NICOLA-SIMILKAMEEN INNOVATIVE FORESTRY SOCIETY
INNOVATIVE FORESTRY PRACTICES AGREEMENT

MERRITT TSA TSR 4
DRAFT DATA PACKAGE

Prepared for:

Nicola-Similkameen Innovative Forestry Society

Merritt, B.C.

Prepared by:

Timberline Natural Resource Group

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1.0 INTRODUCTION

1.1 Background

This Draft Data Package has been prepared by Timberline Natural Resource Group Ltd. (Timberline) as a source document for the initial First Nations consultation and public referral of the net-down criteria to be used for the timber supply review (TSR) 4. The netdown information will be available for viewing on the NSIFS website. Information gathered during this 60 day period will be reviewed and incorporated into the final data package where appropriate. The final data package is planned for mid-June 2009, and the timber supply analysis will commence soon after that.

The final data package document will serve as a summary of the inputs and assumptions made in preparing the draft data package for TSR 4. To be included are inventory and land base summaries and management assumptions for timber and non-timber resources as they relate to timber supply net-downs. The analysis involves modeling a Base Case which is intended to represent current management practices. In addition, a number of sensitivity analyses will also be conducted to test the impact of different assumptions on timber supply.

Upon acceptance by the British Columbia Ministry of Forests and Range (MoFR) Timber Supply Analyst, the assumptions and methodology provided in the Data Package will be used to prepare and submit a timber supply analysis to the MoFR. All analysis results will be provided to the Chief Forester of British Columbia, or designate, for allowable cut determination.

1.2 Project Objective

The purpose of this project has been to prepare a draft data package for the Merritt TSA in support of the TSR4 timber supply analysis. This draft data package will be presented by the MoFR for First Nations consultation and public referral.

1.3 Project Scope

The project scope is as follows:

I. Develop draft Data Package
   - i. Participate in project initiation, review of technical issues, and clarification of management assumptions
   - ii. Confirm all sources of relevant data and management requirements
     1. Describe any limitations or constraints with data
   - iii. Summarize previous analysis factors and assumptions
     1. Issues
     2. Sensitivities
   - iv. Summarize on-going or forecasted plans that should be reviewed or revisited for future Timber Supply analysis.
   - v. Summarize data acquired through item (i.) in preparation/consideration of analysis work

II. Support NSIFS and MoFR in initiating public and First Nations' review
   - i. Coordinate draft package to MoFR

2.0 TIMBER SUPPLY ANALYSIS PROCESS

Multiple management options will be considered and modeled in this analysis. The main models considered are:

- Base Case - current management practice; and
- Sensitivity analyses (see Section 10).

2.1 Missing Data

- MPB forecasts not included, to be incorporated
- In some cases, harvest block information was available, but the harvest year could not be determined. Blocks that occurred in mature stands (as determined from the VRI) were assumed to have been harvested in 2008. In cases where these blocks fell in immature stands, the block information was assumed to have been captured by a previous VRI update, and the harvest block was ignored.
- OGMA information was provided by the licencees for this analysis. However, insufficient time and resources were available to collate and clean up this data to the point that it could be incorporated into the GIS resultant. The raw data was compared to the OGMA spatial data used for the Silviculture Type 2 analysis, and the differences were found to be minor. The older OGMA data has been used for this project.

3.0 TIMBER SUPPLY OPTIONS

This section provides an overview of the options that will be evaluated in the timber supply analysis.

3.1 TSR 4 Base Case Including MPB Forecast

3.1.1 Changes from the Previous TSR

Many inputs into the analysis process change over time- information is continually updated and legislation changed. The major changes from TSR 3 are listed below:

- Updated land base summary (see section 5.0).
- OGMAs are used instead of aspatial seral requirements;
- Disturbances will be modeled in the non-THLB productive land base;
- MPB modeling methodology to be refined

3.2 Alternative Harvest Flows

A number of different harvest flows will be explored, based on tradeoffs between short and medium-term harvest levels. Forest cover objectives and the biological capacity of the net timber harvesting land base (THLB) ultimately dictate the harvest levels. However, a number of alternative harvest flows are possible. In this analysis, the main objective will be to:

- Identify the amount of mountain pine beetle (MPB) affected pine able to be harvested to determine an appropriate initial harvest level;
- Mitigate the impact of MPB on the mid-term timber supply (building on the work in the Type II); and
- Find a sustainable long run harvest level that reflects managed stand yields.

3.3 Other Options

There are no scenarios additional to this timber supply analysis identified at this time.

4.0 CURRENT FOREST COVER INVENTORY

This section describes the base mapping, forest cover inventory and other data used in the analysis.

4.1 Base Mapping

All spatial information is registered to the Terrain Resource Inventory Mapping (TRIM), North American Datum (NAD) 83 base using the Albers projection. Inventory data has been prepared using the ARC/INFO™ Geographic Information System (GIS). Use of GIS ensures that spatial relationships between the various inventory attributes are maintained throughout the analysis process. One example is existing roads and streams have been buffered to provide specific area reductions from the THLB. Another example is the classification of THLB vs. non-THLB productive land base. Forest on the non-THLB productive land base is not available for harvesting but can contribute to forest cover objectives for non-timber resources (depending on its structural state).

4.2 Vegetation Resource Inventory

The Vegetation Resource Inventory (VRI) was downloaded from the LRDW in 2006 and has been updated for disturbance to 2001 and projected to the end of 2008. A new VRI was made available in January 2009, but the GIS Analyst, MoFR Cascades District has advised against using this new coverage due to problems with the leading species. In order to complete the disturbance updated RESULTS blocks and licensee forest stewardship plan information has been incorporated into the resultant database. The cut-off date for depletion for this draft data package was December 31, 2008. Licencee depletions were provided March 2009 and are current to December 31, 2008 with the exception of one licencee. Timberline provided block depletion coverage from 2007, but this data does not included status or harvest year. VDYP has been run to determine net volume by species for forested stands.

4.2.1 Missing Species in the Inventory

The version of the VRI data set being used for this analysis has no species information for 32,712 ha of productive land, of which 28,187 ha are in the THLB. For these stands, leading species will be assigned using information in the predictive ecosystem maps.

For blocks that were updated from licencee information, the species composition for the regenerating stand will be assumed to be the same as that of the original stand.

4.3 Data Sources

Many sources of data were compiled to provide input to this timber supply analysis - these are documented in Table 1.

Table 1. Source Data

Spatial Data Group	Standard Data Layer	Source	Date
Tenure	Community Forest - Princeton	MoFR	March, 2009
Tenure	Ownership	Type II	2006
Tenure	Small Wood	Type II	2006
Tenure	TSA Boundary	Type II	2006
Tenure	Woodlots	MoFR (Smith)	March, 2009
Forest	Depletions - Licencees	Licencees	March, 2009
Forest	VRI	Type II	2006
Operational	Cultural Heritage Resources	RAAD	March, 2009
Operational	Fencelines	MoFR (Smith)	March, 2009
Operational	Landings	Licencees	March, 2009
Operational	Operability	Type II	2006
Operational	Roads	Licencees	March, 2009
Operational	Roads - TRIM	TRIM	2006
Operational	Small Scale Salvage	LRDW	March, 2009
Environmental	BEC	Type II	2006
Environmental	Community Watershed Intakes	Type II	2006
Environmental	Community Watersheds	Type II	2006
Environmental	Environmentally Sensitive Areas	Type II	2006
Environmental	Heritage Trails (Hudson's Bay Trail)	MoFR	March, 2009
Environmental	Landscape Units	Type II	2006
Environmental	OGMA	Licencees	March, 2009
Environmental	Parks	MOE	2006
Environmental	Predictive Ecosystem Mapping	TRNG	2006
Environmental	Streams - Classified	Type II	2006
Environmental	Terrain Stability	MoFR (Smith)	March, 2009
Environmental	TRIM water	TRIM	2006
Environmental	VQO	Type II	2006
Environmental	Wildlife Tree Patch	Licencees	March, 2009
Habitat	“Great Basin” Gopher Snake	MOE	March 25, 2009
Habitat	“Interior” Western Screech-Owl	MOE	March 25, 2009
Habitat	Coastal Tailed Frog	MOE	March 25, 2009
Habitat	Deer	MOE (Burwash)	March 26, 2009
Habitat	Elk	MOE (Burwash)	March 26, 2009
Habitat	Flammulated Owl	MOE	March 25, 2009
Habitat	Goat	MOE (Burwash)	March 26, 2009
Habitat	Grizzly Bear WHA	MOE	March 25, 2009
Habitat	Moose	MOE (Burwash)	March 26, 2009
Habitat	Mountain Goat	MOE	March 25, 2009
Habitat	Rattlesnake	MOE (Iredale)	March 26, 2009
Habitat	Sheep	MOE (Burwash)	March 26, 2009
Habitat	Spotted Bat	MOE	March 25, 2009
Habitat	Ungulate Winter Range	MOE	March 25, 2009
Habitat	Williamson Sapsucker	MOE (Iredale)	March 26, 2009

5.0 DESCRIPTION OF LAND BASE

5.1 Overview

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

The Merritt TSA is located in the southern interior region of B.C., and contains several communities, including Merritt, Princeton, Tulameen, Brookmere, Missezula Lake, and Allison Lake. The TSA, covering approximately 1.13 million hectares, is within the Southern Interior Forest Region, and is administered by the Cascades Forest District. The TSA is bounded to the north by the Kamloops TSA, to the east by the Okanagan TSA, to the west by the Fraser and Lillooet TSAs, and to the south by Manning and Cathedral Parks and the Canada-U.S.A. border. Figure 1 shows the boundary of the TSA along with the major communities, highways and water bodies.

The topography of the TSA varies from the eastern crest of the Cascade Mountains in the west, to the drier and relatively flat Thompson Plateau in the east. The two major river systems in the TSA are the Similkameen River in the south, and the Nicola River in the north (Timberline, 2003a).

Approximately 72% of the TSA area is productive forested land under crown administration and 77% of this crown productive forested landbase is available for harvesting. Lodgepole pine leading stands comprise 56% of the productive forested landbase, and Douglas-fir leading stands constitute another 27%. Other common tree species include spruce, ponderosa pine, subalpine fir and trembling aspen, as well as small amounts of western hemlock, western red cedar, and western larch (Timberline, 2003a).

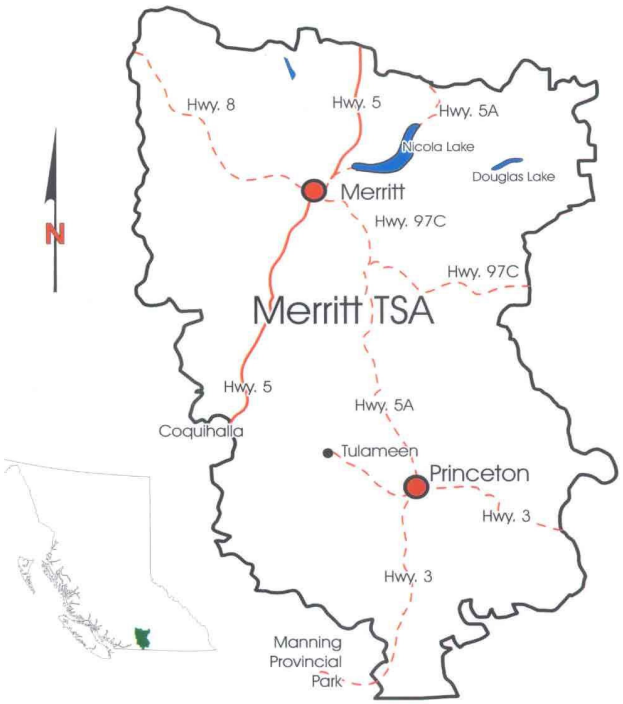

Figure 1 Merritt TSA

5.2 Timber Harvesting Land base Determination

The crown landbase is classified into one of the following four broad categories:

1. Unproductive for forest management purposes;
2. Inoperable, either currently or in the future, under the assumptions of the analysis;
3. Unavailable for harvest for other reasons (e.g. wildlife habitat or preservation of visual quality); or
4. Available for integrated use (including harvesting).

