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Tree Farm Licence 14 Management Plan # 10 Timber Supply Analysis Data Package

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CANFOR

Dated: May 2017
ECORA File No.: FG-16-500-CFP
Version: 3.1

OQM | Organizational Quality Management Program

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Version Control and Revision History

Version	Date	Prepared By	Reviewed By	Notes/Revisions
1	24-Nov-2016	Liza Rodrigues	Jay Greenfield	Initial draft to Canfor
2	29-Nov-2016	Liza Rodrigues	Jay Greenfield	Draft for review at kick-off meeting
3	15-May-2017	Liza Rodrigues	Jay Greenfield	Version for review prior to public review
3.1	17-May-2017	Liza Rodrigues	Jay Greenfield	Version for Public Review

Limitations of Report

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Acronyms and Abbreviations

AAC	Allowable Annual Cut
AOA	Archaeological Overview
AIA	Archaeological Impact Assessments
BEC	Biogeoclimatic Ecosystem Classification
BEO	Biodiversity Emphasis Options
CP	Cutting Permit
DRA	Digital Road Atlas
ECA	Equivalent Clear-cut Area
ERDV	Enhanced Resource Development Zone
FPPR	Forest Planning and Practices Regulation
FRPA	Forest and Range Practices Act
FSC	Forest Stewardship Council
GAR	Government Action Regulation
HA	Hectares
HVCF	High Value Conservation Forest
IRM	Integrated Resource Management Zone
KBHLPO	Kootenay-Boundary Higher Level Plan Order
KBLRMP	Kootenay Boundary Land and Resource Management Plan
LU	Landscape Unit
LUO	Land Use Orders
LRDW	Land Resource Data Warehouse
MFLNRO	Ministry of Forests Lands and Natural Resource Operations
MP	Management Plan
MPB	Mountain Pine Beetle
MOE	Ministry of Environment
MOF	Ministry of Forests
NRL	Non-Recoverable Loss
OAF	Operational Adjustment factor
PEM	Predictive Ecosystem Mapping
PFLB	Productive Forest Land base
RMZ	Riparian Management Zone
RRZ	Riparian Reserve Zone
RTL	Roads, Trails and Landings
UWR	Ungulate Winter Range
SFMP	Sustainable Forest Management Plan
SPAR	Seed Planning and Registry Application
SPH	Stems Per Hectare
TEM	Terrestrial Ecosystem Map
TFL	Tree Farm License
THLB	Timber Harvesting Land base
TIPSY	Table Interpolation for Stand Yields
TSR	Timber Supply Review
TSA	Timber Supply Area
VAC	Visual Absorption Capacity
VEG	Visually Effective Green–Up
VLI	Visual Landscape Inventory
VQO	Visual Quality Objective
VRI	Vegetation Resource Inventory
VDYP	Variable Density Yield Projection
WTP	Wildlife Tree Patch

1. Introduction

The timber supply analysis in support of Management Plan #9 (MP #9) for Tree Farm Licence #14 (TFL 14) was completed in 2007, followed by the allowable annual cut (AAC) determination that became effective April 7th, 2008 and the AAC was set at 180,000 m^3/year.

Canfor is currently preparing Management Plan #10 (MP #10) for TFL 14. As part of the management plan process, Canfor is responsible for preparing a timber supply analysis showing the long-term, strategic timber supply for the land base. Since 2004, TFL 14 has been managed in accordance with Forest Stewardship Council (FSC) standards and will continue to maintain its FSC certification. Accordingly, this data package reflects the management assumptions associated with FSC certification and these assumptions will form the base case for this analysis. This data package documents the procedures, assumptions, and data used in the analysis. Ecora Engineering & Resource Group has been engaged to prepare the data package and conduct the timber supply analysis on behalf of Canfor.

Assumptions are prepared in accordance with the Kootenay Boundary Land and Resource Management Plan (KBLRMP), Kootenay-Boundary Higher Level Plan Order (KBHLPO) and subsequent land use orders (LUOs) for the plan area. The assumptions used in this data package will guide the development of the timber supply analysis, which will include sensitivity analyses, alternative harvest flows, and management options to test the influence of various factors on the harvest level.

2. Land Base Information and Data Sources

2.1 Data Sources

Table 2-1 lists the spatial data sources for this analysis. Data is sourced from internal Canfor layers, standard provincial data from the Land Resource Data Warehouse (LRDW) or from the Ministry of Forests Lands and Natural Resource Operations (MFLNRO).

Table 2-1: Data Sources

Description	Layer Name	Source	Vintage
Avalanche Path Habitat Inventory	tfl_avb	Canfor	Pre-2007
BC Fires	Whse_land_and_natural_resource_prot_historical_fire_polys	LRDW	2016
Biogeoclimatic Zone v6	BEC_version6	Canfor	Pre-2007
Canfor Blocks	Kootenay_block	Canfor	2016
Classified Streams	tfl14_str (line)	Canfor	2014
Columbia Wetlands	WILDLIFE_MGMT_AREAS_SVW	LRDW	2016
Community Watersheds	water_management_wls_community_ws_pub_svw	LRDW	2016
Consolidated Cut Blocks	Forest_vegetation_veg_consldated_cut_blocks	LRDW	2016
Crown Tenures	Tantalis_ta_crown_tenures_svw	LRDW	2016
Domestic Watershed	Dom_water_kbhlpo	Canfor	Pre-2007
Endangered Forest (EF)	Hcvf_ef	Canfor	2014
Environmentally Sensitive Areas	t14_thm	Canfor	Pre-2007
Forest Tenure Cut Blocks	ften_cb_pl	LRDW	2016
High Conservation Value Forest (HCVF)	Hcvf_ef	Canfor	2014
Landscape Units	Landscape_units_tfl14	Canfor	Pre-2007
Merchantability Classes	Tfl_mrch	Canfor	Pre-2007
Old Growth Management Areas	tfl_ogma	Canfor	2014
Operability	Operability	Canfor	Pre-2007
Operating Areas	Wim_operating_area_kootenays	Canfor	2016
Ownership	F_OWN	LRDW	2016
Parks and Protected Areas - Bugaboo	tantalis_ta_park_ecores_pa_svw	LRDW	2016
Permanent Sample Plots	Forest_vegetation_gry_psp_status_all	LRDW	2016
Planning Cells	Wim_planning_cells	Canfor	2016
Private Land - ICIS	Private_land_ICIS	Canfor	2014
Proposed Roads	prop_rd	Ecora	2017
Rare Ecosystems	t14_rar	Canfor	2014
Recreational Areas	ften_recreation_poly_svw	LRDW	2016

