CANADIAN FOREST PRODUCTS LTD.
VAVENBY DIVISION
TREE FARM LICENSE #18

MANAGEMENT PLAN #11

Dated for Reference: January 17, 2017

CANADIAN FOREST PRODUCTS LTD.
VAVENBY DIVISION

ORIGINAL Signed by

Terry Lazaruk, R.P.F.
Strategic Planning Coordinator

ORIGINAL Signed by

Peter Baird R.P.F.
General Manager, Forest Planning,
Planning Administration

Table of Contents

LIST OF FIGURES & TABLES

FIGURES

TABLES

1 INTRODUCTION

1.1 PURPOSE OF THE PLAN

This Management Plan (MP) prepared for Tree Farm Licence 18 (TFL 18) meets the requirements of the *Tree Farm Licence Management Plan Regulation* (B.C. Reg. 280/2009). This regulation, enacted by the provincial government in November 2009 (with associated amendments to the *Forest Act*), includes content requirements, submission timing and public review requirements for TFL Management Plans. These content requirements (in regulation) replace the MP content requirements listed in the tree farm license document and reduce the duplication of Forest Stewardship Plan matters (objectives and strategies).

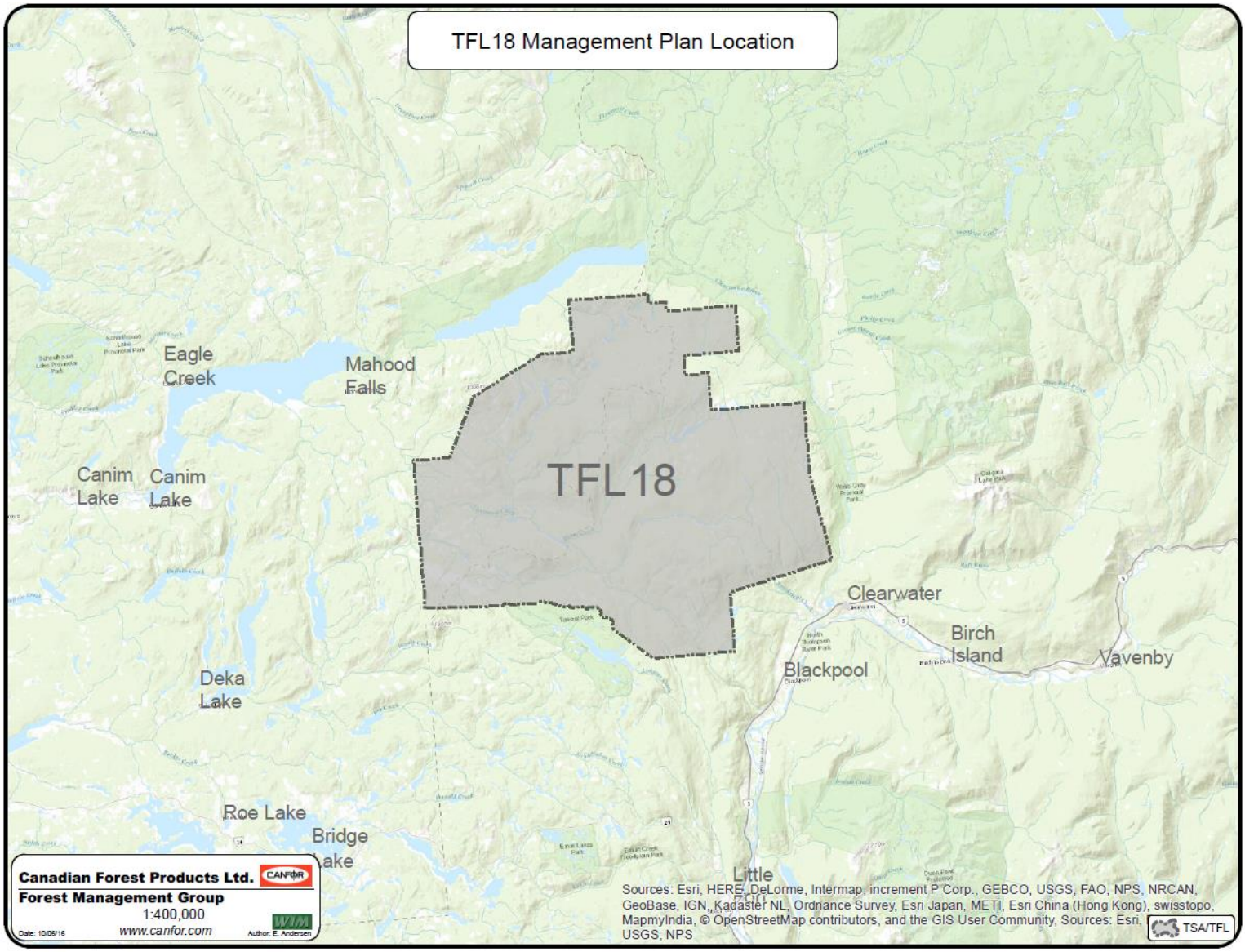
1.2 OVERVIEW

This Management Plan is now submitted to the Chief Forester, Ministry of Forests, Lands and Natural Resource Operations for approval. Coincident with the approval of the MP, the Chief Forester will make an independent determination of the Allowable Annual Cut (AAC) for TFL 18.

1.3 DESCRIPTION OF TREE FARM LICENSE 18

Tree Farm License #18 (TFL 18 or the TFL) is situated immediately northwest of Clearwater B.C. and approximately 30 km west of the Canadian Forest Products Ltd. (Canfor) mill in Vavenby B.C. The license encompasses 74,266 hectares. This area differs slightly from the 74,545 hectares reported in MP #10. The difference can be attributed to the removal of the Taweel protected area.

Figure 1 TFL 18 – Proximity to Vavenby and Surrounding Community



The terrain is undulating, within an elevation range of 516 to 1,989 meters. The majority of the TFL is easily accessible by road. The land base contains numerous small lakes and swamp complexes.

1.4 HISTORY

TFL 18 was awarded as a Forest Management License (FML) on November 2, 1954 to Clearwater Timber Products Ltd. The FML was replaced by a TFL agreement on January 1, 1982. Slocan Forest Products Ltd. purchased Clearwater Timber Products Ltd. in 1987 and became the holder of the license. On April 1, 2004, Canadian Forest Products Ltd. purchased Slocan Forest Products Ltd. and is now the holder of the license for TFL 18. The current license document term began on January 1, 2011 and is for a 25 year term.

The area of the Tree Farm has remained essentially unchanged since its inception. The Taweel protected area, created as a result of the Kamloops LRMP, overlaps approximately 275 hectares in the southwest corner of the TFL. It is unclear if this overlap is consistent with Kamloops LRMP direction, however this area was removed from the Gross Landbase.

An overview map of the TFL boundary is provided in Appendix I.

Since award, the allowable annual cut (AAC) for TFL 18 is as specified in Table 1.

Table 1 – Historical AAC for TFL 18

YEAR OF DETERMINATION	AAC
1955	70,792 m3
1958	70,792 m3
1965	104,772 m3
1969	164,238 m3
1977	209,544 m3
1983	210,000 m3
1988	210,000 m3
1989	200,000 m3
1993	187,000 m3
1995	187,000 m3
2000	177,650 m3
2006	290,000 m^3

The AAC was increased to 290,000 m3 on March 9, 2006 in order to salvage dead pine and spruce and to harvest stands with a high component of MPB susceptible pine.

2 PLANNING

2.1 TFL 18 PLANNING DOCUMENTS

The following table indicates the publicly available planning documents used by Canfor to guide management and operations within TFL 18**:**

Table 2 – Planning Documents for TFL 18

Plan Type	Plan Title	Description	Web Link (as of Date)
LRMP	Kamloops Land and Resource Management Plan	The Kamloops Land and Resource Management (Kamloops LRMP) is a higher level plan approved by Order in Council on January 31, 1996. The Kamloops LRMP identifies seven Resource Management Zones (RMZ's) and details goals, objectives, and strategies within these zones	https://www.for.gov.bc.ca/tasb/slrp/lrmp/kamloops/kamloops/plan/files/klrmp_full.pdf (15_09_2016)
Lakes LRUP	Clearwater Forest District Lakes Local Resource Use Plan	The plan provides guidance for resource activities within the lakeshore management zones of classified lakes. There are 66 classified lakes on TFL 18 that are subject to this guidance.	https://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwiamdzLj5LPAhWo34MKHWYOCiAQFggbMAA&url=https%3A%2F%2Fwww.for.gov.bc.ca%2Fftp%2Fdhw%2Fexternal%2F!publish%2FDHW_Lakes_Local_Resource_Use_Plan%2FDocuments_and_Spreadsheets%2FLakesAug01.doc&usg=AFQjCNHvzSbm5dQWr6G5TxtFS5VgJdwlcQ&bvm=bv.133053837,d.amc (15_09_2016)
SFMP	CSA – SFM Sustainable Forest Management Plan	This Sustainable Forest Management Plan (Canfor and BCTS) was produced to achieve Canadian Standards Association (CSA) certification to the CSA Z809-08 standard	http://www.canfor.com/documents/2014/ntf_plan_2015_final.pdf (15_09_2016)
FSP	Forest Stewardship Plan	A Forest Stewardship Plan shows areas on a map where a forest licensee may carry out forest development activities over a period of up to five years. The areas included in the FSP are called Forest Development Units. The plan also states the results, strategies or measures that the forest licensee will achieve in order to be consistent with government objectives for forest values.	Copies of the FSP can be made available upon request

2.1.1 Proposed Harvest Rates

For the period of MP #11, the requested harvest rate is 201,000 m³ on TFL 18. The Chief Forester will set the AAC and this section will be updated to reflect that determination.

2.1.2 Rationale for Recommending AAC

The rationale for the requested MP #11 AAC of 201,000 m³ is documented in detail in the Timber Supply Analysis Report, dated for reference January 15, 2017.

3 CONSULTATION WITH OTHER RESOURCE USERS

All licensed resource users and known public user groups with an interest in TFL 18 were sent a letter notifying them when the plan will be available for review and comment. All comments, and responses are copied into Appendix IX.

A sample letter and a full list of referral groups and individual tenure holders are provided in Section 5.

4 SIMILARITIES/DIFFERENCES BETWEEN MP 10 AND MP 11

4.1 KEY SIMILARITIES

Key similarities between MP #10 and MP #11 include:

- Commitment to conducting activities consistent with the Kamloops LRMP and Lakes LRUP.
- The strategies for the recreation resource, which proved successful during MP #10 remain similar for MP #11. The Recreation Inventories, updated in 1996 to current standards, remain unchanged.
- Canfor will continue with the cooperative approach to range management practiced during MP #10.
- The apportioned cut for BCTS is proposed to remain the same.
- The goal to eliminate backlog NSR remains the same.
- Utilization standards will remain consistent with the license document.
- Harvesting systems will remain similar while harvesting the full range of terrain profiles.
- Use of innovative computer modeling techniques and GIS technology to provide more detailed and accurate information on the impacts and viability of various management practices.

4.2 KEY DIFFERENCES

Key differences between MP #10 and MP #11 include:

- Changes to the timber harvest land base (THLB) definition and area. This is primarily due to the spatial removal of riparian management zones (RMZ) as opposed to the application of forest cover constraints in the model.
- The spatial removal of legal old growth management areas (OGMAs) from the THLB;
- The 2013 vegetation resource inventory (VRI) from the Government was used in the analysis;
- Updates for recent harvesting;
- Analysis unit definitions have changed to be stand level for existing natural stands and ecosystem-based for managed stands;
- Major forest health factors such as the mountain pine beetle (MPB), spruce beetle and balsam bark beetle have been modelled explicitly in the short term and captured as un-salvaged losses in the long term in the analysis;
- Deciduous species are assumed not to be utilized in the analysis. This includes the removal of deciduous leading stands from the THLB and exclusion of the deciduous component at the stand-level;
- Existing spatially identified wildlife tree reserves (WTR) have been removed from the THLB and future WTR estimates have been revised- increased from 3.4% to 6.1%

5 PUBLIC REVIEW

AGENCY AND PUBLIC REVIEW

This section includes the Public Review Strategy which includes sample referral letters and copies of advertisements, referrals and responses from the management planning process.

SUMMARY OF COMMENTS RECEIVED

Only one letter was received during the review opportunities. The following table summarizes the comments and questions received.

Table 3. – Public and First Nation Comments Received

Draft Data Package Review in 2014	
Comment Provider	**Comment(s) / Question(s) Summary**
N/A	No Comments were received from either the public or any First Nation during this review period.

Draft Management Plan / Timber Supply Analysis Review in 2016	
Comment Provider	**Comment(s) / Question(s) Summary**
Simpcw First Nation	A detailed letter was received from the Simpcw First Nation with a series of comments and questions in regards to the Analysis Report. Key focus areas were on preserving midterm harvest levels, beetle attack levels, amount of dead volume and harvest history in comparison to AAC.

Summary of Revisions in Response to Comments Received

The comments received from the public and First Nations review of the Data Package or Management Plan did not necessitate any revisions to either document.

Public Review Strategy

Tree Farm Licence 18 – Management Plan 11

As part of the preparation of Management Plan 11 (MP 11) for Tree Farm Licence 18 (TFL 18), this strategy has been developed to address legislation and policy requirements for the stakeholder and public review and involvement in the preparation of MP 11.

The public review strategy of MP 11 will be completed in accordance with the actions and approximate timelines in the following table (Table 1).

Table 1 - Public Review Timelines

Step #	Action	Approximate Date(s)
1	Canfor submits review strategy (this document) to RED	May, 2014
2	RED approves review strategy	May, 2014
3	Canfor submits, refers and advertises for review a draft Info Package (IP)	June, 2014
4	Review period occurs over 60 days	June – August, 2014
5	Canfor considers any comments received and submits a final IP	August, 2014
6	IP accepted by FAIB	September, 2014
7	Canfor submits, refers and advertises for review the draft Management Plan (MP), including the timber supply analysis	Early November, 2014
8	Review period occurs over 60 days	November, 2014 – January, 2015
9	Canfor considers any comments received and submits a final MP	January, 2015
10	Chief Forester approves the MP and determines the AAC	April - May, 2015

Advertisements

In June 2014, the attached advertisement (Appendix A) will appear twice in the North Thompson Times Newspaper, to inform the public that the Info Package will be available for review at the local Canfor and Ministry of Forests, Lands and Natural Resource Operations offices, as well as on Canfor's public website.

This same process will be initiated in November 2014 with regard to the draft MP11, with the advertisement as per Appendix B.