Table 2 shows the netdown process used to derive the timber harvesting landbase (THLB).

Table 2 Landbase classification.

Land Classification	Total Area (ha)	Crown Productive Area (ha)	Net Area Removed (ha)
Total Area	**1,130,282**		
Non-crown (includes woodlots, Community Forest)	210,130		
Total Crown Landbase	**920,151**		
Non-productive, non-forest, non-commercial	107,467		
Productive Forest		**812,684**	
Parks, ecological reserves	15,935	10,984	10,984
Environmentally Sensitive Areas (ESAs)	66,406	35,219	34,408
Unstable terrain, inoperable	105,676	59,513	38,678
Problem forest types	45,011	24,933	15,664
Cultural heritage resources	1,198	824	541
Riparian management areas	50,939	23,654	19,988
Heritage trails	584	485	117
Water intakes for community watersheds	15	8	4
Existing roads, trails and landings	17,428	13,791	13,112
Wildlife tree patches (WTPs)	9,122	8,686	7,578
Old growth management areas (OGMAs)	114,771	112,666	47,487
Total Productive Reductions			188,561
Current Timber Harvesting Landbase			**624,123**

5.3 Total Area

The total area of Merritt TSA is 1,130,282 ha, of which 624,123 ha are classified as productive TSA forest land. In TSR 3 the gross area of the TSA was determined to be 1,130,064 ha.

5.4 Non-crown Land

Non-crown land includes selected ownership classes, woodlots and Community Forest Agreements. The ownership classes were identified using the ownership code in the MoFR's ownership layer. The following ownership codes were removed from the productive land base: 0,1,40,50,52,54,75,76,77, 99. Woodlots were identified using a compiled woodlot layer provided by the Ministry of Forest to include the most recent additions to the woodlot layer. WL 355 is planned to be finalized by early April 2009 which covers approximately 200 ha. There are additional top-ups expected to be finalized by the end of the year for WL's 353, 359, 354 and 350. Two future woodlots may be advertised within the next few years (approximately 1200 ha's each). Only woodlots approved by the time the final data package is completed will be included in the analysis.

The Vermilion Forks Princeton Community Forest Area has not been excluded from the land base at this time. However, the spatial coverage is available on the NSIFS website. The MoFR Cascades estimates that the Community Forest Area will be put forward to the Minister for approval within the next 6 months. Depending on approval status of the woodlots and Community Forest at the time of the final data package, these areas could be included in a sensitivity run.

Table 3 summarizes the areas circumscribed by the outer boundary of the Merritt TSA, but not owned or administered by the province of British Columbia. These areas are not part of the THLB, nor are their contributions toward other resource values considered. Thus they are entirely excluded from the analysis.

Table 3 Non-crown area.

Description	Ownership Code	Area Removed (ha)
Area of non-interest	1	15
Private	40	160,997
Federal Reserve	50	42
Indian Reserve	52	34,378
TFL	76	60
Woodlots	n/a[1]	14,579
Crown misc. lease	99	59
Totals		195,551

[1] Woodlot information was not summarized from the ownership data, but rather from a current spatial data set provided by the MoFR District Office.

5.5 Non-commercial, Non-forest and Non-productive Forest

Traditionally non-productive non-forest land would have been identified using the non-productive descriptor field from the forest cover, however, in the VRI additional fields are required to completely identify these areas. In addition to removing NP, U, L, SWAMP, M, NPBR, R, C, GR, CL, G, RIV,

NPBU, AF, A, P identified in the non-productive descriptor field, all vegetated non-treed land identified by the BC land classifications 1 and 2 were removed. The only exception to these removals is where logging history is present. Both VRI and RESULTS logging history were taken into consideration. A total of 107,467 ha were removed from the productive land base using these criteria. TSR 3 was 99,210 ha.

All land classified as non–commercial, non–forest, or non-productive forest is excluded from the THLB. The specific components of the non–forested area reductions are summarized in Table 4 Non–productive forest removals are summarized in Table 5.

Table 4 Non-forest area reduction.

Description	Area removed (ha)
Alpine	15,926
Clay Bank	19
Clearing	633
Gravel Bar	98
Gravel Pit	135
Hayfield	-
Lake	8,360
Meadow	398
Non-Productive Brush	5,491
Non-Productive Burn	4,883
Non-Vegetated (BCLS)	7,794
No Typing Available	242
Open Range	18,635
River	787
Rock	7,250
Swamp	4,607
Urban	5,876
Totals	81,134

Table 5 Non-productive forest area reduction.

Description	Area removed (ha)
Alpine Forest	1,797
Non-Commercial Forest (Type ID)	2,137
Non-Productive Forest (Type ID)	21,766
Non-Productive Forest (NP Code)	634
Totals	26,334

5.6 Parks

There was a reduction of 10,984 ha's (11,017 ha in TSR3) for existing parks and ecological reserves. The Protected Areas Strategy (PAS) Areas of Interest and Approved Study Areas have not been excluded from the Productive Forest Landbase as there are no current plans to establish these proposed PAS areas within the Merritt TSA. Federal and provincial parks, as well as provincial ecological reserves were removed from the THLB, but were allowed to contribute to forest cover requirements for landscape level biodiversity. Table 6 summarizes the area reductions for these landbase categories.

Table 6 Park and ecological reserve area reductions

Description	Ownership code	Area removed (ha)
Crown ecological reserves	60	614
Class A parks	63	693
Provincial parks or equivalent	67	9,677
Totals		10,984

5.7 Environmentally Sensitive Areas and Unstable Terrain

Environmentally sensitive areas (ESAs) were identified using a combination of terrain stability mapping ESA mapping from previous forest cover. The reductions associated with ESAs are soils (S), regeneration (P), recreation (R), avalanche (A) and water (W). ESA1's were fully excluded from the THLB, ESA2's were fully included within the THLB. Where available, terrain stability mapping classifications U, and V were netted out. Table 6.8 provides a summary of the ESA reductions in the Merritt TSA. In all cases previously logged stands are excluded from the ESA, and terrain netdown. ESA reductions amount to 34,408 ha (TSR3 was 34,531 ha). Areas classified in the forest cover inventory as highly environmentally sensitive were removed from the THLB, as summarized in Table 7.

Table 7 Environmentally sensitive area reductions

Description	ESA code	Area removed (ha)
Avalanche	A	361
Avalanche/Regen	AP	46
Recreation	R	1,024
Regen	P	20,641
Regen/Recreation	PR	33
Soil	S	4,531
Soil/Avalanche	SA	5
Soil/Regen	SP	7,550
Soil/Regen/Recreation	SPR	0
Soil/Wildlife	SW	20
Water	H	88
Totals		34,408

5.8 Operability

The forest cover inventory classifies the landbase into operable and inoperable areas, based on physical and economic factors such as topography, soil stability, road access, and timber quality. Areas classified as inoperable are removed from the THLB. In addition to these areas, detailed terrain stability mapping has been conducted on some parts of the Merritt TSA. All areas identified as class V terrain in this inventory are also removed from the THLB. For those areas of the TSA in which terrain stability mapping has not been completed, areas with slopes greater than 65% were also removed from the THLB. These area reductions are summarized in Table 8.

Table 8 Inoperable, steep or unstable terrain area reductions

Description	Area (ha)		
	Total	Productive	Removed
Inoperable	80,358	43,769	30,747
Slopes > 65 %	21,852	12,778	5,729
Class V terrain	3,466	2,965	2,202
Totals			38,678

Note that the categories shown in Table 8 are geographically overlapping, consequently the “Total” and “Productive” area figures shown do include some double-counting. However, the “Area removed” figures shown in the table are net figures and therefore accurately reflect the total area deducted from the landbase for all three categories.

5.9 Problem Forest Types

The following table describes the timber types and areas of "problem forest types" (PFT’s) that have been excluded from the timber harvesting land base because they are not expected to be utilized due to marginal economics (low volumes, and/or quality). PFT area is 16,481 ha’s (TSR3 was 22,856 ha’s) reduced from TSR3.

Table 9 Problem Forest Type Criteria

Species	Type group	New site index (m at 50 years)	Age class	Height class	Height (m)	Crown closure class	Crown forest area (ha)	THLB excluded area (ha)
Balsam / Spruce / Hemlock / Cedar	9–27	< 14.0	4–9		< 22.0	<3 or >7	6,720	4,274
Deciduous	35–42						8,509	7,939
Fir / Yellow Pine / Larch leading	1–8, 32–34	< 10.0	4–9	< 3			8,357	2,441
Pine leading	28–31	< 8.0	1–3				224	217
Pine leading	28–31	< 8.0	4–9	< 3			188	186

Species	Type group	New site index (m at 50 years)	Age class	Height class	Height (m)	Crown closure class	Crown forest area (ha)	THLB excluded area (ha)
All coniferous	1–27, 32–34	< 10.5	1–3				937	606
Totals							24,933	15,664

(a) Stands that have not been assigned silviculture opening numbers have generally not been subjected to management actions in the past (such as silviculture treatments) and are not considered to be under "active management." These areas are not considered to be available for future harvesting at this time.

5.10 Cultural Heritage Resources

To aid in defining cultural heritage values and landscape planning, archaeological inventory studies, archaeological impact assessments and traditional use studies have been undertaken within the TSA. There are 709 archaeological sites identified within the Merritt TSA. The majority of these sites are located on lands outside of the crown forest land base or are in areas removed for other reasons (e.g. lake buffers). The archaeological sites included in this draft data package are from the Ministry of Tourism, Culture and the Arts (Archaeological Branch, March 2009) Remote Access to Archaeological Data (RAAD) website which is updated with new information on monthly basis.

To account for the cultural heritage resources in the Merritt TSA, a 100% net-down was applied to each mapped polygon. This removed 541 ha's from the THLB.

5.11 Riparian Management Areas- Streams, Wetlands and Lakes

Riparian management areas (RMAs) are designed to minimize the impacts of harvesting in areas immediately adjacent to water bodies, including streams, lakes, swamps and wetlands. A riparian management area consists of a riparian management zone (RMZ) in which harvesting activity is restricted through basal area retention requirements, and may also include a riparian reserve zone (RRZ) immediately adjacent to the water body in which harvesting is fully excluded. The presence of a RRZ is dependent on the classification assigned to the water body in question.

For the purposes of timber supply modeling, the RMZ width is reduced by the RMZ retention percentage and added to the RRZ width to arrive at a composite buffer width, as shown in Table 10. GIS buffering techniques were used to construct an effective reserve zone inside of which harvesting activity was fully excluded. Note that the composite buffer width shown in the table was applied to each side of stream features, and to the terrestrial side of wetland or lake features.

5.11.1 Streams

Effective RRZ and RMZ buffers were constructed (as summarized in Table 10) and for this data package. These buffers were consistent with commitments in the Merritt TSA licencee's FSP's. TSR3 had applied a generic 10 m buffer to all streams which resulted in a greater area removed from the THLB.

5.11.2 Lakes

Most lakes within the Merritt TSA have been classified through a local planning process (the Merritt TSA Lakes Classification Process), and were assigned a class of A, B, C, D or E. Each of these classifications designates a lakeshore management zone (LMZ) that in practice extends beyond the RRZ

dictated by the Riparian Guidebook where one exists, and implies specific basal area retention as shown in Table 10. The TSR3 analysis assumed that any RRZ was entirely contained within the LMZ, and the same methodology has been applied to these lakes for the benchmark analysis scenarios.

