Mid Coast Timber Supply Area
Timber Supply Review #3

Data Package

DRAFT

Version 1.0

March 10, 2009

Prepared for:

Mid Coast TSA Licensee/Agency Group

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This data package represents a summary of the data, assumptions and methods proposed for modeling timber supply in the Mid Coast TSA as of March 2009. As the Timber Supply Review process continues, this information is subject to change as a result of:

- input from stakeholders,
- major changes in management practices, or
- better understanding of the data as it applies to the modeling objectives.

The final data, assumptions and modeling methods employed will be documented in an appendix to the timber supply analysis report.

Additional copies of this document are available on the web at www.Forsite.ca/Mid CoastTSR3/ or can be requested using Mid CoastTSR3@forsite.ca.

If you have any questions or would like more information, please contact Cam Brown, RPF at (250) 832-3366.

Record of Changes since V1.0

Change	Who	Date

ACKNOWLEDGEMENTS

The support and contributions from the following people and organizations was instrumental in the compilation of this document:

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Western Forest Products Ltd.	Peter Kofoed
B.C. Timber Sales	Bob Brand Lisa Gibbons
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1.0 Introduction

This document outlines the basic information and assumptions that are proposed for use in the provincial Timber Supply Review (TSR) process currently underway in the Mid Coast Timber Supply Area (TSA). The purpose of the review is to examine effects of current forest management practices on the short- and long-term availability of timber for harvesting in the TSA. A review of this type is intended to be completed at least once every five years in order to capture changes in data, practices, policy, or legislation influencing forest management in the TSA. The previous review (TSR2) was completed in June 1999 with a final Annual Allowable Cut (AAC) determination on June 1, 2001 establishing and AAC of 998,000 m^3/yr. In July of 2002 and September 2006, the Chief Forester set out orders that decreased the AAC because of new designated areas (conservancy and biodiversity areas). The AAC has been set at 768,000 m^3/yr since September 2006. The current TSR process will work towards having all work completed by Dec 31, 2009 such that a new AAC determination can be in place by June 2010.

This timber supply review will focus on a single forest management scenario that reflects current management practices in the TSA. Thus, the analysis goal is to model "what-is", and not "what-if". Current practice here will reflect the land base removals for new parks, conservancies and biodiversity areas associated with the Central Coast Land Use Decision (CCLUD) and Ecosystem Based Management (EBM) practices as described in the Ministerial Land Use Orders. In addition to this current management or "Base Case" scenario, an assessment of how results might be affected by uncertainties is completed using a number of sensitivity analyses. Together, the sensitivity analyses and the Base Case form a solid foundation for discussions among government and stakeholders about appropriate timber harvesting levels.

It is recognized that ongoing treaty negotiations with First Nations have the potential to impact timber supply in the TSA. However, "current management" is the underlying assumption for the analysis and no settlement has yet been reached. The final results from treaty negotiations will be modeled in subsequent timber supply reviews that have the benefit of legal direction in this area.

This report is the first of three documents that will be released during the TSR3 process for Mid Coast TSA. This document provides detailed technical information on the upcoming analysis. A separate document called the Analysis Report will summarize the results of the timber supply analysis and will provide a focus for public discussion. The final document will outline the Chief Forester's AAC decision and the reasoning behind it.

Additional copies of this document are available on the web at http://www.forsite.ca/Mid CoastTSR3/ or can be requested using the email address below.

If you have any questions or would like more information, please contact Cam Brown, RPF at (250) 832-3366 or cbrown@forsite.ca.

1.1 Purpose of the data package

The purpose of this data package is to:

- provide a detailed accounting of the land base, growth and yield, and management assumptions related to timber supply that the Chief Forester must consider under the *Forest Act* when determining an allowable annual cut (AAC) for the Mid Coast TSA and how these will be applied and modeled in the timber supply analysis;
- provide the evidentiary basis for the information used in the analysis;

1.2 Roles and Responsibilities

The Mid Coast Licensee-Agency group chose to take on the responsibility of leading the Mid Coast TSR3 process in 2008. The group consists of major licensees and First Nations with harvesting tenure in the Mid

Coast TSA. To deliver on this commitment, the planning and analysis work associated with the TSR was tendered and subsequently awarded to Forsite Consultants Ltd.

Government agencies play a key role in this TSR process – they set and enforce standards and are responsible for approval of the final Data Package and Analysis Reports. The Ministry of Forests and Range (MFR) provides technical support, facilitate resolution of issues, and validate technical information. Various resource specialists in the Ministries of Agriculture and Land (MoAL) and Environment (MoE) contribute their knowledge and experience. The following table shows the general roles and responsibilities associated with the timber supply analysis leading to an AAC determination.

Table 1. Roles and responsibilities

LICENSEE-AGENCY GROUP Obligations	Government Obligations	
	Forest Analysis Branch	**District And Regional Staff**
Compile data needed for the timber supply analysis, including forest cover and other data related to forest and land characteristics, administration and management regimes. Provide a summary of the data, management assumptions, and modeling methods to be applied in the timber supply analysis in a Data Package document.	Set standards for the data package	Provide data, information, and knowledge of current practices in the TSA.
Provide information to the public and First Nations and summarize comments received for government.		
Make any necessary changes to the data package and submit for government approval.	Review and accept the data package (focus on how data is to be applied in Timber supply analysis).	Review and accept the data package (focus on confirming current practice).
Perform and document a timber supply analysis according to standards provided by the Ministry of Forests.	Provide technical advice and set standards for the analysis and reporting.	
Submit an Analysis Report and digital file containing the complete dataset used in the timber supply analysis.	Review and accept (together with the chief forester) the analysis report.	Review the analysis report to ensure local issues and current practices are adequately reflected.
Provide information to the public and First Nations and summarize comments received for government.		Formal consultation obligations.
Provide additional information as required by the chief forester.	Compile and prepare information for presentation to the chief forester at the determination meetings.	Assist in compiling and preparing information for presentation to the chief forester at the determination meetings.

1.3 Description of the Land base

The Mid Coast TSA is located on the central coast of British Columbia and covers approximately 2.2 million ha. The Mid Coast TSA extends from Cape Caution in the south to Sheep Passage in the north and is bordered by the Pacific Ocean to the west and Tweedsmuir Park to the East (Figure 1). The northern boundary is made up of Tree Farm License (TFL) 25, the Fiordland Recreation Area, and the Kitlope Heritage Conservancy Protected Area.

The terrain is rugged and variable including low lying islands, outlying coastal mainland areas, inland mountainous regions, high elevation non-forested areas, and productive valley bottom steep sided inlets. The forests of the Mid Coast are dominated by four main biogeoclimatic zones as illustrated in Figure 2 below and include Coastal Western Hemlock (CWH), Mountain Hemlock (MH), Engelmann Spruce Subalpine Fir (ESSF), and alpine (CMA). Other zones such as IDF, MS, SBPS, and SBS exist in the transition zone to the interior ecosystems that is contained entirely within Tweedsmuir park.

The Mid Coast TSA exhibits high levels of diversity in landscape, wildlife, and and culture. Diverse populations of both marine and terrestrial wildlife exist in the TSA. The TSA's forests are culturally rich and diversified as well. Archaeological work has yielded evidence of some of the oldest First Nation's habitations on the BC coast.

The Mid Coast TSA is remote and sparsely populated, with the majority of the population living in the Bella Coola valley. Other populated areas include small isolated communities along the outer coast.

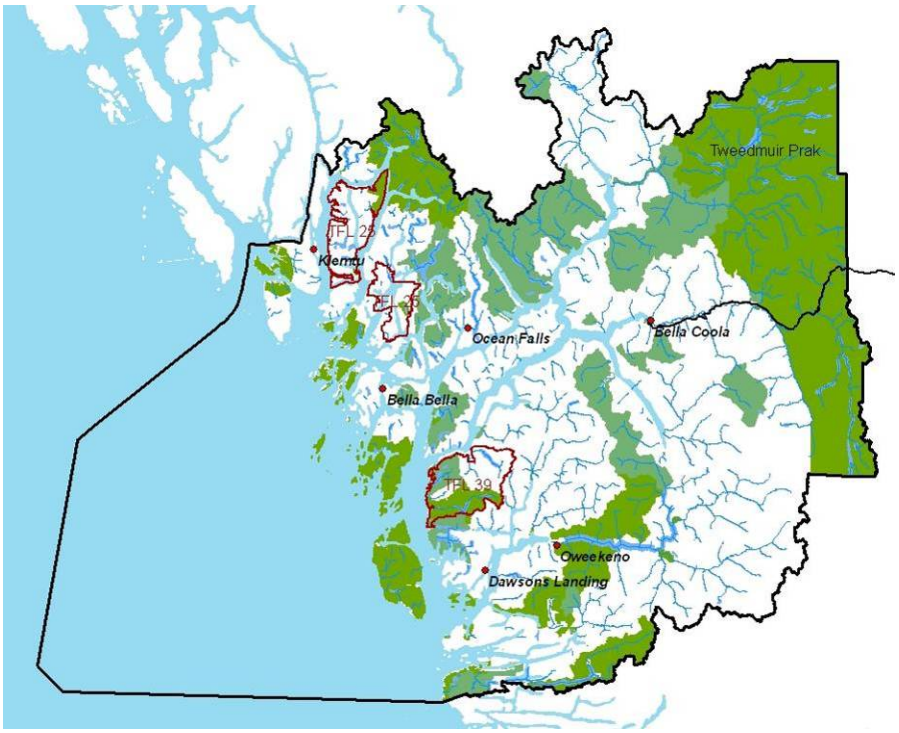


Figure 1. Mid Coast TSA landbase.

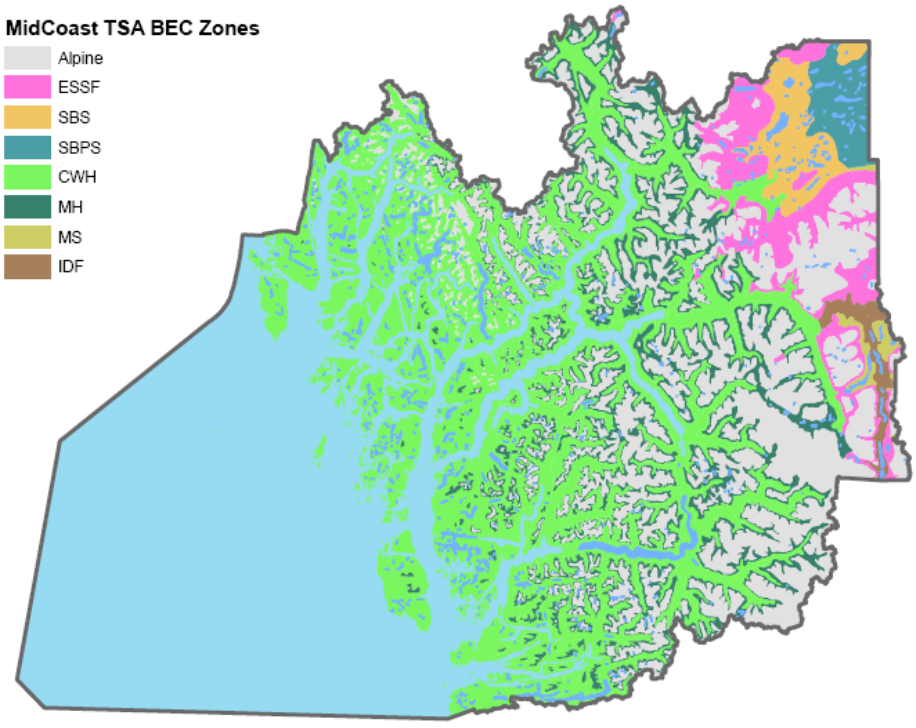


Figure 2. BEC Zones present in Mid Coast TSA.

1.4 History of the Annual Allowable Cut

The history of the Annual Allowable Cut (AAC) for the Mid Coast TSA is summarized below.

- During the mid 1970's to the early 1990's the AAC on the Mid Coast was periodically increased to meet elevating demand for access to timber and improved harvesting practices that allowed utilization of poor forest types. In 1992 the AAC was 1 516 600 m^3/yr.
- Effective January 1992 the AAC was reduced by 39 % as poorer quality stands were not being harvested to the extent previously expected, which left the AAC at 1,000,000 m^3/yr. Also a partition was introduced that required 130 000 m^3/yr of the AAC come from stands of a height class three (trees over 120 years of age and less than 28.5 m in height).
- From 1992-1995 the AAC remained unchanged however the partition requirement was modified to include height class three stands on the outer coast, decadent hemlock-balsam stands outside the operability line, and stands that are accessible by helicopter outside operability lines.
- In June 2000 the AAC for the Mid Coast was determined to be 998 000 m^3/yr. The reduction was to account for a newly issued woodlot license. Within that AAC existed a partition of 200 000 m^3/yr requiring harvesting to occur in poor or low site hemlock / balsam leading stands (site index <=17m). The Chief Forester also stated that at least 59,000 m^3/yr should come from the outer coast and 178,000 m^3/yr should come from outside the conventional operability lines. These are not formal partitions but expectations that will be evaluated in the next TSR when defining the new timber harvesting land base.
- In July of 2002 the chief forester issued an order decreasing the AAC by 203 000 m^3/yr to account for establishment of the Central Coast Designated Area. This volume was removed from both the partition and the overall total volume and remained unchanged until the Designated Area section in the Forest Act expired in January 2006.
- In September of 2006 a new Designated Area section was established in the Forest Act and the Chief Forester reinstated the order that decreased the AAC to the current level of 768 000 m^3/yr.

1.5 Current Practice and EBM

Within the general TSR process, current management practices are primarily defined by:

- Legislation (e.g. Forest and Range Practices Act and its Regulations)
- Ministerial Orders (e.g. South Central Coast Order, Central Coast Designated Areas),
- Government Actions Regulation Orders (e.g. Karst, WHA's, Visuals),
- Current management practices described in Forest Stewardship Plans,
- Other approved BC Forest Service and joint agency forest management practices and policy,
- Current practices of forest tenure holders.

As a result of the Central Coast Land Use decision and the establishment of the South Central Coast Order (Aug 2, 2007) and the Central and North Coast Order (Jan 3, 2008), land use objectives implementing Ecosystem Base Management (EBM) have been put in place for the whole of the Mid Coast TSA (Figure 3). These legal objectives now direct forest practices implemented under the Forest and Range Practices Act. Thus, current practice for Mid Coast TSR3 includes both FRPA and EBM management guidelines. The elements of EBM are discussed in detail throughout this document.

The EBM orders and background data/interpretation information can be found here:
http://ilmbwww.gov.bc.ca/slrp/lrmp/nanaimo/cencoast/plan/objectives/index.html

It should be noted that draft amendments to the EBM Orders were made public in December 2008 and made available for review and comment until Feb 16, 2009. These amendments have not been included here as they do not yet represent current practice in the TSA.

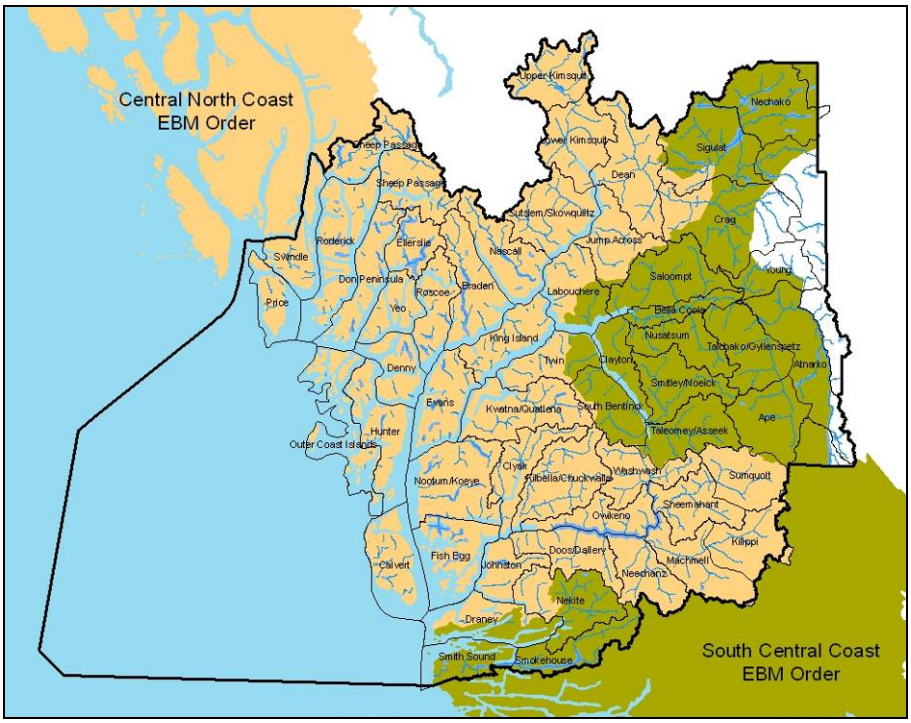


Figure 3. Location of Ministerial Order Boundaries (2007) within the Mid Coast TSA.

A list of the EBM elements included in the orders is provided below. These elements are discussed in detail later in the document (see referenced section numbers).

First Nations Elements

- Objective 3: First Nations' traditional forest resources (Section 3.4.1);
- Objective 4: First Nations' traditional heritage features (Section 3.4.1);
- Objective 5: Culturally modified trees (Section 3.4.1);
- Objective 6: Monumental cedar (Section 3.4.1);
- Objective 7: Stand-level retention of Western red and Yellow Cedar (Section 3.4.1);

Aquatic Habitats

- Objective 8: Important fisheries watersheds (8.5.6);
- Objective 9: High value fish habitat (Section 3.3.12.1);
- Objective 10: Aquatic habitat that is not high value fish habitat (Section 3.3.12.2);
- Objective 11: Forested swamps (Section 8.5.9);
- Objective 12: Upland streams (Section 8.5.10);
- Objective 13: Active fluvial units (Section 3.3.12.4);

Biodiversity

- Objective 14: Landscape-level biodiversity (Section 8.5.12);
- Objective 15: Red-listed and blue-listed plant communities (Section 3.4.2);
- Objective 16: Stand-level retention (Section 3.4.3); and
- Objective 17: Sensitive grizzly bear habitat (Section 0).

2.0 Thematic Data

2.1 Data Sources

Many different data layers were compiled to provide input into the timber supply analyses described in this report and they are documented in Table 2. The use of these data layers is described in subsequent sections of this appendix.

Table 2. Data layers

Data Description	Forsite Coverage Name	Data Source	Description	Vintage
Administrative Line Work				
TSA Boundary	TSABDY	LRDW	Outer boundary of the TSA.	2003
Landscape Units/BEO	LU	ILMB	Legal LU boundaries from LRDW.	2000
Ownership	Owner2008	Forsite	Forsite created using data from LRDW (parks, CFA's, TFL's). TSR2 ownership file (IR's, TL's, Private, UREP, Misc Resv), and ILMB Nanaimo conservancy data. Edits made to TL's.	2008
Ministerial Order Boundaries	Order_bdy	ILMB	ftp://ftpnan.env.gov.bc.ca/dist/gisdata/cclrmp/ebm_data	2006
Inventories				
BEC	Abec_bc_v7	LRDW	Biogeoclimatic units with NDT added based on BEC Web definitions	2008
DEM for slope classes	Slope_mc	TRIM	Elevation data points used to generate slope classes.	?
Depletions	Blks_Mar08	Forsite	Forsite compiled using block data from licensees, results, FTA	2008
Vegetation	Veg	LRDW	Projected to Jan 1, 2008. Site series surrogate values added.	2008
ESA	ESA	TSR2	ILMB Nanaimo. TSR2 ESA were added to the current Veg file.	Pre 1996
Inner/Outer Coast	Partition	TSR2	ILMB Naniamo.	1999
Operability	Oper08	Forsite	Developed by Forsite using economic operability modeling.	2008
Registered Heritage/ARCH	MC_ArchSites	Arch Branch	Polygon data indicating legally protected archeological sites - provided by John McMurdo.	2008
Roads	Roads08	Forsite	Forsite developed using licensee data, FTEN, TRIM, Timberline Woodshed project roads. Includes both existing and proposed rds.	2008
Karst	Karst	LRDW	Gives Karst likelihood and Karst development	2003
EBM				
Active Fluvial Units	Flood08	Forsite	Created using CC_flood cover from LRMP + added TRIM floodplains around Bella Coola - then removed coniferous stands >200 yrs.	2008
Sensitive Grizzly Bear Habitat	SCC_Griz	ILBM	ftp://ftpnan.env.gov.bc.ca/dist/gisdata/cclrmp/ebm_data/	2007
High Value Fish Habitat (HVFH)	HVFH	Forsite	20,000 scale streams with a gradient of <=5% fall on terrain with <=5% slope.	2008
Aquatic Non High Value Fish Habitat	AQ_NHVFH	Forsite	20,000 scale streams classified into S1-S6 – then any S1-S3 streams not called HVFH. Lake and wetlands from TRIM.	2008
EBM Sensitive Watersheds	Sens_WS	ILMB	ftp://ftpnan.env.gov.bc.ca/dist/gisdata/cclrmp/ebm_data/	
Site Series Surrogates	n/a	ILMB	Assigned to veg file using leading species and site index groups.	2008
Other Watersheds (Upland Streams)	3rd_O_WS	ILMB	3rd order watersheds. ftp://ftpnan.env.gov.bc.ca/pub/outgoing/dist/Coast%20Implementation/EBM%20WG/Data/watersheds/	
Management Guidance				
Recreation Inventory	Rec_Inv	LRDW	Inventory describing the significance and sensitivity of the land base from a recreation perspective.	2006
VQO's	VQOs	MFR	http://www.for.gov.bc.ca/dni/gar/GAR.htm VAC attribute added from dataset off of the LRDW.	2005
Streams (Classified)	Streams	Forsite	20,000 scale streams (corporate watershed base) classified into S1-S6 using stream gradient and stream order/magnitude.	2008
Lakes Classified	Lakes	Forsite	20,000 scale lakes and wetlands (corporate watershed base) classified in to L1-L5 / W1-W5 based on size and proximity to each other.	2008
Community Watersheds	CWSs	LRDW	Legal Community Watersheds	2008

Data Description	Forsite Coverage Name	Data Source	Description	Vintage
Ungulate Winter Range	UWR	LRDW	Deer and Mtn Goat winter range habitat areas. http://www.env.gov.bc.ca/wld/frpa/uwr/approved_uwr.html	2007
Wildlife Habitat Areas	WHAs	LRDW	Legally established WHA's (Grizzly only)	2008

2.2 Forest Cover Inventory

The forest cover inventory is a key component to the timber supply review of the TSA. The history of the current forest cover inventory in the Mid Coast TSA can be summarized briefly as follows:

- The inventory data was originally prepared in 1988-1990 from 1977-79 photography and is currently in a Vegetation Resources Inventory (VRI) FIP Rollover format. There are several mapsheets of full VRI format data in the NE corner of the TSA (portion of Tweedmuir park).
- A single flat file was obtained from Forest Analysis and Inventory Branch (James Wang) that included only Rank 1 stand information. Attributes were projected to January 1, 2008 using VDYP 7. Yield curves were also provided for each polygon in a separate database.
- Disturbances from harvesting and fire will be updated in the GIS resultant to March 2008.
- An inventory audit was carried out in 1994 (published 1995) and indicated that the inventory was statistically reliable for some strategic planning purposes at a broad management unit level.
- No ground sampling (Phase 2 work) has been completed to support adjustments to inventory attributes so no adjustments have been applied.
- Site index adjustments have been developed for regenerating managed stands (Timberline's 2008 SIA project[1]) and were used to develop managed stand yield curves. Existing inventory site indices were used for natural (unmanaged) stand yield curves.

It should be noted that planners and practitioners using the forest inventory at a sub-unit or polygon level have found the attributes quite unreliable.[2] The extra demands of EBM (e.g. Site Series Surrogate status reporting) emphasizes the need for more dependable information. To that end a multi year, multi million dollar project to create a new VRI inventory to replace the current forest cover information was initiated in 2008 but will not be completed in time for inclusion in this analysis. In lieu of access to any better forest information the FIP-based data is employed in this TSR.