First Nations Referrals

The attached letter (Appendix C) will be sent to First Nations as per Table 2 below:

Table 2 – First Nations Contacts

First Nation	Phone/Fax	Chief	Main Contact
Adams Lake Indian Band P.O. Box 588 6453 Hillcrest Road Chase, BC V0E 1M0	Ph: 250-679-8841 Fax: 250-679-8813	Paul Michael	Referrals: administrator@alib.ca
Canim Lake Indian Band P.O. Box 1030 100 Mile House, BC V0K 2E0	Ph: 250-397-2227 Fax: 250-397-2769	Michael Archie	Don Dixon, canimnr@xplornet.com Melvin Paul, canimnatres@xplornet.com John Kalmikoff, Forester, clbforestry@lincsat.com, 250-397-2253
Neskonlith Indian Band 461 1st Nations Road Salmon Arm, BC V1E 2Z6	Ph: 250-679-3295 Fax: 250-679-5306	Judy Wilson	Referrals: referrels@neskonlith.net
Simpcw First Nation P.O. Box 220 Barriere, BC V0E 1E0	Ph: 250-672-9995 Fax: 250-672-5858	Nathan Matthew	James Foster, Forester, James.Foster@simpcw.com Carli Pierrot, Referrals and Archaeology Coordinator referrals@simpcw.com

NOTE: the above represents Bands with Traditional Territory within or directly adjacent to TFL18.
Contact information and Governance updated Jan 6, 2017 using INAC website (http://cippn-fnpim.aadnc-aandc.gc.ca/index-eng.html)

Agency and Stakeholder Notification Letters

The attached letter (Appendix D) will be distributed to those identified in the agency (Table 3) and stakeholder contact lists (Table 4). Agency contacts will be sent the documents and maps; the Thompson Rivers District, Clearwater office, will also be provided with a paper copy. All other stakeholders will be directed to a website or to view a paper copy at either Canfor or the Thompson Rivers District office.

Table 3 – Agency Contacts

Ministry of Forests, Lands and Natural Resource Operations	Forest Analysis and Inventory Branch	Jim Brown, Doug Beckett
Ministry of Forests, Lands and Natural Resource Operations	Thompson Rivers District	Ron Van der Zwan

Table 4 – Stakeholder Contacts

First Name	Last Name/ Organization (Search Field)	Address	City	Prov	Postal Code	Primary Interest
	BC Timber Sales - Clearwater	687 South Yellowhead Hwy	Clearwater	BC	V0E 1N2	Licensee
Dave	Baxter	RR #2, Box 2737	Clearwater	BC	V0E 1N0	Woodlot
David	Cadsand	BOX 123	Lone Butte	BC	V0K 1K0	Recreation
	Gilbert Smith Forest Products Ltd.	Box 689	Barriere	BC	V0E 1E0	Licensee
Phil	Johnston	980 Old N. Thompson Hwy	Clearwater	BC	V0E 1N2	Range
	Mahood Lake Forestry Sub-Committee	Box 303	Canim Lake	BC	V0K 1J0	Recreation
Dan	Mcneil	PO Box 70	Canim Lake	BC	V0K 1J0	Range
	Moose Camp Fishing Resort	Box 461	Clearwater	BC	V0E 1N0	Recreation
	Nehalliston Fishing Lodge	Box 69	Little Fort	BC	V0E 2C0	Recreation
	Star Lake Resort	1380 Clearwater - 100 Mile Forest Service Rd.	Clearwater	BC	V0E 1N2	Recreation
	Tolko Industries Ltd. - Thompson Nicola Woodlands	6275 Old Hwy 5	Kamloops	BC	V2H 1T8	Licensee
	Wells Gray Community Forest	224 Candle Creek Road	Clearwater	BC	V0E 1N1	Licensee
John	Livingstone	PO Box 510	Little Fort	BC	V0E 2C0	Range
	Clearwater Chamber of Commerce	201 – 416 Eden Rd	Clearwater	BC	V0E 1N1	
	District Municipality of Clearwater	PO Box 157, 132 Clearwater Station Rd	Clearwater	BC	V0E 1N0	
Ralph Sunderman	Clearwater Snodrifters	339 Helmcken	Clearwater	BC	V0E 1N0	Recreation
	Wells Gray Outdoors Club	1197 Barber Rd	Clearwater	BC	V0E 1N1	Recreation
	Thompson Nicola Regional District	300-465 Victoria St	Kamloops	BC	V2C 2A9	

Public Review Summary

Canfor will reply in writing to each person who took the opportunity to comment on MP 11.

As input is received by Canfor, this correspondence will be shared with MFLNRO staff. To ensure information is shared at regular intervals, conference calls will be held between Canfor and applicable MFLNRO staff on a biweekly basis during the comment and review periods.

A public review summary report will be included in the final Management Plan 11 document, noting the following:

- Name
- Organization (if applicable)
- Medium and date of communication
- Comments and follow-up
- Actions taken to accommodate
- Outstanding concerns

APPENDIX A
NEWSPAPER ADVERTISEMENT – INFO PACKAGE

CANADIAN FOREST PRODUCTS LTD.

Draft Timber Supply Analysis Information Package
Tree Farm Licence 18 Management Plan 11

Notice is hereby given, under section 6 (1) of the *Tree Farm Licence Management Plan Regulation*, that Canadian Forest Products Ltd. (Canfor) is seeking public review and comment on the Draft Timber Supply Analysis Information Package, relating to Management Plan 11 (MP 11) for Tree Farm Licence 18 (TFL 18). MP 11 is being prepared in order to meet the requirements of the *Tree Farm Licence Management Plan Regulation*. This regulation includes content requirements, submission timing and public review requirements for TFL Management Plans. These content requirements replace the Management Plan content requirements previously listed in the Tree Farm Licence document and reduce duplication with associated Forest Stewardship Plan results and strategies.

The Management Plan consists of a summary of the TFL along with the Timber Supply Review Analysis report and Data Package with a reference to the other guiding legislation (i.e Forest Stewardship Plans, Sustainable Forest Management Plans and other Higher Level Plans). This information is provided to the Ministry of Forests, Lands and Natural Resource Operations to set a new Annual Allowable Cut for the TFL.

All interested parties are invited to view and comment on the Draft Timber Supply Analysis Information Package for MP 11, from _____, 2014 through to _____, 2014. Viewing appointments can be arranged by calling our office at (250) 676-1136, or by visiting http://www.canfor.com/responsibility/environmental/plans . Comments will be accepted until 4:00 pm _____, 2014.

For further information, please contact:

Dave Dobi, RPF
Planning Forester,
Canadian Forest Products Ltd.
Forest Management Group,
P.O. Box 39,
Vavenby, BC V0E 3A0

Clearwater Times Thursday, October 23, 2014 www.clearwatertimes.com A17

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Legal Notices

Draft Timber Supply Analysis Information Package
Tree Farm Licence 18 Management Plan 11

CANFOR – CANADIAN FOREST PRODUCTS LTD.

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All interested parties are invited to view and comment on the Draft Timber Supply Analysis Information Package for MP 11, from September 25 through to November 24, 2014. Viewing appointments can be arranged by calling our office at (250) 676-1136, or by visiting http://www.canfor.com/responsibility/environmental/plans . Comments will be accepted until 3:00 pm November 24, 2014.

For further information, please contact:
Dave Dobi, RPF
Planning Forester,
Canadian Forest Products Ltd.
Forest Management Group,
P.O. Box 39,
Vavenby, BC V0E 3A0

APPENDIX B
NEWSPAPER ADVERTISEMENT – DRAFT MP11

CANADIAN FOREST PRODUCTS LTD.

Draft - Tree Farm Licence 18 Management Plan 11

Notice is hereby given, under section 6 (1) of the *Tree Farm Licence Management Plan Regulation*, that Canadian Forest Products Ltd. (Canfor) is seeking public review and comment on Draft Management Plan 11 (MP 11) for Tree Farm Licence 18 (TFL 18). MP 11 is being prepared in order to meet the requirements of the *Tree Farm Licence Management Plan Regulation*. This regulation includes content requirements, submission timing and public review requirements for TFL Management Plans. These content requirements replace the Management Plan content requirements previously listed in the Tree Farm Licence document and reduce duplication with associated Forest Stewardship Plan results and strategies.

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All interested parties are invited to view and comment on MP 11, from month day, year through to month day, year. Viewing appointments can be arranged by calling our office at (250) 676-1136, or by visiting http://www.canfor.com/responsibility/environmental/plans. Comments will be accepted until 4:00 pm month day, year.

For further information, please contact:

Dave Dobi, RPF
Planning Forester,
Canadian Forest Products Ltd.
Forest Management Group,
P.O. Box 39,
Vavenby, BC V0E 3A0

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Draft - Tree Farm Licence 18 Management Plan 11

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The Management Plan consists of a summary of the TFL along with the Timber Supply Review Analysis report and Data Package with a reference to the other guiding legislation (i.e Forest Stewardship Plans, Sustainable Forest Management Plans and other Higher Level Plans). This information is provided to the Ministry of Forests, Lands and Natural Resource Operations to set a new Annual Allowable Cut for the TFL.
All interested parties are invited to view and comment on MP 11, from October 17 through to December 19, 2016. Viewing appointments can be arranged by calling our office at (250) 676-1136, or by visiting http://www.canfor.com/responsibility/environmental/plans. Comments will be accepted until 4:00 pm December 19, 2016.

For further information, please contact:

STEFAN BORGE, RFT
Forestry Supervisor - Planning
Forest Management Group
Canadian Forest Products

Tele: 250-676-1136 Cell: 250-674-1040 Fax: 250-676-954
Email: Stefan.Borge@canfor.com Web: www.canfor.com
2996 McCorvie Rd, PO Box 39, Vavenby, BC, V

APPENDIX C
FIRST NATIONS REFERRAL LETTER

<insert date>
Chief >>>
First Nation>>>

Address>>>

RE: Draft Management Plan 11 for TFL 18 Available for Review and Comment

Dear Chief>>>:

Canadian Forest Products has prepared a Draft Management Plan (MP 11) for TFL 18. The Management Plan is a legislative requirement as well as a requirement of the TFL Agreement with the Provincial Government. The Management Plan consists of a summary of the TFL along with the Timber Supply Review Analysis report and Data Package with a reference to the other guiding legislation (i.e Forest Stewardship Plans, Sustainable Forest Management Plans and other Higher Level Plans). This information is provided to the Ministry of Forests, Lands and Natural Resource Operations to set a new Annual Allowable Cut for the TFL.

Tree Farm License #18 (TFL 18 or the TFL) is situated immediately northwest of Clearwater B.C. and approximately 30 km west of the Canadian Forest Products Ltd. (Canfor) mill in Vavenby B.C.

The terrain is undulating, within an elevation range of 516 to 1,989 meters. The majority of the TFL is easily accessible by road, and the land base contains numerous small lakes and swamp complexes. The principal commercial species are white spruce, subalpine fir and lodgepole pine. The license encompasses 74,545 hectares.

Canadian Forest Products Ltd. requests that the <insert band name> review and provide comments on MP 11 by xx date, a copy of which is enclosed on CD. A paper copy of MP 11 and all maps will be provided at your request.

To facilitate information sharing between Canfor and the <insert band name>, we are interested in meeting to discuss MP 11. Given the fiduciary responsibility of the Crown to First Nations, Canfor will be requesting the Ministry of Forests, Lands and Natural Resource Operations to coordinate any such meeting. If you are interested in participating in a meeting, please contact Dave Dobi, Planning Forester, at (250) 676-1136.

Sincerely,

Dave Dobi, RPF
Planning Forester
(250) 676-1136
Dave.Dobi@Canfor.com

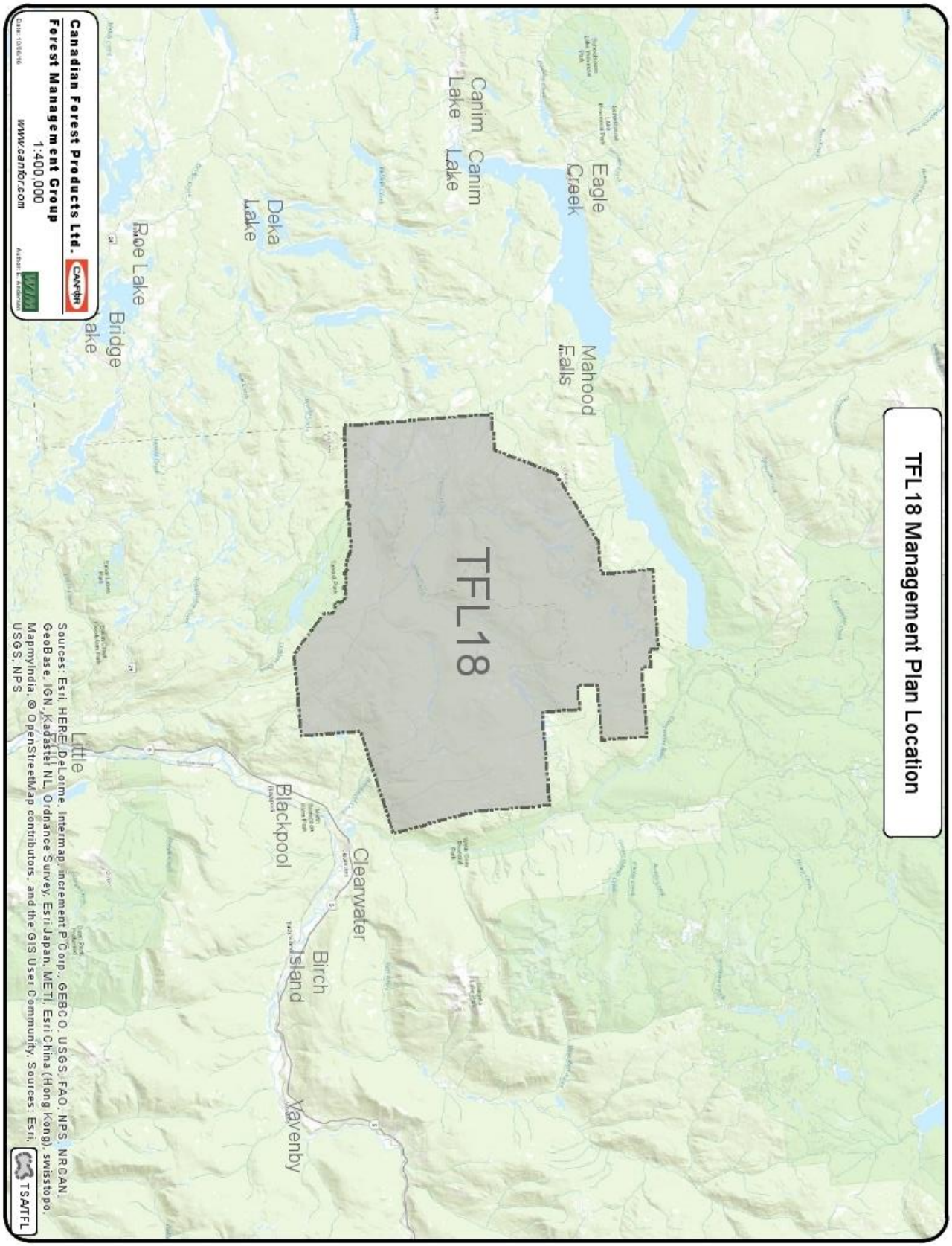
Encls.
Draft Management Plan 11 for TFL48, including maps (CD)
cc: Alan Card, First Nations Relations Advisor, Ministry of Forest Lands and Natural Resource Operations