Lakes not classified through the local planning process were classified by applying the Riparian Guidebook criteria of lake surface area and surrounding BEC subzone (as determined from the provincial BEC ecosystem inventory). This process resulted in the L1 – L4 classifications and associated RRZ buffers listed in Table 10.

5.11.3 Wetlands

For the TSR2 analysis, wetlands were identified from the forest cover inventory spatial files and classified according to Riparian Guidebook criteria of wetland surface area and surrounding BEC subzone. This process resulted in the W1 – W4 classifications and associated RRZ buffers listed in Table 10. The effective RRZs and resulting reductions for RRZ's to the net landbase are exactly those applied in the TSR2 and TSR3 analysis, with BEC subzones being determined from the provincial BEC ecosystem inventory. Management Zone retention targets for wetlands have been derived from Merritt TSA licencee FSP's and there are changes from TSR3. The retention targets have been reduced to 10% (from 25%) for several of the wetlands classifications.

Table 10 Riparian management zone area reductions

Riparian Class	Reserve Zone Width	Management Zone Width	Management Zone Retention	Buffer Width	Productive Area	Area Removed
	m	m	%	m	ha	ha
Streams:						
default				10	22,324	18,843
S1-A	0	100	20	20		
S1-B	50	20	20	54		
S2	30	20	20	34		
S3	20	20	20	24		
S4	0	30	20	6		
S5	0	30	10	3		
S6	0	20	0	0		
Wetlands:						
W1	10	40	10	14	1,239	1,065
W2	10	20	10	12		
W3	0	30	0	0		
W4	0	30	10	3		
W5	10	40	10	14		
Lakes:						
L1	10	0	25	10	91	80
L2	10	20	10	12		
L3	0	30	10	3		
L4	0	30	10	3		

A		200	100	200		
B		200	50	100		
C		200	25	50		
D		200	10	20		
E		200	5	10		
				Totals	23,654	19,988

5.12 Heritage Trails

A "Memorandum of Agreement between the Ministry of Forests and the Ministry of Small Business, Tourism and Culture" was reached in May 1995 declared that the designated heritage trail width shall be standardized at 100 meters each side of trail centerline (200 m total). A 200 meter buffer was applied to all Heritage Trails. Table 11 shows the reductions associated with the designated Heritage Trails within the Merritt TSA.

Table 11 Heritage Trails Netdown

Trail Name	Length (km)	Area (ha)		
		Gross	Productive	Removed
Hope Pass	2.6	15	15	3
Dewdney	3.7	73	73	17
Whatcom	4.0	77	75	22
Hudson Bay	25.0	419	321	76
	Totals	584	485	117

5.13 Water Intakes for Community Watersheds

Table 12 shows the reductions associated with community watershed intakes. As in TSR 2, community watershed intakes were identified from community watershed maps with a 100-metre upland buffer applied.

Table 12 Community Watershed Intakes Netdown

Community Watershed Intakes	Area (ha)		
	Gross	Productive	Removed
Anderson	2	2	1
Bell	2	2	1
Brook	2	2	0
Dillard	1	0	-
Hackett	1	1	0

Kwinshatin	2	-	-
Lee	2	-	-
Skuagam	2	-	-
Thomas	2	-	-
Totals	15	8	4

Section 60(2) of the Forest Practices and Planning Regulation states that "An authorized person must not harvest timber or construct a road in a community watershed if the timber harvesting or road construction is within a 100 m radius upslope of a licensed waterworks where the water is diverted for human consumption, unless the timber harvesting or road construction will not increase sediment delivery to the intake." For this analysis, GIS techniques were used to buffer the point locations of all community watershed intakes with a 100 metre radius circle, and excluding the up-slope half of the circle from the THLB.

There have been attempts by a licencee within the Merritt TSA to have the Dillard Creek CWS de-listed. However, the MOE Water Stewardship Division (Penticton) still designates it as a community watershed and it will be shown as such until the application is approved. The spatial definition of community watersheds is unchanged from the TSR2 analyses.

5.13.1 Existing Roads, Trails and Landings

13,112 ha of existing roads, trails and landings are removed from the productive land base. This compares to 11,745 ha from TSR3. The roads included major and minor highways, regional access, forest service roads and minor logging roads and spurs. Road, trail and landing data was complied through TRIM and licensee roads.

A buffer width of 10 meters was used on all logging roads. An overlay of the roads with previously logged blocks indicated that most blocks had roads either accessing or passing through them. Due to the completeness of the supplied licensee road data it was determined that the existing buffer widths were sufficient to account for in block disturbances. This differs from TSR 3 where a further 4.9% aspatial netdown was applied to stands less than 31 years old to account for existing landings and in-block disturbances, and 13 m width was applied to major roads. A 0.4 ha area netdown was applied to permanent landings for this data package. Table 14 shows the netdowns for permanent roads and landings in the Merritt TSA.

Table 13 Roads, trails and landing netdown.

	Area (ha)		
	Gross	**Productive**	**Removed**
Roads	16,007	12,468	11,856
Landing	1,421	1,323	1,256
Total	17,428	13,791	13,112

5.14 Stand-level Biodiversity (Wildlife Tree Patches)

The retention of wildlife tree patches (WTPs) is modeled by applying a percentage reduction to stand yields at the time they are harvested by the model. This modeling approach means that WTPs are not counted for their contribution toward landscape level biodiversity requirements, although in reality some WTPs may contribute to both landscape level forest structure and old growth habitat.

After other land classification is complete additional reductions to the harvesting landbase may be required to provide sufficient reserves of productive timber for wildlife at the site-specific level. These small reserves are also referred to as wildlife tree patches (WTPs).

NSIFS will be developing a WTP % target strategy for the final data package which will consider Landscape Level Biodiversity contributions in addition to constrained areas such as riparian, visuals, etc. This % will be applied across the TSA to the future stand yields.

Table 14 Wildlife tree patch netdown.

	Area (ha)		
	Gross	**Productive**	**Removed**
Wildlife Tree Patches	9,122	8,686	7,578

5.15 Old Growth Management Areas (OGMAs)

Landscape level biodiversity is addressed through explicit OGMA removal from the THLB - an area of 48,270 ha. This is different from the NSIFS Innovative analysis where OGMAs were removed for 4 AUs and a partial netdown of 3.9% was applied across the remaining 8 AUs. Licencees have submitted updated OGMA coverage that reflect any adjustments to the original spatial OGMA's, but this coverage will not be used for the netdown as over one million polygons were created by the overlapping OGMA's from each licencee. It was assumed that any changes to OGMA's over the past few years resulted in no net change to the THLB and the original OGMA coverage was used for this data package. Table 16 shows the area netdowns associated with OGMA's in the Merritt TSA.

Table 15 OGMA netdown.

	Area (ha)		
	Gross	**Productive**	**Removed**
Old Growth Management Areas	114,771	112,666	47,487

5.16 Not Satisfactorily Restocked Areas

Backlog NSR could not be reliably identified and therefore has not been treated differently from any other forested stand in this analysis.

5.17 Wildlife Habitat Areas

Policy direction is that the THLB impact from Identified Wildlife Management Species (IWMS) WHA's be limited to 1%. Wildlife Habitat Area depletions to the THLB for Landscape level biodiversity will not be addressed through explicit WHA removal from the THLB for the spatially mapped areas at this time. Rather, the Chief Forester will determine the appropriate approach for the landbase netdown as it applies to Wildlife Habitat Areas.

Notices given under Section 7(2) of the Forest Planning and Practices Regulation have been issued, or an order under the Government Actions Regulation apply for the following wildlife species:

Table 16 Wildlife habitat areas by species.

Species	Location	Area (ha)	Comments
Deer	Merritt TSA	312,928	Ungulate Winter Range
Elk	Merritt TSA	443,040	Ungulate Winter Range
Bighorn sheep	Merritt TSA	2,418	Ungulate Winter Range
Moose	Merritt TSA	690,312	Foraging habitat and cover
Mountain Goat	Merritt TSA	6,730	Ungulate Winter Range
Coastal Tailed Frog	Cascades Forest District	332	See IWMS
"Great Basin" Gopher Snake	Cascades Forest District	4,000	See IWMS
Flammulated Owl	Cascades Forest District	0	Not present in Merritt TSA, mapping not complete.
"Interior" Western Screech-Owl	Cascades Forest District	189	See IWMS
Spotted Bat	Cascades Forest District	0	Not present in Merritt TSA
Grizzly Bear	Merritt TSA	4,680	See IWMS
Western Rattlesnake	Merritt TSA	222	WHA's from MOE
Williamson's Sapsucker	Merritt TSA	403	WHA's from MOE

NSIFS has additional ecological model data for 22 species of focus in the Merritt TSA. This coverage is provided as information only on the NSIFS website.

5.18 Area Distributions by Leading Age and Leading Species

Figure 2 and Table 17 summarize the distribution of area by age for both the productive and net harvesting land base[1].

[1] Stands with a harvest history were reset to age 0 if they were not recently harvested (i.e. > 30 years).

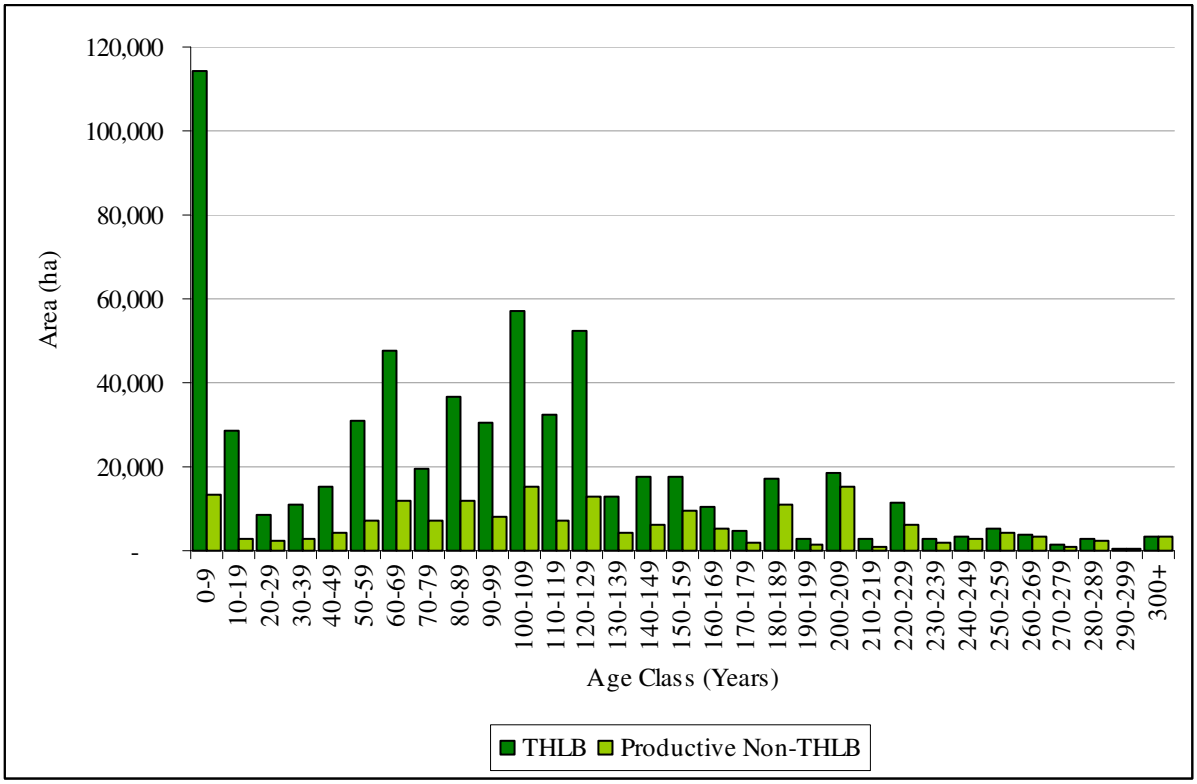

Figure 2 Initial age class distribution.