Description	Layer Name	Source	Vintage
Resource Management Plan	Rmp_plan_non_legal_poly_svw	LRDW	2016
Right of Way	ROW	Canfor	2016
Riparian Buffers FRPA	FPC_BUFF	Canfor	2014
Riparian Buffers FSC	T14_rib	Canfor	2014
Road Network	Kootenay_ff_roads	Canfor	2016
Slope Classes	Slp_cls	Ecora	2017
Terrain Stability	terrain_stability_kootenays	Canfor	Pre-2007
Terrestrial Ecosystem Mapping	Ste_tem_attribute_poly_svw	LRDW	1999
Tree Farm Licences	admin_boundaries_fadm_tfl	LRDW	2016
Ungulate Winter Range	Wildlife_management_wcp_ungulate_winter_range_s	LRDW	2016
Ungulate Winter Range - Habitat Types	tfl_uwr2	Forsite	Pre-2007
Vegetation Resource Inventory	VRI_Update	Ecora	2017
Vegetation Resource Inventory - Bugaboo Park	t14_thm	Canfor	Pre-2007
Visuals	Rec_vims_vli_svw	LRDW	2016
WTP's	tfl14_reserves	Canfor	2016

2.1.1 Vegetation Resources Inventory

The MP #9 analysis was completed in 2007 using the 1986 version of the forest cover inventory. This inventory was updated for harvesting and fires in September 2006 and was projected to January 1st 2007. In 2013, a new vegetation resources inventory (VRI) was completed for the entire TFL. Canfor identified some concerns with the new VRI and consequently have not fully adopted the new VRI into their harvesting and planning operations. Concerns identified include:

1. Generalization of silviculture polygons, and
2. Substantial differences in polygon delineation and species composition across the entire TFL between the two forest inventories.

Ecora has undertaken a general review of the VRI and comparison with the old forest cover inventory. Through this review, it was determined that a very generalized version of the harvest history layer was incorporated into the original VRI and therefore the VRI does not reflect the current status of the land base in and around where harvesting has occurred. For example, the gross block boundary (including WTP) has been used in harvested areas. The label for these polygons then becomes an average over a very diverse area as is shown in the example provided in Figure 1 below.

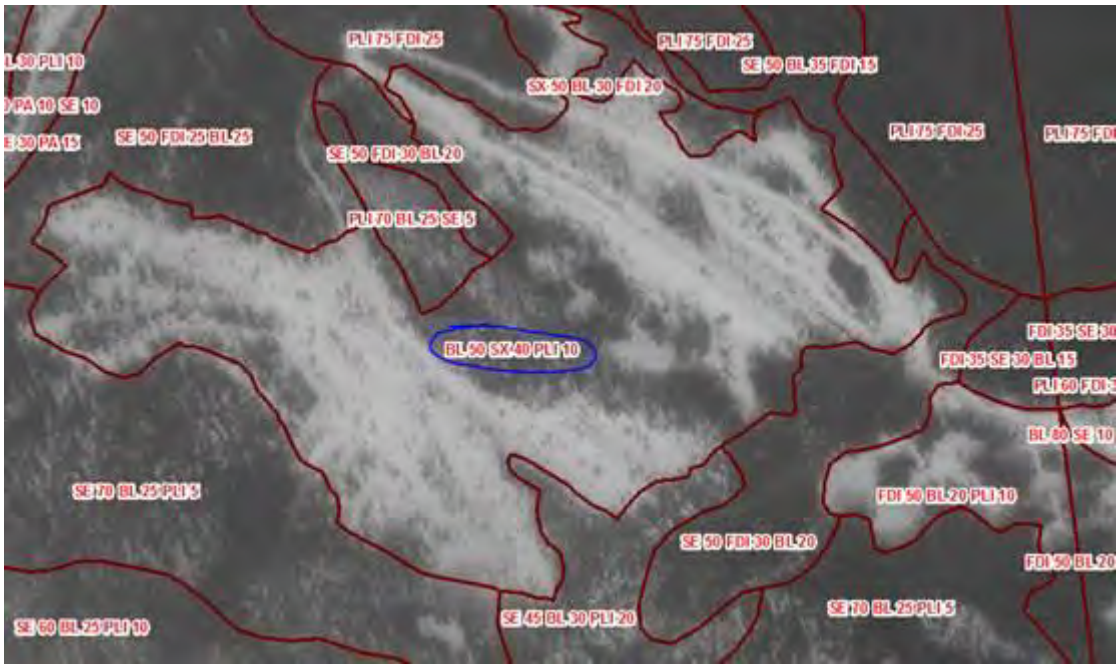

Figure 1: Generalized VRI Polygons.

As a result of not being utilized regularly, there have been little or no updates (harvesting or natural disturbance) applied to this VRI since 2013. With a significant focus on the salvage of susceptible pine over the last five to 10 years, the overall species composition of the forest has changed substantially.

To address the concerns with the 2013 VRI, Canfor has contracted Ecora to update the VRI with the best available silviculture information. This update involves the following steps:

1. Add all existing silviculture line work (include WTPs and other reserves) to the VRI.
2. Reconcile polygon line work where new polygons are created.
3. Update VRI attributes wherever reliable silviculture information exists.
4. Adjust the VRI attributes for any residual polygons affected by the silviculture data.

These updates will be completed in a 3D softcopy environment using the Summit software package. Although this update will not likely fix 100% of the VRI issues identified, we anticipate that it will result in a substantial improvement in the overall reliability and usability of the VRI[1].

2.1.2 Inventory Adjustment

An inventory audit project was completed by Timberline in 2000 to assess, and later to adjust, the age, height and inventory volumes used in the MP #9 analysis. According to the MP #9 Information Package. “the net effect of all adjustments was a 21% increase in merchantable volume”. These adjustments were applied to the 1986 forest

[1] The VRI update process will continue through the public review period. This inventory update is not anticipated to have a significant impact on the THLB or any of the other assumptions in the data package. Once the VRI update is complete the netdown will be re-run. Any changes to the THLB will be documented in the Analysis Report.

cover inventory. This inventory adjustment project pre-dates formal Phase II Inventory Adjustment standards but was approved by Government staff as part of the analysis process.

As this was not a formal Phase II Inventory Adjustment project, the original plot data was not stored in the FLRNO corporate data base. The original inventory adjustment report contains a portion of the data as an appendix however, this data is incomplete and does not include specific plot location information beyond the original mapsheet and polygon in which the plot was located. Attempts to locate the source data used in the adjustment have been unsuccessful.

We are in the process of reviewing the inventory adjustment information included in the adjustment report relative to the information included in the updated 2013 VRI. Through this review, we will assess the degree to which the new VRI has corrected the volume bias encountered in the 1986 forest cover inventory. Should significant volume bias still exist we will work with Forest Analysis and Inventory Branch (FAIB) to establish a process for correcting this bias in the analysis. This approach will need to consider the current state and age of the data and the inherent limitations to a "normal" adjustment process this creates.

2.1.3 Terrestrial Ecosystem Mapping

Terrestrial ecosystem mapping (TEM) was completed in 1999 by JMJ Holdings Inc. and plays a significant role in several aspects of this analysis including:

- Facilitating the use of SIBEC site index estimates;
- Defining managed stand analysis units; and
- Identifying rare and endangered ecosystems.

