Tree Farm Licence #30
Management Plan #10

Timber Supply Analysis
Data Package

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1.0 BACKGROUND

The timber supply analysis in support of Management Plan #9 was completed in 2003, followed by the allowable annual cut (AAC) determination effective July 1st, 2003 in which the AAC was set at 330,000 m^3/year.

On April 4th, 2006 under a Postponement Order (Section 8 (3.1) of the *Forest Act*), Canfor provided a letter to the Chief Forester to have the next AAC determination postponed to July 1st, 2013. The Chief Forester concluded that the factors used to assess timber supply have not changed to the extent that they would have an impact on existing timber supply. Consequently, the next AAC determination will occur on July 1st, 2013.

Canfor has initiated a timber supply analysis in support of Management Plan #10 and this document has been prepared to describe the data and assumptions to be used in the timber supply analysis for TFL 30 that are relevant in determining a sustainable harvest level.

2.0 LAND BASE INFORMATION AND DATA

Table 2 describes the input data layers used in this analysis.

Table 1: Input Data Layers

Layer	Vintage	Date Received	Source
Biogeoclimatic Ecosystem Classification (BEC)	2012	18-Feb-12	LRDW
Blocks (Recent Depletion)	2012	12-Apr-12	CANFOR
Caribou Habitat	2012	23-Jan-12	LRDW
Existing and Proposed Roads	2012	30-Mar-12	CANFOR
Forest Health Overview	2011	6-Mar-12	MoFLRNO
Fisheries Sensitive Watersheds	2011	23-Feb-12	MoFLRNO
Hydology - Streams	2000	31-Jan-12	CANFOR
Hydrology - Polygons	2000	31-Jan-12	CANFOR
Landscape Units	2002	23-Jan-12	CANFOR
Operability	2012	generated	TRIM
Operating Areas	2000	1-Feb-12	CANFOR
Ownership - Private Land	2010	26-Jan-12	LRDW
Ownership - Schedule A Lands	2012	26-Jan-12	LRDW
Parks and Protected Areas	2012	2-Mar-12	LRDW
Planning Cells	2000	1-Mar-12	CANFOR
Recreation Emphasis Areas	2000	23-Feb-12	CANFOR
Recreation Sites	2012	14-Mar-12	CANFOR
RESULTS - Blocks	2012	27-Jan-12	LRDW
RESULTS - Treatments	2012	27-Jan-12	LRDW
Special Management Zones	2006	23-Jan-12	CANFOR
Terrestrial Ecosystem Mapping (TEM)	2001	23-Jan-12	CANFOR
TFL Boundary	2012	23-Jan-12	LRDW
Terrain Stability Mapping (TSM)	1996	17-Feb-12	CANFOR
Visual Landscape Inventory (VLI)	1999/2005	20-Mar-12	MOFR
Vegetation Resource Inventory (VRI)	2002	23-Jan-12	CANFOR
Watersheds - H60	2005	5-Mar-12	CANFOR
Watersheds	2005	26-Jan-12	LRDW
Weevil Hazard - V2	1999	23-Jan-12	CANFOR

Data Source and Comments:

- Existing and proposed roads data was reviewed operationally in March 2012 in conjunction with a helicopter flight of the TFL. Additional proposed roads were identified to access the small percentage of the TFL not currently roaded.

- An operability layer was created whereby any area with a slope greater than or equal to 35% was classified as cable ground. Area with slope less than 35% was classified as conventional ground.

- The four recreation areas were buffered to create a 4 ha circle around these point features.

- The TFL boundary from the LRDW was compared with other versions of the boundary. Through this review it was determined that the LRDW version of the boundary best represents the TFL. Additionally, the LRDW boundary is referred to as the official boundary in the licence document.

- The VRI was originally completed in 2000 using 1995 photos. Disturbances in the inventory have been updated to March 2012 and the inventory has been projected to January 1st, 2012.

- Approximately 281 Phase II VRI samples have been installed on the TFL between 1997 and 1999 as well as 2011. This data has been used to adjust the VRI.

3.0 TIMBER HARVESTING LAND BASE DEFINITION

The netdown process starts with the gross area of the land base and removes area in a stepwise fashion according to detailed classification criteria. A complete description of the data and assumptions used in the analysis is documented in the sections below. Through the netdown, area is systematically removed in order to establish both the productive forest and timber harvesting land base (THLB). The netdown process classifies area into three broad categories:

- **Non- Productive**: areas that are non-crown or non-forested and unable to grow viable timber;
- **Productive non-THLB**: the productive land base that is unlikely to be harvested for reasons such as inoperability or special environmental protection; and
- **THLB**: the productive land base that is expected to be available for harvest over the long-term.

The following sections describe the steps that were taken to determine the THLB for TFL 30. The TFL covers a total area of 180,347 ha. Table 2 shows a summary of the area removed in each step of the netdown process.

Table 2: Land Base Classification.

Land Classification	Area (ha)	% of the Productive Forest
Total Area	**180,347**	
Reductions to CFLB		
Outside the TFL	0	
Not Managed by Canfor (Private Land)	-	
Non-Forest	19,202	
Existing Roads and Trails	1,681	
Non-Commercial Brush	5,789	
Existing Unmapped Landings	1,112	
Unclassified Lands	77	
Total Reductions to CFLB	**27,862**	
Productive Forested Land Base (PFLB)	**152,485**	
Reductions to PFLB		
Giscome Portage Trail	0	0%
Unstable Terrain	2,755	2%
Caribou Winter Range	8,404	6%
Recreation Areas	829	1%
Recreation Sites	17	0%
Riparian Reserve Zones	6,054	4%
Special Riparian Areas	1,032	1%
Difficult Regeneration	893	1%
Deciduous Leading	3,689	2%
Non-Merchantable - Mature	4,717	3%
Non-Merchantable - Immature	687	0%
Low Site	-	0%
Wildlife Tree Patches	1,436	1%
Total Reductions to PFLB	**30,514**	20%
Timber Harvesting Land Base (THLB)	**121,971**	80%

3.1 Non-TFL

All data layers have been clipped to the TFL boundary and therefore there are no removals for non-TFL area. The boundary file for TFL 30 from the LRDW was used in this analysis. This boundary was compared with other boundary versions and reviewed with Ministry of Forests, Lands and Natural Resource Operations (MoFLNRO) staff on February 24th, 2012. It was agreed that this boundary file should be used in the analysis.

3.2 Private Land

All private lands within the TFL are not managed by Canfor and consequently were removed from the Crown forest land base. This does not include Schedule A lands that are considered part of the TFL.

3.3 Non-Forest and Non-Productive

Non-forest and non-productive areas area identified and removed from the THLB using a combination of TEM and VRI data. Stands with non-forested leading TEM site series are removed as non-forest and non-productive areas (Table 3). VRI polygons without a leading species are also removed. Areas with a harvest history are not removed.

Table 3: Non-Forested Site Series.

BEC Subzone	TEM Map Code / Site Series	Description
All	CB	Cut Bank
	ES	Exposed Soil
	FS	Non-Forest
	GB	Gravel Bar
	GP	Gravel Pit
	LA	Lake
	OW	Open Shallow Water
	PD	Pond
	RI	River
	RO	Rock
	RU	Unknown
	TA	Talus Slope
	UR	Urban
ESSFwc3	AL	Alder - Lady fern
	BG	Bluejoint - Arrow-leaved groundsel meadow
ESSFwcp3	FH	Bl - Heather mesic krumholz forest
	FR	Bl - Rhododendron
	FV	Bl - Valerian wet meadow
	LC	Bracted louse-wort - Palmate coltsfoot
	SS	Leatherleaf saxifrage - Sedge wetland
	FA	Subalpine fir - Mountain arnica mesic meadow (Mesic forb meadow)
ESSFwk2	BB	Scrub birch - Sedge - Sphagnum
	AL	Sitka alder - Lady fern
	WS	Water sedge - Sphagnum
ICHvk2	BB	Scrub birch - Sedge - Sphagnum
	AL	Sidka alder - Lady fern
SBSmk1	WM	Bog willow-Shore sedge
	HS	Hardhack - Sedge
	AS	Mountain alder - Skunk cabbage - Lady Fern
	HW	Sitka Willow - Horsetail