Table 17 Initial age class distribution

Age Class	Area (ha)	
	THLB	non-THLB Productive
0-9	114,184	13,172
10-19	28,557	2,942
20-29	8,629	2,159
30-39	11,080	2,621
40-49	15,417	4,492
50-59	31,110	7,360
60-69	47,421	11,966
70-79	19,620	6,914
80-89	36,810	11,845
90-99	30,693	8,173
100-109	57,078	15,113
110-119	32,539	7,139
120-129	52,285	12,812
130-139	12,916	4,218
140-149	17,682	6,087
150-159	17,444	9,670

Age Class	Area (ha)	
	THLB	non-THLB Productive
160-169	10,438	5,079
170-179	4,754	1,690
180-189	17,203	11,064
190-199	2,851	1,585
200-209	18,433	15,356
210-219	2,633	1,054
220-229	11,251	6,175
230-239	2,994	1,926
240-249	3,400	2,898
250-259	5,013	4,326
260-269	3,763	3,352
270-279	1,451	1,165
280-289	2,849	2,328
290-299	400	682
300+	3,225	3,196
Totals	624,123	188,561

Table 18 and Figure 3 summarize the distribution of area by leading species for both the productive and THLB. As with the leading age distributions, NSR is not included in the summaries.

Table 18 Leading species distribution

Species	Area (ha)	
	THLB	non-THLB Productive
Pine	351,091	57,603
Douglas-fir	165,734	71,833
Spruce	49,759	20,265
Unknown	28,187	4,525
Balsam	28,176	24,991
Hemlock	782	567
Deciduous	300	8,603
Larch	78	129
Cedar	16	46
Total	**624,123**	**188,561**

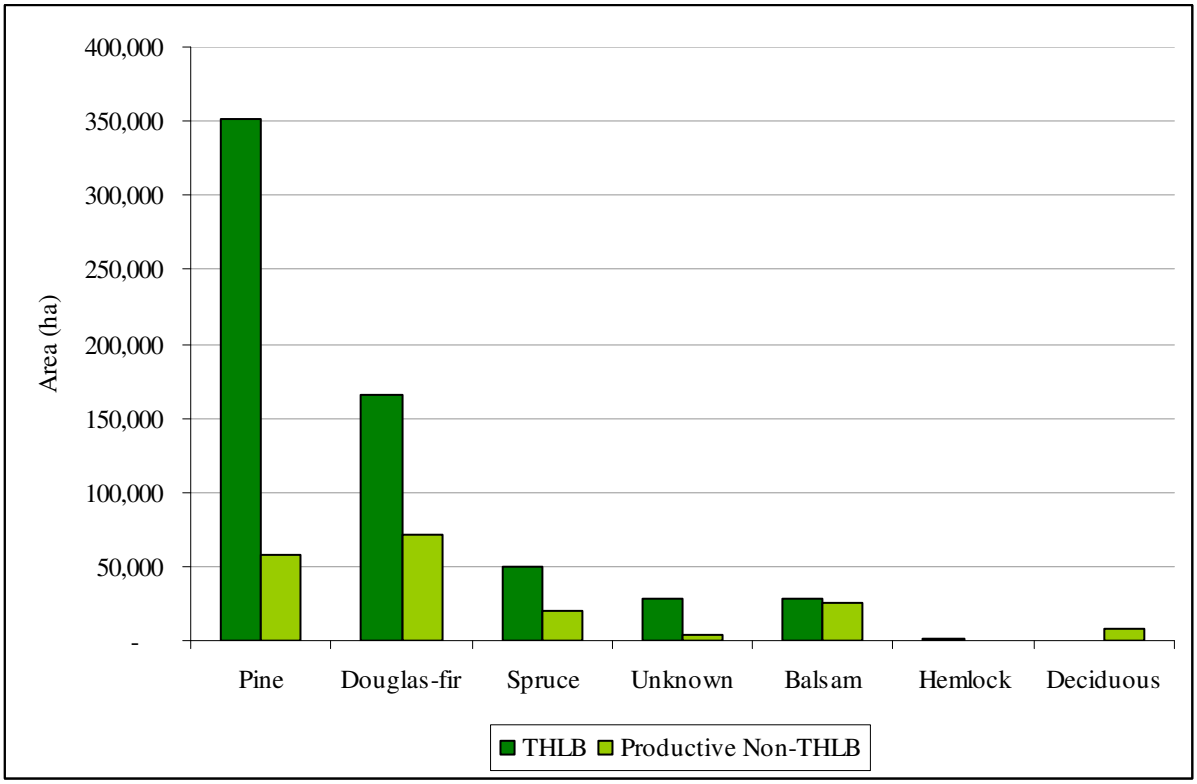

Figure 3 Leading Species Distribution

6.0 GROWTH AND YIELD

6.1 Introduction

In order to reduce the complexity of the forest description for the purposes of timber supply analysis, aggregation of individual forest stands is necessary. However, it is critical that this aggregation obscures neither differences in biological productivity nor 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.

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

6.2 Analysis Unit Definitions

Analysis units (AUs) are aggregates of stands of similar characteristics and growth and yield responses. In order to precisely capture the value from each stand it is important to keep as much stand level information as possible, which in turn means that there is less opportunity for aggregation. For this analysis a balance was found by rounding certain stand level attributes and then aggregating in cases where the rounded attributes were identical. The rounding and classification process involved:

- Rounding age to the nearest 10 years;
- Rounding inventory site index to the nearest multiple of 3;
- Finding the leading species;
- A stands MPB characteristics:
    - The 2012 MPB severity rating: very severe (V), severe(S), moderate (M), low (L) or not affected;
    - If a stands is very severe (V) MPB affected: finding the year a stand became “very severe” MPB affected (from selected years: 2000/02/04/06/08/10/12 or never);
- Harvest type: clear-cut or partial harvest (MDWR/Caribou) (the partial harvest methodology will be discussed in later sections in more detail); and
- BEC zone.

After this classification process, stands with the same rounded age, rounded site index, leading species, MPB characteristics, harvest type and BEC zone were grouped together in AUs. Table 19 shows a few examples AU keys.

Table 19 Analysis Unit Example Definitions

Age	SI	MPB 2012	V year	Leading Species	Partial Harvest Type	BEC zone
100	18	V	2012	Pine	none	ESSF
100	21	V	2006	Pine	mdwr_dt_M	SBPSxc
100	21	V	2008	Spruce/Balsam	none	SBPSxc
100	6	V	2004	Spruce/Balsam	none	MSxv
100	6	V	2002	Douglas_fir	mdwr_dt_L	IDFdk3
100	6	V	2008	Pine		IDFdk3

This process was used for aggregation purposes only. In other calculations, the attributes are area weight averaged for each AU which provides for a more accurate representation (for example age, site index and pine percentage).

The MoFR Variable Density Yield Prediction (VDYP) model (Version 6.6d) will be used to develop natural stand yields at the AU level. A yield curve was first generated for each stand using the species composition, crown closure and site index of the stand. These yield curves were then area weight averaged to produce one yield curve for each analysis unit. Volumes were calculated net of secondary deciduous species volume contributions. The average inputs to VDYP are not presented because of the large number of natural AUs.

6.3 Managed Stand AU and Yields

Ecologically based analysis units were made for this analysis. They were based off the silvicultural regimes made by J.S. Thrower for the NSIFS Innovative Timber Supply Analysis (J.S. Thrower, 2003). Site series based silviculture regimes for the TSA were collated through a licensee questionnaire and silviculture survey data. These silviculture regimes were subsequently modified to be consistent with the approved PEM based map entities (J.S. Thrower, 2003).

Combinations of BEC, site series and leading species were aggregated into AUs. There are 92 AUs; 87 conventional, 3 smallwood partition and 2 single tree selection. All non-THLB productive land was assigned to AU 99 in order to facilitate disturbance in the non-THLB. The characteristics of these AUs are outlined in the sections and Table 20 below. Stands that are undergoing grassland conversion were assigned to AU 79 which regenerates to AU 99 (non-THLB) after the first rotation.

Existing and future managed stand yields will be developed using MoFR BatchTIPSY (Version 4.1). The planted species composition used as input for TIPSY are presented in Table 20. AU 2 will have a final yield curve made up of 60% natural and 40% planted regeneration.

Table 20 TIPSY regeneration composition inputs

Au	THLB Area	Description	PSI	Sp1	%	GG	Sp3	%	GG	Sp3	%	GG	Stock (st/ha)
101	5,621	ESSFdc2-BG-Pl	17	Pl	55	2	Sx	45	5				1,500
102	3,671	ESSFdc2-BG-Sx	16	Pl	55	2	Sx	45	5				1,500
103	614	ESSFdc2-BG-Bl	13	Pl	55	2	Sx	45	5				1,500
104	28	ESSFdc2-BG-Fd	16	Pl	55	2	Sx	45	5				1,500
105	871	ESSFdc2-PG-Pl	16	Pl	100	2							1,500
106	1,259	ESSFdc2-PG-Sx	15	Pl	100	2							1,500
107	50	ESSFdc2-PG-Bl	13	Pl	100	2							1,500
108	149	ESSFdc2-BB-Sx	18	Sx	75	5	Pl	25	2				1,350
109	74	ESSFdc2-BB-Pl	18	Sx	75	5	Pl	25	2				1,350
110	1	ESSFdc2-BB-Bl	11	Sx	75	5	Pl	25	2				1,350
111	483	ESSFmw-BR-Bl	12	Sx	70	5	Pl	30	2				1,600
112	2,851	ESSFmw-BR-Sx	19	Sx	70	5	Pl	30	2				1,600
113	1,021	ESSFmw-BR-Pl	20	Sx	70	5	Pl	30	2				1,600
114	37	ESSFmw-BR-H	21	Sx	70	5	Pl	30	2				1,600
115	11	ESSFmw-BR-Fd	17	Sx	70	5	Pl	30	2				1,600