Since the TEM was completed there have been significant modifications to the BEC variant classifications in this area meaning that there is currently inconsistency between the provincial BEC classifications and those used in the TEM. Furthermore, we have identified approximately 600ha of THLB with a site series of '00'. This classification is generally used to describe non-forested ecosystems however, these '00' sites have VRI attributes that meet all the minimum merchantability specifications required for inclusion in the THLB. TEM data is in the process of being reviewed and may be updated prior to the completion of the final analysis. Any changes to the THLB will be described in the final analysis.

2.1.4 Recent Logging

For recent cut-blocks, all available silviculture information and harvest history is incorporated into the data set. This analysis includes harvest history and fire information up to December 31st, 2016.

2.2 Follow-up to Chief Forester's Comments

Following the last rationale, the Chief Forester identified several topics to address or monitor prior to the next timber supply analysis. This section describes Canfor's response to each of those topics:

- **Mountain pine beetle:** since 2007 the epidemic has been controlled and no longer represents a significant consideration.

- **Silvicultural systems used in pine-leading stands:** harvesting performance on pine leading stands is comparable with other species. On steep slopes 34% of pine leading stands have been harvested in comparison with 40% of other species. While on flat terrain 62% of pine leading stands and 60% of other species have been harvested.

- **Review the approach used to determine productivity reductions associated with future roads, landings and in-block disturbance.** Roads, trails and landing methodology has been reviewed and improved to utilize better and more up-to-date data.

- **Low productivity pine stands on steep slopes**: Low productivity stands on steep slopes that do not meet the minimum merchantable criteria are removed from the THLB. Any stands that remain within the THLB are considered economically viable and will be considered part of future harvesting operations.

- **Complete stream inventory:** see comments in Section 2.3 below

- **Regeneration on partially cut pine stands**. Through the inventory update process, the inventory attributes for partially harvested stands have been reviewed and updated. Partially harvested stands will remain on natural stand yield curves. These curves will be developed using VDYP and the updated VRI attributes for the post-treatment stand conditions as described in Section 6.1.1.

2.3 Updates Since Management Plan #9

This section provides a summary of the changes in input data and management assumptions that have occurred since MP #9 was completed. These may be the result of changing management assumptions, changing practices or the use of improved and updated information.

MP #9 used a 1986 Forest Cover inventory updated and projected to 2006 while an updated version of the 2013 VRI is used in this analysis.

TFL 14 was awarded FSC certification in 2004. This resulted in changes to the management practices and objectives for the TFL that are now part of current management practices for the land base. Not all of these practices were considered “current management” when the last management plan analysis was completed. Specifically, the following management assumptions can be attributed to FSC certification that were not reflected in the base case in the 2007 analysis:

- Increased riparian buffers as described in section 3.12 below;
- The designation of high conservation value forests (HCVF) with modified management practices; and
- The designation of endangered forest (EF) that are unavailable for harvesting;
- The designation of buffered avalanche paths for wildlife.

In MP #9 ungulate winter range was addressed through a section 7 notice. However, an agreement was made with the Ministry of Environment to manage TFL 14 according to requirements listed in the UWR U-4-008 Order. For MP #10 this agreement remains in place in addition to Government Actions Regulation (GAR) orders that have enacted UWR 4-014, for the TFL. As such UWR 4-014 has been added as a no harvest zone (netdown) for MP #10.

In addressing the Chief Forester's recommendation to improve stream class information, Canfor has worked to update and enhance its stream inventory layer to the point where the entire stream layer has been classified. As such, riparian netdown information has been significantly improved over the MP #9 data and assumptions. Important distinctions such as the difference between S5a and S5b streams are now part of the inventory and can be addressed in the analysis.

Forest Planning Studio (FPS) was the forest estate model used to complete the timber supply analysis in MP #9. FPS is a spatial simulation model and harvest scheduling decisions are made on a period by period basis with little or no consideration into how decisions in one period might affect the available harvest volume in other periods. As additional constraints are applied to the model, the ability of a simulation model to maintain harvest levels is further compromised. Conversely, in the current analysis, Patchworks is used. Patchworks, a spatially explicit optimization model, examines the overall impact of harvest scheduling decisions across all periods and can evaluate trade-offs based on their effect on the overall harvest level. In doing so, the model can overcome temporary shortages in available volume that simulation models cannot. Because Patchworks is a fully spatial model it can provide spatially explicit harvest schedule information that can facilitate the on the ground implementation of the optimized schedule.

Other changes from MP #9 include:

- Road data has been continually updated and the most up-to-date information has been included in the analysis.
- As discussed above we will assess the 2000 inventory audit data relative to the new VRI to determine if an inventory adjustment is warranted.
- 12 permanent sample plots are found in TFL 14, but at the time of MP #9 51 were found.
- Mountain pine beetle was a significant consideration in MP #9. Since 2007 the epidemic has been managed and no longer represents a significant consideration.

3. Land Base Classification

The land base classification process starts with the gross area of the TFL and removes area in a stepwise fashion according to the detailed classification criteria below. Through this process, area is systematically removed to establish both the crown forest land base (CFLB) and the timber harvesting land base (THLB). The crown forest land base is the forested land that contributes towards meeting non-timber objectives, whereas the THLB is defined as the area available for harvest. The land base classification process classifies area into three broad categories:

1. **Non-Productive**: areas that are not managed for forest values, non-forested or non-productive and unable to grow viable timber;
2. **Productive Non-THLB**: productive land base that is unlikely to be harvested for reasons such as inoperability or special environmental protection; and
3. **THLB**: productive land base that is expected to be available for harvest over the long-term.

Table 3-1 lists each classification step and the sections below describe how each step is determined. The total area within TFL 14 boundary is 162,264 ha, of which 97,758 ha (60%) is classified as productive and 45,621 ha (28%) is harvestable.

The assumptions and data used to define the THLB are documented in section 3.1 to section 3.20

Table 3-1: Land base Classification

Classification	Gross Area (ha)
Total TFL 14 Gross Area (including Bugaboo Park)	**162,264**
Non-TFL and Private Land	821
Non-Productive and Non-Forested	61,533
Roads, Trails, and Landings	2,152
Crown Forested Land Base (CFLB)	**97,758**
Bugaboo Park	4,016
Non-Commercial Cover	1,623
Inoperable and Inaccessible	28,135
Unstable Terrain	1,068
Non-Merchantable	3,292
Low Productivity Sites	493
Riparian Management	6,589
Ungulate Winter Range	558
Avalanche Tracks	255
Old Growth Management Area (OGMA)	4,274
Endangered Forests (EF)	283
Rare and Uncommon Ecosystems	247
Wildlife Tree Patches	1,251
Recreation Sites	53
Total Timber Harvesting Land base (THLB)	**45,621**

3.1 Total Area

TFL 14 total area is 162,264 ha including Bugaboo Park (10,869 ha).

3.2 Non-TFL and Private Land

Areas not managed by Canfor within the TFL are excluded from the CFLB. The exception to this is the Bugaboo Park which is included in the CFLB as it contributes to meeting seral stage objectives within the TFL. There are 26 ha of private lands and 795 ha of utility line right of way that are removed from the CFLB.