6 APPENDICES[1]

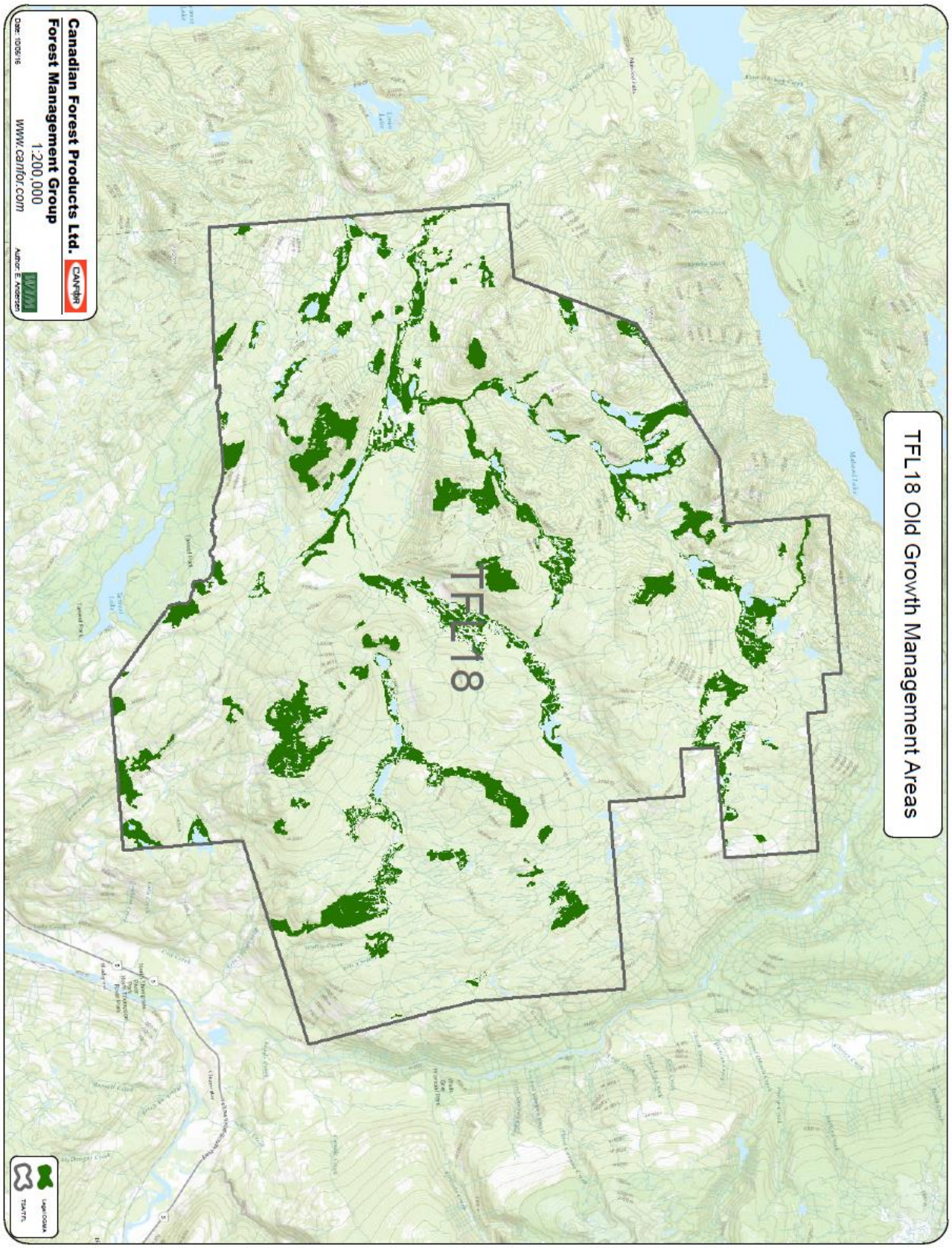
Appendix I	Description of TFL 18 Boundary
Appendix II	Old Growth Management Areas for TFL 18
Appendix III	Public Recreation Map
Appendix IV	Visual Inventory
Appendix V	Terrain Mapping Overview
Appendix VI	Road Classification Map
Appendix VII	Intermediate Utilization Balsam Map
Appendix VIII	Stream Riparian Classification
Appendix IX	Copy of Referral Comment Submission
Appendix X	Copies of Information Package, Analysis

[1] Recreation Features and Recreation Opportunity Spectrum unchanged from MP #9. Cultural heritage resource details available from Ministry of Forests – Headwaters District, and Kamloops LRMP AOA process.

APPENDIX I: TFL 18 BOUNDARY


TFL18 Management Plan Location
TFL18
Canadian Forest Products Ltd.
Forest Management Group
1:400,000
www.canfor.com
Eagle Creek
Canim Lake
Canim Lake
Deka Lake
Roe Lake
Bridge
ake
Mahood Falls
Little
Blackpool
Clearwater
Birch Island
Vavenby
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community, Sources: Esri, USGS, NPS
TSA/TFL

APPENDIX II: Old Growth Management Areas for TFL 18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TFL 18
Canadian Forest Products Ltd.
Forest Management Group
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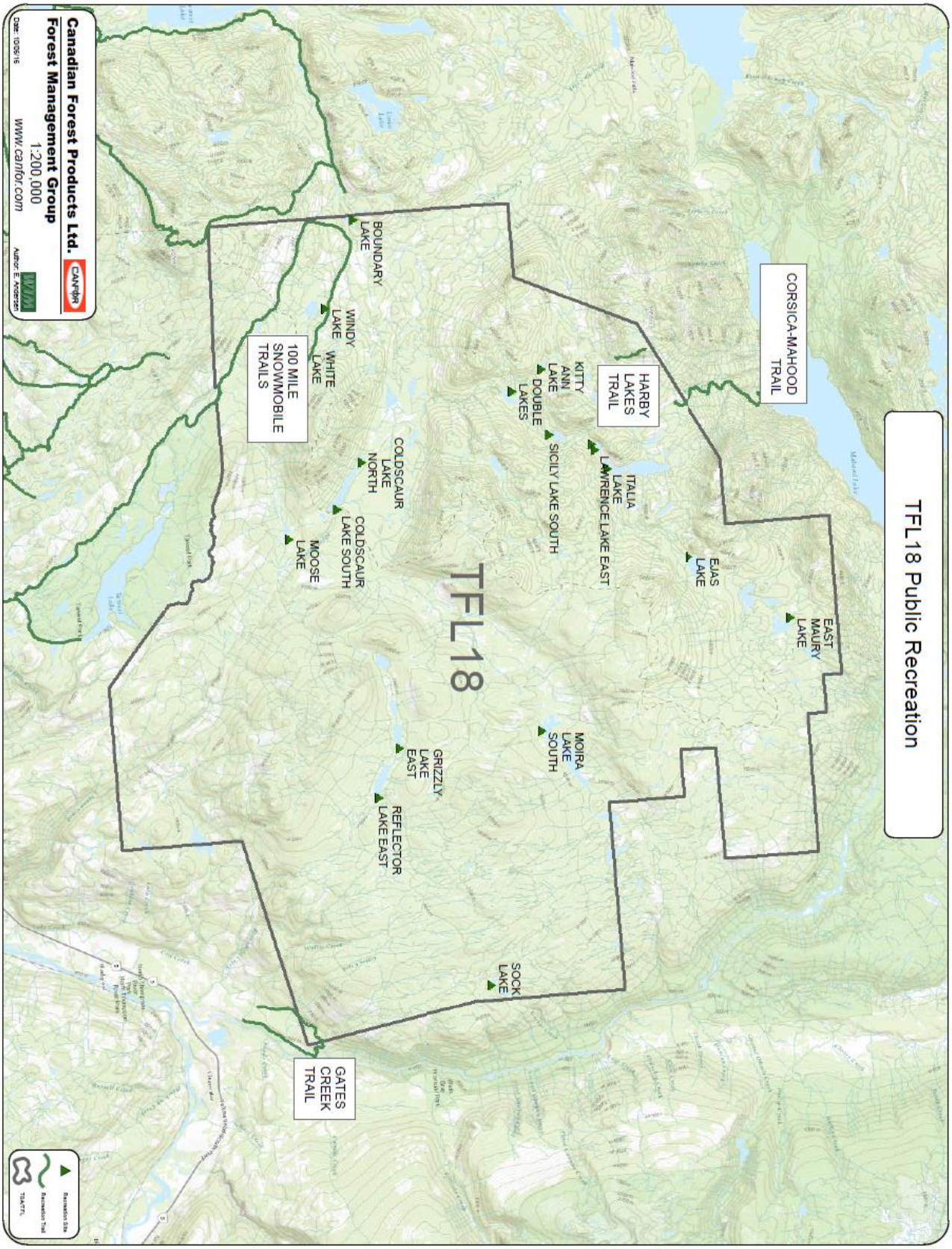
www.canfor.com
Date: 10/05/16
Author: E. Anderson

APPENDIX III: Public Recreation Map


TFL18 Public Recreation
TFL18
CORSICA-MAHOOD TRAIL
HARBY LAKES TRAIL
GATES CREEK TRAIL
100 MILE SNOWMOBILE TRAILS
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WINDY LAKE
WHITE LAKE
KITTY ANN LAKE
DOUBLE LAKES
SICILY LAKE SOUTH
ITALIA LAKE
LAWRENCE LAKE EAST
EJAS LAKE
EAST MAURY LAKE
COLDSCAUR LAKE NORTH
COLDSCAUR LAKE SOUTH
MOOSE LAKE
MOIRA LAKE SOUTH
GRIZZLY LAKE EAST
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Canadian Forest Products Ltd.
Forest Management Group
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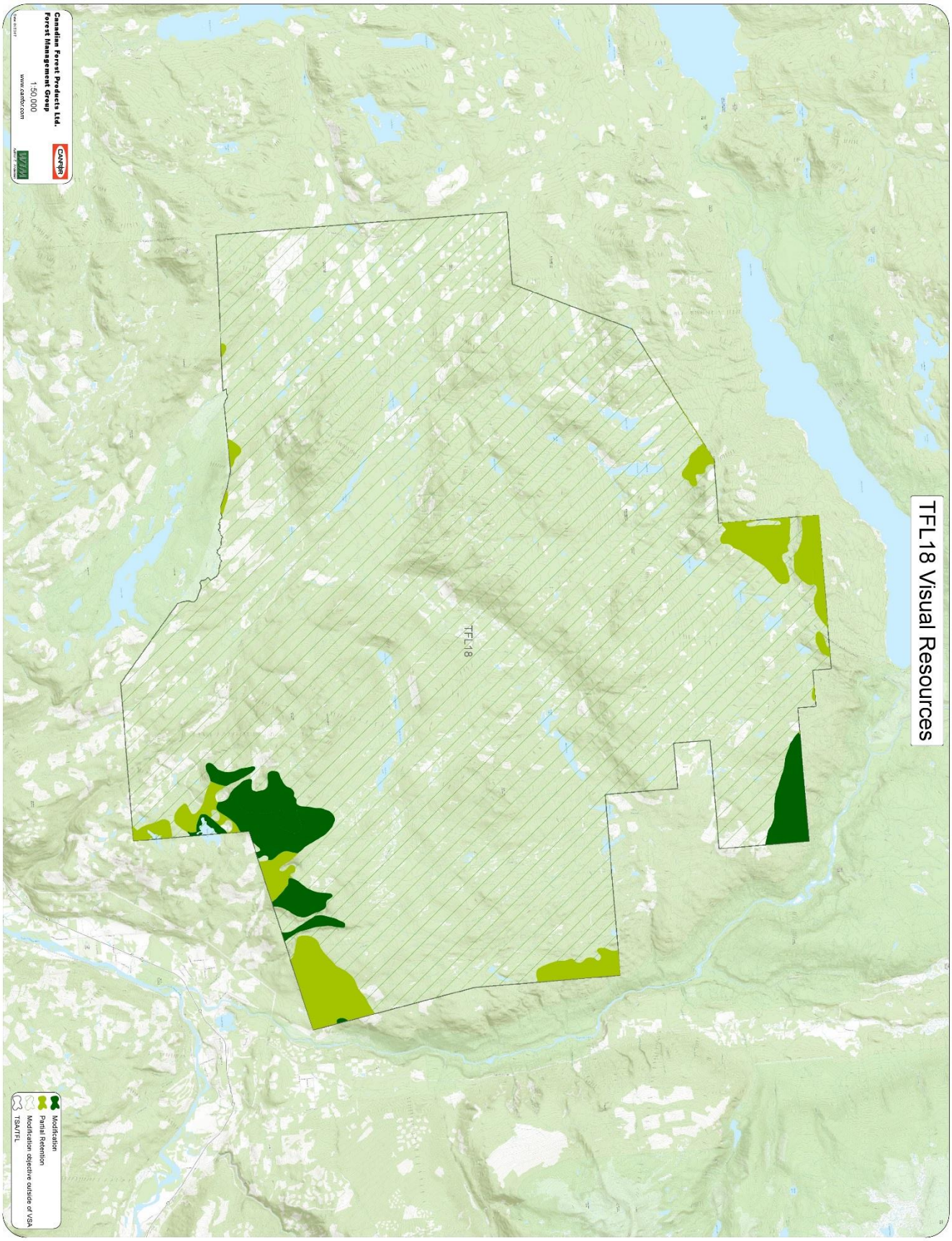
www.canfor.com