[1] Site Index Adjustment Of The Mid Coast Timber Supply Area (Project # BC0108405), January 2009, Timberline Natural Resource Consultants, Victoria, BC

[2] Central Coast LRMP Area Vegetation Resources Inventory Strategic Inventory Plan, February 2008. pg 7

3.0 Timber Harvesting Land Base

3.1 Land Base Definitions

The Productive Forest Land Base (PFLB) is the area of productive forest under crown ownership. This is the land base that contributes to landscape level objectives for biodiversity and non timber resource management. The PFLB excludes non-crown land, woodlots, non-forest and non-productive areas.

The timber harvesting land base (THLB) is the portion of the management unit where forest licensees under license to the province of BC are expected to harvest timber. The THLB excludes areas that are inoperable or uneconomic for timber harvesting, or are otherwise off-limits to timber harvesting. The THLB is a subset of the PFLB. Table 3 and Figure 4 / Figure 5 summarize the land base associated with the base case harvest forecast.

Table 3. Landbase Area Netdown Summary

	Base Case			
Land Base Element	**Total Area (ha)**	**Effective* Area (ha)**	**% Total**	**% PFLB**
Total area (Mid Coast TSA Bdy – less ocean)	**3,012,310**	**3,012,310**		
Less:				
Private Land, Indian Reserves	14,276	14,276		
TFL's, CFA's, Woodlots, Misc Leases, Etc	270,786	270,786		
Timber License's (unreverted)	7,767	7,767		
Total TSA Area	**2,719,481**	**2,719,481**	100.0%	
Non forest / Non-productive forest	1,691,972	1,691,972	62.2%	
Non-Commercial Brush	481	481	0.0%	
Existing Roads, Trails and Landings	3721	3,520	0.1%	
Total Productive Forest Land Base ** **(PFLB)**	**1,023,508**	**1,023,508**	37.6%	**100%**
Less:				
Parks and Ecological Reserves	490,122	490,122	18.0%	47.9%
Inoperable/Inaccessible	865,883	353,227	13.0%	34.5%
Environmentally Sensitive Areas (ESA's)	263,675	7,960	0.3%	0.8%
Non-Merchantable or Problem Forest Types	197,679	36	0.0%	0.0%
Low Productivity Sites	178,222	18,060	0.7%	1.8%
Grizzly Wildlife Habitat Areas (WHA's)	13,659	3,902	0.1%	0.4%
Mountain Goat Winter Range	32,558	163	0.0%	0.0%
FRPA Riparian (not including S6's)	17,423	6,340	0.2%	0.6%
Recreation Values	10,586	3,376	0.1%	0.3%
EBM - High Valve Fish Habitat (Obj 9)	5,784	1,629	0.1%	0.2%
EBM – Non High Value Aquatic Habitat (Obj 10)	6,625	2,083	0.1%	0.2%
EBM – Active Fluvial Units (Obj13)	5,693	1,163	0.0%	0.1%
EBM – Sensitive Grizzly Bear Habitat (Obj 17)	3,957	157	0.0%	0.0%
Spatial Timber Harvesting Land Base (ha)		**135,293**	5.0%	**13.2%**
Non Spatial Netdowns Applied to Each THLB Polygon:				
FRPA Riparian – S6's (0.3%)		406	0.0%	0.0%
EBM – Arch/FN (Obj 4-7 = 1.3%)		1,759	0.1%	0.2%
EBM - Red and Blue (Obj 15 – 3.0%)		4,059	0.1%	0.4%
EBM – Stand Level Retention (Obj 16 – 3.3%)		4,465	0.2%	0.4%
Effective Timber Harvesting Land Base (ha)		**124,605**	4.6%	**12.2%**
Future Reductions:				
Future roads, trails and landings		2,713	0.1%	0.3%
Future Gains:				
TL Reversions		7,767	0.3%	0.8%
Long Term Timber Harvesting Land Base (ha)		**129,659**	4.8%	**12.7%**

* Effective netdown area represents the area that was actually removed as a result of a given factor. Removals are applied in the order shown above, thus areas removed lower on the list do not contain areas that overlap with factors that occur higher on the list. For example, the parks netdown does not include any non forested area.

** Productive forest in this context denotes the forest area that contributes to forest management objectives, such as landscape-level biodiversity, wildlife habitat and visual quality. It does not include alpine forest or Non productive areas with tree species.

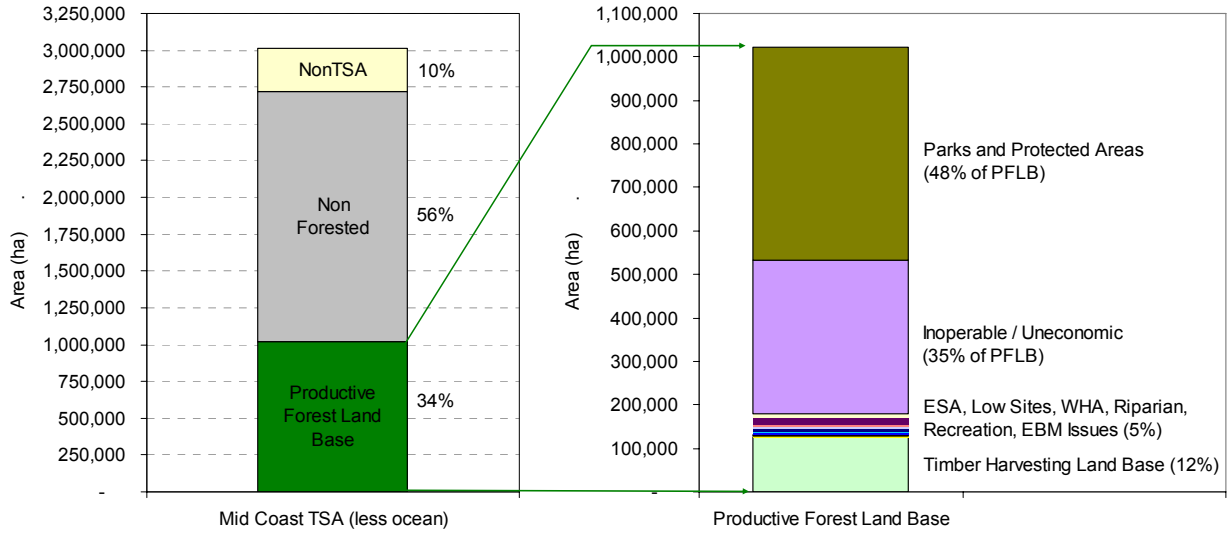


Figure 4. Mid Coast Land Base Area Summary

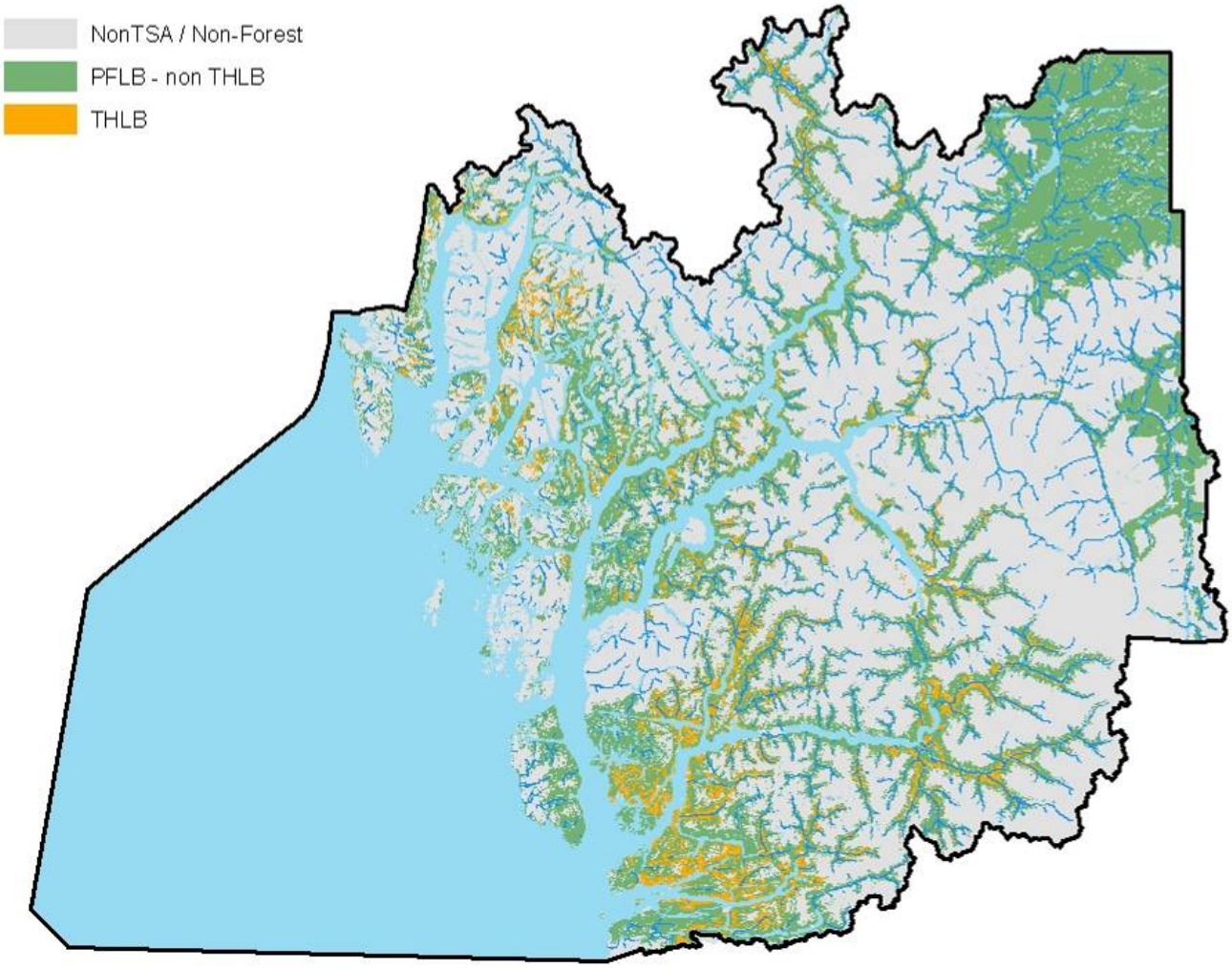


Figure 5. Mid Coast TSA Land Base Definition Map

3.2 Exclusions from the Productive Forest Land Base (Spatial)

3.2.1 Ownership classes not part of the TSA

The area of the Mid Coast Timber Supply Area is divided into ownership classes that describe the nature of ownership of a particular parcel of land. For forest management in the Mid Coast TSA, only those lands that are under provincial crown ownership will contribute to forest management objectives, like landscape level biodiversity.

Table 4 describes the various ownership codes in the Mid Coast TSA, and their contribution to the Productive Forest Land Base, the Timber Harvesting Land base, or both. Parks and protected areas are described in more detail in section 3.3.1.

Table 4. Ownership codes and application in TSR3

Ownership Code Description	Percent Contribution to PFLB	Percent Contribution to THLB	Total area (ha)	Effective Netdown Area (ha)
CFA	0%	0%	169,165	169,165
Indian Reserve	0%	0%	4,880	4,880
Misc Reserve	0%	0%	1,592	1,592
Private	0%	0%	9,396	9,396
TFL	0%	0%	93,058	93,058
TL/CFA	0%	0%	6,452	6,452
UREP	0%	0%	519	519
Total			**285,062**	**285,062**

* More detail is provided on park areas in Table 8.

3.2.2 Non-forest, non-productive and non-typed

All land classified as non-forest, non-productive (lakes, swamps, rock, alpine, *etc*.), or non-typed in the forest cover files were excluded from the timber harvesting land base. The non-forest and non-productive areas used in the netdown process are listed in Table 5.

Table 5. Non-forest and non-productive area

Description	Percent Reduction	Total area (ha)	Effective Netdown Area (ha)
Alpine	100%	1,074,703	1,074,703
Alpine forest	100%	294,098	294,098
Clearing	100%	88	88
Clay bank	100%	341	341
Gravel bar	100%	403	403
Gravel pit	100%	4	4
Lake	100%	75,033	75,033
Meadow	100%	53	53
Mud flat	100%	185	185
Non-applicable	100%	8,617	8,617
Non-productive	100%	167,391	167,391
Non-productive brush	100%	11,298	11,298
Non-productive burn	100%	1,663	1,663
No typing available	100%	35,465	35,465
Open range	100%	1	1
Rock	100%	6,086	6,086
River	100%	8,497	8,497
Swamp (muskeg)	100%	7,503	7,503
Tidal flat	100%	138	138
Urban	100%	406	406
Total		**1,691,972**	**1,691,972**

3.2.3 Non-commercial cover

Non-commercial cover is productive forest land that is otherwise occupied by non-commercial tree or shrub species. This area of land does not currently grow commercial tree species, and is not expected to do so without intervention. This area was therefore excluded from the Productive Forest Land Base.

Table 6. Non-commercial cover

Description	Percent Reduction	Total area (ha)	Effective Netdown Area (ha)
Non-Commercial (NF Desc=NCBr or NC)	100%	481	481

3.2.4 Roads, trails, and landings

Quantifying the area that is, and will be, disturbed by roads, trails, landings (RTLs) and other access features in the TSA is an important part of determining the THLB. Areas that were expected to remain non-productive were removed from the working land base as outlined below.

3.2.4.1 Existing classified roads

Classified roads are those roads identified in the forest cover inventory. These roads are frequently large roads or highways with a wide right-of-way and are netted out in Table 5.

3.2.4.2 Existing unclassified roads, trails, and landings

Roads not represented in the forest cover data are considered unclassified. Roads and trails are tracked as line features in separate road files. A consolidated dataset was compiled by Forsite in August 2008 using data from licensees, TRIM, MFR tenures, and a woodshed analysis project completed by Timberline in 2000. Roads were flagged as either existing or proposed with a road type of either mainline or spur. The widths associated with these road features were estimated by members of the Mid Coast TSR technical committee and applied as buffers to the existing roads (Table 7). These areas were assumed to include landings, pullouts, and unmapped trails – and were removed spatially from the timber harvesting land base.

Table 7. Access feature classification

Road Type	Unproductive Road Width (m)	Total Area (ha)	Effective Netdown Area (ha)
Main	15 m	3,721	3,520
Spur	11 m		

Note: Overlap between these features and non-forested areas exist but no double counting occurred during netdowns.

3.2.4.3 Future roads, trails and landings

Deductions for future roads are necessary to account for the unproductive area created as new roads, trails and landings are built. The first time conventional logging occurs in an unroaded area of the TSA, all of the timber volume in that stand is captured. Any subsequent entries will harvest less volume, recognizing that there is now an unproductive area that would exist as roads, trails and landings.

FRPA limits the impact of permanent access structures to 7.0% and this value is consistent with commitments made in licensee Forest Stewardship Plans. For the purpose of this analysis, the 7% impact associated with future permanent access structures will be applied to the following area:

- Unlogged THLB (natural stand AU's), that are
- >250 meters from existing roads, and
- planned for conventional logging systems (not helicopter logging).

It is assumed that the area within 250m can currently be accessed from the existing roads and all previously logged areas will not need the netdown applied.

Deductions for future roads, trails and landings were applied as a volume reduction to the yield tables of all future managed stand analysis units. The THLB area meeting the criteria described above (38,755 ha) was multiplied by 7.0% to get an effective area reduction **(2,713 ha**). This area was then calculated as percentage of the total area on the future managed stand yield curves (106,956 ha) and implemented as a volume reduction (2.5%) on these curves.

3.3 Exclusions from the Timber Harvesting Land Base

3.3.1 Parks and Protected Areas

Provincial parks and other protected areas in the Mid Coast TSA are excluded from the THLB but can contribute to non-timber objectives, meaning that they remain in the productive forest land base (PFLB) Table 8 summarizes the existing parks, protected areas, and conservancies in the TSA.

Table 8. Parks and Ecological Reserves in Mid Coast TSA

Name	Type	Percent Reduction	Prod Area (ha)	Effective Netdown Area (ha)
Ape Lake	Designated Area	100%	757	757
Barer Creek	Designated Area	100%	1,110	1,110
Bella Coola Conservancy	Designated Area	100%	4	4
Bentinck Estuaries	Designated Area	100%	35	35
Burnt Bridge Creek Conservancy	Designated Area	100%	598	598
Calvert Island Conservancy	Park / Protected Area	100%	11,695	11,695
Cape Caution Conservancy	Park / Protected Area	100%	3,480	3,480
Cape Caution-Blunden Bay Conservancy	Park / Protected Area	100%	9	9
Carter Bay Conservancy	Park / Protected Area	100%	292	292
Cascade-Sutslem Conservancy	Designated Area	100%	19,141	19,141
Clayton Falls Conservancy	Designated Area	100%	650	650
Clyak Estuary Conservancy	Park / Protected Area	100%	166	166
Codville Extension Conservancy	Designated Area	100%	764	764
Codville Lagoon Marine Park	Park / Protected Area	100%	384	384
Cranstown Point Conservancy	Park / Protected Area	100%	77	77
Dean River Conservancy	Designated Area	100%	17,514	17,514
Dean River Corridor Conservancy	Designated Area	100%	2,700	2,700
Ellerslie Conservancy	Designated Area	100%	10,867	10,867
Entiako Park	Park / Protected Area	100%	2	2
Fiordland Conservancy	Park / Protected Area	100%	11,192	11,192
Fish Egg	Designated Area	100%	11,460	11,460
Goose Bay Conservancy	Designated Area	100%	6	6
Goose Bay Conservancy	Park / Protected Area	100%	931	931
Hakai Conservation Study Area	Park / Protected Area	100%	11,281	11,281
Hot Springs - No Name Creek Conservancy	Designated Area	100%	2,704	2,704
Huchsduwachsdu Nuyem Jees / Kitlope Heritage Conservancy	Park / Protected Area	100%	2	2
Indian Reserve	Designated Area	100%	175	175
Inland Cape Caution	Designated Area	100%	9,301	9,301
Jump Across Conservancy	Designated Area	100%	7,255	7,255
Kilbella Estuary Conservancy	Park / Protected Area	100%	81	81
Kimsquit Estuary Conservancy	Designated Area	100%	10	10
King	Designated Area	100%	11,710	11,710
Kitasoo Spirit Bear Conservancy	Park / Protected Area	100%	2,569	2,569
Koeye Conservancy	Park / Protected Area	100%	15	15
Kunsoot River	Designated Area	100%	980	980

Name	Type	Percent Reduction	Prod Area (ha)	Effective Netdown Area (ha)
Kwatna Estuary Conservancy	Designated Area	100%	81	81
Lady Douglas - Don Penninsula Conservancy	Park / Protected Area	100%	1,910	1,910
Lockhart - Gordon Conservancy	Park / Protected Area	100%	11,928	11,928
Machmell Conservancy	Park / Protected Area	100%	1,364	1,364
Namu Conservancy	Designated Area	100%	27	27
Nekite Estuary Conservancy	Park / Protected Area	100%	257	257
Nekite Estuary West	Designated Area	100%	196	196
Nooseseck Conservancy	Designated Area	100%	25	25
Outer Central Coast Islands Conservancy	Park / Protected Area	100%	5,796	5,796
Owikeno Conservancy	Park / Protected Area	100%	22,301	22,301
Penrose Island Park	Park / Protected Area	100%	922	922
Penrose-Ripon Conservancy	Designated Area	100%	28	28
Penrose-Ripon Conservancy	Park / Protected Area	100%	2,125	2,125
Restoration Bay Conservancy	Designated Area	100%	776	776
Roscoa Conservancy	Designated Area	100%	12,957	12,957
Sheemahant Conservancy	Park / Protected Area	100%	610	610
Sir Alexander Mackenzie Park	Park / Protected Area	100%	5	5
South Bentinck	Designated Area	100%	6,033	6,033
Thorsen Creek Conservancy	Designated Area	100%	2,512	2,512
Troup Passage Conservancy	Designated Area	100%	1,512	1,512
Tsa-Latl/Smokehouse Conservancy	Park / Protected Area	100%	12,475	12,475
Tweedsmuir Park (North)	Park / Protected Area	100%	148	148
Tweedsmuir Park (South)	Park / Protected Area	100%	264,227	264,227
Upper Kimsquit River Conservancy	Designated Area	100%	1,989	1,989
Total			**490,122**	**490,122**

3.3.2 Inoperable or Inaccessible Areas

Inoperable areas are areas that are not available for timber harvesting because they are not economically viable to access and harvest. In response to concerns expressed by the Chief Foresters in his TSR2 rationale, a new operability study was conducted as part of this TSR (*Economic Operability Assessment for the Mid Coast TSA,* Forsite, Dec 2008). The study used the following general approach:

- A road network was developed to show the extent of potential access throughout the TSA, and included both existing and planned/potential roads. This road dataset was then used to assign harvest systems. Areas within 250 m of roads were considered conventional harvest, while areas beyond that but limited to 2km away were considered helicopter harvest. Helicopter harvest was also designated up to 2km from potential water drop locations. Areas without a harvest system were immediately considered inoperable. Those with a harvest system were assessed for economic viability.
- Stands with no potential for harvest in the future were removed from eligibility (Non TSA ownership, parks/designated areas, very low productivity sites, highly environmentally sensitive areas, major riparian areas / floodplains, mountain goat habitat areas, important grizzly habitat areas, etc). An economic subset of these areas was ultimately put back into the operable landbase so that TSR netdowns and sensitivities could explore the impacts of these factors.
- Costs were assigned to each stand for planning, logging, barging, scaling, and silviculture using costs provided by licensees and the coastal appraisal manual. See the full project report for more detail.
- Values were assigned to each stand using 10 year average market prices for each species and grade. Grade distributions were determined using historical TSA scaling data for each species and then these species specific grade distributions were applied to each stand in the forest inventory.
- A net value (before road costs) was determined for each stand, and then these values and a full road network (existing and proposed) was fed into a model (Patchworks) to allocate harvesting and road use

across the land base for 200 years. Road use triggered any required building costs, maintenance costs, and hauling costs associated with harvesting a specific set of stands. The sum of the stand net values less road related costs in each period provided average net revenue in each period.

- The modeling objective was to find the largest possible land base that could generate a reasonable economic return to the crown over time. Cut block blending or the ability to harvest positive and negative value blocks within each period was allowed as long as the net return after all costs were considered was $6.33/m^3 in every 5 year period. The $6.33/m^3 target is based on the average stumpage paid in the TSA over the last 10 years ($9.08/m^3 not including BCTS) less the current EBM allowance of $2.75. This financial objective limited the amount of negative value stands harvested in each period to a reasonable level.
- Any stands harvested by the model during the 200 years planning horizon were considered to be operable. Previously logged blocks in the TSA were considered operable only when they were logged by the model. This left over 8000 ha of previously logged stands outside of the operability land base.

The size of the area considered inoperable is shown in Table 9. For more detail on how the operable area was developed, refer to the full report cited above.

Table 9. Inoperable areas

Description	Percent Reduction	Prod Area (ha)	Effective Netdown Area (ha)
Inoperable	100%	865,883	353,227

3.3.3 ESAs and Unstable Terrain

Environmentally sensitive sites and areas of significant value for other resource uses have been delineated within the forest cover inventory as Environmentally Sensitive Areas (ESA's). ESA's are broad classifications that indicate sensitivity for unstable soils (E1s), forest regeneration problems (E1p), snow avalanche risk (E1a), and high water values (E1h). Where terrain stability mapping is available, it is often used in place of ESA soils designations, but there was none available for use in this analysis. Table 9 summarizes the netdown areas attributed to ESA's. Environmentally sensitive area reductions were established by MFR for the 1999 timber supply analysis. The percentages reflect sites sensitivity to forest management, value for other resources, and current management practices.

Table 10. ESA netdown areas

ESA Type	Description	Percent Reduction	Prod Area (ha)	Effective Netdown Area (ha)
ESA1 p	High Regeneration Sensitivity	100%	103,386	1,407
ESA1 a	High Avalanche Sensitivity	100%	4,462	91
ESA1 s	High Soil Sensitivity / Unstable Terrain	90%	140,309	2,631
ESA2 s	Mod Soil Sensitivity / Unstable Terrain	40%	15,518	3,831
Totals			**263,675**	**7,960**

Note: The total productive area of ESA1 soils (TSA forested land) was 158,899 ha and the total for ESA2 soils was 38,794 ha.

