 19.7 m (Table 2). Most area of existing PHR stands is in the 20-m site index class (Figure 3). The overall average site index used for existing PHR stands in MP 2 was about 15.7 m.[3]

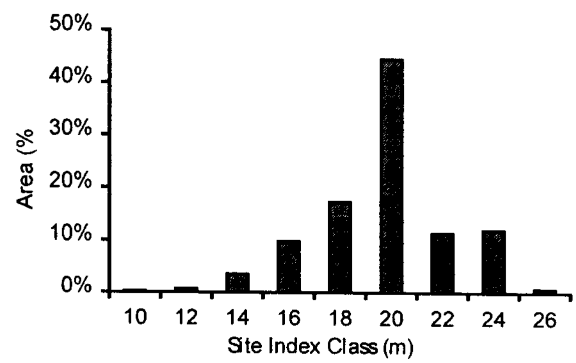


Figure 3. Proportion of area by site-index class for existing PHR stands.

Table 2. PSI statistics (m) for existing PHR stands.

Spp	Area (ha)	Avg.	Min.	Max.	SD
Pl	37,871	19.7	9.1	25.7	2.4
Sx	8,282	19.9	10.2	26.0	3.1

3.4 Stand Density & Species Composition

Stand density and species

[2] J.S. Thrower & Associates Ltd. 2000. Potential Site Indices for Major Commercial Tree Species on TFL 52. Contract Rep. to West Fraser Mills Ltd., Quesnel, BC JST Contract WFQ-101-018, March 15, 2000. 18 pp.
[3] Computed from table 28 in the revised MP 2 data package (page 41).

composition at establishment were estimated using results from free-growing surveys as reflected in the silviculture regimes. Stand density at establishment was estimated by adding 10% to the free-growing densities. This was to account for mortality during this period. The free-growing densities averaged about 2,190/ha ranging from about 1,100 to 2,400/ha (Figure 4). Balsam (Bl) was modeled in Tipsy as white spruce, while aspen (At) was modeled as lodgepole pine.

Table 3. Area by species composition for existing PHR stands.

Area (ha)	%	Sp1	%	Sp2	%	Sp3	%
18,300	39.6%	Pl	70	Sx	25	At	5
10,496	22.7%	Pl	60	Sx	40		
6,752	14.6%	Pl	70	Sx	30		
6,665	14.4%	Sx	70	Pl	30		
1,274	2.8%	Pl	100				
965	2.1%	Se	60	Pl	30	Bl	10
538	1.2%	Pl	60	Sx	30	Fd	10
358	0.8%	Sx	50	Pl	50		
294	0.6%	Sx	80	Pl	20		
215	0.5%	Pl	75	Fd	20	At	5
212	0.5%	Pl	50	Sx	50		
67	0.1%	Pl	70	Se	30		
15	0.0%	Pl	50	Sx	30	Fd	20
3	0.0%	Pl	90	At	10		
1	0.0%	Sx	60	Pl	30	Fd	10
46,15	100%						

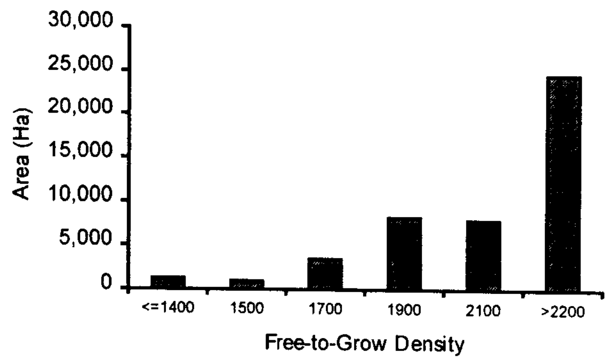


Figure 4. Distribution of stand density at free-growing for existing PHR stands.

The species composition at establishment was assumed the same as at free-growing. There were 15 different species compositions assumed among the different site series (Table 3) and most were Pl-Sx mixes.

3.5 Operational Adjustment Factors

The OAF1 estimate for existing PHR stands was localized to the TFL using the recently completed TEM. This was done by assuming a base OAF1 of 7.5% where an additional amount was added to account for NP areas described within eco-polygons. This additional NP area was approximated using the proportion of NP site series in each subzone (Table 4). The standard MOF OAF2 of 5% was used for all subzones.

3.6 Treatments

3.6.1 Genetic Gain

Genetically improved stock has been planted on the TFL since 1998, however, no yield increases were added to the MSYTs for existing PHR stands. Yield increases will be modeled for future PHR stands (Section 4.6.1).

3.6.2 Commercial Thinning

No commercial thinning (CT) was assumed for existing PHR stands. However, the potential to use CT to help alleviate possible adjacency constraints may be examined if preliminary timber supply analyses suggests that this may be a limiting factor.

3.6.3 Juvenile Spacing

Some existing PHR stands on the TFL have been spaced, however, this was not explicitly included in the MSYTs for existing PHR stands. The effects of spacing on stand growth and yield were considered adequately incorporated in stand descriptions in the silviculture regimes.

3.6.4 Fertilization

No fertilization of existing PHR stands has occurred on the TFL, thus no adjustments were made to the MSYTs.

3.7 Miscellaneous

3.7.1 Utilization Limits

Yield tables were generated for 12.5 cm and 17.5 cm limits for all species.

3.7.2 Weevil

The OAF1 estimates are considered to include yield reductions associated with endemic levels of weevil attack for about 2-3% reduction in overall stand yield. No additional reductions in yield were made to the MSYTs for existing PHR stands to account for past or potential future attack (Appendix II). Surveys completed in the summer of 1999 suggest that weevil attack on the TFL is not significantly above expected endemic levels, thus no extra reductions were made.

Table 4. OAF1 by subzone.

Subzone	Area			
	Total (ha)	NP (ha)	NP (%)	New OAF1
SBSwk1	86,169	2,781	3.2%	10.7%
ESSFwk1	70,059	1,547	2.2%	9.7%
SBSmw	50,559	1,253	2.5%	10.0%
ESSFwc3	32,109	2,854	8.9%	16.4%
SBSdw1	1,699	84	5.0%	12.5%
ICHmk3	1,076	11	1.0%	8.5%
ICHwk4	456	0	0.0%	7.5%
ESSFwcp3	219	219	100.0%	100.0%
SBSmh	99	1	1.1%	8.6%
Total	242,444	8,750	3.6%	11.1%

3.7.3 CCLUP

There were no considerations of the CCLUP identified that affect development of the MSYTs for existing PHR stands.

4. FUTURE PHR STANDS

4.1 DESCRIPTION

Future PHR are all stands that currently do not exist, but that will exist in the future when existing stands are harvested and regenerated, including stands that are currently NSR. The MSYTs for future PHR stands were generated considering only TEM polygons, TRIM to estimate elevation and refine PSI, and the silviculture regimes to define stand attributes. The modeling unit was biogeoclimatic site series and PSI.

4.2 SILVICULTURE REGIMES

The same silviculture regimes (Appendix III) used for existing PHR stands were also used for future PHR stands. A regeneration delay of two years was again assumed on all sites, and will be applied in the timber supply process (not in the MSYTs).

4.3 POTENTIAL SITE INDEX

The PSI for future PHR stands was also assigned using the results of the SIA project (the same as for existing PHR stands). The average PSI for future PHR stands was 19.3 for Pl and 17.4 m for Sx, with most area in the 20-m site index class (Table 5, Figure 5). About 40% of the Sx-leading PHR stands were in the ESSFwc3 where the productivity is lower, which accounts for the lower overall Sx site index.

Table 5. PSI statistics (m) for future PHR stands.

Spp	Area (ha)	Avg.	Min.	Max.	SD
Pl	169,022	19.3	7.9	25.7	3.0

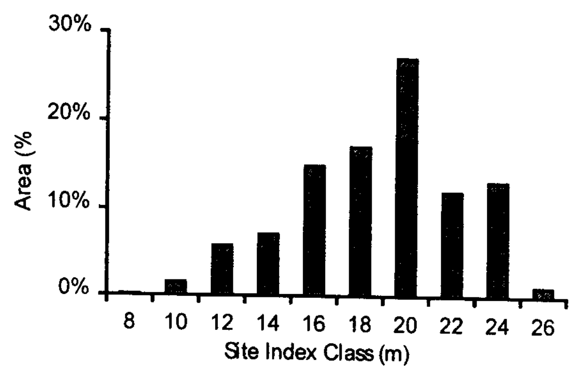


Figure 5. Proportion of area by site-index class for future PHR stands.

4.4 STAND DENSITY & SPECIES COMPOSITION

The stand density and species composition of future PHR stands were as described in the silviculture regimes (Appendix III). The densities at time of free-growing averaged about 2,050/ha and ranged from about 1,100 to 2,400 stems/ha (Figure 6). Establishment density was assumed to be 10% higher than the density at free-growing (to account for mortality between time of establishment and free-growing). The species composition for future PHR stands were as described by the silviculture regimes (Table 6). Balsam (Bl) was modeled in Tipsy as white spruce, while aspen (At) was modeled as lodgepole pine.

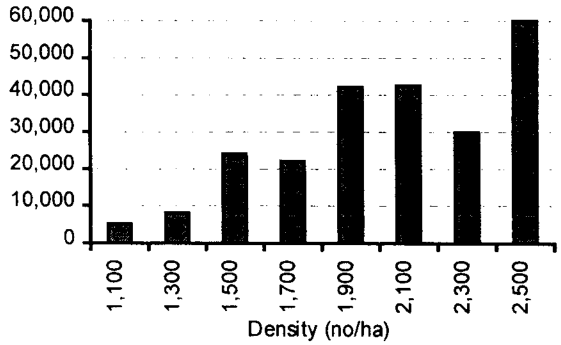


Figure 6. Distribution of FTG densities (future PHR).

Table 6. Species composition for future PHR stands.

Area (ha)	%	Sp1	%	Sp2	%	Sp3	%
69,056	29.6%	Pl	70	Sx	25	At	5
59,558	25.5%	Pl	60	Sx	40		
34,012	14.6%	Sx	70	Pl	30		
25,968	11.1%	Se	60	Pl	30	Bl	10
24,910	10.7%	Pl	70	Sx	30		
6,302	2.7%	Pl	100				
3,287	1.4%	Pl	70	Se	30		
3,198	1.4%	Sx	50	Pl	50		
2,268	1.0%	Pl	50	Sx	50		
1,720	0.7%	Pl	75	Fd	20	At	5
1,453	0.6%	Sx	80	Pl	20		
965	0.4%	Pl	50	Sx	30	Fd	20
801	0.3%	Pl	60	Sx	30	Fd	10
135	0.1%	Pl	90	At	10		
40	0.0%	Sx	60	Pl	30	Fd	10

4.5 Operational Adjustment Factors

The OAF1 and OAF2 for future PHR stands were the same as those for existing PHR stands (Table 4).

4.6 Treatments

4.6.1 Genetic Gain

Stock from class A seed has been planted for Sx on the TFL since 1998, and by 2005 all Pl and Fdi seedlings will be from class A seed. Expected volume gain from this seed was estimated as 8% for Sx and 5% for Pl and Fdi. Improved stock was not assumed to be planted on low productivity site series. These low productivity sites usually account for less than 4% of area within a given subzone. No planting of improved stock was assumed for the ESSFwc3.

Table 7. Area by subzone with and without tree improvement.

Subzone	With Tree Improvement (ha)	(%)	Without Tree Improvement (ha)	(%)
ESSFwc3	0	0.0%	29,254	100.0%
ESSFwk1	67,313	98.2%	1,200	1.8%
ICHmk3	1,065	100.0%	0	0.0%
ICHwk4	456	100.0%	0	0.0%
SBSdw1	1,593	98.7%	22	1.3%
SBSmh	95	97.3%	3	2.7%
SBSmw	47,793	96.9%	1,513	3.1%
SBSwk1	80,394	96.4%	2,994	3.6%
Total	198,709	85.0%	34,985	15.0%

4.6.2 Commercial Thinning

CT will not be included in the timber supply analysis, unless preliminary results suggest there may be a problem with adjacency and that CT may help alleviate the problem.

4.6.3 Juvenile Spacing

Juvenile spacing will be used on the TFL to meet free-growing obligations where needed. This is estimated to occur on about 600 ha of area regenerated to Pl leading stands. Potential growth and yield effects of spacing were not explicitly included in the MSYTs.

4.6.4 Fertilization

No fertilization is planned for future PHR stands on the TFL, thus no adjustments were made to these MSYTs.

4.7 MISCELLANEOUS

4.7.1 Utilization Limits

Yield tables were generated for 12.5 cm and 17.5 cm limits for all species.

4.7.2 Weevil

No additional reductions were made to the MSYTs for existing or future PHR stands (Appendix II). Surveys completed in the summer of 1999 suggest that weevil attack on the TFL is not significantly above expected endemic levels, and that yield reductions from the weevil should be low. This rate of attack is not expected to change in the future, thus no additional reductions were made to the MSYTs for future PHR stands.

4.7.3 CCLUP

There were no considerations of the CCLUP identified that affect development of the MSYTs for future PHR stands.

5. YIELD TABLE OUTPUT

5.1 Overview of Aggregate Curves

This process generated 24,823 MSYTs and NSYTs for existing stands (natural and PHR) and another 460 MSYTs for future PHR stands. These curves were then aggregated into 332 groups based on the current and future leading species, site index, and treatment. Each polygon was then assigned one of these 332 aggregate curves. Statistics for the 50 most important curves (representing 90% of the landbase) are given in Appendix IV. The higher yield of PHR stands reflects the higher site indices and results of TIPSY versus VDYP (Figure 7). Yields for existing and future PHR stands were only marginally different, reflecting the different landbases where the curves apply.

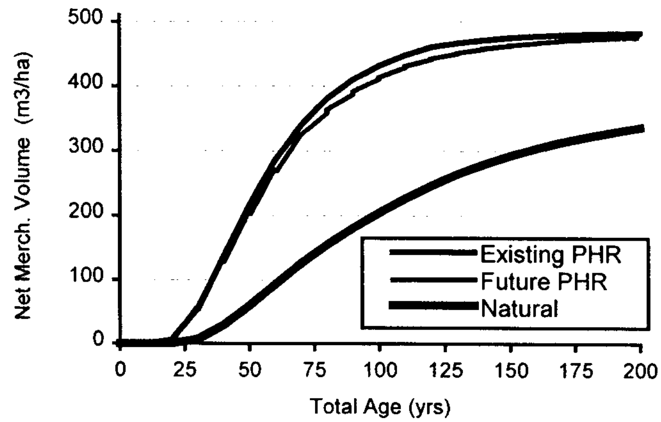


Figure 7. Area-weighted average yield curves (12.5 cm+) for the three curve types.

5.2 Existing Natural Stands

5.2.1 Summary Statistics

The average maximum mean annual increment (MAI) for NSYTs (12.5-cm utilization) for existing natural stands was about 2.1 m^3/ha/yr (Table 8). Maximum MAI varied primarily between 1-3m^3/ha/yr (Figure 8). The area-weighted average MAI in the MP 2 data package for natural stands was 2.11 m^3/ha/yr.[4] Culmination age was reached on average at 119 years with most area having rotations from about 80-160 years.

5.2.2 Volume Curves

As expected, the NSYTs generally reflect the potential productivity of the different areas with yield being highest in the SBSmw and lowest in the ESSFwc3 (Figure 9).

[4] Computed from tables 20-23 in the timber supply analysis data package prepared by TFIC for MP 2 dated May 16, 1996.

5.3 Existing PHR Stands

5.3.1 Summary Statistics

The average maximum MAI for existing PHR stands (12.5-cm utilization) was 5.0 m^3/ha/yr (Table 9). This is about 2.5 times the average maximum MAI for natural stands. Maximum MAI varied mainly between 3-7 m^3/ha/yr (Figure 8). Culmination age was on average 73 years, a decrease of 46 years compared to NSYTs. Culmination age varied mainly between 60 and 100 years.

5.3.2 Volume Curves

The yield curves were higher on average in the SBSmw than in other subzones (Figure 9). The SBSwk1 average curve was also above the average, and the MSYTs for the two ESSF subzones were below the overall average for the TFL.

5.4 Future PHR Stands

5.4.1 Summary Statistics

The average maximum MAI for future PHR stands (12.5 cm utilization) was 4.8 m^3/ha/yr (Table 10). This was marginally lower than the maximum MAI for existing PHR stands. Maximum MAI varied mainly between 3-7 m^3/ha/yr (Figure 8). Culmination age was on average 79 years, an increase of 6 years compared to culmination age for existing PHR stands. Culmination age for future PHR stands varied mainly between 50 and 150 years. Summary statistics for future PHR stands age given by subzone in Appendix V.

5.4.2 Volume Curves

The yield curves for future PHR stands are similar to those for existing PHR stands (Figure 9).

Table 8. Growth estimates at culmination age for existing natural stands.

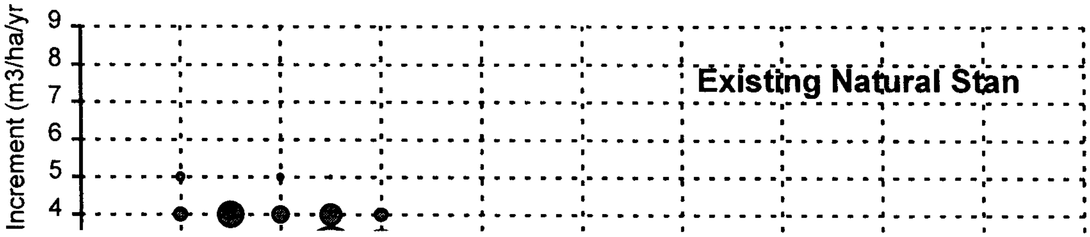
Curve Type / Area	Area		MAI (m^3/ha/yr)			Culmination Age (yrs)		
	(ha)	%	Avg	Min	Max	Avg	Min	Max
SBSwk1 (12.5 cm+)	59,991	31%	2.4	0.2	4.9	111	50	350
SBSmw (12.5 cm+)	43,040	22%	2.7	0.2	4.8	94	40	300
ESSFwk1 (12.5 cm+)	57,476	30%	1.8	0.0	4.6	131	60	350
ESSFwc3 (12.5 cm+)	30,893	17%	1.4	0.3	4.0	147	60	300
All Areas (area weighted) (12.5 cm+)	193,937	100%	2.1	0.0	4.9	119	40	350
All Areas (area weighted) (17.5 cm+)	193,937	100%	2.0	0.0	4.6	139	40	350

Table 9. Growth estimates at culmination age for existing PHR stands.

Curve Type / Area	Area		MAI (m^3/ha/yr)			Culmination Age (yrs)		
	(ha)	%	Avg	Min	Max	Avg	Min	Max
SBSwk1 (12.5 cm+)	25,365	55%	5.2	1.4	6.5	65	60	180
SBSmw (12.5 cm+)	6,952	16%	6.2	1.6	7.9	65	50	170
ESSFwk1 (12.5 cm+)	11,815	27%	3.9	1.5	4.9	89	80	190
ESSFwc3 (12.5 cm+)	1,032	2%	2.6	1.0	4.1	125	90	200
All Areas (area weighted) (12.5 cm+)	46,154	100%	5.0	1.0	7.9	73	50	200
All Areas (area weighted) (17.5 cm+)	46,154	100%	4.5	1.0	7.6	84	60	200

Table 10. Growth estimates at culmination age for future PHR stands.

Curve Type / Area	Area		MAI (m^3/ha/yr)			Culmination Age (yrs)		
	(ha)	%	Avg	Min	Max	Avg	Min	Max
SBSwk1 (12.5 cm+)	83,388	36%	5.4	1.4	6.8	64	60	180
SBSmw (12.5 cm+)	49,305	22%	6.4	1.6	8.3	60	50	170
ESSFwk1 (12.5 cm+)	68,513	29%	4.0	0.8	5.1	88	80	230
ESSFwc3 (12.5 cm+)	29,254	13%	2.5	0.8	4.1	131	90	230
All Areas (area weighted) (12.5 cm+)	233,693	100%	4.8	0.8	8.4	79	50	230
All Areas (area weighted) (17.5 cm+)	233,693	100%	4.4	0.7	8.0	86	50	240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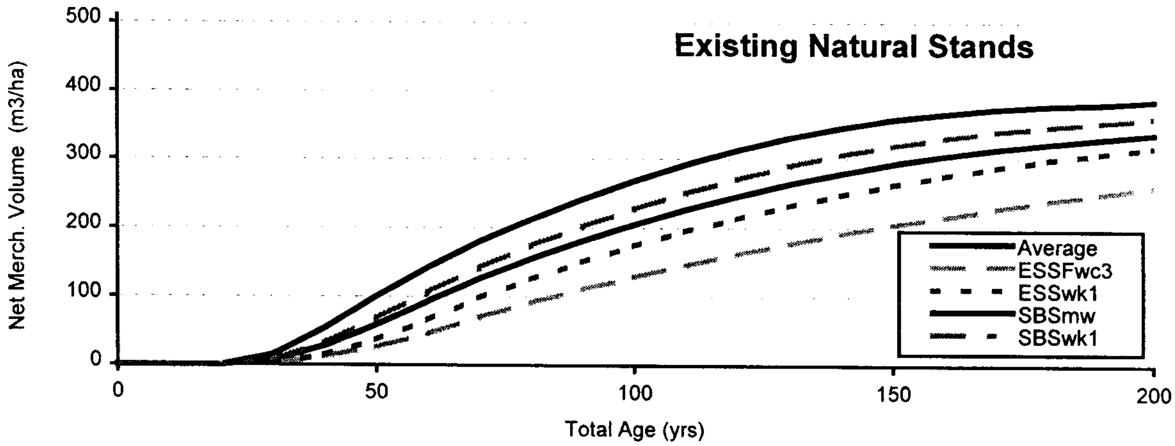
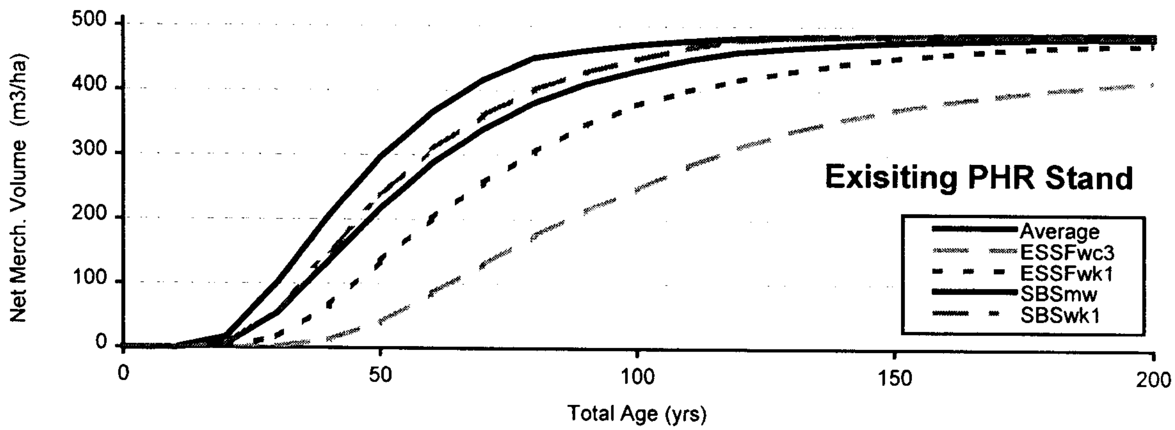
Existing Natural Stan





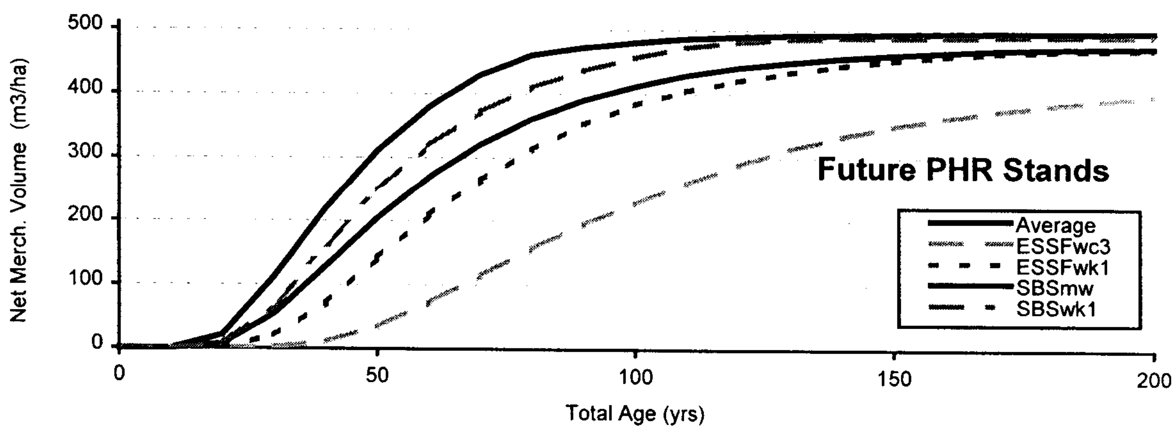


Figure 9. Area-weighted average yield curves (12.5 cm+) for existing natural, existing PHR, and future PHR stands for the four major subzones in the TFL.

APPENDIX I - TFL 52 AREA

Landbase Summary

TFL 52 is located in the Quesnel Forest District in the Cariboo Forest Region, east of Quesnel and west of Bowron Lake Provincial Park. The TFL total area is about 264,046 ha, of which about 92% is productive forest land (PFLB, Table 11). The AAC for the TFL was increased in 1996 in the last MP by 6% to 549,000 m^3.

Table 11. TFL 52 landbase summary.

Description	Area		
	(ha)	(%)	
Non-PFLB			
No Typing Avail.	2	0%	
Non-Productive	21,492	99%	
Non-Commercial	108	<1%	
Sub-Total	21,602	100%	8%
PFLB			
Immature	102,118	42%	
Immature Residual	4,522	2%	
Mature	130,554	54%	
NSR	5,249	2%	
Sub-Total	242,444	100%	92%
Total	*264,046*		*100%*

Ecological Profile

There are three Biogeoclimatic zones and eight subzones in the PFLB. The vast majority of area (about 87%) is in the SBSwk1, SBSmw, ESSFwk1, and ESSFwc3 subzones (Figure 11). There are also small areas in the ICHmk3, ICHwk4, SBSdw1, and SBSmh.

Inventory Profile

Most area in the TFL is in stands leading in spruce (Sx), lodgepole pine (Pl), or balsam (Bl) (Figure 10). Minor species include Douglas-fir (Fdi), aspen (At), cottonwood (Ac), birch (Ep), black spruce (Sb), western redcedar (Cw), and western hemlock (Hw). Age class 1 stands are about 60% Sx leading with most others Pl leading (Figure 10). Most area in age lass 5-7 stands are Pl leading and most age class 8 and 9 stands are Sx leading.

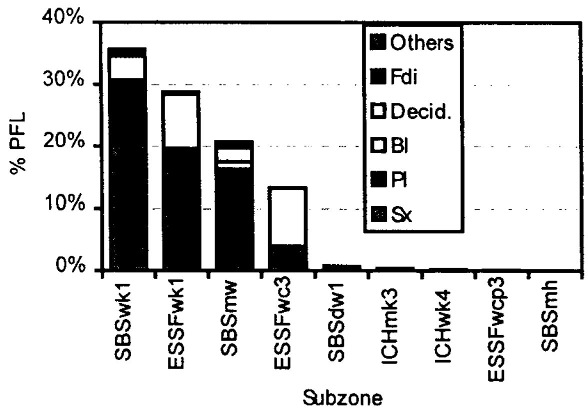


Figure 11. Distribution of area (%) in the PFLB by leading species and BGC subzone.

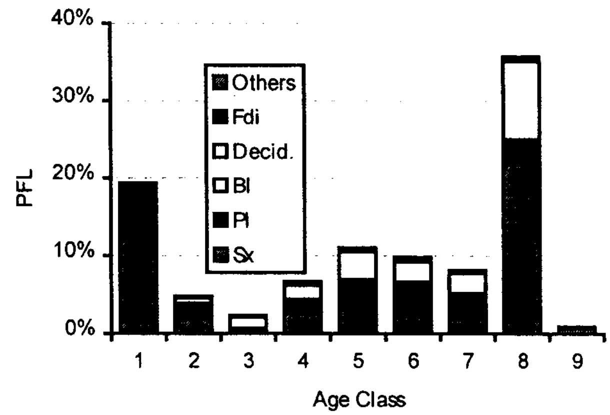


Figure 10. Distribution of species by age class.

APPENDIX II - SPRUCE WEEVIL IMPACT

Data were collected in the summer of 1999 to assess the level of spruce weevil attack on the TFL. This was done by J.S. Thrower & Associates Ltd. in conjunction with the site index adjustment project (SIA) project. Data were collected in 37 plots randomly located throughout Pl-leading and Sx-leading stands approximately 15-80 years total age in all subzones in the TFL (excluding the ESSFwc3). Data collected on each plot included: total density, number of Sx stems, number of attacks on each Sx tree, and presence/absence of spruce weevil damage in the 1998 leader. This information was used to estimate the cumulative and current attack rates using methods developed by Rene Alfaro, *PhD.*[5]

[5] Dr. René Alfaro, Canadian Forest Service, personal communication, 11 April 2000.

Many of the sample plots were not Sx leading or were too old to assess weevil damage (approximately 40 years and older). Thus, fewer plots were available to assess overall weevil attack. Of the 21 plots containing Sx and of suitable age, 17 (81%) were ranked as low attack, three (14%) as moderate, and only one sample (5%) was categorized as high attack.

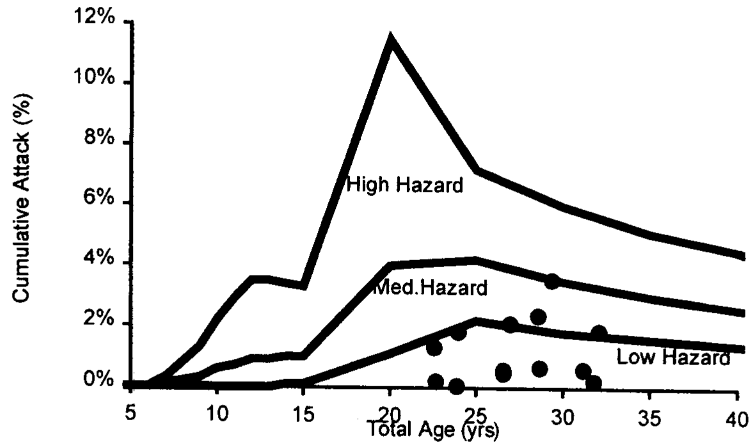


Figure 12. TFL 52 weevil sample plots.