APPENDIX IV: Visual Inventory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www.canfor.com
CANFOR
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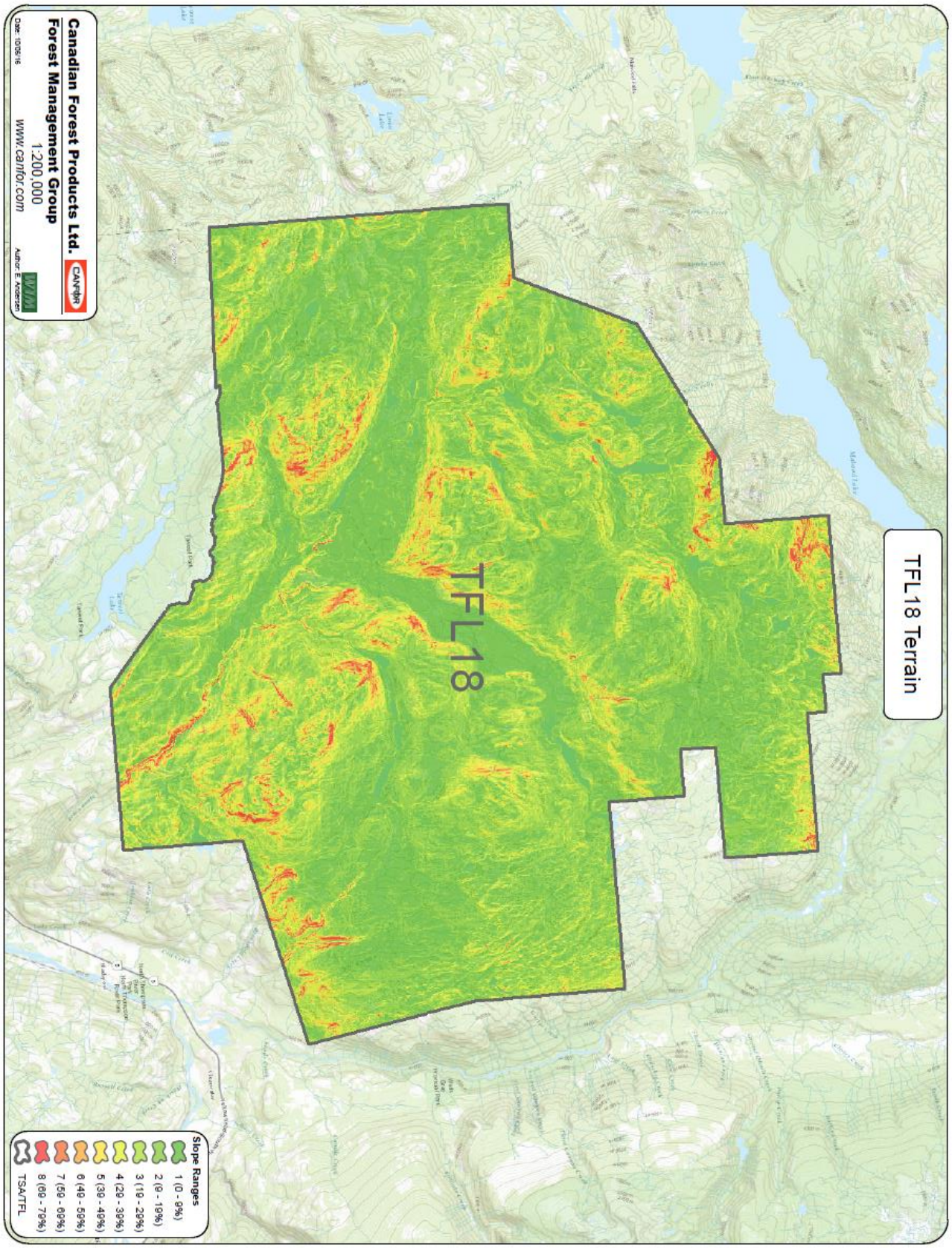
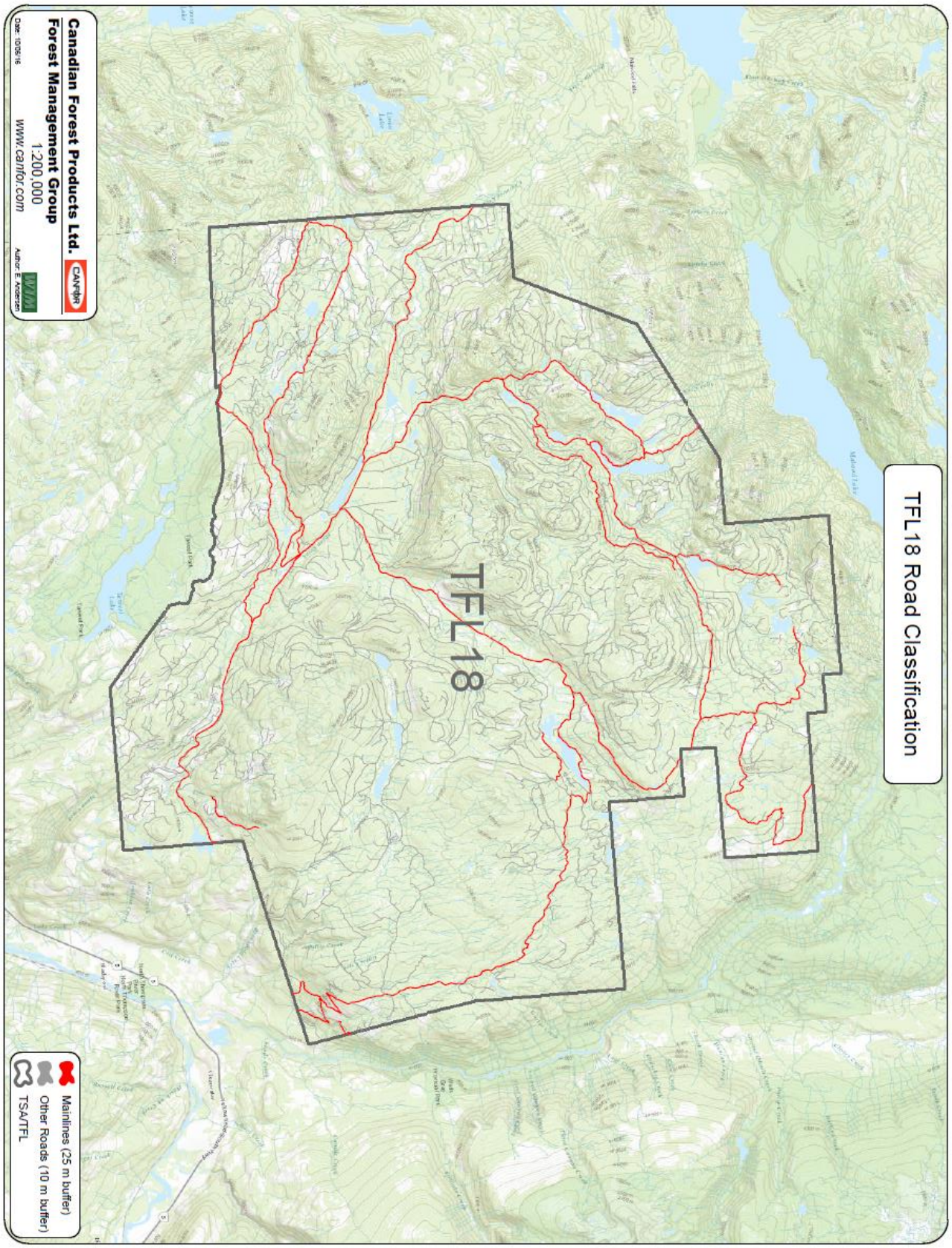
Partial Retention
Modification objective outside of VQA
TSA/TFL
TFL18 Visual Resources

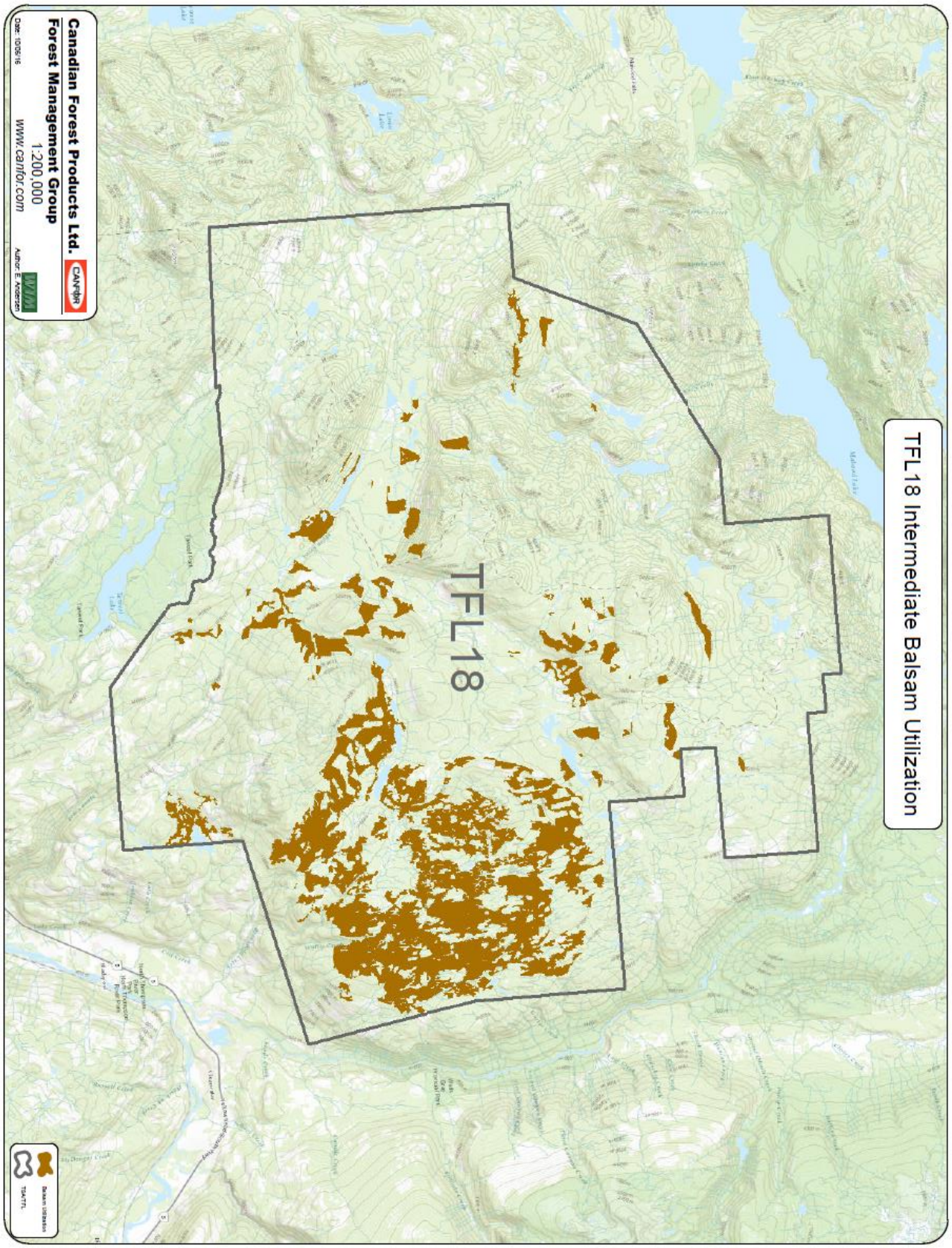
APPENDIX V: Terrain Mapping Overview


Canadian Forest Products Ltd.
Forest Management Group
1:200,000
www.canfor.com
Date: 10/05/16
Author: E. Anderson
TFL18 Terrain
TFL18
Slope Ranges
1 (0 - 9%)
2 (9 - 19%)
3 (19 - 29%)
4 (29 - 39%)
5 (39 - 49%)
6 (49 - 59%)
7 (59 - 69%)
8 (69 - 79%)
TSA/TFL

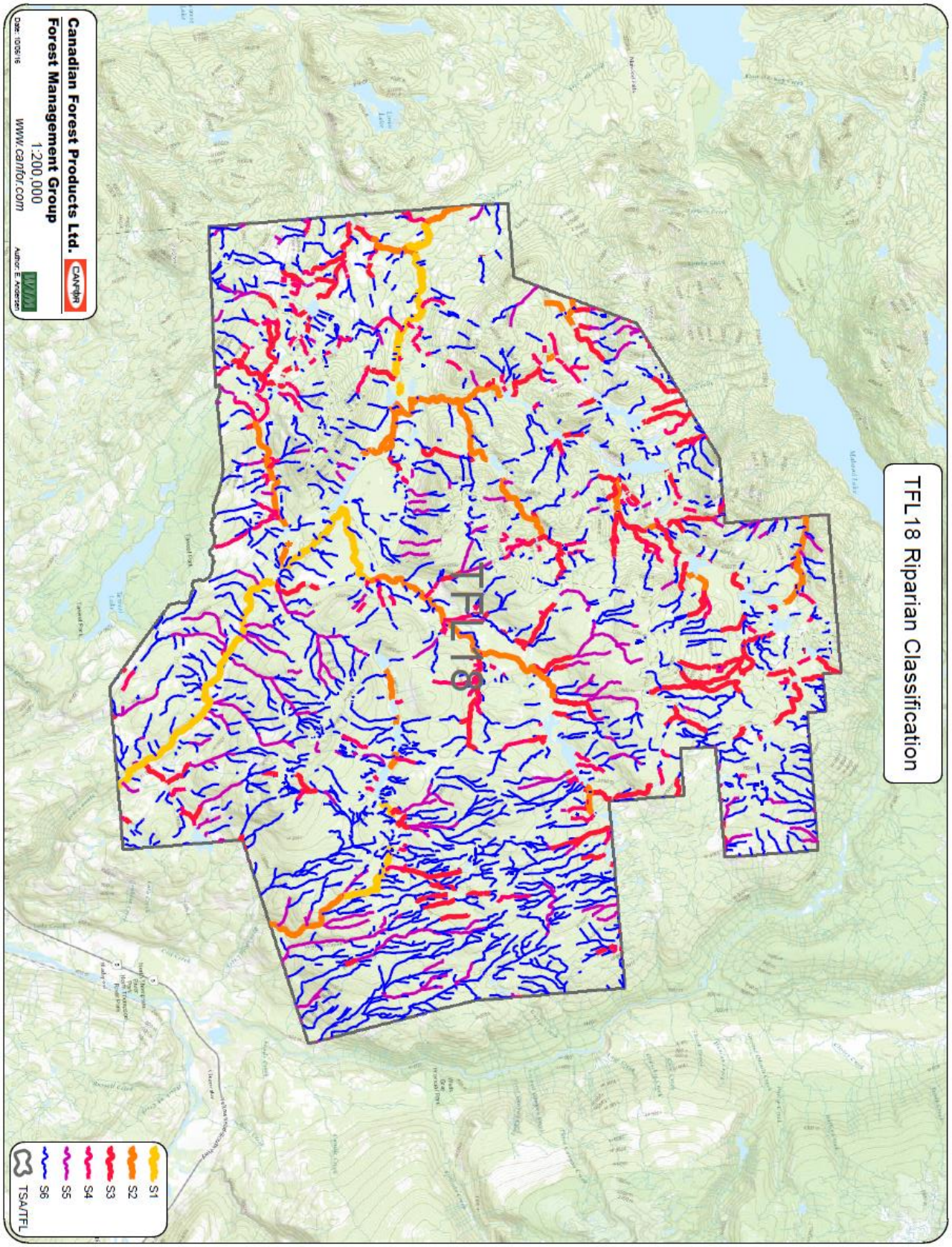
APPENDIX VI: Road Classification Map


TFL18 Road Classification
TFL18
Canadian Forest Products Ltd.
Forest Management Group
1:200,000
www.canfor.com
Date: 10/05/16
Author: E. Anderson
Mainlines (25 m buffer)
Other Roads (10 m buffer)
TSA/TFL

APPENDIX VII: Intermediate Utilization Balsam Map


TFL18 Intermediate Balsam Utilization
TFL18
Canadian Forest Products Ltd.
Forest Management Group
1:200,000
www.canfor.com
Date: 10/05/16
Author: E. Anderson

APPENDIX VIII: Stream Riparian Classification


Canadian Forest Products Ltd.
Forest Management Group
1:200,000
www.canfor.com
Date: 10/05/16
Author: E. Anderson
TFL 18
TFL18 Riparian Classification
TSA/TFL
S6
S5
S4
S3
S2
S1

APPENDIX IX: Copy of Referral Comments and Responses

Simpcw First Nation
"People of the Rivers"

November 7, 2014

Kelly Hicks
First Nations Advisor
Thompson Rivers District
Ministry of Forests, Lands and Natural Resource Operations

RE Canfor TFL18 AAC and MP11

Dear Kelly,

Thank you for the letter dated October 20, 2016. Simpcw First Nation (SFN) has concerns related to the AAC recommendation letter sent to the Chief Forester, the draft Management Plan #11 and associated analysis documents. Although we do not have sufficient resources to do a detailed review and analysis of the material related to the TFL18 AAC recommendation, there are some questions and concerns identified based on our preliminary review that could have impacts to SFN's aboriginal interests?

In general the establishment and renewal of this area based tenure in Simpcwul'ecw, over which SFN has Title and Rights, has taken place without SFN consent. The current accommodation measures offered by the Province for these infringements are insufficient. The FCRSA does not provide enough resources, as referenced above, to address the technical aspects of the AAC determination sufficiently. The current term of 25 years on this licence does not allow for consideration of SFN's title and rights as they continue to be confirmed and strengthened by significant factors such as results of our continued research efforts and court decisions.

Some specific questions and concerns related to the current AAC recommended by Canfor for TFL18 include:

Although in the material it is stated "The MPB epidemic has generally run its course (though a significant amount of merchantable dead pine remains) on the TFL and salvage is expected to be concluded over the next several years." and "…Canfor has been aggressive in salvaging damaged timber. As a result, very little un-salvaged losses are incurred", Canfor is recommending a higher harvest rate than base case supports. We are unable to determine, from the material presented, where or how much dead Pl, SX or Bl volume exists to support this elevated cut. To minimize the midterm fall down, any harvesting should be focussed on remaining salvage of beetle impacted stands. Addressing dead MPB or 0.8% per year in Bl stands, should be part of the base case harvesting strategy, not "in addition to" and requiring uplift. Is the 0.8% mortality per year for Bl higher than endemic levels and if so by how much?