Au	THLB Area	Description	PSI	Sp1	%	GG	Sp3	%	GG	Sp3	%	GG	Stock (st/ha)
116	184	ESSFmw-PG-Bl	13	Sx	55	5	Pl	45	2				1,500
117	1,098	ESSFmw-PG-Sx	18	Sx	55	5	Pl	45	2				1,500
118	389	ESSFmw-PG-Pl	19	Sx	55	5	Pl	45	2				1,500
119	9	ESSFmw-BF-Bl	14	Pl	90	2	Sx	10	5				1,400
120	84	ESSFmw-BF-Sx	16	Pl	90	2	Sx	10	5				1,400
121	38	ESSFmw-FP-Pl	18	Pl	90	2	Sx	10	5				1,400
122	13	ESSFmw-FP-Bl	13	Sx	75	5	Pl	25	2				1,400
123	604	ESSFmw-FP-Sx	17	Sx	75	5	Pl	25	2				1,400
124	36	ESSFmw-SG-Bl	11	Sx	70	5	Pl	30	2				1,200
125	109	ESSFmw-SG-Sx	20	Sx	70	5	Pl	30	2				1,200
126	2,998	ESSFxc-PG-Pl	16	Pl	100	2							1,500
127	986	ESSFxc-PG-Sx	14	Pl	100	2							1,500
128	451	ESSFxc-PG-Bl	13	Pl	100	2							1,500
129	137	ESSFxc-JL-Pl	15	Pl	100	2							1,400
130	44	ESSFxc-BR-Pl	15	Pl	90	2	Sx	10	5				1,500
131	36	IDFdk1-FJ-Fd	15	Pl	85	2	Py	15	0				1,300
132	106	IDFdk1-FJ-Pl	17	Pl	85	2	Py	15	0				1,300
133	9,487	IDFdk1-ZA-Pl	20	Pl	90	2	Fd	5	0	Py	5	0	1,300
134	2,997	IDFdk1-ZA-Fd	18	Pl	90	2	Fd	5	0	Py	5	0	1,300
135	7,617	IDFdk1-ZA-Sx	19	Pl	90	2	Fd	5	0	Py	5	0	1,300
136	276	IDFdk1-ZA-At	16	Pl	90	2	Fd	5	0	Py	5	0	1,300
137	69	IDFdk2-ZG-Pl	21	Pl	70	2	Sx	25	6	Fd	5	0	1,600
138	46	IDFdk2-ZG-Fd	19	Pl	70	2	Sx	25	6	Fd	5	0	1,600
139	32	IDFdk2-ZG-Sx	20	Pl	70	2	Sx	25	6	Fd	5	0	1,600
140	673	IDFdk2-ZC-Fd	16	Pl	90	2	Fd	5	0	Py	5	0	1,650
141	1,624	IDFdk2-ZC-Pl	18	Pl	90	2	Fd	5	0	Py	5	0	1,650
142	1,671	IDFdk2-ZC-Sx	17	Pl	90	2	Fd	5	0	Py	5	0	1,650
143	8,647	IDFdk2-ZD-Pl	20	Pl	95	2	Fd	5	0				1,600
144	2,292	IDFdk2-ZD-Fd	18	Pl	95	2	Fd	5	0				1,600
145	4,843	IDFdk2-ZD-Sx	19	Pl	95	2	Fd	5	0				1,600
146	86	IDFdk2-ZD-At	15	Pl	95	2	Fd	5	0				1,600
147	98	IDFxh1-FP-Pl	14	Py	60	0	Fd	40	0				850
148	301	IDFxh1-FP-Fd	16	Py	60	0	Fd	40	0				850
149	315	IDFxh2-FP-Fd	14	Fd	60	0	Py	40	0				900
150	81	IDFxh2-PS-Pl	13	Fd	80	0	Py	20	0				700
151	631	IDFxh2-FP-Sx	17	Fd	80	0	Py	20	0				700
152	1,911	MSdm2-ZG-Pl	18	Pl	90	2	Sx	10	5				1,600
153	1,070	MSdm2-ZG-Sx	19	Pl	90	2	Sx	10	5				1,600
154	100	MSdm2-ZG-Fd	16	Pl	90	2	Sx	10	5				1,600
155	665	MSdm2-ZF-Fd	17	Pl	90	2	Sx	10	5				1,700
156	552	MSdm2-ZF-Pl	18	Pl	90	2	Sx	10	5				1,700
157	840	MSdm2-ZF-Sx	18	Pl	90	2	Sx	10	5				1,700
158	49	MSdm2-ZF-Bl	13	Pl	90	2	Sx	10	5				1,700
159	12,876	MSdm2-ZH-Pl	19	Pl	85	2	Sx	15	5				1,700
160	6,795	MSdm2-ZH-Sx	19	Pl	85	2	Sx	15	5				1,700
161	395	MSdm2-ZH-Bl	14	Pl	85	2	Sx	15	5				1,700
162	259	MSdm2-ZH-Fd	17	Pl	85	2	Sx	15	5				1,700
163	15,089	MSxk-ZG-Pl	19	Pl	90	2	Sx	10	5				1,350

Au	THLB Area	Description	PSI	Sp1	%	GG	Sp3	%	GG	Sp3	%	GG	Stock (st/ha)
164	7,237	MSxk-ZG-Sx	18	Pl	90	2	Sx	10	5				1,350
165	187	MSxk-ZG-Fd	17	Pl	90	2	Sx	10	5				1,350
166	106	MSxk-ZG-Bl	14	Pl	90	2	Sx	10	5				1,350
167	162	MSxk-LJ-Pl	17	Pl	90	2	Sx	10	5				1,200
168	516	MSxk-LJ-Sx	16	Pl	90	2	Sx	10	5				1,200
169	1,563	MSxk-LG-Pl	18	Pl	100	2							1,500
170	306	MSxk-LG-Sx	18	Pl	100	2							1,500
171	54	MSxk-ZF-Fd	17	Pl	95	2	Sx	5	5				1,350
172	64	MSxk-ZF-Pl	19	Pl	95	2	Sx	5	5				1,350
173	67	MSmw-PG-Pl	18	Pl	90	2	Sx	10	5				1,600
174	27	MSmw-FF-Fd	17	Pl	90	2	Sx	10	5				1,700
175	394	MSmw-YU-Pl	19	Pl	85	2	Sx	15	5				1,700
176	193	MSmw-PG-Sx	18	Pl	85	2	Sx	15	5				1,700
177	41	MSmw-YU-Bl	13	Pl	85	2	Sx	15	5				1,700
178	31	MSmw-YU-Fd	17	Pl	85	2	Sx	15	5				1,700
179	10,232	BGxw1-WJ-Fd	20	Pl	70	2	Sx	25	6	Fd	5	0	1,600
180	296	CWHms1-AM-Sx	17	Pl	90	2	Sx	10	5				1,600
181	2,871	IDFdk1-GM-Sx	20	Sx	70	6	Pl	30	2				1,300
182	513	IDFdk2-BF-Sx	18	Sx	70	6	Pl	30	2				1,400
183	599	IDFxh1-BB-Sx	18	Py	60	0	Fd	40	0				850
184	1,952	IDFxh2a-FB-Sx	18	Fd	70	0	Pl	20	2	Sx	10	6	1,350
185	432	MSmw-YU-Sx	19	Pl	60	2	Sx	40	5				1,750
186	12	PPxh2-ZT-Pl	12	Fd	70	0	Pl	20	2	Sx	10	6	1,350
187	491	PPxh2-ZF-Fd	15	Fd	70	0	Pl	20	2	Sx	10	6	1,350
188	1,800	MSxk-ZG-Pl	19	Pl	90	2	Sx	10	5				1,350
189	1,224	IDFdk1-ZA-Pl	19	Pl	90	2	Fd	5	0	Py	5	0	1,300
190	92	ESSFxc-PG-Pl	15	Pl	100	2							1,500
191	491	IDFdk1-ZA-Fd	15	Fd	85	Pl	12	Sx	3				-
192	1,277	IDFdk2-ZD-Fd	17	Fd	86	Pl	8	Sx	6				-

6.3.1 Regeneration Delay

Regeneration delays are deployed separately from yield prediction in the forest level analysis. After review with the licencees, a regeneration delay of 3 years was used throughout the analysis. The 2008 SFMP for the Merritt TSA reports that 99% of areas prescribed for planting were completed within the third growing season from start date of harvest. That compares to just under 99% in 2007 and ~94% in 2006. 100% of areas prescribed for natural regeneration with a regeneration expiry date within the reporting period were successfully regenerated.

6.3.2 Genetic Gains

Tree improvement statistics have been obtained from Matt LeRoy, Tree Improvement Branch, and comprised genetic gain estimates for the years 2003-2009, along with the proportion of class A seed planted in the Merritt TSA for that same time period. This data requires interpretation to assign genetic gain estimates to each silviculture regime for the final data package.

6.3.3 Volume Reductions

Volume reductions are to be applied to the yield curves for the following reasons:

- Douglas-fir retention;
- Future Roads, trails and landings, and
- Wildlife tree patches.

Previously there was a volume reduction to natural stand yield curves for the deciduous component. In this analysis the deciduous component will not be reduced.

Douglas-fir Retention

NSIFS is developing a target for Douglas-fir retention for specified Analysis Units. Considerations will be current practice, FSP commitments, and results from FREP monitoring.

Future Roads, Trails and Landings

Upon harvesting, a component of each stand is placed into a category that will remain in a disturbed state for perpetuity. If the area harvested is included in an area associated with forest cover constraints relating to integrated resource management, the road area will become part of the disturbance area permanently. These stands will provide harvest volume on the first entry but not on further entries and the area contributing to the long-term sustainable harvest is net of this area. Both TSR2 and TSR3 applied 6.9% for future roads, trails and landings based on the March 1999 "Report on Roads, Trails and Landings for the Merritt TSA" (Graeme Hope, MoFR Region). The report assumed 5.7% for road and landing disturbance, and 0.4% for existing roads.

The 2008 Sustainable Forest Management Plan (SFMP) prepared for the Merritt TSA (March 2009) shows that the percent of cutblock areas in permanent access structures (e.g. roads and landings) has declined every year since 2003 from 5% down to 2.8% in 2008. The average area occupied by permanent access structures in harvested blocks for the past 3 years is approximately 3%. NSIFS will develop a strategy for the appropriate % reduction to the remaining THLB based on current practice for the final data package.

Wildlife Tree Patches

After other land classification is complete additional reductions to the harvesting landbase may be required to provide sufficient reserves of productive timber for wildlife at the site-specific level. These small reserves are also referred to as wildlife tree patches (WTPs). NSIFS is developing WTP targets for the final data package.

6.4 Conversion to Grassland

The TSR2 and TSR3 analysis modeled the conversion of grassland ecosystems that have been encroached upon by Douglas–fir back to grasslands. All portions of the THLB falling within either the Bunchgrass (BG) ecosystem zone or any of the "a"-phase IDF zone were harvested once, and then removed from the THLB under the assumption that they would subsequently be managed as grasslands. This methodology will be applied to the TSR4 analysis.

6.4.1 Silviculture History

For growth and yield application, stands are classified into two categories based on their silviculture regime: natural stands and managed stands. Natural stands have no prior silviculture treatments and were regenerated naturally. Managed stands have had previous silviculture treatments and are assumed to be artificially regenerated. Following on from TSR3, all stands less than 30 years old are assumed to be managed.

6.4.2 Backlog and Current Not Satisfactorily Restocked

Both backlog and current NSR was assumed to regenerate with normal managed stand regeneration delays. Backlog NSR was removed in the netdown process and added back into the THLB in order to keep a consistent netdown order with the last TSR.

6.4.3 Utilization Levels

The utilization levels modeled are listed in Table 21. The levels reflect current standards and performance. Note: dbh = diameter breast height, dib = diameter inside bark

Table 21 Utilization levels

Leading Species	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
Pine	12.5	30.0	10.0
All others	17.5	30.0	10.0

6.5 Decay Waste and Breakage – Natural Stands

Decay, waste and breakage (DWB) factors associated with forest inventory zone (D/G/H) the appropriate public sustained yield unit (PSYU) 123 were used to model the natural stands. NVAF sampling has not been completed for the Merritt TSA and NSIFS is reviewing a sampling strategy for the next TSR.

6.6 Operational Adjustment Factors – Managed Stands

Standard Operational Adjustment Factors (OAFs) were used in managed stands. OAF1 accounts for stocking holes in stands and OAF2 accounts for age dependent losses such as disease. The OAF1 stocking reduction was 15% and the OAF2 reduction used was 5%.

6.7 Yield Tables for Single Tree Selection Management

Yield tables for the single tree selection stratum are based on the VDYP outputs. These growth rates are to be applied to stands in the single tree selection (STS) stratum with the assumption that a minimum economic volume threshold was met (150 m3/ha), that only 50% of the standing volume was removed and that adequate regeneration was achieved. This method was consistent with TSR2 and the uplift submission.