3.3 Non-Productive and Non-Forest

Non-forest and non-productive areas are identified and removed from the THLB using VRI data. This land base reduction step removes non-treed areas such as rock, water, or vegetated areas that cannot sustain forest growth. The currently used VRI is still in the process of being updated. In this version of the data package VRI polygons with non-treed land cover classification are removed from the THLB in areas that do not have a disturbance history.

3.4 Existing and Future Roads Trails and Landings

Often a small portion of classified roads are large enough to be accounted for as non-forest. For all other roads, Canfor has kept an updated inventory of road classes and landings and their estimated widths. This inventory has been maintained separately from the digital atlas and TRIM road inventory. Road and landing inventories were used to classify existing and future roads, trails and landings (RTL). Buffers according to road classification (in Table 3-2) were applied to each road line, and the buffered area was removed from the CFLB.

Table 3-2: Road Classification

Road Class	Buffer Width (m)
Highway	20
Mainline	18
Logging	10
Trail	4

Ecora is currently working with Canfor on a modified approach to estimating the area occupied by roads, trails and landings using Canfor's LiDAR data. Initial results are promising and once finalized will be utilized to estimate the roads, trails and landings netdown based on the actual area occupied by these structures as opposed to the traditional line buffer approach.

Much of Canfor's operations have moved towards roadside processing and therefore very few landings are created through existing operations. However, Canfor maintains a spatial layer identifying all the area occupied by existing landings. Areas occupied by existing landings have been removed from the THLB. Based on this change in operations there will be no future reductions applied to account for landings.

A large percentage of the current THLB within the TFL is already accessible using the existing road network. To estimate the amount of future road reductions that would be required to access the remaining THLB a future road network was developed to ensure that all THLB was within 300m of an existing or future proposed road. Future roads were then buffered by 10 m and removed from the THLB. As a result, no additional reductions for future roads are required.

3.5 Crown Forested Land Base

The total area is reduced by non-productive and non-forested areas as well as existing roads, trails and landings to create the crown forested land base (CFLB) area. This is the area that contributes to meeting non-timber objectives for seral stage distribution, visual quality objectives, integrated resource management and wildlife habitat.

3.6 Parks

This reduction step sets the treed area of the Bugaboo Park, which is located within LU I-34 (Bob Burns), as CFLB. The park will contribute to satisfying biodiversity requirements within LU I-34.

3.7 Non-Commercial Cover

Deciduous, whitebark pine and western white pine leading stands without logging history are netted out as non-commercial cover. Whitebark pine and western white pine are not commercialized for conservation purposes while deciduous stands are not economically viable.

3.8 Inoperable and Inaccessible

Productive areas not available for timber harvesting due to physical inaccessibility or economic limitations related to steep slopes, road access or other logistical components are considered inoperable and are removed from the THLB.

3.9 Unstable Terrain

Areas with no harvest history and that are identified as ‘U’ (unstable terrain) in Canfor’s slope stability layer are removed from the THLB. There are approximately 4,700 ha of THLB area identified as “potentially unstable”. A review of these areas shows significant harvest history within these areas suggesting that no further reductions are required.

3.10 Non-Merchantable

Mature stands without a harvest history that have not reached the minimum harvest volume shown in Table 3-3 are classified as non-merchantable forest types. These stands have been removed from the THLB.

Table 3-3: Non-Merchantable Criteria

Class	Leading Species	Mature Age (Years)	Volume (m^3/ha)
Low volume	Fdi	150	< 120
Low volume	All others	100	< 120
Low volume on slopes >= 45%	Fdi	150	< 150
Low volume on slopes >= 45%	All others	100	< 150

3.11 Low Productivity Stands

This land base classification step excludes immature stands not suitable for forest production due to low growth potential. These stands are identified using site index. Yield curves for various site index values were tested using the Table Interpretation Program for Stand Yields (TIPSY). The lowest site index value in which a mature stand would reach the minimum harvest volume was used to derive the minimum site index values shown in Table 3-4. Immature stands with a site index lower than these values, without harvest history information, are excluded from the THLB.

Table 3-4: Low Productivity by Slope and Leading Species

Class	Leading Species	Site Index
Low productivity on slopes < 45%	Balsam	< 9.5
	Cedar	< 10
	Fir	< 11
	Larch	< 13
	Pine	< 10
	Spruce	< 9
Low productivity on slopes >= 45%	Balsam	< 10
	Fir	< 12
	Larch	< 14
	Pine	< 11
	Spruce	< 10

3.12 Riparian Management

Riparian buffers are defined according to the classification of streams, wetlands and lakes. In this analysis, riparian requirements are assessed according to FSC guidelines for Riparian Management Zones (RMZ).

For each classification, an effective buffer width is calculated by adding the riparian reserve zone (RRZ) width to the product of the RMZ width and the retention percent. The effective buffer widths are presented in Table 3-5.

Riparian buffers according to Sections 47 to 53 of the Forest Planning and Practices Regulations (FPPR) of the *Forest and Range Practices Act* (FRPA) will be assessed through sensitivity analysis.

Table 3-5: Riparian Buffers

Riparian Class	FSC				FRPR			
	RRZ Width (m)	RMZ Width (m)	Retention percent (% basal area)	Effective Buffer (m)	RRZ Width (m)	RMZ Width (m)	RMZ Retention (% basal area)	Effective Buffer (m)
S1-A	30	40	65	56	0	100	20	20
S1-B	-	-	-	-	50	20	20	54
S2	30	40	65	56	30	20	20	34
S3	30	20	65	43	20	20	20	24
S4	30	20	65	43	0	30	10	3
S5a	20	20	65	33	0	30	10	3
S5b	0	15	30	4.5	0	30	10	3
S6 and S6a	20	20	65	33	0	20	-	0
S6b	0	15	10	1.5	-	-	-	-
L1	20	15	30	24.5	10	10	10	11
L3	20	15	30	24.5	0	30	10	3
W1	15	15	30	19.5	10	40	10	14
W3	15	15	30	19.5	0	30	10	3
W5	15	15	30	19.5	10	40	10	14

Using this information, all streams, lakes and wetlands are classified and buffered according to the effective buffer width from Table 3-5. In the case of streams, this buffer is applied to each side of the stream. Areas totalling 6,627 ha are removed from the THLB and represent the combined impact of both the RRZ and RMZ management practices.

3.13 Ungulate Winter Range

The Order for Ungulate Winter Range (UWR) U-4-014 has been established under the Government Actions Regulation (GAR) and was implemented in 2009 to protect mountain caribou winter habitat in the Central Kootenay planning unit. Caribou management zone 1 (or unit 1) is currently the only unit in the TFL. As per this Order, timber harvesting or road construction must not occur unless for accessing areas outside of the unit, or for maintenance of forest health, or other special reasons. Therefore, this area has been removed from the THLB.

3.14 Avalanche Tracks

As part of Canfor's FSC certification and to further protect grizzly bear and ungulate species, important avalanche paths were identified by biologists. Mapped avalanche tracks were buffered and indexed according to biological significance. Avalanche paths classified as high and moderate habitat value are excluded from the THLB.