PO Box 220, Barriere, BC V0E 1E0 Ph (250)672-9995 Fax (250)672-5858 Administration@simpcw.com

Removal of the 10% reduction in cut per year maximum rule and the minimum harvestable volume rule seem to be utilized in a way that focuses on short term volume/economic gains not factors such as local economic stability, ecosystem function or midterm supply concerns.

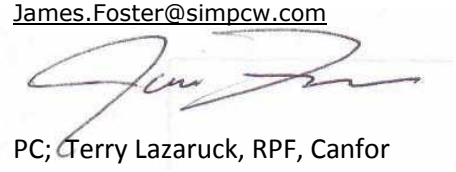
Sensitivity analysis seems to suggest impacts to midterm supply could be reduced, to a greater degree than in the recommended AAC, with lower initial harvest levels and a reduction in the minimum harvest volume criteria. Since the overriding Harvest Flow Objective appears to be "Attempt to maintain the current AAC 290,000 m3/year for ten years or, failing that, find the highest initial harvest level that can be sustained for ten years", it seems considerations such as midterm supply are secondary to short term volume/economic interests. The statement "An initial uplift harvest level of 201,000 m3/year can be sustained for 10 years without impacting the midterm minimum harvest level determined in the base case." This seems to ignore the potential outlined in the sensitivity analysis to decrease midterm fall down.

We understand that the current AAC of 290,000m3/year is an uplift from 177,650m3/year that was established in 2006 to address MPB mortality. A recommended harvest level that is almost 40% higher than the base case presented and 14% above pre beetle uplift level seems to focus on short term volume/economic interests rather than reducing impacts to the midterm harvest or ecological concerns related to biodiversity, ecosystem function etc. What volume has been harvested over the last 10 years since the uplift and what percentage was salvage? Was the uplift that was established utilized appropriately?

I realize some of these questions and concerns may be best addressed by the licensee and have CCed Canfor on this communication.

Kukwstsémc

James Foster RPF
Natural Resources Department Manager and Rights and Title Coordinator
James.Foster@simpcw.com



PC; Terry Lazaruck, RPF, Canfor

PO Box 220, Barriere, BC V0E 1E0 Ph (250)672-9995 Fax (250)672-5858 Administration@simpcw.com

Canadian Forest Products Ltd.

Vavenby

December 16th, 2016

James Foster, RPF
Natural Resources Dept. Manager and Rights and Title Coordinator
PO Box 220,
Barrier, BC
V0E 1E0

Re: Tree Farm License 18 Management Plan 11 Comments

Dear Mr. Foster:

Thank you for taking the time to review and provide comments on the Draft Management Plan and associated Timber Supply Analysis work.

Being that the scope of this review is isolated to the Draft Management Plan and the Timber Supply Analysis work completed, we will limit our response to those areas identified within your letter and defer any comments regarding Simpcw rights and title or accommodation to the Ministry of Forests, Lands and Natural Resource Operations staff.

The following points are setup to follow the order the comments were provided in your letter dated November 7, 2016:

1) 'How much dead volume exists to support this elevated cut':

a. Canfor has endeavored to apply assumptions that are relatively conservative in nature due to the higher level of uncertainty on this topic. Specifically, Canfor has a total chance plan developed in regards to salvage operations, and these blocks were built into the modelling harvest sequence for the first period. In addition, volume lost from spruce and balsam beetle attack were assumed to be not available for harvest, although there may be some salvage opportunities still available. In both of these circumstances, if we choose to relax these assumptions, the initial harvest rate would increase, as the model would attempt to salvage more of this volume before it was 'lost' to shelflife.

   To answer your question, at year 0 the total amount of dead pine within the THLB is 197,061 m^3 within the TFL. This may seem like a relatively low number, however the stands where this volume resides are mixed, so the overall % of dead volume in any given stand is low. All of the high pine % stands have already been salvaged, leaving only scattered patches of dead pine throughout the TFL. It is also important to note that the inventory volume does not track dead volume of the other species (spruce and balsam), so the combined dead volume available in reality is higher than the amount noted.

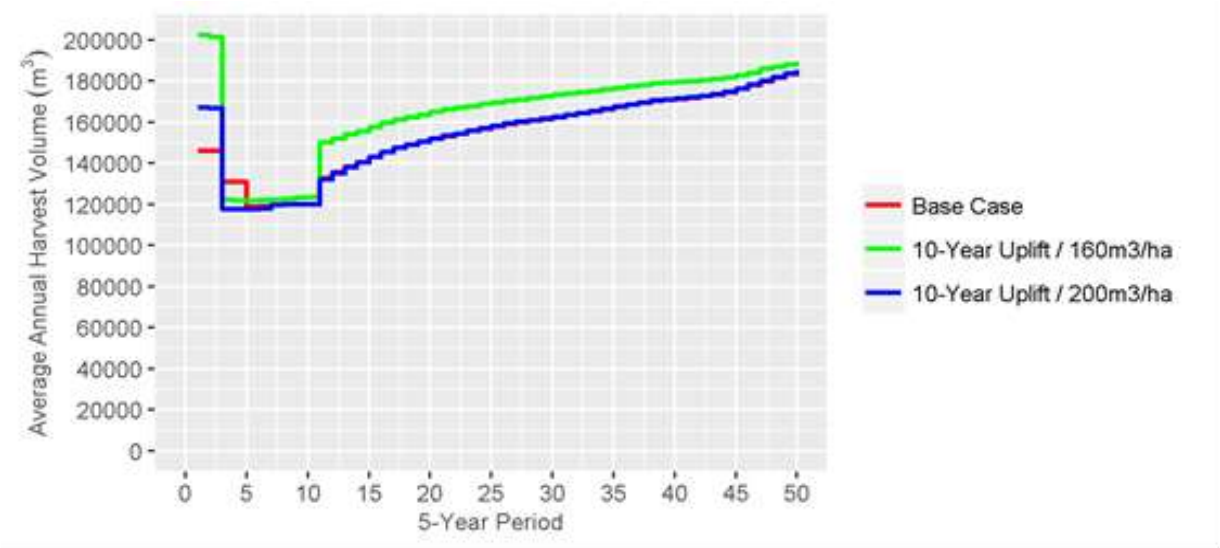
2) 'Harvest should be focused on remaining salvage of beetle impacted stands':

a. Canfor agrees with this as a management priority on the TFL, and as such, the proposed harvest scenario has built that into the assumptions. The level of insect attack within the TFL area has had a large impact on operations, and the forecasted harvest rates in the midterm and long term are reflecting the volume loss. These losses (and the

associated impact to AAC) will occur in the midterm regardless of where the short term harvest levels are set.

This is simply due to shelflife of the attacked stands. Whether there is an elevated initial harvest rate (focused on salvage), a reduced initial rate, or a stepped down AAC scenario, the midterm harvest between all of these scenarios are almost identical.

The chart below shows the impact of alternate initial harvest rates on the mid and long term harvest levels:



3) 'Addressing dead MPB or 0.8% /yr in BL stands should be part of the base case':

a. The 0.8%/year level of volume loss was built in to the Base Case scenario, as well as maximizing the salvage opportunities for all species. One of the larger constraints in the Base Case scenario was the requirement to step the harvest level down to the midterm level at 10% loss per decade. This was one of the reasons Canfor chose to remove the step down assumption.

4) 'Is the 0.8% mortality for Bl higher than endemic levels':

a. The level of attack within the TFL, and the shelflife of both spruce and balsam was a big topic of discussion. The 0.8% annual reduction to volume was based on survey data collected by Ministry staff, and the highest annual change was used (0.8% / year). To answer the question of whether this is higher than endemic levels or not is a difficult question to answer, however, at ~30% mortality across the TFL for spruce and balsam, this is a large enough of an issue that requires additional management consideration.

In discussions with Lorraine Maclauchlan (MFLNRO – Entomologist), defining endemic versus epidemic infestations is somewhat complicated. That being said, when annual infestation rates reach 0.5 to 1.0 % (or higher), it is typically considered to be beyond endemic levels.

5) ‘Removal of the 10% reduction in cut/yr and minimum harvestable vol rule’:

a. The decision to remove the 10%/decade step down requirement for the TFL was made in order to maximize the salvage opportunities in the short term. However, as noted throughout the report, this was done in such a manner as to not put any other resource value at risk. For example, Old Growth Management Areas and Visuals are retaining significant amounts of mature forest within the TFL, which are retained well past the point of hitting culmination MAI.

If the stepped down AAC approach is applied, the only impact is that additional dead volume is left to deteriorate, putting those stands on an extended timeframe for falling below the minimum volume per hectare threshold, regenerating naturally, and then converting to a natural stand yield curve.

Again, as noted in point #2 above, there is little in the way of feasible options to mitigate the midterm harvest levels, and to your other point regarding maximizing salvage, this does exactly that.

Your other concern regarding the volume per hectare (VPH) assumption being utilized to focus harvest in the short term is not 100% clear, however, we can point out that the VPH thresholds used are based off of harvest performance over the last 10 years, and some considerations applied for stands with a small % of deciduous as well as planned blocks that are sitting below the historical average. The chart in point #2 shows that there is little impact to the midterm when the VPH limit is reduced. Again, due to the beetle attack, the options are limited for midterm mitigation.

6) ‘midterm supply (impact) could be reduced, to a greater degree than in the recommended AAC, with lower initial harvest levels and a reduction in the minimum harvest volume criteria’:

a. As shown and discussed above, with the high level of insect attack and damage, there are few options for changing the mid-term harvest level. The only sensitivity run that made a significant difference was the one in which minimum harvest age was set at the point at which each stand reached 125 m3/hectare. This scenario may not be operationally realistic, as all this does, is allow for young, small profile stands to start contributing sooner thereby propping up the midterm.

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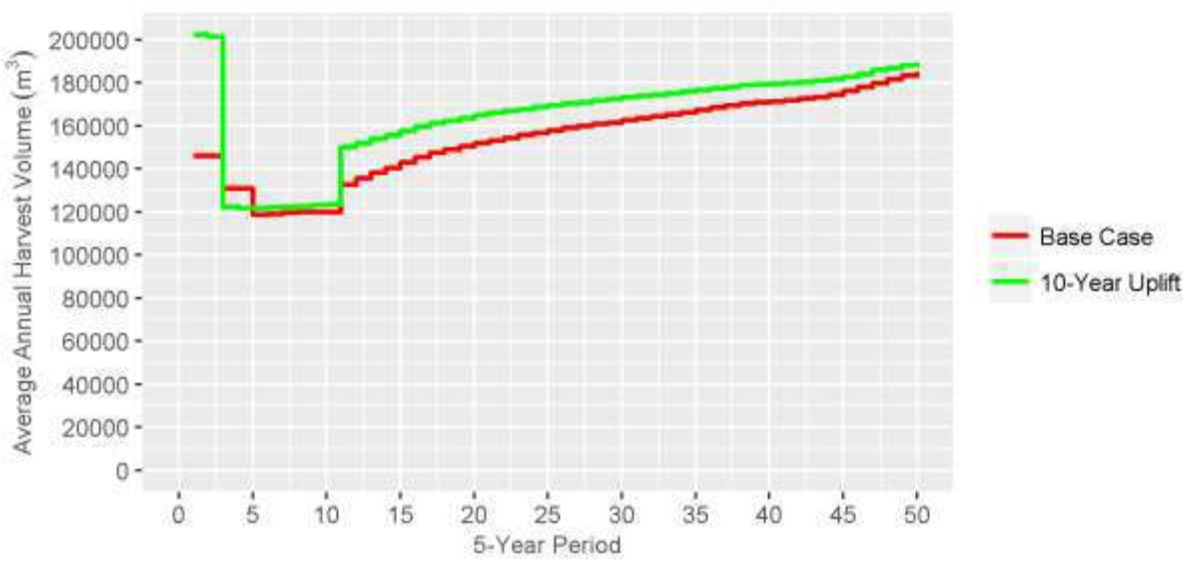
Telephone 250-567- 8260 Fax 250-567- 3911

It should be noted, that with the proposed AAC scenario, the midterm drop is actually less than the Base Case scenario, although not by much (see below). This slight increase is more a function of the change in the VPH limit.



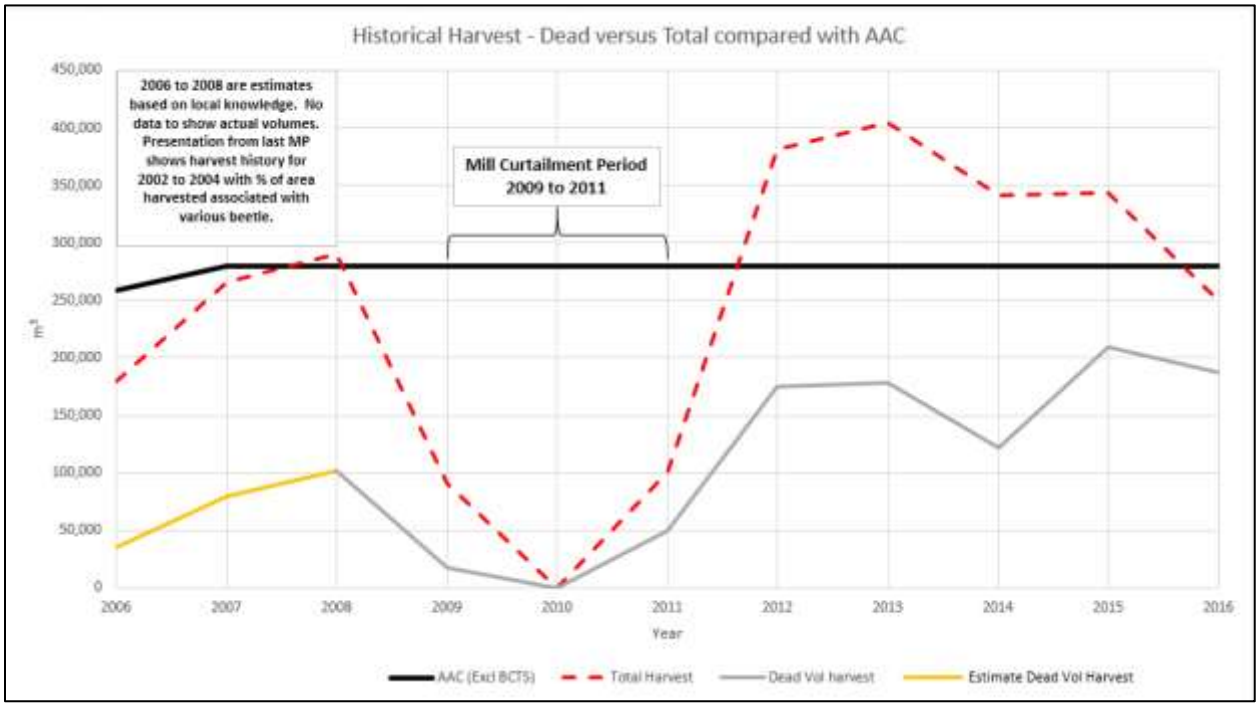
7) Question concerning overriding harvest flow objective for the Base Case:

a. In completing most Timber Supply Review analysis, there is a common set of objectives that are applied when setting up the Base Case scenario. One of those are to: maintain the current AAC for ten years or, failing that, find the highest initial harvest level that can be sustained for ten years.