The results of this weevil attack assessment and risk rating are comparable to the findings of a white spruce/white pine susceptibility study conducted in 1995 in spruce plantations in the SBSwk1 biogeoclimatic subzone, just north of TFL 52.[6] The correlation study concluded that weevil hazard ratings were low to medium for plantations with greater than 60% spruce above an elevation of 825 m in the SBSwk1 subzone. Given that elevation was considered an important predictor of current weevil attack and less than 2% of the TFL is below 825 m, no additional reductions in yield were in the MSYTs for the TFL.

[6] Taylor, S.P. 1997. Relationships between white spruce vulnerability ot the white pine weevil and ecological site conditions in the interior of British Columbia. Faculty of Natural Resources and Environmental Studies. Univ. Northern British Columbia. 75 p.

APPENDIX III - SILVICULTURE REGIMES

Ecological Areas					Harvest & Trmt Type			Regeneration & Species Composition													Silviculture Treatment Specifications			
								Regen Type & Establishment				Species Composition at Free Growing or Post Spacing				Treatments		Genetic Improvement			Juvenile Spacing		Commercial Thinning	
BGC Unit	BGC Area (ha)	Site Series #	Site Series Prop	Site Series Area (ha)	THLB (Y/N)	Trmt Grp	Hvst Method	Regen Type (P/N/B)	Regen Delay (yrs)	Planting Density (no/ha)	Survival (%)	Density at FG (no/ha)	Sp1%	Sp2%	Sp3%	Trmt Type Code	Trmt Prop (%)	Prop Improved Stock (%)	Year	Gain (%)	Pre-JS Density (no/ha)	Post-JS Density (no/ha)	Age of CT	Vol Removal (%)
SBSwk1	84,396	01	48.0%	40,515	Y	B	CC	P	2	2,000	95	2,200	Pl70	Sx25	At5	N	70	100	2005	5.50				
					Y	B	CC	P	2	2,000	95	2,200	Pl70	Sx25	At5	S	10	100	2005	5.50	7,000	2,200		
					Y	B	CC	P	2	2,000	95	2,200	Pl70	Sx25	At5	C	30	100	2005	5.50			50	20
		02	0.1%	123	Y	I	CC/PC	P	2	1,400	85	1,200	Pl100			N	100							
		03	4.0%	3,367	Y	D	CC/PC	P	2	1,800	95	1,700	Pl100			N	100	100	2005	5.00				
		04	0.8%	654	Y	D	CC/PC	P	2	1,800	95	1,700	Pl75	Fd20	At5	N	90	100	2005	4.75				
					Y	D	CC/PC	P	2	1,800	95	1,700	Pl75	Fd20	At5	S	10	100	2005	4.75	7,000	2,000		
		05	24.8%	20,968	Y	B	CC/PC	P	2	2,000	95	2,200	Pl70	Sx30		N	70	100	2005	5.90				
					Y	B	CC/PC	P	2	2,000	95	2,200	Pl70	Sx30		S	10	100	2005	5.90	7,000	2,200		
					Y	B	CC/PC	P	2	2,000	95	2,200	Pl70	Sx30		C	30	100	2005	5.90			50	20
		06	0.8%	707	Y	C	CC/PC	P	2	1,400	85	1,200	Pl50	Sx50		N	100			6.50				
		07	17.0%	14,336	Y	A	CC/PC	P	2	1,800	85	1,800	Sx70	Pl30		N	75	100	2005	5.90				
					Y	A	CC/PC	P	2	1,800	85	1,800	Sx70	Pl30		S	5	100	2005	5.90	5,000	2,000		
					Y	A	CC/PC	P	2	1,800	85	1,800	Sx70	Pl30		C	25	100	2005	5.90			60	20
		08	2.1%	1,755	Y	A	CC/PC	P	2	1,800	85	1,800	Sx70	Pl30		N	75	100	2005	5.90				
					Y	A	CC/PC	P	2	1,800	85	1,800	Sx70	Pl30		C	25	100	2005	5.90			60	20
		09	2.1%	1,795	Y	C	CC/PC	P	2	1,400	85	1,200	Sx50	Pl50		N	100							
		11	0.2%	177	Y	G	CC/PC	P	2	1,200	80	1,000	Pl50	Sx50		N	100							
ESSFwk1	69,132	01	57.7%	39,870	Y	D	CC/PC	P	2	1,800	95	2,000	Pl60	Sx40		N	70	100	2005	6.20				
		02	1.1%	734	Y	F	CC/PC	P	2	1,600	80	1,000	Pl60	Sx40		N	100							
		03	28.2%	19,517	Y	D	CC/PC	P	2	1,800	95	1,600	Pl60	Sx40		N	100	100	2005	6.20				
		04	10.4%	7,164	Y	C	CC/PC	P	2	1,800	85	1,800	Sx70	Pl30		N	95	100	2005	7.10				
		05	2.0%	1,390	Y	A	CC/PC	P	2	2,000	85	1,800	Sx80	Pl20		N	80	100	2005	7.40				
		06	0.5%	360	?	G	CC/PC	P	2	1,600	85	1,200	Pl50	Sx50		N	100							
		07	0.1%	98	Y	E	CC/PC	P	2	1,600	85	1,400	Sx80	Pl20		N	100							
SBSmw	49,717	01	56.9%	28,293	Y	B	CC	P	2	2,000	95	2,100	Pl70	Sx25	At5	N	60	100	2005	5.50				
					Y	B	CC	P	2	2,000	95	2,100	Pl70	Sx25	At5	S	10	100	2005	5.50	7,000	2,200		
					Y	B	CC	P	2	2,000	95	2,100	Pl70	Sx25	At5	C	40	100	2005	5.50			50	20
		02	0.1%	28	Y	F	CC	P	2	1,400	85	1,200	Pl100			N	100							
		03	5.6%	2,789	Y	D	CC	P	2	1,800	95	1,800	Pl100			N	100	100	2005	5.00				
		04	2.1%	1,054	Y	D	CC	P	2	1,800	95	2,000	Pl75	Fd20	At5	N	90	100	2005	4.75				
					Y	D	CC	P	2	1,800	95	2,000	Pl75	Fd20	At5	S	10	100	2005	4.75	7,000	2,000		
		05	8.4%	4,184	Y	A(C)	CC	P	2	1,300	85	1,200	Pl70	Sx30		N	100	100	2005	5.90				
		06	3.6%	1,783	Y	A	CC	P	2	2,000	95	2,100	Pl70	Sx25	At5	N	60	100	2005	5.50				
					Y	A	CC	P	2	2,000	95	2,100	Pl70	Sx25	At5	S	10	100	2005	5.50	7,000	2,200		
					Y	A	CC	P	2	2,000	95	2,100	Pl70	Sx25	At5	C	40	100	2005	5.50			50	20
		07	19.7%	9,798	Y	A	CC	P	2	2,000	85	1,700	Sx70	Pl30		N	60	100	2005	7.10				
					Y	A	CC	P	2	2,000	85	1,700	Sx70	Pl30		C	40	100	2005	7.10			60	20
		08	0.7%	354	Y	A	CC	P	2	2,000	85	1,700	Sx70	Pl30		N	60	100	2005	7.10				
					Y	A	CC	P	2	2,000	85	1,700	Sx70	Pl30		C	40	100	2005	7.10			60	20
		09	1.2%	577	Y	C	CC	P	2	1,600	85	1,500	Sx50	Pl50		N	100							
		10	1.7%	855	Y	G	CC	P	2	1,200	80	1,000	Pl50	Sx50		N	100							
ESSFwc3	28,601	01	82.0%	23,441	Y	F	CC/PC	P	2	1,600	90	1,300	Se60	Pl30	Bl10	N	100							
		02	11.1%	3,178	y	I	CC/PC	P	2	1,200	80	1,000	Pl70	Se30		N	100							
Ecological Areas					Harvest & Trmt Type			Regeneration & Species Composition													Silviculture Treatment Specifications			

BGCUnit	BGC Area (ha)	Site Series	Site Series Prop	Site Series Area (ha)	Mgmt for Tbr (Y/N)	Trtmt Grp	Hrvst Method	Regen Type & Establishment: Regen Type (P/N/B)	Regen Delay (yrs)	Plant Density (no/ha)	Survival (%)	Species Composition at Free Growing or Post-Spacing: Density at FG (no/ha)	Sp1%	Sp2%	Sp3%	Treatments: Trmt Code	Trmt Prop (%)	Genetic Improvement: Prop Improvd Stock (%)	Year	Gain (%)	Juv Spacing: Pre-JS Density (no/ha)	Post-JS Density (no/ha)	Commercial Thinning: Age of CT	Vol.Removal(%)
		03	6.9%	1,983	Y	C	CC/PC	P	2	1,800	80	1,500	Se60	Pl30	Bl10	N	100							
SBSdw1	1,604	01	56.7%	909	Y	B	CC	P	2	1,800	95	2,000	Pl50	Sx30	Fd20	N	60	100	2005	5.90				
					Y	B	CC	P	2	1,800	95	2,000	Pl50	Sx30	Fd20	S	10	100	2005	5.90	7,000	2,200		
					Y	B	CC	P	2	1,800	95	2,000	Pl50	Sx30	Fd20	C	40	100	2005	5.90			50	20
		03	8.0%	128	Y	F	CC	P	2	1,600	85	1,800	Pl90	At10		N	100	100	2005	4.50				
		04	5.4%	86	Y	D	CC	P	2	1,800	95	1,500	Pl100			N	100	100	2005	5.00				
		05	0.1%	2	Y	B	CC	P	2	1,800	95	1,800	Pl60	Sx30	Fd10	N	90	100	2005	5.90				
					Y	B	CC	P	2	1,800	95	1,800	Pl60	Sx30	Fd10	S	10	100	2005	5.90	7,000	2,000		
		06	2.5%	40	Y	A	CC	P	2	1,800	85	1,800	Sx60	Pl30	Fd10	N	60	100	2005	6.80			50	20
					Y	A	CC	P	2	1,800	85	1,800	Sx60	Pl30	Fd10	S	10	100	2005	6.80	5,000	2,000		
					Y	A	CC	P	2	1,800	85	1,800	Sx60	Pl30	Fd10	C	40	100	2005	6.80			60	20
		07	16.2%	260	Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		N	60	100	2005	7.10				
					Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		C	4	100	2005	7.10			60	20
		08	9.6%	154	Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		N	60	100	2005	7.10				
					Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		C	40	100	2005	7.10			60	20
		09	1.6%	25	Y	C	CC	P	2	1,600	85	1,200	Sx50	Pl50		N	100							
ICHmk3	1,116	01	48.3%	539	Y	B	CC	P	2	1,800	95	2,000	Pl60	Sx30	Fd10	N	80	100	2005	5.90				
					Y	B	CC	P	2	1,800	95	2,000	Pl60	Sx30	Fd10	S	10	100	2005	5.90	7,000	2,200		
					Y	B	CC	P	2	1,800	95	2,000	Pl60	Sx30	Fd10	C	20	100	2005	5.90			50	20
		04	15.3%	171	Y	A	CC	P	2	1,800	95	2,000	Sx70	Pl30		N	80	100	2005	7.10				
					Y	A	CC	P	2	1,800	95	2,000	Sx70	Pl30		S	10	100	2005	7.10	5,000	2,000		
					Y	A	CC	P	2	1,800	95	2,000	Sx70	Pl30		C	20	100	2005	7.10			60	20
		05	11.9%	133	Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		N	80	100	2005	7.10				
					Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		C	20	100	2005	7.10			60	20
		06	17.7%	198	Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		N	80	100	2005	7.10				
					Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		C	20	100	2005	7.10			60	20
		07	6.7%	75	Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		N	80	100	2005	7.10				
					Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		C	20	100	2005	7.10			60	20
ICHwk4	464	01	63.1%	293	Y	B	CC	P	2	1,800	95	2,000	Pl60	Sx30	Fd10	N	80	100	2005	5.90				
					Y	B	CC	P	2	1,800	95	2,000	Pl60	Sx30	Fd10	S	10	100	2005	5.90	7,000	2,200		
					Y	B	CC	P	2	1,800	95	2,000	Pl60	Sx30	Fd10	C	20	100	2005	5.90			50	20
		04	1.1%	5	Y	D	CC	P	2	1,800	85	1,500	Pl70	Sx30		N	100	100	2005	5.90				
		06	7.7%	36	Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		N	80	100	2005	7.10				
					Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		C	20	100	2005	7.10			60	20
		07	28.1%	131	Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		N	80	100	2005	7.10				
					Y	A	CC	P	2	1,800	85	1,800	Sx70	Pl30		C	20	100	2005	7.10			60	20
SBSmh	100	01	44.9%	45	Y	B	CC	P	2	1,800	95	2,000	Pl50	Sx30	Fd20	N	60	100	2005	5.90				
					Y	B	CC	P	2	1,800	95	2,000	Pl50	Sx30	Fd20	S	10	100	2005	5.90	7,000	2,200		
					Y	B	CC	P	2	1,800	95	2,000	Pl50	Sx30	Fd20	C	40	100	2005	5.90			50	20
		02	0.3%	0	Y	F	CC	P	2	1,400	85	1,200	Pl100			N	100							
		04	19.7%	20	Y	D	CC	P	2	1,800	95	2,000	Pl70	Fd30		N	60	100	2005	5.00				
					Y	D	CC	P	2	1,800	95	2,000	Pl70	Fd30		S	10	100	2005	5.00	7,000	2,200		
		06	32.8%	33	Y	A	CC	P	2	1,800	90	1,800	Sx70	Pl30		N	60	100	2005	7.10				
					Y	A	CC	P	2	1,800	90	1,800	Sx70	Pl30		C	40	100	2005	7.10			60	20
		09	2.3%	2	Y	C	CC	P	2	1,600	85	1,200	Sx50	Pl50		N	100							

APPENDIX IV - SUMMARY STATISTICS FOR AGGREGATED YIELD TABLES

Table 12. Summary statistics for the 50 largest aggregated yield tables.

Table ID	Area (ha)	Current Conditions			Future Conditions			Current Curves			Future Curves		
		Ldg Spp	SI Class	Treated	Ldg Spp	SI Class	Treated	max MAI	culm Age	culm Vol	max MAI	culm Age	culm Vol
215	24,480	PL	19	No	PL	19	Yes	4.2	70	293	5.1	70	354
229	20,399	PL	22	No	PL	22	Yes	5.0	60	301	6.1	60	365
90	17,081	BL	13	No	SX	13	No	1.2	140	172	2.4	130	318
86	15,030	BL	13	No	PL	16	Yes	1.3	140	185	3.7	90	332
248	14,072	SX	13	No	PL	16	Yes	1.6	150	246	3.7	90	337
200	10,309	PL	16	No	PL	16	Yes	3.2	90	287	3.7	90	337
216	8,931	PL	19	No	PL	22	Yes	2.8	90	256	6.2	60	373
249	8,275	SX	13	No	PL	19	Yes	1.7	140	240	4.9	70	340
264	6,947	SX	16	No	PL	19	Yes	2.3	110	253	5.0	70	348
87	6,750	BL	13	No	PL	19	Yes	1.3	140	178	4.9	70	342
252	5,455	SX	13	No	SX	13	No	1.5	150	231	2.6	120	312
280	5,449	SX	19	No	PL	22	Yes	2.9	100	292	6.0	60	361
263	5,202	SX	16	No	PL	16	Yes	2.3	110	254	3.8	90	343
265	5,117	SX	16	No	PL	22	Yes	2.4	110	260	6.0	60	359
279	4,538	SX	19	No	PL	19	Yes	3.0	100	295	5.0	70	352
202	4,000	PL	16	No	PL	22	Yes	2.2	100	225	6.1	60	367
201	3,597	PL	16	No	PL	19	Yes	2.3	100	228	5.1	70	356
250	3,453	SX	13	No	PL	22	Yes	1.7	140	241	5.7	60	344
293	3,035	SX	22	No	PL	22	Yes	3.5	90	317	6.2	60	373
228	2,192	PL	22	No	PL	19	Yes	3.4	70	239	5.1	60	305
88	2,071	BL	13	No	PL	22	Yes	1.2	140	167	5.7	60	344
214	1,909	PL	19	No	PL	16	Yes	2.8	80	227	3.7	80	296
83	1,843	BL	13	No	PL	13	No	1.1	150	170	1.7	140	242
292	1,816	SX	22	No	PL	19	Yes	3.4	90	310	5.1	70	356
272	1,768	SX	16	No	SX	22	Yes	2.4	110	259	5.9	70	414
278	1,681	SX	19	No	PL	16	Yes	2.9	100	287	3.8	90	346
255	1,576	SX	13	No	SX	16	Yes	1.6	140	228	4.0	90	362
101	1,561	BL	16	No	PL	16	Yes	2.2	100	215	3.7	90	337
258	1,539	SX	13	No	SX	22	Yes	1.7	140	243	5.9	70	411
62	1,466	AT	19	No	PL	22	Yes	1.9	90	170	6.4	60	382
331	1,447	SX	22	No	SX	22	Yes	5.8	70	403	6.0	70	422
286	1,310	SX	19	No	SX	22	Yes	2.9	100	286	5.9	70	416
102	1,275	BL	16	No	PL	19	Yes	2.0	100	202	5.0	70	350
303	1,240	SX	25	No	PL	22	Yes	3.8	80	306	6.3	60	377
257	1,217	SX	13	No	SX	19	Yes	1.6	150	245	4.8	70	337
188	1,215	PL	13	No	PL	16	Yes	1.5	130	199	3.6	90	321
189	963	PL	13	No	PL	19	Yes	1.6	130	211	5.1	70	354
116	940	BL	19	No	PL	22	Yes	2.5	90	225	6.3	60	377
241	936	PL	25	No	PL	22	Yes	4.1	60	245	6.3	60	375
223	928	PL	19	No	SX	22	Yes	2.8	90	253	6.0	70	419
242	897	PL	25	No	PL	25	Yes	6.7	60	401	7.2	60	430
327	893	SX	13	No	SX	13	No	2.7	120	319	2.7	120	319
267	876	SX	16	No	SX	13	No	2.3	110	253	2.7	120	319
103	844	BL	16	No	PL	22	Yes	1.9	100	191	6.1	60	365
271	777	SX	16	No	SX	19	Yes	2.4	110	261	5.0	70	348
299	734	SX	22	No	SX	22	Yes	3.3	90	300	5.9	70	416
70	663	AT	22	No	PL	22	Yes	2.5	90	221	6.2	60	375
105	654	BL	16	No	SX	13	No	2.3	100	225	2.5	130	327
175	628	FD	22	No	PL	22	Yes	3.4	80	271	6.4	60	383
330	595	SX	19	No	SX	19	Yes	4.6	80	367	4.8	80	382

APPENDIX V - SUBZONE SUMMARIES FOR FUTURE PHR STANDS

This appendix contains a summary for the yield curves in each BGC subzone on the TFL. The statistics and average curves given for each subzone were computed as the area-weighted average of all curves in the subzone.

			Average of Inputs			Average of Outputs		
Subzone	Area (ha)	Prop of PFLB	Avg. SI (m)	Establish. Density (no/ha)	Species Comp.	MAI (m^3/ha/yr)	Culm. Age (yrs)	Culm. Vol. (m^3/ha)
SBSwk1	83,338	36%	20.2	2,261	Pl63Sx35	5.4	64	341
ESSFwk1	68,513	29%	16.8	2,031	Pl56Sx44	4.0	88	347
SBSmw	49,305	21%	22.2	2,085	Pl63Sx33	6.4	60	365
ESSFwc3	29,254	13%	12.8	1,408	Sx66Pl34	2.5	131	313
SBSdw1	1,614	<1%	19.5	2,079	Pl51Sx37Fd12	4.7	73	343
ICHmk3	1,065	<1%	24.3	2,119	Sx51Pl44Fd5	7.4	58	426
ICHwk4	456	<1%	24.5	2,117	Pl50Sx44Fd6	7.5	57	426
SBSmh	98	<1%	21.9	2,105	Pl48Sx37Fd15	6.0	64	382

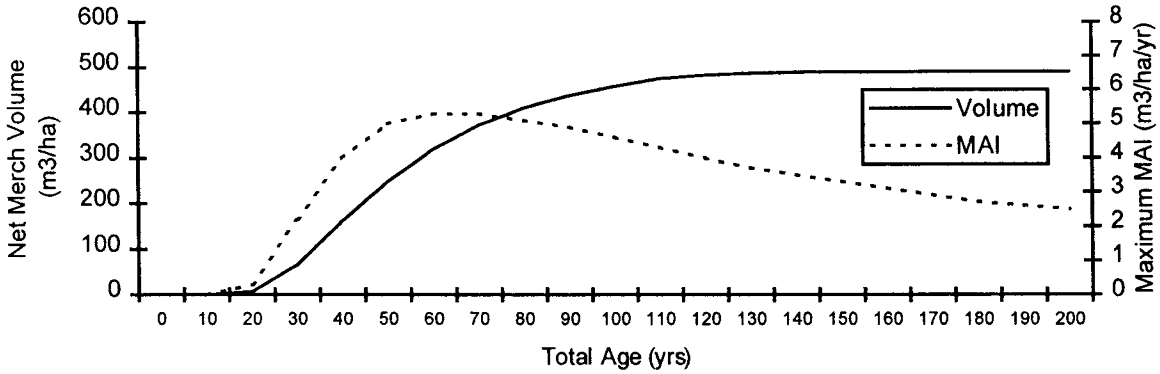
TFL 52 - SBSwk1

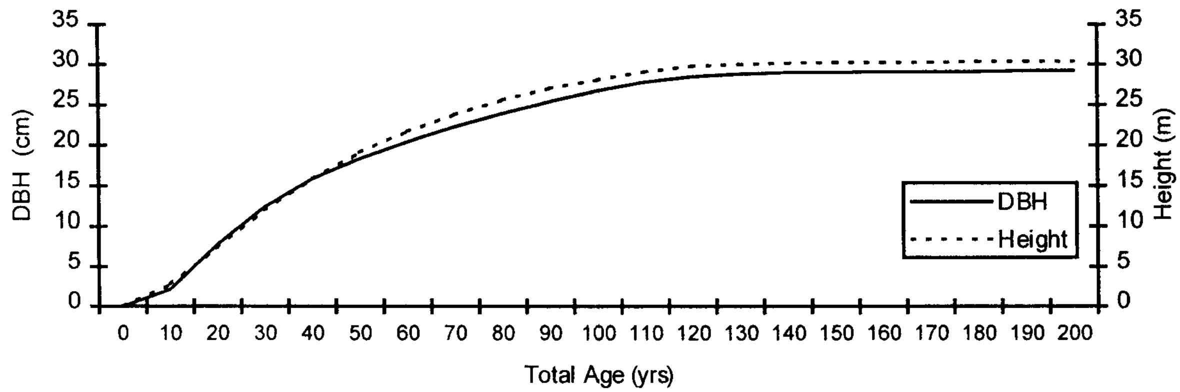
Average TIPSY Input

Attribute	Value
Total Area	83,388
Prop of PFLB	36%
Site Index	20.2
Density	2,261
Percent Fd	0
Percent Pl	65
Percent Sx	35
OAF1	90.0%
OAF2	95.0%

Average TIPSY Output

Site Series	Area (ha)	Prop of subzone (%)	Prop of PFLB (%)	Max MAI (m^3/ha/yr)	Culm Age (yrs)	Culm Vol (m^3/ha)
01	39,262	47.1%	17%	5.5	60	328
02	122	0.1%	0%	1.6	110	178
03	3,281	3.9%	1%	2.8	80	226
04	662	0.8%	0%	4.2	70	291
05	20,710	24.8%	9%	5.5	60	327
06	710	0.9%	0%	4.8	80	382
07	14,067	16.9%	6%	5.9	70	416
08	1,702	2.0%	0%	6.8	60	408
09	2,602	3.1%	1%	4.0	90	361
11	270	0.3%	0%	1.4	180	245
Avg				5.4	64	341
Min				1.4	60	178
Max				6.8	180	416
Std Dev				0.7	10	43





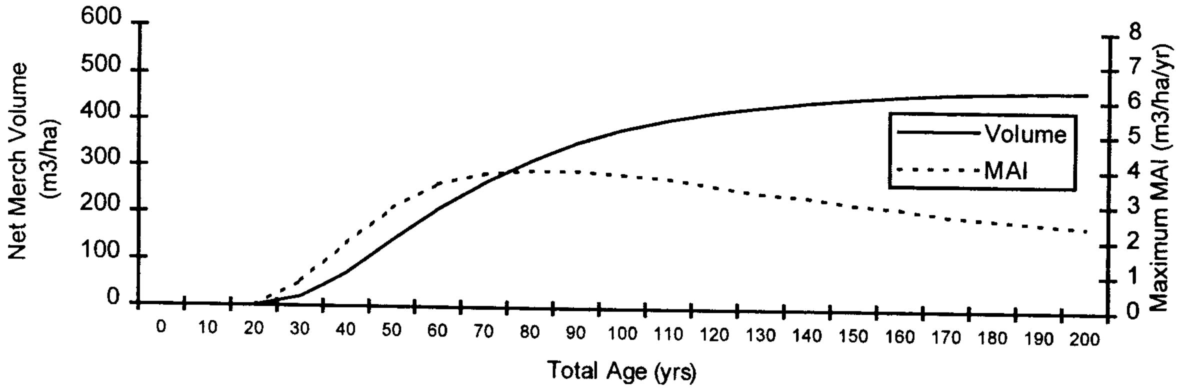
TFL 52 - ESSFwk1

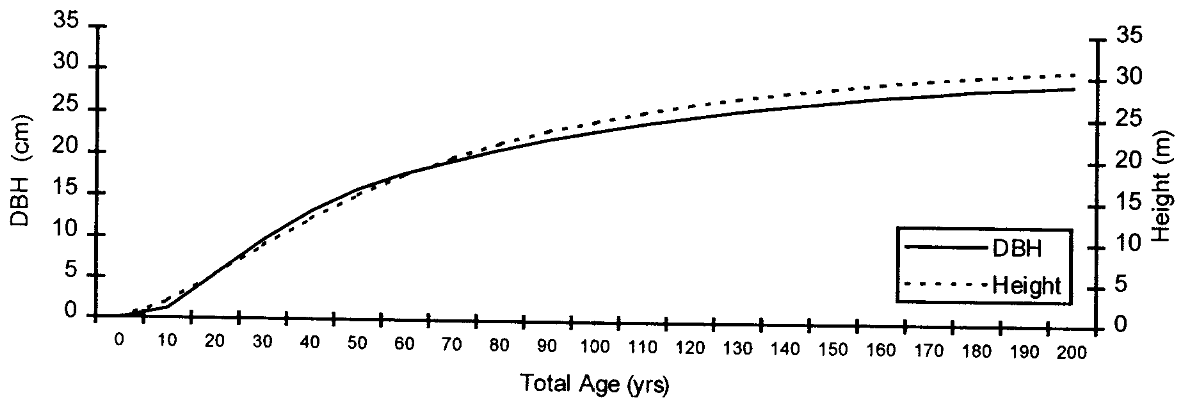
Average TIPSY Input

Attribute	Value
Total Area	68,513
Prop of PFLB	29%
Site Index	16.8
Density	2,031
Percent Fd	0
Percent Pl	56
Percent Sx	44
OAF1	91.0%
OAF2	95.0%

Average TIPSY Output

Site Series	Area (ha)	Prop of subzone (%)	Prop of PFLB (%)	Max MAI (m^3/ha/yr)	Culm Age (yrs)	Culm Vol (m^3/ha)
01	39,473	57.6%	17%	4.1	84	343
02	724	1.1%	0%	2.0	141	276
03	19,361	28.3%	8%	3.7	94	342
04	7,125	10.4%	3%	4.2	92	380
05	1,353	2.0%	1%	4.9	82	404
06	376	0.5%	0%	1.8	160	288
07	100	0.1%	0%	2.9	126	372
Avg				4.0	88	347
Min				1.0	80	230
Max				5.1	230	419
Std Dev				0.5	10	20


Net Merch Volume (m3/ha)
600
500
400
300
200
100
0
Maximum MAI (m3/ha/yr)
8
7
6
5
4
3
2
1
0
Volume
MAI
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Total Age (yrs)


DBH (cm)
35
30
25
20
15
10
5
0
Height (m)
DBH
Height
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Total Age (yrs)

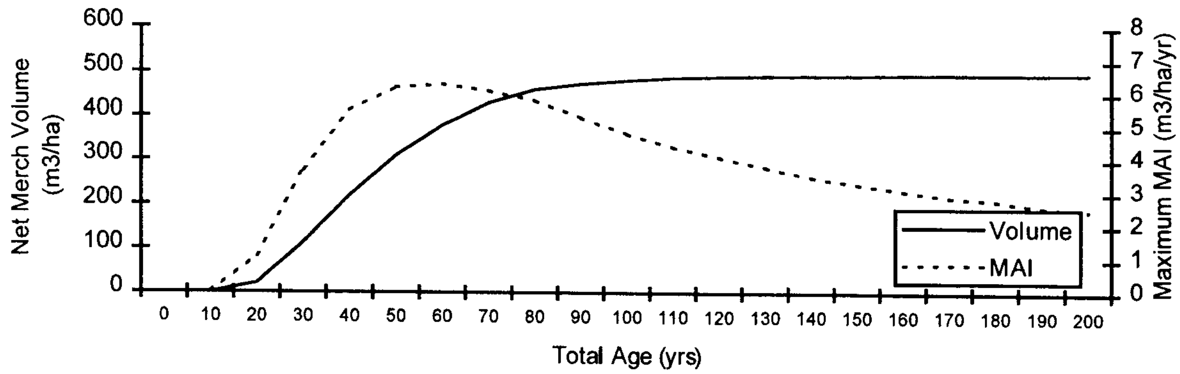
TFL 52 - SBSmw

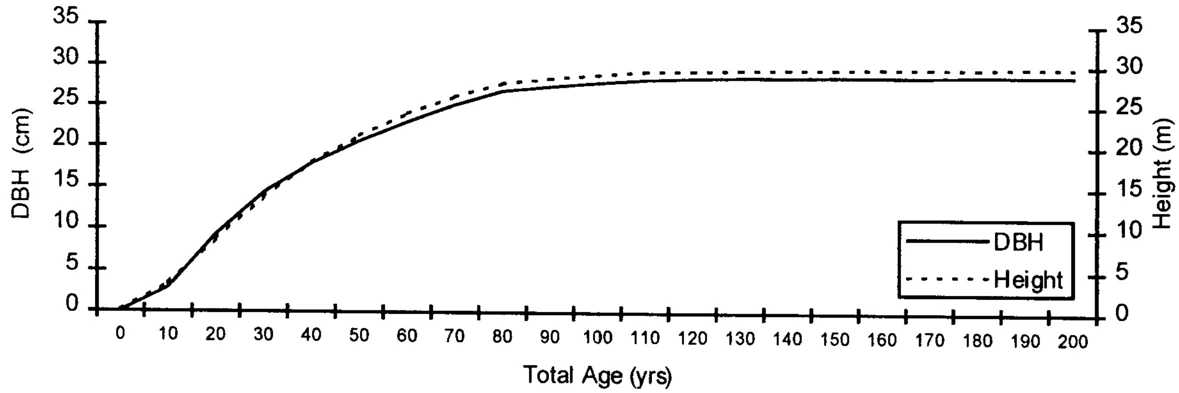
Average TIPSY Input

Attribute	Value
Total Area	49,305
Prop of PFLB	21%
Site Index	22.2
Density	2,085
Percent Fd	0
Percent Pl	66
Percent Sx	33
OAF1	90.7%
OAF2	95.0%