3.15 Old Growth Management Areas

Harvesting does not occur in mapped old growth management areas (OGMAs). The impact of allowing OGMA movement to occur through the application of aspatial old growth constraints will be assessed through sensitivity analysis.

3.16 Endangered Forests

High conservation value forest (HCVF) is a component of FSC certification used to identify important forested areas containing one of the following:

- high and pristine biodiversity, or
- containing rare/endangered ecosystems, or
- provision of basic services of nature in critical situation such as preventing erosion, or
- significant to local communities

Extensive research has been conducted on TFL 14 to identify HCVF. Recognizing and preserving the values of these areas is part of acquiring FSC certification. HCVF identified as endangered forests (EF) are removed from the THLB. For all others HCVF areas on the land base a series of conservation strategies were established to guide management and harvesting in these areas. These strategies are detailed on site plans and only affect harvesting on the operational level.

3.17 Rare and Uncommon Ecosystems

The East Kootenay Conservation Project defined rare ecosystems as having less than 0.1% site series in ecosystem group representation throughout the land base and uncommon ecosystems having 0.2% to 0.5%. The rar_eco spatial layer displays attributes for rare and uncommon ecosystem groups, which are also described in the *Sustainable Forest Management Plan Canfor Kootenay Operations Version 4.0*. (Canfor, 2016). The ecosystems listed in Table 3-6 require 100% forest retention and are therefore removed from the THLB.

Table 3-6: Rare and Uncommon Ecosystem Groups

Ecosystem groups	Site Series within the Ecosystem Group
Rare Ecosystem Groups	
15	IDF dm2 07 IDF dm2 XB
19	MSdk 07 IDFdm2A-SB
24	ESSFdm2/FS
Uncommon Ecosystem groups	
10	ICH mk1 06
17	ICH mk1 07 ICH dm-SD
18	MSdk 06 IDFdm2a-SH
29	ESSFwm 04
35	ESSFdku-FH ESSFdmu1-FH ESSFwmu-WE ESSFdmu2-WE

3.18 Existing Wildlife Tree Patch Retention

Existing wildlife tree patches (WTP) have been removed from the THLB. Reduction's to account for future WTP are addressed as yield curve reductions and are described in Section 6.4.1.

3.19 Recreation Sites

Most recreation sites overlap with FSC riparian buffers and therefore do not affect timber supply. Recreation areas outside of riparian zones are removed from the THLB.

3.20 Other Considerations

The following factors were considered, but did not require specific netdown assumptions beyond those already identified above.

3.20.1 Permanent Sampling Plot Reserves

There are 12 – 300 m buffered permanent growth and yield sample plots (PSP) located within TFL 14. We are confirming with FAIB as to whether these should be removed from the THLB or not.

3.20.2 Wildlife Habitat Areas

There are no known Wildlife Habitat Areas within TFL14 as of December 2016.

3.20.3 Culturally Significant Areas

Archeological Overview (AOA) mapping has been completed for all of TFL 14. As development proceeds, detailed archaeological impact assessments (AIA) are completed. To date, the areas reserved from forestry activities for protection of heritage resources at the site-specific level have been very small and generally overlap with riparian zones. Accordingly, no further reductions have been applied to account for these values.

4. Current Forest Management Assumptions

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

4.1 Non -Timber Resource Management

Non-timber resource requirements in the TFL 14 were determined by the KBHLPO and provincial orders. These requirements are met by setting harvesting constraints within the THLB. Table 4-1 shows the modelled non-timber resource management zones. Each management strategy is further described in the sections below.

Table 4-1: Non-Timber Resource Management Zones

Resource Management	CFLB (ha)	THLB(ha)
Cut-block adjacency and green-up	97,758	45,621
Biodiversity	97,758	45,621
Visual Quality Objectives	13,382	8,866
Watersheds	1,536	932
Wildlife	28,996	20,082

4.2 Cut-block Adjacency and Green-up

Cut-block adjacency and green-up will be modelled by applying maximum disturbance constraints. The KBHLUPO Enhanced Resource Developed (ERDV) Timber Zone and the Integrated Resource Management Zone (IRM) fall within TFL 14 and require different modelling approaches as described in Table 4-2. IRM zones within the THLB are grouped by LU-BEC combination, and do not overlap with ERDV Timber Zones.

Table 4-2: Green-up Requirement

Management Zone	Green-up Requirement	Modelled Green-up Constraint[2]	Landscape Unit Patch Size
KBHLUPO ERDV Timber Zone	Successful regeneration (fully stocked) of cut-blocks provided this is consistent with any landscape unit patch size objectives	Max 33% < 2 years within LU-ERDZ	THLB inside mapped KBHLUPO ERDV Timber Zone
IRM	2.5 m tall trees (areas fully stocked) or 3 m tall (areas not satisfactorily stocked)	Max 33% < 12 years within each LU/IRM	All THLB outside the ERDV Timber Zone

Cut-block adjacency and green-up can be modelled explicitly using the patch size criteria identified in the *Biodiversity Guidebook* (MoF, 1995), which varies according to natural disturbance type. The application of specific cut block and patch size objectives may be explored through sensitivity analysis.

[2] Modelled constraints are taken from the *Invermere TSA TSR Updated Data Package (FLRNO, 2016).*

4.3 Biodiversity

Biodiversity requirements follow the KBHLPO guidelines. Biodiversity rules are applied within the landscape unit (LU) and at the stand level. The following sections outline how retention of old and mature forest and wildlife trees/patches is modelled.

4.3.1 Seral Stage Requirements

Seral stage requirements refer to the maintenance of areas of old and mature forest on the land base. In this analysis, these requirements are defined by biogeoclimatic ecosystem classification (BEC) zone from the *Biodiversity Guidebook* (MOF, 1995) as shown in Table 4-3 and Table 4-4. A minimum percentage (from Table 4-4) of stands 100 years and older is retained throughout the planning horizon by LU-BEC. In this analysis mapped OGMAs help accomplish old seral targets. In the low BEO units 1/3 of the required seral target is met in the first rotation, 2/3 in the second rotation, and full target on the third rotation.