BEC Subzone	TEM Map Code / Site Series	Description
SBSvk	AA	ActSx - Mountain Alder
	PW	Cow-Parsnip - Meadowrue - Wildrye
	LC	Labrodor tea - Cloudberry - Red Peatmoss
	AD	Mountain Alder - Red - osier dogwood
	AS	Mountain Alder - Skunkcabbage - Ladyfern
	PL	Pl - Labrador tea - Red Peatmoss
	LB	Pl - Scrub birch - Sedge - Sphagnum
	SP	Scheuchzeria - Shore Sedge - Rusty Peatmoss
	BB	Scrub Birch - Beaked Sedge - Beatmoss
	BH	Scrub Birch - Hardhack - Beaked Sedge
	SB	Shore Sedge - Buckbean - Green Peatmoss
	WH	Sitka Willow - Horsetail
	SU	Sxw - Huckleberry - Sphagnum
	WF	Water sedge fen
	WB	Willow - Water Sedge - Bluejoint
SBSwk1	AL	Alder - Lady Fern
	SF	Beaked Sedge fen
	WM	Bog Willow - Shore sedge - Hook Moss Beaked Sedge
	HS	Hard hack
	LS	Labrador tea - Red peatmoss
	AD	Mountain alder - Red-osier dogwood Floodplain
	AS	Mountain alder - Skunk cabbage
	WB	Pacific Willow - Beaked Sedge
	PL	Pl - Labrador Tea - Rusty Peatmoss
	BH	Sb - Common Horsetail - Feathermoss
	BP	Sb - Water Horsetail - Buckbean -Red Peatmoss
	WS	Sitka Willow - Beaked Sedge
	WD	Sitka Willow -Red-osier Dogwood
	WH	Willow - Hardhack

3.4 Non-Commercial Cover

Areas without a harvest history and having a crown closure of less than 10% are removed as non-commercial cover. Areas with a harvest history are not removed.

3.5 Existing and Future Roads and Trails

The majority of the TFL is accessible by either existing or proposed roads. Road data was reviewed prior to the analysis and additional future roads were added to the road network such that 100% of the accessible land base has either an existing or future road to it. Each road was classified into one of the four categories below and attributed as either in-block or out of block based on the existing cutblock layer.

A comprehensive Roads, Trails and Landings inventory was completed for the Prince George TSA in 2011. This project classified roads across the TSA and field measured road widths for 404 randomly located points across the Prince George Forest Districts (another 566 plots were located in the Fort St. James District). Roads were classified into one of the 25 different categories of roads shown in Table 4, which were then grouped into one of 15 strata (numbered 17 to 31 for the Prince George District).

Table 4: Prince George Forest District Road Stratifications

Stratum ID	Status	Method	Season	Class	Type
17	In-Block	Conventional	All	Main	ICAM
17	In-Block	Roadside	All	Main	IRAM
17	In-Block	Unknown	All	Main	IUAM
18	In-Block	Roadside	All	Operational	IRAO
19	In-Block	Roadside	Summer	Spur	IRSS
20	In-Block	Conventional	Winter	Operational	ICWO
20	In-Block	Roadside	Unknown	Operational	IRUO
20	In-Block	Roadside	Winter	Operational	IRWO
20	In-Block	Unknown	Unknown	Operational	IUUO
20	In-Block	Unknown	Summer	Operational	IUWO
21	In-Block	Roadside	Unknown	Spur	IRUS
21	In-Block	Roadside	Winter	Spur	IRWS
22	In-Block	Conventional	All	Operational	ICAO
22	In-Block	Conventional	Unknown	Operational	ICUO
23	In-Block	Conventional	Summer	Spur	ICSS
23	In-Block	Conventional	Unknown	Spur	ICUS
24	In-Block	Conventional	Winter	Spur	ICWS
25	In-Block	Unknown	All	Operational	IUAO
26	In-Block	Unknown	Summer	Spur	IUSS
26	In-Block	Unknown	Unknown	Spur	IUUS
27	In-Block	Unknown	Winter	Spur	IUWS
28	Outside	None	All	Main	ONAM
29	Outside	None	All	Operational	ONAO
30	Outside	None	Winter	Operational	ONWO
31	Outside	None	All	Trail	ONAT

In order to relate the average road widths calculated for the Prince George Forest District with the road classification information that exists for the TFL some of the Prince George Forest District strata were combined and related to existing road classifications as shown in Table 5. In combining strata a new average road width was calculated for the combined group based on the weighted distribution of that road across the district. Table 5 shows the original road widths as well as the new weighted mean road widths for each new stratum.

Each road (existing and proposed) has been buffered according to its road class (new stratum) and new weighted mean road width from Table 5. Existing road buffers have been removed form the THLB. Buffer areas for proposed roads will be removed once harvested for the first time.

Table 5: Road Buffer Widths.

Original Data from PG TSA RTL Project (2010)				Modified Groupings to Reflect TFL 30 Road Classes		
Stratum ID	Original Mean Road Width (m)	Road Length (m)	Original Mean Road Width * Road Length	New Strata ID	New Stratum	New Weighted Mean Road Width (m)
17	20.7	738,103	15,308,263	1	In Block - Mainline	20.7
18	9.1	2,318,656	21,050,587	2	In Block - Operational	8.1
19	9.3	2,390,476	22,320,213			
20	10.2	840,794	8,542,464			
21	7.0	2,721,896	19,020,870			
22	7.9	4,510,633	35,716,013			
23	5.1	3,040,900	15,523,796	3	In Block - Spur	6.7
24	5.8	3,255,725	18,831,798			
25	7.5	1,444,828	10,815,571			
26	7.6	1,040,310	7,867,346			
27	4.4	684,224	2,976,375			
28	23.7	1,371,530	32,493,345	4	Outside - Mainline	23.7
29	11.6	5,531,741	64,137,458	5	Outside - Operational	11.4
30	9.1	433,572	3,945,507			
31	3.8	3,049,469	11,679,467	6	Outside – Spur	3.8

3.6 Existing Unmapped Landings

Current harvesting practices have evolved such that landings are either not required (i.e. cut-to-length or roadside processing) or are minimized. However, due to previous harvesting practices, unmapped landings exist on the land base. To reflect the loss of productive forest due to unmapped landings, 2% of the THLB is removed in all areas harvested before 1995.

3.7 Unclassified Lands

When the VRI and TEM inventories were created they utilized a different project boundary than the currently approved boundary layer on the LRDW. This issue was noted in the MP#9 analysis as well. VRI and PEM data from the adjacent TSA is also missing for these areas. Without VRI data it is not feasible to model timber supply in these areas and therefore they have been removed from both the productive forest and the THLB. This netdown was applied last in order to assess the true impact of this boundary issue. Of the 958 ha without VRI or TEM data, only 77 ha remains after the other netdowns have been applied.

3.8 Productive Forest Area

The productive forest area represents the land base area once non-Crown, non-forest / non-productive, non-commercial cover and existing roads have been removed.

3.9 Parks and Protected Areas

Areas identified as parks, protected areas and ecological reserves are considered part of the productive forest but are excluded from the THLB. This includes the Giscome Portage Trail, which is identified as a park.

3.10 Unstable Terrain

Level 'D' terrain stability mapping has been completed for the entire TFL. Areas identified as 'unstable' or 'reduced stability' terrain have been completely removed from the THLB.

3.11 Caribou High Habitat

As required by Ungulate Winter Range Order #U-7-003 (MOE, 2009), timber harvesting and road construction is generally excluded from all Caribou – High habitat and therefore this area is excluded from the THLB. Management within the caribou corridor zones identified in this order is addressed in Section 4.3.1 using forest cover retention constraints.

3.12 Recreation Areas

Harvesting is excluded from the Tri-Lakes, Woodall and Horseshoe recreation areas and these areas have been excluded from the THLB.

3.13 Recreation Sites

There are five recreation sites located in the TFL. Consistent with the analysis for Management Plan #9, each site has been buffered creating a 4 ha area which is removed from the THLB. The recreation sites are as follows:

1. Pass Lake,
2. Boundary Lake,
3. Amanita Lake,
4. Averil Creek, and
5. Freya Lake.

3.14 Riparian Management

Sections 47 to 51 and 53 of the Forest Planning and Practices Regulations (FPPR) of the Forest and Range Practices Act (FRPA) govern harvesting activities within riparian areas of the TFL and specify the reserve zone (RRZ) and management zone (RMZ) widths for each type of riparian feature listed in Table 6.

Canfor's Forest Stewardship Plan (FSP) (2011) prescribes RMZ retention targets as a function of windthrow hazard within the specific riparian area. Areas with a moderate to high windthrow hazard receive >= 25% retention while those with a low windthrow hazard receive no retention. A review of current practices indicates that generally RMZ areas in the TFL are assessed as having moderate to high windthrow hazard and are managed for 25% retention.

A general review of stream classification data indicates that of the 3,577 kms of stream data, classification has been completed on approximately 1,682 kms (47%). It is generally believed that all of the S1 and S2 streams have been classified meaning that the remaining 2,032 kms of unclassified streams reflect a combination of S3, S4, S5, S6 and NCD streams. Based on these assumptions Table 6 shows the percent distribution of these stream classes within the S3-S6, NCD portion of the classified streams. Of the unclassified streams, only the S3 streams will have an impact on timber supply with a 20m RRZ and 20m RMZ with 25% retention. By applying a RMA buffer of 4.95 m to all the unclassified streams we can approximate the timber impact of the RMA of the unclassified streams, assuming that distribution of stream class in the unclassified portion of the land base is similar to the classified portion.