Average TIPSY Output

Site Series	Area (ha)	Prop of subzone (%)	Prop of PFLB (%)	Max MAI (m^3/ha/yr)	Culm Age (yrs)	Culm Vol (m^3/ha)
01	28,019	56.8%	12%	7.0	50	352
02	28	0.1%	0%	2.4	90	212
03	2,783	5.6%	1%	3.5	70	245
04	1,059	2.1%	0%	4.6	60	277
05	4,195	8.5%	2%	5.7	70	400
06	1,775	3.6%	1%	8.3	50	414
07	9,605	19.5%	4%	6.2	70	432
08	357	0.7%	0%	8.1	50	407
09	573	1.2%	0%	4.5	80	363
10	912	1.9%	0%	1.6	170	273
Avg				6.4	60	365
Min				1.6	50	212
Max				8.3	170	432
Std Dev				1.2	18	48


Net Merch Volume (m3/ha)
600
500
400
300
200
100
0
Maximum MAI (m3/ha/yr)
8
7
6
5
4
3
2
1
0
Volume
MAI
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Total Age (yrs)


DBH (cm)
35
30
25
20
15
10
5
0
Height (m)
35
30
25
20
15
10
5
0
DBH
Height
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Total Age (yrs)

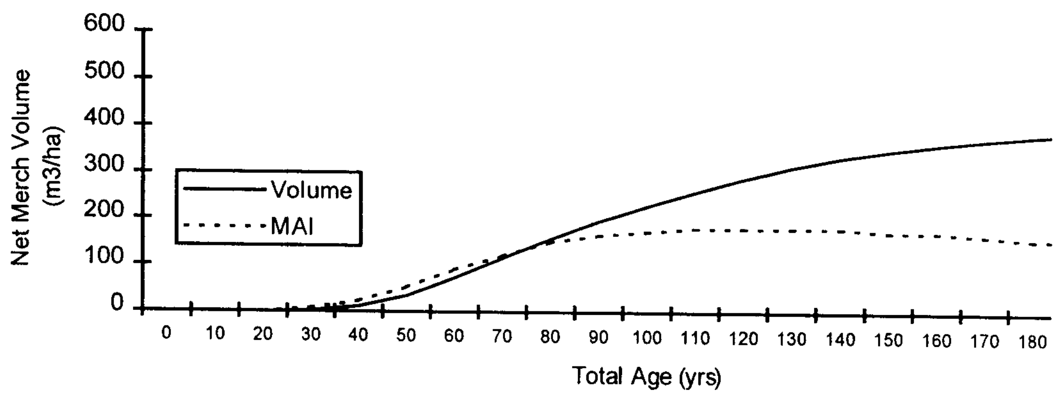
TFL 52 - ESSFwc3

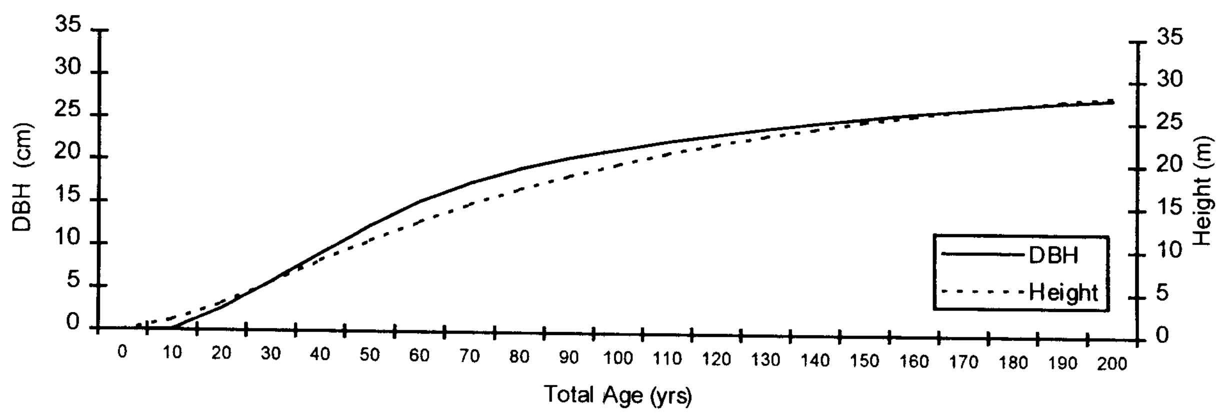
Average TIPSY Input

Attribute	Value
Total Area	29,254
Prop of PFLB	13%
Site Index	12.8
Density	1,408
Percent Fd	0
Percent Pl	34
Percent Sx	66
OAF1	84.7%
OAF2	95.0%

Average TIPSY Output

Site Series	Area (ha)	Prop of subzone (%)	Prop of PFLB (%)	Max MAI (m^3/ha/yr)	Culm Age (yrs)	Culm Vol (m^3/ha)
01	23,962	81.9%	10%	2.5	129	323
02	3,287	11.2%	1%	1.4	167	222
03	2,005	6.9%	1%	3.7	96	351
Avg				2.5	131	313
Min				0.8	90	180
Max				4.1	230	373
Std Dev				0.5	18	36





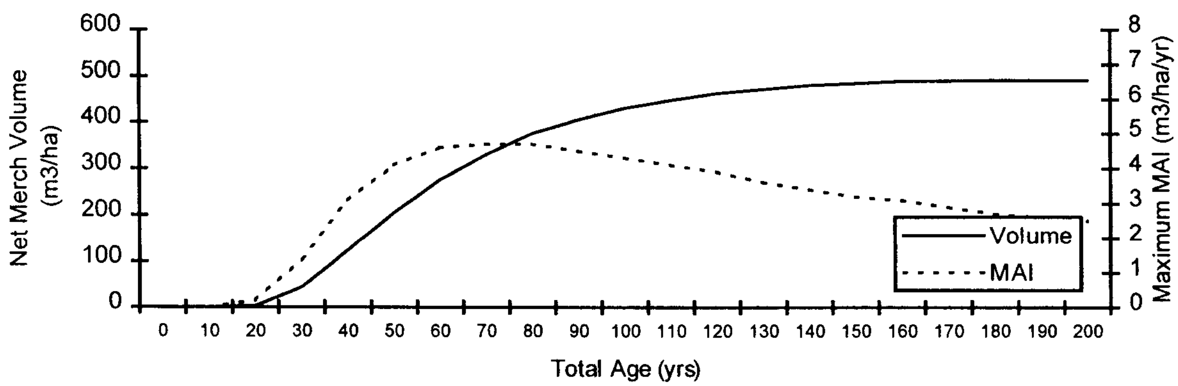
TFL 52 - SBSdw1

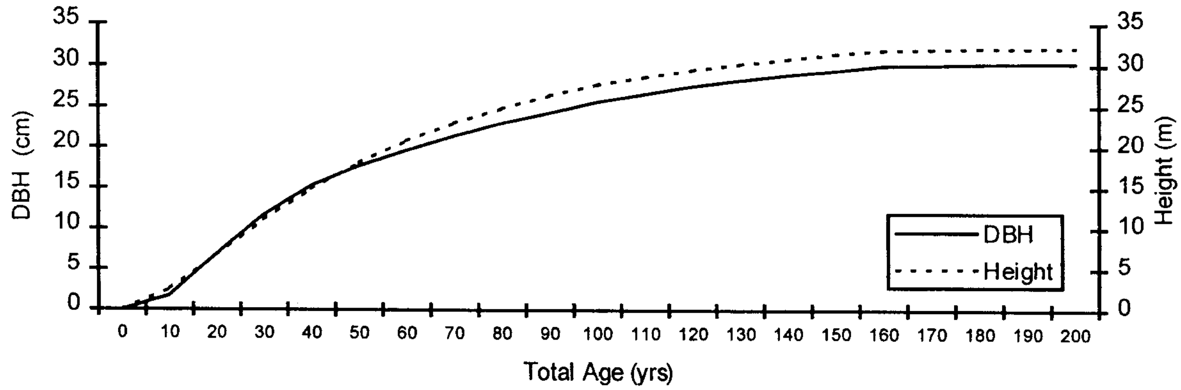
Average TIPSY Input

Attribute	Value
Total Area	1,614
Prop of PFLB	<1%
Site Index	19.5
Density	2,079
Percent Fd	12
Percent Pl	51
Percent Sx	37
OAF1	88.4%
OAF2	95.0%

Average TIPSY Output

Site Series	Area (ha)	Prop of subzone (%)	Prop of PFLB (%)	Max MAI (m^3/ha/yr)	Culm Age (yrs)	Culm Vol (m^3/ha)
01	921	57.0%	0%	4.8	70	333
03	135	8.4%	0%	3.0	80	237
04	87	5.4%	0%	4.2	70	297
05	2	0.1%	0%	4.5	70	315
06	40	2.5%	0%	5.1	70	359
07	254	15.7%	0%	5.0	80	397
08	154	9.6%	0%	6.1	70	429
09	22	1.3%	0%	3.8	90	342
Avg				4.7	73	343
Min				3.0	70	237
Max				6.1	90	429
Std Dev				0.7	5	48





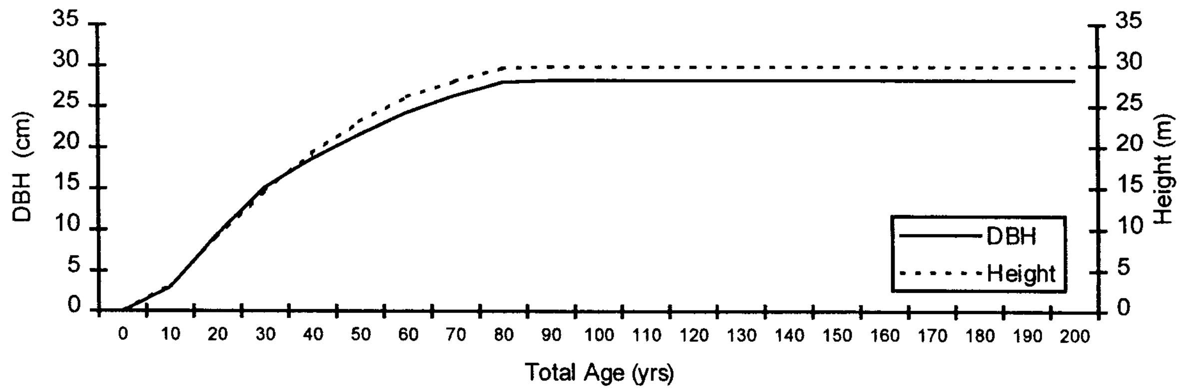
TFL 52 - ICHmk3

Average TIPSY Input

Attribute	Value
Total Area	1,065
Prop of PFLB	<1%
Site Index	24.3
Density	2,119
Percent Fd	5
Percent Pl	44
Percent Sx	51
OAF1	92.1%
OAF2	95.0%

Average TIPSY Output

Site Series	Area (ha)	Prop of subzone (%)	Prop of PFLB (%)	Max MAI (m^3/ha/yr)	Culm Age (yr)	Culm Vol (m^3/ha)
01	508	47.7%	0%	7.1	60	426
04	163	15.3%	0%	7.4	60	442
05	124	11.6%	0%	6.9	60	414
06	197	18.5%	0%	8.3	50	415
07	74	6.9%	0%	7.4	60	442
Avg				7.4	58	426
Min				6.9	50	414
Max				8.3	60	442
Std Dev				0.5	4	10


DBH (cm)
Height (m)
Total Age (yrs)
DBH
Height
0
5
10
15
20
25
30
35
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200

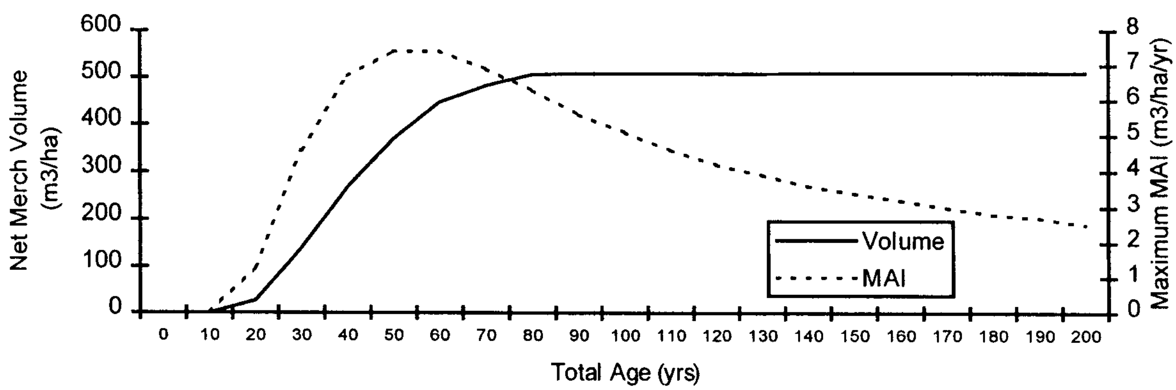
TFL 52 - ICHwk4

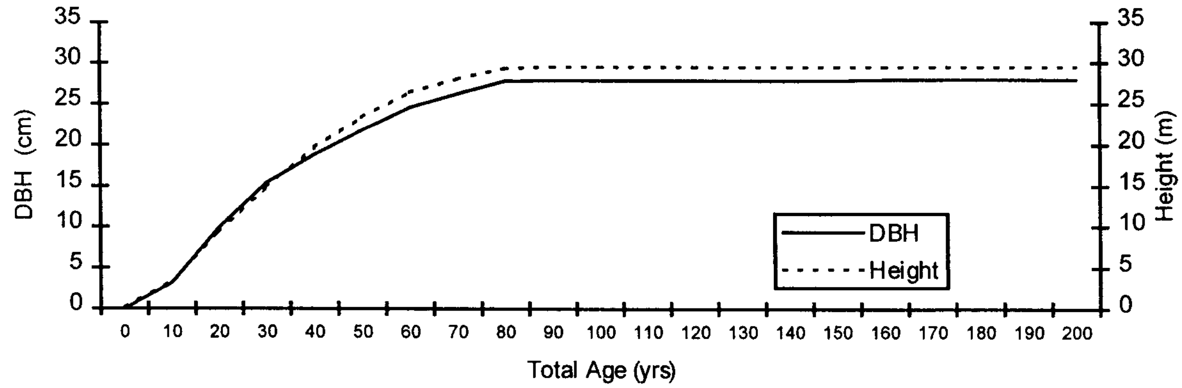
Average TIPSY Input

Attribute	Average
Total Area	456
Prop of PFLB	<1%
Site Index	24.5
Density	2,117
Percent Fd	6
Percent Pl	50
Percent Sx	44
OAF1	93.0%
OAF2	95.0%

Average TIPSY Output

Site Series	Area (ha)	Prop of subzone (%)	Prop of PFLB (%)	Max MAI (m^3/ha/yr)	Culm Age (yrs)	Culm Vol (m^3/ha)
01	291	63.9%	0%	7.2	60	430
04	5	1.1%	0%	5.4	70	377
06	30	6.6%	0%	7.0	60	418
07	129	28.4%	0%	8.4	50	419
Avg				7.5	57	426
Min				5.4	50	377
Max				8.4	70	430
Std Dev				0.6	5	7




35
30
25
20
15
10
5
0
DBH (cm)
Height (m)
DBH
Height
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
Total Age (yrs)

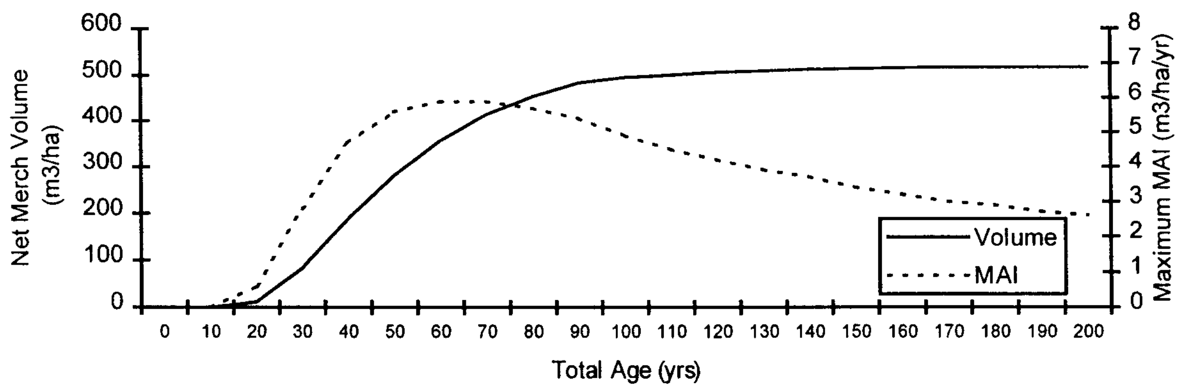
TFL 52 - SBSmh

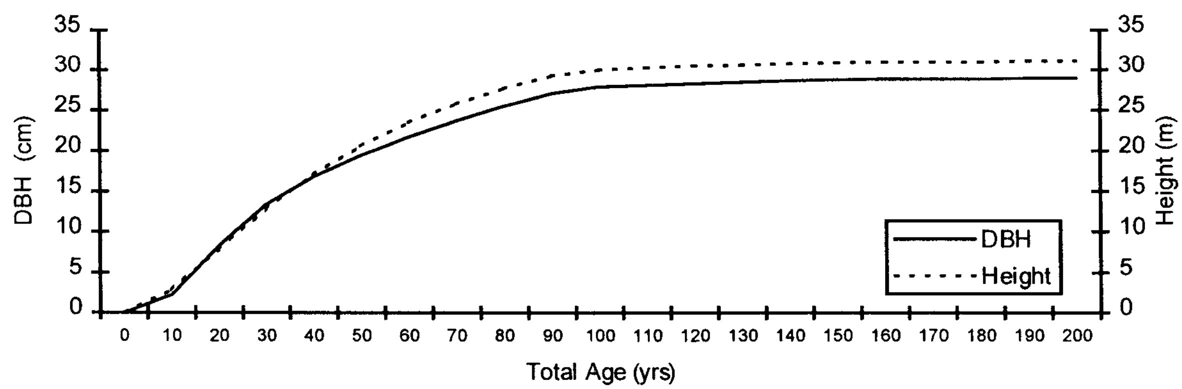
Average TIPSY Input

Attribute	Value
Total Area	98
Prop of PFLB	<1%
Site Index	21.9
Density	2,105
Percent Fd	15
Percent Pl	48
Percent Sx	37
OAF1	92.0%
OAF2	95.0%

Average TIPSY Output

Site Series	Area (ha)	Prop of subzone (%)	Prop of PFLB (%)	Max MAI (m^3/ha/yr)	Culm Age (yr)	Culm Vol (m^3/ha)
01	44	44.9%	0%	6.3	60	380
02	0	0.3%	0%	2.4	90	219
04	19	19.9%	0%	4.8	60	287
06	32	32.5%	0%	6.4	70	447
09	2	2.4%	0%	4.0	90	356
Avg				6.0	64	382
Min				2.4	60	219
Max				6.4	90	447
Std Dev				0.7	6	58





APPENDIX IV – Existing NSYT Descriptions & Minimum Harvest Ages

Existing NSYT Areas & Minimum Harvest Attributes

Existing NSYT Analysis Unit	THLB Area (ha)	Existing NSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
1 PLSXAT-11.6	265	110	167	1.5	17.7	22.2
7 SXPLBL-12.8	23	120	283	2.4	22.6	23.4
11 ACSXBL-11.5	1	150	122	0.8	26.8	38.2
13 ACPLSX-19.8	20	80	167	2.1	26.2	30.4
14 ACSXPL-18.3	4	90	170	1.9	26.4	31.3
15 ACPLSX-18.6	3	80	155	1.9	25.0	30.0
16 ACBLAT-22.1	11	70	127	1.8	26.6	30.5
18 ACSXPL-22.3	1	70	201	2.9	26.8	30.8
19 ACSXPL-20.8	11	70	154	2.2	25.3	29.4
20 ACPLSX-24.4	12	70	177	2.5	28.9	30.9
21 ACSXPL-27.1	4	60	166	2.8	29.3	31.4
22 ACSXBL-25.9	4	60	162	2.7	28.1	30.5
25 PLATSX-16.2	5	80	142	1.8	20.4	21.8
26 ATPLSX-16.3	26	100	175	1.8	22.6	27.8
27 ATSXPL-16.3	158	100	173	1.7	22.6	28.1
28 ATSXPL-16.7	22	100	172	1.7	23.1	29.0
29 ATPLSX-18.8	2	100	175	1.8	25.7	31.1
30 ATSXPL-19.7	27	90	208	2.3	25.8	28.4
31 ATSXPL-18.9	157	90	186	2.1	24.7	28.7
32 ATPLSX-19.2	488	90	182	2.0	25.1	28.7
33 ATBLEP-19.6	101	90	174	1.9	25.6	30.4
34 ATSXPL-17.7	58	100	160	1.6	24.3	32.0
35 ATSXPL-19.6	2	90	191	2.1	25.6	29.7
36 ATSXPL-19.1	64	90	190	2.1	25.0	28.4
37 ATPLSX-22.3	22	90	231	2.6	28.8	30.8
38 ATSXPL-21.7	71	90	214	2.4	28.2	30.8
39 ATPLSX-21.8	288	90	228	2.5	28.3	30.3
40 ATSXBL-22.9	49	90	233	2.6	29.5	31.2
41 ATPLSX-22.4	64	90	237	2.6	29.0	30.5
42 ATSXEP-22.1	2	80	183	2.3	27.3	30.4
43 ATSXPL-26.1	20	90	248	2.8	33.4	32.9
44 ATPLSX-24.7	29	80	229	2.9	30.2	31.2
45 BLSX-10.4	0	130	142	1.1	18.3	28.9
46 BLSXPL-10.8	297	130	156	1.2	18.9	29.0
47 BLSXPL-11.2	106	130	167	1.3	19.6	29.4
48 BLSXPL-11.1	11,573	130	166	1.3	19.4	29.0
49 BLSXPL-11.4	4,171	130	172	1.3	20.0	29.4
50 BLSXPL-11.2	1,176	130	167	1.3	19.7	29.4
51 BLSXPL-11.4	75	130	174	1.3	20.1	29.3
52 BLSX-10.5	3,089	130	153	1.2	18.5	28.5
53 BLSX-12.9	28	120	181	1.5	21.4	31.2

Existing NSYT Areas & Minimum Harvest Attributes (cont.)

Existing NSYT Analysis Unit	THLB Area (ha)	Existing NSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
54 BLSX-10.7	91	130	153	1.2	18.8	28.9
55 BLSXPL-11.5	390	120	158	1.3	19.1	28.6
56 BLSX-11.8	1	130	197	1.5	20.8	29.9
57 BLSXPL-11.6	449	120	157	1.3	19.3	29.0
58 BLSXPL-11.6	268	130	179	1.4	20.5	30.0
59 BLSXCW-11.7	12	120	164	1.4	19.5	28.3
61 BLSXAT-15.8	23	100	213	2.1	23.2	29.8
62 BLSXPL-15.4	1,128	100	206	2.1	22.6	29.7
63 BLSXPL-15.5	1,053	100	199	2.0	22.7	30.0
64 BLSXPL-16.2	590	100	208	2.1	23.7	30.7
65 BLSXPL-16.3	8	100	226	2.3	23.9	30.1
66 BLSX-15.7	106	100	217	2.2	23.0	29.9
67 BLSX-15.4	2	90	152	1.7	20.8	30.2
68 BLSXPL-15.6	40	100	206	2.1	22.8	30.2
69 BLSX-15.9	31	100	218	2.2	23.3	30.8
70 BLSXPL-15.8	51	100	208	2.1	23.2	30.4
71 BLSXFD-15.7	26	100	208	2.1	23.0	29.6
72 BLSXPL-18.4	225	90	227	2.5	25.0	31.0
73 BLSXPL-18.6	185	80	189	2.4	23.2	29.4
74 BLSXAT-18.8	565	90	228	2.5	25.6	31.3
75 BLSXAT-18.5	6	80	170	2.1	23.1	29.8
76 BLSXAT-19.0	8	80	226	2.8	23.7	29.5
77 BLATSX-18.4	2	90	159	1.8	25.0	32.4
78 BLSXAT-19.0	2	90	249	2.8	25.8	31.0
79 BLSXPL-18.6	43	90	245	2.7	25.4	31.2
80 BLSXPL-18.7	67	80	208	2.6	23.4	29.4
81 BLSXEP-21.6	9	80	212	2.7	27.2	31.8
82 BLSXAT-21.4	17	80	210	2.6	26.9	30.9
83 BLSXPL-21.3	51	80	219	2.7	26.7	31.3
84 BLSXEP-22.1	433	80	226	2.8	27.7	30.8
85 BLSXAT-21.1	8	80	243	3.0	26.5	30.2
87 BLSXEP-22.1	11	80	227	2.8	27.7	31.2
88 BLSXPL-24.5	14	80	248	3.1	30.8	31.4
89 BLSXEP-26.1	107	80	227	2.8	32.9	31.6
90 CWSXBL-12.9	8	100	164	1.6	18.2	27.1
91 CWSXBL-13.1	3	100	169	1.7	18.5	27.5
92 CWHWFD-14.1	32	90	180	2.0	18.8	27.2
93 CWSXHW-13.9	33	90	180	2.0	18.5	26.6
94 SXEPBL-14.0	18	110	149	1.4	20.5	29.2
96 EPSXAT-19.0	25	100	186	1.9	26.0	30.3
97 EPSXBL-19.3	3	90	188	2.1	25.2	28.7
98 EPSXBL-19.4	1	100	248	2.5	26.4	29.9
99 EPSXAT-23.4	16	80	218	2.7	28.8	30.0

Existing NSYT Areas & Minimum Harvest Attributes (cont.)

Existing NSYT Analysis Unit	THLB Area (ha)	Existing NSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
100 EPBLSX-22.0	21	80	168	2.1	27.2	29.7
101 EPSXBL-21.3	14	80	204	2.6	26.4	29.0
102 EPSXBL-22.4	2	80	201	2.5	27.6	29.4
103 EPSXAT-25.0	23	80	228	2.9	30.6	31.5
104 EPSXAT-25.8	12	80	210	2.6	31.5	31.6
105 EPSXAT-24.2	7	80	217	2.7	29.7	31.1
106 FDSXPL-13.3	8	130	164	1.3	21.9	30.9
107 FDPLAT-13.1	13	120	133	1.1	20.8	29.5
108 FDSXPL-16.6	1	110	239	2.2	25.1	31.3
109 FDSXPL-16.4	165	110	213	1.9	24.9	31.1
110 FDPLSX-16.6	226	110	213	1.9	25.2	31.5
111 FDSXPL-14.9	3	120	216	1.8	23.6	31.5
112 FDSXBL-15.6	8	110	202	1.8	23.6	30.7
113 FDPLSX-18.7	12	90	242	2.7	25.2	28.6
114 FDSXPL-19.0	156	100	267	2.7	27.3	31.1
115 FDSXPL-19.5	364	100	245	2.5	28.1	31.8
116 FDSXPL-19.5	18	100	239	2.4	28.1	31.7
117 SXFDPL-18.9	14	90	222	2.5	25.5	30.7
118 FDATPL-18.9	23	100	225	2.3	27.3	32.0
119 FDPLSX-22.1	3	90	285	3.2	29.9	29.8
120 FDPLSX-22.1	50	90	289	3.2	29.9	30.6
121 FDSXPL-22.1	479	100	328	3.3	31.8	34.2
122 FDSXPL-22.6	76	90	301	3.3	30.6	31.5
123 FDSXPL-21.6	15	100	322	3.2	31.2	33.3
124 FDPLAT-24.3	13	90	310	3.4	32.9	32.0
125 FDPLSX-26.1	21	90	336	3.7	35.4	33.5
126 FDSXAT-25.0	16	90	273	3.0	33.8	33.3
127 HWBLSX-10.1	17	130	212	1.6	18.3	28.3
128 HWBLSX-11.5	42	120	236	2.0	19.7	28.6
129 HWCWBL-11.6	3	120	207	1.7	20.0	28.5
130 PLSX-13.7	1	90	141	1.6	18.1	22.3
131 PLSXBL-12.2	35	110	203	1.9	18.9	22.4
132 PLSXBL-12.5	69	100	152	1.5	17.7	21.7
133 PLSXBL-12.6	976	110	173	1.6	18.6	22.1
134 PLSXBL-13.0	814	100	160	1.6	18.2	21.4
135 PLSXAT-12.9	388	110	178	1.6	19.0	22.3
136 PLSXBL-13.2	11	100	175	1.8	18.5	21.5
137 PLSXBL-12.8	60	100	160	1.6	18.1	21.0
138 PLSX-14.5	3	100	186	1.9	20.0	23.3
139 PLSXBL-12.9	2	100	149	1.5	18.1	22.3
140 PLSXFD-12.2	57	110	152	1.4	18.0	22.6
141 PLSXBL-13.1	41	100	148	1.5	18.4	22.2
142 PLSXBL-16.1	3	90	203	2.3	20.8	22.4
143 PLSXBL-16.3	48	80	176	2.2	19.8	21.8

Existing NSYT Areas & Minimum Harvest Attributes (cont.)