Table 4-3: Seral Stage Definitions by BEC Zone

BEC	NDT	Seral stage	
		Mature	Old
ICH	1	> 100	> 250
EESF	1	> 120	> 250
ICH	2	> 100	> 250
ESSF	2	>120	> 250
ICH, MS	3	> 100	> 140
ESSF	3	>120	> 140
ICH, IDF, PP	4	> 100	> 250

Table 4-4: Recommended Seral Stage Distribution

BEC	NDT	Mature + Old			Old		
		L	I	H	L	I	H
ICH	1	> 17	> 34	> 51	> 4.3	> 13	> 19
ESSF	1	> 19	> 36	> 54	> 6.3	> 19	> 28
ICH	2	> 15	> 31	> 46	> 3	> 9	> 13
ESSF	2	> 14	> 28	> 42	> 9	> 9	> 13
MS	3	> 14	> 26	> 39	> 4.7	> 14	> 21
ESSF	3	> 14	> 23	> 34	> 4.7	> 14	> 21
ICH	3	> 14	> 23	> 34	> 4.7	> 14	> 21
ICH	4	> 17	> 34	> 51	> 4.3	> 13	> 21
IDF	4	> 17	> 34	> 51	> 4.3	> 13	> 21
PP	4	> 17	> 34	> 51	> 4.3	> 13	> 21

* L = low BEO, I = intermediate BEO and H = high BEO

Table 4-5: Landscape Unit Biodiversity Emphasis Option

Landscape Unit	Landscape Unit #	Biodiversity Emphasis
Bobbie Burns	I34	Low
Lower Spillimacheen	I35	Low
Upper Spillimacheen	I37	Intermediate
Twelve Mile	I38	Low
		Intermediate

4.4 Visual Quality Objectives

To manage visual quality objectives, visually sensitive areas are mapped as part of the visual landscape inventory (VLI). Visual quality objectives are applied to each visually sensitive area. In this timber supply analysis, visual modelling is implemented according to the Procedures for Factoring Visual Resources into Timber Supply Analyses (MOF, 1998), and the update bulletin Modelling Visuals in TSR III (MOF, 2003).

Polygons with visual quality objectives (VQO) have been identified in the VLI and have been classified based on their permissible visually effective disturbance level. Within these classifications, categories of visual absorptive capacity (VAC) help define the maximum percent (%) alteration allowed in each VLI polygons. The numbers in Table 4-6 are applied to clear-cut harvesting.

A digital elevation model is used to derive average slope for each VLI polygon and the perspective to plan (P2P) ratios and visually effective green–up (VEG) heights were derived for each VLI polygon based on the values shown in Table 4-6.

Table 4-6: P2P Ratios and VEG Height Requirements by Slope Percentage

Category	Slope Classes (%)														
	0-5	6-10	10.1-15	15.1-20	20.1-25	25.1-30	30.1-35	35.1-40	40.1-45	45.1-50	50.1-55	55.1-60	60.1-65	65.1-70	70.1+
P2P	4.68	4.23	3.77	3.41	3.04	2.75	2.45	2.22	1.98	1.79	1.6	1.45	1.29	1.17	1.04
VEG (m)	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	6.5	7.0	7.5	8.0	8.5	8.5	8.5

The max % alteration in plan view for each VLI polygon is calculated based on the assigned VQO and P2P ratio. For example, a maximum % alteration of 7% is assigned to a VLI polygon classified as 'PR', which is then multiplied by the P2P ratio depending on average polygon slope. The VEG height is determined for each VLI polygon based on slope using the same methodology as summarised in Table 4-7.

Table 4-7: VQO Assumptions

VQO Class	% Alteration by VAC (Perspective View)		
	Low	Medium	High
P (Preservation)	0	0	0
PR (Partial Retention)	1.6	4.3	7.0
M (Modification)	7.1	12.5	18.0

4.5 Watershed

In TFL 14 there are 6 domestic watersheds (Casals, Billy Goat, Billy Goat Face, Spillimacheen Face, Mad Trapper and Delong Creek) and no community watersheds. The later three watersheds are outside of the operability line and harvesting is not a priority in these areas. For this analysis harvesting may occur in domestic watersheds to a maximum disturbance of 25% less than 6m tall (see Table 4-8).

Table 4-8: Forest Cover Requirements for Watersheds

Watershed Type	Forest Cover Objectives
Domestic	Max 25% < 6 m tall

4.6 Wildlife

The following sections describe the management assumptions applied to address wildlife management objectives. There are 2 different commitments for ungulate winter range.

4.6.1 Ungulate Winter Range

The 20 to 50 m buffer surrounding the Columbia Wetlands (HCVF- 1102) is as an important winter range for ungulate species. This area has been identified in the *TFL 14 High Conservation Value Forest / Endangered Forest Management Strategies* (Tembec, 2009) and small patch cutting is the prescribed silvicultural system. For the purpose of this analysis HCVF 1102 will be modelled as a partial retention and high VAC VQO polygon.

GAR U-4-014 overlaps with TFL 14 area. Harvesting is not permitted within U-4-014 mapped areas, which was addressed in Section 3.13 as a netdown.

Canfor has made a commitment to manage portions of TFL 14 according to U-4-008 (established under a GAR that went into effect on February 10, 2005) even though this order does not directly overlap with the TFL. U-4-008 was set out to protect winter habitat for moose, white-tailed deer, mule deer, elk, bighorn sheep and mountain goat. The forest cover retention strategy is determined according to habitat types and moisture levels as shown in Table 4-9.

Table 4-9: UWR 4.008 Management Strategy

Habitat type	Landscape and Stand Level Retention Requirement	Forest Cover Retention Requirement	Modelled Constraint
Open Range	Stocking standards 5-75 stems/ha	Include 5-20 stems/ha of the largest 1/3 of the diameter range	Operationally addressed
Open Range	Stocking standards 76-400 stems/ha	Include 5-20 stems/ha of the largest 1/3 of the diameter range	Operationally addressed
Managed Forest (Dry)	Mature Cover 10% (min)	>100 years and evergreen CC=> 20%, or layer 1 age >100 years	Minimum 10%>100 years
Managed Forest (Transitional)	Snow interception cover 10% (min), and	>60 years and evergreen CC=> 40%	Minimum 10%>100 years in leading Fd and Sx stands, and minimum 10%>60 years in other stands
	Mature cover 10% (min)	>100 years, Fd or Sx leading and evergreen CC => 40%	
Managed Forest (Mesic)	Snow interception cover 10% (min), and	>60 years and evergreen CC=> 40%	Minimum 20%>100 years in leading Fd and Sx stands, and minimum 20%>60 years in other stands
	Mature cover 20% (min)	>100 years, Fd or Sx leading and evergreen CC => 40%	
Managed Forest (Moist)	Snow interception cover 20% (min)	>60 years and evergreen CC=> 40%	Minimum 20%>60 years
Managed Forest (Wet)	Snow interception cover 30% (min)	>60 years and evergreen CC=> 40%	Minimum 30%>60 years
Managed Forest (all)	Maximum of 33% < 21 years		Maximum of 33% < 21 years

4.6.2 Grizzly Bear Habitat and Connectivity Corridors

KBHLOP requires that mature and old growth forests be kept in areas identified (mapped) as grizzly bear habitat and as connectivity corridors. These areas are not additional to seral targets, instead KBHLOP suggests that required mature and old stands are placed in identified grizzly bear habitat and connectivity corridors. Forests on slopes greater than 80% do not contribute as corridors.

5. Modelling Approach

5.1 Forest Estate Model

Forest estate modelling 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.

5.2 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 several alternative harvest flows possible. In this analysis, the harvest levels will reflect the following objectives:

- Attempt to maintain the current AAC for as long as possible;
- Decrease to a highest mid-term harvest level that can be sustained as growing stock levels fall; and
- Increase to an even-flow long-term harvest level that produces a non-declining growing stock over a 250-year planning horizon.
- For the base case, the species, age-class and volume-class distribution of the harvest will be summarized and reported.