Table 6: Riparian Reserve and Management Zone Widths for Unclassified Streams.

Stream Class	Length (Km)	% of Unclassified Streams	Total Reserve Zone (m)	Pro-Rated Buffer (m)
S1	505		25 / 55	
S2	256		35	
S3	182	20%	25	4.95
S4	208	23%	0	-
S5	247	27%	0	-
S6	145	16%	0	-
NCD	138	15%	0	-
Unclassified	2,032			
Total	3,577			
Total S3 – S6, NCD	920			4.95

Using this information all streams lakes and wetlands are classified and buffered according to the total RMA buffer from Table 7. These areas are removed from the THLB and represent the combined impact of both the RRZ and RMZ management practices.

Table 7: Riparian Reserve and Management Zone Widths.

Riparian Class	Riparian Reserve Zone (RRZ) Width (m)	Riparian Management Zone RMZ Width (m)	RMZ Retention (%)	RMZ Equivalent (m)	Total RMA Buffer (m)
S1-A	0	100	25	25	25
S1-B	50	20	25	5	55
S2	30	20	25	5	35
S3	20	20	25	5	25
S4	0	30	0	0	0
S5	0	30	0	0	0
S6	0	20	0	0	0
Unclassified Streams					4.95
W1	10	40	25	10	20
W2	10	20	25	5	15
W3	0	30	0	0	0
W4	0	30	0	0	0
W5	10	40	25	10	20
L1-A	0	0	N/A	0	0
L1-B	10	0	N/A	0	10
L2	10	20	25	5	15
L3	0	30	0	0	0
L4	0	30	25	7.5	7.5

3.15 McGregor River and Seebach Creek Management Zones

Current harvesting practices dictate harvest exclusion in the McGregor River and Seebach Creek Management Zones. These areas have been removed from the THLB.

3.16 Difficult Regeneration

Historically, environmentally sensitive areas (ESA) data has been used to identify areas in which regeneration difficulties are likely to be encountered. However, the TEM data provides a much more accurate reflection of where these areas are likely to exist. Using TEM data, stands with the leading site series identified in Table 8 have been removed from the THLB. These exclusions are not applied in areas in which there is a harvest history.

Table 8: Site Series with Regeneration Difficulties.

BEC Subzone	TEM Map Code / Site Series	Description
ESSFwc3	01 02 03	Bl - Rhododendron - Oak fern Bl - Rhododendron - Queen's cup Bl - Globeflower - Horsetail
ESSFwk2	02 31	Bl - Oak fern - Sarsaparilla Non-forested bog
SBSmk1	10	Sb - Scrub birch - Sedge
SBSwk1	11 12	SbSxw - Scrub birch - Sedge SbPl - Feathermoss

3.17 Deciduous Leading

All deciduous-leading stands are removed from the THLB.

3.18 Non-Merchantable - Mature

All stands without a harvest history that do not meet the minimum merchantability limits described in Table 9 are removed from the THLB.

Table 9: Minimum Merchantability Limits.

Harvest System	Leading Species	Age (years)	Minimum Volume (m3/ha)
Conventional	Pine Balsam Other	100 120 140	140
Cable	Pine Balsam Other	100 120 140	250

3.19 Low Productivity - Immature

Stands without a harvest history that are younger than the age limits identified in Table 9 above are excluded from the THLB if the PSI is less than values identified in Table 10.

Table 10: Low Productivity Site Index Limits.

Leading Species	Minimum Site Index
Douglas fir	8.5
Cedar	9.0
Hemlock	8.0
Balsam	8.0
Spruce	7.5
Lodgepole Pine	7.5

3.20 Wildlife Tree Patches

With respect to stand-level biodiversity, Canfor's FSP commits to ensuring that at least 7% of the total area of cutblocks harvested over a 12 month period will be covered by wildlife tree retention and that at least 3.5% of each individual cut block will be covered by wildlife tree retention. Operationally, retention requirements are first met using portions of the stand that don't typically contribute to timber supply (riparian areas, deciduous stands, unstable terrain, non-merchantable areas, and retention for visual quality and wildlife habitat). Existing wildlife tree patches (WTP) have been removed from the THLB.

A review of blocks harvested since 1995 shows that operationally an average of 7.8% of the productive forest area has been retained as WTP (Table 11). The current THLB definition shows that within these blocks approximately 11.5% of the area is occupied by productive non-THLB (including existing WTP areas).

Table 11: WTP / Non-THLB Areas

Log Year	Productive Area (ha)	Existing WTP Area (ha)	Productive Non-THLB (ha)	THLB (ha)	Existing WTP %	Productive Non-THLB %	% of Total THLB
<1995	62,595	139	8,084	54,510	0.2%	12.9%	45%
1995 - 2000	10,391	749	1,233	9,158	7.2%	11.9%	8%
2001 - 2011	9,061	772	1,008	8,053	8.5%	11.1%	7%
2012 +	4,347	338	368	3,979	7.8%	8.5%	3%
No harvest history	66,091	47	19,820	46,271	0.1%	30.0%	38%
Total	**152,485**	**2,044**	**30,514**	**121,971**	**1.3%**	**20.0%**	
Area harvested between 1995 and 2011	19,452	1,521	2,241	17,211	7.8%	11.5%	14%
The remainder of the land base (non-WTP area)	133,033	524	28,273	104,760	0.4%	21.3%	86%
Total	**152,485**	**2,044**	**30,514**	**121,971**	**1.3%**	**20.0%**	**100%**

Areas harvested prior to 1995 and the proportion of the THLB without a harvest history (the non-WTP area) will follow current practices and future WTP areas will be focused in existing non-THLB areas. A summary of the non-WTP portion of the productive forest shows that 21.3% of this area is productive non-THLB – almost double that of the area harvested since 1995. Even if the caribou high habitat is excluded as contributing only to the WTP objectives of cutblocks in close proximity to the caribou high areas, the proportion of productive non-THLB within the remainder of the land base is approximately 16.5%.

Additionally, management for old forest objectives, visual quality and other habitat requirements will increase the amount of stand level retention and contribute to meeting WTP requirements without removing additional areas from the THLB. Given the considerable overlap between these factors and the stand level retention objectives there are no additional reductions required to ensure that the timber supply impacts of this objective are being achieved on the land base.

3.21 Old Growth Management Areas

As described in Section 5.2 of the FSP, old growth management within the TFL is governed by the Provincial Non-Spatial Old Growth Order. Spatial old growth management areas (OGMA) have not been defined in the TFL and therefore there are no reductions to the THLB. Management objectives for old growth are discussed in Section 4.2.1 below.

4.0 CURRENT FOREST MANAGEMENT ASSUMPTIONS

The following sections describe management objectives not captured through the land base reductions described above.

4.1 Resource Management Objectives

Resource management objectives represent areas in which specific management objectives are applied, generally to reflect non-timber values on the landbase. Each resource management objective has specific forest cover objectives (either retention or disturbance requirements) applied. Detailed modelling information on each objective is provided in the sections below.

Table 12 shows the area by resource management objectives in the TFL. Resource management zones often overlap and therefore the sum of the areas is not equivalent to the total TFL area.

Table 12: Resource Management Objective Area Summary.

Resource Management Objective	Area (ha)		
	Total Productive	Non-THLB Productive	THLB
Seral Stage Objectives	Entire Land Base		
Watershed PFI Objectives	Entire Land Base		
Caribou Corridors	3,431	892	2,539
Visual Quality Objectives	10,990	3,892	7,098

4.2 Landscape and Stand Level Biodiversity

4.2.1 Seral Stage Distribution

As discussed above, objectives for old growth management follow the Provincial Non-Spatial Old Growth Order and are described in Canfor's FSP.

Table 13: Seral Stage Objectives.

Landscape Unit	Biodiversity Emphasis Option (BEO)	Natural Disturbance Type (NDT)	BEC Subzone / Variant	Age (years)	Target %	Target Drawn Down by 2/3 (%)
Averil	Low	3	SBS wk1 SBS mk1	> 140	> 11	> 3.7
		1	ICH vk2	> 250	> 13	> 4.3
		1	ESSF wk2	> 250	> 19	> 6.3
Seebach	Low	2	SBS vk	> 250	> 9	> 3.0
		3	SBS wk1	> 140	> 11	> 3.7
		1	ICH vk2	> 250	> 13	> 4.3
		1	ESSF wk2 ESSF wc3	> 250	> 19	> 6.3
Woodall	Low	2	SBS vk	> 250	> 9	> 3.0
		2	ICH vk2	> 250	> 13	> 4.3
		1	ESSF wk2 ESSF wc3	> 250	> 19	> 6.3

4.2.2 Patch Size Distributions

Section 5.8 of the FSP describes objectives for patch size distribution within the TFL30 FDU. These targets are shown in Table 14 below and apply only to “young forest”. For the purpose of this analysis, “young forest” is defined as any stand with an age <= 20 years.