Existing NSYT Analysis Unit	THLB Area (ha)	Existing NSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
144 PLSXBL-16.3	20	80	172	2.2	19.8	21.8
145 PLSXBL-16.5	1,826	80	267	3.3	20.7	20.8
146 PLSXBL-16.4	2,918	80	182	2.3	19.9	21.3
147 PLSXAT-16.4	3,427	90	204	2.3	21.2	22.3
148 PLSXBL-16.2	17	90	210	2.3	20.9	21.7
149 PLSXBL-15.5	64	90	197	2.2	20.1	21.8
150 PLATSX-16.2	11	90	191	2.1	20.9	22.7
151 PLSXBL-16.4	23	80	173	2.2	20.0	22.2
152 PLSXBL-16.2	87	90	194	2.2	20.9	23.0
153 PLSXAT-16.3	270	90	202	2.2	21.0	22.7
154 PLSX-18.8	2	80	228	2.9	22.6	22.1
155 PLSXFD-18.6	29	80	206	2.6	22.4	23.2
156 PLSXBL-18.9	1,577	70	199	2.8	21.2	21.4
157 PLSXBL-19.5	4,905	70	305	4.4	22.5	21.6
158 PLSXAT-19.2	7,518	70	197	2.8	21.6	21.4
159 PLSXAT-19.2	481	70	193	2.8	21.6	21.4
160 PLSXBL-18.1	31	70	191	2.7	20.4	21.5
161 PLSXBL-18.6	13	70	191	2.7	20.8	21.7
162 PLSXBL-19.0	22	70	184	2.6	21.3	21.8
163 PLSXBL-19.1	302	70	197	2.8	21.5	21.9
164 PLSXAT-19.0	805	70	194	2.8	21.3	21.5
165 PLSXAT-21.3	7	70	213	3.0	23.8	23.4
166 PLSXAT-21.1	11	70	224	3.2	23.6	22.7
167 PLSXBL-21.7	486	60	208	3.5	22.2	21.3
168 PLSXAT-21.7	1,961	70	243	3.5	24.2	22.6
169 PLSXAT-21.6	4,604	50	252	5.0	20.4	19.6
170 PLSXBL-21.8	261	70	237	3.4	24.3	22.8
171 PLSX-22.5	4	60	214	3.6	23.1	21.8
172 PLSXBL-21.1	1	70	241	3.4	23.6	22.9
173 PLSXAT-21.8	59	70	244	3.5	24.3	23.3
174 PLSXAT-21.5	379	70	237	3.4	24.0	22.8
175 PLSXAT-25.3	1	60	231	3.9	26.0	23.2
176 PLATSX-26.2	8	60	217	3.6	26.8	23.2
177 PLSXBL-25.0	68	60	248	4.1	25.6	22.7
178 PLSXBL-24.8	305	60	247	4.1	25.4	22.6
179 PLSXAT-25.1	774	60	245	4.1	25.7	22.6
180 PLSXFD-24.1	23	50	353	7.1	23.2	21.6
181 PLSXAT-24.1	40	60	242	4.0	24.7	22.4
182 PLSXAT-24.6	68	60	241	4.0	25.2	22.7
183 SXPLBL-11.7	7	140	218	1.6	23.6	32.6
184 SXBLPL-11.8	130	130	203	1.6	22.8	30.6
185 SXBLPL-12.1	95	130	206	1.6	23.1	31.2
186 SXBLPL-11.8	11,869	130	204	1.6	22.7	30.1
187 SXBLPL-12.1	6,565	130	214	1.7	23.1	30.4

Existing NSYT Areas & Minimum Harvest Attributes (cont.)

Existing NSYT Analysis Unit	THLB Area (ha)	Existing NSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
188 SXBLPL-12.3	2,743	130	216	1.7	23.4	30.8
189 SXBLPL-12.7	127	130	246	1.9	24.0	31.4
190 SXBLPL-11.4	2,236	130	192	1.5	22.1	29.8
191 SXBL-10.4	26	140	157	1.1	21.9	31.6
192 SXBLPL-11.7	197	130	200	1.5	22.6	30.5
193 SXBLPL-11.9	1,245	130	201	1.6	22.9	30.9
194 SXBLPL-11.8	1,041	130	202	1.6	22.7	30.7
195 SXBLPL-12.2	1,171	130	216	1.7	23.4	31.2
196 SXBLCW-12.6	125	130	225	1.7	23.9	31.9
197 SXBLPL-15.5	4	110	245	2.2	24.9	30.7
198 SXBLPL-15.9	15	110	241	2.2	25.4	30.9
199 SXBLPL-16.1	61	110	243	2.2	25.7	32.2
200 SXBLPL-15.8	4,526	110	241	2.2	25.3	30.8
201 SXBLPL-15.9	5,278	110	245	2.2	25.4	30.8
202 SXBLPL-15.9	4,244	110	246	2.2	25.4	30.8
203 SXBLPL-16.0	246	110	248	2.3	25.5	31.4
204 SXBLPL-15.8	390	100	214	2.1	23.6	29.3
205 SXBLPL-15.5	41	110	222	2.0	24.9	31.5
206 SXBLPL-15.7	19	110	244	2.2	25.2	30.7
207 SXBLPL-15.9	498	110	242	2.2	25.4	31.4
208 SXBLPL-16.1	638	110	251	2.3	25.6	31.5
209 SXBLPL-16.0	1,446	110	247	2.3	25.5	31.4
210 SXBLFD-15.8	140	110	244	2.2	25.3	31.3
211 SXBLPL-18.9	8	100	273	2.7	27.3	30.6
212 SXPLBL-18.4	18	100	256	2.6	26.8	33.0
213 SXBLPL-18.8	1,394	100	273	2.7	27.2	31.1
214 SXBLPL-19.1	3,988	100	281	2.8	27.5	31.3
215 SXPLBL-19.1	4,299	100	274	2.7	27.5	31.3
216 SXPLAT-18.8	321	100	274	2.7	27.3	31.2
217 SXBLPL-18.7	97	90	239	2.7	25.2	29.4
218 SXBLPL-18.5	22	100	272	2.7	26.9	31.6
219 SXBLPL-18.8	342	90	242	2.7	25.4	30.0
220 SXBLPL-19.0	512	100	269	2.7	27.5	32.0
221 SXBLPL-18.9	1,116	100	272	2.7	27.3	31.9
222 SXAT-18.7	3	100	248	2.5	27.1	33.8
223 SXACBL-22.1	13	80	230	2.9	26.9	31.8
224 SXPLAC-22.2	6	90	302	3.4	29.2	31.4
225 SXBLPL-21.7	220	90	294	3.3	28.6	31.1
226 SXBLPL-21.7	1,617	90	295	3.3	28.7	31.2
227 SXPLAT-21.9	2,521	90	303	3.4	28.9	31.0
228 SXPLAT-21.7	211	90	292	3.2	28.6	31.3
229 SXBLAC-21.8	30	80	262	3.3	26.5	30.4
230 SXBLAT-21.5	121	90	278	3.1	28.4	31.9
231 SXBLPL-21.9	606	90	290	3.2	28.8	32.1

Existing NSYT Areas & Minimum Harvest Attributes (cont.)

Existing NSYT Analysis Unit	THLB Area (ha)	Existing NSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
232 SXPL-21.0	2	80	232	2.9	25.6	30.0
233 SXBLPL-25.9	129	80	285	3.6	31.0	31.2
234 SXPLAT-25.5	247	80	303	3.8	30.6	30.4
235 SXPLBL-25.3	1,062	80	291	3.6	30.3	30.4
236 SXPLAT-25.3	120	90	316	3.5	32.6	31.9
238 SXPLBL-26.8	31	80	310	3.9	31.9	31.9
239 SXPLBL-25.8	104	80	306	3.8	30.9	31.1
241 SXPLBL-11.5	39	130	150	1.2	19.7	30.5
242 SXPL-10.7	48	140	161	1.2	19.5	28.9
243 SXPL-11.1	26	140	167	1.2	20.1	29.5
244 SXACAT-11.9	7	130	161	1.2	20.2	29.9
245 SXPL-12.5	7	120	166	1.4	20.1	28.9
246 SXBLAT-11.0	26	140	154	1.1	19.9	30.1
247 SXPL-10.9	15	140	160	1.1	19.6	29.3
248 SXPLBL-11.0	17	140	167	1.2	19.9	29.2
249 PLSX-15.5	1	90	178	2.0	19.9	24.4
250 SXPLAT-16.9	3	100	207	2.1	23.0	30.1
251 PLSXAT-15.5	4	90	185	2.1	19.9	23.7
252 SXPL-19.8	2	90	258	2.9	24.8	28.9
253 SXAC-19.0	1	80	198	2.5	22.2	28.1
260 SXBLPL-18.4	60	100	242	2.4	25.9	30.7

APPENDIX V – Existing MSYT Descriptions & Minimum Harvest Ages

Existing MSYT Areas & Minimum Harvest Attributes

Existing MSYT Analysis Unit	THLB Area (ha	Existing MSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
301 PLSXAT-11.6	0	120	186	1.6	18.6	22.9
313 PLSX-20.4	9	60	328	5.5	21.9	20.2
316 PLSXAT-21.8	5	60	354	5.9	23.2	22.2
317 PLSXFD-23.9	5	60	428	7.1	25.9	24.0
323 PLSXAT-18.6	0	60	256	4.3	19.3	19.6
324 PLSX-20.6	1	60	332	5.5	22.2	20.6
331 PLSXAT-19.9	0	60	294	4.9	20.9	19.9
339 PLSXAT-22.4	30	60	369	6.2	23.7	22.7
352 SXPLBL-12.9	12	120	285	2.4	22.6	23.5
362 PLSX-16.5	1	80	295	3.7	21.0	20.5
363 PLSXAT-19.5	6	60	298	5.0	20.9	19.7
364 PLSXAT-21.9	0	60	358	6.0	23.2	22.1
370 SXPL-21.9	2	70	397	5.7	25.6	24.2
373 PLSX-19.9	24	60	301	5.0	21.0	19.9
374 PLSXAT-22.3	58	60	373	6.2	23.8	22.7
380 SXPL-21.8	5	70	397	5.7	25.6	24.2
383 PLSXAT-19.7	21	60	303	5.1	21.2	20.4
384 PLSXAT-22.3	28	60	382	6.4	24.2	23.2
400 PLSXAT-23.0	20	60	386	6.4	24.4	23.5
409 PLSXAT-20.1	35	60	303	5.1	21.1	19.8
415 PLSXAT-22.4	75	60	380	6.3	24.1	22.6
416 PLSXAT-23.6	49	50	351	7.0	22.8	21.2
421 PLSXAT-22.4	106	60	388	6.5	24.4	22.9
431 PLSXAT-12.2	312	120	229	1.9	20.0	23.0
432 PLSX-13.4	13	100	206	2.1	18.4	21.1
435 PLSXAT-22.2	3	60	366	6.1	23.5	22.3
445 PLSX-16.7	8,403	80	299	3.7	21.1	20.7
446 PLSX-19.8	213	60	305	5.1	21.2	20.0
447 PLSXAT-22.0	78	60	364	6.1	23.5	22.3
453 SXPL-21.4	2	70	388	5.5	25.3	23.9
456 PLSX-16.6	55	80	294	3.7	21.0	20.9
457 PLSX-19.8	16,191	60	303	5.1	21.1	19.9
458 PLSXAT-22.1	476	60	371	6.2	23.7	22.5
459 PLSXAT-23.8	73	50	359	7.2	23.2	21.7
468 PLSXAT-19.8	44	60	306	5.1	21.3	20.2
469 PLSXAT-21.6	12,149	60	365	6.1	23.5	22.1
470 PLSXAT-23.9	46	50	359	7.2	23.2	21.7
480 PLSXFD-24.0	745	50	357	7.1	23.1	21.6
484 PLSX-12.1	0	120	213	1.8	19.3	22.6
500 PLSX-16.7	76	80	303	3.8	21.3	20.6
501 PLSX-19.5	506	60	297	5.0	20.8	19.8
502 PLSXAT-21.4	421	60	357	6.0	23.2	21.8

Existing MSYT Areas & Minimum Harvest Attributes (cont.)

Existing MSYT Analysis Unit	THLB Area (ha	Existing MSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
503 PLSXAT-24.0	25	50	360	7.2	23.3	21.7
508 SXPL-19.4	4	70	321	4.6	23.0	22.6
509 SXPL-21.4	11	70	391	5.6	25.4	24.0
510 SXPL-25.4	4	60	438	7.3	26.9	25.3
513 PLSX-16.8	95	80	306	3.8	21.4	20.8
514 PLSXAT-19.8	897	60	301	5.0	21.0	19.9
515 PLSXAT-21.9	1,355	60	361	6.0	23.3	22.0
516 PLSXAT-24.0	76	50	362	7.2	23.3	21.9
520 SXPL-19.5	19	70	328	4.7	23.3	22.9
521 SXPL-21.5	63	70	395	5.6	25.5	24.1
525 PLSX-17.0	6	80	314	3.9	21.7	21.3
526 PLSXAT-19.8	297	60	305	5.1	21.2	20.0
527 PLSXAT-22.1	130	60	373	6.2	23.8	22.6
528 PLSXAT-23.9	3	50	358	7.2	23.2	21.7
531 SXPL-21.7	0	70	393	5.6	25.5	24.1
532 SXPL-24.0	81	60	417	7.0	26.2	24.3
540 PLSX-10.7	1	150	234	1.6	20.2	23.9
542 PLSX-16.2	1	70	235	3.4	18.8	20.2
554 SXPLBL-13.2	790	120	297	2.5	23.0	23.9
555 SXPLBL-15.1	73	90	280	3.1	22.0	23.0
556 PLSX-17.1	203	80	336	4.2	22.4	21.4
557 PLSX-18.5	452	70	333	4.8	22.4	21.7
558 SXPL-21.6	1,301	70	398	5.7	25.7	24.2
559 SXPL-24.4	139	60	423	7.1	26.4	24.6
560 SXPLBL-18.1	5	80	318	4.0	23.0	22.7

APPENDIX VI – Future MSYT Descriptions & Minimum Harvest Ages

Future MSYT Areas & Minimum Harvest Attributes

Future MSYT Analysis Unit	THLB Area (ha)	Future MSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
301 PLSXAT-11.6	267	120	186	1.6	18.6	22.9
302 PLSX-12.7	3	90	189	2.1	17.5	19.5
303 PLSX-16.4	475	90	340	3.8	22.6	21.8
304 PLSX-19.4	761	70	346	4.9	22.8	21.4
305 PLSXAT-21.1	407	60	351	5.9	22.9	21.4
306 PLSXAT-25.4	23	50	375	7.5	23.8	22.3
307 SXPLBL-12.8	41	120	283	2.4	22.6	23.4
308 SXPL-16.6	114	90	336	3.7	23.6	22.5
309 SXPL-17.9	63	80	343	4.3	23.9	22.7
310 SXPL-22.1	9	70	394	5.6	25.6	24.0
311 PLSX-16.8	1	80	308	3.9	21.4	21.1
312 PLSX-17.1	72	80	318	4.0	21.8	21.2
313 PLSX-20.4	35	60	328	5.5	21.9	20.2
314 SXPL-19.4	5	80	368	4.6	25.0	23.8
315 SXPL-21.2	5	70	388	5.5	25.3	23.8
316 PLSXAT-21.8	16	60	354	5.9	23.2	22.2
317 PLSXFD-23.9	5	60	428	7.1	25.9	24.0
318 SXPL-18.9	1	80	375	4.7	24.9	24.3
319 SXPL-21.3	11	70	391	5.6	25.4	23.9
320 PLSXAT-19.1	12	60	289	4.8	20.6	19.6
321 SXPL-19.3	4	80	375	4.7	25.3	23.7
322 SXPL-22.0	4	70	409	5.8	26.1	24.7
323 PLSXAT-18.6	3	60	256	4.3	19.3	19.6
324 PLSX-20.6	1	60	332	5.5	22.2	20.6
325 PLSX-17.0	5	90	356	4.0	23.1	22.7
326 PLSX-18.9	26	70	329	4.7	22.3	21.4
327 PLSXAT-22.9	158	60	381	6.4	24.1	22.8
328 SXPL-22.4	22	70	408	5.8	26.0	24.7
329 PLSX-14.5	2	80	196	2.5	17.7	20.2
330 PLSX-16.4	27	80	266	3.3	19.9	20.0
331 PLSXAT-19.9	157	60	294	4.9	20.9	19.9
332 PLSXAT-22.7	492	60	379	6.3	24.1	22.9
333 PLSXAT-23.7	101	50	353	7.1	23.0	21.8
334 SXPL-16.8	58	90	315	3.5	22.9	24.0
335 SXPL-19.6	2	80	378	4.7	25.6	23.8
336 SXPL-22.2	64	70	419	6.0	26.3	25.0
337 PLSX-16.7	22	80	302	3.8	21.3	21.4
338 PLSX-19.9	84	60	304	5.1	21.3	20.2
339 PLSXAT-22.4	318	60	369	6.2	23.7	22.7
340 PLSXAT-23.9	49	50	358	7.2	23.1	21.6
341 SXPL-21.8	64	70	402	5.7	25.8	24.4
342 SXPL-24.2	2	60	412	6.9	26.2	24.9

Future MSYT Areas & Minimum Harvest Attributes

Future MSYT Analysis Unit	THLB Area (ha)	Future MSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
343 PLSXAT-21.9	45	60	367	6.1	23.7	22.6
344 SXPL-20.8	29	70	384	5.5	25.1	23.9
345 SXPLBL-10.4	0	130	142	1.1	18.3	28.9
346 PLSX-11.6	297	120	217	1.8	19.6	22.7
347 PLSX-13.8	106	100	250	2.5	19.7	21.0
348 PLSX-16.4	11,653	80	292	3.7	20.8	20.2
349 PLSX-19.2	4,282	70	341	4.9	22.6	21.2
350 PLSXAT-21.0	1,204	60	343	5.7	22.6	21.1
351 PLSXAT-24.1	75	50	362	7.2	23.2	21.6
352 SXPLBL-12.9	3,104	120	285	2.4	22.6	23.5
353 SXPL-14.1	28	120	305	2.5	22.7	22.8
354 SXPLBL-15.3	91	100	299	3.0	23.0	23.4
355 SXPL-16.6	390	90	330	3.7	23.4	22.3
356 SXPLBL-17.9	1	90	349	3.9	24.6	23.9
357 SXPL-18.7	450	80	365	4.6	24.7	24.0
358 SXPL-21.3	277	70	385	5.5	25.2	23.8
359 SXPL-25.1	12	60	442	7.4	27.0	25.3
361 PLSX-14.3	23	90	262	2.9	19.8	20.0
362 PLSX-16.5	1,129	80	295	3.7	21.0	20.5
363 PLSXAT-19.5	1,066	60	298	5.0	20.9	19.7
364 PLSXAT-21.9	595	60	358	6.0	23.2	22.1
365 SXPL-23.5	8	60	395	6.6	25.5	24.4
366 SXPLBL-12.6	106	120	277	2.3	22.3	23.5
367 PLSX-12.1	2	110	238	2.2	19.4	20.8
368 SXPL-15.7	40	90	319	3.5	23.0	22.0
369 SXPL-18.7	31	80	368	4.6	24.8	23.7
370 SXPL-21.9	76	70	397	5.7	25.6	24.2
371 SXPL-24.2	26	60	422	7.0	26.5	25.2
372 PLSX-16.8	286	80	312	3.9	21.6	20.9
373 PLSX-19.9	220	60	301	5.0	21.0	19.9
374 PLSXAT-22.3	636	60	373	6.2	23.8	22.7
375 PLSXAT-23.8	6	50	359	7.2	23.2	21.6
376 SXPLBL-13.7	13	120	297	2.5	23.1	23.8
377 PLSX-14.4	2	90	257	2.9	19.9	21.0
378 SXPL-16.4	2	90	302	3.4	22.3	23.3
379 SXPL-19.7	43	80	369	4.6	24.8	24.6
380 SXPL-21.8	72	70	397	5.7	25.6	24.2
381 PLSX-13.9	9	100	233	2.3	19.4	21.5
382 PL-16.9	17	80	293	3.7	21.0	21.4
383 PLSXAT-19.7	79	60	303	5.1	21.2	20.4
384 PLSXAT-22.3	461	60	382	6.4	24.2	23.2
385 PLSXAT-23.9	8	50	354	7.1	23.1	21.8
387 SXPL-21.8	11	70	414	5.9	26.1	24.9

Future MSYT Areas & Minimum Harvest Attributes

Future MSYT Analysis Unit	THLB Area (ha)	Future MSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
388 PLSX-18.6	14	70	352	5.0	23.0	21.6
389 PLSXAT-22.7	112	60	392	6.5	24.6	23.3
390 PLSX-18.6	8	70	342	4.9	22.6	21.1
391 PLSXAT-20.6	3	60	332	5.5	22.1	20.6
392 PLSXFD-24.7	32	50	370	7.4	23.4	21.8
393 SXPL-24.9	33	60	438	7.3	26.8	25.1
394 PLSXAT-22.5	18	60	387	6.5	24.3	23.0
395 PLSXAT-20.6	2	60	331	5.5	22.1	20.5
396 PL-18.3	28	60	293	4.9	20.7	19.9
397 PLSXAT-21.9	5	60	377	6.3	24.0	22.7
398 PLSXAT-24.1	1	50	363	7.3	23.3	21.8
399 PLSXAT-20.1	16	60	317	5.3	21.5	20.0
400 PLSXAT-23.0	59	60	386	6.4	24.4	23.5
401 PLSXAT-23.5	14	50	347	6.9	22.8	22.0
402 SXPL-20.7	2	70	363	5.2	24.5	23.5
403 PLSXFD-19.9	23	70	342	4.9	23.5	21.5
404 PLSXAT-22.9	36	60	393	6.6	24.5	23.0
405 SXPL-18.9	7	80	355	4.4	24.7	24.3
406 PLSX-18.9	8	70	320	4.6	22.0	20.9
407 PLSXAT-22.9	15	60	374	6.2	23.8	22.3
408 PLSX-17.0	1	90	342	3.8	22.8	22.7
409 PLSXAT-20.1	201	60	303	5.1	21.1	19.8
410 PLSXAT-21.7	226	60	366	6.1	23.5	22.1
411 PLSXAT-23.5	3	50	350	7.0	22.8	21.2
412 SXPL-20.8	8	70	373	5.3	24.8	23.6
413 PLSX-17.4	12	70	280	4.0	20.3	19.9
414 PLSX-20.3	156	60	321	5.4	21.7	20.2
415 PLSXAT-22.4	439	60	380	6.3	24.1	22.6
416 PLSXAT-23.6	67	50	351	7.0	22.8	21.2
417 SXPL-20.3	14	70	347	5.0	24.0	23.1
418 PLSXFD-22.5	23	60	376	6.3	24.0	22.6
419 SXPL-16.8	3	90	325	3.6	22.9	22.7
420 PLSXAT-20.0	51	60	319	5.3	21.6	20.3
421 PLSXAT-22.4	585	60	388	6.5	24.4	22.9
422 PLSXAT-24.2	76	50	366	7.3	23.5	22.0
423 SXPL-22.4	15	70	428	6.1	26.6	25.2
424 PLSX-20.4	13	60	323	5.4	21.7	20.1
425 PLSXAT-21.2	21	60	343	5.7	22.8	22.1
426 SXPL-22.2	16	70	421	6.0	26.4	25.0
427 PLSX-18.7	17	70	343	4.9	22.6	21.1
428 PLSXAT-20.6	42	60	332	5.5	22.1	20.6
429 PLSXFD-24.6	3	50	375	7.5	23.6	21.9
430 PLSX-13.7	1	90	141	1.6	18.1	22.3

Future MSYT Areas & Minimum Harvest Attributes

Future MSYT Analysis Unit	THLB Area (ha)	Future MSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
431 PLSXAT-12.2	347	120	229	1.9	20.0	23.0
432 PLSX-13.4	87	100	206	2.1	18.4	21.1
433 PLSX-16.2	976	80	284	3.6	20.6	20.6
434 PLSX-19.9	814	60	306	5.1	21.2	20.0
435 PLSXAT-22.2	392	60	366	6.1	23.5	22.3
436 PLSXAT-23.9	11	50	359	7.2	23.2	22.1
437 SXPLBL-12.6	60	120	278	2.3	22.3	23.5
438 SXPL-15.7	3	90	308	3.4	22.5	23.6
439 SXPL-16.9	2	90	359	4.0	24.4	23.0
440 SXPL-18.6	57	80	356	4.5	24.4	24.5
441 SXPL-21.4	41	70	388	5.5	25.2	24.0
442 PL-16.1	3	90	203	2.3	20.8	22.4
443 PLSX-12.3	48	120	227	1.9	19.9	23.0
444 PLSX-13.6	24	100	239	2.4	19.5	21.6
445 PLSX-16.7	10,507	80	299	3.7	21.1	20.7
446 PLSX-19.8	3,134	60	305	5.1	21.2	20.0
447 PLSXAT-22.0	3,506	60	364	6.1	23.5	22.3
448 PLSXAT-23.7	17	50	355	7.1	23.0	21.4
449 SXPLBL-13.3	64	120	294	2.5	22.9	23.9
450 SXPLBL-16.6	11	90	309	3.4	22.8	23.6
451 SXPL-16.9	23	90	335	3.7	23.6	22.8
452 SXPL-19.7	87	70	325	4.6	23.1	22.8
453 SXPL-21.4	272	70	388	5.5	25.3	23.9
454 SXPL-13.5	2	110	210	1.9	19.5	22.9
455 PLSX-13.5	29	100	215	2.2	18.7	21.3
456 PLSX-16.6	1,677	80	294	3.7	21.0	20.9
457 PLSX-19.8	21,549	60	303	5.1	21.1	19.9
458 PLSXAT-22.1	8,005	60	371	6.2	23.7	22.5
459 PLSXAT-23.8	554	50	359	7.2	23.2	21.7
460 SXPLBL-13.3	31	120	290	2.4	22.7	23.8
461 SXPL-16.7	13	90	340	3.8	23.7	24.6
462 SXPL-17.1	22	80	285	3.6	21.8	21.5
463 SXPL-19.7	302	80	373	4.7	25.0	24.5
464 SXPL-21.5	805	70	396	5.7	25.5	24.2
465 PLSX-11.2	7	140	194	1.4	18.8	22.9
466 PLSX-14.1	11	100	243	2.4	19.6	21.7
467 PL-16.5	486	70	252	3.6	19.3	19.6
468 PLSXAT-19.8	2,005	60	306	5.1	21.3	20.2
469 PLSXAT-21.6	17,355	60	365	6.1	23.5	22.1
470 PLSXAT-23.9	313	50	359	7.2	23.2	21.7
471 SXPL-17.5	4	90	348	3.9	24.0	25.1
472 SXPL-16.2	1	80	257	3.2	20.5	21.4
473 SXPL-19.7	59	70	334	4.8	23.4	23.0

Future MSYT Areas & Minimum Harvest Attributes

Future MSYT Analysis Unit	THLB Area (ha)	Future MSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
474 SXPL-21.5	379	70	396	5.7	25.5	24.4
475 PLSX-11.5	1	130	200	1.5	19.1	23.2
476 PLSX-13.8	8	100	236	2.4	19.5	22.0
477 PL-16.4	68	80	291	3.6	20.9	20.9
478 PLSXAT-20.1	305	60	299	5.0	21.2	20.1
479 PLSXAT-22.0	774	60	374	6.2	23.9	22.7
480 PLSXFD-24.0	782	50	357	7.1	23.1	21.6
481 SXPL-19.8	40	70	319	4.6	23.5	22.1
482 SXPL-21.5	68	70	397	5.7	25.6	24.3
483 SXPLBL-11.7	7	130	198	1.5	22.4	31.4
484 PLSX-12.1	130	120	213	1.8	19.3	22.6
485 PLSX-13.3	95	100	231	2.3	19.2	21.1
486 PLSX-16.5	11,883	80	298	3.7	21.1	20.5
487 PLSX-19.1	6,599	60	289	4.8	20.6	19.6
488 PLSXAT-21.0	2,767	60	343	5.7	22.6	21.2
489 PLSXAT-24.0	127	50	360	7.2	23.2	21.7
490 SXPLBL-13.3	2,240	120	299	2.5	23.1	23.9
491 SXPL-13.8	30	110	273	2.5	21.7	22.7
492 SXPLBL-15.4	197	100	316	3.2	23.5	23.9
493 SXPL-16.8	1,249	90	331	3.7	23.5	22.4
494 SXPL-19.0	1,044	80	364	4.6	24.6	24.1
495 SXPL-21.3	1,171	70	385	5.5	25.2	23.8
496 SXPL-25.1	125	60	440	7.3	27.0	25.2
497 SXPLBL-15.5	4	110	245	2.2	24.9	30.7
498 PLSX-11.8	15	120	210	1.8	19.2	22.6
499 PLSX-13.1	62	100	232	2.3	19.1	20.9
500 PLSX-16.7	4,682	80	303	3.8	21.3	20.6
501 PLSX-19.5	5,813	60	297	5.0	20.8	19.8
502 PLSXAT-21.4	4,716	60	357	6.0	23.2	21.8
503 PLSXAT-24.0	296	50	360	7.2	23.3	21.7
504 SXPLBL-13.2	391	110	269	2.5	22.1	23.1
505 PLSX-12.7	41	100	235	2.4	19.1	20.3
506 SXPLBL-15.9	19	90	293	3.3	22.5	23.3
507 SXPL-16.8	498	90	337	3.7	23.6	22.6
508 SXPL-19.4	642	70	321	4.6	23.0	22.6
509 SXPL-21.4	1,458	70	391	5.6	25.4	24.0
510 SXPL-25.4	144	60	438	7.3	26.9	25.3
511 SXPLBL-10.7	8	140	208	1.5	19.8	23.3
512 PLSX-12.2	18	110	210	1.9	18.7	21.6
513 PLSX-16.8	1,489	80	306	3.8	21.4	20.8
514 PLSXAT-19.8	4,894	60	301	5.0	21.0	19.9
515 PLSXAT-21.9	5,764	60	361	6.0	23.3	22.0
516 PLSXAT-24.0	401	50	362	7.2	23.3	21.9

Future MSYT Areas & Minimum Harvest Attributes

Future MSYT Analysis Unit	THLB Area (ha)	Future MSYT Minimum Harvest Age Attributes				
		Age	Volume (m3/ha)	MAI (m3/ha/yr)	Height (m)	Diameter (cm)
517 SXPLBL-13.4	97	120	301	2.5	23.1	24.0
518 SXPL-15.7	22	100	309	3.1	23.1	24.0
519 SXPL-16.8	342	90	331	3.7	23.4	22.5
520 SXPL-19.5	531	70	328	4.7	23.3	22.9
521 SXPL-21.5	1,183	70	395	5.6	25.5	24.1
522 PLSXFD-24.0	8	60	433	7.2	26.0	24.1
523 PLSX-11.3	13	120	195	1.6	18.4	21.9
524 PLSX-12.9	6	100	184	1.8	17.8	21.2
525 PLSX-17.0	226	80	314	3.9	21.7	21.3
526 PLSXAT-19.8	1,914	60	305	5.1	21.2	20.0
527 PLSXAT-22.1	2,651	60	373	6.2	23.8	22.6
528 PLSXAT-23.9	215	50	358	7.2	23.2	21.7
29 SXPL-17.2	30	90	348	3.9	24.0	22.9
SXPL-19.6	121	70	319	4.6	23.0	22.8
SXPL-21.7	606	70	393	5.6	25.5	24.1
SXPL-24.0	97	60	417	7.0	26.2	24.3
PLSX-16.9	129	70	255	3.6	19.5	19.5
PLSXAT-20.1	247	60	303	5.1	21.2	19.9
PLSXAT-22.3	1,069	60	375	6.3	23.8	22.5
PLSXAT-24.0	120	50	366	7.3	23.4	21.9
SXPL-18.8	31	80	348	4.4	24.1	24.2
SXPL-21.5	104	70	395	5.6	25.5	24.2
PLSX-10.7	1	150	234	1.6	20.2	23.9
LSX-11.9	39	110	204	1.9	18.7	22.0
LSX-16.2	48	70	235	3.4	18.8	20.2
LSX-18.8	28	60	273	4.6	20.1	20.4
LSX-21.5	7	60	345	5.8	23.1	23.4
XPL-16.8	7	90	308	3.4	22.5	23.6
XPL-16.6	26	90	339	3.8	23.7	23.2
XPL-18.5	15	80	345	4.3	24.0	23.9
XPL-21.2	17	70	381	5.4	25.0	24.0
LSX-16.9	1	60	207	3.5	17.4	18.5
LSXAT-19.7	3	60	298	5.0	20.8	20.5
LSXAT-21.0	4	60	340	5.7	22.6	22.1
LSXAT-22.2	2	60	378	6.3	23.9	22.7
XPL-22.7	1	60	363	6.1	24.3	23.8
XPLBL-13.2	797	120	297	2.5	23.0	23.9
XPLBL-15.1	73	90	280	3.1	22.0	23.0
LSX-17.1	212	80	336	4.2	22.4	21.4
LSX-18.5	502	70	333	4.8	22.4	21.7
XPL-21.6	1,365	70	398	5.7	25.7	24.2
559 SXPL-24.4	149	60	423	7.1	26.4	24.6
560 SXPLBL-18.1	66	80	318	4.0	23.0	22.7

Final analysis sent to B.K. by Bill Kuzmuk on Dec. 12/2002.
genetic gain sensitivity analysis is attached.