These netdowns were implemented spatially by randomly selecting ESA polygons from the TSA's forested land base until the correct percentage was achieved. The selected polygons were then 100% removed from the THLB. Areas with previous logging history were not removed as part of this netdown.

3.3.4 Non-Merchantable or Problem Forest Types

Non-merchantable forest types are stands that contain tree species not currently utilized in the TSA, or timber of low quality, small size and/or low volume. Non-merchantable types are entirely excluded from the timber harvesting land base as shown in Table 11.

Table 11. Non-merchantable forest types

PFT Type	Description	Percent Reduction	Prod Area (ha)	Effective Netdown Area (ha)
Pine	All pine leading stands (Pl / Pw / Py) *	100%	178,681	26
Larch	All larch leading stands *	100%	8	0
Decid	All deciduous leading stands *	100%	18,990	10
Total			**197,679**	**36**

* Sites with a previous logging history were retained in the landbase.

The net impact of this netdown is low because these stands were typically deemed uneconomic during the operability assessment because they provided little to no economic value (revenue) when harvested. Alder leading stands will be put back into the THLB during a sensitivity analysis because it is at times worth more than hemlock.

3.3.5 Low Productivity Sites

Sites with low growing potential are areas that are not expected to contribute to the THLB because they take too long to produce a commercial crop of trees. The list of exclusion criteria can be found in Table 12. These definitions were derived based on a review of past licensee performance in various site index categories.

Table 12. Low site netdowns

Leading Species	Description	Percent Reduction	Prod Area (ha)	Effective Netdown Area (ha)
Fd	150 yr old Fd stands <350 m3/ha or SI<17 m*	100%	3,982	427
Cw/Yc	150 yr old Cw stands <300 m3/ha or SI<12 m*	100%	105,697	16,435
Hw/Ba	150 yr old Hw/Ba stands <350 m3/ha or SI<11 m*	100%	47,258	1,190
Sx	150 yr old Sx stands <350 m3/ha or SI <10 m*	100%	21,285	7
Total			**178,222**	**18,060**

* Sites with a previous logging history were not removed by this netdown.

A portion of these stands were already removed during the economic operability assessment as they were not economically viable to harvest. Low productivity stands incurred higher costs because they were assumed to have smaller piece sizes and they had less volume per ha over which to amortize fixed costs such as logging system setup, road building, and silviculture costs.

3.3.6 Cultural Heritage Resource Deductions

The *Heritage Conservation Act* provides for the protection of British Columbia's archaeological sites predating 1846. In accordance with the *Act* (Section 13(2)), archaeological sites may not be damaged, excavated or altered without a permit issued by the Minister or designate. The BC Provincial Heritage Register database is the basis for records on archaeological sites. The sites contained in this database were obtained and reviewed by Mid Coast technical committee members from the Heiltsuk and Gwa'sala'Nakwaxda First Nations. The mapped areas were deemed inadequate to represent the issue as several know sites were missing and there will be further impacts from currently unknown sites. Considering the effort required to improve the dataset and the sensitivity of this information to FN's, it was decided to include this issue with the non spatial netdown approach taken to address the First Nation EBM issues discussed later in this document. Refer to section 8.5 for more detail. Uncertainty around this issue will be addressed in the THLB size sensitivity analysis.

3.3.7 Karst

In March 2007, a GAR order established specific elements of karst systems as "resource features" in the North Island - Central Coast Forest District and this designation results in protection under FRPA's Forest Planning and Practices Regulations. The elements named in the GAR order are:

- Karst caves
- Important features and elements within high and very high vulnerability karst
- Significant surface karst features

Mapped inventory data reflecting karst likelihood (presence) and development intensity (quality) was reviewed for the Mid Coast TSA. This mapping does not directly identify karst vulnerability it was assumed that areas with a high likelihood of occurrence combined with a high quality rating would meet this definition. There was almost no area ranked as high (primary) likelihood in the TSA. Discussions within the MFR staff and licensees confirmed that karst features are rare in the TSA and any occurrences can be effectively dealt with using stand level retention strategies. Thus, no netdown was specifically implemented for karst.

3.3.8 Wildlife habitat areas (WHA's)

The provincial *Identified Wildlife Management Strategy* provides for the creation of Wildlife Habitat Areas (WHA) within the TSA, to protect key habitat features of listed wildlife species. Legal WHA's exist in the TSA for Grizzly Bear while Draft WHA's have been developed for Sandhill Crane, Tail Frog, Northern Goshawk, and Marbled Murrelets. Only the legal Grizzly Bear WHA's will be netted out of the landbase in the Base Case as the others are not yet finalized. Proposed WHA's may be evaluated using sensitivity analysis and can also be addressed at the time of determination by considering their contribution to the target 1% impact on the THLB as defined in the Identified Wildlife Management Strategy.

Table 13. Reductions for established WHA's

Description	Percent Reduction	Prod Area (ha)	Effective Netdown Area (ha)
Grizzly Bear WHA's	100%	13,659	3,902

3.3.9 Mountain Goat Winter Range

In 2007, a Government Action Regulation (GAR - #U-5-004)) order was established that identifies habitat areas and prevents harvest from occurring in 90% of the habitat area in each landscape unit. This will be modeled by ensuring 90% of the habitat in each LU is spatially reserved from harvest.

Table 14. Reductions for Mountain Goat

Description	Percent Reduction	Prod Area (ha)	Effective Netdown Area (ha)
Mountain Goat WR	90%	32,558	163

The area to be reserved (90% or 32,558 ha) was selected using any constrained landbase first and then any unconstrained landbase starting with the lowest site indexes. Each LU was evaluated independently. The vast majority of the Mountain Goat area overlapped with inoperable areas, parks, or ESA's.

3.3.10 FRPA Riparian Reserve and Management Zones

Riparian reserve areas around lakes, wetlands, and streams in the Mid Coast TSA are excluded from the timber harvesting land base. Management practices within riparian management zones also resulted in areas excluded from the timber harvesting land base. Based on typical licensee FSP commitments, a portion of the volume/area of these zones was retained as shown in the tables below. In the analysis, this was represented by an additional buffer width that was 100% excluded. When the reserve zone and representative portion of the management zone were added together, an "effective" buffer width was defined and then ultimately used in the model as a 100% spatial netdown. See Table 16 for a description of the netdown assumptions for lakes and wetlands, and Table 15 for a description of stream netdown assumptions.

3.3.10.1 Streams and Rivers

Stream classifications were assigned to all TRIM stream reaches using a classification algorithm designed to be consistent with the FRPA definitions. Stream widths were inferred from stream order and magnitude (number of reaches above). Buffers were applied to both sides of mapped streams using 'effective' widths as per Table 15 and then removed from the timber harvesting land base. Basal area retention in management zones is reflective of typical management practices in the TSA.

Table 15. Land base reductions for streams

Stream Class	Reserve Zone (RRZ) (m)	Mgmt Zone (RMZ)(m)	RMZ Basal Area Retention (%)	Effective (1) Riparian Rsv Width (m)	Prod Area (ha)	Effective Netdown Area (ha)
S1-A (>100m)	0	100	50	50	15,795	5,853
S1-B (20-100m)	50	20	50	60		
S2	30	20	50	40		
S3	20	20	50	30		
S4	0	30	25	7.5		
S5	0	30	15	4.5		
S6	0	20	5	1		

(1) Effective riparian rsv width = RRZ + (RMZ * (basal area retention / 100)). This width is applied to both sides of the stream.

Only buffered S1-S5 streams were removed spatially. The small buffers on S6 streams were used to calculate a non-spatial retention percentage for each polygon and then this was tracked in Patchworks. These areas are able to contribute toward non timber objectives but did not contribute toward harvest volumes/areas.

3.3.10.2 Lakes and Wetlands

Lake and wetland classifications were assigned to all TRIM water polygons consistent with the logic in the Riparian Management Guidebook (MFR 1997). Buffers were created adjacent to mapped lakes and wetlands using 'effective' widths as per Table 16 and then removed from the timber harvesting land base.

Table 16. Land base reductions for lakes and wetlands

Lake/Wetland Class	Reserve Zone (RRZ) (m)	Mgmt Zone (RMZ) (m)	RMZ Basal Area Retention (%)	Effective (1) Riparian Rsv Width (m)	Prod Area (ha)	Effective Netdown Area (ha)
L1-A (>1000 ha)	0	0	0	0	1,139	346
L1-B (5-1000 ha)	10	40	0	10		
L2	10	20	25	15		
L3	0	30	25	7.5		
L4	0	30	25	7.5		
W1 (> 5ha)	10	40	25	20	489	141
W2	10	20	25	15		
W3	0	30	25	7.5		
W4	0	30	25	7.5		
W5	10	40	25	20		
Total					**1,628**	**487**

(2) Effective riparian reserve width = reserve zone + (management zone * (basal area retention / 100)).

3.3.11 Recreation Features

Recreation features are features on the landbase that are important to public and commercial recreation activities. These can include wildlife viewing areas, camp sites, sheltered moorage areas, etc and can sometime result in the exclusion of harvest activities.

Using the Recreation Features Inventory (RFI) dataset for the Mid Coast TSA, high value areas were identified. Polygons coded with Significance/Sensitivity ratings of VH-H, H-H, VH-M, H-M, M-H were selected for netdown considerations. After a review of these areas, it was determined that only a subset (50%) of the areas falling outside constraining VQO polygons (Preservation, Retention, Partial Retention) should be removed as netdowns. These areas represented things like grizzly bear viewing areas in river valleys and a 100% netdown was considered excessive. Licensee's operational experience in the TSA is that recreational values can be accommodated through management and rarely result in landbase netdowns.

Table 17. Recreation netdowns

Description	Percent Reduction	Prod Area (ha)	Effective Netdown Area (ha)
Recreation inventory polygons outside of P, R, and PR VQO's with the following Significance - Sensitivity ratings: VH-H, H-H, VH-M, H-M, M-H	50%	21,172 (10,586 after 50%)	3,376

The 50% netdown was turned into a spatial 100% netdown (10,586 ha) by randomly selecting resultant polygons until half of the designated productive area was selected. Then only the area falling outside of previous netdowns was counted toward the effective netdown area.

3.3.12 EBM Riparian Management

EBM requirements for High Value Fish Habitat, Aquatic Non High Value Fish Habitat, Active Fluvial Units (Floodplains), and Forested Swamps have the potential to result in additional landbase netdowns and are discussed below. EBM requirements for Upland Streams and Important Fisheries Watersheds are addressed using forest cover constraints and are discussed in sections 8.5.6 and 8.5.10.

For the purpose of defining reserve zones, the following tree heights were used:

- Outer Coast: 30 m
- Inner Coast: 40 m

Both EBM Orders[3] also offer the potential to use alternative riparian reserve strategies with the implementation of adaptive management, information sharing with FN's, and environmental monitoring – but the default EBM assumptions have been assumed for the base case.

3.3.12.1 High Value Fish Habitat (EBM Obj 9)

High Value Fish Habitat is defined as "critical spawning and rearing areas for anadromous and nonanadromous fish". This occurs in a subset of streams and portions of the ocean shoreline.

For streams:
HVFH was spatially identified using 1:20000 scale streams with a gradient of <= 5% on terrain with <=5% slope and under 900 m in elevation. These criteria are meant to capture the vast majority of alluvial streams in the TSA based on the direction that all alluvial streams should be treated as HVFH unless proven otherwise in the field[4]. The link between 5% gradient streams and alluvial

[3] South Central Coast Order (Aug 2, 2007) and the Central and North Coast Order (Jan 3, 2008)

[4] Background and Intent Document for the SCC and CNC Land Use Objectives Orders, April 18, 2008, pg 23

streams is drawn from work completed by Glynnis Horel, P.Eng.[5] The inclusion of the terrain constraint was intended to eliminate sharply incised draws that are unlikely to be alluvial in nature. A buffer of 45m (30m x 1.5) on the outer coast and 60m (40m x 1.5) on the inner coast was then applied to both side of the streams and the resulting area was fully reserved from harvest.

For oceans:
Key spawning habitat was identified on nautical charts using symbology indicating a high correlation with the occurrence of high value fish habitat (shallow water depth, soft seabed). These portions of the shoreline were then captured and buffered in the same manner as HVFH streams.

Table 18. Reductions for HVFH

Description	Percent Reduction	Prod Area (ha) (Incremental to Other Riparian)	Effective Netdown Area (ha)
HVFH	100%	5,784	1,629

The total productive area shown here represents only the incremental reserves beyond FRPA requirements. If HVFH were to be implemented without FRPA, this area would be significantly higher.

3.3.12.2 Aquatic Non High Value Fish Habitat (EBM Obj 10)

Aquatic non-high value fish habitat was also derived from the TRIM 20,000 scale stream data and using FRPA stream classifications. Both orders require that S1-S3 streams, lakes >0.25 ha, and wetlands >0.25 ha be classified as aquatic non-high value fish habitat. The orders differ slightly in their requirements for reserves (Table 19) and the areas impacted can be found in Table 20.

Table 19. Riparian Retention requirements for Aquatic Non HVFH

Riparian Feature	SCC Order	CNC Order
S1- S3 Streams that are not HVFH	Retain 90% of the PFLB within 1.5x dominant tree height * (implemented as 100% reserve within 1.35x tree height)	
Lakes and wetlands >1ha	Retain 90% of the PFLB within 1.5x dominant tree height * (implemented as 100% reserve within 1.35x tree height)	
Lakes and wetlands 0.25 to 1ha	SCC order : 90% Retention within 1.5 tree height. (1.35 x tree height)	CNC order: 90% Retention within 1.0 tree height. (0.9 x tree height)

* Tree heights were 30m on outer coast and 40m on inner coast.

Table 20. Reductions for Aquatic NonHVFH

Description	Percent Reduction	Prod Area (ha) (Incremental to Other Riparian)	Effective Netdown Area (ha)
Aquatic Non HVFH	100%	6,625	2,083

The total productive area shown here represents only the incremental reserves beyond FRPA requirements. Without FRPA, this area would be significantly higher.

3.3.12.3 Forested Swamps (EBM Obj 11)

Both EBM orders require that forested swamps >0.25 ha are to have 70% retention within 1.5x the dominant tree height. Because they are relatively rare in coastal BC[6], and typically have marginal timber values on them, they were assumed to be addressed in the netdown for stand level retention (EBM Obj 16).

[5] Defining Active Fluvial Units, Glynnis Horel - Ostapowich Engineering Services Ltd, April 1, 2006, pg 2

[6] Pers Con. Ken Zielke of Symmetree Consulting Ltd. Based on experience doing EBM training work and compliance assessments.

3.3.12.4 Active Fluvial Units (EBM Obj 13)

Floodplain (active fluvial units) areas were identified using the CCLRMP floodplain dataset (which was derived using the coastal small scale PEM SELES model) and the mapped TRIM floodplains. These areas were then reduced by excluding any areas occupied by coniferous stands at least 200 years old (>80% coniferous) and any isolated polygons <=0.25 ha in size. The very small polygons were considered to be noise in the dataset and eliminated. The CCLRMP floodplains included high bench floodplains that were not meant to be considered active fluvial units in the final orders. Thus areas with old conifer stands were assumed to be stable within the timeframe of forest management and not "active fluvial units" as defined in the orders (Defining Active Fluvial Units, Glynnis Horel, P. Eng., Ostapowich Engineering Services Ltd, April 1, 2006).

Reserved areas for floodplains are detailed in both the North and South Central Coast EBM orders, although the application of reserves differs. The SCC order requires the reserve of 90% of mapped floodplain areas and the CNC order requires the reserve of 100% of mapped floodplain areas plus 90% retention within 1.5 times dominant tree hts (1.35X avg. dominant tree ht.). Tree heights were 30m on outer coast and 40m on inner coast.

Within the SCC area, the area to be reserved (90%) was selected using any constrained landbase first and then any unconstrained landbase starting with the lowest site indexes.

Table 21. Reductions for Active Fluvial Units

Description	Percent Reduction	Prod Area (ha) (Incremental to Other Riparian)	Effective Netdown Area (ha)
Active Fluvial Units (Floodplains) – SCC	100%	773	126
Active Fluvial Units (Floodplains) – CNC	100%	4,920	1,037
Total		**5,693**	**1,163**

The total productive area shown here represents only the incremental reserves beyond FRPA requirements. Without FRPA, this area would be significantly higher.

3.3.13 Sensitive/Critical Grizzly Bear Habitat (EBM Obj 17)

Grizzly bears are a highly important regional species on the South Central Coast and Central and North Coast. The EBM orders spatially identify sensitive habitat (SCC) or critical habitat (CNC) and then require that it be maintained as functional habitat.

SCC Order Area:

The order requires that sensitive grizzly bear habitat mapped in Schedule 6 (released Oct 2007) be maintained. These mapped areas represent class 1 grizzly bear habitat. The order provides for limited harvesting to occur in these areas if an RPBio confirms that it will not cause a 'material adverse impact' to the habitat, suitable monitoring is completed, and information sharing/consultation takes place with First Nations.

The licensees felt that this would preclude harvest from 90% of the mapped habitat based on their opinion that not all of the mapped area will have the desired attributes on the ground, and a small amount of harvesting would not negatively impact habitat values. Thus, a spatial netdown representing 90% of the mapped grizzly habitat area was implemented. The 90% target was met in each LU by selecting non contributing or constrained areas first – this left the areas most likely to be in the THLB as contributing. For example, if up to 10% of the mapped habitat area in an LU is THLB then there would be no impact on the THLB.

CNC Order Area:

This order requires that all class 1 grizzly bear habitat and 50% of class 2 grizzly habitat as mapped in Schedule 2 be maintained. As no Schedule 2 has been made legal, the base case (current practice) will assume no netdowns for EBM grizzly bear in the CNC order area. A sensitivity analysis is planned

to examine the impact of using the habitat areas found in the Draft Schedule 2 map (released Dec 2008) to derive netdowns.

Table 22. Reductions for Sensitive/Critical Grizzly Bear

Description	Percent Reduction	Prod Area (ha)	Effective Netdown Area (ha)
SCC Sensitive Grizzly Bear	90%	3,957	157
CNC Class 1 Grizzly Bear	90%	0	0
CNC Class 2 Grizzly Bear	50%	0	0

3.4 Exclusions from the Productive Forest Land Base (Non-Spatial)

3.4.1 EBM Objective 4, 5, 6, 7 – First Nations Considerations

Both the Central and North Coast Order (CNC) and the South Central Coast Order (SCC) contain objectives to manage for issues important to First Nations that will result in land base netdowns:

- Objective 4 (Traditional Heritage Features) is aimed at protecting specific traditional heritage features that are of continuing importance to First Nations.
- Objective 5 (Culturally Modified Trees) is designed to identify and protect culturally modified trees of continuing importance to First Nations.
- Objective 6 (Monumental Cedar) is designed to provide for a sufficient volume of monumental cedar to support the present and future cultural cedar needs of First Nations.
- Objective 5 (Stand Level Retention of Cw/Yc) is designed to ensure that sufficient western red and yellow cedar is maintained across the landbase to support First Nations present and future cultural and social uses.

Note: Objective 3 (Traditional Forest Resources) is not addressed through netdowns so is not included here. See section 8.5.1 for details.

The consideration of the First Nations values described in EBM Objective's 4, 5, 6, and 7 are estimated to have a 1.3% net impact on the THLB. This impact level is based on doubling the net THLB impact attributed to these factors in Kingcome TSA TSR3 which doubled the known impact in that area, effectively making this MC reduction 400% greater than known information. The Kingcome dataset representing known First Nations heritage sites was more complete, and updating the Mid Coast dataset was not considered practical within the timelines of this TSR. The technical committee felt that it was best to rely on the recent efforts invested in Kingcome TSA and then double it for application in the Mid Coast TSA. This 1.3% impact was implemented as a non spatial reduction to all THLB polygons. The resulting netdown was treated as part of the PFLB. Uncertainty around this issue will be addressed in the THLB size sensitivity analysis.

3.4.2 EBM Objective 15 – Red and Blue Listed Plant Communities

The SCC and CNC orders require 100% (5% can be disturbed for access) retention of red listed plant communities and 70% retention of blue-listed plant communities. Identifying the spatial locations of these communities is currently difficult as no detailed ecosystem mapping is available for the Mid Coast TSA. Thus, the net THLB impact for the Kingcome TSR3 process was adopted (3% net impact) with the understanding that it likely overstates the impacts slightly.[7] The Kingcome TSA estimate was based on a biophysical model simulation of ecosystems and correlations between these ecosystems and red/blue listed plant communities developed by the Timberline Natural Resources Group.[8] The 3% net impact is entirely attributed to blue listed species because red listed one were so rare as to not have any meaningful net impact on the landbase. This 3% impact was implemented as a non spatial area reduction to all THLB

[7] Pers cmmunication between Mike Landers and Bob Green.

[8] Methods Used to Model Ecosystem Based Management in the Kingcome TSA for Timber Supply Review 3, Timberline Natural Resource Group, 2007

polygons. The resulting netdown area was treated as part of the PFLB. Uncertainty around this issue will be addressed in the THLB size sensitivity analysis.

3.4.3 Stand Level Retention (EBM Obj 16)

The retention of mature standing timber in each block is required to provide structure and diversity at the stand level. Both the SCC and CNC orders state that a minimum 15% of each cutblock should be retained and 50% of this retention should be internal to the cutblock if it's over 15 ha. For the purpose of timber supply analysis, it was necessary to determine what the net impact of this stand level retention objective was because there is significant overlap with other modeling objectives. For example, riparian areas are often used to meet stand level retention requirements and they have already been addressed in the THLB netdown process.

An assessment completed by Forsite to estimate the net impact of the 15% retention requirement produced an incremental impact of 4.6% on the THLB after all other netdowns were considered. This analysis was based on an EBM monitoring report produced by Symmetree Consulting Ltd that examined the retention left in EBM blocks in 2006.[9] The key findings were that the group retention blocks had an actual retention level of 21% (instead of 15%) and 21.8% of this retention appeared to be incremental to the netdowns already spatially addressed in this analysis. Thus, a 4.6% net impact was anticipated from the EBM stand level retention requirement. However, the 1.3% impact discussed earlier for First Nations EBM considerations was felt to be encompassed within the 4.6% because licensees would chose to use areas retained for First Nations issues (CMT's, heritage sites) to meet stand level retention objectives. This left only a 3.3% net impact to be attributed to stand level retention. This small net impact is partially due to the fact that >80% of the TSA's productive forested landbase has already been excluded from timber harvesting and incremental impacts for First Nations issues and Red/Blue listed plant communities have also been assumed.

This 3.3% impact was modeled as a non spatial reduction to all THLB polygons (in addition to the 1.3% for FN issues and 3% for red/blue listed species). The resulting netdown was treated as part of the PFLB. Uncertainty around this issue will be addressed in the THLB size sensitivity analysis.

3.5 Timber License Reversions

Timber licensees (TL's) are old tenures where licensees have the rights to standing mature timber within specified tenure boundaries and this harvest does not count toward the TSA AAC. Once harvested and regenerated, these areas revert to the crown and become part of the TSA landbase – thus contributing to the mid and long term timber supply in the TSA.

Area that were < 50 yrs old inside the mapped TL's were consider to have already reverted to the TSA for purposed of timber supply modeling. The remaining areas were considered to revert at 600 ha per year (consistent with TSR2 assumptions.)

Table 23 provides a summary of the TL's falling inside the Mid Coast TSA.

[9] Implementation Monitoring of EBM in the Central Coast (Symmetree, Feb 28, 2007)

Table 23. Timber Licences occurring in the Mid Coast TSA

TL #	Licensee	Location	Expiry Date
T0377	A&A Trading Ltd	TSA	June 10, 2019
T0398	IFP	TSA	Sept. 3, 2024
T0407	IFP	TSA	Sept. 3, 2009
TO416	IFP	TSA	Expired
T0438	IFP	TSA	Expired
T0474	IFP	TSA	Sept. 3, 2024
T0483	IFP	TSA	Sept. 3, 2017
T0499	IFP	TSA	Sept. 3, 2009
T0572	IFP	TSA	Sept. 3, 2015
T0608	IFP	TSA	Sept. 3, 2024
T0614	Dean Channel FP Ltd	TSA	Sept. 3, 2021
T0633	Dean Channel FP Ltd	TSA	Sept. 3, 2015
T0690	IFP	TSA	Dec. 9, 2010
T0697	IFP	TSA	Dec. 30, 2009
T0742	IFP	TSA	Apr. 16, 2016
T0906*	WFP	TSA	Expired
T0912*	WFP	TSA	Apr. 27, 2010
T0941	IFP	TSA	Oct. 23, 2007
T0945	IFP	TSA	Oct. 23, 2009
T0952	A&A Trading Ltd	TSA	Oct. 23, 2024
T0964	IFP	TSA	Oct. 23, 2024
T0973	IFP	TSA	Oct. 23, 2024
T0980	IFP	TSA	Oct. 23, 2024
T0996	IFP	TSA	Oct. 23, 2024
T1001	IFP	TSA	Oct. 23, 2014

The TL's that will revert to the Community Forest upon harvest will not contribute toward the TSA in the future. Only the areas associated with the TL's that will ultimately revert to the TSA are shown below.