6.8 Site Index- PSI

Potential site index (PSI) estimates for Pl were derived from the site index adjustment (SIA) project (J.S. Thrower, 2002) and were applied to all existing immature and future managed stands in BEC zones above and below 1650 m elevation2. For Sx and Fd leading species, site index conversion equations based on Pl were used.

Table 22 shows methods of assigning PSI according to BEC, position above or below 1650 meters elevation and species.

Table 22 Merritt TSA PSI Application Method by Group

Group	Species			
	Pl	Fd	Sx	Other
MSdm2, MSmw, MSxk, IDFdk1, IDFdk2	AdjPSI	CE	CE	InvSI
ESSFdc2, ESSFmw, ESSFxc < 1,650 m	AdjPSI	CE	CE	InvSI
ESSFdc2, ESSFmw, ESSFxc > 1,650 m	PPSI	NA	CE	InvSI

Note in the table above:

- AdjPSI is the adjusted PSI based on ground sampling;
- CE is PSI from a conversion equation;
- InvSI is the inventory site index;
- PPSI is unadjusted preliminary PSI; and
- NA is not applicable.

Conversion equations are given in Table 23 below. Each stand (resultant polygon) was given a site index weighted by species composition. The approach used is identical to the NSIFS timber supply analysis.

Table 23 Conversion Equations for Sx and Fd from Pl

Sx PSI = -2.150 + 1.090 x Pl PSI
Fd PSI = 0.709 + 0.935 x Pl PSI

6.9 Predictive Ecosystem Mapping

Predictive ecosystem mapping (PEM) provides a basis for defining the spatial distribution of ecosystems (i.e., site series) in a given geographic area (TSA). PEM is an ecological mapping tool for use in wildlife, biodiversity, growth & yield, and inventory programs. It is recognized that there is variation and uncertainty around PEM predictions. NSIFS completed the PEM to support several innovative forestry practices and was approved for use in TSR3.

2 Area above 1650m elevation had the PSI assigned using the unadjusted preliminary site index instead of the adjusted PSI due to statistical uncertainty.

7.0 PROTECTION

7.1 Non Recoverable Losses

Damage to timber caused by fire, wind, insects, diseases and other pests contribute to loss in harvestable volumes. This volume loss is difficult to quantify, although losses to insect and disease that normally occupy stands (endemic losses) are accounted for in empirical yield curve estimates. Depending on the type of damage and stand accessibility, losses due to catastrophic or epidemic events may be either salvageable or unsalvageable. These non-recoverable losses are not accounted for in the yield curves.

Unsalvaged loss estimates for this analysis were taken from the TSR2 analysis report (MoF, 2001). Insect losses are based on aerial survey data from 1997 and are now irrelevant given the mountain pine beetle outbreak. Harvest volume forecasts derived from all scenarios described in this report will be reduced by the total annual losses shown in Table 24. The MoFR Cascades District have indicated that a new process for estimating NRL's in the Southern Interior Forest Region is currently being developed and may be available prior to the determination.

Table 24 Unsalvaged losses

Disturbance Agent	Annual loss (m3/yr)
Insects	93,841
Wind	18,565
Fire	31,220
Total	143,626

8.0 MPB MODELLING

This section details the planned MPB modeling assumptions.

8.1 MPB Projections

Since 1999, the MoFR has been projecting the spread of MPB throughout the province and recalibrating the projections each year with the forest health overview. The projections have been made using raster based stochastic modelling in SELES. The output provided from the MoFR are two 400m X 400m (16 ha) grids for each year projected. The first grid has the percent of the pine affected by MPB and the second has the percent of the stand that is pine. The percent of each grid that is affected is calculated by multiplying the percent pine MPB affected by the percent pine.

To provide consistency in reporting the percent of the stand affected has been classified using the forest health overview (FHO) classification system. This classification system is shown in Table 25.

Table 25 MoFR Severity Class Definition

Classification	Classification abbreviation	% of stand attacked by MPB
Trace	T	0 – 1 %
Light	L	1 – 10 %
Moderate	M	10 -30 %
Severe	S	30 – 50 %
Very Severe	V	> 50 %

One important variance from the FHO classification system is that the MoFR MPB projections are reported showing the accumulative impact of MPB instead of the annual impact. This was done because the MPB projections rarely showed annual impacts beyond the trace and low classes and because the overall impact is more important for making strategic level decisions.

8.1.1 Shelf Life

Shelf life is defined as the time a stand will remain economically viable to harvest. This time is taken from the year that a stand first becomes "very severely" (over 50%) affected by MPB. NSIFS is working with Timberline to develop a shelf-life curve based on recent studies in the interior plateau of British Columbia.

The way that this shelf life decay curve will be applied to each stand (through analysis unit) is as follows:

- The years since affected was found for each year per 5 year harvest period.
- The corresponding sawlog percentage was found for each year.
- The sawlog percentage was averaged for each 5 year period.
- The yield curve volume was adjusted by the sawlog percentage for that 5 year period. Since the age of the stand was known, the volume was only adjusted at that stand age.

8.1.2 Pine and Non-pine Harvest

Harvesting performance focused on salvage of mountain pine beetle infested stands in the Merritt TSA by NSIFS licencees over the past several years has been excellent. The NSIFS MPB Strategy 2007 Annual Report for the Merritt TSA states "The 2007 harvesting was very similar to 2006 in terms of priority category and continues to consist primarily of heavily infested MPB stands and volume at risk to MPB. In 2007 licensees reported the volume harvested that was in blocks >70% Pl volume. Licensees harvested 77% of the volume from >70% Pl stands. The remaining volume was in Lodgepole Pine leading stands with most being 60 to 70 percent pine. Other harvesting in greenwood was necessary to either meet mill needs or to manage cutting permit expiry issues. It also states that for 2008 *"It is anticipated that greater than 90% of harvest will be in heavily infested stands and greater than 95% in heavily infested and volume at risk."* 2007 harvest was 107% of the AAC, and 2008 was planned 114% of the AAC which shows a strong commitment to harvesting the beetle-killed timber.

8.1.3 MPB Harvest Queuing

Harvest queuing is the order in which the stands are prioritized for harvest. In the basecase the harvest queuing is controlled for the first 5 years (2010-2015) with 2015 V stands affected before or in 2015 queued first.

Stands not harvested in the years identified will be assumed to be unavailable for harvest and the volume will be lost. When stands are prioritized for harvest:

1. Minimum harvest age is reduced to age 40 to ensure that stands are not inappropriately limited from harvest;
2. Spatial adjacency and IRM targets are not enforced;
3. Visual requirements are not enforced for targeted stands; and
4. All other landbase requirements are enforced (*e*.g. OGMAs).

8.1.4 Unharvested MPB stands

MPB affected stands that were harvested regenerate on a managed stand yield curve. Stands that were affected and not harvested lose the affected volume according to the rules below. All landbase requirements are restored to normal (*i.e.* Visuals and IRM are turned back on). The schema below (Figure 4) shows how the productive landbase is classified into various MPB classes and the reductions that apply to each of these classes.

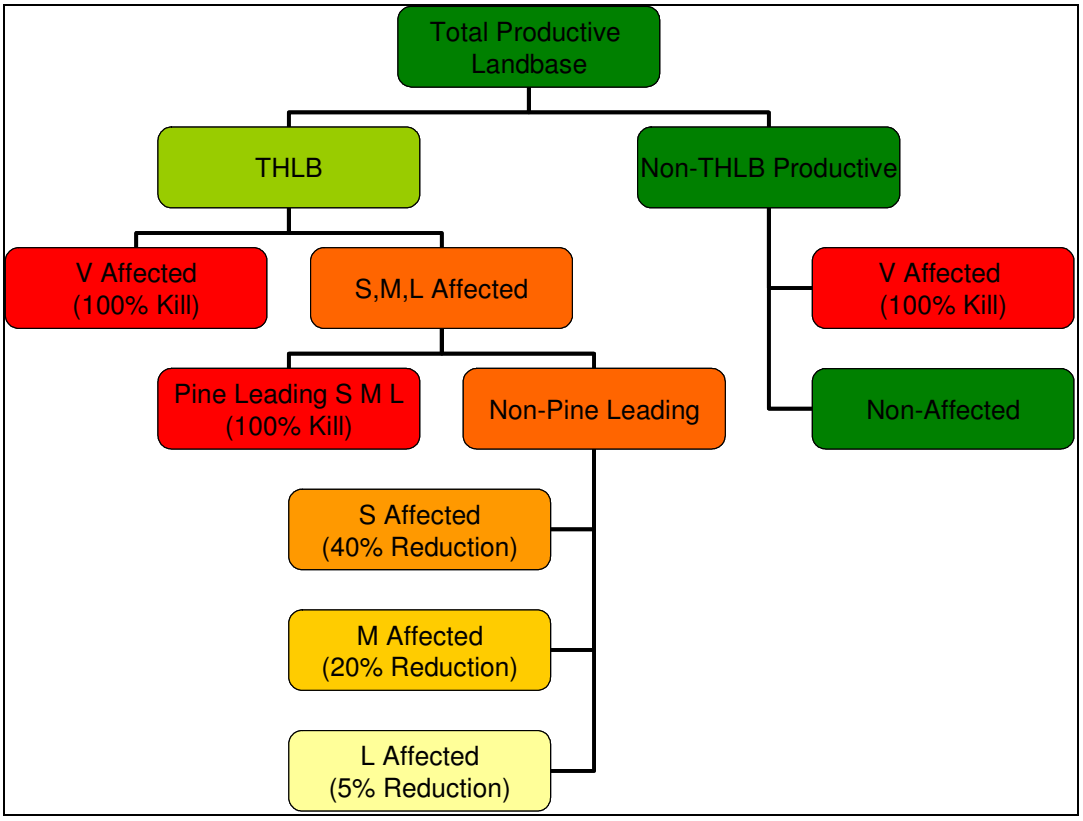

Figure 4 MPB affected stand classification and volume reduction

If a stand is not harvested, it is treated according to the following rules:

1. V MPB affected stands:
    - 15 year regeneration delay;
    - Grow back on a natural stand yield curve.
2. SML MPB affected stands that are pine leading:
    - 15 year regeneration delay;
    - Grow back on a natural stand yield curve.
3. SML MPB affected stands that are not pine leading:
    - Stands with severe, moderate or low MPB infestation continue growing on the natural stand yield curve with volume reductions according to level of infestation (severe- 40%, moderate - 20% and low - 5%).
    - Stands that are partially harvested and with S, M or L MPB affection have their stand yields reduced in a slightly different way to imitate the interaction between partial harvesting and partial stand death in a realistic manner. Instead of modelling a straight reduction in yield curve as would happen for a clear-cut stands, the reduction in yield is modelled by deferring the harvest until this volume has grown back. This was calculated by: Volume MPB Affected (%) % Volume Partial Harvested (%) × Cutting Cycle (years).

4. On non-THLB productive land, pine leading stands that are projected to be very severe impacted by 2012 are all reduced by 100% in 2012.

Current forest resource management practices are modeled using forest cover requirements. This section provides a summary of the forest cover objectives.

Unique management characteristics are modeled by grouping areas into resource management zones (RMZs), which are aggregates of area with similar non-timber resource concerns. These include visual sensitivity and wildlife habitat. Maximum disturbance (based on green-up height requirements) and minimum mature and old growth forest cover objectives will be assigned to each RMZ forest cover group to address needs of the resource. RMZs are aggregated within each landscape unit to reflect operational management of the resource. Where RMZ classifications overlap, areas must meet all overlapping forest cover objectives before harvesting.