WEST FRASER MILLS LTD.
BOWRON-COTTONWOOD TREE FARM LICENSE
(TFL 52)
MANAGEMENT PLAN 3

TIMBER SUPPLY ANALYSIS

Prepared by:
West Fraser Mills Ltd. – Quesnel, B.C.
&
Timberline Forest Inventory Consultants Ltd.

July 12, 2001

Reference: 9941015.5.1

Timberline
Forest Inventory Consultants

The Base Case includes management guidelines reflecting new inventory data, Forest Practices Code (FPC) requirements and the Cariboo-Chilcotin Land Use Plan (CCLUP).

The current AAC of 549,000 m3/year did not utilize all available timber and make use of the productive capacity of the timber harvesting land base (THLB). Therefore the initial harvest rate was increased to 596,000 m3/year. Beginning in year 60 of the Base Case simulation the harvest increases to the long-term level of 735,700 m3/year at year 110.

Key factors contributing to the increase in harvest compared to the current AAC include:

- New inventory data (forest cover, terrestrial ecosystem, etc.) which provides more refined forest stand information;
- New managed stand yield tables based on site index estimates to the site series level;
- Refined stream classification and riparian reserves; and
- Updated boundaries and forest cover constraints for caribou.

The short-term (decades 1 – 5) harvest is limited by the existing inventory of mature timber and constraints on those stands to address old growth requirements. Initially, many of the older stands are placed in temporary reserve to meet old forest constraints. In addition, the availability of second growth stands is important in determining the timing and extent of the increase to the long-term harvest level. Due to a lack of stands currently 40 – 60 years old, there is a limit on available timber at year 50 of the Base Case simulation.

After decade six many of the old forest requirements have been satisfied and there is more flexibility in selecting candidate stands for harvest. In addition, many managed stands have reached minimum harvest age and begin to make up a significant portion of the annual harvest.

Excluding old growth requirements in the Base Case allows the initial harvest to increase to 663,400 m3/year, 21% above the current AAC. This scenario is based on the CCLUP Biodiversity Conservation Strategy, which indicates that there are concerns about the 250-year old growth age in certain natural disturbance types (NDT). Even without the old forest constraints being enforced, most areas achieve recommended old forest percentages within two rotations.

In the Alternative Biodiversity option, the biodiversity emphasis was shifted from the draft assignments. This approach attempted to match the intermediate and high emphasis assignments with areas that are highly constrained for other non-timber interests (visual quality, wildlife, etc.). It also assigned areas within the Quesnel Highlands Special Resource Development Zone (SRDZ) to intermediate or high emphasis. In addition the distribution was targeted at 45% low, 45 intermediate and 10% high within the TFL.

As a result of these management assumptions the initial harvest increased to 632,200 m3/year. This increase is a result of removing high and intermediate emphasis from areas of the TFL that have very few other constraints, thereby providing more access to mature timber, while still addressing the non-timber concerns for visuals, wildlife and landscape level biodiversity.

TABLE OF CONTENTS

1.0 INTRODUCTION

An analysis of the timber supply on the Bowron-Cottonwood Tree Farm License (TFL 52) has been completed on behalf of West Fraser Mills Ltd. (WFM) of Quesnel, B.C. as part of the Management Plan 3 (MP #3) submission. The analysis has considered current management requirements and expected requirements associated with the Forest Practices Code (FPC) and the Cariboo-Chilcotin Land Use Plan (CCLUP). Requirements for both timber and non-timber resources have been included.

Timber supply is the quantity of timber available for harvest over time. It is dynamic, not only because trees naturally grow and die, but also because conditions that affect tree growth, and the social and economic environment that effect the availability of trees for harvest, change with time.

Timber supply analysis is the process of assessing and predicting the current and future timber supply from a management unit. The Chief Forester of British Columbia uses this information in determining a permissible harvest level for the management unit. Timber supply projections made in support of TFL management plans look 250 years into the future. However, due to uncertainty surrounding both the information used in analysis, and future forest management objectives, these projections are not viewed as static or prescriptive. They remain relevant only as long as the information in them is current. TFL licensees are required to re-evaluate timber supply for each successive management plan, every five years.

Three options were identified and analysed for this timber supply analysis in support of MP #3:

- Base Case;
- Alternative Landscape Level Biodiversity Emphasis; and
- 20-Year Spatial Feasibility.

For the Base Case and Alternative Landscape Level Biodiversity Emphasis options a number of sensitivity analysis results are presented which can be used to isolate the effects of changes to analysis inputs. The Information Package (Appendix I) describes inputs and assumptions used for each of the options. Any departures from the inputs and assumptions presented in the Information Package are provided in this report.

The following objectives were used in developing harvest schedules:

- To sustain a harvest level at least as high as the current AAC of 549,000 m3/year plus 6,750 m3/year of non-recoverable losses for as long as possible. This includes 35,239 m3/year for the Small Business Forest Enterprise Program (SBFEP).
- To achieve the maximum long-term even-flow harvest of timber without compromising the total inventory of timber on the TFL.
- To manage the landbase in a manner consistent with the principles of integrated resource use.

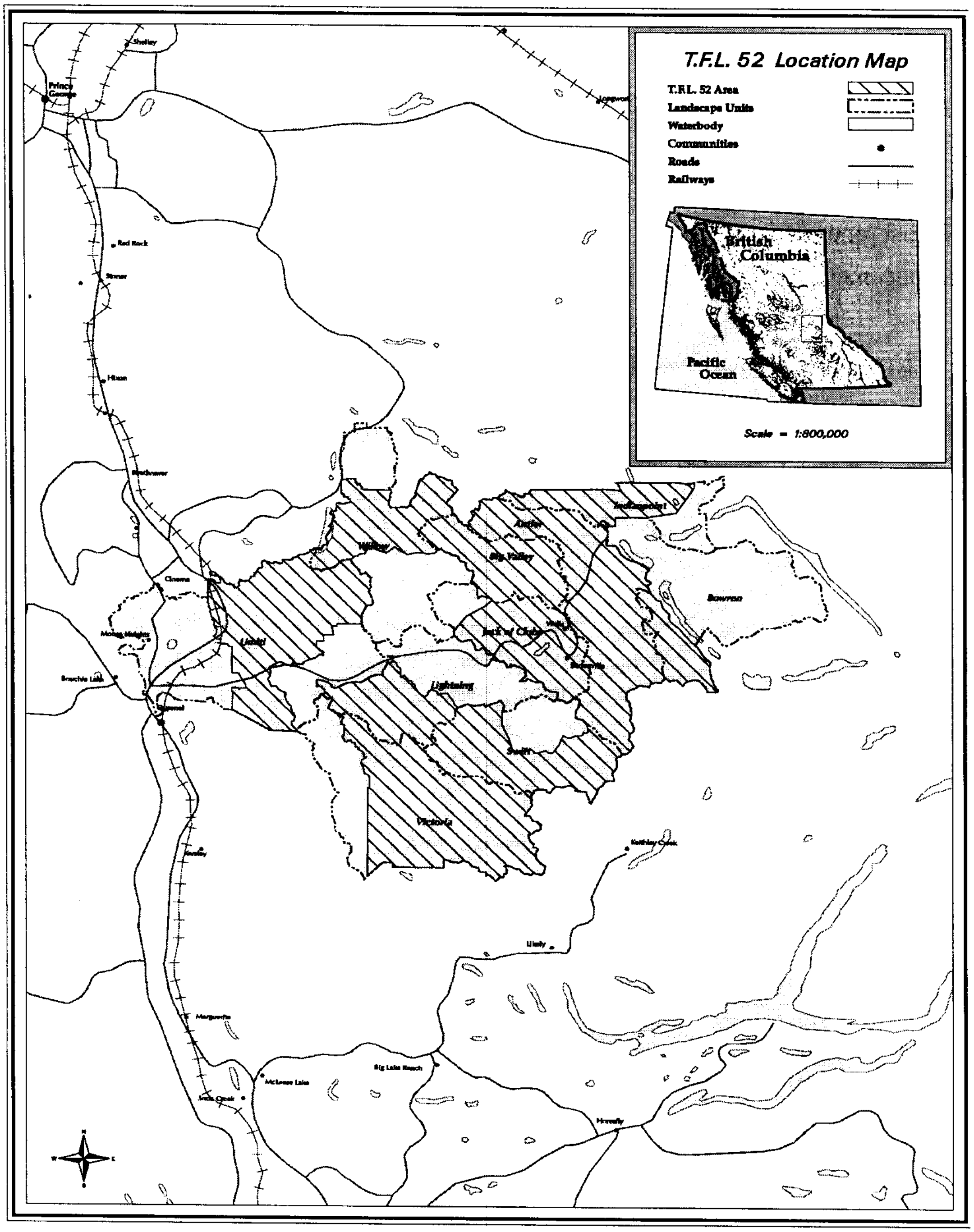


Figure 2.1 – TFL 52 Overview Map

Table 3.1 provides a summary of the areas removed for each land base reduction in determining the THLB.

Table 3.1 – Base Case Timber Harvesting Land Base Determination

Land Classification	Total Area[1] (ha)	Net Reduction		Net Remainder	
		Area (ha)	Volume (1000s m3)	Area (ha)	Volume (1000s m3)
Total Area	258,866			258,866	43,080
Non-productive & non-forest	16,203	16,203	830		
Non-productive forest & alpine forest	2,401	2,401	113		
Existing roads	5,191	5,191	167		
NCBr	48	47	1		
Productive Forest				235,023	41,969
Productive reductions:					
Riparian reserve zones (RRZ)	9,426	6,692	1,554		
Riparian management zones (RMZ)	7,994	5,380	1,217		
Caribou "No-harvest"	22,292	17,554	3,168		
Inoperable	4,572	3,518	721		
Low productivity sites	3,789	2,695	357		
Deciduous	4,214	3,359	92		
Non-merchantable & Balsam IU	8,063	5,318	188		
Preservation VQO	76	76	21		
Wildlife tree patches (WTP)		1,473	359		
Total Reductions		46,067	7,678		
Current Net Operable Land Base				188,956	34,291
NSR				4,480	31
Immature				87,589	5,597
Mature				96,887	28,663
Less future road reductions		2,462			
Long-term Net Operable Land Base				186,494	34,291

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

In the analysis culmination age was used to estimate minimum harvest age for all clear cut stands. The caribou selection harvest used a planned rotation of 240 years with entries permitted every 80 years. In the selection harvest area, 33% of the mature volume was available for harvest during each entry.

3.3 Management Practices

Timber supply is directly linked to forest management activities. Current practices are modeled by matching inputs to actual activity using the functionality of CASH6.2.

To model landscape level biodiversity objectives (mature and mature+old constraints) the land base was classified into units based on landscape unit, BEC to the variant level and natural disturbance type (LU-BEC/NDT). Mature and old forest requirements were assigned to each of the LU-BEC/NDTs identified on TFL 52. Areas from outside TFL 52 within the Bowron and Indianpoint LUs were included in the analysis database and were able to contribute to the mature and old requirements for those specific LU-BEC/NDTs. These two LUs occur only within TFL 52 and Bowron Provincial Park. The productive forest from Bowron Park did not contribute to any other forest cover requirements (visual quality or wildlife) and was never available for harvest. Section 7.1 of the Information Package summarises these LU-BEC/NDT units.

Landscape level constraints assigned in the analysis are based on the draft biodiversity emphasis and associated FPC Biodiversity Guidebook mature and old growth ages and minimum percentages for each LU-BEC/NDT. Alternative methods were evaluated in the Alternative Landscape Level Biodiveristy option. The Base Case did not incorporate any adjustments to the old growth constraints as outlined in the *Biodiversity Conservation Strategy for the Cariboo-Chilcotin Land Use Plan*. These factors, which relax the old growth constraints, are currently being used by WFM in their 5-Year Forest Development Plans (FDP).

Resource emphasis areas (REAs) or management zones have been assigned to the land base for modeling purposes. REAs facilitate the application of management criteria. Specifically, REAs are defined on the basis of wildlife habitat and the maintenance of visual quality. Details of the zone assignments can be found in Section 7.2 of the Information Package.

4.2 Analysis Results

Results of the various analysis scenarios are presented in graphic and tabular form. Tables provide actual harvest levels achieved during each period of the simulation. Graphic results display trends in timber inventory (stock) and harvest levels, and age class distributions. Four categories are presented in the inventory summary figures:

- Total - the total inventory on the THLB regardless of age;
- Operable – the inventory on the THLB above minimum harvest age;
- Available – the estimated portion of the operable timber inventory that is not excluded from harvest by forest cover constraints; and
- Periodic harvest.

Inventories are reported at the beginning of each simulation period.

not be incorporated into the timber supply analysis directly. Therefore it was agreed that a comparison scenario would be modeled for the Base Case in which old forest constraints were only monitored, not enforced. As shown in the results in Table 5.1 the initial harvest is considerably higher in the No Old Growth scenario.

The Base Case harvest level selected for this analysis reflects the maximum even-flow harvest level of 596,900 m3/year in the short-term, with subsequent increases in annual harvest during periods 6 – 10 to the sustainable long-term level of 735,700 m3/year. WFM elected to use this scenario as it incorporates a conservative approach to modeling landscape level biodiversity while utilizing the productive capacity of the land base. The Base Case demonstrates the stable nature of the timber supply on TFL 52, even with more limitations on harvest than are being implemented in current operations.

Figure 5.1 provides a graphic summary of the inventory and harvest levels over time for the MP #3 Base Case.

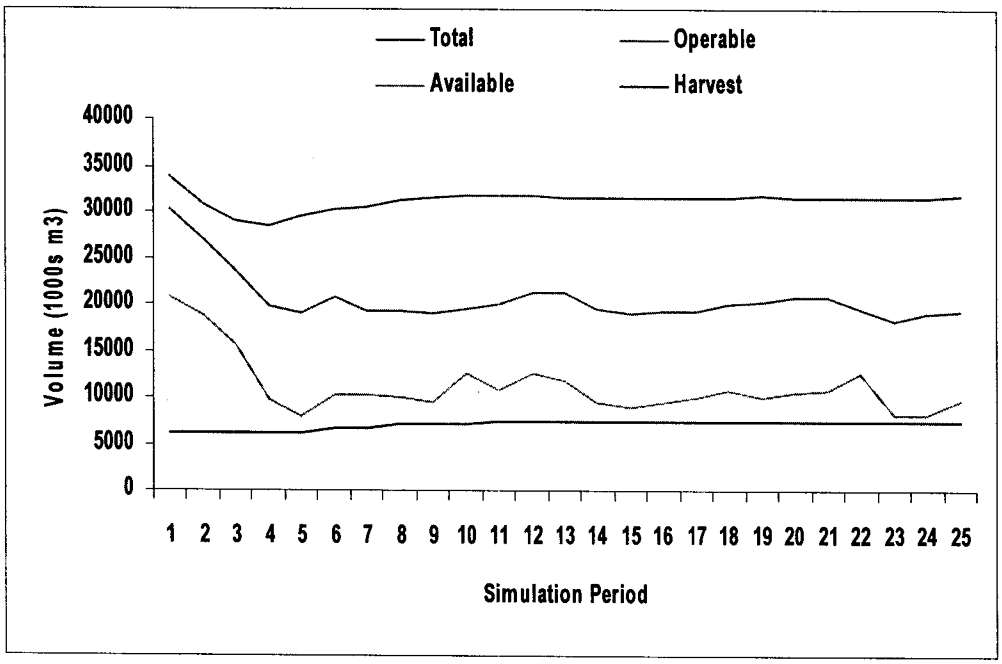


Figure 5.1 – Base Case Inventory and Harvest Levels

The important feature of Figure 5.1 is the low point in available inventory at period 5. At this time a number of factors are restricting access to timber for harvest:

- Mature stands are being held in temporary reserves to satisfy old forest requirements;
- Stands currently between 40 and 60 years of age are required to support the harvest during this period and there are limited hectares in these age classes; and
- Only a small number of managed stands are reaching minimum harvest age during this period.

Therefore the available volume at period 5 dictates any harvest flow modeled for the first 50 years.

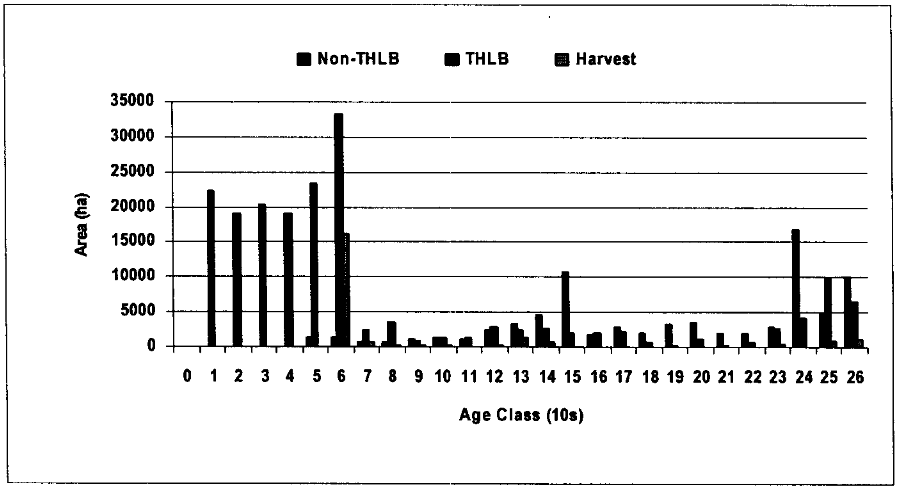


Figure 5.3 – Base Case Age Class Distribution at Year 50

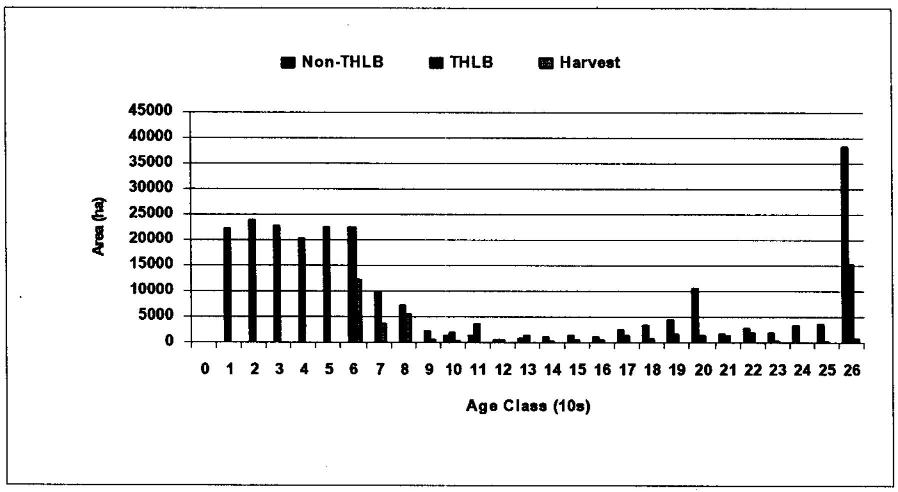


Figure 5.4 – Base Case Age Class Distribution at Year 100

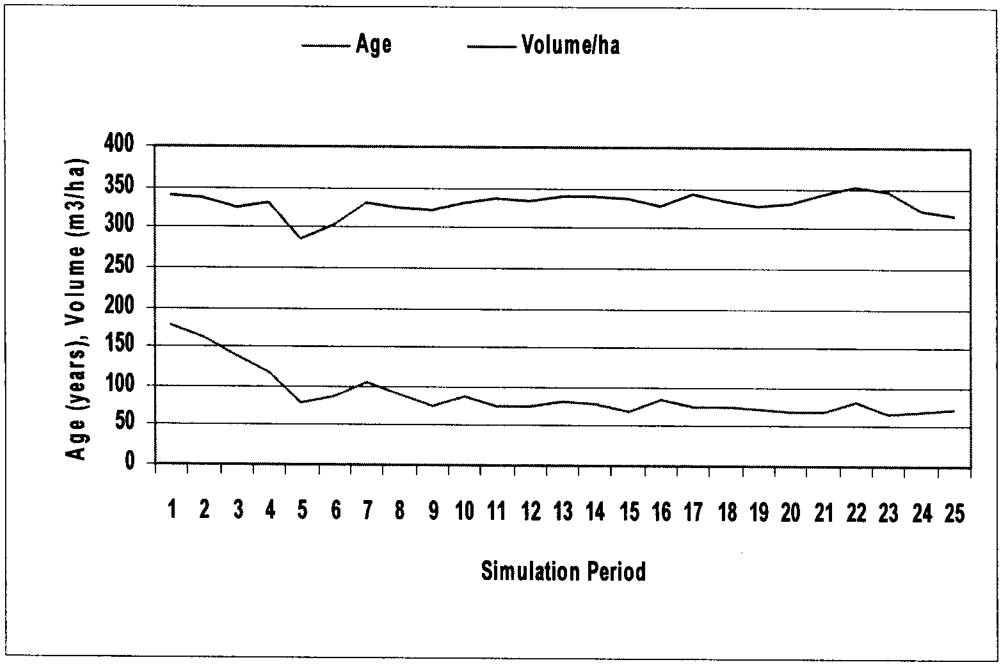


Figure 5.6 – Base Case Average Harvest Statistics

Average harvest age is 176 years during the first period and declines to approximately 80 years at decade 5. The modest increase over the next few periods is due to the increased access to older stands that are no longer in old forest reserves. Over the long-term the average harvest age is very close to the calculated average harvest age of 71 years for managed stands. This is a clear indication that forest cover constraints do not limit the Base Case harvest in the long-term.

Average yields (volume/ha) are very consistent over the 250-year planning horizon. Typically existing natural stands, which are much older at harvest, provide higher volumes per hectare. Improved estimates of site productivity and managed stand yields for the MP #3 analysis increase the managed stand volumes considerably. Another issue is the signal that natural stand yields are underestimated for TFL 52. The MoF inventory audit shows that average sampled volumes are 10% higher than those estimated using VDYP.

Table 5.2 summarizes the state of the forest with respect to old growth targets specified for each LU-BEC/NDT. These targets are based on the draft biodiversity emphasis and landscape units for the Quesnel Forest District and include full FPC mature and old forest constraints.

6.0 BASE CASE SENSITIVITY ANALYSES

In order to test the impacts of changes to analysis inputs, a number of sensitivity analyses were completed for the Base Case. These were grouped into three categories:

- Land base;
- Growth and yield; and
- Management assumptions, including forest cover constraints.

The results are summarized in the following sections.

6.1 Land Base Sensitivity Analysis

Table 6.1 lists the annual harvest rates developed for the land base adjustments sensitivity analyses.

Table 6.1 –Land Base Adjustments Sensitivity Annual Harvest Results

Simulation Period	Annual Harvest Level by Scenario (m3/year)					
	Base Case	Add Balsam IU	Add Mature Low Site	Exclude Goal-2 PAS	THLB –10%	THLB +10%
1	596900	606600	598000	597500	551200	643100
2	596900	606600	598000	597500	551200	643100
3	596900	606600	598000	597500	551200	643100
4	596900	606600	598000	597500	551200	643100
5	596900	606600	598000	597500	551200	643100
6	650100	665100	652400	652200	605500	675500
7	650100	665100	652400	652200	641800	675500
8	709900	665100	652400	705300	681800	675500
9	709900	665100	652400	705300	681800	675500
10	709900	737100	742200	705300	681800	775900
11	735700	737100	742200	734600	681800	775900
Average	697996	699480	697070	651030	733280	733280

Balsam IU areas are stands that were selectively harvested during the 1960s and have marginal stocking and/or low volumes at this time. These were excluded from the Base Case because of the low volumes they currently exhibit. Including them in the THLB increases the initial harvest by less than 2%, and the long-term harvest is almost the same as the Base Case. These stands contribute to non-timber interests such as old growth and therefore when they are harvested constraints must be satisfied with other more productive stands. In addition, these stands only contribute 75 m3/ha at initial harvest, which is much lower than the average harvest volume from the remainder of the THLB.

6.2 Growth and Yield Sensitivity Analysis

Table 6.2 lists the annual harvest rates developed for the growth and yield sensitivity analyses.

Table 6.2 – Harvest Age and NSYT Growth and Yield Sensitivity Annual Harvest Results

Simulation Period	Annual Harvest Level by Scenario (m3/year)					
	Base Case	Minimum Harvest Age -10 years	Minimum Harvest Age +10 years	NSYT Volume -10%	NSYT Volume +10%	NSYT Volume +15%
1	596900	650600	511700	549000	650200	675600
2	596900	650600	511700	549000	650200	675600
3	596900	650600	511700	549000	650200	675600
4	596900	650600	511700	549000	650200	675600
5	596900	650600	511700	517100	650200	675600
6	650100	650600	511700	576900	683200	693900
7	650100	650600	562000	634300	683200	693900
8	709900	650600	618300	697800	683200	693900
9	709900	650600	679900	733600	683200	693900
10	709900	714400	742900	733600	683200	738900
11	735700	714400	742900	733600	744800	738900
Average	697996	691430	672670	683730	713560	719040

The results of the minimum harvest age sensitivity analyses illustrate the importance of having second growth stands available in periods 5 and 6 of the simulation. If there is a delay in gaining access to these stands, the short-term harvest is reduced by 14% (7% below the current AAC). In the long-term the harvest is increased because all stands provide additional volume per hectare at time of harvest.

Conversely a reduction in minimum harvest ages permits the initial harvest to increase 9% over the Base Case rate. This increase results from additional second growth stands being available during the critical period 50 to 60 years into the future. The long-term harvest level falls below the Base Case level by approximately 3%. At younger ages the managed stands provide less volume per unit area and therefore more stands must be harvested to achieve the target. Disturbance forest cover constraints play a more important role in limiting the long-term harvest as a result.

Reducing the natural stand yields by 10% lowers the initial harvest level by 9%, down to the current AAC. An additional 5% decline during decade 5 is necessary prior to increasing the harvest to the long-term level, which is similar to that of the Base Case. The long-term harvest rate is not affected because the majority of the volume is provided by managed stands at this point in the simulation. Managed stand volumes were not adjusted for this scenario.

Table 6.3 lists the annual harvest rates developed for additional growth and yield sensitivity analyses.