Table 24. Timber license area summary

Currently Reverted Area (ha)	Currently Unreverted Area (ha)	Total Area (ha)
25,101	7,767	32,868

3.6 Changes From TSR2

Since the last timber supply review for the Mid Coast TSA, numerous changes have occurred that impact the size of the THLB. A summary of these changes is provided below:

- New Conservancies, and Biodiversity, Mining and Tourism Areas have been established.
- Two new community forest tenures exist and are no longer part of the TSA.
- A new operable area was defined using stand level economic assessments and Patchworks modeling.
- Low productivity site netdowns now use lower thresholds (vol/ha and site index).
- Recreation netdowns are now based on a new inventory and then limited to areas outside of the most constraining VQO polygons (Preservation, Retention, Partial Retention)
- Legal WHA's exist for grizzly bear.
- New Mountain Goat Winter Range areas have been established and almost entirely exclude harvest from within them.
- Riparian management netdowns were implemented spatially using classified stream/lake/wetland datasets.
- Culturally Modified Trees (CMT's) were addressed as part of the First Nations EBM issue.
- EBM considerations from the North and South Central Coast Orders resulted in netdowns for:
    - High Value Fish Habitat (HFVH)
    - Aquatic Non High Value Fish Habitat
    - Active fluvial units (floodplains)
    - CMT's/Cultural Cw/ Monumental Cw
    - Sensitive/Critical Grizzly Bear Habitat
    - Red and Blue List Species

The TSR3 short term THLB of 124,605 is smaller than the TSR2 'preferred reference' forecast[10] THLB by 34.6%. The majority of this difference comes from the introduction of new parks/protected areas, a new operable landbase, and the introduction of EBM and wildlife requirements.

Other, non-THLB related changes since TSR2 include (Described in section 8.0):

- Higher stand level retention requirements now exist (EBM Obj16).
- Disturbance limits exist in Important Fisheries Watersheds (EBM Obj 8)
- Retention is required around Forested Swamps (EBM Obj 11)
- ECA requirements applied in portions of certain watersheds to manage Upland Streams (EBM Obj 12)
- Higher old seral retention requirement are now applicable and they were modeled at a finer level on the landbase (LU-site series surrogate combinations instead of LU-BEC variant combinations).
- The amount of mid seral forest was limited to 50%.
- A new UWR order for black tailed deer exists and requires from 20-25% of the habitat in each LU to be >141 yrs old at any time. TSR 2 required 25% > 250 yrs old.

[10] TSR2 Rationale pg 17. The THLB area was the same as in the 'revised operability' forecast but the rate of harvest from the outer coast and non-conventional areas was controlled to be sustainable over the long term – effectively lowering the amount of these areas that could be accessed in the short and midterm and making this comparison of landbase imperfect.

4.0 Growth and Yield

4.1 Analysis units

To reduce the complexity and volume of information in the timber supply analysis, individual stands were aggregated into 'analysis units' based on leading tree species (inventory type group), site productivity, and age. Each analysis unit had an associated yield table that provided the net merchantable volume available for harvest at various stand ages.

Table 25. Analysis Unit Descriptions

Analysis Unit Description	Existing Stand AU #	Regen Stand AU#	PFLB Area (ha)	THLB Area (ha)	SI Wtd Avg (Inv)	SI Wtd Avg (Adj)	Variables used to define analysis unit		
							Leading Species	Site index range	Age Range (yrs)
Existing Natural Stands:									
Douglas-fir-good	101	201	1,111	417	29.7	29.7	Fd	>27	26-140yrs
Douglas-fir-medium	102	202	3,397	773	24.7	24.7	Fd	20-27	26-140yrs
Douglas-fir-poor	103	203	3,632	115	18.0	18.0	Fd	<20	26-140yrs
Cedar-good	104	204	1,163	616	27.1	23.9	Cw or Yc	>23	20-140yrs
Cedar-medium	105	205	3,087	2,003	22.9	23.1	Cw or Yc	>19-23	20-140yrs
Cedar-poor	106	206	1,029	508	15.6	21.4	Cw or Yc	15-19	20-140yrs
Cedar-low	107	207	1,988	92	13.7	22.3	Cw or Yc	<15	20-140yrs
Hemlock/balsam-good	108	208	6,332	2,226	28.1	27.3	H or B	>22	26-140yrs
Hemlock/balsam-medium	109	209	17,522	6,195	21.6	26.9	H or B	>17-22	26-140yrs
Hemlock/balsam-poor	110	210	7,264	550	14.6	25.6	H or B	12.5-17	26-140yrs
Hemlock/balsam-low	111	211	12,151	32	11.7	24.3	H or B	<12.5	26-140yrs
Spruce-good	112	212	1,302	322	27.6	27.6	S	>22	26-140yrs
Spruce-medium	113	213	3,444	314	20.7	20.7	S	15-22	26-140yrs
Spruce-poor	114	214	4,097	56	11.7	11.7	S	<15	26-140yrs
Douglas-fir-good	121	221	391	42	27.7	27.7	Fd	>27	>140yrs
Douglas-fir-medium	122	222	5,265	969	23.1	23.1	Fd	20-27	>140yrs
Douglas-fir-poor	123	223	9,278	554	18.8	18.8	Fd	<20	>140yrs
Cedar-good	124	224	386	149	24.1	22.4	Cw or Yc	>23	>140yrs
Cedar-medium	125	225	2,692	793	20.4	22.9	Cw or Yc	>19-23	>140yrs
Cedar-poor	126	226	47,876	17,523	16.6	20.5	Cw or Yc	15-19	>140yrs
Cedar-low	127	227	262,370	36,365	13.1	19.1	Cw or Yc	<15	>140yrs
Hemlock/balsam-good	128	228	4,546	562	24.1	26.5	H or B	>22	>140yrs
Hemlock/balsam-medium	129	229	44,226	10,540	18.8	24.4	H or B	>17-22	>140yrs
Hemlock/balsam-poor	130	230	131,643	20,317	15.0	24.3	H or B	12.5-17	>140yrs
Hemlock/balsam-low	131	231	133,242	2,795	11.7	22.9	H or B	<12.5	>140yrs
Spruce-good	132	232	3,271	375	26.9	26.9	S	>22	>140yrs
Spruce-medium	133	233	23,432	948	18.8	18.8	S	15-22	>140yrs
Spruce-poor	134	234	43,764	806	13.3	13.3	S	<15	>140yrs
Non Merch - Cottonwood	151	256	3,296	-	-	-	Ac	All	All
Non Merch - Alder	152	255	9,055	-	-	-	Dr	All	All
Non Merch - All Others	153	257	186,526	-	-	-	At, Mb, Pl, L	All	All
Existing Managed Stands:									
Douglas-fir-good	301	401	1,158	706	28.6	28.6	Fd	>27	<=25
Douglas-fir-medium/poor	302	402	2,646	1,808	23.6	23.6	Fd	20-27	<=25
Douglas-fir-poor	303	403	1,086	275	15.8	15.8	Fd	<27	<=25
Cedar-good	304	404	1,035	879	26.8	17.9	Cw or Yc	>23	<=19
Cedar-medium	305	405	2,701	1,908	22.0	17.9	Cw or Yc	19-23	<=19
Cedar-poor	306	406	3,955	2,717	17.1	16.0	Cw or Yc	15-19	<=19
Cedar-low	307	407	2,592	1,240	13.4	20.6	Cw or Yc	<15	<=19
Hemlock/balsam-good	308	408	7,623	5,501	25.1	25.7	H or B	>22	<=25
Hemlock/balsam-medium	309	409	12,928	9,319	21.5	26.3	H or B	>17-22	<=25
Hemlock/balsam-poor	310	410	4,168	2,233	15.2	23.3	H or B	12.5-17	<=25
Hemlock/balsam-low	311	411	2,145	217	11.9	22.9	H or B	<12.5	<=25
Spruce-good	312	412	997	572	27.8	27.8	S	>22	<=25
Spruce-medium	313	413	1,426	887	21.0	21.0	S	15-22	<=25
Spruce-poor	314	414	89	72	12.0	12.0	S	<15	<=25
Total			**1,023,326**	**135,293**	**17.2**	**22.3**			

Note: The adjusted site index (SI Wtd Avg -Adj) shown for each AU in this table is only applicable to managed stands (AU's > 200).

4.2 Site index

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

4.2.1 Site Index Adjustment for Managed Stands

Timberline Natural Resource Group completed a Site Index Adjustment (SIA) project for the Mid Coast TSA during 2008[11]. The project developed improved estimates of site index for managed Cw and Hw leading stands. These adjusted site indexes will be used in place of inventory site indexes when building managed stands yield curves (TIPSY curves) for the TSR3 base case.

The statistical adjustment process compared field data to expert derived preliminary estimates of site index generated for individual polygons and then used a ratio-of-means (ROM) statistical procedure to adjust the site indexes. The 95% sampling error was 1.2m for Cw and 1.3m for Hw and was within the target sampling error of ±1.5m (95% probability).

Table 26. Cw and Hw Site Index Adjustment Statistics

Species	Target Population		Sample List			ROM	R^2	Adj. Pop.	
	Area (ha)	Prelim PSI (m)	n	Field SI (m)	Prelim PSI (m)			Avg. SI (m)	SE (m)
Cw	483,436	20.5	42	23.6	22.6	1.046	4.4	21.4	1.2
Hw	483,436	24.8	60	27.7	27.6	1.002	1.1	24.9	1.3

N = number of samples, SE = sampling error.

When the adjusted site indexes are compared against inventory site indexes (Cw and Hw stands) in the target population, the adjusted values can be seen to be significantly higher: +7.3m (or 56%) for Cw and +9.8m (or 63%) for Hw. The change is average site index for each Analysis Unit and the THLB as a whole can be viewed Table 25. When applied fully in the THLB, the average site index rises from 17.2m to 22.3 m (+5.1m or 29.7%).

4.2.2 Site curves

For each tree species, site curves were available to illustrate the relationship between stand height and age for a range of site indices. In all cases, this analysis used the standard site curves recommended by the BC Ministry of Forests as identified in the *Site Tools* software. They were as follows:

Table 27. Site index source

Species	Source
Cw (coastal)	Kurucz (1985ac)
Hw (coastal)	Wiley (1978ac)
Ss	Nigh (1997)
Fd (coastal)	Bruce (1981ac)
Ba	Kurucz (1982ac)
Dr	Nigh and Courtin (1998)

4.3 Utilization level

Utilization levels define the maximum height of stumps that may be left on harvested areas, the minimum top diameter (inside bark), and the minimum diameter at breast height (dbh) of stems that must be removed from harvested areas. These factors were needed to calculate merchantable stand volume for use in the analysis, and will be used for all analysis units.

[11] Timberline Natural Resource Consultants Ltd. 2009. *Site Index Adjustment of the Mid Coast Timber Supply Area* (Project # BC0108405), January 2009, Timberline Natural Resource Consultants, Victoria, BC

Table 28. Utilization levels

Species	Minimum dbh[1] (cm)	Maximum stump height (cm)	Minimum top dib[2] (cm)
Existing Natural Stands	17.5	30	10
Existing Managed Stands	12.5	30	10
Future Managed Stands	12.5	30	10

[1] Diameter breast height
[2] Diameter inside bark

4.4 Decay, waste and breakage for unmanaged stands

Decay, waste and breakage (DWB) factors are applied to natural stand yield tables (VDYP) to obtain net harvest volumes per hectare. Initial net volume estimates were generated using the adjusted inventory attribute values (age, height, site index) in VDYP with the default decay, waste and breakage factors applied.

4.5 Operational adjustment factors for managed stands

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

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

Standard operational adjustment factors (OAF) were used to model managed stands. OAF1 was set to 0.85 (15% reduction) and OAF2 was set to 0.95 (5% reduction).

4.6 Natural Stand Volume Projections

Yield tables were derived for existing natural stands using VDYP 6 Batch v6.6d. A yield table was generated for each polygon and then aggregated into one table for each Analysis Unit (AU) using area weighted averages. The yield tables used during modeling and are provided in Appendix A.

4.7 Managed Stand Yield Tables

All future managed stand AU's had an associated existing stand AU from which it inherited stands when they were logged. These future managed stand AU's used the area weighted adjusted site indexes for each AU (Table 25) and the regeneration assumption outlined in this document (Section 5.0). These values were input into Batch TIPSY 4.1c to generate a yield curve for each AU.

Existing managed stand yields were also derived using the adjusted site index (Table 25) and the regeneration assumptions outlined in Section 5.0. Existing managed stands are those currently under 25 years of age (est. 1983) for Fd, Hw and Ba stands and under 19 years of age (est. 1989) for Cw/Yc stands.

The regeneration assumptions required to model managed stands in TIPSY consist of:

- Species composition (See Section 5.1);
- Initial density (See Section 5.1);
- Regeneration method (See Section 5.1);
- Area-weighted average site index (See Section 5.1);
- Area-weighted genetic gains (See Section 5.4);
- Operational adjustment factors (See Section 4.5); and
- Regeneration delay (See Section 5.3).

Once merchantable stand yields were obtained from TIPSY, yield estimates were further reduced to reflect the area lost to future roads (see section 3.2.4.3). These 'effective' yield tables were used during modelling and are provided in Appendix A.

4.8 Existing Timber Volume Check

To verify that no errors were made in natural stand yield table aggregation and that no significant aggregation bias exists, the total volume of the current (starting) inventory using polygon-specific inventory volumes was compared to the volume derived using analysis unit yield tables. The results for existing natural (VDYP) AU's are shown in Table 29 by AU and in Table 30 by age class.

Table 29. Existing timber volume check by AU

AU	THLB Area (ha)	Volume derived from:		Difference From Inv		Comments
		Yield tables (AU)	Inventory	m3	%	
101	417	187,943	201,347	13,404	-7.1%	AU's 101 to 114 (which are natural stands <140 yrs), tended to have poorer correlations between inventory and yield tables. Better correlations occurred in the older (≥ 140 yrs) AU's where the bulk of the THLB exists.
102	773	226,177	227,535	1,358	-0.6%	
103	115	17,139	18,946	1,807	-10.5%	
104	616	111,183	108,282	-2,901	2.6%	
105	2,003	84,723	67,833	-16,890	19.9%	
106	508	24,876	26,746	1,870	-7.5%	
107	92	16,284	17,222	938	-5.8%	
108	2,226	739,076	723,567	-15,509	2.1%	
109	6,195	654,065	583,321	-70,744	10.8%	
110	550	76,249	85,793	9,544	-12.5%	
111	32	7,409	7,592	183	-2.5%	
112	322	72,873	70,337	-2,536	3.5%	
113	314	38,271	31,497	-6,774	17.7%	
114	56	7,178	8,307	1,129	-15.7%	
121	42	37,709	38,650	941	-2.5%	
122	969	660,525	673,068	12,543	-1.9%	
123	554	265,689	272,483	6,794	-2.6%	
124	149	125,724	127,990	2,266	-1.8%	
125	793	592,200	603,880	11,680	-2.0%	
126	17,523	10,151,890	10,345,176	193,286	-1.9%	
127	36,365	15,668,896	15,981,065	312,169	-2.0%	
128	562	520,147	530,666	10,519	-2.0%	
129	10,540	8,413,255	8,574,024	160,769	-1.9%	
130	20,317	12,539,990	12,769,845	229,855	-1.8%	
131	2,795	1,311,868	1,331,741	19,873	-1.5%	
132	375	395,120	403,282	8,162	-2.1%	
133	948	868,607	886,305	17,698	-2.0%	
134	806	587,309	594,882	7,573	-1.3%	
All VDYP	**106,959**	**54,402,375**	**55,311,384**	**909,009**	**-1.7%**	

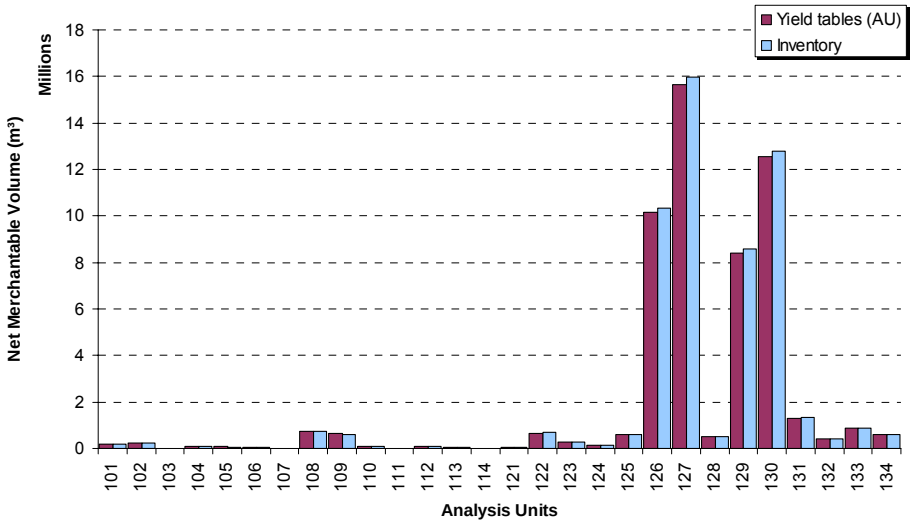


Figure 6. Net volumes by AU based on AU curves or forest inventory data

Table 30. Existing timber volume check by Age Class

Age Class	THLB Area (ha)	Volume derived from:		Difference From Inv		Comments
		Yield tables (AU)	Inventory	M^3	%	
0-20	343	318	21	-297	93.4%	Yield curves in younger age classes (<140 years) tended to have poor correlations between yield curves and inventory volumes. Better correlations occurred in the older (≥ 140 yrs) age classes where the bulk of the THLB exists.
21-40	9,054	482,155	402,958	-79,197	16.4%	
41-60	2,238	474,601	473,372	-1,229	0.3%	
61-80	401	151,511	145,181	-6,330	4.2%	
81-100	735	360,584	350,077	-10,507	2.9%	
101-120	428	230,145	250,183	20,038	-8.7%	
121-140	1,021	564,132	556,532	-7,600	1.3%	
141-250	13,281	7,508,254	7,661,503	153,249	-2.0%	
250+	79,458	44,630,675	45,471,555	840,880	-1.9%	
All VDYP	**106,959**	**54,402,375**	**55,311,384**	**909,009**	**-1.7%**	

Figure 7. Net volumes by age class based on AU curves or forest inventory data

Overall, the volumes being generated from the AU yield tables correlated well with the inventory (<2% difference).

5.0 Silviculture

5.1 Silviculture management regimes

While several different silvicultural management regimes have historically been utilized in the Mid Coast TSA, the dominant regime has been to clearcut and retain patches of leave trees within or adjacent to harvest units. With the introduction of EBM, there has been an emphasis on leaving more retention, and dispersing it more widely in the harvest unit. Specific to the Mid Coast TSA, this type of silviculture can be broken down into two broad categories:

- Group Retention
    - Retention is left in groups or patches along the edge of a block or internal to a block. Under EBM, blocks over 15 ha in size require half of the required retention to be left internal to the block.
    - The amount of retention left in group selection blocks in the Mid Coast TSA has typically been consistent with the 15% EBM requirement but additional retention is sometimes left in constrained areas (i.e. areas managed for visuals). The impacts of this *additional* retention will be captured by the modeling of disturbance limits in VQO polygons – which also serves to limit the accessible volume in these areas.
    - Productivity losses associated with shading from the retention left in group retention blocks is considered to be insignificant and is not addressed in the analysis.[12]
    - This silviculture regime is expected to be the dominant approach used in the TSA going forward.
- Dispersed Retention
    - Retention is left scattered throughout the harvest unit so that almost the entire unit is under the influence of retained stems. Retention levels are typically >40%.
    - The amount of retention in dispersed retention blocks in the Mid Coast TSA is typically higher than with group retention because it is typically utilized in areas managed for visuals or other non timber values. As with group selection above, the impacts of this additional retention will be captured through the modeling of these other values (i.e. VQO disturbance limits). Productivity losses from shading are likely an issue with this system but it is difficult to know what incremental impacts should be applied beyond those arising from the disturbance constraints. Also, the amount of this type of silviculture regime occurring in the future is expected to be very small (licensees estimate 50 ha/yr) so it has not been modeled explicitly here. Currently logged blocks with this system have had all volume depleted from them.

The term 'High Retention' harvesting has received a large amount of attention in the last several years on the BC coast. It involves leaving a large amount of dispersed mature stems on site (>30-40m^2 of basal area) such that the stand is still considered 'stocked' after harvesting and thus there is no regeneration obligation. In the Mid Coast TSA, a small amount of this type of harvesting has occurred in the last 5 years and mostly in what was considered to be Non THLB stands. Past harvest areas fitting this description have been depleted from the inventory. In the future, licensees have no plans to do High Retention harvesting so it has not been modeled in this analysis.

For the purposes of TSR3, analysis units have been built to model only group retention silvicultural regimes that retain stems to meet EBM requirements. It is recognized that operational practices are somewhat more complex than this but a degree of generalization is required for TSR modeling, and the vast majority of logging in the TSA will follow this regime.

5.2 Regeneration Assumptions

After harvest, stands in the TSA follow various silvicultural management regimes depending on originating stand type. Some stand types rely on natural regeneration while others rely on planting or a combination of the two. This section of the data package summarizes the silvicultural management inputs used in the TIPSY growth and

[12] Personal discussions with Mario DiLucca (MFR Growth and Yield Specialist).

yield model for each managed stand AU. Table 31 provides a summary of the inputs used in TIPSY to produce managed stands yield curves. These assumptions were developed by licensee silviculture staff and reflect current regeneration practices for each of the stand types shown.

Table 31. Regeneration Assumptions (TIPSY inputs) Future Managed Stands

Existing AU#	Regen AU #	Description	Regen Method	Regen Species and Weighting (%)	SI Range	Initial Competing Density* (stems/ha)	OAFs	Regen Delay (yrs)	Genetic Worth (Prorated GW)
101/121	201/221	Douglas fir good	Plant $_{100}$	$Fd_6Cw_2Hw_2$	>27	1200	15/5	1	Fd – 3.5% Hw – 0% Cw – 5.8% Ss – 0%
102/122	202/222	Douglas fir medium	Plant $_{95}$ Natural $_5$	$Fd_6Cw_2Hw_2$ Fd_5Hw_5	20-27	1200 4000	15/5	1 2	
103/123	203/223	Douglas fir poor	Plant $_{80}$ Natural $_{20}$	$Fd_7Hw_2Cw_1$ $Fd_5Hw_3Cw_2$	<20	1200 4000	15/5	1 2	
104/124	204/224	Cedar good	Plant $_{95}$ Natural $_5$	$Cw_7Hw_2Ba_1$ $Cw_5Hw_4Ba_1$	>23	1200 4000	15/5	1 2	
105/125	205/225	Cedar medium	Plant $_{80}$ Natural $_{20}$	$Cw_7Hw_2Ba_1$ Hw_5Cw_5	>19-23	1200 4000	15/5	1 2	
106/126	206/226	Cedar poor	Plant $_{80}$ Natural $_{20}$	$Cw_7Hw_2Yc_1$ $Cw_4Hw_4Yc_2$	15-19	1000 4000	15/5	1 3	
107/127	207/227	Cedar low	Plant $_{80}$ Natural $_{20}$	$Cw_6Yc_2Hw_2$ $Cw_4Hw_4Yc_2$	<15	1000 4000	15/5	1 3	
108/128	208/228	Hemlock/balsam good	Plant $_5$ Natural $_{95}$	$Hw_4Cw_4Ba_2$ Hw_6Ba_4	>22	1400 4000	15/5	1 2	
109/129	209/229	Hemlock/balsam med	Plant $_{40}$ Natural $_{60}$	$Hw_5Ba_3Cw_2$ Hw_5Ba_5	>17-22	1400 4000	15/5	1 2	
110/130	210/230	Hemlock/balsam poor	Plant $_{30}$ Natural $_{70}$	$Hw_6Ba_2Cw_2$ $Hw_6Ba_3Cw_1$	12.5-17	1400 4000	15/5	1 3	
111/131	211/231	Hemlock/balsam low	Plant $_{20}$ Natural $_{80}$	$Hw_6Ba_2Yc_1Cw_1$ $Hw_6Ba_3Yc_1$	<12.5	1400 4000	15/5	1 3	
112/132	212/232	Spruce good	Plant $_{95}$ Natural $_5$	$Ss_5Ba_4Hw_1$ $Hw_5Ss_4Ba_1$	>22	1400 4000	15/5	1 3	
113/133	213/233	Spruce medium	Plant $_{95}$ Natural $_5$	$Ss_4Ba_4Hw_2$ $Hw_4Ba_3Ss_3$	15-22	1200 4000	15/5	1 3	
114/134	214/234	Spruce poor	Plant $_{95}$ Natural $_5$	$Ss_4Ba_3Hw_3$ $Hw_6Ba_2Ss_2$	>15	1200 4000	15/5	1 3	
151	251	Cottonwood	Natural $_{100}$	Ac	All	5000	15/5	1	
152	252	Alder	Natural $_{100}$	Dr	All	5000	15/5	1	

* This density refers to the number of stems/ha that are competing to be the next crop trees. This number is typically higher than a well spaced number and lower than a total stems number because all competing stems are counted but those in a different layer (or cohort) are not counted.