Note: A 15 year regeneration delay for MPB killed stands not salvaged will be used unless NSIFS develops an alternative management assumption for the final data package.

8.1.5 Secondary Stand Structure

Section 43.1 of the Forest Planning and Practices Regulation came into force July 25, 2008 with the intention of requiring licencees to leave MPB killed stands with an "adequate stocking density" of "suitable secondary structure" un-harvested and to harvest pine leading stands that have little or no secondary structure instead. By avoiding harvesting stands with adequate stocking density of suitable secondary structure, a higher percentage of the land base will be stocked and growing timber which should improve timber supplies. This regulation applies to the Merritt TSA at this time.

There is no information available for the Merritt TSA as to the impact of this regulation on mid-term timber supply, or how much of the land base is currently un-available for harvest. No harvest flow constraints will be modeled for secondary stand structure for TSR4.

A study in the Merritt TSA concluded that for 28 stands surveyed in the MS zone the abundance of advanced regeneration had no consistent relationship with moisture regime or over-storey density and distribution.

8.1.6 Managed Stand Mortality

The NSIFS MPB Strategy 2007 Annual Report stated that "In 2007 there were several cases of older plantations with high level of both red and green attack. It is anticipated that the beetle will not do as well in these immature stands and the majority of beetle attack is originating from adjacent mature stands. Once the beetle populations decline within a landscape unit the infestations in these plantations should subside." No summary was available for the draft data package from the MoFR Regional Entomologist.

9.0 MANAGEMENT ZONES, GROUPS AND OBJECTIVES

9.1 Overview

The Merritt TSA supports non-timber resource demands which are expressed in analysis as forest cover objectives. The analysis will apply forest cover objectives to model wildlife habitat guidelines, biodiversity, hydrologic green-up, and visual quality objectives. Forest cover objectives place maximum and minimum limits on the amount of young second growth and/or old growth found in RMZs.

9.1.1 Ungulate Winter Range (UWR)

Notices given under Section 7(2) of the Forest Planning and Practices Regulation have been issued for Mule deer, Bighorn sheep, Elk, Moose and Mountain goat.

Ungulate winter range for deer, sheep and elk identifies a maximum of 315,870 ha, not exceeding a net impact equivalent to 7,000 ha of mature timber harvesting land base at 100% forest cover retention. Snow interception cover, foraging habitat and security cover requirements are identified in the Section 7 Notice.

Moose winter range amounts to 694,072 ha with no impact to the timber supply. Winter foraging habitat and cover is to be distributed within moose winter ranges according to the attributes within the Notice.

Mountain goats require a maximum of 6,916 ha with no impact to the timber supply. Habitat requirements for escape terrain, foraging, thermal and security cover and snow interception are identified in the Section 7 Notice.

9.1.2 Community Watersheds (CWS)

Forest Stewardship Plan results and strategies for preventing the cumulative hydrological effects of primary forest activities within the community watersheds which may result in a materially adverse impact require that a hydrological assessment be completed for the watershed (or relevant portions thereof) where ECA >25% (30% for BCTS). No harvesting constraints resulting from assessments have been identified by NSIFS at this time. However, an Equivalent Clearcut Area (ECA) of 30% has been agreed to for TSR4. The associated disturbance limits will be represented explicitly in terms of height. Specifically, the proportion of the productive landbase permitted to be under 6.6 meters in height will be restricted to 30%. Stands managed under a selection harvest silvicultural system will be assumed to meet adjacency and green up requirements within community watersheds at all times.

9.1.3 Integrated Resource Management Areas (IRM)

A three pass harvesting system will be assumed for clearcut stands within the integrated resource management zone, along with a 3 meter green-up height. These assumptions are unchanged from the benchmark analyses, except that the green-up condition will be explicitly stated in terms of stand height. The maximum disturbance limit of 33% on the productive landbase will be applied within each of the twelve landscape units.

9.1.4 Visual Quality Objectives (VQO)

The spatial definition of visually sensitive areas is unchanged from TSR3. The visual landscape inventory for the Merritt TSA formally established VQO's on September 30, 2003. The limits to disturbance within those areas will be represented explicitly in terms of height. Stands managed under a selection harvest silvicultural system will be assumed to meet green up and thermal cover conditions

within visually sensitive areas at all times. The requirements shown in Table 26 will be applied within each individual visually sensitive polygon to non-salvage related scenarios only.

Table 26 Visually sensitive areas cover requirements

VQC-VAC	Disturbance	
	Max Disturbance %	Minimum Height
P-low	3	5
P-intermediate	4	4
P-high	5	3
R-low	5	5
R-intermediate	7.5	4
R-high	10	3
PR-low	10	5
PR-intermediate	15	4
PR-high	20	3
M-low	17.5	5
M-intermediate	22.5	4
M-high	27.5	3

9.2 Timber Harvesting

9.2.1 Minimum Harvest Age

Minimum harvest ages (MHA) was set at the age at which a harvest volume of 150m^3/ha was reached. Minimum harvest age, MAI, DBH and volume per ha is shown for each AU.

Minimum harvest age (MHA) was assessed for each AU, as the age at which the stand volume reaches 90% MAI (mean annual increment) with a minimum volume of 150 m^3/ha. The MHA by AU is shown in two columns (natural AUs and managed AUs) in Table 27 below.

Table 27 Minimum harvest ages, at 90% of culmination MAI

AU	MHA (yrs)	90% MAI (m3/ha/yr)	DBH (cm)	Volume (m3/ha)	AU	MHA (yrs)	90% MAI (m3/ha/yr)	DBH (cm)	Volume (m3/ha)
1	70	2.29	19.5	160	**101**	60	3.10	19.8	186
2	100	1.62	26.5	162	**102**	60	2.72	19.1	163
3	120	1.38	27.9	165	**103**	90	1.89	19.4	170
4	110	1.36	29.4	150	**104**	70	2.77	19.9	194
5	80	2.19	20.3	175	**105**	60	2.87	19.5	172
6	110	1.54	27.2	169	**106**	70	2.64	19.9	185
7	120	1.33	28.2	159	**107**	90	1.91	19.5	172
8	100	1.72	27.3	172	**108**	60	3.07	21.1	184
9	70	2.39	19.7	167	**109**	60	3.25	21.4	195
10	130	1.17	28.7	152	**110**	110	1.61	21.1	177
11	110	1.50	27.4	165	**111**	90	1.72	19.4	155
12	100	1.59	26.8	159	**112**	60	3.83	21	230

AU	MHA (yrs)	90% MAI (m3/ha/yr)	DBH (cm)	Volume (m3/ha)	AU	MHA (yrs)	90% MAI (m3/ha/yr)	DBH (cm)	Volume (m3/ha)
13	70	2.34	19.5	164	**113**	50	3.18	19.3	159
14	70	2.70	25.5	189	**114**	50	4.22	20.6	211
15	80	2.01	26.4	161	**115**	60	2.62	19.3	157
16	100	1.66	26.9	166	**116**	80	1.94	19.7	155
17	100	1.72	26.9	172	**117**	60	3.38	20.9	203
18	70	2.41	19.6	169	**118**	60	3.63	21.2	218
19	100	1.53	26.9	153	**119**	80	2.20	20.2	176
20	100	1.60	26.3	160	**120**	60	2.78	19.9	167
21	70	2.19	19.5	153	**121**	50	3.26	19.7	163
22	110	1.45	27.4	160	**122**	90	2.07	21	186
23	90	1.88	26.4	169	**123**	60	2.87	20.5	172
24	120	1.36	27.9	163	**124**	110	1.59	21.9	175
25	90	1.74	26.2	157	**125**	50	3.38	21.5	169
26	80	2.01	19.8	161	**126**	60	2.77	19.3	166
27	110	1.46	25.2	161	**127**	70	2.20	19	154
28	110	1.50	27.4	165	**128**	80	2.14	19.5	171
29	90	1.92	20.9	173	**129**	70	2.63	20.5	184
30	80	1.88	19.5	150	**130**	60	2.58	18.9	155
31	130	1.20	31.3	156	**131**	70	2.59	20.9	181
32	90	1.73	21.7	156	**132**	60	3.17	21.1	190
33	80	2.06	20.2	165	**133**	50	4.12	21.6	206
34	120	1.27	30.4	152	**134**	50	3.02	19.9	151
35	80	1.94	25.2	155	**135**	50	3.96	21.4	198
36	130	1.18	30.9	153	**136**	70	2.67	21.1	187
37	70	2.19	20	153	**137**	40	4.00	18.3	160
38	100	1.59	28.7	159	**138**	50	3.58	19	179
39	70	2.26	25.9	158	**139**	50	4.36	20	218
40	120	1.31	30.3	157	**140**	60	2.87	18.6	172
41	90	1.90	21.8	171	**141**	50	3.42	18.6	171
42	90	1.70	24.6	153	**142**	50	3.02	18	151
43	80	2.00	20.1	160	**143**	40	3.95	18.4	158
44	120	1.35	30.8	162	**144**	50	3.34	18.7	167
45	90	2.03	27.4	183	**145**	50	4.02	19.6	201
46	110	0.96	21.2	106	**146**	70	2.54	19	178
47	120	1.29	32.8	155	**147**	100	1.55	22.9	155
48	120	1.28	31.8	154	**148**	90	1.93	23.6	174
49	140	1.14	33.3	159	**149**	100	1.53	22.4	153
50	130	1.17	31.5	152	**150**	140	1.08	24.9	151
51	90	1.83	27.1	165	**151**	90	1.94	25.9	175
52	80	2.06	20.1	165	**152**	50	3.66	19.1	183
53	90	1.70	25.8	153	**153**	50	4.00	19.6	200
54	110	1.37	29.2	151	**154**	60	3.17	19.4	190
55	110	1.51	29.5	166	**155**	60	3.28	19.2	197
56	90	1.93	21.5	174	**156**	50	3.80	18.9	190
57	100	1.73	27.1	173	**157**	50	3.74	18.9	187
58	110	1.44	28	158	**158**	80	2.18	18.6	174
59	70	2.14	18.9	150	**159**	50	4.28	19.5	214
60	90	1.78	25.7	160	**160**	50	3.96	19.2	198

AU	MHA (yrs)	90% MAI (m3/ha/yr)	DBH (cm)	Volume (m3/ha)	AU	MHA (yrs)	90% MAI (m3/ha/yr)	DBH (cm)	Volume (m3/ha)
61	100	1.62	27.4	162	**161**	70	2.36	18.3	165
62	110	1.56	29.8	172	**162**	50	3.22	18	161
63	80	2.11	19.5	169	**163**	50	3.76	20.8	188
64	100	1.72	26	172	**164**	50	3.54	20.5	177
65	110	1.49	29.1	164	**165**	60	3.02	20.6	181
66	110	1.54	28	169	**166**	70	2.14	19.7	150
67	90	1.96	20.5	176	**167**	60	2.93	21.6	176
68	90	1.74	25.1	157	**168**	60	2.67	21	160
69	80	1.98	19.4	158	**169**	50	3.58	19.7	179
70	90	1.77	25.4	159	**170**	50	3.36	19.3	168
71	120	1.27	29.9	152	**171**	60	3.18	20.9	191
72	90	1.91	20.8	172	**172**	50	3.74	20.8	187
73	80	2.05	19.9	164	**173**	50	3.46	18.9	173
74	90	1.97	28.2	177	**174**	60	3.33	19.3	200
75	70	2.26	19.4	158	**175**	50	4.10	19.3	205
76	90	1.94	27.8	175	**176**	50	3.74	18.8	187
77	100	1.60	25.8	160	**177**	80	1.99	18.1	159
78	90	1.68	27.2	151	**178**	60	3.42	19.3	205
79	70	2.66	25.3	186	**179**	40	3.80	18.1	152
80	80	2.26	25.5	181	**180**	60	3.32	19.7	199
81	90	2.03	26.9	183	**181**	50	3.52	21.2	176
82	90	1.74	28.1	157	**182**	60	3.30	21.2	198
83	80	1.94	29.2	155	**183**	70	2.30	23	161
84	80	1.98	26.8	158	**184**	70	2.63	20.7	184
85	80	2.14	26.4	171	**185**	50	3.84	18.7	192
86	160	0.94	37.1	151	**186**	140	1.07	19.8	150
87	130	1.25	32.8	163	**187**	90	1.91	20.4	172
88	120	1.38	20.2	166	**188**	50	3.62	20.6	181
89	110	1.37	20.3	151	**189**	50	3.92	21.3	196
90	110	1.38	20.3	152	**190**	60	2.57	18.9	154
91	140	1.07	34.4	150	**191**	140	1.07	34.4	150
92	130	1.21	34	157	**192**	130	1.21	34	157

It should be recognized that the application of cover constraints in particular zones may delay stand entry well beyond these minimum ages. This will result in realized long-term harvest levels that are lower than the theoretical Long Run Sustained Yield (LRSY), which is based on harvesting all stands at culmination age.