Table 6.3 – Regen Delay and MSYT Growth and Yield Sensitivity Annual Harvest Results

Simulation Period	Annual Harvest Level by Scenario (m3/year)						
	Base Case	Regen Delay 0 Years	Regen Delay 4 Years	MSYT -10%	MSYT -40%	MSYT +10%	MSYT +40%
1	596900	602000	596200	589100	579600	596900	620000
2	596900	602000	596200	589100	579600	596900	620000
3	596900	602000	596200	589100	579600	596900	620000
4	596900	602000	596200	589100	579600	596900	620000
5	596900	602000	596200	589100	517100	596900	620000
6	650100	653900	649500	615300	477400	656300	727600
7	650100	653900	649500	615300	445100	656300	830900
8	709900	715600	686200	615300	445100	721000	948500
9	709900	715600	686200	615300	445100	789900	1015800
10	709900	715600	686200	666000	445100	806400	1015800
11	735700	765000	710600	666000	445100	806400	1015800
Average	697996	717580	679900	642500	470790	748420	915020

Changes to regeneration delay had minimal impacts on the short-term harvest compared to the Base Case. In the long-term a regen delay of 0 years permits an increase of approximately 4%. Increasing the delay to 4 years lowers the long-term harvest by the same 4%. Regeneration delays affect the timing of availability for future stands. Therefore, the impact will be similar to that of changing minimum harvest age.

The short-term impact is much less than with minimum harvest age because the regeneration delay was changed by 2 years compared with 10 years in the harvest age sensitivity analyses. WFM continues to manage logged areas to achieve regeneration delays of less than 2 years on average to ensure that all stands will be available when expected in the future.

Reducing managed stand yields has a modest impact in the short-term and still maintains the initial harvest well above the current AAC. A 10% decline in managed stand yields forces the initial harvest down by approximately 1%. The long-term harvest level is lowered by almost 10%, indicating that growth and yield factors are more important in developing the harvest rate for TFL 52.

Reducing managed stand yields by 40%, which makes the managed stands volumes less than the volumes expected from natural stands causes the harvest to decline by 3% in the short-term and 40% in the long-term. However the managed stands developed for the MP #3 analysis are based on a much more thorough review of site productivity and inventory information than in past analyses and therefore should be much more reliable for predicting timber supply on the TFL.

Table 6.4 – REA Forest Cover Constraint Sensitivity Annual Harvest Results

Simulation Period	Annual Harvest Level by Scenario (m3/year)				
	Base Case	Reduce Disturbance	Increase Disturbance	2-Metre Green-up	4-Metre Green-up
1	596900	558700	608200	602900	594300
2	596900	558700	608200	602900	594300
3	596900	558700	608200	602900	594300
4	596900	558700	608200	602900	594300
5	596900	558700	608200	602900	594300
6	650100	644500	648300	656100	649500
7	650100	644500	648300	656100	649500
8	709900	704200	708300	694100	709200
9	709900	704200	708300	694100	709200
10	709900	704200	708300	694100	709200
11	735700	715100	740900	739200	732200
Average	697996	676860	703040	699880	695240

Changes in the initial harvest level are only required with significant adjustments to the disturbance limits. In the sensitivity analyses presented in Table 6.4 VQO disturbance was shifted one "class" (*eg.* partial retention, VOQ-PR, changed to retention in the Reduce Disturbance scenario). This changed the maximum disturbance by as much as 10%.

Reducing the maximum disturbance lowers the short-term harvest by approximately 6% compared to the Base Case. The long-term harvest rate is 3% below that developed for the Base Case. There are certain areas of the TFL that contribute timber during the short-term because they are not constrained by old forest requirements. When that access is limited by reducing disturbance limits, the harvest level must drop. However these disturbance limits are well below the current management requirements for the TFL, especially when considered with landscape level constraints assigned in the analysis.

Increasing the disturbance limits does not provide the opportunity to harvest much additional timber. The short-term harvest is only increased by 2%. Old forest constraints and the transition to second growth stands at year 50 of the simulation still impose an upper limit on the harvest. Similarly the long-term harvest is only marginally higher than the Base Case.

Adjusting the green-up heights makes very little difference to the Base Case harvest level. Changes to the harvest are less than 1% at any time during the planning horizon. Once again this indicates that forest cover issues are not as important as growth and yield inputs when developing a harvest rate for TFL 52.

Figure 6.4 provides a graphic summary of the harvest schedules developed for the REA forest cover constraint sensitivity analyses.

Shifting the draft biodiversity emphasis in certain landscape units increases the initial harvest rate by 6% over the Base Case, or 15% over the current AAC. The long-term rate is reached in decade 8 and is 4% higher than that achieved in the Base Case. By assigning intermediate and high emphasis to areas that have the greatest constraints for non-timber (wildlife, visual quality, CCLUP special resource development zone (SRDZ)) there is more flexibility for harvesting in the areas that remain in low emphasis. The key landscape units that were re-assigned to high biodiversity emphasis for this scenario are:

- Bowron LU – part of SRDZ, includes Bowron Provincial Park, caribou no-harvest and many VQOs; and
- Jack of Clubs LU – part of SRDZ, includes caribou no-harvest and selection harvest areas, and many VQOs.

The key landscape units that were re-assigned to low biodiversity emphasis for this scenario are:

- Victoria LU – part of ERDZ, 94% of the productive forest land base is classified as IRM; and
- Umiti LU – part of ERDZ, 92% of the productive forest land base is classified as IRM.

Table 7.2 summarizes the assignment of landscape units to biodiversity emphasis for the Alternative BEO scenario and compares it to the Base Case.

Table 7.2 – Alternative Biodiversity Emphasis for Draft Landscape Units

Landscape Unit	Gross Productive Area (ha) & Percent of TFL 52 (%)	Alternative Biodiversity Option Emphasis	Base Case Biodiversity Emphasis
Bowron	7,444 (3.1)	High	Low
Jack of Clubs	18,955 (8.0)	High	Low
subtotal	26,399 (11.1)		
Antler	42,077 (17.7)	Intermediate	Intermediate
Big Valley	18,233 (7.7)	Intermediate	Low
Indianpoint	11,905 (5.0)	Intermediate	Low
Lightning	14,705 (6.2)	Intermediate	Low
Willow	18,463 (7.9)	Intermediate	Low
subtotal	105,283 (44.4)		
Swift	25,357 (10.7)	Low	Low
Umiti	36,709 (15.5)	Low	Intermediate
Victoria	43,574 (18.4)	Low	High
subtotal	105,640 (44.5)		
Total	237,423 (100.0)		

Using the MoF approach of determining the mature and old constraints by weighting the FPC Biodiversity Guidebook constraints 45% low, 45% intermediate and 10% high also improves the

8.0 20-YEAR SPATIAL FEASIBILITY OPTION

In order to test the ability to locate harvest opportunities on the ground, the Base Case harvest was modeled spatially for 20 years. In addition to all land base, growth and yield and forest cover constraints assigned in the Base Case, the following inputs were included in this analysis scenario:

- The productive forest was assigned to cutblocks, based partly on WFM's current 5-Year and 20-Year Plans and partly on blocks developed in the GIS;
- Priority harvest was assigned to WFM 5-Year and 20-Year blocks;
- Cutblocks must be harvested as a single unit; no "splitting" of blocks is permitted;
- Adjacency information to ensure that cutblocks were excluded from harvest until after all neighbouring blocks reach 3 metre height; and
- Aggregation of patches (blocks) to limits specified by the FPC Biodiversity Guidebook for each NDT.

A map of the results of the 20-Year Spatial Feasibility harvest is included in Appendix II. The results of the simulation runs completed for this option clearly indicate that the 20-year harvest target can be met with the addition of cutblocks and adjacency green-up requirements. All forest cover constraints were satisfied at both the REA and landscape levels. Some areas were placed in temporary reserve to meet the old forest constraints, similar to the Base Case.

In addition, the 20-Year Plan submitted as part of MP #3 also supports a harvest at least as high as the Base Case. Table 8.1 summarizes the distribution of cutblock sizes harvested in this scenario and the component of the harvest made up by WFM 5-year and 20-year plan blocks.

Table 8.1 –Size Distribution of Cutblocks Harvested

Block Size (ha)	Contribution to Annual Harvest (m3/year & %)			Total
	5-Year FDP Blocks	20-Year Plan Blocks	GIS Blocks	
< 2	238 (0.0)	0 (0.0)	23132 (3.9)	23370 (3.9)
2 – 5	614 (0.1)	492 (0.1%)	35550 (6.0)	36655 (6.1)
5 – 10	1793 (0.3%)	3317 (0.6%)	31250 (5.2)	36360 (6.1)
10 – 40	66808 (11.2)	179256 (30.0)	62689 (10.5)	308753 (51.7)
40 – 80	68593 (11.5)	113576 (19.0)	4279 (0.7)	186448 (31.2)
80 – 250	5313 (0.9)	0 (0.0)	0 (0.0)	5313 (0.9)
Average	143359 (24.0)	296641 (49.7)	156899 (26.3)	596900 (100)

Approximately 74% of the harvesting in the 20-Year Spatial Feasibility option is in blocks currently included in WFM's 5-Year and 20-Year plans. These plans used a different approach to reviewing old forest requirements and therefore had more flexibility in selecting areas for harvest. It is important to note that the results of the 20-Year Spatial Feasibility simulation represent one of

A major upward pressure on timber supply is the volume estimation for natural stands. The recent MoF inventory audit of TFL 52 indicates that, overall, volumes may be underestimated by as much as 10%. Based on the results of the sensitivity analysis, this input alone has the potential to improve the short-term harvest by an additional 9% to 650,200 m3/year.

9.2 Downward Pressures on Supply

Although some of the sensitivity analysis results indicate a drop in the Base Case harvest level, many of these are not considered to be realistic assessments of the current situation on TFL 52. The most significant reductions in harvest were the result of increasing minimum harvest age by 10 years. However, the approach used to develop minimum harvest age (culmination of MAI and minimum volume requirements) is standard practice, and generally gives conservative results. WFM does not have specific product objectives that would increase minimum harvest ages in the way described in the sensitivity analysis.

9.3 Conclusions

WFM has addressed all inventory and land base issues identified at the commencement of MP #2. Inventory and growth and yield information has been collected and allows a more thorough and detailed review of timber supply for TFL 52. In addition, many unknowns related to the FPC and CCLUP have been clarified during the past four years and have been modeled accordingly in the MP #3 timber supply analysis.

In making an AAC determination for a TFL, the Chief Forester must consider Section 8 of the Forest Act. All of the points listed under Section 8 can be clearly answered from the results of the MP #3 timber supply analysis. The most notable uncertainties identified in the analysis will likely improve the timber supply once they have been clarified.

Therefore it is apparent, based on the results of the MP #3 timber supply analysis for TFL 52, that the AAC can be increased to the Base Case level of 596,900 m3/year. This harvest level will not compromise non-timber interests related to wildlife, visual quality or biodiversity. In addition there is considerable information that this level is a conservative estimate based on the potential to increase the THLB from marginal forest stands, underestimation of natural stand yields and old growth requirements.

APPENDIX I

West Fraser Mills Ltd. Bowron-Cottonwood Tree Farm License (TFL 52) Management Plan #3 Timber Supply Analysis Information Package

(under separate cover)

TFL 52 MP #3 Timber Supply Analysis
2001.05.29

Additional Growth & Yield Sensitivity Harvest Forecast
No Genetic Gains on Managed Stand Yields

Simulation Period	Annual Harvest Level by Scenario (m3/year)	
	Base Case	No Genetic Gains
1	596900	592600
2	596900	592600
3	596900	592600
4	596900	592600
5	596900	592600
6	650100	634200
7	650100	634200
8	709900	634200
9	709900	634200
10	709900	693400
11 - 25	735700	693400

Harvest levels are net of NRLs (6,750 m3/year)

A reduction of 6.15% was applied to all future managed stand volumes to account for no genetic gains. This was the weighted average of genetic gains included in the Base Case. Base Case managed stand yields included genetics gains for spruce (8%), pine (5%) and Douglas-fir (5%).

Final analysis sent to B.K. by Bill Kuzmuk on Dec. 12/2002. genetic gain sensitivity analysis is attached.

WEST FRASER MILLS LTD.
BOWRON-COTTONWOOD TREE FARM LICENSE (TFL 52)
MANAGEMENT PLAN 3

TIMBER SUPPLY ANALYSIS

Prepared by:
West Fraser Mills Ltd. – Quesnel, B.C.
&
Timberline Forest Inventory Consultants Ltd.

July 12, 2001

Reference: 9941015.5.1

Timberline
Forest Inventory Consultants

EXECUTIVE SUMMARY

The availability of timber on West Fraser Mills Ltd.'s (WFM) TFL 52 has been examined as part of Management Plan #3 for the License. The analysis evaluates how current management affects the supply of wood available for harvesting over the next 250 years. It also attempts to quantify the sensitivity of the results of analysis to uncertainties about forest growth and management actions. The timber supply analysis provides the technical basis for the provincial Chief Forester to determine an allowable annual cut for TFL 52 for the next five years.

Three analysis scenarios were completed:

- Base Case – uses assumptions based on current management for the TFL;
- Alternative Landscape Level Biodiversity Emphasis – includes a number of alternative management approaches for addressing landscape level biodiversity; and
- 20-Year Spatial Feasibility – models the Base Case assumptions spatially, including cutblock adjacency and blocks from WFM 5-Year and 20-Year Plans.

TFL 52 MP #3 Timber Supply Analysis Harvest Results

Simulation Period	Annual Harvest Level by Scenario (m3/year)			
	Base Case	Base Case No Old Growth	Alternative Biodiversity	20-Year Spatial
1	596900	663400	632200	636100
2	596900	663400	632200	636100
3	596900	663400	632200	not modeled
4	596900	663400	632200	
5	596900	663400	632200	
6	650100	663400	632200	
7	650100	663400	700500	
8	709900	663400	766700	
9	709900	663400	766700	
10	709900	717500	766700	
11-25	735700	745100	766700	

(net of NRLs of 6,750 m3/year)

Analysis inputs reflect current management practices for TFL 52 and correspond to the approval date of the Statement of Management Objectives Options and Procedures (SMOOP, 2000.04.20).

The Base Case includes management guidelines reflecting new inventory data, Forest Practices Code (FPC) requirements and the Cariboo-Chilcotin Land Use Plan (CCLUP).

The current AAC of 549,000 m3/year did not utilize all available timber and make use of the productive capacity of the timber harvesting land base (THLB). Therefore the initial harvest rate was increased to 596,000 m3/year. Beginning in year 60 of the Base Case simulation the harvest increases to the long-term level of 735,700 m3/year at year 110.

Key factors contributing to the increase in harvest compared to the current AAC include:

- New inventory data (forest cover, terrestrial ecosystem, etc.) which provides more refined forest stand information;
- New managed stand yield tables based on site index estimates to the site series level;
- Refined stream classification and riparian reserves; and
- Updated boundaries and forest cover constraints for caribou.

The short-term (decades 1 – 5) harvest is limited by the existing inventory of mature timber and constraints on those stands to address old growth requirements. Initially, many of the older stands are placed in temporary reserve to meet old forest constraints. In addition, the availability of second growth stands is important in determining the timing and extent of the increase to the long-term harvest level. Due to a lack of stands currently 40 – 60 years old, there is a limit on available timber at year 50 of the Base Case simulation.

After decade six many of the old forest requirements have been satisfied and there is more flexibility in selecting candidate stands for harvest. In addition, many managed stands have reached minimum harvest age and begin to make up a significant portion of the annual harvest.

Excluding old growth requirements in the Base Case allows the initial harvest to increase to 663,400 m3/year, 21% above the current AAC. This scenario is based on the CCLUP Biodiversity Conservation Strategy, which indicates that there are concerns about the 250-year old growth age in certain natural disturbance types (NDT). Even without the old forest constraints being enforced, most areas achieve recommended old forest percentages within two rotations.

In the Alternative Biodiversity option, the biodiversity emphasis was shifted from the draft assignments. This approach attempted to match the intermediate and high emphasis assignments with areas that are highly constrained for other non-timber interests (visual quality, wildlife, etc.). It also assigned areas within the Quesnel Highlands Special Resource Development Zone (SRDZ) to intermediate or high emphasis. In addition the distribution was targeted at 45% low, 45 intermediate and 10% high within the TFL.

As a result of these management assumptions the initial harvest increased to 632,200 m3/year. This increase is a result of removing high and intermediate emphasis from areas of the TFL that have very few other constraints, thereby providing more access to mature timber, while still addressing the non-timber concerns for visuals, wildlife and landscape level biodiversity.

The 20-Year Spatial Feasibility option indicates that the short-term harvest can be placed on the ground with all of the Base Case management assumptions and cutblock adjacency (3 metre green-up) in place. The results of this simulation are provided in mapped output.

Sensitivity analysis indicates that land base changes do not have a significant impact on the harvest rate. Global shifts to the THLB (+/- 10%) result in proportional changes to the long-term harvest. Minor changes in the predicted harvest rate result from specific additions or deletions to the THLB.

Only significant changes to forest cover constraints at the resource emphasis area (REA) level make a significant difference to the predicted harvest rate. This was noted when VQO disturbance limits were changed by +/- 10% (one VQO category). Changes in green-up height had very modest impacts on the harvest.

Growth and yield inputs play a more important role in changing the Base Case harvest. Increasing or decreasing stand volumes for either natural or managed stands has an impact throughout the 250-year planning horizon. Natural stands volume changes affect the short-term harvest more so than managed stands.

In addition minimum harvest ages for managed stands have a noticeable impact on the short-term harvest. This is due to the low point in available timber at year 50 of the simulation. Changing the availability of managed stands at that time based on minimum harvest age affects the harvest level throughout the planning horizon.

Overall the timber supply on TFL 52 is very stable and the land base can support an annual harvest of 596,900 m3/year for the period of MP #3. All of the inventory information has been replaced with new data, removing many of the uncertainties that were noted in the MP #2 timber supply analysis. All non-timber interests have been accounted for in the analysis, either by making land base reductions or assigning forest cover constraints in the timber supply analysis. These address all of the FPC and CCLUP concerns. In addition the 20-Year Spatial Feasibility option demonstrates that the Base Case harvest can be located on the ground even with cutblock adjacency constraints. Over the long-term the harvest has the potential to increase considerably based on the productivity of the managed stands.

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APPENDICES

1.0 INTRODUCTION

An analysis of the timber supply on the Bowron-Cottonwood Tree Farm License (TFL 52) has been completed on behalf of West Fraser Mills Ltd. (WFM) of Quesnel, B.C. as part of the Management Plan 3 (MP #3) submission. The analysis has considered current management requirements and expected requirements associated with the Forest Practices Code (FPC) and the Cariboo-Chilcotin Land Use Plan (CCLUP). Requirements for both timber and non-timber resources have been included.

Timber supply is the quantity of timber available for harvest over time. It is dynamic, not only because trees naturally grow and die, but also because conditions that affect tree growth, and the social and economic environment that effect the availability of trees for harvest, change with time.

Timber supply analysis is the process of assessing and predicting the current and future timber supply from a management unit. The Chief Forester of British Columbia uses this information in determining a permissible harvest level for the management unit. Timber supply projections made in support of TFL management plans look 250 years into the future. However, due to uncertainty surrounding both the information used in analysis, and future forest management objectives, these projections are not viewed as static or prescriptive. They remain relevant only as long as the information in them is current. TFL licensees are required to re-evaluate timber supply for each successive management plan, every five years.

Three options were identified and analysed for this timber supply analysis in support of MP #3:

- Base Case;
- Alternative Landscape Level Biodiversity Emphasis; and
- 20-Year Spatial Feasibility.

For the Base Case and Alternative Landscape Level Biodiversity Emphasis options a number of sensitivity analysis results are presented which can be used to isolate the effects of changes to analysis inputs. The Information Package (Appendix I) describes inputs and assumptions used for each of the options. Any departures from the inputs and assumptions presented in the Information Package are provided in this report.

The following objectives were used in developing harvest schedules:

- To sustain a harvest level at least as high as the current AAC of 549,000 m3/year plus 6,750 m3/year of non-recoverable losses for as long as possible. This includes 35,239 m3/year for the Small Business Forest Enterprise Program (SBFEP).
- To achieve the maximum long-term even-flow harvest of timber without compromising the total inventory of timber on the TFL.
- To manage the landbase in a manner consistent with the principles of integrated resource use.

Timber supply analysis involves three main steps:

- Collection and preparation of information and data. This information has been documented in the Information Package which was accepted by MoF Timber Supply Branch, 2000.12.08.
- Using the data with CASH6.2, a computer forest estate model to develop harvest forecasts. The sensitivity of timber supply to input values are also tested during this step.
- Interpretation and reporting of results.

The following sections outline the timber supply analysis of TFL 52.

2.0 DESCRIPTION OF LICENSE AREA

TFL 52 is located east of Quesnel in the Quesnel Forest District. WFM was granted the TFL 52 in January 1991. The land base is typified by rolling plateaus in the west, and the Cariboo Mountains in the east. Numerous lakes and rivers are found within the Licence area. TFL 52 contains the headwaters of the Cottonwood, Bowron and Willow Rivers, which all flow directly into the Fraser River. The forests of TFL 52 are dominated by white spruce and lodgepole pine. Other species include subalpine fir, trembling aspen, and cottonwood. Douglas-fir, birch, western hemlock, and western redcedar are found in localized areas. Two biogeoclimatic ecological classification (BEC) zones dominate the land base of TFL 52:

- Sub-boreal spruce (SBS), generally below 1200 metres with cool, snowy winters and warm summers; and
- Engelmann spruce-subalpine fir (ESSF), generally above 1200 metres with long, cold winters and short, cool summers.

The interior cedar-hemlock (ICH) BEC zone is found in a very small area near the eastern boundary of the TFL.

Highway 26 between Quesnel and Bowron Lake Provincial Park provides primary access to TFL 52. This highway bisects the License into north and south components. Most forest roads into TFL 52 originate from Highway 26. This provides excellent year-round access for both forest management and recreational activities. A number of communities are associated with TFL 52. These include Quesnel, Wells, Barkerville, Bowron Lake and Cottonwood. Both Wells and Barkerville are located within the License area. Two popular recreational areas, Bowron Lake Provincial Park and Troll Mountain Ski Resort, share a common boundary with TFL 52.

Figure 2.1 provides an overview map of TFL 52.

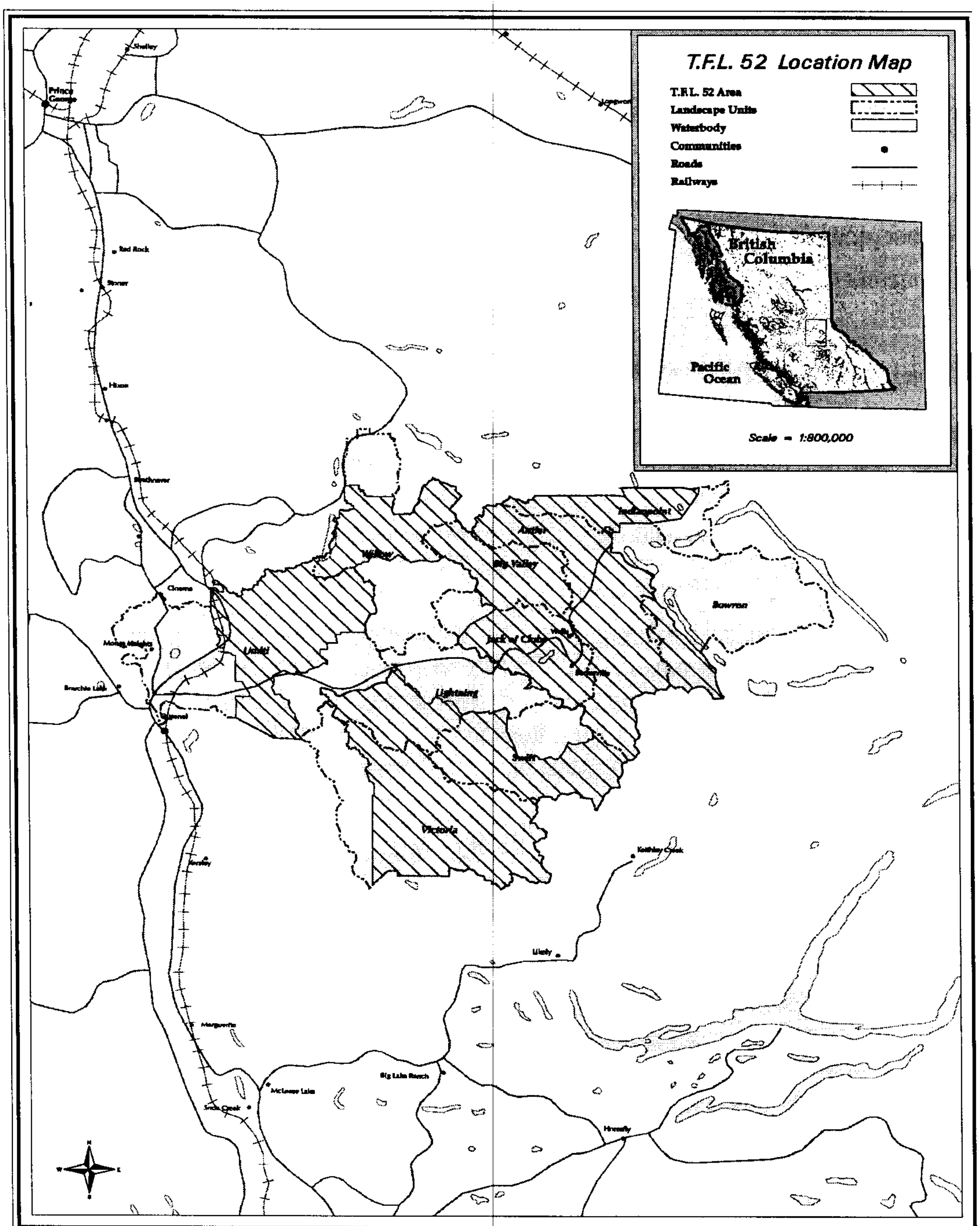

Figure 2.1 – TFL 52 Overview Map

3.0 INFORMATION PREPARATION

Many pieces of information are required to conduct a timber supply analysis. Each piece falls into one of three categories:

- Land base inventory;
- Timber growth and yield; and
- Management practices.

3.1 Land Base and Inventory

Land base inventory information used in this analysis comes from WFM's own digital map database, which is maintained to MoF standards. The data is managed using ARC/INFO GIS software. The majority of the inventory data used for the MP #3 timber supply analysis was collected during MP #2. A complete description of the new inventories is provided in the Information Package.

The digital database contains information for all land within the license area, including areas on which harvesting operations are not expected to take place. The THLB consists of all of the productive land expected to be available for harvest over the long-term. This land base is determined by reclassifying the total land base according to specified management assumptions. Figure 3.1 provides a graphic representation of the land base reductions for the Base Case.

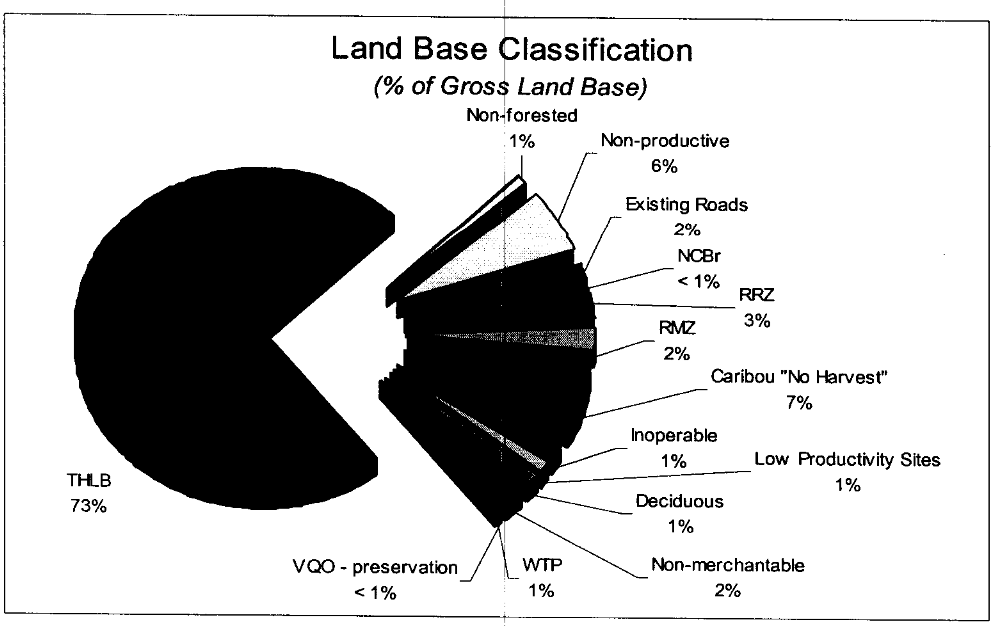

Figure 3.1 – Land Base Classification

Table 3.1 provides a summary of the areas removed for each land base reduction in determining the THLB.

Table 3.1 – Base Case Timber Harvesting Land Base Determination

Land Classification	Total Area[1] (ha)	Net Reduction		Net Remainder	
		Area (ha)	Volume (1000s m3)	Area (ha)	Volume (1000s m3)
Total Area	258,866			258,866	43,080
Non-productive & non-forest	16,203	16,203	830		
Non-productive forest & alpine forest	2,401	2,401	113		
Existing roads	5,191	5,191	167		
NCBr	48	47	1		
Productive Forest				235,023	41,969
Productive reductions:					
Riparian reserve zones (RRZ)	9,426	6,692	1,554		
Riparian management zones (RMZ)	7,994	5,380	1,217		
Caribou "No-harvest"	22,292	17,554	3,168		
Inoperable	4,572	3,518	721		
Low productivity sites	3,789	2,695	357		
Deciduous	4,214	3,359	92		
Non-merchantable & Balsam IU	8,063	5,318	188		
Preservation VQO	76	76	21		
Wildlife tree patches (WTP)		1,473	359		
Total Reductions		46,067	7,678		
Current Net Operable Land Base				188,956	34,291
NSR				4,480	31
Immature				87,589	5,597
Mature				96,887	28,663
Less future road reductions		2,462			
Long-term Net Operable Land Base				186,494	34,291

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

Figure 3.2 summarizes the current age class distribution by leading species.