Table 14: Seral Stage Objectives.

Landscape Unit	Patch Size Category	Patch Size Class (ha)	Target Distribution Range (%)
Averil (grouped into NDT 3)	Small	< 40	10 – 20
	Medium	40 – 250	10 – 20
	Large	250 – 1000	60 – 80
	Extra Large	> 1000	0
Seebach (grouped into NDT 2)	Small	< 40	30 – 40
	Medium	40 – 80	30 – 40
	Large	80 – 250	20 – 40
	Extra Large	> 250	0
Woodall (grouped into NDT 1,2)	Small	< 40	30 – 40
	Medium	40 – 80	30 – 40
	Large	80 – 250	20 – 40
	Extra Large	> 250	0

4.3 Wildlife Habitat

4.3.1 Mountain Caribou

Ungulate winter range order # U-7-003 specifies general wildlife measures (GWM) across three habitat classifications:

- Caribou high;
- Caribou medium; and
- Caribou corridors.

Only caribou high and caribou corridor habitat types exist in the TFL. As noted in Section 2.2.6, all high value habitat areas are removed from THLB. Within the caribou corridor zones harvesting activities will result in a minimum of 20% of the Crown forested land base within each UWR unit greater than 100 years of age and a maximum of 20% of the Crown forested land base less than 3m in height at any point in time. Table 15 shows the caribou corridor zones and the constraints applied to these zones.

Table 15: Caribou Corridor Zones.

UWR #	Rating	Maximum Disturbance Constraint	Minimum Retention Constraint	Non-THLB (ha)	THLB (ha)
P-042	Corridor	20% > 100 years	20% < 3m	258	334
P-046	Corridor	20% > 100 years	20% < 3m	171	719
P-047	Corridor	20% > 100 years	20% < 3m	464	1,486

4.3.2 Grizzly Bear, Marten and Moose Habitat

Under the Management Plan #9 analysis it was assumed that grizzly bear, marten and moose habitat requirements are addressed through the management of other objectives described above. Since the last analysis there has not been any additional information suggesting that additional analysis assumptions are required to address this.

4.4 Watersheds

An Interior Watershed Assessment (IWA) was completed for the TFL in February of 1999 using procedures outlined within the FPC Interior Watershed Assessment Procedure (IWAP) Guidebook, September 1995 edition. Under the IWAP, 27 watersheds were identified and each was assigned an equivalent clear-cut area (ECA) and peak flow index (PFI) threshold based on watershed specific mainstream channel stability, average slope, erosion potential and sediment delivery capability parameters (Beaudry 1999).

Since the 1999 assessment P. Beaudry and Associates Ltd. was commissioned to review and refine the initial set of thresholds set for watersheds under the 1999 IWAP. Based on this review, it was determined that PFI thresholds alone were more appropriate targets for managing and measuring impacts of forest management operations on water quantity and flow than ECA thresholds. In addition, PFI thresholds were reduced from those set under the original assessments for 10 out of the 27 watersheds delineated.

In addition, a draft fisheries sensitive watershed (FSW) order covering the Seebach Creek watershed has been prepared and is expected to be approved in the near future. In addition to limitations on harvesting and road construction, this draft order prescribes additional ECA targets within sub-units of the Seebach Creek watershed.

ECA is calculated using the area harvested within a watershed multiplied by the hydrological recovery of each stand. As stand height increases, hydrological recovery increases with full recovery achieved once the stand reaches 12 meters in height as shown in Table 16. Area above the H60 line contributes 1.5 times the area to the ECA calculation. Peak flow index (PFI) is a measure of the ratio of ECA to total watershed area. PFI threshold values, including those prescribed in the FSW order are shown in Table 17.

Table 16: Hydrological Recovery

Stand Height (m)	Hydrological Recovery (%)
<3	0
3 to < 5	25
5 to < 7	50
7 to < 9	75
9 to < 12	90
12 +	100

Table 17: Peak Flow Index Maximum Threshold Values

Watershed	PFI Threshold (%)
East Olsson	37
Woodall Creek	37
Barney Creek	37
Residual B	37
Horn Creek	37
Residual D	37
Residual C	65
Mokus Creek	90
West Torpy	37
Residual F	65
Averil Creek	65
Herring Creek	65
Lower Olsson	65
Basin 7	80
Residual E	65
Basin 25	80
Basin 4	65
Residual A	65
Basin 20	65
Tay Creek	80
Basin 27	80
Limestone Creek	80
Hubble Creek	80
Upper Olsson	80
Seebach Creek FSW	**30**
Unit #1 (Lower Seebach)	25
Unit #3 (East-Seebach)	25

4.5 Visual Quality

Scenic areas and visual quality objectives (VQO) have been defined through the visual landscape inventory (VLI). The visually effective green-up (VEG) heights and maximum disturbance percentages are calculated for each of the visually sensitive units (VSU) shown in Table 18 as described in the "*Procedures for Factoring Visual Resources into Timber Supply Analysis*" (BC Forest Service, 1998).

Table 18: Visual Quality Objectives.

VSU	VQO	Average Slope	Maximum Disturbance (%)	VEG Height (m)	Non-THLB (ha)	THLB (ha)
291	M	27.9	25.0	5.5	0	-
802	M	51.4	25.0	7.5	168	25
803	M	35.9	25.0	6.5	184	179
804	M	27.0	25.0	5.5	38	-
805	M	30.0	25.0	5.5	-	16
806	M	15.8	25.0	4.5	1	24
807	M	16.2	25.0	4.5	0	31
808	M	16.4	25.0	4.5	9	14
809	M	8.4	25.0	3.5	1	106
810	M	12.6	25.0	4.0	2	25
811	M	19.2	25.0	4.5	9	31
812	M	15.7	25.0	4.5	0	21
813	M	7.5	25.0	3.5	0	22
814	M	14.4	25.0	4.0	6	2
815	M	9.7	25.0	3.5	11	34
816	M	3.3	25.0	3.0	2	40
817	M	18.8	25.0	4.5	2	29
818	M	12.0	25.0	4.0	1	67
819	M	11.5	25.0	4.0	0	24
820	M	15.7	25.0	4.5	3	35
821	M	18.9	25.0	4.5	16	40
822	M	24.3	25.0	5.0	99	226
823	PR	42.8	15.0	6.5	26	-
824	M	4.6	25.0	3.0	5	42
825	PR	59.4	15.0	8.0	96	51
826	PR	58.3	15.0	8.0	342	58
827	PR	37.4	15.0	6.5	56	250
828	M	14.4	25.0	4.0	14	1
829	M	17.1	25.0	4.5	18	2
830	M	12.5	25.0	4.0	-	9
831	M	31.3	25.0	6.0	-	18
832	M	45.2	25.0	7.0	65	212
833	M	21.3	25.0	5.0	4	76
834	M	20.6	25.0	5.0	16	58
835	M	3.6	25.0	3.0	-	24
836	M	16.1	25.0	4.5	0	19
837	M	23.7	25.0	5.0	0	5
838	M	36.1	25.0	6.5	9	-
839	M	24.6	25.0	5.0	-	43
840	M	12.6	25.0	4.0	1	65
841	M	11.0	25.0	4.0	7	-
842	M	25.3	25.0	5.5	22	-
843	M	40.1	25.0	6.0	42	24
844	PR	17.3	15.0	4.5	10	991
845	M	23.6	25.0	5.0	51	595
846	M	19.0	25.0	4.5	13	285

VSU	VQO	Average Slope	Maximum Disturbance (%)	VEG Height (m)	Non-THLB (ha)	THLB (ha)
848	M	9.0	25.0	3.5	-	38
849	PR	31.7	15.0	6.0	54	325
850	PR	24.5	15.0	5.0	34	105
851	M	18.0	25.0	4.5	192	401
853	PR	47.2	15.0	7.0	930	404
854	M	18.3	25.0	4.5	14	174
855	M	23.2	25.0	5.0	-	17
856	M	16.5	25.0	4.5	16	94
857	M	15.1	25.0	4.0	4	105
858	M	13.0	25.0	4.0	4	43
859	M	2.3	25.0	3.0	19	21
860	PR	45.4	15.0	7.0	264	62
861	M	17.5	25.0	4.5	5	32
862	PR	42.5	15.0	6.5	140	161
863	M	56.6	25.0	8.0	95	28
864	PR	40.7	15.0	6.5	336	459
865	M	35.8	25.0	6.5	3	24
866	M	57.8	25.0	8.0	0	194
867	M	21.6	25.0	5.0	23	-
868	M	53.6	25.0	7.5	386	223
869	M	10.2	25.0	4.0	6	192
871	M	16.9	25.0	4.5	0	50
872	M	38.2	25.0	6.5	11	19
873	M	13.5	25.0	4.0	1	76
874	M	27.6	25.0	5.5	4	38

4.6 Modelling Approach

4.6.1 Forest Estate Model

Forest estate modeling has been conducted using the spatially explicit optimization model Patchworks. Patchworks is developed by Spatial Planning Systems in Ontario (www.spatial.ca) and allows the user to explore trade-offs between a broad range of conflicting management goals while considering operational objectives and limitations into strategic-level decisions. The model provides an easy to use interface that allows users to access and understand information in real-time.