5.3 Silviculture Systems

TFL 14 silviculture systems are predominately clear-cut with reserves, and small clear-cut patches employed to VLI polygons and Douglas-fir dry belt. Planting is the predominant method of regeneration.

5.4 Harvest Systems

Harvesting in the TFL uses predominantly ground-based harvest systems. Some steep slope harvesting occurs using cable and winch-assist systems.

5.5 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 the characteristics shown in Table 5-1.

Table 5-1 Harvest Age Criteria

Species	Minimum Volume	Percent Culmination
All	150 m³/ha	95%
Pl on slope <= 45%	120 m³/ha	95%

5.6 Unsalvaged Losses

Unsalvaged losses represent an annual volume of non-recoverable losses of timber due to damage caused by environmental conditions or insects over and above endemic values already captured within the growth and yield models. Most of the mountain pine beetle (MPB) infested stands have been harvested and new MPB infestations remain at endemic levels.

To calculate unsalvaged losses a prorated percentage was projected according to estimates used in the *Invermere TSA TSR Updated Data Package* (MFLNRO, 2016). Prorating was based on the area of the TFL's THLB, which is estimated to be approximately 25% of Invermere's (177,177 ha) (FAIB, 2016).

Table 5-2: Unsalvageable Losses Calculation

Species	Cause	TSA Annual Unsalvageable Losses (m³/y)	TFL Annual Unsalvageable Losses (m³/y)
All	Wildfire	2,341	585
All	Flooding	801	200
All	Windthrow/snowpress	32	8
Fdi	Douglas-fir bark beetle	1,455	364
Fdi	Fir engraver beetle	43	11
Sx/Se	Spruce bark beetle	19,000	4,750
Pl	Western pine beetle	36	9
Bl	Western balsam bark beetle	2,386	597
Total		**26,094**	**6,524**

6. Growth and Yield

Forest tenure cut-block records go back as far as 1984, RESULTS openings go back as far as 1968. It is assumed that stands harvested since 1986 or are less than 31 years are classified as managed, and stands that are older than 31 years are classified as natural.

6.1 Natural Stand Yield Tables

Attributes from the VRI are used to generate natural stand yield tables for each polygon using Variable Density Yield Prediction model (VDYP) version 7. These polygon-level yield tables are then carried into the timber supply model. Due to the large number of yield tables produced it is not feasible to include them in this data package. Digital versions of the natural stand yield tables can be provided.

As discussed above we will assess the 2000 inventory audit data relative to the new VRI to determine if an inventory adjustment is warranted.

6.1.1 Partially Harvested Stands

Partial harvesting is not a practice currently utilized to a large degree on the TFL. However, past practices have resulted in approximately 5,000 ha of partially harvested stands. Through the current VRI update process, the attributes on these stands have been updated to reflect the current condition of these stands.

Partially harvested stands will remain on natural stand yield curves. These curves will be developed using VDYP and the updated VRI attributes for the post-treatment stand conditions.

6.2 Managed Stand Yield Tables

Growth and yield for all recently harvested stands and future regenerated stands is modelled using TIPSY v.4.3. These stands are grouped into analysis units based on their BEC and site series combinations from the Terrestrial Ecosystem Mapping (TEM) (JMJ Holdings Inc, 1999) for the TFL, then further divided into flat or steep slope based on a 45% cut off.

Existing managed stand analysis units are composed of stands that have been logged between 1986 and 2016. Their species composition is the same as expected for future regeneration shown in Table 6-1, except in the ICH BEC zone where Douglas-fir is the leading species instead of Larch. Regeneration delay for these units is the same as in MP #9 (2 years). Area weighted genetic gains are also applied as explained in Section 6.7.

Following harvest, all natural stands transition into future managed stands. Regeneration assumptions reflect current planting practices and are documented in Table 6-1. All stands are regenerated by planting and a 2.16-year regeneration delay is expected according to Canfor's silvicultural records. For the purpose of this analysis regeneration delay is rounded to 2 years.

Table 6-1: Base Case Regeneration Assumptions

BGC_Site Series	Sp1	Sp1 %	Sp2	Sp2 %	Sp3	Sp3 %	Sp4	Sp4 %	Initial Density
ESSFdk_01	Pli	55	Se	35	Lw	7	Fdi	3	1400
ESSFdk_03	Pli	60	Se	30	Lw	5	Fdi	5	1400
ESSFdk_04	Pli	55	Se	35	Lw	5	Fdi	5	1400
ESSFdk_05	Pli	59	Se	36	Lw	5			1400
ESSFdk_06	Pli	55	Se	45					1400
ESSFdk_07	Pli	55	Se	45					1400
ESSFdku_03	Pli	60	Se	30	Lw	5	Fdi	5	1400
ESSFdku_04	Pli	55	Se	35	Lw	5	Fdi	5	1400
ESSFwm_01	Pli	55	Se	35	Lw	7	Fdi	3	1400
ESSFwm_02	Pli	60	Se	30	Lw	5	Fdi	5	1400
ESSFwm_03	Pli	60	Se	30	Lw	5	Fdi	5	1400
ESSFwm_04	Pli	55	Se	35	Lw	5	Fdi	5	1400
ICHmk1_01	Lw	40	Se	23	Pli	24	Fdi	13	1400
ICHmk1_04	Lw	40	Se	23	Pli	24	Fdi	13	1400
ICHmk1_05	Lw	40	Se	23	Pli	24	Fdi	13	1400
ICHmk1_06	Lw	40	Se	23	Pli	24	Fdi	13	1400
ICHmw1_01	Lw	40	Se	23	Pli	24	Fdi	13	1400
ICHmw1_04	Lw	40	Se	23	Pli	24	Fdi	13	1400
ICHmw1_05	Lw	40	Se	23	Pli	24	Fdi	13	1400
ICHmw1_06	Lw	40	Se	23	Pli	24	Fdi	13	1400
IDFdm2_01	Lw	38	Pli	29	Fdi	26	Se	7	1200
IDFdm2_03	Lw	38	Fdi	33	Pli	22	Py	7	1200
IDFdm2_04	Lw	38	Pli	29	Fdi	26	Se	7	1200
IDFdm2_05	Lw	38	Pli	29	Fdi	26	Se	7	1200
IDFdm2_06	Lw	38	Pli	29	Fdi	26	Se	7	1200
IDFdm2_07	Lw	38	Pli	29	Fdi	26	Se	7	1200
MSdk_01	Pli	35	Lw	30	Se	25	Fdi	10	1200
MSdk_03	Pli	48	Lw	24	Se	24	Fdi	10	1200
MSdk_04	Pli	35	Lw	30	Se	25	Fdi	10	1400
MSdk_05	Pli	48	Lw	24	Se	24	Fdi	4	1400
MSdk_06	Pli	48	Lw	24	Se	24	Fdi	4	1200
MSdk_07	Pli	48	Lw	24	Se	24	Fdi	4	1200

6.3 Operational Adjustment Factors

Operational adjustment factors (OAF) for managed stand yields are applied using standard values of 15% for OAF 1 and 5% for OAF 2. To account for the impacts of Armillaria, Douglas-fir leading stands within the ICH BEC zone, the OAF 2 value was increased to 10.8% - consistent with Invermere TSA TSR Data Package (2016).