Table 32. Regeneration Assumptions (TIPSY inputs) Existing Managed Stands

Existing AU#	Regen AU #	Description	Regen Method	Regen Species and Weighting (%)	SI Range	Initial Competing Density* (stems/ha)	OAFs	Regen Delay (yrs)	Genetic Worth (Prorated GW)
301	401	Douglas-fir-good	Plant $_{100}$	$Fd_6Cw_2Hw_2$	>27	1200	15/5	1	Fd – 0 % Hw – 0% Cw – 0% Ss – 0%
302	402	Douglas-fir-medium/poor	Plant $_{95}$ Natural $_5$	$Fd_6Cw_2Hw_2$ Fd_5Hw_5	20-27	1200 4000	15/5	1 2	
303	403	Douglas-fir-poor	Plant $_{80}$ Natural $_{20}$	$Fd_7Hw_2Cw_1$ $Fd_5Hw_3Cw_2$	<20	1200 4000	15/5	1 2	
304	404	Cedar-good	Plant $_{95}$ Natural $_5$	$Cw_7Hw_2Ba_1$ $Cw_5Hw_4\ Ba_1$	>23	1200 4000	15/5	1 2	
305	405	Cedar-medium	Plant $_{80}$ Natural $_{20}$	$Cw_7Hw_2Ba_1$ Hw_5Cw_5	>19-23	1200 4000	15/5	1 2	
306	406	Cedar-poor	Plant $_{80}$ Natural $_{20}$	$Cw_7Hw_2Yc_1$ $Cw_4Hw_4Yc_2$	15-19	1000 4000	15/5	1 3	
307	407	Cedar-low	Plant $_{80}$ Natural $_{20}$	$Cw_6Yc_2Hw_2$ $Cw_4Hw_4Yc_2$	<15	1000 4000	15/5	1 3	
308	408	Hemlock/balsam-good	Plant $_5$ Natural $_{95}$	$Hw_4Cw_4Ba_2$ Hw_6Ba_4	>22	1400 4000	15/5	1 2	
309	409	Hemlock/balsam-medium	Plant $_{40}$ Natural $_{60}$	$Hw_5Ba_3Cw_2$ Hw_5Ba_5	>17-22	1400 4000	15/5	1 2	
310	410	Hemlock/balsam-poor	Plant $_{30}$ Natural $_{70}$	$Hw_6Ba_2Cw_2$ $Hw_6Ba_3Cw_1$	12.5-17	1400 4000	15/5	1 3	

Existing AU#	Regen AU #	Description	Regen Method	Regen Species and Weighting (%)	SI Range	Initial Competing Density* (stems/ha)	OAFs	Regen Delay (yrs)	Genetic Worth (Prorated GW)
311	411	Hemlock/balsam-low	Plant $_{20}$ Natural $_{80}$	$Hw_6Ba_2Yc_1Cw_1$ $Hw_6Ba_3Yc_1$	<12.5	1400 4000	15/5	1 3	
312	412	Spruce-good	Plant $_{95}$ Natural $_{5}$	$Ss_5Ba_4Hw_1$ $Hw_5Ss_4Ba_1$	>22	1400 4000	15/5	1 3	
313	413	Spruce-medium	Plant $_{95}$ Natural $_{5}$	$Ss_4Ba_4Hw_2$ $Hw_4Ba_3Ss_3$	15-22	1200 4000	15/5	1 3	
314	414	Spruce-poor	Plant $_{95}$ Natural $_{5}$	$Ss_4Ba_3Hw_3$ $Hw_6Ba_2Ss_2$	>15	1200 4000	15/5	1 3	

5.3 Regeneration delay

Regeneration delay is the time between harvesting and the time when stand regrowth begins. The delay incorporates both the time taken to establish a stand, and the age of seedling stock planted, if applicable. Based on past practices and the anticipated approach going forward, a one year delay for planted stands and a 2-3 year delay for naturally regenerating stands was used. See Table 31 for details.

5.4 Gene resources — use of select seed

Where it is available, the TSA uses select seed (class A seed from orchards) for regeneration because of its superior volume production. This section describes the yield adjustments used in this analysis to account for the use of select seed (i.e., orchard & superior provenance seed with a known genetic gain as measured by Genetic Worth [GW]).

Seed Planning Units (SPU's) are polygon features that geographically delineate the appropriate area of seedling use for stock originating from specific seed orchards throughout the province. Each SPU identifies the area and elevation range in which seedlings of a given orchard may be used in regeneration. The SPUs relevant in the Mid Coast TSA are shown in Table 33. Hemlock is not shown because it is rarely planted. Estimates of future genetic worth and seedling availability from MFR Tree Improvement Branch are provided for each SPU in Table 34.

Table 33. Seed Planning Units within the Mid Coast TSA (Class A seed)

Species	Genetic Class "A" Seed Planning Zone	Elevation Band
Douglas Fir	Maritime high	700-1200m
Douglas Fir	Maritime low	1-700m
Douglas Fir	Submaritime low	400-1200m
Western Red Cedar	Maritime low	1-600m
Western Red Cedar	Maritime high	600-1500m
Western Red Cedar	Submaritime low	200-100m

Table 34. Seed Planning Units (Class A Seed) genetic worth and seed availability

SPU	THLB Area (ha)	Percent of Species THLB	Genetic Worth Achieved (2006-08 Spar)	Percent Class A Seedlings (2006-08 Spar)	Planned GW for 2009	Planned Class A Seed Availability for 2009	Projected Future Genetic Worth % (2015)	Projected Class A Seed Availability (2015)
Fdc M High	3,959	4%	0%	0%	0%	0%	0%	0%
Fdc M low	63,478	65%	8%	50%	14%	35.8%	17%	60.2%
Fdc SM low	30,969	31%	0%	0%	2%	42.8%	8%	85.7%
Cw M High	9,602.6	7%	0%	0%	0%	0%	0%	0%
Cw M low	95,477	74%	2%	80%	8%	97.2%	12%	100%
Cw SM Low	23,182	18%	0%	0%	0%	0%	0%	0%

A net GW applicable to each SPU was calculated using the values shown above for 2009 (GW x Avail% x % THLB). For example, Cw M Low has a gain of 8% projected or 2009 and class A seed is expected to be used

97.2% of the time on 74% of THLB (8 x 0.972 x 0.74 = 5.8%). Current use (2008) of select seed is less than predicted by timelines for 2009 but this was felt to be offset by the increased gains projected into the future (between 2008 and 2015).

These values were then simplified to the species level by prorating the SPU values using THLB area.

Existing managed stands did not receive any adjustment reflecting improved seed use as the majority of stands would not have been established with improved seed. There will be a slight underestimation of timber supply in the future as a small portion of these stands will actually benefit from GW gains.

Future managed stands received the 2009 net GW's for Fdc (3.5%), Cw (5.8%).

Genetic gains were incorporated into the growth and yield curves through TIPSY model functionality. When Cw or Fdc were included in a planted managed stand AU, its associated Net GW was input into TIPSY. This net GW reflects the average genetic gain associated with ALL seedlings of a given species planted in a typical year and is shown in Table 35.

No increase in genetic worth was implemented during the planning horizon. This likely results in an underestimation of long term timber supply but was done because long term projected gains have yet to be proven.

Table 35. Net genetic worth by species to be applied in timber supply model

Species	Genetic Gains applied in TIPSY For Base Case Future Managed Stands (GW%xAval%)
Cw	5.8%
Hw	0%
Fdc	3.5%

5.5 Silviculture History (defining existing managed stands)

For growth and yield modeling, stands are classified into two categories based on their management status: natural/unmanaged stands and managed stands (2nd growth). Natural stands typically regenerated with no silviculture treatments that would have ensured full stocking and/or a good distribution of stems. Managed stands have had silviculture treatments and are assumed to be full stocked and well distributed. The area considered managed and natural is summarized in Table 36

Table 36. Managed and natural stand area

Management Status	Definition	THLB (ha)
Natural	Cw leading >19 yrs and others > 25 yrs	28,334
Managed	Cw leading <=19 yrs (est 1989) and others <= 25 yrs (Est 1983)	106,959
Total (not including TL reversions)		135,293

5.6 Backlog and current not satisfactorily restocked areas (NSR)

Backlog NSR is any area that was denuded prior to 1987 (when basic silviculture became the obligation of licensees) and is not yet fully stocked. There is no backlog NSR remaining in the Mid Coast TSA.
All other NSR areas are considered current NSR. Current NSR was assigned to existing managed stand analysis units and any delay in restocking these sites was reflected in the regeneration delay's assigned to these analysis units. These sites have either been reforested but are not yet confirmed in the inventory file, or will be reforested because licenses are under a legal obligation to do so.

5.7 Incremental Silviculture and Commercial Thinning

In the Mid Coast TSA, approximately 1000 ha of fertilization occurred in the early 1990's but little to no incremental silvicultural practices have occurred since. Commercial thinning is not occurring or planned.

6.0 Timber harvesting

6.1 Minimum harvestable age / merchantability standards

In order for a stand within the timber supply model to be considered for harvesting, it must achieve a minimum harvest age that ensures it meets reasonable economic criteria and emulates what is generally current practice by forest licensees. Note that these are minimum criteria, not the actual ages at which stands are forecast for harvest. Some stands may be harvested at the minimum thresholds to meet forest-level objectives while other stands may be not be harvested until well past their "optimal" timber production ages due to management objectives for other resource values such as old forest retention requirements, or ungulate winter range.

The minimum harvest age to be utilized for each analysis unit is defined in Table 37. For a detailed description of all analysis unit definitions, see Table 25.

Table 37. Minimum harvest ages

Existing Stands			Future Stands		
AU #	AU Description	Min Harvest Age	AU #	AU Description	Min Harvest Age
101	Douglas fir good <=140yrs	80	201	Douglas fir good <=140yrs	60
102	Douglas fir medium <=140yrs	90	202	Douglas fir medium <=140yrs	60
103	Douglas fir poor <=140yrs	140	203	Douglas fir poor <=140yrs	110
104	Cedar good <=140yrs	100	204	Cedar good <=140yrs	80
105	Cedar medium <=140yrs	120	205	Cedar medium <=140yrs	80
106	Cedar poor <=140yrs	200	206	Cedar poor <=140yrs	90
107	Cedar low <=140yrs	230	207	Cedar low <=140yrs	80
108	Hemlock/balsam good <=140yrs	70	208	Hemlock/balsam good <=140yrs	60
109	Hemlock/balsam medium <=140yrs	90	209	Hemlock/balsam medium <=140yrs	60
110	Hemlock/balsam poor <=140yrs	140	210	Hemlock/balsam poor <=140yrs	60
111	Hemlock/balsam low <=140yrs	180	211	Hemlock/balsam low <=140yrs	70
112	Spruce good <=140yrs	60	212	Spruce good <=140yrs	60
113	Spruce medium <=140yrs	80	213	Spruce medium <=140yrs	80
114	Spruce poor <=140yrs	130	214	Spruce poor <=140yrs	130
121	Douglas fir good >140yrs	80	221	Douglas fir good >140yrs	60
122	Douglas fir medium >140yrs	90	222	Douglas fir medium >140yrs	70
123	Douglas fir poor >140yrs	120	223	Douglas fir poor >140yrs	100
124	Cedar good >140yrs	110	224	Cedar good >140yrs	90
125	Cedar medium >140yrs	130	225	Cedar medium >140yrs	80
126	Cedar poor >140yrs	160	226	Cedar poor >140yrs	100
127	Cedar low >140yrs	230	227	Cedar low >140yrs	110
128	Hemlock/balsam good >140yrs	80	228	Hemlock/balsam good >140yrs	60
129	Hemlock/balsam medium >140yrs	100	229	Hemlock/balsam medium >140yrs	70
130	Hemlock/balsam poor >140yrs	130	230	Hemlock/balsam poor >140yrs	70
131	Hemlock/balsam low >140yrs	170	231	Hemlock/balsam low >140yrs	80
132	Spruce good >140yrs	60	232	Spruce good >140yrs	60
133	Spruce medium >140yrs	90	233	Spruce medium >140yrs	80
134	Spruce poor >140yrs	120	234	Spruce poor >140yrs	110
301	Douglas-fir-good	60	401	Douglas-fir-good	60
302	Douglas-fir-medium/poor	70	402	Douglas-fir-medium/poor	70
303	Douglas-fir-poor	150	403	Douglas-fir-poor	150
304	Cedar-good	130	404	Cedar-good	130
305	Cedar-medium	130	405	Cedar-medium	130
306	Cedar-poor	160	406	Cedar-poor	160
307	Cedar-low	100	407	Cedar-low	100
308	Hemlock/balsam-good	70	408	Hemlock/balsam-good	70
309	Hemlock/balsam-medium	60	409	Hemlock/balsam-medium	60
310	Hemlock/balsam-poor	70	410	Hemlock/balsam-poor	70

Existing Stands			Future Stands		
AU #	**AU Description**	**Min Harvest Age**	**AU #**	**AU Description**	**Min Harvest Age**
311	Hemlock/balsam-low	80	411	Hemlock/balsam-low	80
312	Spruce-good	60	412	Spruce-good	60
313	Spruce-medium	80	413	Spruce-medium	80
314	Spruce-poor	120	414	Spruce-poor	120

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

- Existing stands: Minimum volume of 350 m^3/ha and 45 cm dbh (Cw) or 35 cm dbh (others) for the largest 250 trees.
- Future stands: Minimum volume of 350 m^3/ha and 45 cm dbh (Cw) or 35 cm dbh (others) for the largest 250 trees. Must also be within 90% of the culmination MAI.

These criteria were developed in the Economic Operability project (Forsite 2009) and carried forward here. The diameter thresholds are consistent with TSR2.

6.2 Harvest Priorities / Target Weightings

Traditional harvest priorities are not being applied in this analysis. The model being utilized (Patchworks) is an optimization heuristic model which dynamically explores many potential solutions to find the one that best meets user defined goals. Thus, the concept of harvest priorities is not relevant.

Within a goal seeking heuristic model, it is necessary to weight various targets or objectives relative to each other so that solutions reflect the desired outcome. In this analysis, the harvest volume target will be weighted substantially lower than all other targets so that non timber objectives will not be sacrificed to deliver volume. The objective is for harvest volume only to be attractive to the model when all other issues have been addressed (old seral objectives, ungulate winter range objectives, watershed disturbance limits, etc).

Patchworks generates millions of alternative solutions and scores them for how well they achieve the users objectives. As long as the model continues to find better solutions, modeling continues. For this analysis, solutions will be considered final once improvements are less than 0.1% in 100,000 iterations.

6.3 Harvest Profiles

The amount of harvest from the following subsets of the landbase will be monitored and regulated if necessary to ensure that harvest volumes are not inordinately dependant on these types in any one harvest period:

- TSR2 Partition: Hembal Stands with site index <17m. (partition is for ~20% of harvest)
- Non-conventional (Heli) Harvest (as defined in the 2009 Mid Coast Operability Project)
- Inner / Outer Coast stands (TSR2 mapped designation).

7.0 Natural Forest Disturbance

It is inevitable that natural disturbances will occur within the forests of the Mid Coast TSA and the implications of these disturbances on forest age classes and volumes are recognized in the timber supply analysis process. Natural disturbances are events caused by factors such as wildfire, wind, landslides, snow press, insects, disease and other forest health considerations. Two approaches to addressing these issues are used during modeling; one on the THLB and one on the remainder of the forested area of the TSA.

7.1 Unsalvaged Losses on the THLB

The purpose of this section is to quantify the average annual volume of timber that, in the future, will be damaged or killed on the THLB and not salvaged or accounted for by other factors. This factor is meant to capture catastrophic natural events like fires. Endemic pest losses are dealt with through factors applied in the growth and yield models as noted below:

TIPSY: Operational Adjustment Factor 2 reduces gross volumes to account for losses toward maturity such as decay, and endemic forest health issues like minor infestations.
VDYP: The model predicts actual average yields from appropriate inventory ground plots. Endemic losses are inherently recognized in the model data.

Expected non-recoverable losses are summarized in Table 38 and have not changed since TSR2. This volume was added to the annual harvest target in order to remove this volume from the land base and cause an appropriate amount of stand area to have its age set to zero. The unsalvaged loss volume is not included in reported harvest levels for the TSA.

Table 38. Non-recoverable losses

Cause of Loss	Annual Unsalvaged Losses (m^3)
Insects	0
Fire	7,102
Windthrow	13,000
Total	**20,102 m^3/yr**

It should be noted that a decline in yellow cedar (Yc) stands has been observed along the BC coast since 2004 at specific elevation bands. It is believed to be an endemic issue but is not recognized in the VDYP yield curves. Insufficient data exists to quantify its impact for inclusion in the unsalvaged losses estimate but it should be considered as an unquantifiable factor at the time of AAC determination.

7.2 Disturbance in the Non-THLB

As forested stands in the non-THLB contribute toward several forest cover objectives (i.e., landscape level biodiversity, visuals, etc.), it is important that the age class distributions in these stands remain consistent with natural processes. By implementing disturbance in these stands, a natural age class distribution can be maintained in the model and a realistic contribution toward seral goals ensured.

A constant area was disturbed annually in each LU/NDT combination. The amount of disturbance in each LU/NDT combination was based on the BEC variants present and their associated natural disturbance intervals and old seral definitions as outlined in the *Biodiversity Guidebook* (September 1995) and Table 39 below.

Using the negative exponential equation, the proportion of the forest that would typically occur as old seral forest can be calculated based on the disturbance interval (% area old = exp(-[old age / disturbance interval]). Using this % area in old, the calculation of an effective rotation age associated with this seral distribution was possible

(Effective rotation age = interval / (1 – proportion old)). The effective rotation age can then be used to define an annual area of disturbance. For example, ESSF variants in NDT1 have a disturbance interval of 350 yrs and an old definition of 250 yrs. This translates into a typical age class distribution where 49% of the area is "old" (>250 yrs) and the oldest stands are around 490 years. Thus 1/490th of the area needs to be disturbed each year to maintain this age class distribution.

The base case includes annual disturbance of the contributing Non-THLB area in each LU/NDT. The area target was achieved by randomly selecting stands (without replacement) to be disturbed in each period and then hardwiring this into the model. Stands of all ages had equal opportunity to be disturbed.

This method is a simplification of Option 4 in *Modeling Options for Disturbance Outside the THLB - Working Paper* (MFR, June 2003). Modeling of disturbance at the LU/BEC variant level was simplified to the LU/NDT level in order to minimize the number of modeled zones while ensuring that each zone would have a single, old seral age. No minimum amount of old was implemented because disturbance was selected randomly - independent of modeled harvest priority.

Table 39. Calculation of area to be disturbed annually in forested non-THLB by LU/NDT

BEC	NDT	Disturbance Interval (yrs)	"OLD" Defn (yrs)	% Area > OLD*	Effective Rotation Age (yrs)*	Contributing Non-THLB Area (ha)	Annual Area Disturbed (ha) (area / rot age)
MH	1	350	250	49%	490	65,988	135
CWH	1	250	250	37%	395	418,466	1,058
CWH	2	200	250	29%	350	146,044	417
ESSF	2	200	250	29%	350	82,619	236
MS	3	150	140	39%	231	15,308	66
SBPS	3	100	140	25%	186	56,731	305
SBS	3	125	140	33%	208	83,106	400
IDF	4	250	250	37%	395	19,954	50
Total						**888,216**	**2,667**

* % area old = exp (-[old age / disturbance interval]), Effective rotation age = old age / (1 – % area old)

8.0 Integrated Resource Management

This section of the document describes the range of timber and non-timber management objectives that occur within the Mid Coast TSA and how they will be addressed in the timber supply model. The most common method of inclusion is through the application of forest cover requirements.

Forest cover requirements can:

- Limit disturbance in an area by limiting the amount of forest that can be younger than a specific age (or shorter than a specific height);
- Maintain specific stand types on the land base by ensuring that at least a specified amount of forest older than a certain age (or taller than a certain height) is retained at all times;

Forest cover requirements from several different resource objectives can occur in a common area and result in overlapping constraints within the TSA (e.g. visual constraints inside a community watershed). Each requirement is evaluated independently to ensure that the harvesting of a specific stand does not violate any forest cover requirements.[13]

A summary of all non timber management issues and modeling approaches is provided in Table 40 below. Detail on each can be found in either the netdown section of this document or in the remainder of this section.

Table 40. Summary of Management Issues and Modelling Assumptions.

Resource Issue	Modeling Approach
Cutblock Size/Adjacency	Maximum of 25% < 3m tall. Applied to the THLB within each LU.
Visuals	Maximum disturbance limit defined by VQO and VAC. VEG height defined by avg slope of VQO polygon. Modeled as a disturbance limit (i.e. max 15% < 6m tall) on the PFLB portion of each VQO polygon.
Community Watersheds	Maximum of 1% of forested area logged / year (10% every 10 yrs).
Black Tailed Deer	Minimum of 25% > 141 yrs old within 80 yrs for all LU's. Specific LU's have reduced constraints to be applied for first 80 yrs (either 20%>141 yrs or 20%>121 yrs). To be met within the PFLB of the mapped habitat areas in each LU.
Mountain Goat	Reserve 90% of identified habitat areas (See netdown section 3.3.9)
Grizzly Bear WHAs	Reserve legally established WHA's. (See netdown section 3.3.8)
Sandhill Crane WHAs	To be addressed with 1% IWMS budget at time of determination.
Marbled Murralet WHAs	To be addressed with 1% IWMS budget at time of determination.
Tailed Frog WHA's	To be addressed with 1% IWMS budget at time of determination.
Goshawk WHA's	To be addressed with 1% IWMS budget at time of determination.
Karst	Assumed to be addressed within the existing netdowns and/or the stand level retention budget (Obj16).
Recreation	Spatial netdown - see section 3.3.11.
EBM Obj 3 FN Traditional Forest Resources	250m3/yr per band assumed to be harvested outside of the AAC (added to NRL volume).
EBM Obj 4: FN Traditional Heritage Features	Together, all four objectives are assumed to have a net 1.3% impact on THLB. This is in additional to the stand level retention impact discussed below. Implemented as an aspatial area retention factor in all THLB polygons.
EBM Obj 5: Culturally Modified Trees	
EBM Obj: 6: Monumental Cedar	
EBM Obj 7: Stand Level Retention of Cw/Yc	

[13] Where a minimum amount of forest is required and does not exist, some harvesting may still occur if there are any stands old enough for harvest once the oldest available stands have been set aside to meet the objective.