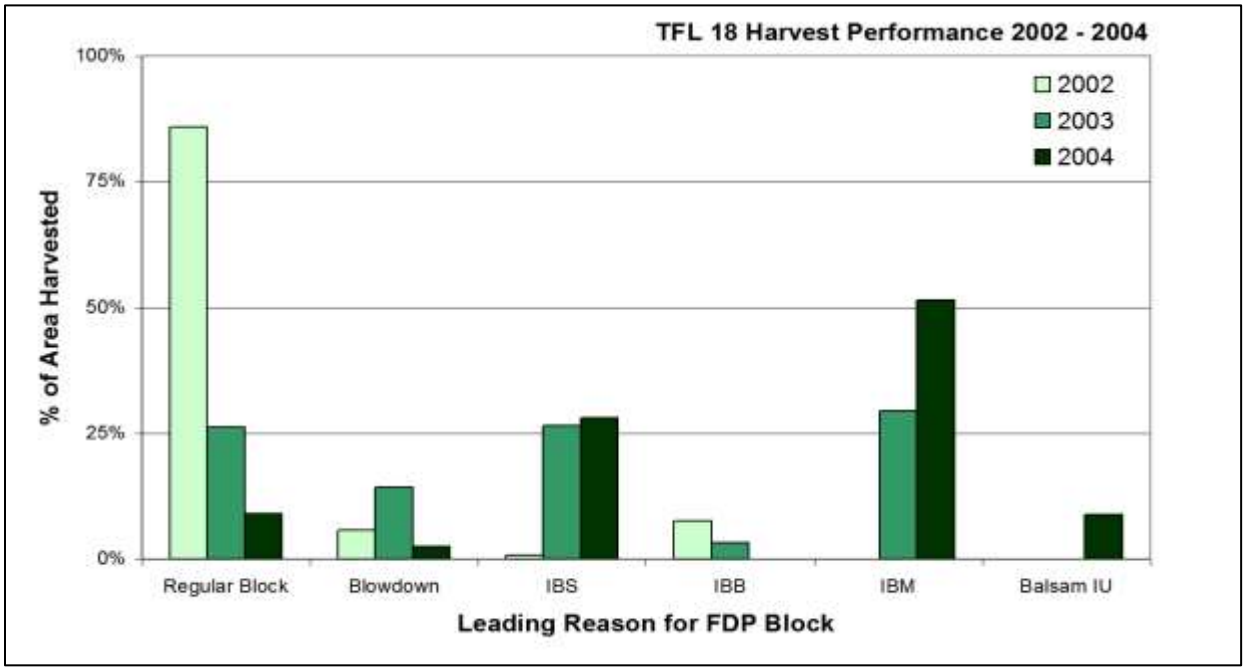
This objective works well for most land bases that have a relatively stable harvest pattern, but for those that have experienced a major level of disturbance and have to address AAC reductions, this objective becomes more difficult to manage. For TFL18, this is the case. Canfor has attempted to balance a number of key values and objectives with the proposed AAC scenario, but Canfor did not rank any objective so that short term economics had a higher priority than anything else.

8) Salvage harvest history:

a. The chart below shows the historical levels of harvest on the TFL as well as the amount of that harvest that was dead volume. Overall, the average % of dead harvested has been around 42% with the most recent activity sitting at ~75% for 2016.



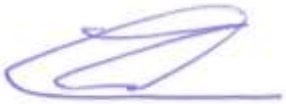
Prior to 2006, is shown below (no data is available for 2005):



As shown in the chart above, the levels of attack were dramatically increasing from 2002 to 2004 (IBB, IBS and IBM) with subsequent waves of attack (IBS and IBB) occurring again in ~2014. Excluding the mill curtailment period, the amount of dead volume being harvested has been steadily increasing as the levels of attack have also increased.

Again, Canfor would like to thank you for your comments and questions, and should you need any further clarification on the information provided information, please feel free to contact me.

Sincerely,



Terry Lazaruk, RPF
Strategic Planning Coordinator
Canfor Forest Management Group

CC: Kelly Hicks, Fist Nations Advisor, MFLNRO

APPENDIX X: Copies of Information Package, and Analysis Report

Tree Farm Licence #18
Management Plan #11
Timber Supply Information Package

Presented To:

Canadian Forest Products Ltd.

Dated: January 2017

ECORA File No.: KE-13-076

OQM | Organizational Quality Management Program

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Presented To:

OQM | Organizational Quality Management Program

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Prepared by:

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Version Control and Revision History

Version	Date	Prepared By	Reviewed By	Notes/Revisions
V11	12 July 2016	Jerry Miehm	David Coster	Update reference tables
V12	16 January 2017	Jerry Miehm		Final Edits

Table of Contents

List of Tables

List of Figures

Acronyms and Abbreviations

AAC	Allowable Annual Cut
AU	Analysis Unit
BEC	Biogeoclimatic Ecosystem Classification
BEO	Biodiversity Emphasis Option
CFLB	Crown Forested Land Base
ECA	Equivalent Clearcut Area
ERA	Ecosystem Representation Analysis
FDU	Forest Development Unit
FPPR	Forest Planning and Practices Regulations
FRPA	Forest and Range Practices Act
FSP	Forest Stewardship Plan
FSW	Fisheries Sensitive Watershed
GWM	General Wildlife Measure
IWA	Interior Watershed Assessment
IWAP	Interior Watershed Assessment Procedures
LRDW	Land and Resource Data Warehouse
M	Modification VQO Classification
MFLNRO	Ministry of Forests, Lands and Natural Resource Operations
MHA	Minimum Harvest Age
MOE	Ministry of Environment
MOF	Ministry of Forests
MP	Management Plan
MPB	Mountain Pine Beetle
NCD	No Channel Defined
NDT	Natural Disturbance Type
NRL	Non-Recoverable Losses
NSR	Not Sufficiently Restocked
OAF	Operational Adjustment Factor
OGMA	Old Growth Management Areas
PFI	Peak Flow Index
PFLB	Productive Forest Land Base
PR	Partial Retention VQO Classification
RESULTS	Reporting Silviculture Updates and Land Status Tracking System
RMA	Riparian Management Area
RMZ	Riparian Management Zone
RRZ	Riparian Reserve Zone
SPH	Stems Per Hectare
TEM	Terrestrial Ecosystem Mapping
TFL	Tree Farm Licence
THLB	Timber Harvesting Land Base
TIPSY	Table Interpolation Program for Stand Yields
TSA	Timber Supply Area
TSM	Terrain Stability Mapping
VDYP	Variable Density Yield Prediction Growth and Yield Model
VEG	Visually Effective Green-up Height
VLI	Visual Landscape Inventory
VQO	Visual Quality Objectives
VRI	Vegetation Resource Inventory
VSU	Visually Sensitive Unit

WTP	Wildlife Tree Patch
WTR	Wildlife Tree Reserve

1. Introduction

The timber supply analysis in support of Management Plan #10 for Tree Farm Licence #18 (TFL 18) was completed in 2004, followed by the allowable annual cut (AAC) determination effective March 9th, 2006 in which the AAC was set at 290,000 m^3/year.

Canadian Forest Products Ltd. (Canfor) is currently preparing Management Plan #11 for TFL 18, shown in Figure 1.1. 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. This data package documents the procedures, assumptions, data and model to be used in the analysis. Ecora Resource Group Ltd. (Ecora) has been engaged to prepare the data package and conduct the timber supply analysis on behalf of Canfor. This package follows the format of the *Provincial Guide for the Submission of Timber Supply Information Packages for Tree Farm Licences*.

Assumptions are prepared in accordance with the Kamloops Land and Resource Management Plan (KLRMP) 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 harvest levels. All analyses will be submitted to the Chief Forester for determination of the AAC.

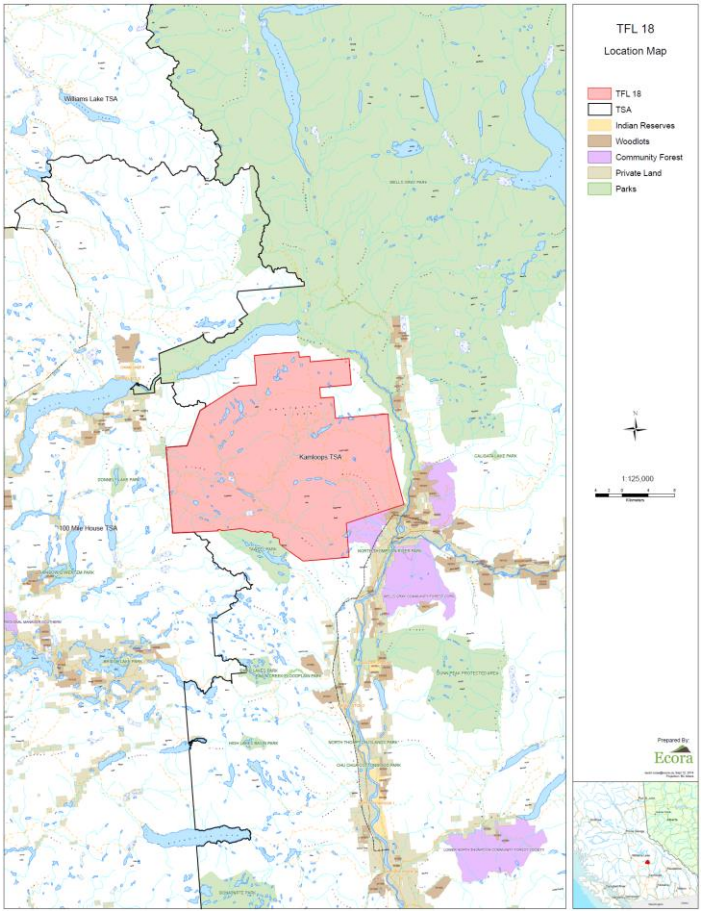

Figure 1.1. Location of TFL 18

2. Land Base Information and Data

2.1 Input Data Layers

Table 2.1 describes the input data layers used in this timber supply analysis.

Table 2.1. Input Data Layers

Description	Name	Source	Date
Balsam IU	balsam	FESL	June 2014
Digital Road Atlas	dra_buf	LRDW	June 2012
Elevation	dem	Ecora	August 2014
ESA	esa	Canfor	April 2014
Fertilization	rslt_fert	LRDW	November 2013
FTEN Blocks	ften_cut_b	LRDW	November 2013
H60	tfl18_h60	Canfor	April 2014
Lakes and Wetlands	tfl18_lakes	Canfor	April 2014
Lakes and Wetlands Riparian	tfl18_lk_wet	Canfor	April 2014
Lakeshore Management Zones	tfl18_lmz	Canfor	April 2014
Lakeshore Classes	tfl18_lmz2	Canfor	September 2014
Landscape Units	lu	LRDW	2012
Moose Camp Lease	camp_lease	Canfor	September 2014
Old Growth Management Areas	ogma_lg	LRDW	July 2014
Parks and Protected Areas	pa_protect	LRDW	February 2014
Permanent Sample Plots	psp_al	LRDW	2011
Planning Sub-basins	tfl18_sub_bas	Canfor	April 2014
Planning Watersheds	tfl18_wtshd	Canfor	April 2014
PSI	psi	Canfor	April 2014
RESULTS - Openings	rslt_open	LRDW	November 2013
RESULTS – Forest Cover	rslt_fcslv	LRDW	November 2013
Seed Planning Zone	seeds	LRDW	July 2014
Slope Stability	ste_ter_st	LRDW	July 2014
Streams	tfl18_stream	Canfor	April 2014
Terrestrial Ecosystem Map	tem	Ecocat	May 2014
Third Order Watersheds	ws_3rd	LRDW	July 2014
TFL 18 Blocks	vav_blks	Canfor	August 2014
TFL Boundary	bc_tfl	LRDW	February 2011
TFL Roads	tfl18_rd	Canfor	April 2014
Vegetation Resource Inventory - LRDW	rank1_lrdw	LRDW	March 2014
Visual Quality Objectives	tfl18_scenic	Canfor	April 2014
Walk-In Lake Zone	walk_in_zn	Canfor	September 2014
Wildlife - Moose	amoose_tka	ILMB archived file	2001
Wildlife Tree Patches	tfl18_reserv	Canfor	August 2014

2.2 Follow-up to Chief Forester's Comments

Following the last rationale, the Chief Forester identified five topics to address or monitor prior to the next timber supply analysis. This section describes Canfor's response to each of those topics. Canfor is already committed to monitoring and managing the mid-term timber supply risks and opportunities in several projects as Management Plans are implemented to help reduce risk and uncertainties associated with key factors affecting timber supply. In response to the Chief Foresters request, Canfor has focused on salvaging the remaining MPB affected stands and addressed the Chief Forester's points:

- ***Volume estimates for existing unmanaged stands****:* the extent of high volume stands represents a small area within the THLB. There are 120 ha of existing live merchantable volume as identified in the VRI with greater than 400 m^3/ha and no area with volume greater than 500 m^3/ha as shown in Figure 2.1. Harvest volume by volume class will be monitored and tracked in this analysis.

- ***Site productivity estimates****:* The Chief Forester requested that monitoring occur in managed stands to confirm or revise that the estimated gains in growth and yield, noting that mid-term timber supply would be particularly sensitive to productivity assumption in these stands. No monitoring program has yet been implemented. Such a program may be considered once forest health issues are addressed and salvage logging is complete.

- ***Residual balsam stands****:* The Chief Forester requested that the estimates regarding existing stand volumes and growth and yield continue to be improved. Due to the significant impact from the spruce budworm and bark beetle in Balsam IU stands, no work has been done to improve growth and yield estimates.

- ***Forest health – spruce bark beetle****:* Ground surveys were completed following the last determination and identified that the majority of the spruce and balsam stands in the northern half of the TFL were either dead or attacked. These stands are currently being logged in order to reduce risk to the mid-term timber supply. Cruise data may be summarized to determine the extent of mortality in this analysis.

- ***Retention of non-pine volumes***: Harvest has shifted from predominantly pine to a higher percentage of non-pine species. Despite this, the harvesting focus is still on salvaging dead/dying stands within the TFL, but instead of dealing with strictly MPB, other forest health factors are impacting harvest priorities.

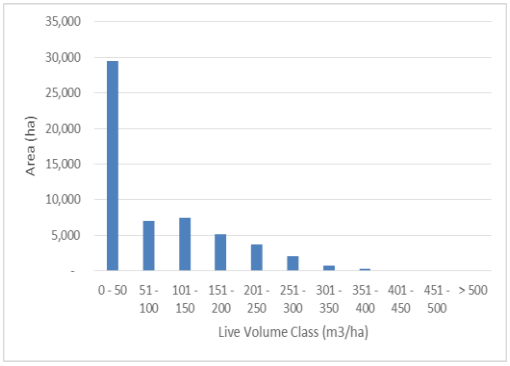

Figure 2.1 THLB Area with High Volume Stands

2.3 Updates Since Management Plan #10

Major updates to the analysis since the previous management plan (MP) include:

- Changes to the timber harvest land base (THLB) definition and area. This is primarily due to the spatial removal of riparian management zones (RMZ) as opposed to the application of forest cover constraints in the model.
- The spatial removal of legal old growth management areas (OGMAs) (see section 3) from the THLB;
- The 2013 vegetation resource inventory (VRI) from the Government was used in the analysis;
- Updates for recent harvesting;
- Analysis unit definitions have changed to be stand level for existing natural stands and ecosystem-based for managed stands;
- Major forest health factors such as the mountain pine beetle (MPB), spruce beetle and balsam bark beetle have been modelled explicitly in the short term and captured as un-salvaged losses in the long term in the analysis;
- Deciduous species are assumed not to be utilized in the analysis. This includes the removal of deciduous leading stands from the THLB and exclusion of the deciduous component at the stand-level;
- Existing spatially identified wildlife tree reserves (WTR) have been removed from the THLB and future WTR estimates have been revised- increased from 3.4% to 6.1%.