The model has been formulated using five-year planning periods over a 250-year planning horizon.

4.6.2 Harvest Flow Objectives

The biological capacity of the land base as well as forest cover and green-up requirements dictate the sustainable harvest level for a particular land base. There are a number of alternative harvest flows possible. In this analysis, the harvest levels will reflect the following objectives:

- Maintain the current AAC for as long as possible;
- Decrease to a non-declining mid-term harvest level that reflects the productive capability of the land base; and
- Increase to an even-flow long-term harvest level over a 250-year planning horizon.

A harvest rule that maintains the existing AAC over the short-term will be applied while the long-term harvest level produces a non-declining growing stock. This is consistent with current practice.

Alternative initial, mid-term and long-term harvest levels will also be considered in sensitivity analyses. For example, if a step-up to a higher long-term harvest level is possible (while maintaining stable growing stock levels), it will be implemented.

4.6.3 Minimum Harvest Age

Minimum harvest age (MHA) for both existing natural, existing managed and future managed stands is derived for each analysis unit based on the age at which the stand achieves both 95% of culmination MAI and has achieved at least 140 m3/ha.

Alternative MHA limits will be examined in sensitivity analyses.

4.6.4 Reductions for Future Roads

All future roads have been identified spatially, classified and buffered according to the classifications listed in Table 5. These areas will be removed from the THLB once they are harvested for the first time.

4.6.5 Disturbing the non-THLB

In traditional timber supply analysis the productive non-THLB ages continuously throughout the planning horizon which likely overestimates its contribution to meeting old seral targets as natural disturbances generally impact the age of these stands. This is addressed by modeling disturbances in the non-THLB.

This section describes the process of disturbing the non-THLB used for this analysis. This approach mimics the natural disturbance regimes and natural range of variation for each Biogeoclimatic Ecosystem Classification (BEC) zone in accordance with the Biodiversity Guidebook (MOF, 1995). This is done by:

1. Calculating the annual natural disturbance area required to achieve the natural disturbance return intervals within each BGC zone in the Biodiversity Guidebook; and

2. Imposing an annual natural disturbance on the non-THLB that is roughly equivalent to the areas calculated above.

Annual Disturbance

The disturbance return interval from the Biodiversity Guidebook (MOF 1995) for each natural disturbance type (NDT) / BEC reflects the number of years in which 100% of the area is affected by natural disturbance. Therefore the annual disturbance percent can be calculated by dividing 100% by that interval. The annual disturbance percent is then multiplied by the non-THLB area within each NDT / BEC to produce the annual disturbance area as shown in Table 19.

Table 19: Non-THLB Annual Disturbance.

BEC Label	NDT	Disturbance Interval (years)	Percent Disturbed Annually	Total Non-THLB Area (ha)	Annual Disturbance (ha)
ESSF wc3	1	350	0.29%	2,832	8
ESSF wcp	1	350	0.29%	747	2
ESSF wk2	1	350	0.29%	5,985	17
ICH vk2	1	250	0.40%	1,556	6
SBS mk1	3	125	0.80%	1,134	9
SBS vk	2	200	0.50%	9,022	45
SBS wk1	2	200	0.50%	9,238	46

At the beginning of the analysis, polygons are randomly selected from the non-THLB until the annual natural disturbance targets are met. A disturbance schedule is then developed for these polygons and this schedule is enforced on the model prior to the harvest schedule optimization, thereby simulating the impacts of natural disturbance on the harvest schedule.

4.6.6 Non-Recoverable Losses

Past performance has demonstrated that protection measures within the TFL have been effective at minimizing natural disturbances. When they do occur, Canfor has been aggressive in salvaging damaged timber. Over the last decade, salvaged timber has accounted for 20 to 25% of the annual harvested volume. As a result, very little unsalvaged losses are incurred. Since the last AAC determination, Canfor has determined that unsalvaged losses have remained consistent with figures used under MP8 and that no changes are anticipated. Therefore, the unsalvaged loss estimates used under MP9 will also be applied under MP10 as follows:

Table 20: Non-Recoverable Loss (NRL) Estimates.

Damaging Agent	Gross Volume Loss (m3/yr)	Volume Salvaged (m3/year)	NRL (m3/year)
Insects (Epidemic)	37,420	35,940	1,480
Wind	19,700	18,540	1,160
Fire	10,200	9,200	1,000
Total	**67,320**	**63,680**	**3,640**

4.6.7 Mountain Pine Beetle Impacts

Pine represents only a small proportion of the profile of TFL 30. Small outbreaks of MPB have occurred in the western portion of the TFL and have been promptly harvested. Aside from the NRL estimates above, no additional measures are required to address MPB impacts.

5.0 GROWTH AND YIELD

A stand's growth in terms of height, diameter and volume is predicted using growth and yield models. The assumptions, inputs and outputs used in these models are documented in the following sections. Stands are either classified as natural or managed depending on their silviculture history and the origins of the stand. In TFL 30, recorded harvest history dates back to the early 1940's however very little, if any silviculture was practiced until around 1978. A review of RESULTS data for blocks harvested between 1978 and 1985 shows that approximately 88% of regenerated areas is from planted stock (stock type code = 'ART). This increases to 93% for blocks harvested between 1986 and 1987 and to 96% for blocks harvested after 1998. As shown in Table 22 below, many site series regeneration assumptions include a component of natural regeneration. In 1990, the practice of using genetically improved seed began, gradually increasing as the availability of genetically improved stock increased. By 1998, continuing to present time, all of the planting stock used on the TFL is from genetically improved seed.

Starting in 2010, Canfor began planting weevil tolerant seedlings on blocks harvested in 2008. Walk-through surveys of these plantations suggest that attack rates have been reduced by up to 60% in these plantations (pers. comm. Dale Likes, Canfor Silviculture Forester).

Based on this information, stand yield will be modelled using the silviculture eras described in Table 21 below.

Table 21: Silviculture Eras.

Harvest Year	Silviculture Era	Growth and Yield Assumptions	THLB Area (ha)
< 1978 or None	R0 - existing natural stands	Use VDYP with stand composition from the VRI	66,013
1978 to 1997	R1 - existing managed stands – no genetic gains.	Use TIPSY with regen. assumptions from Table 22 with no genetic gains.	39,629
1998 to 2008	R2 - Existing managed stands – partial genetic gains	Use TIPSY with regen. assumptions from Table 22 with partial genetic gains from Table 26	11,607
2008 +	R3 - Future managed stands	Use TIPSY with regen. assumptions from Table 22 with partial genetic gains from Table 26 + weevil tolerant stock.	4,722

5.1 Growth and Yield Models

Stands harvested prior to 1978 or those without harvest history information are classified as existing natural stands with yield projections produced using the Variable Density Yield Prediction model version 7 (VDYP7).

All stands with a harvesting history after 1977 are classified as managed stands with yield projections produced using the Table Interpolation Program for Stand Yields Version 4.2 (TIPSY4.2).

5.2 Analysis Unit Aggregation

Analysis units are aggregations of stands with similar species composition, site productivity and treatment regimes. To capture the diversity of natural stands that exist on the land base and are reflected in the inventory, each existing natural stand is modelled using its own yield curve – there is no aggregation of existing natural stands into analysis units.

Stands harvested after 1978 (including future stands) will be grouped into analysis units by BGC zone, subzone, variant and site series according to the TEM and will be modelled using TIPSY.

5.3 Natural Stands

Natural stands are defined as those stands without a harvest history or those harvested prior to 1978. These stands will be modelled using VDYP7. Adjusted inventory attributes from the VRI will be used as inputs to the model including net volume adjustment factors derived through the Phase II VRI Adjustment (Ecora 2012).

5.4 Managed Stands

Managed stands are grouped into analysis units based on BGC zone and site series as shown in Table 22. The planting species mix, densities, regeneration delay and regeneration type reflect current silviculture practices that are expected to continue into the future. Managed stands reflect a combination of planted and natural regeneration as indicated.