9.2.2 Silviculture Systems

There are two harvest methods that will be employed across the Merritt TSA:

1. Conventional clear cut and
2. Single tree selection (AUs 1/101 and 23/123).

9.2.3 Initial Harvest Rate

The current AAC for the Merritt TSA is 2.8 million m^3/yr which includes an uplift of 1,000,000m^3/year for MPB salvage. The base case initial harvest rate will be affected by the amount of pine able to be harvested while still fulfilling land base requirements.

9.2.4 Harvest Rule

Harvest rules are used by the simulation model to rank stands for harvest. During the first 10 years of modeling, pine leading MPB affected stands (in order of severity) will be prioritized for harvest first. The rule used in this analysis will be driven by oldest first. Harvest rules interact with forest cover constraints to determine the actual order of harvesting within the model. If a higher ranked stand is in a constrained zone and cannot be harvested then the model will choose the next highest ranked stand that is unconstrained to be harvested.

9.2.5 Harvest Flow Objectives

Forest cover objectives and the biological capacity of the net timber harvesting land base (THLB) ultimately dictate the harvest level. However, a number of alternative harvest flows are possible. In this analysis, the main objective is to:

- Identify the amount of pine able to be harvested to determine an appropriate initial harvest level;
- To mitigate the impact of MPB on the mid-term timber supply; and
- Have a long run harvest level that reflects managed stand yields and non-timber resource values, and is sustainable.

9.2.6 Disturbing the Inoperable

During timber supply runs, the entire productive landbase is available to fulfill various landbase requirements (i.e. seral requirements). Traditionally, the only form of disturbance modeled is timber harvesting in the THLB. This is a concern because eventually in the model all the non-THLB becomes old and can lead to the non-THLB fulfilling an unrealistic portion of forest cover requirements, thereby reducing the impact on the THLB. In reality, there will be some level of natural disturbance within the non-THLB.

This section describes the theoretical process of disturbing the non-THLB used in the modeling of this analysis. The intentions are to achieve the early, mature and old seral percentages for each BEC variant in accordance with the natural range of variation (NROV) defined in the Biodiversity Guidebook.

The method used for this analysis is to: impose a seral requirement on the non-THLB of each BEC variant, which will force the non-THLB to achieve a seral zone distribution similar to the NROV from the *Biodiversity Guidebook*. From the non-THLB, the model will recruit the oldest stands first in order to achieve seral requirements as soon as possible. Then, the model forces an annual harvest disturbance to the non-THLB of each BEC zone using the oldest first harvest rule. The size of the disturbance will be determined from the disturbance frequency in the *Biodiversity Guidebook*

This process has been carried out by:

1. Determining the BEC zones and their area breakdown in the Merritt TSA;
2. Using the Biodiversity Guidebook to determine the NDT, disturbance interval, mature and old age for each BEC zone;

3. Estimate the seral stage distribution following the Biodiversity Guidebook procedure (Appendix 4);
4. Determine the appropriate seral requirement (mature and old) for each BEC zone; and
5. Determine the annual disturbance for each BEC zone.

Table 28 and Figure 5 provide the summary information for the BEC and NDT zones in Merritt TSA. Note that the area of BEC At and BEC is too small to include.

Table 28 Summary information for BEC-NDT zones

NDT	BEC	Disturbance Interval	Mature Age	Old Age	THLB	Non-THLB Productive	TOTAL
2	**CWH**	200	80	250	1,146	1,360	2,506
2	**ESS**	200	120	250	37,876	30,851	68,726
3	**ESS**	150	120	140	75,895	19,402	95,297
3	**MS**	150	100	140	253,049	37,891	290,940
4	**IDF**	250	100	250	275,781	87,397	363,179
4	**PP**	250	100	250	3,507	6,420	9,927

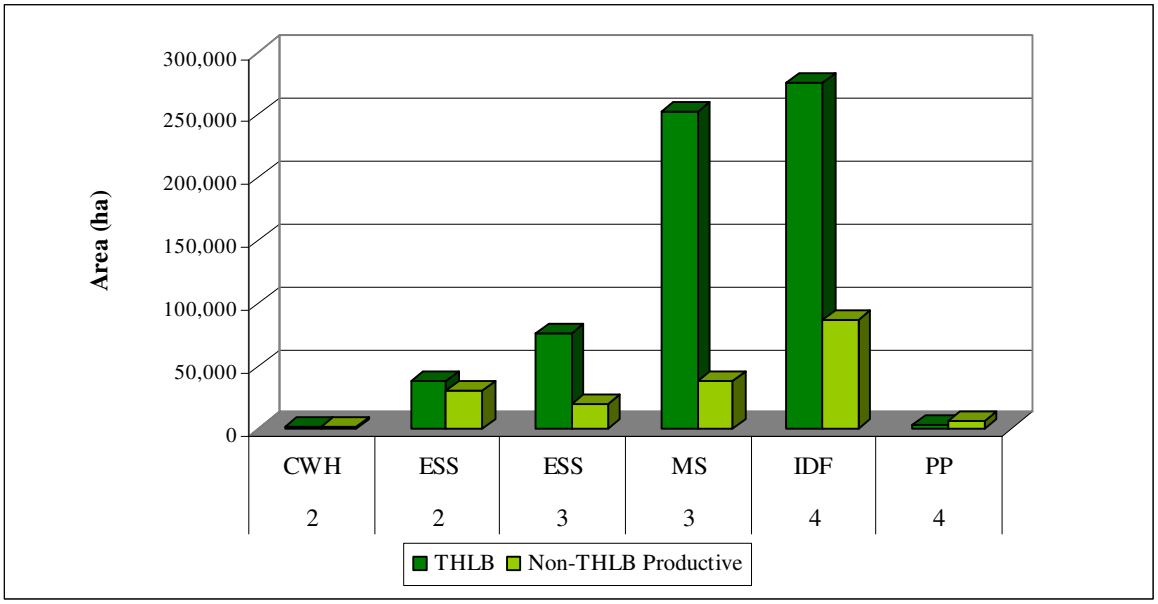

Figure 5 Area by BEC-NDT for THLB and non-THLB

The seral stage distribution is estimated using the negative exponential equation from Appendix 4 of the *Biodiversity Guidebook*. The negative exponential equation uses disturbance interval and gives the percent older than the input age:

Percent older than specified age = exp (-age/return interval)

Table 29 shows the seral stage distribution for the three fire return intervals that occur in the Merritt TSA (150, 200 and 250 years).

Table 29 Seral stage distribution for fire return intervals of 150, 200 and 350 years

Age	150		200		250	
	Greater than	Less than	Greater than	Less than	Greater than	Less than
20	88%	12%	90%	10%	92%	8%
40	77%	23%	82%	18%	85%	15%
60	67%	33%	74%	26%	79%	21%
80	59%	41%	67%	33%	73%	27%
100	51%	49%	61%	39%	67%	33%
120	45%	55%	55%	45%	62%	38%
140	39%	61%	50%	50%	57%	43%
160	34%	66%	45%	55%	53%	47%
180	30%	70%	41%	59%	49%	51%
200	26%	74%	37%	63%	45%	55%
220	23%	77%	33%	67%	41%	59%
240	20%	80%	30%	70%	38%	62%
250	19%	81%	29%	71%	37%	63%

Table 30 shows the area that will be disturbed each year in each BEC-NDT zone and also shows the seral zone requirements that will be placed on the BEC-NDT zones in order to achieve the desired NROV.

Table 30 Disturbance levels and mature and retention requirements in non-THLB

						Seral requirements			
NDT	BEC	Disturbance Interval	Non-THLB Prod Area	Annual Disturbance (%)	Annual Disturbance (ha)	Mature Plus Old		Old	
						Percentage	Age	Percentage	Age
2	CWH	200	1,360	0.50%	7	67%	80	29%	250
2	ESS	200	30,851	0.50%	154	55%	120	29%	250
3	ESS	150	19,402	0.67%	129	45%	120	39%	140
3	MS	150	37,891	0.67%	253	51%	100	39%	140
4	IDF	250	87,397	0.40%	350	67%	100	37%	250
4	PP	250	6,420	0.40%	26	67%	100	37%	250

9.3 Natural Range of Variation

When reporting on environmental trends it is important to provide a baseline for comparison. The current status of our forest does not provide for an appropriate baseline for comparison because it has resulted from anthropogenic pressures. However, much like our inability to predict how nature will disturb the inoperable, we are unable to predict how nature would have disturbed the land base had humans not intervened.

10.0 SENSITIVITY ANALYSES

This section briefly describes the sensitivity analyses that will be performed on the base case. The sensitivities reflect the stability of the base case in the face of uncertainty surrounding specific analysis assumptions. They also reflect the impact of alternative management or potential changes in forest practices.

Sensitivity analysis provides a measure of the reasonable upper and lower bounds of the harvest forecast, reflecting the uncertainty of assumptions made in the base case. The magnitude of the increase and decrease in the sensitivity variable reflects the degree of uncertainty surrounding the assumption associated with that given variable. By developing and testing a number of sensitivity analyses, it is possible to determine which variables most influence results. To allow meaningful comparison of sensitivity analyses, they are usually performed using the base case (*i.e.* current performance) and varying only the assumption being tested (*i.e.* all other assumptions remain the same as in the base case). The sensitivities that will be carried out for this analysis are listed in Table 31.

Table 31 Sensitivity analyses

Issue	Sensitivity Test
Growth and Yield	Adjust natural stand yields by ± 10%
	Adjust managed stand yields by ± 5%
	Adjust minimum harvest age by ± 10 years
	Adjust minimum harvest volume to 100 m3/ha
	Adjust stand productivity ± 3 meters
	Adjust regen delay in beetle-killed stands, NSIFS to define
	Remove Smallwood from AAC
Landbase classification	Adjust net harvesting landbase (THLB) by ± 10%
	Adjust landbase for Community Forest and Woodlots expansions
Resource Emphasis	Adjust greenup height in IRM by ± 1 metre
	Visual retention requirements ± 5%
	Temperature Sensitive Streams, management recommendations
Harvest Flow	Alternative harvest queue, random vs. oldest first
	Extend uplift for 20 year period at highest level possible
MPB	Adjust shelf-life assumptions, NSIFS to define
	Beetle spread rates, ± 5 years
	Managed stand mortality, MoFR Region to define
Adjacency	Adjust duration of spatial adjacency rules by ± 10 years

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