2.4 Forest Characteristics

This section summarizes important forest characteristics on TFL 18. The following land base characteristics are summarized:

- Biogeoclimatic zone (BGC);
- Leading species;
- Site index; and
- Age distribution.

2.4.1 Biogeoclimatic Zone

Figure 2.2 shows the THLB and non-THLB productive area in each BGC zone in TFL 18. The most common BGC zone with 43% of the THLB is ESSFwc2.

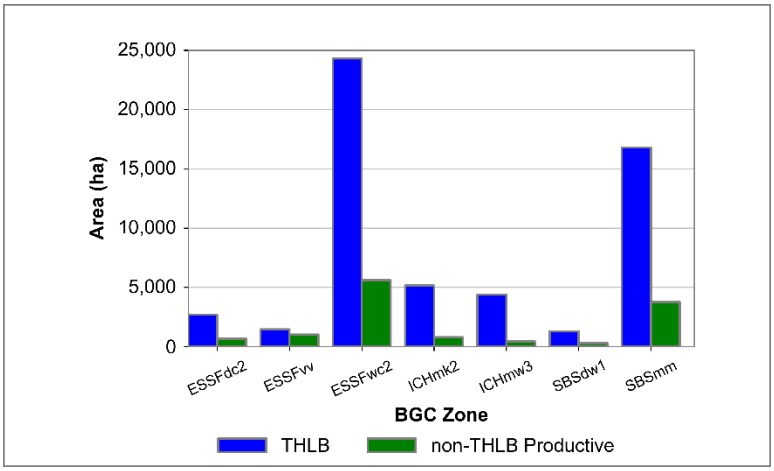

Figure 2.2 Biogeoclimatic Summary

2.4.2 Leading Species

Figure 2.3 shows the area by leading species in TFL 18. The THLB is 41% spruce leading followed by 25% pine leading and 25% balsam leading.

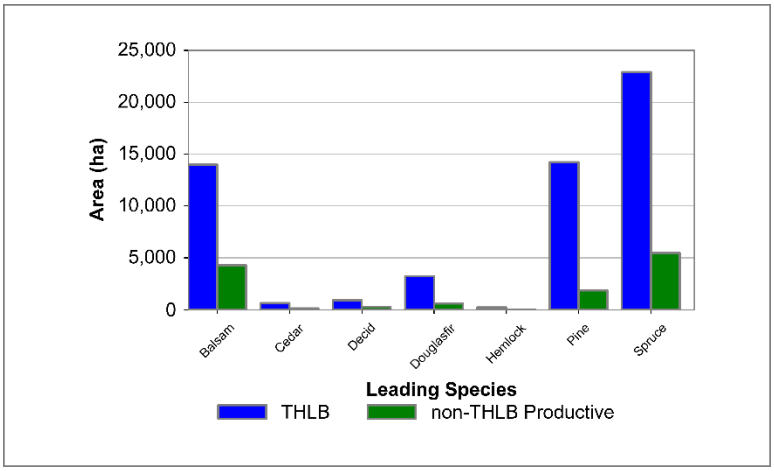

Figure 2.3 Leading Species Summary

2.4.3 Site Index

Figure 2.4 shows the area by site index class (inventory site index rounded to the nearest 3m) in TFL 18. The area-weighted average inventory site index is 15m.

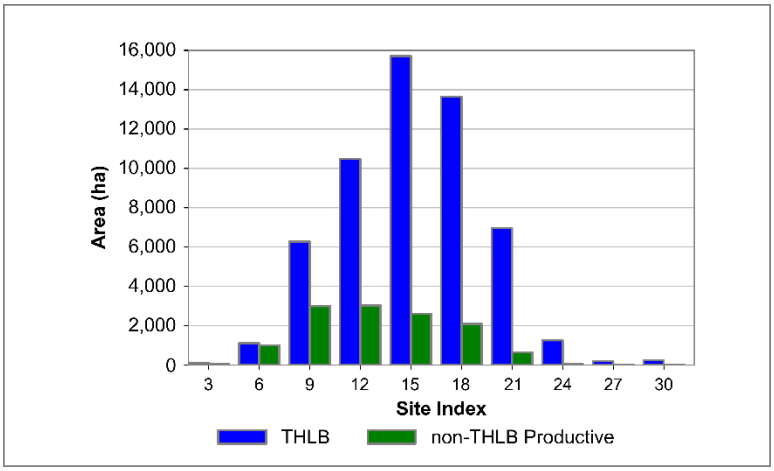

Figure 2.4 Site Index Summary

2.4.4 Age Distribution

Figure 2.5 shows the area by age class in TFL 18. There is a large amount of THLB area (56%) in age class 1 (0 - 20 years) and age class 2 (21 - 40 years) due to recent logging activity in the area.

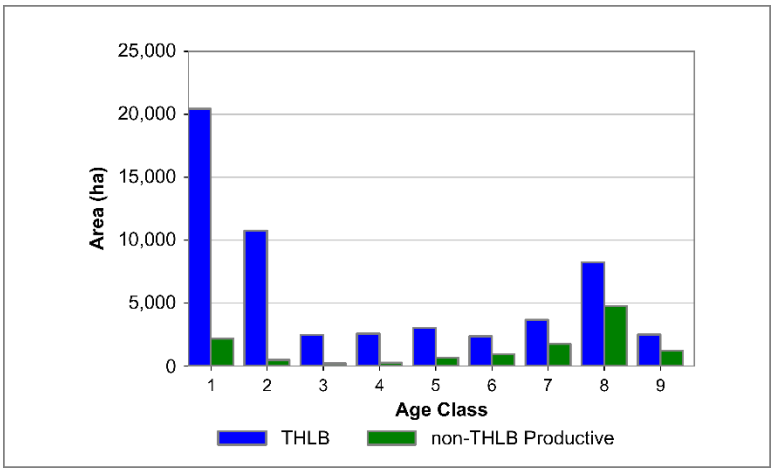

Figure 2.5 Age Distribution Summary

3. Land Base Classification

The land base classification process starts with the gross area 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 this process, area is systematically removed in order to establish both the productive forest and timber harvesting land base (THLB). The land base classification process classifies area into three broad categories:

- ***Non-Productive***: areas that are non-TFL, non-forested or non-productive and unable to grow viable timber;
- ***Productive non-THLB (PFLB)*:** 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 18. The TFL covers a total area of 74,266 ha. The size of the TFL is slightly reduced since the previous Management Plan, when the reported area was 74,542 ha. A boundary change was made by Government to follow the height of land. This resulted in most of Taweel Park being removed from TFL.

Table 3.1 shows a summary of the area removed in each step of the netdown process.

Table 3.1 Land Base Netdown

	Total Area (ha)	Area Removed (ha)	Net Area (ha)
Total			**74,266**
Non Crown		-	
Camp	3	3	
Non Forest	13,066	3,621	
Roads	2,268	2,217	
Park	31	30	
Crown Forest Land Base			**68,395**
Riparian - Streams	2,330	1,999	
Riparian - Lakes	305	175	
Riparian - Wetlands	2,510	1,879	
Unstable Terrain	44	16	
Environmentally Sensitive Areas	939	612	
Permanent Sample Plots	6	6	
Deciduous-Leading Stands	1,216	217	
Non-Merchantable Stands	22,275	5,147	
Old Growth Management Areas	7,763	4,508	
Wildlife Tree Patches	1,031	524	
Recreation Sites	48	6	
Timber Harvesting Land Base			**53,306**

Since the 2004 MP, the following changes have been made to the land base classification:

- The non-forest and non-productive netdown has decreased. This is due to using BCLCS classification instead of the non-productive and non-forest fields in the VRI that are now non-supported. Decreases in area here are largely balanced out by the increase in the non-merchantable stand removal;

- The area removed for existing roads has increased from 1,381ha to 2,217 ha. This is partially due to a decrease in the removal area above and more roads built;
- Riparian area netdown is consistent with last TSR for riparian reserve zones (RRZ). Riparian management zone (RMZ) partial netdowns were also included in this netdown step to simplify the modeling process;
- Deciduous leading stands were not removed in the last analysis but due to lack of harvest history, are removed here;
- OGMAs were not removed last time and account for an additional 4,508 ha;

The crown forest land base occupies 92.0% of the total TFL 18 area and THLB is 71.8% of the total area.

Figure 3.1 depicts the spatial location by netdown classification.

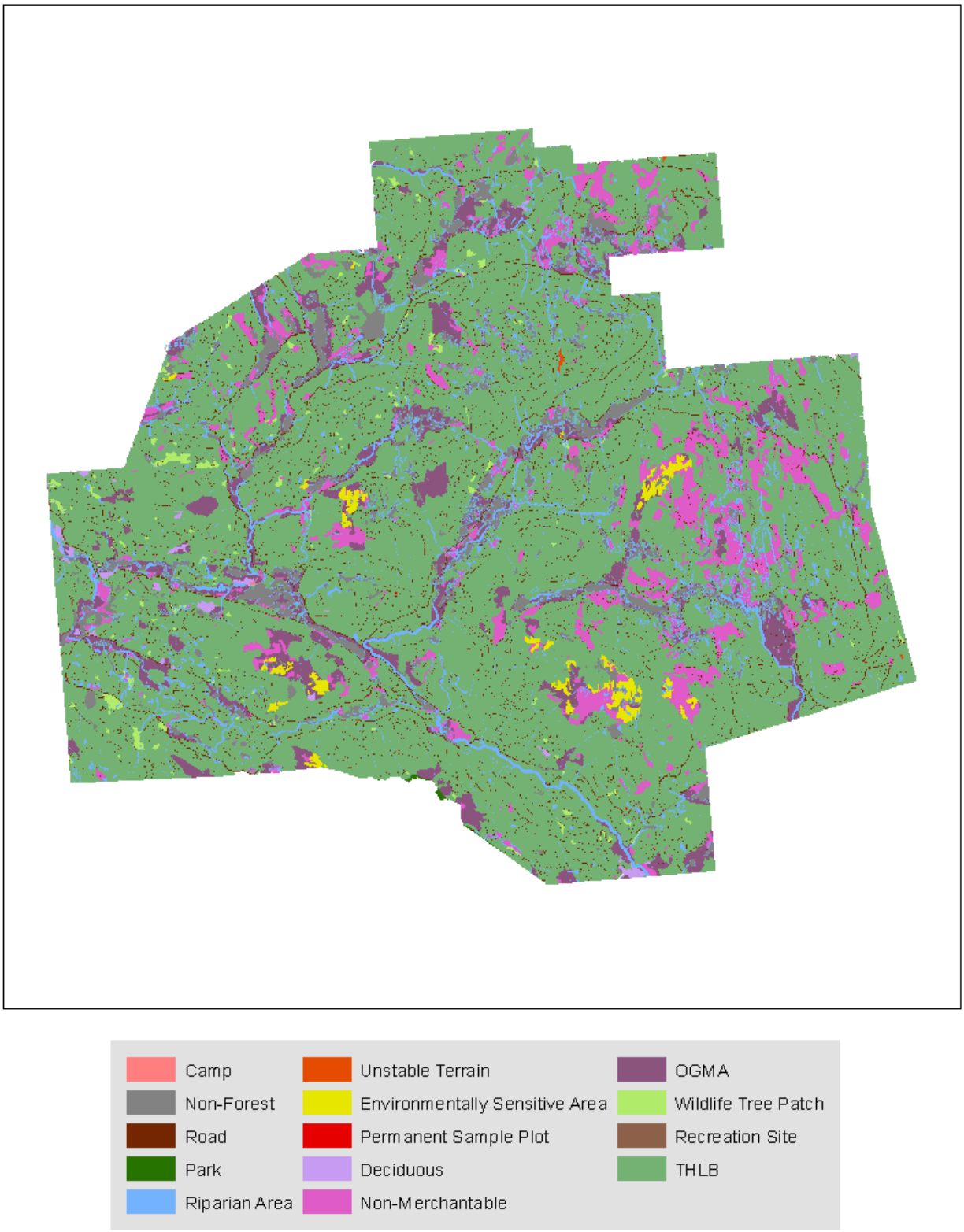

Figure 3.1 Netdown Classification

3.1 Non-TFL

All data layers have been clipped to the TFL boundary. The boundary file for TFL 18 from the LRDW was used in this analysis. 4 ha of moose camp lease have been identified as private land within the TFL boundary and have been removed from the productive area.

3.2 Non-Forest, Non-Productive and Non-Commercial Brush

Non-forest and non-productive areas were identified and removed from the THLB using VRI data. This netdown reduces the land base by areas that are non-treed such as rock, water, and vegetated but will not sustain trees. VRI polygons with BCLCS Level 1 = 'N' (non-vegetated) or BCLCS Level 2 <> 'T' (not treed) were removed from the land base, as well as stands with a crown closure of less than 10%. Areas with a harvest history were not removed.

3.3 Existing and Future Roads

The majority of the TFL is accessible by either existing or proposed roads. Roads were provided by Canfor and supplemented with the Digital Road Atlas (DRA) where Canfor roads did not cover. They were categorized into the following classes and assigned buffer widths according to Table 3.2 (the buffer width listed is total assumed width).

Table 3.2 Road Classification

Road Class	Buffer Width (m)	Source
Gravel Main	25	Canfor - tfl18_roads
Operational	25	
Spur and Spur Road	10	
Temporary	10	
Unclassified	10	
All	10	LRDW - dra_digi

3.4 Parks and Protected Areas

Areas identified as parks are considered part of the productive forest but are excluded from the THLB. This is a small sliver along the boundary of Taweel Provincial Park to the south of the TFL.

3.5 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 riparian reserve zone (RRZ) and riparian management zone (RMZ) widths for each type of riparian feature.

Using this information, all streams, lakes and wetlands were classified and buffered according to the total RMA buffer depicted in Table 3.3.

In the case of streams, this buffer is applied to each side of the stream. These areas were removed from the THLB and represent the combined impact of both the RRZ and RMZ management practices.

Table 3.3 Riparian Class

Riparian Class	Length (km)	Riparian Reserve Zone (RRZ) Width (m)	Riparian Management Zone RMZ Width (m)	RMZ Retention (%)	RMZ Equivalent (m)	Total RMA Buffer (m)
S1	38.3	50	20	50%	10	60
S2	61.7	30	20	50%	10	40
S3	140.1	20	20	50%	10	30
S4	81.1	0	30	25%	7.5	7.5
S5	179.8	0	30	25%	7.5	7.5
S6	909.2	0	20	5%	1	1
Unclassified Streams	225.2	0	0	0%	0	0
W1		10	40	25%	10	20
W3		0	30	25%	7.5	7.5
W5		10	40	25%	10	20
L1		10	10	25%	2.5	12.5
L3		0	30	25%	7.5	7.5

3.6 Unstable Terrain

Areas with no harvest history and that are identified as ‘V’ unstable terrain from the LRDW slope stability layer have been completely removed from the THLB. Terrain mapping replaces the older ESA mapping. ESA_1 = S has not been removed from the THLB.