Resource Issue	Modeling Approach
EBM Obj 8: Important Fisheries Watersheds	ECA values assessed on the forested portion of each watershed identified in the SCC and NCC Order Schedules. ECA limited to a maximum of 20%. Recovery curves from the 1999 CWAP guidebook were used (function of stand ht).
EBM Obj 9: High Value Fish Habitat	Spatial netdown - see section 3.3.12.1
EBM Obj 10: Non HVFH Aquatic Habitat	Spatial netdown - see section 3.3.12.2
EBM Obj 11: Forested Swamps	Assumed to be addressed within the stand level retention budget (Obj16), section 3.3.12.3
EBM Obj 12: Upland Streams	FRPA riparian removed spatially (netdown section 3.3.10) and then the forested portion of the upland stream area in each watershed was limited to 30% < 9m tall (i.e. hyrdologically recovered). SCC Order: applied only in watersheds identified in Schedule 2 NCC Order: applied in all watersheds.
EBM Obj 13: Active Fluvial Units	Spatial netdown - see section 3.3.12.4.
EBM Obj 14: Landscape Level Biodiversity	A minimum amount of old forest was retained in the productive forest of each LU/SSS combination. Amounts were specified in Schedule 1 of the EBM orders. The amount of mid seral forest in each LU/SSS combination was also limited to 50%.
EBM Obj 15: Red/Blue Listed Plant Communities	Assumed to have a net 3% impact on THLB. Implemented as an aspatial area retention factor in all THLB polygons (Section 8.5.13).
EBM Obj 16: Stand Level Retention	The 15% requirement is assumed to have a net 3.3% impact on THLB. Combined with the FN EBM objectives and EBM Red/Blue impact, the total stand level volume reduction is 7.6% (1.3 + 3 + 3.3). Implemented as an aspatial area retention factor in all THLB polygons (Section 8.5.14).
EBM Obj 17: Sensitive /Critical Grizzly Bear Habitat	Spatial netdown - see section 0.

Non timber objective addressed through forest cover constraints are discussed in detail below.

8.1 Cutblock Size and Adjacency

Green-up requirements specify that a logged block must achieve a specific condition called green-up before adjacent areas can be logged. Green-up refers to the average height of the regenerating forest reaching a specified target. Green-up requirements can often be waived if licensees manage for patch size distributions consistent with biodiversity objectives as described in the Landscape Unit Planning Guide (MFR/MoE 1999). Modeling of green-up requirements was done using forest level objectives, as opposed to block specific objectives, because this was consistent with the operational flexibility afforded by patch size management.

The amount of THLB area less than 3m in height was limited to 25% within each landscape unit (refer to Table 41). This is consistent with the objective applied in TSR 2.

Table 41. Green-up requirements

Management Zone	Green-up Requirement	Modeled Green-up Constraint	Area to which it applies
Integrated Resource Management Zone	3 m tall trees	Max 25% < 3m within each LU	THLB area within each LU

8.2 Visual resources

The management of visual resources is based on legally established Visual Quality Objectives (VQO's) assigned to specific areas of the land base. The assumptions used here are consistent with the procedure document listed in the references section. The four VQO ratings modeled in this analysis were preservation (P), retention (R), partial retention (PR), and modification (M). Maximum allowable disturbance percentages for each VQO were modeled as per Table 42 below and reflect higher allowable disturbance limits when VQO polygons have high Visual Absorption Capability (VAC) ratings.

Table 42. Modelling of visual management

VQO	Maximum allowable disturbance (%)		
	VAC = L	VAC= M	VAC = H
P	0.0%	0.5%	1%
R	1%	3%	5%
PR	5%	10%	15%
M	15%	20%	25%

Visually effective green-up (VEG) height requirements vary by slope class as per Table 43. Height curves were included in the model for each AU in order to model height based disturbance limits directly.

Table 43. Visual Effective Green-up (VEG) heights and ages by slope class

Slope (%)	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-45	46-50	51-55	56-60	60+
Tree Ht (m)	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5
Derived Age	6	7	9	10	11	13	14	15	16	17	18	19

The area impacted by visual constraints is summarized below.

Table 44. Areas impacted by visual constraints

VQO	VAC	Forested Non THLB Area (ha)	THLB Area (ha)	Total PFLB Area (ha)
P	L	557	172	729
	M	49	0	49
	H	-	-	-
R	L	16,279	3,778	20,057
	M	7,548	1,274	8,822
	H	142	43	186
PR	L	33,767	9,001	42,768
	M	29,915	7,959	37,874
	H	1,486	246	1,732
M	L	21,877	9,320	31,197
	M	32,121	8,685	40,806
	H	2,662	722	3,384
Total		**146,403**	**41,201**	**187,604**

8.3 Community Watersheds

Community watersheds are managed by limiting the amount of disturbance that can occur in each year. As in TSR 2, harvesting will be limited to a maximum of 1% of the forested area per year – modeled as a maximum 10% per decade. This translates into the following maximum annual harvests:

Table 45. Harvest limits applied to community watersheds

Community Watershed	Total Area (ha)	PFLB Area (ha)	THLB Area (ha)	1% of PFLB Area (ha)	10% of PFLB Area (ha)
910.001	25	25	0	0.3	2
910.003 (Martin River)	2,204	2,204	120	22.0	220
910.004 (Snootli Crk)	3,847	3,847	94	38.5	385
910.005 (Tastsquan Crk)	2,794	2,795	75	28.0	279
CAM.001	227	227	39	2.3	23
Total	**9,097**	**9,097**	**328**		

8.4 Black Tailed Deer Winter Range

In February 2007, a GAR order was introduced for black tailed deer in the Mid Coast TSA (U-5-005) and it identified specified areas where habitat requirements must be met. Since these cover requirements reflect current management of deer winter range in this TSA, they were applied in the base case. Modeling applied a cover constraint to the specified area in each LU as per the GAR order. Table 46 summarizes the cover constraints applied.

Table 46. Summary of cover constraints for Black Tailed Deer by Landscape Unit

Landscape Unit	Minimum Mature Forest Cover Requirements for first 80 years	Minimum Mature Forest Cover Requirements after 80 years
Kilbella/Chuckwalla, Sumquolt, Lower Kimsquit	20% ≥ 141 years	25% ≥ 141 years **(Implemented in year 40 to ensure target is met by year 80)**
Clayton, Machmell, Nusatsum, Salloompt, Sheemahant, South Bentinck, Smitley/Noeick, Taleomey/Asseek, Upper Kimsquit, Clyak	20% ≥ 121 years	
All other LU's	25% ≥ 141 years	

* Order also indicates that the crown closure must be ≥ 56% and ≤85% and have a leading species of either Douglas-fir, Sitka spruce, or Hemlock. It was not possible to assess crown closure or leading species as part of constraints in the model.

The areas impacted by black tailed deer constraints are shown below.

Table 47. Areas impacted by black tailed deer cover constraints

Landscape Unit	Forested Non THLB (ha)	THLB Area (ha)	PFLB Area (ha)
Ape	0.2	0	0.2
Atnarko	4	0	4
Bella Coola	605	246	851
Braden	2,377	1,107	3,484
Clayton	267	306	573
Clyak	1,074	2,400	3,474
Crag	478	0	478
Dean	2,671	260	2,931
Don Peninsula	623	1,045	1,668
Doos/Dallery	388	251	639
Draney	409	439	849
Ellerslie	2,355	888	3,243
Evans	53	35	89
Johnston	24	24	47
Jump Across	1,230	103	1,333
Kilbella/Chuckwalla	1,568	951	2,519
Kilippi	3	41	44
King Island	1,545	1,416	2,961
Kwatna/Quatlena	1,283	1,164	2,447
Labouchere	1,884	780	2,664
Lower Kimsquit	1,985	1,743	3,728
Machmell	766	704	1,470
Nascall	1,683	130	1,812

Landscape Unit	Forested Non THLB (ha)	THLB Area (ha)	PFLB Area (ha)
Neechanz	444	402	846
Nekite	1,758	1,757	3,515
Nootum/Koeye	3	0	3
Nusatsum	180	0	180
Owikeno	1,394	354	1,747
Roscoe	2,337	217	2,554
Saloompt	878	828	1,706
Sheemahant	1,238	1,271	2,508
Sheep Passage	3,770	693	4,462
Smitley/Noeick	256	494	750
Smokehouse	1,819	945	2,764
South Bentinck	44	0	44
Sumquolt	927	146	1,073
Sutslem/Skowquiltz	2,868	109	2,977
Swindle	318	14	332
Taleomey/Asseek	238	273	511
Twin	452	306	758
Upper Kimsquit	1,738	1,379	3,118
Washwash	669	55	725
Young	26	0	26
Total	**44,631**	**23,277**	**67,909**

8.5 Ecosystem Based Management (EBM) Objectives

Land use orders have been made legal for the South Central Coast (Aug 2, 2007) and Central and North Coast (Jan 3, 2008). These orders define land use objectives that implement Ecosystem Base Management (EBM) on the central and north coast of BC and both apply to portions of the Mid Coast TSA (Figure 3 and Table 48). The integration of these objectives into the Mid Coast TSR3 process is discussed in the following sections. The full legal text of the EBM orders can be found here:
http://ilmbwww.gov.bc.ca/slrp/lrmp/nanaimo/cencoast/plan/objectives/index.html

Table 48. Ministerial order areas for the Mid Coast TSA

EBM Order Area	Forested non THLB	THLB	Total Productive Forest
CNC	525,883	104,173	630,056
SCC	362,333	31,119	393,452
Total	**888,216**	**135,293**	**1,023,508**

It should be noted that proposed amendments to these EBM Orders were made public in December 2008 and are open to review and comment until Feb 16, 2009. These amendments have not been recognized here as they do not yet represent current practice in the TSA. However, some of the elements captured in the proposed amendments will be analyzed in sensitivity runs during the analysis work.

8.5.1 EBM Objective 3 – First Nations Traditional Forest Resources

The intent of this objective is to provide for the maintenance of forest resources traditionally used by First Nations for food, social, or ceremonial purposes. This can include merchantable timber and based on the fact that First Nations can access 250m^3/yr without paying stumpage through Free Use Permits, 250m³/year was allocated to each band to be harvested outside of the AAC. For the purposes of this analysis, six bands were considered (Gwa'sala-'Nakwaxda'xw, Heiltsuk, Kitasoo, Nuxalk, Ulkatcho and Wuikinuxv) for a total of 1,500 m³/year. This volume was added to the non recoverable losses and logged in the model on top of the AAC request. This 250 m^3/year allocated to each band also helps to address EBM Objectives 6 and 7 below.

8.5.2 EBM Objective 4 – First Nations Traditional Heritage Features

"The intent of this objective is to provide for the protection of defined First Nation's traditional heritage features that are of continued importance to the First Nation within areas proposed for forest development activities. The objective directs licensees to share information and work with First Nations to protect traditional heritage features." (SCC and CNC Background and Intent Document – April 18 2008)

This objective was addressed through non-spatial netdowns to the THLB (see section 3.4.1). Non spatial netdowns were used because they represent a portion of each of the polygon used during modeling.

8.5.3 EBM Objective 5 – Culturally Modified Trees

"The intent of this objective is to provide for the identification and protection of culturally modified trees that are of continuing importance to First Nations. The objective directs licensees to share information and work with First Nations to identify and protect culturally modified trees within area proposed to be altered or harvested and to reserve culturally modified tree areas where practicable." (SCC and CNC Background and Intent Document – April 18 2008)

This objective was addressed through non-spatial netdowns to the THLB (see section 3.4.1).

8.5.4 EBM Objective 6 – Monumental Cedar

"The intent of this objective is to provide for the maintenance of monumental cedar for First Nations use. The South Central Coast objective directs licensees to share information and collaborate with First Nations to maintain a sufficient volume of monumental cedar to support present and future cultural use. The Central and North Coast objective directs licensees to share information and work with First Nations to identify and protect monumental cedar within areas proposed to be altered or harvested and to reserve monumental cedar areas where practicable." (SCC and CNC Background and Intent Document – April 18 2008)

This objective was addressed through non-spatial netdowns to the THLB (see section 3.4.1).

8.5.5 EBM Objective 7 – Stand Level Retention of Cw/Yc

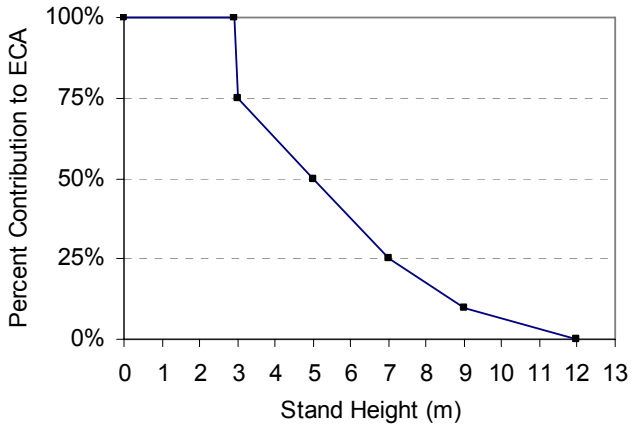
"The intent of this objective is to ensure sufficient Western red and Yellow cedar is maintained to support First Nation's present and future cultural and social uses." (SCC and CNC Background and Intent Document – April 18, 2008)

This objective was addressed through non-spatial netdowns to the THLB (see section 3.4.1).

8.5.6 EBM Objective 8 – Important Fisheries Watersheds

The intent of this objective is to ensure forest development activities do not negatively impact watershed health and/or fish habitat in important fisheries watersheds. Important fisheries watersheds are identified in Schedule 2 of the SCC Order and Schedule 3 of the CNC Order, but are not meant to capture small watersheds composed of S5 and S6 streams flowing directly into the ocean. Identified Important Fisheries Watersheds are to be managed using the concept of Equivalent Clearcut Area (ECA) and hydrologic greenup to limit the amount of disturbance within these watersheds. When evaluated on the forested portion of each watershed area, ECA's are to be kept at <20%. For TSR3 modeling, stands are assumed to recover as per the recovery curve shown below. This curve was adapted from the Coastal Watershed Assessment Procedures Guidebook (v2.1 Apr 1999).

The graph below shows that as long as disturbed areas are below 3m in height, they are considered 100% 'clearcut' while only 50% of an area with a height of 5m is considered 'clearcut'.



Modeling applied a maximum 20% ECA to the forested portion of each watershed in Schedule 2 of the SCC Order and Schedule 3 of the CNC Order. Stand height curves assigned to each stand type (AU) were used to calculate ECA percents dynamically in each period for comparison to the target.
The areas impacted by Important Fisheries Watershed constraints are shown below.

Table 49. Areas impacted by Important Fisheries Watershed constraints

Ministerial Order Area	Forested Non THLB (ha)	THLB (ha)	PFLB Area (ha)
CNC	190,645	42,211	232,856
SCC	78,238	7,438	85,676
Total	**268,883**	**49,649**	**318,532**

8.5.7 EBM Objective 9 – High Value Fish Habitat (HVFH)

HVFH was treated as a spatial netdown from the THLB (see section 3.3.12.1)

8.5.8 EBM Objective 10 – Aquatic Non High Value Fish Habitat

Aquatic Non-HVFH was treated as a spatial netdown from the THLB (see section 3.3.12.2)

8.5.9 EBM Objective 11– Forested Swamps

The intent of this objective is to maintain the natural ecological function of forested swamps by managing forests that occur adjacent to these areas. As these are rare in coastal BC, it has been assumed that they can be addressed within the impacts attributed to stand level retention strategies (see section 3.3.12.3).

8.5.10 EBM Objective 12 – Upland Streams

The intent of this objective is to maintain the natural ecological function of upland streams and to provide for the maintenance of hydrological and ecological processes within specific watersheds. The objective does not require management of every small upland stream, but does require that functional riparian forest exist on at least 70% of upland portions of watersheds.

Upland streams are to be managed in watersheds identified in Schedule 2 of the SCC order and all watersheds (min 3rd order) in the CNC order. Watershed boundaries beyond those mapped in Schedule 3 for the CNC area were obtained from: ftp://ftpnan.env.gov.bc.ca/pub/outgoing/dist/Coast Implementation/EBM WG/Data/watersheds/ and represent 3rd order or larger watersheds.

Within the relevant watersheds, sufficient functional riparian forest was maintained in upland portion of the watersheds by allowing a maximum of 30% of the upland forest area to be below the hydrologically effective greenup height of 9m. This height comes from the CWAP guidebook which states that 9 meter tall stands are assumed to be 90% hydrologically recovered (maximum recovery shown in the table).

Upland forest is the portion of the watershed occupied by upland streams. For the analysis this was assumed to be forested areas with a >5% slope outside HVFH, Aquatic Non HVFH, and Active Fluvial areas. This amounted to 74,858 ha in the SCC and 416,999 ha in the CNC (216,753 ha FSW and 200,246 ha other watersheds).

Table 50. Areas managed for upland streams

Ministerial Order Area	Important Fisheries Watersheds	Forested Non THLB (ha)	THLB (ha)	PFLB Area (ha)
	Yes	**174,806**	**41,947**	**216,753 ***
CNC	**No**	**159,624**	**40,622**	**200,246**
	Subtotal	**334,430**	**82,569**	**416,999**
SCC	**Yes**	**67,473**	**7,385**	**74,858**
Total		401,903	89,955	491,858

* This area is smaller than in Table 49 because of the slope and riparian exclusions.

8.5.11 EBM Objective 13 – Active Fluvial Units

This objective is present in both the Central and North Coast Order (CNC) and the South Central Coast Order (SCC). The objective intends to maintain the integrity and natural ecological function of active fluvial units (floodplains). Protection will be achieved though the application of a spatial netdown to the THLB (section 3.3.12.4).

8.5.12 EBM Objective 14 – Landscape Level Biodiversity

The intent of this objective is to ensure that a specified amount of forest is maintained in old seral condition in each ecosystem surrogate based on the relative rarity of the surrogate and the range of natural variation. The CNC order defines old forest as a stand of trees 250 years or older whereas the SCC defines it as 180 years or older. To represent this objective, a constraint was applied that maintained a minimum amount of old forest in each Site Series Surrogate (SSS)[14] by LU as per Schedule 3 (SCC) and 4 (CNC) of the EBM orders. In LU/SSS units where deficits occurred, recruitment was handled on an oldest first basis (no consideration of landbase type). A table of all units with areas and targets can be found in Appendix B.

In addition, the amount of mid seral forest in each LU/SSS was explicitly limited to 50% in Patchworks using accounts that track this seral stage. Mid seral is defined as:

- CWH: 40-80 years old
- ESSF: 40-120 years old
- MH: 40- 120 years old

Landscape units that spanned order boundaries (See Figure 3) were assigned to a single order for biodiversity management. The assignments were consistent with the proposed order amendments (Dec 19, 2008) and were as follows:

Table 51. LU assignments to EBM orders for purpose of landscape level biodiversity management

LU's Spanning Order Boundaries	**Order Assign to for TSR3 Biodiversity Modeling**
Sigulat, Crag, Labouchere, Twin, South Bentinck, Nekite, Draney)	South Central Coast
Dean, Jump Across, Sumquolt	Central North Coast

[14] Site Series Surrogate (SSS) are groupings of stand types within BEC variants. There are 13 potential stand groupings that can occur within each BEC variant that are a function of leading species and site index. For example, Stand type#1 = Fd leading with SI > 27.

8.5.13 EBM Objective 15 – Red and Blue Listed Plant Communities

The intent for this objective is to protect and maintain the abundance and distribution of existing rare, threatened and endangered ecosystems. All occurrences of red listed plant communities are to be protected, while at least 70% of blue listed plant communities are to be protected.

This objective was addressed through aspatial netdowns to the THLB (see section 3.4.2)

8.5.14 EBM Objective 16 – Stand Level Retention

The intent of this objective is to maintain forest structure and habitat elements at the stand level. Both the SCC and CNC orders require a minimum of 15% of each cutblock to be retained, where 50% of this retention should be internal to the cutblock if it's over 15 ha.

This issue was addressed though the application of a-spatial netdowns to the THLB (section 3.4.3).

8.5.15 EBM Objective 17 – Sensitive/Critical Grizzly Bear Habitat

The intent of this objective is to support the long term viability of this regionally important species through the establishment of spatial reserves that work toward maintaining sensitive / critical grizzly bear habitat.

Protection of identified habitat will be achieved through the application of a spatial netdown to the THLB (see section 3.3.13).

9.0 Timber Supply Modeling

9.1 Timber Supply Model

For forecasting and analysis, the PATCHWORKS™ modeling software will be used. This suite of tools is sold / maintained by Spatial Planning Systems Inc. of Deep River, Ontario (Tom Moore - www.spatial.ca).

Patchworks is a fully spatial forest estate model that can incorporate real world operational considerations into a strategic planning framework. It is unique in its ability to dynamically assess spatial relationships during modeling and adapt solutions to achieve spatial objectives. It utilizes a goal seeking approach and an optimization heuristic to schedule activities across time and space in order to find a solution that best balances the targets/goals defined by the user. Targets can be applied to any aspect of the problem formulation. For example, the solution can be influenced by issues such as mature/old forest retention levels, young seral disturbance levels, patch size distributions, conifer harvest volume, growing stock levels, snag densities, CWD levels, ECA's, specific mill volumes by species, road building/hauling costs, delivered wood costs, net present values, etc. Patchworks continually generates alternative solutions until the user decides a stable solution has been found. Solutions with attributes that fall outside of specified ranges (targets) are penalized and the goal seeking algorithm works to minimize these penalties – resulting in a solution that reflects the user's objectives and priorities.

Patchworks' flexible interactive approach is unique in several respects:

- Patchworks' interface allows for highly interactive analysis of trade-off's between competing sustainability goals.
- Patchworks integrates operational-scale decision-making within a strategic-analysis environment: realistic spatial harvest allocations can be optimized over long-term planning horizons. Patchworks can simultaneously evaluate forest operations and log transportation problems using a multiple-product to multiple-destination formulation. The model can identify in precise detail how wood will flow to mills over a complex set of road construction and transportation alternatives.
- Allocation decisions can be made considering one or many objectives simultaneously and objectives can be weighted for importance relative to each other. (softer vs. harder constraints)
- Allocation decisions can include choices between stand treatment types (Clearcut vs. partial cut, fertilization, rehabilitation, etc).
- Unlimited capacity to represent a problem – only solution times limit model size.
- Fully customizable reporting on economic, social, and environmental conditions over time. Reports are built web-ready for easy sharing of analysis results – even comparisons of multiple indicators across multiple scenarios.

Because it is up the user to decide when Patchworks should stop searching for a better solution, a specific defined criteria for a 'stable' solution is desirable. This helps ensure that differences between scenario results occur because of model input differences and not from extra effort spent finding a better solution. For the purpose of this project, Patchwork results were accepted once the objective function improved by less than 0.1% in 100,000 iterations.

9.2 Harvest Flow Objectives

Harvest flow objectives used during analysis area consistent with MFR policy[15]. The primary objective is to gradually adjust harvest levels, if required, to arrive at the long-term harvest level (LTHL) for the TSA. A wide range of harvest flows are possible but ideally the flows will:

- Achieve an acceptable short-term harvest level beginning at the current AAC whenever possible;
- Where harvest level changes are required, make steps no larger than 10%;

[15] Harvest Flow Considerations for the Timber Supply Review" http://www.llbc.leg.bc.ca/public/PubDocs/bcdocs/365082/DFAM_harvest_flow_options.pdf

- A medium-term harvest level below the long-term harvest level should be avoided and if present, minimized.
- Do not permit the mid-term harvest level to fall below a level reflecting the productive capacity of the TSA (natural stand yield estimates); and
- Achieve a maximum long-term stable harvest level over a 300-year time horizon reflecting the productive capacity of the TSA (based on TIPSY yield estimates). One indicator of a stable long-term harvest level will be a constant long-term total inventory (growing stock on the THLB).

9.3 Initial harvest rate

The base case harvest forecast will use the following initial harvest rates:

Initial Harvest: 768,000 m^3/yr + 20,102 m^3/yr (NRL) + 1,500 m^3/yr (EBM Obj 3) = 789,602 m^3/yr

No partitioning of the harvest level occurred.