Table 22: Managed Stand Yield Input Assumptions.

Site Series	Gross Area (ha)	Natural %	Planted %	Planted								Natural							
				SP1	SP1 %	SP2	SP2 %	SP3	SP4 %	Planting Density	Regen. Delay	SP1	SP1 %	SP2	SP2 %	SP3	SP3 %	Density	Regen. Delay
ESSFwk2-01	7,528	85	15	Sx	100					1,500	2	Bl	100					1,725	4
ESSFwk2-03	49	85	15	Sx	100					1,500	2	Bl	100					1,725	4
ESSFwk2-04	685	85	15	Sx	100					1,500	2	Bl	100					1,725	4
ESSFwk2-05	1,405	85	15	Sx	100					1,500	2	Bl	100					1,725	4
ESSFwk2-06	235	85	15	Sx	100					1,500	2	Bl	100					1,725	4
ICHvk2-01	6,181	85	15	Sx	70	Fdi	30			1,500	2	Cw	100					1,725	4
ICHvk2-02	109	85	15	Fdi	70	Pli	30			1,200	2	Cw	100					1,380	4
ICHvk2-03	407	85	15	Fdi	70	Sx	30			1,500	2	Cw	100					1,725	4
ICHvk2-04	2,145	80	20	Sx	70	Fdi	30			1,500	2	Cw	100					1,800	4
ICHvk2-05	916	80	20	Sx	70	Pli	30			1,500	2	Cw	100					1,800	4
ICHvk2-06	75	80	20	Sx	70	Pli	30			1,500	2	Cw	100					1,800	4
ICHvk2-07	40	80	20	Pli	70	Sx	30			1,200	2	Cw	100					1,440	4
SBSmk1-01	2,449	70	30	Sx	60	Pli	40			1,400	2	Pli	67	Sx	17	Bl	16	1,820	4
SBSmk1-03	4	80	20	Pli	100					1,400	2	Pli	100					1,680	4
SBSmk1-04	126	70	30	Pli	50	Fdi	30	Sx	20	1,400	2	Pli	67	Sx	17	Bl	16	1,820	4
SBSmk1-05	833	70	30	Sx	60	Pli	40			1,400	2	Pli	67	Sx	17	Bl	16	1,820	4
SBSmk1-06	1,410	70	30	Pli	60	Sx	40			1,400	2	Pli	67	Sx	17	Bl	16	1,820	4
SBSmk1-07	861	85	15	Sx	60	Pli	40			1,400	2	Pli	34	Sx	33	Bl	33	1,610	4
SBSmk1-08	284	70	30	Sx	70	Pli	30			1,400	2	Pli	67	Sx	17	Bl	16	1,820	4
SBSmk1-09	734	85	15	Pli	70	Sx	30			1,000	2	Sx	67	Bl	33			1,150	4
SBSvk-01	41,778	85	15	Sx	100					1,500	2	Bl	67	Sx	33			1,725	4
SBSvk-02	281	100	0	Pli	80	Sx	20			1,500	2								
SBSvk-03	1,468	100	0	Sx	70	Fdi	30			1,500	2								
SBSvk-04	7,080	85	15	Sx	100					1,500	2	Bl	67	Sx	33			1,725	4
SBSvk-05	9,382	85	15	Sx	100					1,500	2	Bl	67	Sx	33			1,725	4
SBSvk-06	4,485	85	15	Sx	100					1,500	2	Bl	67	Sx	33			1,725	4
SBSvk-07	1,632	85	15	Sx	100					1,500	2	Bl	67	Sx	33			1,725	4
SBSvk-08	1,106	85	15	Sx	100					1,500	2	Bl	67	Sx	33			1,725	4
SBSvk-09	70	100	0	Pli	80	Sx	20			1,000	2								
SBSvk-10	1,514	100	0	Sx	100					1,000	2								
SBSvk-11	5,331	100	0	Sx	100					1,500	2								
SBSwk1-01	26,809	75	25	Sx	70	Pli	30			1,400	2	Pli	60	Sx	20	Bl	20	1,750	4
SBSwk1-02	11	100	0	Pli	100					1,200	2								
SBSwk1-03	347	100	0	Pli	100					1,200	2								
SBSwk1-04	2,386	75	25	Sx	70	Pli	30			1,400	2	Pli	60	Sx	20	Bl	20	1,750	4
SBSwk1-05	8,284	75	25	Sx	70	Pli	30			1,400	2	Pli	60	Sx	20	Bl	20	1,750	4
SBSwk1-06	3,443	75	25	Sx	70	Pli	30			1,400	2	Pli	60	Sx	20	Bl	20	1,750	4
SBSwk1-07	3,390	75	25	Sx	70	Pli	30			1,400	2	Pli	60	Sx	20	Bl	20	1,750	4
SBSwk1-08	5,986	75	25	Sx	70	Pli	30			1,400	2	Pli	60	Sx	20	Bl	20	1,750	4
SBSwk1-09	3,314	100	0	Sx	70	Pli	30			1,400	2								
SBSwk1-10	215	100	0	Sx	70	Pli	30			1,400	2								

5.4.1 Regeneration Delay

Regeneration delay is a measure of the time between harvest and establishment of new trees. The average regeneration delay for the TFL is 2 years.

5.4.2 White Pine Weevil

In the previous MP9 analysis spruce weevil impacts were modelled by applying reductions to managed yield curves as additional OAF 1 values. Weevil attack rates were calculated from regenerating spruce density and elevation using the following formula (adapted from Taylor, 1998):

Attack Percent = 429.4 – 11.02 * LN(SX sph) – 50.03 * LN(elevation)

These attack percentages were then reduced by half of the existing OAF 1 values and were then applied to the yield curves as OAF1 volume reductions resulting in an average volume reduction of 6.2% for existing managed stand volumes and 4.9% for future managed stand volumes.

This approach assumes that volume losses due to weevil are roughly equivalent to the percentage of trees attacked and likely overestimate the volume impacts at time of harvest. In practice, the weevil rarely kills trees but causes the tree to suffer delayed growth while being attacked.

Following discussions with the MFLRNO Regional Pathologist (pers. comm.), it was decided that the application of a regeneration delay corresponding with the projected level of attack would better reflect the growth and yield impacts of the weevil. It is estimated that the most severely attacked stands will suffer, at most, a 10-year regeneration delay due to repeated weevil attacks on the leader. It is estimated that stands attacked at a rate of 80% or greater would all experience the maximum 10-year regeneration delay and that the regeneration delay suffered by a stand gradually increases as the attack percentage increases.

Starting in 2010 Canfor began planting weevil tolerant spruce seed across the TFL. Walkthrough surveys of these plantations suggest that the incidences of leader weevil attack have decreased by as much as 60% (Dale Likes, pers. comm.).

Based on these assumptions and the fact that TIPSY can only model regeneration delay in whole year increments, the relationship between attack percentage and regeneration delay, shown in Figure 1, is used to model the impacts of leader weevil on stand growth for both standard planting stock (planted prior to 2010) and weevil resistant stock (planted 2010 and beyond). Using this information, an average attack percentage is calculated for each regenerated analysis unit and the corresponding regeneration delay is applied to the yield curve for that analysis unit. Table 23 shows the average attack percentages and regeneration delay applied to each analysis unit. These regeneration delays are applied in addition to the standard regeneration delays shown in Table 22.

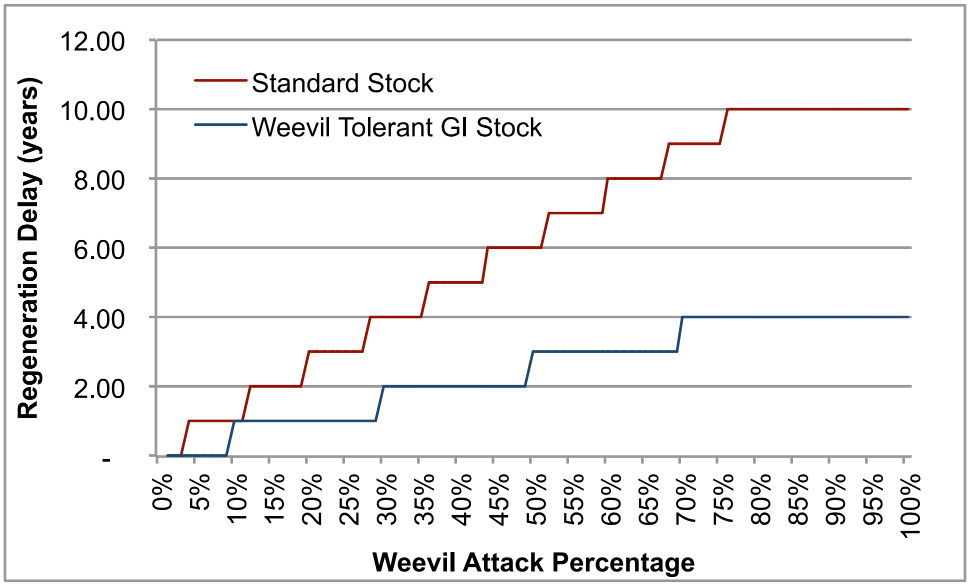

Figure 1: Regeneration Delay Due to Leader Weevil.