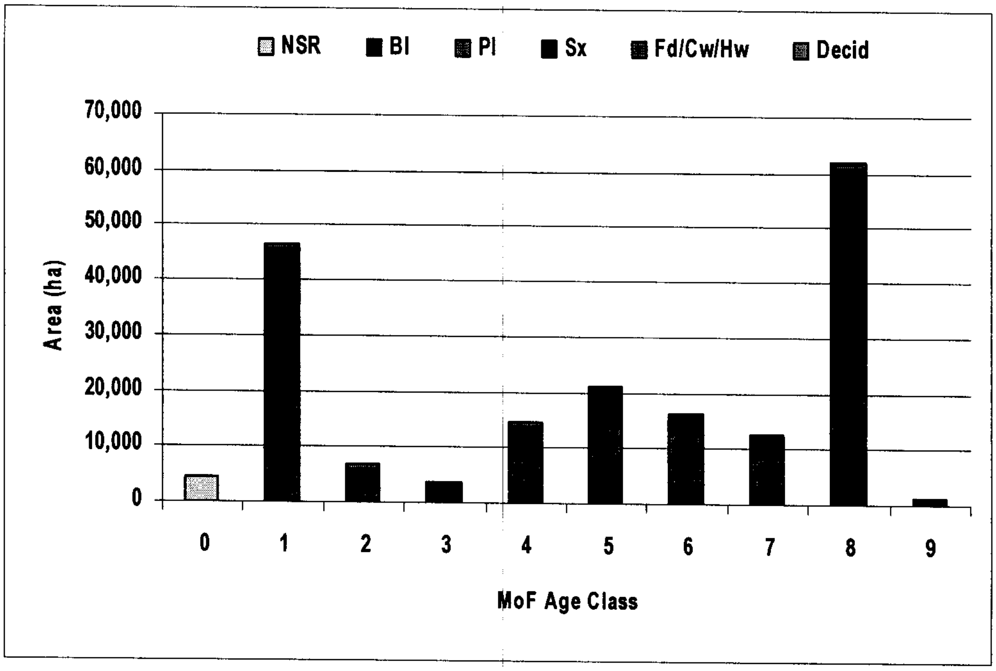

Figure 3.2 – THLB Leading Species and Age Class Distribution

3.2 Timber Growth and Yield

Timber growth and yield refers to the prediction of growth and development of individual forest stands over time. Yield tables for stands of natural origin were prepared using Variable Density Yield Prediction (VDYP version 6.0a). These are referred to as natural stand yield tables (NSYT). Managed stand yield tables (MSYT) were developed using the Table Interpolation for Stand Yields (TIPSY batch version 2.5r).

Table 3.2 summarizes the average productivity estimates for the yields used in the MP #3 analysis. The long run harvest level estimate is for the entire THLB (186,494 ha) for each yield type.

Table 3.2 – Theoretical Long-Run Productivity Estimates

Yield Type	Average Culmination MAI (m3/ha/year)	Weighted Average Culmination Age	Theoretical Long-Run Harvest Level (m3/year)
Natural stands	2.79	96	520,300
Managed stands	4.81	71	897,000

In the analysis culmination age was used to estimate minimum harvest age for all clear cut stands. The caribou selection harvest used a planned rotation of 240 years with entries permitted every 80 years. In the selection harvest area, 33% of the mature volume was available for harvest during each entry.

3.3 Management Practices

Timber supply is directly linked to forest management activities. Current practices are modeled by matching inputs to actual activity using the functionality of CASH6.2.

To model landscape level biodiversity objectives (mature and mature+old constraints) the land base was classified into units based on landscape unit, BEC to the variant level and natural disturbance type (LU-BEC/NDT). Mature and old forest requirements were assigned to each of the LU-BEC/NDTs identified on TFL 52. Areas from outside TFL 52 within the Bowron and Indianpoint LUs were included in the analysis database and were able to contribute to the mature and old requirements for those specific LU-BEC/NDTs. These two LUs occur only within TFL 52 and Bowron Provincial Park. The productive forest from Bowron Park did not contribute to any other forest cover requirements (visual quality or wildlife) and was never available for harvest. Section 7.1 of the Information Package summarises these LU-BEC/NDT units.

Landscape level constraints assigned in the analysis are based on the draft biodiversity emphasis and associated FPC Biodiversity Guidebook mature and old growth ages and minimum percentages for each LU-BEC/NDT. Alternative methods were evaluated in the Alternative Landscape Level Biodiveristy option. The Base Case did not incorporate any adjustments to the old growth constraints as outlined in the *Biodiversity Conservation Strategy for the Cariboo-Chilcotin Land Use Plan*. These factors, which relax the old growth constraints, are currently being used by WFM in their 5-Year Forest Development Plans (FDP).

Resource emphasis areas (REAs) or management zones have been assigned to the land base for modeling purposes. REAs facilitate the application of management criteria. Specifically, REAs are defined on the basis of wildlife habitat and the maintenance of visual quality. Details of the zone assignments can be found in Section 7.2 of the Information Package.

4.0 ANALYSIS METHODS

4.1 Forest Estate Modeling

Two versions of CASH6, a forest-level simulation model, were used to model all analysis scenarios presented in this report:

- TINC1.3.2 for the non-spatial analysis simulations; and
- CASH6.2g for the spatial modeling scenarios.

The model includes a number of features to address integrated resource management requirements. Maximum disturbance and minimum old growth constraints are explicitly implemented. Productive forest stands that are excluded from timber harvesting are included in the analysis to better model forest structure and disturbance levels where appropriate.

Two forest cover constraint classes are 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.
- Retention - the minimum area that must be older than, or as old as, a specified age. This is intended to model both retention of mature/thermal cover and retention of old growth.

The use of forest cover constraints as described above improves forest management modeling by ensuring that non-timber resources are given appropriate consideration. Constraints for various REAs may be overlapped to ensure that all management objectives are satisfied.

In addition to those described above, CASH6.2 allows a second level of constraints to be applied. These are used to monitor seral stage (mature and mature+old) constraints for the maintenance of landscape level biodiversity.

Outputs from CASH6.2 include:

- Harvest and inventory levels;
- Forest cover status reports related to disturbance, mature and old growth constraints; and
- Seral stage status reports for up to five seral stages.

All non-spatial analysis simulations used a 250-year planning horizon with 10-year periods. Spatial analyses included four 5-year planning periods. Non-recoverable losses (NRLs) modeled in the simulations (assumed to be 6,750 m^3/year) are not included in harvest levels presented in this report.

4.2 Analysis Results

Results of the various analysis scenarios are presented in graphic and tabular form. Tables provide actual harvest levels achieved during each period of the simulation. Graphic results display trends in timber inventory (stock) and harvest levels, and age class distributions. Four categories are presented in the inventory summary figures:

- Total - the total inventory on the THLB regardless of age;
- Operable – the inventory on the THLB above minimum harvest age;
- Available – the estimated portion of the operable timber inventory that is not excluded from harvest by forest cover constraints; and
- Periodic harvest.

Inventories are reported at the beginning of each simulation period.

5.0 BASE CASE

Inputs for the Base Case have been described in the previous sections and in the Information Package. The various harvest levels developed for the Base Case are summarized in Table 5.1.

Table 5.1 – Base Case Annual Harvest Results

Simulation Period	Annual Harvest Level by Scenario (m3/year)			
	Base Case [1]	Even-flow	Increase Initial	No Old Growth
1	596900	596900	631300	663400
2	596900	596900	631300	663400
3	596900	596900	573100	663400
4	596900	596900	573100	663400
5	596900	596900	573100	663400
6	650100	596900	653000	663400
7	650100	596900	653000	663400
8	709900	596900	712700	663400
9	709900	596900	712700	663400
10	709900	596900	712700	717500
11-25	735700	596900	736000	745100
Average	698000	596900	698640	714580

[1] Chosen as the Base Case harvest forecast for the MP #3 analysis.

As shown in Table 5.1, a number of alternative harvest flows were evaluated for the Base Case. The objective of setting the initial harvest rate at the current AAC of 549,000 m3/year did not utilize all available timber and recognize the productive capacity of the land base. Therefore the initial harvest rate was increased to 596,900 m3/year, 9% above the current AAC.

The Non-declining Even-Flow harvest forecast ultimately became the short-term (years 1 – 50) harvest. However, after the transition to managed stands in years 51 – 90, this harvest flow did not take advantage of the improvements in yields.

It is possible to increase the short-term harvest as noted in the Increase Initial scenario. However this requires a decline in harvest during periods 3 – 5. Although the lowest harvest level developed in this scenario is still 4% higher than the current AAC, this harvest flow is not acceptable.

During the preparation of the Information Package WFM and MoF Timber Supply Branch discussed a method to evaluate the *Biodiversity Conservation Strategy for the Cariboo-Chilcotin Land Use Plan* conclusion that old forest evaluation may not be appropriate for the Cariboo Region using the guidelines in the FPC and/or the inventory available for the Region. The "area factoring" approach outlined in the Conservation Strategy and currently in use for WFM's 5-year FDP could not be incorporated into the timber supply analysis directly. Therefore it was agreed that a comparison scenario would be modeled for the Base Case in which old forest constraints were only monitored, not enforced. As shown in the results in Table 5.1 the initial harvest is considerably higher in the No Old Growth scenario.

The Base Case harvest level selected for this analysis reflects the maximum even-flow harvest level of 596,900 m3/year in the short-term, with subsequent increases in annual harvest during periods 6 – 10 to the sustainable long-term level of 735,700 m3/year. WFM elected to use this scenario as it incorporates a conservative approach to modeling landscape level biodiversity while utilizing the productive capacity of the land base. The Base Case demonstrates the stable nature of the timber supply on TFL 52, even with more limitations on harvest than are being implemented in current operations.

Figure 5.1 provides a graphic summary of the inventory and harvest levels over time for the MP #3 Base Case.

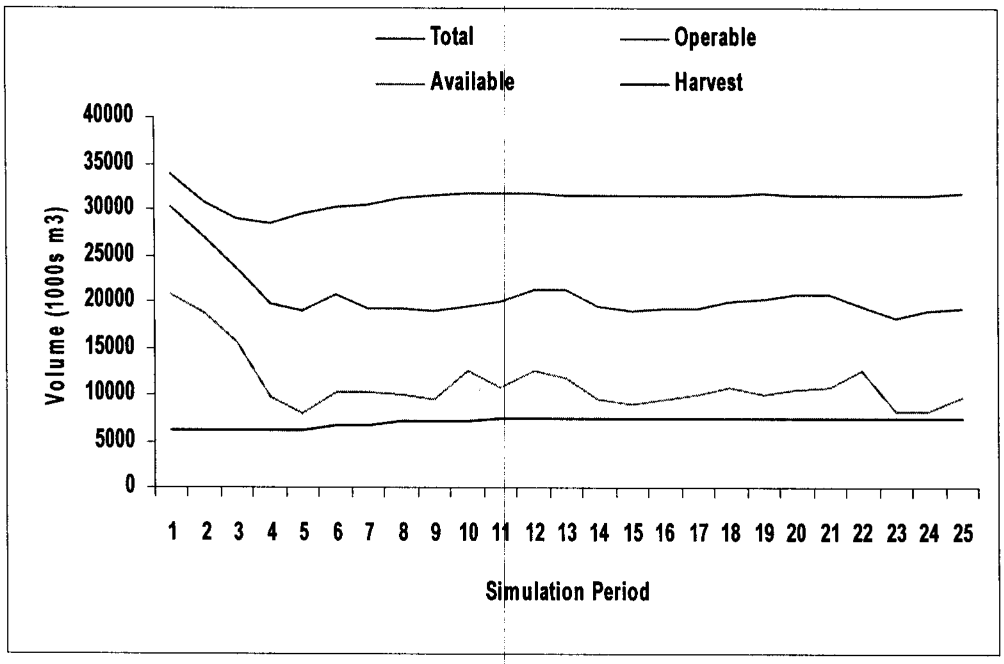

Figure 5.1 – Base Case Inventory and Harvest Levels

The important feature of Figure 5.1 is the low point in available inventory at period 5. At this time a number of factors are restricting access to timber for harvest:

- Mature stands are being held in temporary reserves to satisfy old forest requirements;
- Stands currently between 40 and 60 years of age are required to support the harvest during this period and there are limited hectares in these age classes; and
- Only a small number of managed stands are reaching minimum harvest age during this period.

Therefore the available volume at period 5 dictates any harvest flow modeled for the first 50 years.

Even though there is a surplus of mature (operable) inventory some of the old forest constraints limit the availability of these stands. As shown in Figure 5.1 the operable inventory is more than twice that of the available inventory during period 5.

After the simulation passes through this "pinch" point, there is a significant improvement in the available timber supply allowing the increase to the long-term level of 735,700 m3/year. During periods 6 – 9 many LU-BEC/NDTs reach the target old forest requirements, especially from stands outside the THLB, thereby allowing more access to stands within the THLB.

Another important aspect of Figure 5.1 is the stable nature of the total and operable inventories. After the initial decline in volume during the first five decades, the inventory levels recover and remain consistent over the long-term. The total inventory at year 250 is approximately 95% of the initial level. Figures 5.2 through 5.5 provide the age class distributions over time for the Base Case.

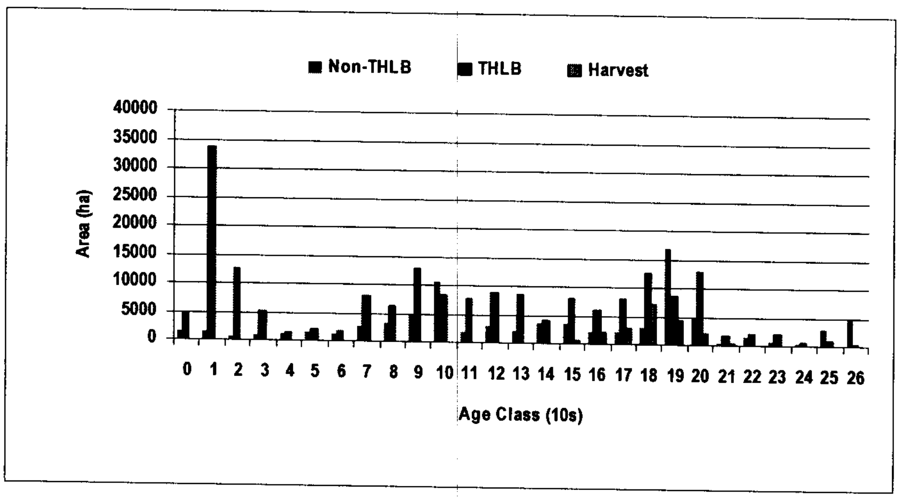

Figure 5.2 – Base Case Age Class Distribution at Year 1

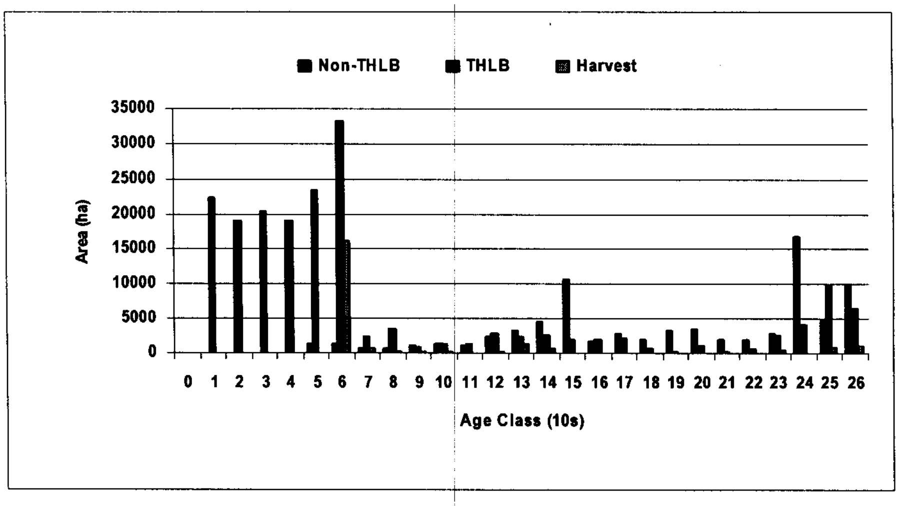

Figure 5.3 – Base Case Age Class Distribution at Year 50

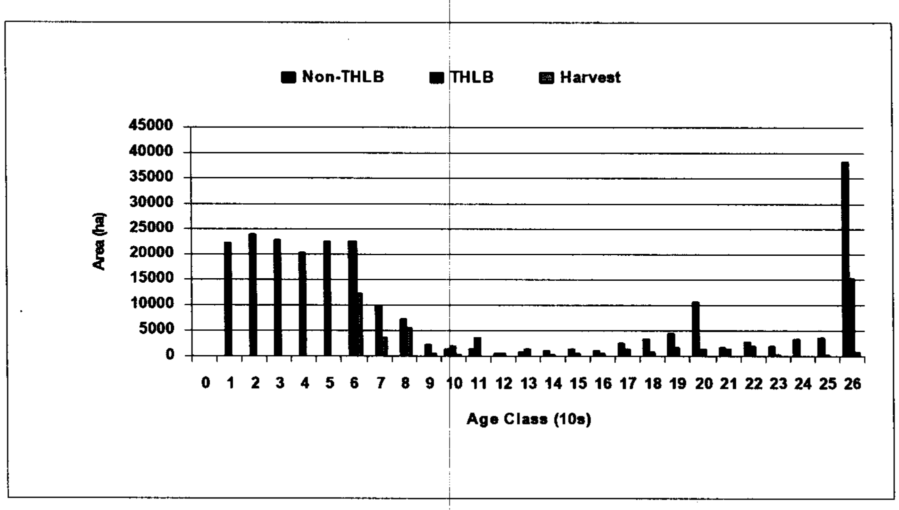

Figure 5.4 – Base Case Age Class Distribution at Year 100

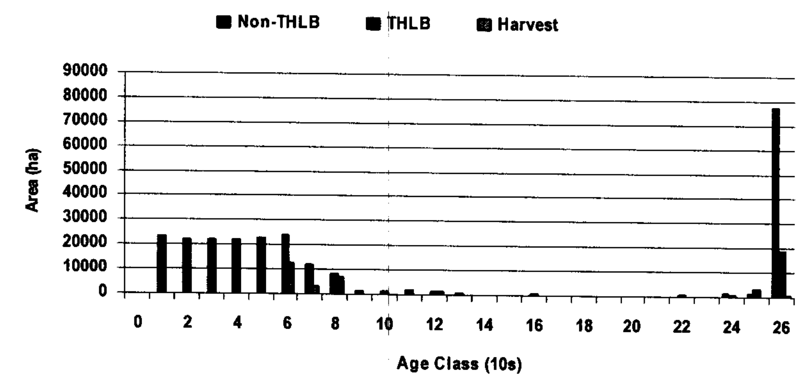

Figure 5.5 – Base Case Age Class Distribution at Year 250

As noted above, the lack of inventory currently between ages 40 and 60 (Figure 5.2) contributes to the low of available timber at decade 5 of the simulation. The lack of inventory at least 250 years of age at the outset of the simulation forces the model to reserve the oldest stands to eventually satisfy the old forest constraints. Early in the planning horizon the harvest is distributed across many age classes, generally in older stands.

At year 50 there is an accumulation of old (> 250 years) forest, especially in the non-THLB. This allows some additional harvest in the oldest age classes of the THLB (Figure 5.3). However, there is a significant amount of harvest in stands just reaching minimum harvest age (between 60 – 70 years) demonstrating the need to utilize managed stands during the critical fifth and sixth decades.

Within 100 years the age classes are becoming more evenly distributed and harvesting is distributed across a number of age classes. All of the old forest requirements have been met and this introduces additional flexibility in the selection of harvest candidates and allows a significant increase in the periodic cut. Many areas still have limited access due to REA-based cover constraints, particularly retention VQOs. However, these constraints do not restrict the harvest significantly at this point of the planning horizon.

After 250 years the younger managed forest is evenly distributed. Most harvesting is concentrated in the stands 60 –80 years old. All of the non-THLB area has grown into old forest and there are virtually no stands between 100 and 230 years of age.

Figure 5.6 provides a summary of the average harvest statistics over time for the Base Case analysis.

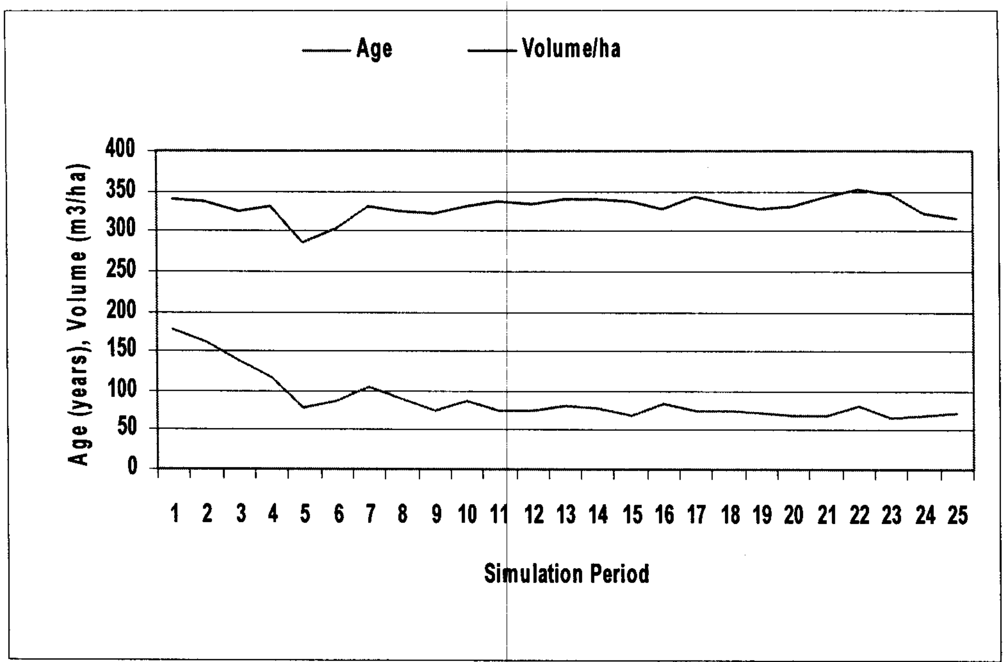

Figure 5.6 – Base Case Average Harvest Statistics

Average harvest age is 176 years during the first period and declines to approximately 80 years at decade 5. The modest increase over the next few periods is due to the increased access to older stands that are no longer in old forest reserves. Over the long-term the average harvest age is very close to the calculated average harvest age of 71 years for managed stands. This is a clear indication that forest cover constraints do not limit the Base Case harvest in the long-term.

Average yields (volume/ha) are very consistent over the 250-year planning horizon. Typically existing natural stands, which are much older at harvest, provide higher volumes per hectare. Improved estimates of site productivity and managed stand yields for the MP #3 analysis increase the managed stand volumes considerably. Another issue is the signal that natural stand yields are underestimated for TFL 52. The MoF inventory audit shows that average sampled volumes are 10% higher than those estimated using VDYP.

Table 5.2 summarizes the state of the forest with respect to old growth targets specified for each LU-BEC/NDT. These targets are based on the draft biodiversity emphasis and landscape units for the Quesnel Forest District and include full FPC mature and old forest constraints.

Table 5.2 – Periodic Old Growth Compliance

LU-BEC/NDT & Analysis ID	Area (ha)	Old Growth Target (% > years)	Status at Year of Simulation (% > Old Age)			
			Current	Year 50	Year 100	Year250
11 Antler ESSFwc3-1	12,422	19.0 > 250	1.1	4.6	30.7	83.0
12 Antler ESSFwk1-1	15,361	19.0 > 250	0.9	4.6	21.8	35.1
17 Antler SBSwk1-2	14,294	10.0 > 250	0.7	3.6	10.3	28.0
22 Big Valley ESSFwk1-1	12,442	19.0 > 250	0.7	4.7	18.3	19.4
27 Big Valley SBSwk1-2	5,791	10.0 > 250	0.8	4.5	11.2	18.3
31 Bowron ESSFwc3-1	4,179	19.0 > 250	21.6	21.6	64.9	93.3
32 Bowron ESSFwk1-1	8,460	19.0 > 250	24.2	24.0	55.5	75.6
33 Bowron ICHmk3-2	4,028	10.0 > 250	9.1	8.9	43.7	65.4
37 Bowron SBSwk1-2	18,119	10.0 > 250	17.4	17.3	49.0	85.6
42 Indianpoint ESSFwk1-1	2,970	20.0 > 250	2.7	6.2	19.7	35.1
47 Indianpoint SBSwk1-2	13,354	10.0 > 250	1.1	3.0	26.5	36.4
51 Jack of Clubs ESSFwc3-1	6,748	20.0 > 250	3.6	14.8	27.3	41.8
52 Jack of Clubs ESSFwk1-1	10,322	20.0 > 250	1.4	9.5	19.0	19.5
57 Jack of Clubs SBSwk1-2	1,885	10.0 > 250	0.3	9.1	9.0	22.7
62 Lightning ESSFwk1-1	3,443	20.0 > 250	0.0	1.3	19.0	16.7
66 Lightning SBSmw-3	1,961	10.0 > 140	28.5	11.1	11.2	13.2
67 Lightning SBSwk1-2	9,300	10.0 > 250	0.0	1.7	8.6	15.8
71 Swift ESSFwc3-1	7,182	20.0 > 250	2.3	9.8	33.0	57.1
72 Swift ESSFwk1-1	11,286	20.0 > 250	1.7	6.5	18.7	17.8
77 Swift SBSwk1-2	6,889	10.0 > 250	0.5	3.3	9.0	10.0
82 Umiti ESSFwk1-1	3,366	20.0 > 250	0.1	20.7	22.9	24.6
86 Umiti SBSmw-3	27,576	10.0 > 140	10.4	11.0	13.3	22.8
87 Umiti SBSwk1-2	5,768	10.0 > 250	0.0	3.9	8.4	27.2
92 Victoria ESSFwk1-1	8,262	30.0 > 250	6.9	15.4	37.6	47.7
96 Victoria SBSmw-3	18,532	20.0 > 140	16.0	21.6	19.4	33.8
97 Victoria SBSwk1-2	16,780	10.0 > 250	0.4	1.5	13.5	40.4
102 Willow ESSFwk1-1	6,057	20.0 > 250	1.5	4.6	18.9	19.2
107 Willow SBSwk1-2	12,407	10.0 > 250	0.4	1.7	9.0	17.3

It is important to note that the mature forest area was always in excess of the constraint during all simulation periods for all LU-BEC/NDTs.

6.0 BASE CASE SENSITIVITY ANALYSES

In order to test the impacts of changes to analysis inputs, a number of sensitivity analyses were completed for the Base Case. These were grouped into three categories:

- Land base;
- Growth and yield; and
- Management assumptions, including forest cover constraints.

The results are summarized in the following sections.

6.1 Land Base Sensitivity Analysis

Table 6.1 lists the annual harvest rates developed for the land base adjustments sensitivity analyses.

Table 6.1 –Land Base Adjustments Sensitivity Annual Harvest Results

Simulation Period	Annual Harvest Level by Scenario (m3/year)					
	Base Case	Add Balsam IU	Add Mature Low Site	Exclude Goal-2 PAS	THLB –10%	THLB +10%
1	596900	606600	598000	597500	551200	643100
2	596900	606600	598000	597500	551200	643100
3	596900	606600	598000	597500	551200	643100
4	596900	606600	598000	597500	551200	643100
5	596900	606600	598000	597500	551200	643100
6	650100	665100	652400	652200	605500	675500
7	650100	665100	652400	652200	641800	675500
8	709900	665100	652400	705300	681800	675500
9	709900	665100	652400	705300	681800	675500
10	709900	737100	742200	705300	681800	775900
11	735700	737100	742200	734600	681800	775900
Average	697996	699480	697070	651030	733280	733280

Balsam IU areas are stands that were selectively harvested during the 1960s and have marginal stocking and/or low volumes at this time. These were excluded from the Base Case because of the low volumes they currently exhibit. Including them in the THLB increases the initial harvest by less than 2%, and the long-term harvest is almost the same as the Base Case. These stands contribute to non-timber interests such as old growth and therefore when they are harvested constraints must be satisfied with other more productive stands. In addition, these stands only contribute 75 m3/ha at initial harvest, which is much lower than the average harvest volume from the remainder of the THLB.

Addition of mature low site areas has virtually no impact on the short-term harvest. Similarly, the long-term harvest is improved only slightly. As with the Addition of Balsam IU, these older stands (average age 244 years) contribute to old forest requirements in the short-term. The long-term increase is proportional to the area added to the THLB (1,617 ha) times the average long-term MAI (approximately 6.0 m3/ha/year). Some of the long-term harvest is limited by forest cover constraints.

Excluding the Goal-2 PAS has no measurable impact on the Base Case harvest level. In the first two simulation periods the harvest is limited by disturbance constraints in the IRM zone, which encompasses the Deacon Creek Goal-2 PAS. Therefore, excluding these areas does not limit harvesting on the TFL.

Adjusting the THLB +/-10% changes the harvest by approximately the same amount in the long-term. This confirms that timber supply is more closely tied to growth and yield issues than forest cover constraints. However, it is important to note that the short-term harvest is still above the current AAC of 549,000 m3/year when the THLB is reduced by 10%.

Figure 6.1 provides a graphic summary of the simulation runs completed for the Land Base Adjustments sensitivity analyses.

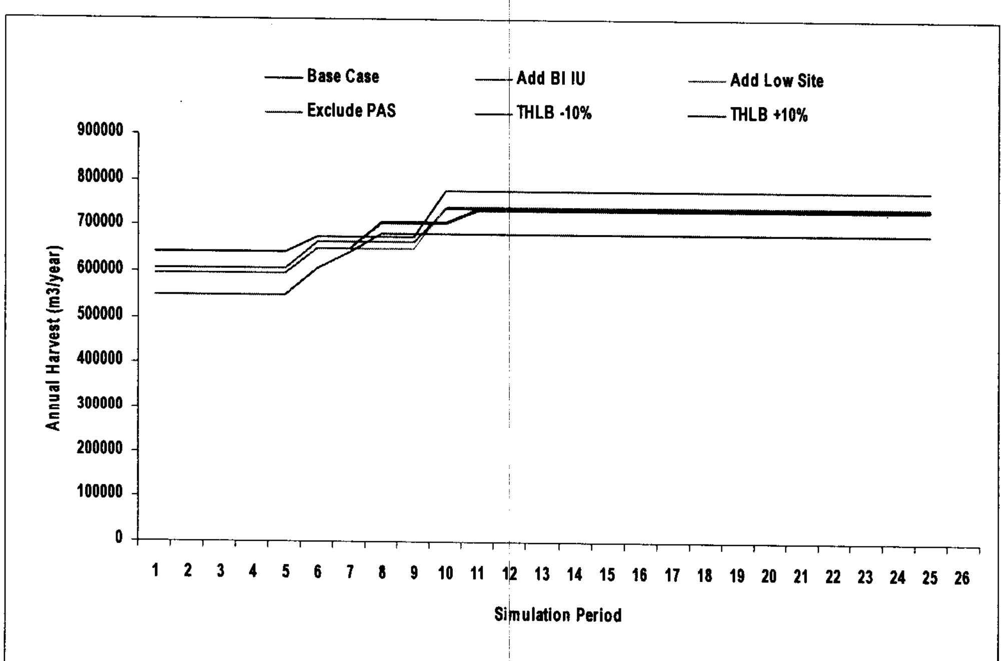

Figure 6.1 – Land Base Adjustments Sensitivity Analyses Annual Harvest

6.2 Growth and Yield Sensitivity Analysis

Table 6.2 lists the annual harvest rates developed for the growth and yield sensitivity analyses.