9.4 Long Run Sustained Yield

Long run sustained yield (LRSY) values calculated on the basis of both natural and managed stand yield curves are shown in Table 52. LRSY is a measure of what the landbase is capable of producing if only timber production is considered and can be used to assess the level of impact arising from non timber management issues.

Table 52. LRSY values for natural and managed stands

Description	Stand Type	
	Natural	Managed
Current THLB (ha)	124,605	124,605
- Future roads (ha)	2,713	2,713
+ TL Reversions	7,767	7,767
= Long term THLB (ha)	129,659	129,659
* Average MAI at culmination (m^3/ha)	3.3	7.4
= Theoretical Gross LRSY (m^3/yr)	**423,756**	**969,963**
- Non-recoverable losses (m^3/yr)	20,102	20,102
= Theoretical Net LRSY (m^3/yr)	**403,654**	**949,861**

9.5 Sensitivities and Critical Issues

The following list of sensitivities and critical issue analyses are planned:

Sensitivities

1. Harvest Flows:
    a. High Initial Harvest Flow
    b. Minimize Midterm Trough
    c. Non Declining Harvest flow
    d. Regulate flow of cedar/cypress (tolerance applied around profile on landbase)
2. Larger THLB (include all previously logged stands
3. Larger THLB (low economic return landbase ~15%)
4. Smaller THLB (high economic return landbase ~15%)
5. Natural stand yields +-10%
6. Natural stand yields from VDYP7
7. Managed stand yield +-10% (consider OAF1 at 8%)
8. Minimum Harvest Ages +-10 yrs

9. Remove site index adjustments (SIA on Cw and Hw)
10. Add site index adjustments to species other than Cw and Hw using conversion equations
11. Greenup hts vary by (+-15%)
12. Yield reduction applied in highly constrained VQO's (P, R, PR) for shading
13. Include Alder stands in THLB and Harvest Volume
14. Apply 100% retention levels for high-value recreation areas (VH-H, H-H)

Critical Issues

15. Integration of Economics (Breakeven + Avg Stumpage – EBM Allowance)
16. EBM alternatives:
    a. No netdown for EBM Grizzly or Grizzly WHA's
    b. Implement CNC Obj 17 (Critical Grizzly habitat mapped in draft Schedule).
    c. THLB increased / decreased by 5% to address uncertainty around stand level retention, red/blue, FN issues, etc.
    d. Alternative Options for Riparian (non defaults)
    e. Treat Active Fluvial the same in both Order areas
    f. SCC old seral as 250 yrs

Actual sensitivity runs completed may vary from this initial plan based on information discovered during the analysis process.

Glossary

Allowable annual cut (AAC)	The rate of timber harvest permitted each year from a specified area of land, usually expressed as cubic meters of wood per year.
Analysis unit	A grouping of types of forest — for example, by species, site productivity, silvicultural treatment, age, and or location — done to simplify analysis and generation of timber yield tables.
Base case harvest forecast	The timber supply forecast which illustrates the effect of current forest management practices on the timber supply using the best available information, and which forms the reference point for sensitivity analysis.
Basic sector	Sectors of the economy, such as forestry, tourism and mining, which create flows of income into the region and are assumed to be drivers of the local economy. Non-basic sectors, such as retail outlets, are supported by basic sectors.
Biodiversity (biological diversity)	The diversity of plants, animals and other living organisms in all their forms and levels of organization, including the diversity of genes, species and ecosystems, as well as the evolutionary and functional processes that link them.
Biogeoclimatic (BEC) variant	A subdivision of a biogeoclimatic subzone. Variants reflect further differences in regional climate and are generally recognized for areas slightly drier, wetter, snowier, warmer or colder than other areas in the subzone.
Biogeoclimatic zones	A large geographic area with broadly homogeneous climate and similar dominant tree species.
Coniferous	Coniferous trees have needles or scale-like leaves and are usually 'evergreen'.
Cutblock	A specific area, with defined boundaries, authorized for harvest.
Cutblock adjacency	The spatial relationship among cutblocks. Most adjacency restrictions require that recently harvested areas must achieve a desired condition (green-up) before nearby or adjacent areas can be harvested. Specifications for the maximum allowable proportion of a forested landscape that does not meet green-up requirements are used to approximate the timber supply impacts of adjacency restrictions.
Deciduous	Deciduous trees shed their leaves annually and commonly have broad-leaves.
Ecosystem Based Management (EBM)	An adaptive approach to managing human activities that seeks to ensure the coexistence of healthy, fully functioning ecosystems and human communities. The intent is to maintain those spatial and temporal characteristics of ecosystems such that component species and ecological processes can be sustained, and human wellbeing supported and improved.
Employment coefficient	The number of person-years of employment supported by every 1,000 cubic meters of timber harvested; for example, a coefficient of 1.0 indicates that every 1,000 cubic meters harvested supports one person-year, or 500,000 cubic meters supports 500 person-years.
Employment multiplier	An estimate of the total employment supported by each direct job, for example a multiplier of 2.0 means that one direct job supports one additional indirect and induced job.
Environmentally sensitive areas (ESA)	Areas with significant non-timber values, fragile or unstable soils, impediments to establishing a new tree crop, or high risk of avalanches.
Forest cover objectives	Specify desired distributions of areas by age or size class groupings. These objectives can be used to reflect desired conditions for wildlife, watershed protection, visual quality and other integrated resource management objectives. General adjacency and green-up guidelines are also specified using forest cover objectives (see **Cutblock adjacency and Green–up**).
Forest inventory	An assessment of British Columbia's timber resources. It includes computerized maps, a database describing the location and nature of forest cover, including size, age, timber volume, and species composition, and a description of other forest values such as recreation and visual quality.
Forest and Range Practices Act (FRPA)	Legislation that govern forest practices and planning, with a focus on ensuring management for all forest values.
Forest type	The classification or label given to a forest stand, usually based on its tree species composition. Pure spruce stands and spruce-balsam mixed stands are two examples.
Free-growing	An established seedling of an acceptable commercial species that is free from growth-inhibiting brush, weed and excessive tree competition.
Green-up	The time needed after harvesting for a stand of trees to reach a desired condition (usually a specific height) — to ensure maintenance of water quality, wildlife habitat, soil stability or aesthetics — before harvesting is permitted in adjacent areas.

Growing stock	The volume estimate for all standing timber at a particular time.
Harvest forecast	The flow of potential timber harvests over time. A harvest forecast is usually a measure of the maximum timber supply that can be realized over time for a specified land base and set of management practices. It is a result of forest planning models and is affected by the size and productivity of the land base, the current growing stock, and management objectives, constraints and assumptions.
Higher level plans	Higher level plans establish the broader, strategic context for operational plans, providing objectives that determine the mix of forest resources to be managed in a given area.
Indirect and induced jobs	Indirect jobs are supported by direct business purchases of goods and services. Induced jobs are supported by employee purchases of goods and services; for example, at retail outlets.
Inoperable areas	Areas defined as unavailable for harvest for terrain-related or economic reasons. Operability can change over time as a function of changing harvesting technology and economics.
Integrated resource management (IRM)	The identification and consideration of all resource values, including social, economic and environmental needs, in resource planning and decision-making.
Karst	An area of limestone terrain characterized by sinks, ravines, and underground streams.
Landscape-level biodiversity	The *Landscape Unit Planning Guide* provides objectives for maintaining biodiversity at both the landscape level and the stand level. At the landscape level, guidelines are provided for the maintenance of seral stage distribution, patch size distribution and landscape connectivity.
Landscape unit	A planning area based on topographic or geographic features, that is appropriately sized (up to 100 000 hectares), and designed for application of landscape-level biodiversity objectives.
Long-term harvest level	A harvest level that can be maintained indefinitely given a particular forest management regime (which defines the timber harvesting land base, and objectives and guidelines for non-timber values) and estimates of timber growth and yield.
Mature seral	Forest stands with trees between 80 and 120 years old, depending on species, site conditions and biogeoclimatic zone.
Management assumptions	Approximations of management objectives, priorities, constraints and other conditions needed to represent forest management actions in a forest planning model. These include, for example, the criteria for determining the timber harvesting land base, the specification of minimum harvestable ages, utilization levels, integrated resource guidelines and silviculture and pest management programs.
Mean annual increment (MAI)	Stand volume divided by stand age. The age at which average stand growth, or MAI, reaches its maximum is called the culmination age (CMAI). Harvesting all stands at this age results in a maximum average harvest over the long term.
Minimum harvestable age (MHA)	The age at which a stand of trees is expected to achieve a merchantable condition. The minimum harvestable age could be defined based on maximize average productivity (culmination of mean annual increment), minimum stand volume, or product objectives (usually related to average tree diameter).
Model	An abstraction and simplification of reality constructed to help understand an actual system or problem. Forest managers and planners have made extensive use of models, such as maps, classification systems and yield projections, to help direct management activities.
Natural disturbance type (NDT)	An area that is characterized by a natural disturbance regime, such as wildfires, which affects the natural distribution of seral stages. For example areas subject to less frequent stand-initiating disturbances usually have more older forests.
Not satisfactorily restocked (NSR)	An area not covered by a sufficient number of well-spaced trees of desirable species. Stocking standards are set by the B.C. Forest Service. Areas harvested prior to October 1987 and not yet sufficiently stocked according to standards are classified as backlog NSR. Areas harvested or otherwise disturbed since October 1987 are classified as current NSR.
Operational Adjustment Factor (OAF)	OAF1 and OAF2 are TIPSY input parameters that reduce predicted yield to account for factors such as non-productive areas within stands, disease and insects, non-commercial cover, stocking gaps, decay, waste, and breakage.
Operability	Classification of an area considered available for timber harvesting. Operability is determined using the terrain characteristics of the area as well as the quality and quantity of timber on the area.
Person-year(s)	One person working the equivalent of one full year, defined as at least 180 days of work. Someone working full-time for 90 days accounts for 0.5 person-years.

Productive forest land base (PFLB)	All forested crown land in a management unit. Used to support the management of non timber resources. The THLB is a subset of this land base.
Protected area	A designation for areas of land and water set aside to protect natural heritage, cultural heritage or recreational values (may include national park, provincial park, or ecological reserve designations).
Riparian area	Areas of land adjacent to wetlands or bodies of water such as swamps, streams, rivers or lakes.
Scenic area	Any visually sensitive area or scenic landscape identified through a visual landscape inventory or planning process carried out or approved by a district manager.
Sensitivity analysis	A process used to examine how uncertainties about data and management practices could affect timber supply. Inputs to an analysis are changed, and the results are compared to a baseline or base case.
Seral stages	Sequential stages in the development of plant communities that successively occupy a site and replace each other over time.
Site index	A measure of site productivity. The indices are reported as the average height, in meters, that the tallest trees in a stand are expected to achieve at 50 years (age is measured at 1.3 meters above the ground). Site index curves have been developed for British Columbia's major commercial tree species.
Stand-level biodiversity	A stand is a relatively localized and homogeneous land unit that can be managed using a single set of treatments. In stands, objectives for biodiversity are met by maintaining specified stand structure (wildlife trees or patches), vegetation species composition and coarse woody debris levels.
Stocking	The proportion of an area occupied by trees, measured by the degree to which the crowns of adjacent trees touch, and the number of trees per hectare.
Table Interpolation Program for Stand Yields (TIPSY)	A B.C. Forest Service computer program used to generate yield projections for managed stands based on interpolating from yield tables of a model (TASS) that simulates the growth of individual trees based on internal growth processes, crown competition, environmental factors and silvicultural practices.
Timber harvesting land base (THLB)	Crown forest land within the timber supply area where timber harvesting is considered both acceptable and economically feasible, given objectives for all relevant forest values, existing timber quality, market values and applicable technology.
Timber supply	The amount of timber that is forecast to be available for harvesting over a specified time period, under a particular management regime.
Timber supply area (TSA)	An integrated resource management unit established in accordance with *Section 7* of the *Forest Act*.
Tree farm license (TFL)	Provides rights to harvest timber, and outlines responsibilities for forest management, in a particular area.
Ungulate	A hoofed herbivore, such as deer.
Unsalvaged losses	The volume of timber killed or damaged annually by natural causes (e.g., fire, wind, insects and disease) that is not harvested.
Variable Density Yield Prediction (VDYP)	An empirical yield prediction system, supported by the Ministry of Forests and Range, designed to predict average yields and provide forest inventory updates over large areas (i.e., Timber Supply Areas). It is intended for use in unmanaged natural stands of pure or mixed species composition.
Vegetation Resources Inventory (VRI)	An assessment of British Columbia's vegetation resources. It includes computerized maps, a database describing the location and nature of forest information, including timber size, stand age, timber volume, tree species composition, and shrub, herb, and bryoid information. It replaces the older forest inventory.
Visual quality objective (VQO)	Defines a level of acceptable landscape alteration resulting from timber harvesting and other activities. A number of visual quality classes have been defined on the basis of the maximum amount of alteration permitted.
Volume estimates	Estimates of yields from forest stands over time. Yield projections can be developed for stand volume, stand diameter or specific products, and for empirical (average stocking), normal (optimal stocking) or managed stands.
Yield projections	See volume estimates
Watershed	An area drained by a stream or river. A large watershed may contain several smaller watersheds.
Wildlife tree	A standing live or dead tree with special characteristics that provide valuable habitat for conservation or enhancement of wildlife.
Woodlot licence	An agreement entered into under the *Forest Act*. It allows for small-scale forestry to be practised in a described area (Crown and private) on a sustained yield basis.

Acronyms

AAC	Allowable Annual Cut
Analysis	Timber Supply Analysis
AU	Analysis Unit
BCTS	British Columbia Timber Sales
BEC	Biogeoclimatic Ecosystem Classification
BEO	Biodiversity Emphasis Option
CF	Chief Forester
CWAP	Coastal Watershed Assessment Procedure
DFO	Department of Fisheries and Oceans
DM	District Manager
EBM	Ecosystem-Based Management
ESA	Environmentally Sensitive Area
FIZ	Forest Inventory Zone
FPC	Forest Practices Code
FPPR	Forest Planning and Practices Regulation
FSP	Forest Stewardship Plan
GAR	Government Action Regulation
GIS	Geographic Information System
HLP	Higher Level Plan
ILMB	Integrated Land Management Bureau (Ministry of Agriculture and Lands)
IP	Information Package
IRM	Integrated Resource Management
LRMP	Land and Resource Management Plan
LU	Landscape Unit
MHA	Minimum Harvestable Age
MOE	Ministry of Environment
MFR	Ministry of Forests and Range
MO	Ministerial Order
NCC	Non-Commercial Cover
NDT	Natural Disturbance Type
NRL	Non-Recoverable Losses
NSR	Not Satisfactorily Restocked
OAF	Operational Adjustment Factor
OGMA	Old Growth Management Area
PSP	Permanent Sample Plot
PFLB	Productive Forest Land Base
PSYU	Public Sustained Yield Unit
QMD	Quadratic Mean Diameter
RFI	Recreation Features Inventory
RMZ	Riparian Management Zone
ROS	Recreation Opportunity Spectrum
RRZ	Riparian Reserve Zone
RVQC	Recommended Visual Quality Class
SI	Site Index
SRMZ	Special Resource Management Zone
TFL	Tree Farm License
THLB	Timber harvesting land base
VAC	Visual Absorption Capability
VQO	Visual Quality Objective
WHA	Wildlife habitat area
UWR	Ungulate winter range

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Appendix A: Yield Curves

	Existing Natural Yields (VDYP)																											
c	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**121**	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
20	1	0	0	3	1	0	0	10	1	0	0	25	10	0	1	0	0	1	0	0	0	3	1	0	0	34	9	1
30	66	26	0	71	27	1	1	122	32	1	1	131	43	12	86	18	2	41	9	1	0	71	9	1	0	128	38	13
40	174	119	17	168	112	19	6	242	122	10	2	255	141	30	217	112	37	130	77	30	3	187	87	20	1	255	114	35
50	266	203	77	257	191	67	37	345	204	58	7	362	238	62	325	199	105	213	150	86	33	288	169	79	11	363	205	87
60	344	274	128	341	264	115	77	434	275	110	41	453	322	112	413	274	163	290	217	140	73	375	241	137	53	455	286	152
70	411	334	172	415	330	159	115	510	337	157	87	530	397	163	488	337	213	360	278	188	111	450	305	189	95	533	357	209
80	470	387	211	485	391	200	151	576	393	199	127	595	463	212	552	393	257	425	333	234	147	516	360	236	133	600	419	262
90	520	431	244	537	438	232	180	630	439	234	163	648	518	256	605	440	294	473	377	270	177	571	408	275	166	655	473	308
100	565	470	273	581	478	260	205	676	479	266	195	693	566	296	650	480	326	513	414	301	203	619	449	310	196	702	519	350
110	605	504	300	619	511	284	227	716	513	294	224	730	608	332	690	515	355	547	446	328	226	660	485	341	222	741	560	387
120	640	533	322	645	535	302	244	749	542	318	250	761	643	364	723	546	379	570	470	347	243	695	515	368	245	774	595	419
130	669	559	342	684	570	325	264	785	573	342	274	793	679	397	754	572	400	606	501	373	264	732	547	395	269	808	630	452
140	692	580	358	720	602	346	283	818	602	366	295	822	713	428	780	595	418	639	530	397	283	765	577	421	290	838	662	483
150	710	597	371	752	630	365	299	848	628	386	315	847	742	456	801	613	432	669	556	418	300	795	603	444	310	865	690	511
160	723	609	381	780	654	381	313	874	651	405	331	870	769	482	817	626	442	695	578	436	314	822	627	464	328	889	716	537
170	732	617	387	803	675	395	324	896	672	422	346	890	793	506	829	634	449	717	596	451	325	845	649	483	344	909	740	560
180	735	621	391	828	697	409	336	917	691	438	359	909	815	529	837	639	452	740	616	467	338	866	669	501	360	928	761	582
190	744	630	398	851	718	423	347	937	710	454	372	926	836	550	848	648	459	762	635	483	350	887	688	517	374	946	781	603
200	752	638	404	874	738	436	358	956	727	468	384	941	855	571	860	657	466	783	652	498	362	905	705	533	388	962	799	623
210	761	646	410	895	757	449	369	974	743	482	395	955	873	590	870	666	473	803	669	512	373	922	721	548	402	977	816	641
220	769	653	415	921	779	464	382	990	758	495	405	968	890	608	881	674	479	828	690	529	387	938	736	562	414	991	832	658
230	777	661	420	947	802	478	395	1,005	772	507	414	980	906	625	890	682	485	851	710	546	400	953	750	575	426	1,003	846	674
240	784	668	425	971	823	492	407	1,019	785	518	423	992	920	642	900	690	491	874	729	563	413	967	763	587	437	1,015	860	689
250	792	674	430	995	844	506	419	1,032	798	529	431	1,002	934	657	908	697	496	896	748	578	426	980	775	598	447	1,026	872	703
260	792	675	431	999	847	509	421	1,039	804	535	437	1,011	945	670	911	698	497	899	751	581	427	987	783	605	454	1,035	883	714
270	793	676	432	1,002	851	512	422	1,045	810	541	443	1,019	954	682	913	698	498	901	754	583	428	995	791	611	460	1,043	893	725
280	794	677	433	1,005	854	514	424	1,051	815	547	448	1,026	963	693	914	699	498	903	757	585	429	1,001	798	617	466	1,050	902	735
290	795	678	434	1,008	857	517	425	1,056	820	552	453	1,033	972	704	916	699	499	905	759	586	430	1,007	804	622	471	1,057	911	744
300	795	678	435	1,010	859	519	426	1,061	824	557	458	1,040	980	715	917	700	499	906	761	588	431	1,012	809	627	476	1,064	919	753
310	796	679	436	1,013	862	521	428	1,065	828	561	462	1,046	987	725	919	700	500	907	763	589	432	1,017	815	632	480	1,070	926	762
320	797	679	437	1,015	864	523	429	1,069	832	565	466	1,052	995	734	920	700	500	909	765	591	433	1,021	819	636	485	1,076	933	770
330	797	680	437	1,016	866	525	430	1,072	835	569	469	1,058	1,002	744	921	700	501	909	767	592	434	1,024	823	640	488	1,082	940	778
340	797	680	438	1,018	868	526	431	1,075	838	573	473	1,063	1,008	752	922	700	501	910	768	593	434	1,027	827	643	492	1,087	946	785
350	798	680	438	1,019	869	528	432	1,078	840	576	476	1,068	1,014	761	922	700	501	910	769	594	435	1,030	830	646	496	1,092	952	792

	Future Managed Yields (TIPSY)																												
Age	**201**	**202**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	**213**	**214**	**221**	**222**	**223**	**224**	**225**	**226**	**227**	**228**	**229**	**230**	**231**	**232**	**233**	**234**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	27	6	0	8	4	3	3	2	6	4	1	17	2	0	21	3	1	4	5	2	1	1	3	1	1	11	0	0
30	152	74	15	100	76	52	64	74	91	65	35	144	37	1	127	61	19	77	81	42	24	66	61	43	22	129	21	2
40	286	179	53	230	191	150	173	237	242	207	152	305	124	9	250	153	62	192	200	134	94	222	193	164	114	287	91	18
50	430	274	107	361	318	262	296	388	389	350	283	459	231	36	371	242	124	316	330	241	182	369	328	295	237	434	182	62
60	556	370	161	487	436	362	408	533	531	488	406	611	332	81	490	323	183	424	450	341	275	512	458	418	351	586	274	118
70	673	463	209	608	548	461	519	655	653	605	519	743	430	127	585	404	234	534	566	435	355	628	571	531	460	712	358	176
80	773	538	251	713	653	556	623	773	768	717	617	867	527	177	680	478	279	637	671	525	431	742	676	631	553	835	444	233
90	860	609	289	805	740	643	710	879	871	820	710	978	611	225	761	538	323	723	758	610	504	850	774	725	639	946	526	286
100	931	675	327	898	822	714	789	968	958	905	799	1,067	689	269	831	597	366	799	846	683	573	936	861	813	721	1,036	597	337
110	997	731	362	979	905	779	871	1,056	1,041	987	872	1,146	765	312	888	651	405	877	929	743	635	1,021	934	885	797	1,115	664	384
120	1,058	781	394	1,049	974	848	943	1,140	1,120	1,063	939	1,216	833	351	939	696	439	947	998	806	688	1,101	1,006	953	861	1,184	728	434
130	1,108	823	423	1,114	1,035	911	1,004	1,217	1,195	1,136	1,004	1,276	896	390	987	737	469	1,005	1,062	866	731	1,177	1,072	1,018	918	1,245	787	480
140	1,151	860	448	1,171	1,093	961	1,060	1,275	1,252	1,201	1,064	1,328	947	430	1,031	773	496	1,058	1,121	920	772	1,240	1,136	1,078	975	1,299	841	522
150	1,188	894	471	1,218	1,143	1,007	1,111	1,325	1,301	1,252	1,122	1,367	991	467	1,069	805	521	1,107	1,170	965	815	1,290	1,193	1,136	1,027	1,341	890	559
160	1,219	923	493	1,258	1,186	1,047	1,154	1,378	1,348	1,295	1,174	1,401	1,034	500	1,100	832	543	1,149	1,213	1,005	856	1,337	1,238	1,186	1,076	1,376	931	594
170	1,250	951	512	1,296	1,223	1,085	1,193	1,426	1,396	1,340	1,215	1,435	1,074	530	1,125	858	564	1,184	1,251	1,041	893	1,386	1,276	1,226	1,123	1,406	967	626
180	1,278	977	529	1,331	1,256	1,117	1,225	1,469	1,439	1,382	1,250	1,467	1,109	558	1,149	880	583	1,215	1,285	1,073	923	1,429	1,312	1,260	1,164	1,438	1,000	657
190	1,303	1,001	545	1,365	1,285	1,144	1,256	1,505	1,473	1,420	1,282	1,495	1,142	584	1,169	899	599	1,244	1,314	1,101	950	1,467	1,350	1,292	1,197	1,467	1,032	687
200	1,323	1,021	560	1,394	1,311	1,168	1,282	1,536	1,504	1,452	1,315	1,516	1,173	609	1,189	917	615	1,269	1,343	1,126	974	1,499	1,384	1,326	1,225	1,491	1,061	715
210	1,343	1,038	573	1,422	1,339	1,193	1,308	1,565	1,531	1,480	1,346	1,536	1,199	632	1,208	936	628	1,294	1,371	1,150	997	1,527	1,415	1,357	1,251	1,510	1,087	740
220	1,362	1,055	585	1,453	1,370	1,221	1,338	1,594	1,557	1,506	1,376	1,532	1,222	654	1,227	954	641	1,321	1,403	1,177	1,020	1,554	1,442	1,386	1,277	1,526	1,112	763
230	1,380	1,069	596	1,480	1,399	1,245	1,368	1,621	1,584	1,529	1,401	1,527	1,240	675	1,243	970	653	1,348	1,432	1,202	1,042	1,580	1,464	1,411	1,304	1,526	1,135	786
240	1,397	1,081	606	1,504	1,425	1,268	1,395	1,646	1,608	1,553	1,423	1,523	1,255	695	1,258	983	663	1,373	1,458	1,224	1,064	1,604	1,485	1,432	1,328	1,526	1,156	805
250	1,413	1,093	615	1,526	1,449	1,288	1,420	1,668	1,630	1,575	1,443	1,519	1,268	713	1,271	995	673	1,396	1,481	1,244	1,083	1,626	1,504	1,451	1,350	1,526	1,174	822
260	1,428	1,104	624	1,547	1,470	1,310	1,443	1,687	1,649	1,595	1,460	1,515	1,281	730	1,283	1,005	683	1,416	1,502	1,263	1,101	1,646	1,523	1,469	1,369	1,526	1,188	838
270	1,441	1,114	632	1,565	1,490	1,331	1,462	1,703	1,666	1,613	1,477	1,511	1,293	745	1,293	1,014	691	1,436	1,521	1,280	1,118	1,664	1,541	1,485	1,386	1,526	1,200	853
280	1,452	1,123	639	1,584	1,507	1,349	1,480	1,718	1,681	1,629	1,492	1,506	1,303	759	1,302	1,022	699	1,453	1,538	1,298	1,134	1,679	1,557	1,500	1,401	1,526	1,211	867
290	1,462	1,132	645	1,601	1,523	1,367	1,496	1,731	1,694	1,644	1,506	1,502	1,313	772	1,311	1,030	706	1,469	1,555	1,315	1,148	1,692	1,572	1,515	1,414	1,526	1,220	879
300	1,462	1,132	646	1,602	1,526	1,382	1,499	1,742	1,702	1,652	1,517	1,502	1,313	772	1,311	1,030	708	1,469	1,558	1,318	1,151	1,703	1,580	1,525	1,423	1,526	1,221	880
310	1,462	1,132	646	1,602	1,526	1,382	1,499	1,742	1,702	1,652	1,517	1,502	1,313	772	1,311	1,030	708	1,469	1,558	1,318	1,151	1,703	1,580	1,525	1,423	1,526	1,221	880
320	1,462	1,132	646	1,602	1,526	1,382	1,499	1,742	1,702	1,652	1,517	1,502	1,313	772	1,311	1,030	708	1,469	1,558	1,318	1,151	1,703	1,580	1,525	1,423	1,526	1,221	880
330	1,462	1,132	646	1,602	1,526	1,382	1,499	1,742	1,702	1,652	1,517	1,502	1,313	772	1,311	1,030	708	1,469	1,558	1,318	1,151	1,703	1,580	1,525	1,423	1,526	1,221	880
340	1,462	1,132	646	1,602	1,526	1,382	1,499	1,742	1,702	1,652	1,517	1,502	1,313	772	1,311	1,030	708	1,469	1,558	1,318	1,151	1,703	1,580	1,525	1,423	1,526	1,221	880
350	1,462	1,132	646	1,602	1,526	1,382	1,499	1,742	1,702	1,652	1,517	1,502	1,313	772	1,311	1,030	708	1,469	1,558	1,318	1,151	1,703	1,580	1,525	1,423	1,526	1,221	880