Table 23: Additional Regeneration Delay Due to Leader Weevil.

Analysis Unit	Average Attack %	Regeneration Delay (years)	THLB Area (ha)
r1_ICHvk201	14	2	1,207
r1_ICHvk202	-	0	13
r1_ICHvk203	22	3	29
r1_ICHvk204	8	1	389
r1_ICHvk205	11	1	56
r1_ICHvk206	-	0	8
r1_ICHvk207	-	0	5
r1_SBSmk101	52	6	404
r1_SBSmk104	1	0	50
r1_SBSmk105	16	2	161
r1_SBSmk106	55	7	185
r1_SBSmk107	26	3	114
r1_SBSmk108	39	5	62
r1_SBSmk109	38	5	143
r1_SBSmk110	29	4	3
r1_SBSvk001	36	4	14,135
r1_SBSvk002	13	2	18
r1_SBSvk003	11	1	218
r1_SBSvk004	20	3	1,877
r1_SBSvk005	39	5	2,322
r1_SBSvk006	45	6	1,188
r1_SBSvk007	42	5	211
r1_SBSvk008	20	3	74
r1_SBSvk009	64	8	20
r1_SBSvk010	45	6	96
r1_SBSvk011	6	1	471
r1_SBSwk101	49	6	7,958
r1_SBSwk103	11	1	32
r1_SBSwk104	13	2	713
r1_SBSwk105	36	4	1,989
r1_SBSwk106	49	6	1,297
r1_SBSwk107	42	5	955
r1_SBSwk108	45	6	1,574
r1_SBSwk109	48	6	846

Analysis Unit	Average Attack %	Regeneration Delay (years)	THLB Area (ha)
r1_SBSwk110	31	4	41
r1_SBSwk111	18	2	94
r2_ICHvk201	3	0	296
r2_ICHvk204	0	0	92
r2_ICHvk205	-	0	101
r2_ICHvk207	-	0	0
r2_SBSmk101	28	3	486
r2_SBSmk104	-	0	9
r2_SBSmk105	12	2	57
r2_SBSmk106	28	3	456
r2_SBSmk107	33	4	221
r2_SBSmk108	39	5	38
r2_SBSmk109	31	4	71
r2_SBSmk110	0	0	3
r2_SBSvk001	12	2	3,031
r2_SBSvk002	4	0	27
r2_SBSvk003	-	0	84
r2_SBSvk004	24	3	741
r2_SBSvk005	11	1	1,003
r2_SBSvk006	19	2	180
r2_SBSvk007	35	4	35
r2_SBSvk008	10	1	20
r2_SBSvk010	9	1	80
r2_SBSvk011	0	0	305
r2_SBSwk101	19	2	1,758
r2_SBSwk103	-	0	0
r2_SBSwk104	19	2	119
r2_SBSwk105	12	1	385
r2_SBSwk106	20	2	347
r2_SBSwk107	43	5	131
r2_SBSwk108	26	3	504
r2_SBSwk109	27	3	245
r2_SBSwk110	55	7	9
r2_SBSwk111	-	0	29
r3_ICHvk201	4	0	226
r3_ICHvk204	-	0	15
r3_ICHvk205	-	0	1
r3_ICHvk206	-	0	3
r3_ICHvk207	-	0	0
r3_SBSmk101	11	1	130
r3_SBSmk105	-	0	2
r3_SBSmk106	13	1	257
r3_SBSmk107	31	2	75
r3_SBSmk108	74	4	22
r3_SBSmk109	32	2	44
r3_SBSmk110	-	0	2
r3_SBSvk001	24	1	1,696
r3_SBSvk003	1	0	46
r3_SBSvk004	7	0	275
r3_SBSvk005	20	1	243
r3_SBSvk006	14	1	96
r3_SBSvk007	-	0	10
r3_SBSvk008	-	0	4
r3_SBSvk010	10	1	87
r3_SBSvk011	-	0	136
r3_SBSwk101	23	1	641
r3_SBSwk103	-	0	14
r3_SBSwk104	42	2	54
r3_SBSwk105	4	0	92

Analysis Unit	Average Attack %	Regeneration Delay (years)	THLB Area (ha)
r3_SBSwk106	22	1	202
r3_SBSwk107	33	2	28
r3_SBSwk108	17	1	182
r3_SBSwk109	21	1	41
r3_SBSwk110	62	3	12
r3_SBSwk111	-	0	8

5.4.3 Dothistroma Needle Blight

Aside from some plantations established between 1975 and 1978 there has been very little pine planted on the TFL. The existing pine plantations have all been severely impacted by dothistroma such that nearly all of the pine has been killed. The results of NSR surveys conducted across the TFL have been entered into RESULTS and this information will be used to generate yield curves that accurately reflect the stocking in these stands.

5.4.4 Site Index

Managed stand site productivity estimates were identified for each polygon through the Potential Site Index project (J.S. Thrower and Assoc. 2000).

5.4.5 Operational Adjustment Factor

Operational adjustment factor (OAF) 1 is used to represent reduced yield due to gaps in stocking; and OAF2 is used to represent decay and losses due to disease and pest when they are present in large magnitudes. OAF1 is a constant reduction factor that shifts the yield curve down whereas the influence of OAF2 increases with age and therefore alters the shape of the curve.

Under the MP9 analysis an OAF 1 value of 14.6% was calculated using a 7.5 % default OAF 1 value and adding the percentage of the THLB occupied by non-productive site series from the TEM. A similar approach has been used for this analysis, calculating the non-productive portion for each productive site series as shown in Table 24. Consistent with MP9, the standard OAF 2 value of 5% will be used for this analysis.

Table 24: OAF Values.

Managed AU	THLB Area (ha)	OAF 1 (default)	OAF 1 (NP)	Total OAF 1	OAF 2 (%)
r1_ESSFwc301	3	7.5	59.4	66.9	5.0
r1_ESSFwk201	509	7.5	11.6	19.1	5.0
r1_ESSFwk202	3	7.5	10.0	17.5	5.0
r1_ESSFwk203	0	7.5	-	7.5	5.0
r1_ESSFwk204	53	7.5	10.4	17.9	5.0
r1_ESSFwk205	85	7.5	0.1	7.6	5.0
r1_ESSFwk206	21	7.5	9.2	16.7	5.0
r1_ICHvk201	1,207	7.5	1.2	8.7	5.0
r1_ICHvk202	13	7.5	-	7.5	5.0
r1_ICHvk203	29	7.5	24.9	32.4	5.0
r1_ICHvk204	389	7.5	10.4	17.9	5.0
r1_ICHvk205	56	7.5	6.5	14.0	5.0
r1_ICHvk206	8	7.5	-	7.5	5.0
r1_ICHvk207	5	7.5	28.5	36.0	5.0
r1_SBSmk101	404	7.5	1.1	8.6	5.0
r1_SBSmk104	50	7.5	-	7.5	5.0
r1_SBSmk105	161	7.5	0.5	8.0	5.0