Table 6.2 – Harvest Age and NSYT Growth and Yield Sensitivity Annual Harvest Results

Simulation Period	Annual Harvest Level by Scenario (m3/year)					
	Base Case	Minimum Harvest Age -10 years	Minimum Harvest Age +10 years	NSYT Volume -10%	NSYT Volume +10%	NSYT Volume +15%
1	596900	650600	511700	549000	650200	675600
2	596900	650600	511700	549000	650200	675600
3	596900	650600	511700	549000	650200	675600
4	596900	650600	511700	549000	650200	675600
5	596900	650600	511700	517100	650200	675600
6	650100	650600	511700	576900	683200	693900
7	650100	650600	562000	634300	683200	693900
8	709900	650600	618300	697800	683200	693900
9	709900	650600	679900	733600	683200	693900
10	709900	714400	742900	733600	683200	738900
11	735700	714400	742900	733600	744800	738900
Average	697996	691430	672670	683730	713560	719040

The results of the minimum harvest age sensitivity analyses illustrate the importance of having second growth stands available in periods 5 and 6 of the simulation. If there is a delay in gaining access to these stands, the short-term harvest is reduced by 14% (7% below the current AAC). In the long-term the harvest is increased because all stands provide additional volume per hectare at time of harvest.

Conversely a reduction in minimum harvest ages permits the initial harvest to increase 9% over the Base Case rate. This increase results from additional second growth stands being available during the critical period 50 to 60 years into the future. The long-term harvest level falls below the Base Case level by approximately 3%. At younger ages the managed stands provide less volume per unit area and therefore more stands must be harvested to achieve the target. Disturbance forest cover constraints play a more important role in limiting the long-term harvest as a result.

Reducing the natural stand yields by 10% lowers the initial harvest level by 9%, down to the current AAC. An additional 5% decline during decade 5 is necessary prior to increasing the harvest to the long-term level, which is similar to that of the Base Case. The long-term harvest rate is not affected because the majority of the volume is provided by managed stands at this point in the simulation. Managed stand volumes were not adjusted for this scenario.

Increasing natural stand volumes by either 10% of 15% provides opportunity for significant increases in the short-term harvest. Improvements of 9% and 13% over the Base Case initial harvest are possible with the 10% and 15% volume increases, respectively. The additional volume provided by natural stands in the short-term reduces the dependence on second growth stands during period 5 of the simulation. In addition, more volume is provided for every hectare logged and therefore forest cover constraints do not play as much of a role in determining the annual harvest.

MoF inventory audit results (2000.07.27) indicate that the natural stand volumes for TFL 52 may be underestimated by 10%. Results of the audit were not included in the Base Case due to the sampling methods used in that process.

Results of the minimum harvest age and natural stand yield sensitivity analyses are summarized graphically in Figure 6.2.

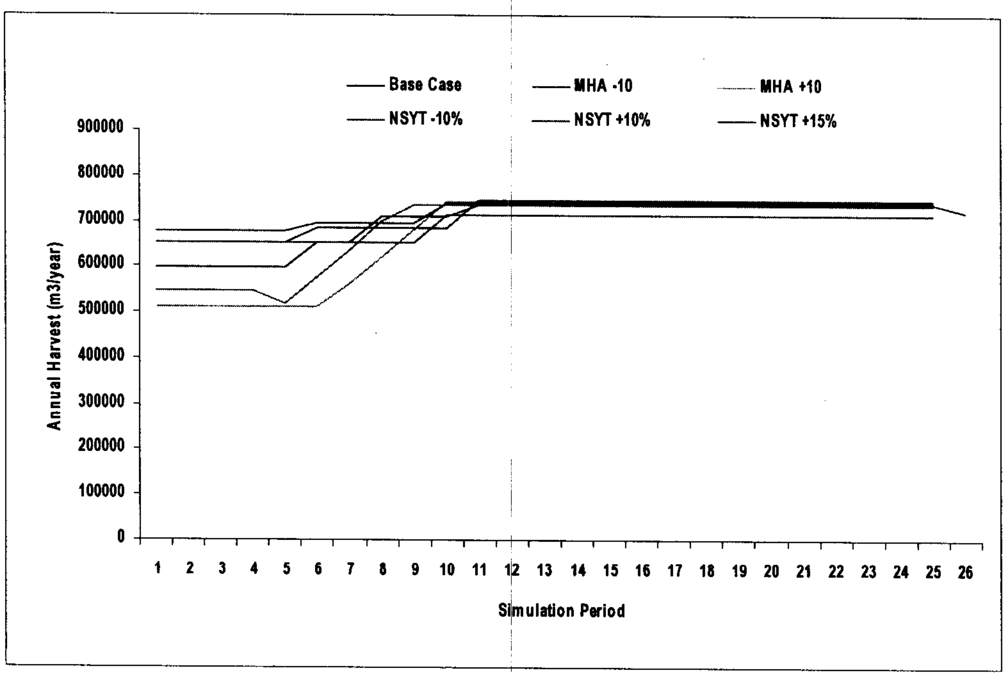

Figure 6.2 – Regeneration Delay and Natural Stand Yield Sensitivity Analyses Annual Harvest

Table 6.3 lists the annual harvest rates developed for additional growth and yield sensitivity analyses.

Table 6.3 – Regen Delay and MSYT Growth and Yield Sensitivity Annual Harvest Results

Simulation Period	Annual Harvest Level by Scenario (m3/year)						
	Base Case	Regen Delay 0 Years	Regen Delay 4 Years	MSYT -10%	MSYT -40%	MSYT +10%	MSYT +40%
1	596900	602000	596200	589100	579600	596900	620000
2	596900	602000	596200	589100	579600	596900	620000
3	596900	602000	596200	589100	579600	596900	620000
4	596900	602000	596200	589100	579600	596900	620000
5	596900	602000	596200	589100	517100	596900	620000
6	650100	653900	649500	615300	477400	656300	727600
7	650100	653900	649500	615300	445100	656300	830900
8	709900	715600	686200	615300	445100	721000	948500
9	709900	715600	686200	615300	445100	789900	1015800
10	709900	715600	686200	666000	445100	806400	1015800
11	735700	765000	710600	666000	445100	806400	1015800
Average	697996	717580	679900	642500	470790	748420	915020

Changes to regeneration delay had minimal impacts on the short-term harvest compared to the Base Case. In the long-term a regen delay of 0 years permits an increase of approximately 4%. Increasing the delay to 4 years lowers the long-term harvest by the same 4%. Regeneration delays affect the timing of availability for future stands. Therefore, the impact will be similar to that of changing minimum harvest age.

The short-term impact is much less than with minimum harvest age because the regeneration delay was changed by 2 years compared with 10 years in the harvest age sensitivity analyses. WFM continues to manage logged areas to achieve regeneration delays of less than 2 years on average to ensure that all stands will be available when expected in the future.

Reducing managed stand yields has a modest impact in the short-term and still maintains the initial harvest well above the current AAC. A 10% decline in managed stand yields forces the initial harvest down by approximately 1%. The long-term harvest level is lowered by almost 10%, indicating that growth and yield factors are more important in developing the harvest rate for TFL 52.

Reducing managed stand yields by 40%, which makes the managed stands volumes less than the volumes expected from natural stands causes the harvest to decline by 3% in the short-term and 40% in the long-term. However the managed stands developed for the MP #3 analysis are based on a much more thorough review of site productivity and inventory information than in past analyses and therefore should be much more reliable for predicting timber supply on the TFL.

Increasing managed stand volumes by 10% above the Base Case estimates does not affect the short-term harvest rate but increases the long-term level by almost 10%. A dramatic increase of 40% in managed yields improves the harvest by 4% and 38% in the short-term and long-term, respectively.

Figure 6.3 summarizes the results of the regeneration delay and managed stand yield sensitivity analyses.

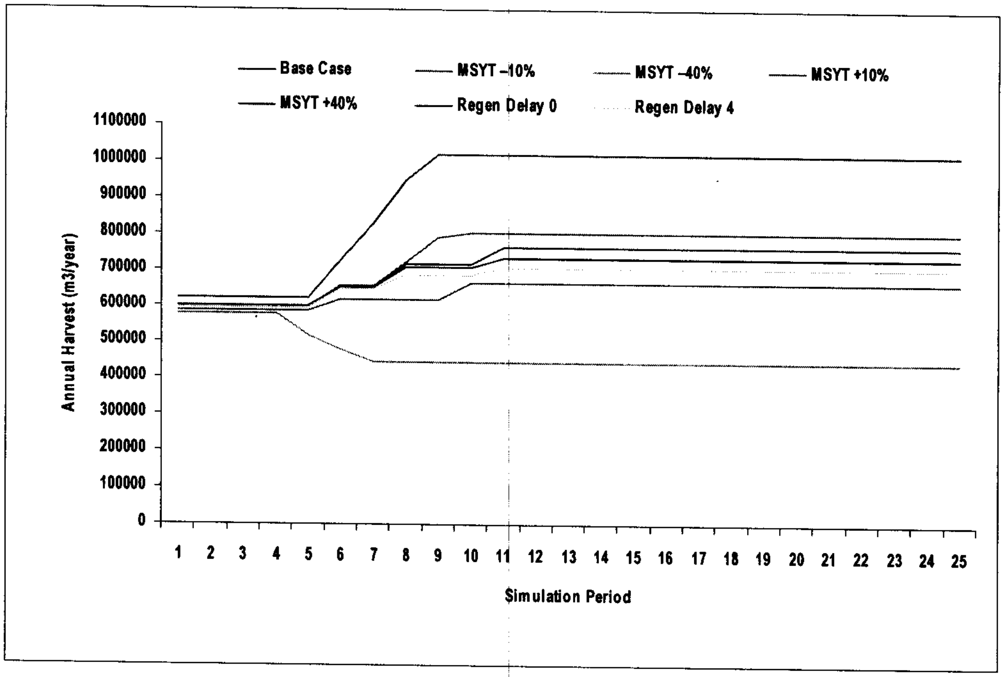

Figure 6.3 – Regeneration Delay and Managed Stand Yield Sensitivity Analyses Annual Harvest

6.3 Forest Cover Constraint Sensitivity Analysis

In this group of sensitivity analyses the forest cover constraints related to REAs are adjusted to test their impact on timber supply. These constraints include disturbance and green-up. Constraints related to landscape level biodiversity are discussed in the Alternative Landscape Level Biodiversity Option (Section 7). Table 6.4 lists the annual harvest rates developed for the REA forest cover constraint sensitivity analyses.

Table 6.4 – REA Forest Cover Constraint Sensitivity Annual Harvest Results

Simulation Period	Annual Harvest Level by Scenario (m3/year)				
	Base Case	Reduce Disturbance	Increase Disturbance	2-Metre Green-up	4-Metre Green-up
1	596900	558700	608200	602900	594300
2	596900	558700	608200	602900	594300
3	596900	558700	608200	602900	594300
4	596900	558700	608200	602900	594300
5	596900	558700	608200	602900	594300
6	650100	644500	648300	656100	649500
7	650100	644500	648300	656100	649500
8	709900	704200	708300	694100	709200
9	709900	704200	708300	694100	709200
10	709900	704200	708300	694100	709200
11	735700	715100	740900	739200	732200
Average	697996	676860	703040	699880	695240

Changes in the initial harvest level are only required with significant adjustments to the disturbance limits. In the sensitivity analyses presented in Table 6.4 VQO disturbance was shifted one "class" (*eg*. partial retention, VOQ-PR, changed to retention in the Reduce Disturbance scenario). This changed the maximum disturbance by as much as 10%.

Reducing the maximum disturbance lowers the short-term harvest by approximately 6% compared to the Base Case. The long-term harvest rate is 3% below that developed for the Base Case. There are certain areas of the TFL that contribute timber during the short-term because they are not constrained by old forest requirements. When that access is limited by reducing disturbance limits, the harvest level must drop. However these disturbance limits are well below the current management requirements for the TFL, especially when considered with landscape level constraints assigned in the analysis.

Increasing the disturbance limits does not provide the opportunity to harvest much additional timber. The short-term harvest is only increased by 2%. Old forest constraints and the transition to second growth stands at year 50 of the simulation still impose an upper limit on the harvest. Similarly the long-term harvest is only marginally higher than the Base Case.

Adjusting the green-up heights makes very little difference to the Base Case harvest level. Changes to the harvest are less than 1% at any time during the planning horizon. Once again this indicates that forest cover issues are not as important as growth and yield inputs when developing a harvest rate for TFL 52.

Figure 6.4 provides a graphic summary of the harvest schedules developed for the REA forest cover constraint sensitivity analyses.

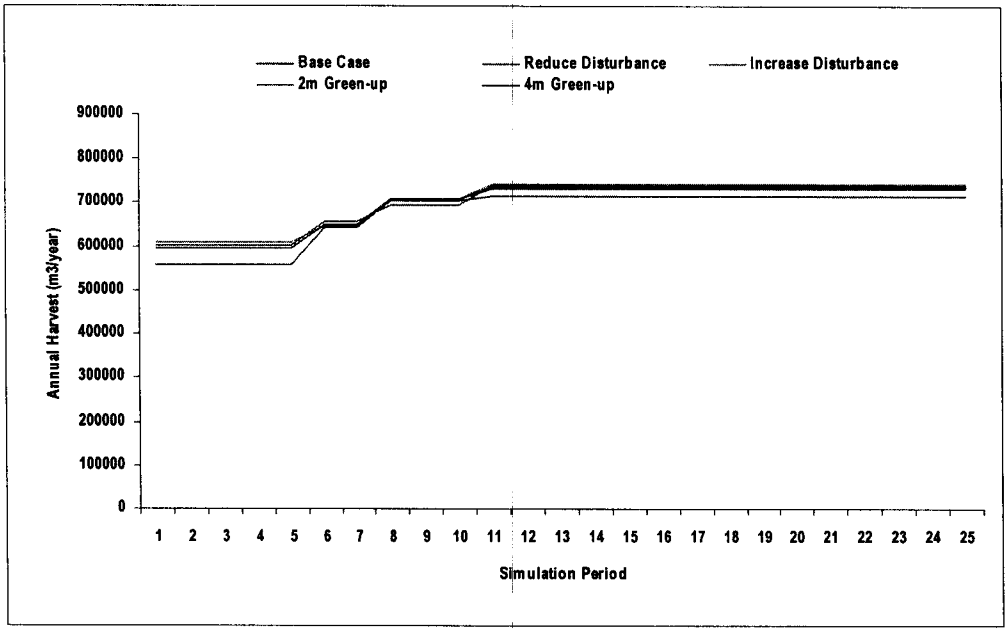

Figure 6.4 – REA Forest Cover Constraint Sensitivity Analyses Annual Harvest

7.0 ALTERNATIVE LANDSCAPE LEVEL BIODIVERSITY OPTION

A number of alternative approaches to modeling landscape level biodiversity were evaluated in this analysis option. An additional scenario, Old Age 200, was added after MoF accepted the final Information Package. In this scenario the old growth age for NDT-1 and NDT-2 areas was reduced from 250 years to 200 years. Table 7.1 summarizes the results of the various scenarios.

Table 7.1 –Alternative Landscape Level Biodiversity Annual Harvest Results

Simulation Period	Annual Harvest Level by Scenario (m3/year)					
	Base Case	Alternative BEO	45-45-10	Include Early Seral	Exclude Bowron Park	Old Age 200[1]
1	596900	632200	636100	508800	592400	637700
2	596900	632200	636100	508800	592400	637700
3	596900	632200	636100	508800	592400	637700
4	596900	632200	636100	508800	592400	637700
5	596900	632200	636100	508800	592400	637700
6	650100	632200	636100	650900	644200	637700
7	650100	700500	636100	688900	644200	637700
8	709900	766700	703900	723900	693300	637700
9	709900	766700	771400	723900	693300	637700
10	709900	766700	771400	723900	730900	717500
11	735700	766700	771400	723900	730900	749700
Average	697996	731772	730816	676560	693250	708090

[1] Replaces 250 year old growth age only.

Shifting the draft biodiversity emphasis in certain landscape units increases the initial harvest rate by 6% over the Base Case, or 15% over the current AAC. The long-term rate is reached in decade 8 and is 4% higher than that achieved in the Base Case. By assigning intermediate and high emphasis to areas that have the greatest constraints for non-timber (wildlife, visual quality, CCLUP special resource development zone (SRDZ)) there is more flexibility for harvesting in the areas that remain in low emphasis. The key landscape units that were re-assigned to high biodiversity emphasis for this scenario are:

- Bowron LU – part of SRDZ, includes Bowron Provincial Park, caribou no-harvest and many VQOs; and
- Jack of Clubs LU – part of SRDZ, includes caribou no-harvest and selection harvest areas, and many VQOs.

The key landscape units that were re-assigned to low biodiversity emphasis for this scenario are:

- Victoria LU – part of ERDZ, 94% of the productive forest land base is classified as IRM; and
- Umiti LU – part of ERDZ, 92% of the productive forest land base is classified as IRM.

Table 7.2 summarizes the assignment of landscape units to biodiversity emphasis for the Alternative BEO scenario and compares it to the Base Case.

Table 7.2 – Alternative Biodiversity Emphasis for Draft Landscape Units

Landscape Unit	Gross Productive Area (ha) & Percent of TFL 52 (%)	Alternative Biodiversity Option Emphasis	Base Case Biodiversity Emphasis
Bowron	7,444 (3.1)	High	Low
Jack of Clubs	18,955 (8.0)	High	Low
subtotal	26,399 (11.1)		
Antler	42,077 (17.7)	Intermediate	Intermediate
Big Valley	18,233 (7.7)	Intermediate	Low
Indianpoint	11,905 (5.0)	Intermediate	Low
Lightning	14,705 (6.2)	Intermediate	Low
Willow	18,463 (7.9)	Intermediate	Low
subtotal	105,283 (44.4)		
Swift	25,357 (10.7)	Low	Low
Umiti	36,709 (15.5)	Low	Intermediate
Victoria	43,574 (18.4)	Low	High
subtotal	105,640 (44.5)		
Total	237,423 (100.0)		

Using the MoF approach of determining the mature and old constraints by weighting the FPC Biodiversity Guidebook constraints 45% low, 45% intermediate and 10% high also improves the annual harvest by as much as 7%. It is unlikely that this approach will be used to manage the forests of TFL 52 operationally.

Including the early seral constraint, based on draft emphasis used in the Base Case, limits the short-term harvest by 15% compared to the Base Case. This is due to adding an additional disturbance limit on some of the key areas that supply harvest during the early decades. The high and intermediate emphasis landscape units are particularly impacted in this scenario. There is no requirement to include early seral constraints in the management of the TFL over the period of MP #3.

Excluding the influence of Bowron Provincial Park in the assessment of the mature and old forest constraints changes the Base Case by less than 1%. This provides additional comfort that the TFL can supply the necessary old forests to meet the FPC requirements without any support from outside the license area.

Reducing the old growth age from 250 to 200 years increases the initial harvest by 7% over the Base Case. The old forest targets are met much earlier based on this younger age and this reduces the impact of the availability issues at year 50. The low point in available timber is pushed ahead to year 70 and at this time there are many more second growth stands available for harvest. There is currently a lack of forest older than 200 years on the TFL, a situation that is common across the Cariboo Forest Region. This is the reason for making adjustments to the assessment of old growth in the 5-year forest development plan and sub-regional planning processes.

Figure 7.1 provides a graphic summary of the simulation runs completed for the Alternative Landscape Level Biodiversity option.

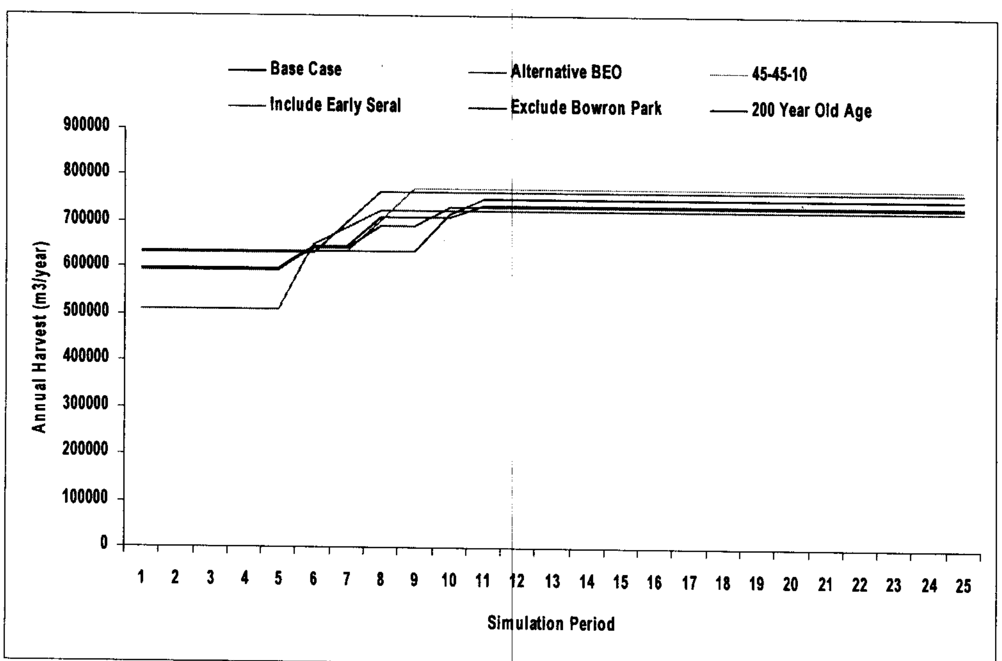

Figure 7.1 – Alternative Landscape Level Biodiversity Annual Harvest

8.0 20-YEAR SPATIAL FEASIBILITY OPTION

In order to test the ability to locate harvest opportunities on the ground, the Base Case harvest was modeled spatially for 20 years. In addition to all land base, growth and yield and forest cover constraints assigned in the Base Case, the following inputs were included in this analysis scenario:

- The productive forest was assigned to cutblocks, based partly on WFM's current 5-Year and 20-Year Plans and partly on blocks developed in the GIS;
- Priority harvest was assigned to WFM 5-Year and 20-Year blocks;
- Cutblocks must be harvested as a single unit; no "splitting" of blocks is permitted;
- Adjacency information to ensure that cutblocks were excluded from harvest until after all neighbouring blocks reach 3 metre height; and
- Aggregation of patches (blocks) to limits specified by the FPC Biodiversity Guidebook for each NDT.

A map of the results of the 20-Year Spatial Feasibility harvest is included in Appendix II. The results of the simulation runs completed for this option clearly indicate that the 20-year harvest target can be met with the addition of cutblocks and adjacency green-up requirements. All forest cover constraints were satisfied at both the REA and landscape levels. Some areas were placed in temporary reserve to meet the old forest constraints, similar to the Base Case.

In addition, the 20-Year Plan submitted as part of MP #3 also supports a harvest at least as high as the Base Case. Table 8.1 summarizes the distribution of cutblock sizes harvested in this scenario and the component of the harvest made up by WFM 5-year and 20-year plan blocks.

Table 8.1 –Size Distribution of Cutblocks Harvested

Block Size (ha)	Contribution to Annual Harvest (m3/year & %)			Total
	5-Year FDP Blocks	20-Year Plan Blocks	GIS Blocks	
< 2	238 (0.0)	0 (0.0)	23132 (3.9)	23370 (3.9)
2 – 5	614 (0.1)	492 (0.1%)	35550 (6.0)	36655 (6.1)
5 – 10	1793 (0.3%)	3317 (0.6%)	31250 (5.2)	36360 (6.1)
10 – 40	66808 (11.2)	179256 (30.0)	62689 (10.5)	308753 (51.7)
40 – 80	68593 (11.5)	113576 (19.0)	4279 (0.7)	186448 (31.2)
80 – 250	5313 (0.9)	0 (0.0)	0 (0.0)	5313 (0.9)
Average	143359 (24.0)	296641 (49.7)	156899 (26.3)	596900 (100)

Approximately 74% of the harvesting in the 20-Year Spatial Feasibility option is in blocks currently included in WFM's 5-Year and 20-Year plans. These plans used a different approach to reviewing old forest requirements and therefore had more flexibility in selecting areas for harvest. It is important to note that the results of the 20-Year Spatial Feasibility simulation represent one of many possible harvest solutions for achieving the Base Case harvest target. The results of this scenario are not to be considered an operational plan. However, the results can assist planning staff with identifying candidate areas for harvesting and areas that may be restricted due to non-timber constraints.

9.0 DISCUSSION AND CONCLUSIONS

The results of the MP #3 timber supply analysis for TFL 52 clearly indicate that the harvest can be increased above the current AAC of 549,000 m3/year. All of the inventory information has been updated for the land base, new growth and yield inputs have been collected and consideration for non-timber resources has been included in the analysis. The following sections outline the potential changes to the Base Case that may exist.

9.1 Upward Pressures on Supply

A number of the analysis inputs could be changed with additional information or guidelines from MoF or MoELP. These changes will have a positive influence on the timber supply for TFL 52.

Old growth constraints modeled in the Base Case are much more conservative than the constraints that are being used under current management and planning for TFL 52 and for sub-regional planning in the Quesnel Forest District. This stems from the definition of old forests in NDT-1 and NDT-2 forest types. As noted for the Base Case scenario in which old growth constraints were not enforced, the initial harvest could be increased considerably with an adjustment to old forest constraints. Similarly, reducing the old growth age to 200 years in NDT-1 and NDT-2 allows a significant improvement in the short-term harvest level.

It is clear that old forest constraints will be applied to TFL 52. However, the use of the adjustment factors outlined in the *Biodiversity Conservation Strategy for the Cariboo-Chilcotin Land Use Plan*, acknowledges that old forest constraints currently defined in the FPC Biodiversity Guidebook may not be appropriate for TFL 52.

The draft biodiversity emphasis assignments could shift to more appropriately combine the highly constrained areas of the land base with intermediate and high emphasis biodiversity. This would provide more opportunities for non-timber resources and improve harvesting access to unconstrained areas on the TFL.

Over the period of MP #3 WFM expects to address the remainder of the Balsam IU stands and this will provide a minor upward influence on timber supply. Similarly, with the new TSM and managed stand site index information, some of the mature stands excluded as low productivity are likely to be included in the THLB in future.

A major upward pressure on timber supply is the volume estimation for natural stands. The recent MoF inventory audit of TFL 52 indicates that, overall, volumes may be underestimated by as much as 10%. Based on the results of the sensitivity analysis, this input alone has the potential to improve the short-term harvest by an additional 9% to 650,200 m3/year.

9.2 Downward Pressures on Supply

Although some of the sensitivity analysis results indicate a drop in the Base Case harvest level, many of these are not considered to be realistic assessments of the current situation on TFL 52. The most significant reductions in harvest were the result of increasing minimum harvest age by 10 years. However, the approach used to develop minimum harvest age (culmination of MAI and minimum volume requirements) is standard practice, and generally gives conservative results. WFM does not have specific product objectives that would increase minimum harvest ages in the way described in the sensitivity analysis.

9.3 Conclusions

WFM has addressed all inventory and land base issues identified at the commencement of MP #2. Inventory and growth and yield information has been collected and allows a more thorough and detailed review of timber supply for TFL 52. In addition, many unknowns related to the FPC and CCLUP have been clarified during the past four years and have been modeled accordingly in the MP #3 timber supply analysis.

In making an AAC determination for a TFL, the Chief Forester must consider Section 8 of the Forest Act. All of the points listed under Section 8 can be clearly answered from the results of the MP #3 timber supply analysis. The most notable uncertainties identified in the analysis will likely improve the timber supply once they have been clarified.

Therefore it is apparent, based on the results of the MP #3 timber supply analysis for TFL 52, that the AAC can be increased to the Base Case level of 596,900 m3/year. This harvest level will not compromise non-timber interests related to wildlife, visual quality or biodiversity. In addition there is considerable information that this level is a conservative estimate based on the potential to increase the THLB from marginal forest stands, underestimation of natural stand yields and old growth requirements.

10.0 FUTURE INFORMATION REQUIREMENTS

In order to improve the estimation of timber supply and overall management of TFL 52, WFM will continue to gather information that will assist them in achieving these objectives. Based on the results of the MP #3 timber supply analysis, the following issues should be addressed:

- Determine the attributes that characterize old growth stands, including how these stands can be created using silviculture, and how to model these attributes in timber supply analysis.
- Continue to monitor managed stands to ensure that yield estimates, including site index, OAFs and harvesting ages are correct.
- Maintain or improve the 2-year regeneration delay.
- Confirm the yield estimates for existing natural stands.

APPENDIX I

West Fraser Mills Ltd. Bowron-Cottonwood Tree Farm License (TFL 52) Management Plan #3 Timber Supply Analysis Information Package

(under separate cover)

APPENDIX II

20-Year Spatial Feasibility Harvest Map

TFL 52 MP #3 Timber Supply Analysis
2001.05.29

Additional Growth & Yield Sensitivity Harvest Forecast
No Genetic Gains on Managed Stand Yields

Simulation Period	Annual Harvest Level by Scenario (m3/year)	
	Base Case	No Genetic Gains
1	596900	592600
2	596900	592600
3	596900	592600
4	596900	592600
5	596900	592600
6	650100	634200
7	650100	634200
8	709900	634200
9	709900	634200
10	709900	693400
11 - 25	735700	693400

Harvest levels are net of NRLs (6,750 m3/year)

A reduction of 6.15% was applied to all future managed stand volumes to account for no genetic gains. This was the weighted average of genetic gains included in the Base Case. Base Case managed stand yields included genetics gains for spruce (8%), pine (5%) and Douglas-fir (5%).