	Existing Managed Yields (TIPSY)														Future Managed Yields (TIPSY)													
Age	**301**	**302**	**303**	**304**	**305**	**306**	**307**	**308**	**309**	**310**	**311**	**312**	**313**	**314**	**401**	**402**	**403**	**404**	**405**	**406**	**407**	**408**	**409**	**410**	**411**	**412**	**413**	**414**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	24	4	0	1	1	0	2	1	6	1	1	18	2	0	24	4	0	1	1	0	2	1	6	1	1	18	2	0
30	142	65	8	23	20	8	39	53	84	31	22	150	40	1	142	65	8	23	20	8	39	53	84	31	22	150	40	1
40	274	162	33	92	80	44	130	202	233	133	115	317	135	11	274	162	33	92	80	44	130	202	233	133	115	317	135	11
50	408	254	68	174	158	104	236	347	379	260	239	478	246	42	408	254	68	174	158	104	236	347	379	260	239	478	246	42
60	534	340	111	260	240	170	337	488	522	378	355	635	351	92	534	340	111	260	240	170	337	488	522	378	355	635	351	92
70	642	426	152	338	316	234	429	602	642	490	465	771	453	142	642	426	152	338	316	234	429	602	642	490	465	771	453	142
80	743	502	188	405	384	296	520	711	757	586	560	900	553	194	743	502	188	405	384	296	520	711	757	586	560	900	553	194
90	830	565	220	472	449	350	606	818	863	677	648	1,014	639	246	830	565	220	472	449	350	606	818	863	677	648	1,014	639	246
100	901	626	247	535	511	396	681	908	950	762	731	1,105	721	292	901	626	247	535	511	396	681	908	950	762	731	1,105	721	292
110	962	682	273	595	567	442	743	987	1,033	839	809	1,187	800	337	962	682	273	595	567	442	743	987	1,033	839	809	1,187	800	337
120	1,020	730	296	648	619	486	800	1,065	1,110	903	875	1,259	871	377	1,020	730	296	648	619	486	800	1,065	1,110	903	875	1,259	871	377
130	1,074	773	318	695	665	527	861	1,138	1,185	963	932	1,321	934	421	1,074	773	318	695	665	527	861	1,138	1,185	963	932	1,321	934	421
140	1,118	810	340	734	703	564	916	1,207	1,250	1,022	989	1,373	986	463	1,118	810	340	734	703	564	916	1,207	1,250	1,022	989	1,373	986	463
150	1,155	842	361	766	736	598	963	1,264	1,300	1,074	1,043	1,412	1,032	501	1,155	842	361	766	736	598	963	1,264	1,300	1,074	1,043	1,412	1,032	501
160	1,186	871	378	795	765	629	1,004	1,310	1,344	1,127	1,093	1,448	1,076	535	1,186	871	378	795	765	629	1,004	1,310	1,344	1,127	1,093	1,448	1,076	535
170	1,214	897	394	827	796	656	1,040	1,350	1,390	1,174	1,140	1,484	1,117	566	1,214	897	394	827	796	656	1,040	1,350	1,390	1,174	1,140	1,484	1,117	566
180	1,240	919	408	858	826	678	1,072	1,395	1,434	1,213	1,183	1,517	1,153	595	1,240	919	408	858	826	678	1,072	1,395	1,434	1,213	1,183	1,517	1,153	595
190	1,264	940	421	885	853	696	1,101	1,436	1,473	1,245	1,217	1,544	1,188	623	1,264	940	421	885	853	696	1,101	1,436	1,473	1,245	1,217	1,544	1,188	623
200	1,285	961	433	911	877	713	1,126	1,472	1,504	1,274	1,246	1,566	1,219	648	1,285	961	433	911	877	713	1,126	1,472	1,504	1,274	1,246	1,566	1,219	648
210	1,305	979	444	936	901	728	1,152	1,502	1,533	1,300	1,273	1,566	1,246	673	1,305	979	444	936	901	728	1,152	1,502	1,533	1,300	1,273	1,566	1,246	673
220	1,325	998	455	962	925	746	1,178	1,529	1,559	1,329	1,299	1,566	1,266	697	1,325	998	455	962	925	746	1,178	1,529	1,559	1,329	1,299	1,566	1,266	697
230	1,341	1,014	466	983	946	762	1,204	1,552	1,583	1,356	1,325	1,566	1,285	718	1,341	1,014	466	983	946	762	1,204	1,552	1,583	1,356	1,325	1,566	1,285	718
240	1,357	1,027	475	1,002	965	781	1,227	1,574	1,607	1,380	1,350	1,566	1,300	739	1,357	1,027	475	1,002	965	781	1,227	1,574	1,607	1,380	1,350	1,566	1,300	739
250	1,370	1,039	483	1,020	982	800	1,248	1,597	1,630	1,402	1,373	1,566	1,314	757	1,370	1,039	483	1,020	982	800	1,248	1,597	1,630	1,402	1,373	1,566	1,314	757
260	1,383	1,050	492	1,035	997	818	1,267	1,617	1,650	1,421	1,393	1,566	1,327	774	1,383	1,050	492	1,035	997	818	1,267	1,617	1,650	1,421	1,393	1,566	1,327	774
270	1,396	1,059	500	1,048	1,011	834	1,285	1,636	1,668	1,437	1,410	1,566	1,339	790	1,396	1,059	500	1,048	1,011	834	1,285	1,636	1,668	1,437	1,410	1,566	1,339	790
280	1,408	1,068	507	1,062	1,025	850	1,300	1,652	1,685	1,452	1,426	1,566	1,349	804	1,408	1,068	507	1,062	1,025	850	1,300	1,652	1,685	1,452	1,426	1,566	1,349	804
290	1,419	1,076	514	1,076	1,038	864	1,316	1,667	1,699	1,465	1,439	1,566	1,360	817	1,419	1,076	514	1,076	1,038	864	1,316	1,667	1,699	1,465	1,439	1,566	1,360	817
300	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818
310	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818
320	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818
330	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818
340	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818
350	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818	1,419	1,076	515	1,076	1,041	866	1,320	1,679	1,706	1,474	1,449	1,566	1,360	818

Appendix B: Old Seral Forest Cover Requirements by LU/SSS

Area Summary by LU/BEC/SSS for BEC units with THLB area in the TSA.

			Landbase Type		
LU	**EBM Order**	**BGC LABEL**	**THLB (ha)**	**PFLB non THLB**	**Total PFLB (ha)**
Allison	SCC	CWH vh 1	37	27	64
Allison Total			**37**	**27**	**64**
Ape	SCC	CWH ds 2		1,633	1,633
		MH mm 2		222	222
Ape Total				**1,855**	**1,855**
Atnarko	SCC	CWH ds 2		2,547	2,547
Atnarko Total				**2,547**	**2,547**
Bella Coola	SCC	CWH ds 2	710	2,781	3,491
		CWH ms 2	73	175	248
		CWH ws 2	36	673	709
		MH mm 2	16	100	116
Bella Coola Total			**835**	**3,729**	**4,564**
Braden	CNC	CMA unp		1	1
		CWH vm 1	2,444	12,773	15,217
		CWH vm 2	57	1,484	1,541
		MH mm 1		18	18
Braden Total			**2,501**	**14,275**	**16,776**
Calvert	CNC	CWH vh 2		20,439	20,439
		MH wh 1		529	529
Calvert Total				**20,968**	**20,968**
Clayton	SCC	CMA unp		7	7
		CWH ms 2	546	771	1,317
		CWH vm 3	1	133	134
		CWH ws 2	320	776	1,096
		MH mm 1	0	528	528
		MH mm 2	69	935	1,005
Clayton Total			**935**	**3,151**	**4,087**
Clyak	CNC	CMA unp		111	111
		CWH vh 2	236	679	915
		CWH vm 1	6,457	6,718	13,175
		CWH vm 2	1,349	5,448	6,798
		MH mm 1	58	1,167	1,224
Clyak Total			**8,100**	**14,123**	**22,223**
Crag	SCC	CWH ds 2		10,847	10,847
		CWH ws 2		2,318	2,318
		MH mm 2		1,207	1,207
Crag Total				**14,373**	**14,373**
Dean	CNC	CMA unp		82	82
		CWH ds 2	508	5,715	6,223
		CWH ms 2	163	1,627	1,790
		CWH ws 2	354	6,061	6,415
		MH mm 2	28	4,188	4,215
Dean Total			**1,053**	**17,673**	**18,726**
Denny	CNC	CWH vh 2	1,859	12,962	14,821
Denny Total			**1,859**	**12,962**	**14,821**
Don Peninsula	CNC	CWH vh 2	4,131	8,359	12,490
		CWH vm 1	2,402	1,581	3,983
		CWH vm 2	10	8	18
		MH wh 1		15	15
Don Peninsula Total			**6,544**	**9,963**	**16,507**
Doos/Dallery	CNC	CMA unp		56	56
		CWH vh 2	483	417	899
		CWH vm 1	1,681	6,606	8,287
		CWH vm 2	922	6,305	7,227
		MH mm 1	71	1,600	1,671
Doos/Dallery Total			**3,157**	**14,984**	**18,141**
Draney	SCC	CWH vh 2	10,828	17,310	28,138
		CWH vm 1	1,368	1,851	3,219
		CWH vm 2	2,036	3,683	5,719
		MH mm 1	92	218	310

			Landbase Type		
LU	**EBM Order**	**BGC LABEL**	**THLB (ha)**	**PFLB non THLB**	**Total PFLB (ha)**
		MH wh 1	393	485	877
Draney Total			**14,717**	**23,546**	**38,263**
Ellerslie	CNC	CMA unp	1	14	15
		CWH vh 2	228	2,332	2,560
		CWH vm 1	3,009	6,559	9,568
		CWH vm 2	69	566	635
		MH wh 1	1	28	29
Ellerslie Total			**3,308**	**9,499**	**12,807**
Evans	CNC	CMA unp		4	4
		CWH vh 2	1,563	26,164	27,727
		CWH vm 1	69	360	429
		CWH vm 2	4	867	871
		MH mm 1		9	9
		MH wh 1		233	233
Evans Total			**1,635**	**27,637**	**29,272**
Fish Egg	CNC	CWH vh 2	8,152	26,301	34,453
		MH wh 1	1	226	227
Fish Egg Total			**8,153**	**26,526**	**34,680**
Hunter	CNC	CWH vh 2	797	8,991	9,788
		MH wh 1		32	32
Hunter Total			**797**	**9,023**	**9,820**
Johnston	CNC	CMA unp	15	86	101
		CWH vh 2	4,934	7,284	12,217
		CWH vm 1	544	463	1,007
		CWH vm 2	1,050	3,210	4,261
		MH mm 1	29	371	400
		MH wh 1	90	781	871
Johnston Total			**6,662**	**12,194**	**18,856**
Jump Across	CNC	CWH ms 2	280	3,878	4,158
		CWH vm 3	12	1,946	1,958
		CWH ws 2	30	3,516	3,546
		MH mm 1		748	748
		MH mm 2		805	805
Jump Across Total			**322**	**10,894**	**11,216**
Kilbella/Chuckwalla	CNC	CMA unp	1	153	154
		CWH vh 2	30	96	125
		CWH vm 1	4,636	9,869	14,504
		CWH vm 2	1,271	6,688	7,959
		MH mm 1	156	2,540	2,696
Kilbella/Chuckwalla Total			**6,092**	**19,346**	**25,439**
Kilippi	CNC	CMA unp		292	292
		CWH ms 2	598	329	927
		CWH ws 2	1,066	2,597	3,663
		MH mm 2	139	4,772	4,911
Kilippi Total			**1,803**	**7,990**	**9,793**
King Island	CNC	CMA unp		4	4
		CWH ms 2	637	2,761	3,398
		CWH vm 1	4,278	8,816	13,094
		CWH vm 2	717	5,061	5,779
		CWH vm 3	148	562	711
		MH mm 1	45	767	812
King Island Total			**5,826**	**17,972**	**23,798**
Kwatna/Quatlena	CNC	CMA unp		16	16
		CWH vh 2	657	3,319	3,976
		CWH vm 1	4,561	8,757	13,317
		CWH vm 2	642	6,996	7,639
		MH mm 1	28	1,371	1,399
Kwatna/Quatlena Total			**5,888**	**20,460**	**26,347**
Labouchere	SCC	CMA unp		70	70
		CWH ms 2	1,297	5,242	6,539
		CWH vm 3	460	4,293	4,753
		MH mm 1		620	620
Labouchere Total			**1,757**	**10,225**	**11,982**
Lower Kimsquit	CNC	CMA unp		12	12

			Landbase Type		
LU	**EBM Order**	**BGC LABEL**	**THLB (ha)**	**PFLB non THLB**	**Total PFLB (ha)**
		CWH ms 2	2,398	4,273	6,671
		CWH vm 3	5	1	6
		CWH ws 2	1,104	6,317	7,421
		MH mm 2	0	2,153	2,153
Lower Kimsquit Total			**3,507**	**12,757**	**16,264**
Machmell	CNC	CMA unp		393	393
		CWH ms 2	3,187	3,787	6,973
		CWH vm 3	293	1,052	1,345
		CWH ws 2	1,177	3,952	5,129
		MH mm 1		253	253
		MH mm 2	67	3,460	3,527
Machmell Total			**4,723**	**12,897**	**17,620**
Nascall	CNC	CWH ms 2	213	2,438	2,651
		CWH vm 1	20	3,340	3,359
		CWH vm 2		596	596
		CWH vm 3	2	514	516
		MH mm 1		20	20
Nascall Total			**235**	**6,907**	**7,142**
Neechanz	CNC	CMA unp		197	197
		CWH ms 2	1,990	3,591	5,580
		CWH vm 1	5	93	98
		CWH vm 2	39	90	129
		CWH vm 3	1,842	7,368	9,210
		MH mm 1	32	4,019	4,051
Neechanz Total			**3,907**	**15,358**	**19,266**
Nekite	SCC	CMA unp		90	90
		CWH vh 2		3,564	3,564
		CWH vm 1	5,924	8,925	14,849
		CWH vm 2	1,117	9,758	10,875
		MH mm 1	56	1,569	1,625
		MH wh 1		131	131
Nekite Total			**7,097**	**24,036**	**31,133**
Nootum/Koeye	CNC	CMA unp	1	64	65
		CWH vh 2	3,247	6,744	9,991
		CWH vm 1	55	444	498
		CWH vm 2	264	744	1,008
		MH mm 1	4	136	139
		MH wh 1	40	449	489
Nootum/Koeye Total			**3,611**	**8,580**	**12,191**
Nusatsum	SCC	CMA unp		41	41
		CWH ds 2	24	34	58
		CWH ms 2		561	561
		CWH ws 2	132	2,020	2,152
		MH mm 2	1	1,272	1,273
Nusatsum Total			**157**	**3,928**	**4,085**
Outer Coast Islands	CNC	CWH vh 2	274	7,247	7,521
Outer Coast Islands Total			**274**	**7,247**	**7,521**
Owikeno	CNC	CMA unp		55	55
		CWH ms 2	914	2,602	3,516
		CWH vm 1	204	5,275	5,478
		CWH vm 2	16	2,319	2,335
		CWH vm 3	237	2,242	2,479
		MH mm 1	1	1,897	1,898
Owikeno Total			**1,372**	**14,390**	**15,762**
Price	CNC	CWH vh 2	98	5,571	5,668
Price Total			**98**	**5,571**	**5,668**
Roderick	CNC	CWH vh 2	455	3,085	3,540
		CWH vm 1		2	2
Roderick Total			**455**	**3,086**	**3,542**
Roscoe	CNC	CMA unp	0	24	24
		CWH vh 2	1,594	10,053	11,647
		CWH vm 1	523	8,000	8,523
		CWH vm 2	74	1,266	1,340
		MH wh 1		3	3
Roscoe Total			**2,192**	**19,346**	**21,538**

			Landbase Type		
LU	**EBM Order**	**BGC LABEL**	**THLB (ha)**	**PFLB non THLB**	**Total PFLB (ha)**
Saloompt	SCC	CMA unp		3	3
		CWH ds 2	147	315	461
		CWH ms 2	1,081	1,839	2,919
		CWH vm 3		112	112
		CWH ws 2	1,156	2,615	3,771
		MH mm 1		51	51
		MH mm 2	15	638	653
Saloompt Total			**2,398**	**5,573**	**7,971**
Sheemahant	CNC	CMA unp		337	337
		CWH ms 2	3,613	4,458	8,071
		CWH vm 3	255	493	748
		CWH ws 2	1,225	3,979	5,204
		MH mm 1	16	306	323
		MH mm 2	120	3,900	4,020
Sheemahant Total			**5,230**	**13,473**	**18,703**
Sheep Passage	CNC	CMA unp	1	3	4
		CWH vm 1	2,180	14,491	16,671
		CWH vm 2	145	1,580	1,725
		MH mm 1		25	25
Sheep Passage Total			**2,326**	**16,099**	**18,425**
Sigulat	SCC	CWH ds 2		22	22
Sigulat Total				**22**	**22**
Smith Sound	SCC	CWH vh 1	3,146	16,082	19,228
		CWH vh 2	4	7	10
		CWH vm 1	5	12	17
Smith Sound Total			**3,154**	**16,101**	**19,256**
Smitley/Noeick	SCC	CMA unp		37	37
		CWH ms 2	1,280	1,798	3,079
		CWH ws 2	1,340	3,816	5,156
		MH mm 2	51	2,492	2,543
Smitley/Noeick Total			**2,671**	**8,144**	**10,815**
Smokehouse	SCC	CMA unp		17	17
		CWH vh 1	9	48	58
		CWH vm 1	2,385	9,774	12,159
		CWH vm 2	532	6,776	7,309
		MH mm 1	12	980	992
Smokehouse Total			**2,939**	**17,595**	**20,533**
South Bentinck	SCC	CMA unp		1	1
		CWH ms 2	552	2,421	2,973
		CWH vm 3		12	12
		CWH ws 2	270	1,444	1,714
		MH mm 2	25	713	738
South Bentinck Total			**848**	**4,591**	**5,438**
Sumquolt	CNC	CMA unp		209	209
		CWH ms 2	581	2,815	3,396
		CWH ws 2	553	4,741	5,294
		MH mm 2	16	3,838	3,854
Sumquolt Total			**1,150**	**11,603**	**12,753**
Sutslem/Skowquiltz	CNC	CWH ms 2	214	8,155	8,369
		CWH vm 3	2	4,726	4,728
		MH mm 1		129	129
Sutslem/Skowquiltz Total			**216**	**13,010**	**13,226**
Swindle	CNC	CMA unp	3	6	9
		CWH vh 2	2,399	10,660	13,059
		CWH vm 1	209	981	1,190
		MH wh 1		13	13
Swindle Total			**2,611**	**11,660**	**14,271**
Talchako/Gyllenspetz	SCC	CWH ds 2		988	988
		MH mm 2		89	89
Talchako/Gyllenspetz Total				**1,076**	**1,076**
Taleomey/Asseek	SCC	CMA unp	3	98	102
		CWH ms 2	1,938	2,580	4,518
		CWH vm 3		92	92
		CWH ws 2	1,109	3,751	4,860
		MH mm 1		56	56

			Landbase Type		
LU	**EBM Order**	**BGC LABEL**	**THLB (ha)**	**PFLB non THLB**	**Total PFLB (ha)**
		MH mm 2	343	3,114	3,457
Taleomey/Asseek Total			**3,393**	**9,691**	**13,084**
Twin	SCC	CMA unp		40	40
		CWH ms 2	708	3,178	3,887
		CWH vm 1	1,020	2,138	3,158
		CWH vm 2	201	1,202	1,403
		CWH vm 3	83	2,133	2,216
		MH mm 1	8	1,092	1,100
Twin Total			**2,021**	**9,783**	**11,804**
Upper Kimsquit	CNC	CMA unp		17	17
		CWH ws 2	2,456	8,689	11,145
		MH mm 1		13	13
		MH mm 2	65	3,302	3,367
Upper Kimsquit Total			**2,521**	**12,021**	**14,542**
Washwash	CNC	CMA unp		58	58
		CWH ms 2	281	4,436	4,717
		CWH vm 3	282	4,600	4,882
		MH mm 1	61	2,750	2,811
Washwash Total			**625**	**11,844**	**12,468**
Yeo	CNC	CWH vh 2	1,347	7,976	9,323
		MH wh 1		10	10
Yeo Total			**1,347**	**7,985**	**9,333**
Young	SCC	CWH ds 2		164	164
		CWH ws 2		19	19
Young Total				**183**	**183**
Total PFLB			**143,060**	**630,498**	**773,558**

Note: THLB shown here includes TL Areas that will revert to the TSA in the future.