Managed AU	THLB Area (ha)	OAF 1 (default)	OAF 1 (NP)	Total OAF 1	OAF 2 (%)
r1_SBSmk106	185	7.5	2.4	9.9	5.0
r1_SBSmk107	114	7.5	0.9	8.4	5.0
r1_SBSmk108	62	7.5	-	7.5	5.0
r1_SBSmk109	143	7.5	2.4	9.9	5.0
r1_SBSmk110	3	7.5	33.4	40.9	5.0
r1_SBSvk001	14,135	7.5	1.0	8.5	5.0
r1_SBSvk002	18	7.5	23.5	31.0	5.0
r1_SBSvk003	218	7.5	1.3	8.8	5.0
r1_SBSvk004	1,877	7.5	0.7	8.2	5.0
r1_SBSvk005	2,322	7.5	1.6	9.1	5.0
r1_SBSvk006	1,188	7.5	7.0	14.5	5.0
r1_SBSvk007	211	7.5	7.6	15.1	5.0
r1_SBSvk008	74	7.5	26.2	33.7	5.0
r1_SBSvk009	20	7.5	4.7	12.2	5.0
r1_SBSvk010	96	7.5	18.1	25.6	5.0
r1_SBSvk011	471	7.5	0.5	8.0	5.0
r1_SBSwk101	7,958	7.5	3.7	11.2	5.0
r1_SBSwk103	32	7.5	0.9	8.4	5.0
r1_SBSwk104	713	7.5	0.6	8.1	5.0
r1_SBSwk105	1,989	7.5	2.4	9.9	5.0
r1_SBSwk106	1,297	7.5	6.1	13.6	5.0
r1_SBSwk107	955	7.5	8.0	15.5	5.0
r1_SBSwk108	1,574	7.5	6.7	14.2	5.0
r1_SBSwk109	846	7.5	14.8	22.3	5.0
r1_SBSwk110	41	7.5	27.3	34.8	5.0
r1_SBSwk111	94	7.5	49.3	56.8	5.0
r2_ESSFwk201	477	7.5	8.7	16.2	5.0
r2_ESSFwk202	5	7.5	65.9	73.4	5.0
r2_ESSFwk203	7	7.5	-	7.5	5.0
r2_ESSFwk204	128	7.5	8.2	15.7	5.0
r2_ESSFwk205	122	7.5	14.5	22.0	5.0
r2_ESSFwk206	8	7.5	13.0	20.5	5.0
r2_ICHvk201	296	7.5	4.4	11.9	5.0
r2_ICHvk204	92	7.5	0.1	7.6	5.0
r2_ICHvk205	101	7.5	12.5	20.0	5.0
r2_ICHvk207	0	7.5	-	7.5	5.0
r2_SBSmk101	486	7.5	0.3	7.8	5.0
r2_SBSmk104	9	7.5	-	7.5	5.0
r2_SBSmk105	57	7.5	3.8	11.3	5.0
r2_SBSmk106	456	7.5	1.1	8.6	5.0
r2_SBSmk107	221	7.5	0.1	7.6	5.0
r2_SBSmk108	38	7.5	1.3	8.8	5.0
r2_SBSmk109	71	7.5	17.5	25.0	5.0
r2_SBSmk110	3	7.5	10.0	17.5	5.0
r2_SBSvk001	3,031	7.5	0.7	8.2	5.0
r2_SBSvk002	27	7.5	-	7.5	5.0
r2_SBSvk003	84	7.5	0.3	7.8	5.0
r2_SBSvk004	741	7.5	0.5	8.0	5.0
r2_SBSvk005	1,003	7.5	0.8	8.3	5.0
r2_SBSvk006	180	7.5	11.3	18.8	5.0
r2_SBSvk007	35	7.5	12.4	19.9	5.0
r2_SBSvk008	20	7.5	14.4	21.9	5.0
r2_SBSvk010	80	7.5	21.4	28.9	5.0
r2_SBSvk011	305	7.5	0.0	7.5	5.0
r2_SBSwk101	1,758	7.5	2.3	9.8	5.0
r2_SBSwk103	0	7.5	-	7.5	5.0
r2_SBSwk104	119	7.5	-	7.5	5.0
r2_SBSwk105	385	7.5	2.7	10.2	5.0
r2_SBSwk106	347	7.5	3.4	10.9	5.0

Managed AU	THLB Area (ha)	OAF 1 (default)	OAF 1 (NP)	Total OAF 1	OAF 2 (%)
r2_SBSwk107	131	7.5	10.2	17.7	5.0
r2_SBSwk108	504	7.5	13.7	21.2	5.0
r2_SBSwk109	245	7.5	17.3	24.8	5.0
r2_SBSwk110	9	7.5	17.2	24.7	5.0
r2_SBSwk111	29	7.5	38.5	46.0	5.0
r3_ESSFwk201	25	7.5	24.3	31.8	5.0
r3_ESSFwk203	17	7.5	-	7.5	5.0
r3_ESSFwk204	6	7.5	-	7.5	5.0
r3_ESSFwk205	25	7.5	19.7	27.2	5.0
r3_ESSFwk206	3	7.5	75.5	83.0	5.0
r3_ICHvk201	226	7.5	2.6	10.1	5.0
r3_ICHvk204	15	7.5	-	7.5	5.0
r3_ICHvk205	1	7.5	-	7.5	5.0
r3_ICHvk206	3	7.5	-	7.5	5.0
r3_ICHvk207	0	7.5	-	7.5	5.0
r3_SBSmk101	130	7.5	0.5	8.0	5.0
r3_SBSmk105	2	7.5	-	7.5	5.0
r3_SBSmk106	257	7.5	2.7	10.2	5.0
r3_SBSmk107	75	7.5	0.0	7.5	5.0
r3_SBSmk108	22	7.5	-	7.5	5.0
r3_SBSmk109	44	7.5	3.8	11.3	5.0
r3_SBSmk110	2	7.5	10.0	17.5	5.0
r3_SBSvk001	1,696	7.5	0.6	8.1	5.0
r3_SBSvk003	46	7.5	0.6	8.1	5.0
r3_SBSvk004	275	7.5	-	7.5	5.0
r3_SBSvk005	243	7.5	0.5	8.0	5.0
r3_SBSvk006	96	7.5	3.7	11.2	5.0
r3_SBSvk007	10	8.5	42.5	51.0	6.0
r3_SBSvk008	4	9.5	17.4	26.9	7.0
r3_SBSvk010	87	10.5	6.5	17.0	8.0
r3_SBSvk011	136	11.5	-	11.5	9.0
r3_SBSwk101	641	12.5	1.4	13.9	10.0
r3_SBSwk103	14	13.5	-	13.5	11.0
r3_SBSwk104	54	14.5	-	14.5	12.0
r3_SBSwk105	92	15.5	0.5	16.0	13.0
r3_SBSwk106	202	16.5	30.9	47.4	14.0
r3_SBSwk107	28	17.5	0.9	18.4	15.0
r3_SBSwk108	182	18.5	7.8	26.3	16.0
r3_SBSwk109	41	19.5	2.1	21.6	17.0
r3_SBSwk110	12	20.5	16.1	36.6	18.0
r3_SBSwk111	8	21.5	76.0	97.5	19.0

5.4.6 Previously Fertilized Stands

Approximately 1,863 ha of the TFL was fertilized in 2006. Separate yield curves have been generated for these stands using the fertilization information in RESULTS.

5.5 Non Satisfactorily Restocked

There are no backlog NSR stands on the TFL and therefore all stands with a harvest history that are classified as non-vegetated or vegetated non-treed in the inventory will remain in the THLB and will be considered current NSR. Standard regeneration assumptions as per Table 22 will be applied to these stands.

5.6 Utilization

Yield curves have been generated using the standard utilization levels shown in Table 25.

Table 25: Utilization Levels.

Leading Species	Minimum dbh (cm)	Maximum Stump Height (cm)	Minimum Top dib (cm)
All conifer except pine	17.5	30	10
Pine	12.5	30	10

5.7 Genetic Gain

Since 1998, Canfor has been planting genetically improved stock on the TFL. Initially, the availability of genetically improved stock was limited but this increased over time until all planting occurred using genetically improved stock. Table 26 shows the average genetic gains by species by silviculture era. These genetic gains are applied to all future managed stand yield tables.

Table 26: Genetic Gains by and Era.

Silviculture Era	% G.I. Stock Planted			Genetic Gains (%)		
	Pli	Sx	Fdi	Pli	Sx	Fdi
1998 to 2008	2	100	0	9	19	0
2008 +	2	100	0	9	28	0

5.8 Silviculture Systems

Clearcutting is the predominant silviculture system used on the TFL.

5.9 Reductions for Deciduous Component

Consistent with current practices, the deciduous component of conifer leading stands has been modelled as a reduction in area according to the percentage of deciduous within each stand.

5.10 Reductions for Future Wildlife Tree Patches

As discussed in Section 3.20, wildlife tree patch targets are satisfied through various other land base reductions and objectives and therefore no additional reductions are required.

6.0 SENSITIVITY ANALYSIS

Sensitivity analysis provides information on the degree to which uncertainty in the base case data and assumptions might affect the proposed harvest level for the TFL. The magnitude of the change in the sensitivity variable(s) reflects the degree of risk associated with a particular uncertainty – a very uncertain variable that has minimal impact on the harvest forecast represents a low risk. By developing and testing a number of sensitivity issues, it is possible to determine which variables most affect results and to provide information to guide management decisions in consideration of uncertainty.

Each of the sensitivities shown in Table 27 test the impact of a specific variable with impacts measured relative to the base case harvest forecast. The list of sensitivities may be amended as the analysis is completed and other issues arise.

Table 27: Sensitivity Analyses.

Sensitivity	Range Tested
Alternate Harvest Flow	Increase initial harvest level No increase harvest level Maintain initial harvest level
Minimum Harvest Age	120 m^3/ha 180 m^3/ha 200 m^3/ha
Stand Volume	Managed Stand Yield +/- 10% Natural Stand Yields +/- 10%
Ecosystem Representation Targets	Enforce draft ERA targets as defined in Canfor's SFM Plan for the TFL.

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