6.4 Volume Reductions

All deciduous, whitebark and white pine leading stands are removed from the THLB. Additionally, the deciduous component of conifer leading stands has been removed from natural stand yields.

6.4.1 Future Wildlife Tree Patch Retention

Through Canfor's FSC certification, spatial requirements for WTP are prescribed according to the landscape unit and BEC variants shown in Table 6-2. For each LU-BEC, the WTP % requirement is based on the % of the unit that has been logged without WTPs along with the % of the unit that is available for harvest as shown in Table 6-2. Gross WTP % reductions are applied as yield curve reductions on future managed stand yield curves.

Table 6-2: Wildlife Tree Patch Distribution and Requirement

LU	LU Name	BEC variant	CFLB (ha)	THLB (ha)	% Logged no WTP	% Available for Harvest	Gross WTP % Required
I34	Bobbie Burns	ESSFdk	4,879	3,206	27.2	65.7	6.3
I34	Bobbie Burns	ESSFdkp	1	-	0.0	0.0	0.0
I34	Bobbie Burns	ESSFdku	535	32	0.0	5.9	0.0
I34	Bobbie Burns	ESSFwm	8,217	4,043	22.1	49.2	4.1
I34	Bobbie Burns	ESSFwmp	9	-	0.0	0.0	0.0
I34	Bobbie Burns	ESSFwmu	1,049	62	0.0	5.9	0.0
I34	Bobbie Burns	MS dk	3,185	1,927	18.8	60.5	4.9
I35	Lower Spillimacheen	ESSFdk	1,757	986	24.6	56.1	5.1
I35	Lower Spillimacheen	ESSFdkp	1	-	0.0	0.0	0.0
I35	Lower Spillimacheen	ESSFdku	148	-	0.0	0.0	0.0
I35	Lower Spillimacheen	ESSFwm	7	3	0.0	39.1	0.9
I35	Lower Spillimacheen	ICHmk1	100	73	14.3	73.5	5.8
I35	Lower Spillimacheen	IDFdm2	8,500	5,911	9.1	69.5	4.9
I35	Lower Spillimacheen	MSdk	12,446	8,867	11.6	71.2	5.3
I37	Upper Spillimacheen	ESSFdk	7,698	5,058	29.2	65.7	6.5
I37	Upper Spillimacheen	ESSFdkp	1	-	0.0	0.0	0.0
I37	Upper Spillimacheen	ESSFdku	309	7	0.0	2.4	0.0
I37	Upper Spillimacheen	ESSFwm	10,499	6,506	21.1	62.0	5.3
I37	Upper Spillimacheen	ESSFwmp	6	-	0.0	0.0	0.0
I37	Upper Spillimacheen	ESSFwmu	1,045	105	0.0	10.1	0.0
I37	Upper Spillimacheen	MSdk	948	703	45.7	74.1	9.0
I38	Twelve Mile	ESSFdk	10	10	0.0	100.0	7.0
I38	Twelve Mile	ESSFdkp	-	-	0.0	0.0	0.0
I38	Twelve Mile	ESSFdku	-	-	0.0	0.0	0.0
I38	Twelve Mile	ESSFwm	636	305	6.1	48.0	2.4
I38	Twelve Mile	ESSFwmp	-	-	0.0	0.0	0.0
I38	Twelve Mile	ESSFwmu	24	-	0.0	0.0	0.0
I38	Twelve Mile	ICHmk1	2,429	1,743	17.7	71.8	5.9
I38	Twelve Mile	ICHmw1	1,849	1,499	3.1	81.0	5.4
I38	Twelve Mile	IDFdm2	2,640	1,899	3.2	71.9	4.5
I38	Twelve Mile	MSdk	2,684	1,876	4.7	69.9	4.5

6.5 Utilization Levels

Yield curves have been generated using the standard utilization levels based on leading species as shown in Table 6-3.

Table 6-3: Utilization Criteria

Leading Species	Minimum DBH (cm)	Stump Height (cm)	Minimum Top DIB (cm)
Pine	12.5	30.0	10.0
All other species	17.5	30.0	10.0

6.6 Site Productivity Estimates

Site Index by BEC Site Series (SIBEC) values is used for existing and future managed stands. BEC and site series are derived from the TEM inventory. Lastly, where SIBEC values are not available the provincial site productivity tile is used.

6.7 Genetic Gains

Canfor utilizes 100% of the available genetically improved stock on the TFL. Class A and B+ (select) seeds have enhanced genetic traits that improve timber yield and forest health. Genetic worth is a measure of the genetic quality of a seedlot for a specific trait. For example, a seedlot with a genetic worth (GW) of "G+03" has a 3% potential growth gain over natural stand seed (MoF, 1995).

Seed Planning & Registry Application (SPAR) reports were generated for the TFL showing seedlot orders from 2002 to 2011 and its GW. Estimated GW for 2012 to 2016 and future were obtained from species plans (MFLNRO, 2016). Data for the proportion of planted select seeds was gathered from SPAR reports (2002 to 2005) when not available from Canfor.

For existing managed stands the product of the average GW from 2002 to 2016 and the percent of select seeds planted was used to calculate the net GW proportionally applied to each species in each analysis unit as shown in Table 6-4. For future managed stands, net GW was calculated based on the future projected genetic gain for each species and expected planting trends summarized in Table 6-5.

Table 6-4: Estimated Genetic Gains (2002-2016)

Species	Average GW (%) (2002-2016)	% of select seeds (2002-2016)	Net GW (%) (2002-2016)
Fdi	0	0	0
Lw	19	96	18
Pli (non-ESSF)	4	43	2
Sx	19	88	17

Table 6-5: Future Genetic Gains

Species	Future GW (%)	% of Select seeds	Net GW (%)
Fdi	25	25 *	6
Lw	27	100	27
Pli (non-ESSF)	10	33	3
Sx	22	100	22

*Selected Fdi seeds are expected to be planted only in low elevation.

7. Sensitivity Analysis

Sensitivity analyses results help quantify the degree to which uncertainty in the analysis might affect the resulting timber supply for the land base. The sensitivities listed below are being considered in the analysis. This list will be refined in consultation with other stakeholders as the analysis is conducted.

Table 7-1: Sensitivity Analyses

Parameter modelled	Description
FRPR	Modelling FRPA regulation as the base case instead of FSC standards. Riparian management, wildlife and HCVF changes.
Spatial OGMAs	Maintaining mapped OGMAs spatially fixed (non-rotational)
Columbia Wetlands	Base case allows harvesting while sensitivity doesn`t allow harvesting in the Columbia Wetlands WHA.
Minimum Harvest Age	Assess the impacts of Increase / decrease minimum harvest volume
Yield Assumption	Increase / decrease both managed and natural stand yields by 10%
Site Index – no SIBEC	Managed stands yields with no SIBEC adjustment

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