3.7 Difficult Regeneration

Environmentally sensitive areas (ESA) data has been used to identify areas in which regeneration difficulties are likely to be encountered. ESA high for ‘P’ (planting) have been removed from the THLB. These exclusions are not applied in areas in which there is a harvest history.

3.8 Permanent Sample Plots

There are 8 permanent sample plots in the TFL. A 50 m buffer was created around these plots and they are completely removed from the THLB.

3.9 Deciduous Leading

All deciduous-leading stands (ACT, AC and EP) without a harvest history were removed from the THLB.

3.10 Non-Merchantable Mature Stands

All stands without a harvest history that do not meet the minimum merchantability limit of 200 m^3/ha at age 250 years are removed from the THLB. VDYP7 was used to grow stands to estimate the volume at 250 years.

3.11 Old Growth Management Areas

Old growth management areas (OGMA) were identified from the Ministry's legal OGMA layer (OGMA_LG). Areas with LEGAL_OGMA_PROVI not blank were removed from the THLB. Section 4.4 on page 17 provides additional detail along with a map showing OGMA locations.

3.12 Wildlife Tree Reserves

706 ha are removed as the last netdown step for existing WTRs from a gross identified area of 1,117 ha. Operationally, retention requirements are first met using portions of the stand that don't typically contribute to timber supply, such as riparian areas, deciduous stands, unstable terrain, non-merchantable areas, and retention for visual quality and wildlife habitat.

Future WTR estimates were revised according to a GIS summary of existing WTRs in and out of the current THLB from blocks logged post 1985. As shown in Table 3.4, of the total area of spatially identified WTRs, 706ha or 63% are in the THLB and 37% fall outside of the THLB in area already removed from the THLB in previous netdown steps.

As a percentage of the identified Canfor blocks logged post 2000, this works out to 6.1%. Therefore, future WTRs will be accounted for in the forest estate model at 6.1%.

Table 3.4 Wildlife Tree Reserve Calculation

Netdown Item	Area (ha)
Total Area of WTR	1,117
WTR included in previous netdown steps	411
WTR overlap with OGMA	86
Area removed exclusively for WTR	706
Canfor blocks logged since 2000	11,600
% of WTR in the blocks logged since 2000	6.1%

3.13 Wildlife

In the previous Information Package there were no netdown considerations for wildlife. Government Action Regulations (GAR) are being developed, however there are currently no GAR orders in the TFL. Within the KLRMP there are considerations for moose winter range, these have been embedded in Canfor's FSP and will be addressed in the resource management section of this document.

3.14 Recreation Areas, Sites and Trails

The previous Information Package did not include any netdowns for recreational areas, sites and trails. For this analysis, recreation sites have been netted out of the THLB.

4. Current Forest Management Assumptions

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

4.1 Resource Management Zones

Resource management zones (RMZs) are grouped areas that support non-timber resource requirements. Each RMZ has specific forest cover objectives (either retention or disturbance requirements) which are applied to sub-sets of the land base. They are often overlapping and therefore not additive in area. The following RMZs occur in the potential area:

- Integrated resource management (IRM) requirements;
- Lakeshore management zones (LMZ);
- Landscape level biodiversity (OGMAs);
- Wildlife habitat (KLRMP moose winter range); and
- Visually sensitive areas.

Table 4.1 shows a summary of the area by RMZ in TFL 18.

Table 4.1 Resource Management Zone Summary

RMZ	THLB (ha)	Non-THLB Productive (ha)	Total Productive (ha)
Integrated resource management	49,177	-	49,177
Lakeshore management zones	1,644	1,547	3,191
Old growth management areas	0	7,763	7,763
Wildlife habitat (moose)	1,652	302	1,954
Visually sensitive areas	4,129	625	4,753

4.2 Integrated Resource Management

In the base case, patch size distribution is modeled aspatially using a landscape green-up constraint that specifies no more than 33% of the THLB can be less than 3 meters in height. These requirements are applied by landscape unit / BGC zone combination.

4.3 Lakeshore Management Zones

The Lakes Local Resource Use Plan (LRUP) for the Clearwater District published the Lakeshore Management Guidelines that specifies practices within 200 meters of lakeshore management zones based on visual quality objectives (VQO) by lake class. Figure 4.1 shows the location by lakeshore class.

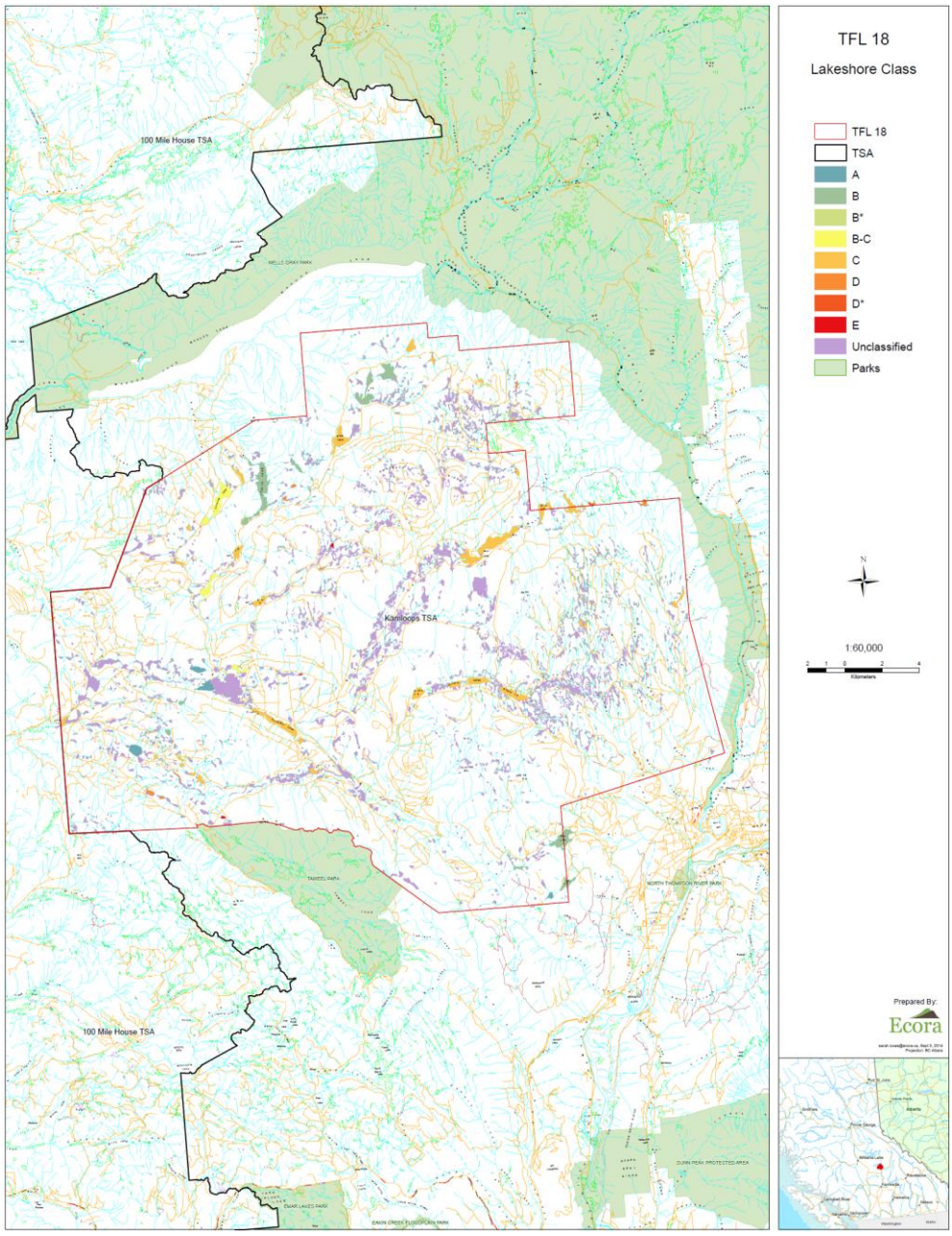

Figure 4.1 Lakeshore Management Zones

Guidelines for maximum cut block size and maximum harvest per pass are contingent on achieving the VQO, therefore VQO guidelines are applied as forest cover constraints as defined in Table 4.2. These remain guidelines and not legislative requirements; therefore, these are not applied in the base case but may be applied in a sensitivity analysis. Lakeshore management visual objectives are then assigned to each individual lakeshore polygon as described in Table 4.2. The visually effective green-up (VEG) heights are calculated based on the average slope by Lakes LRUP Class. The method used is described in Table 6 of MOF 1998. In Table 4.2, the 'Av. VEG height' column shows the average height by Lakes LRUP Class.

Table 4.2 Lakeshore Management Zone Green-up Requirements

LMZ	Area (ha)	VAC	VQC	Avg Slp	Denude (%)	Veg Height (m)
4	53	M	P	25	0	5.0
5	34	M	R	23	3	5.0
7	42	M	R	12	3	4.0
10	53	M	R	15	3	4.0
12	28	M	M	8	20	3.5
15	28	M	M	8	20	3.5
17	37	M	M	10	20	3.5
23	8	M	PR	12	10	4.0
29	36	M	PR	10	10	4.0
33	13	M	PR	14	10	4.0
41	50	M	M	15	20	4.5
42	54	M	PR	6	10	3.5
47	10	M	PR	13	10	4.0
58	26	M	PR	9	10	3.5
59	30	M	PR	8	10	3.5
62	89	M	P	7	0	3.5
63	6	M	PR	11	10	4.0
64	27	M	PR	10	10	3.5
66	35	M	R	13	3	4.0
67	41	M	PR	24	10	5.0
69	137	M	PR	12	10	4.0
71	33	M	R	13	3	4.0
77	54	M	PR	14	10	4.0
78	92	M	PR	9	10	3.5
82	49	M	PR	10	10	3.5
86	73	M	PR	8	10	3.5
87	25	M	M	10	20	4.0
88	24	M	R	13	3	4.0
94	24	M	PR	6	10	3.5
96	22	M	PR	6	10	3.5
99	317	M	P	7	0	3.5
100	23	M	R	10	3	3.5
101	30	M	R	12	3	4.0
103	23	M	PR	8	10	3.5
105	52	M	PR	9	10	3.5
121	31	M	M	10	20	4.0
122	62	M	PR	19	10	4.5
124	12	M	PR	17	10	4.5
125	26	M	R	11	3	4.0
126	74	M	PR	18	10	4.5

LMZ	Area (ha)	VAC	VQC	Avg Slp	Denude (%)	Veg Height (m)
128	12	M	PR	8	10	3.5
129	7	M	PR	15	10	4.0
131	28	M	R	9	3	3.5
132	17	M	PR	16	10	4.5
135	26	M	M	16	20	4.5
140	40	M	PR	14	10	4.0
150	26	M	PR	9	10	3.5
161	52	M	PR	15	10	4.5
162	30	M	M	5	20	3.5
165	218	M	PR	12	10	4.0
166	34	M	PR	13	10	4.0
170	10	M	R	10	3	4.0
171	30	M	PR	20	10	4.5
174	53	M	PR	9	10	3.5
175	33	M	PR	15	10	4.5
179	9	M	PR	15	10	4.0
181	6	M	PR	15	10	4.0
183	10	M	PR	19	10	4.5
184	15	M	PR	22	10	5.0
185	26	M	M	16	20	4.5
187	9	M	PR	24	10	5.0
189	35	M	M	10	20	4.0
190	9	M	PR	19	10	4.5
200	29	M	M	19	20	4.5
201	71	M	R	10	3	4.0
202	20	M	PR	11	10	4.0
209	37	M	R	9	3	3.5
210	33	M	PR	11	10	4.0
211	68	M	PR	14	10	4.0
213	82	M	R	14	3	4.0
216	60	M	R	14	3	4.0
217	28	M	R	13	3	4.0
220	106	M	PR	13	10	4.0
221	44	M	PR	7	10	3.5
229	37	M	M	9	20	3.5
233	40	M	PR	12	10	4.0
236	135	M	R	11	3	4.0
238	87	M	R	14	3	4.0
240	42	M	PR	14	10	4.0
242	56	M	PR	20	10	5.0

4.4 Old Growth Management Areas

In accordance with the Old Growth Management Objectives for the KLRMP area, landscape level biodiversity requirements are addressed through the removal of OGMAs from the THLB. Of a total 7,763 ha covered by legal OGMAs, 4,508 ha are removed in this netdown step. Figure 4.2 shows a map of OGMA locations.

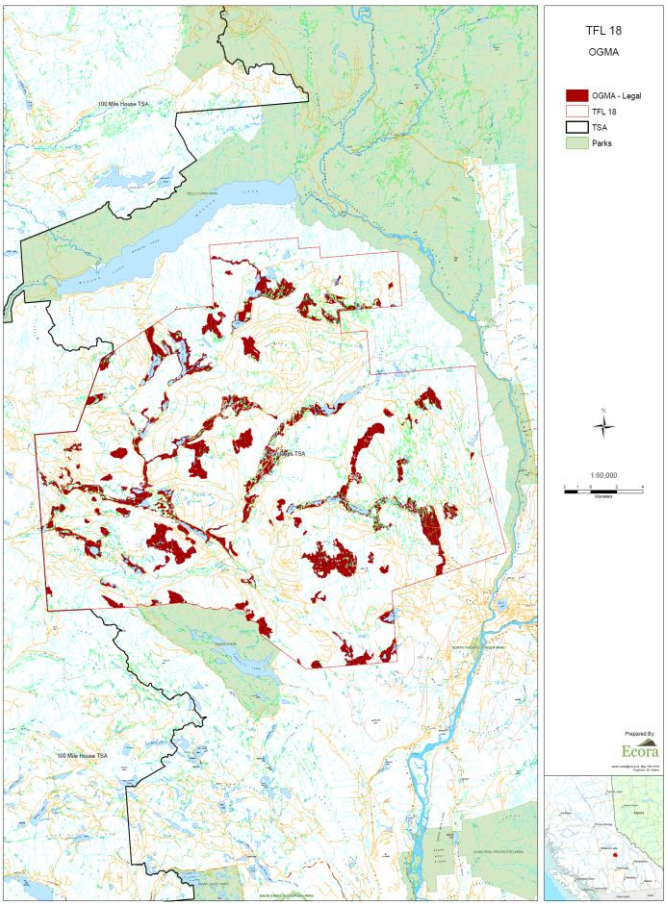

Figure 4.2 OGMA Locations

All of TFL 18 falls in the Clearwater Landscape Unit, which has a Biodiversity Emphasis Option of 'Low'.

4.5 Wildlife Habitat – KLRMP Critical Moose Range

There are just under 2,000 ha of moose winter habitat in the southwestern portion of the TFL that was modeled in the analysis. In relation to Critical Moose Winter Range objectives, Canfor has committed in their FSP to results and strategies such that:

- Ensuring harvesting and/ or road construction does not result in a reduction of thermal cover below 33% in age class 3 or greater. This is modeled with the requirement that a minimum of 33% must be greater than 40 years; and

- Through on-going harvesting activities, trend toward maintaining 15% or more of the crown forested land base in age class 2 or less. This is modeled with the requirement that a minimum of 15% must be less than 40 years.

These requirements are applied simultaneously to areas identified as Critical Moose Winter Range within the KLRMP as shown in Figure 4.3.

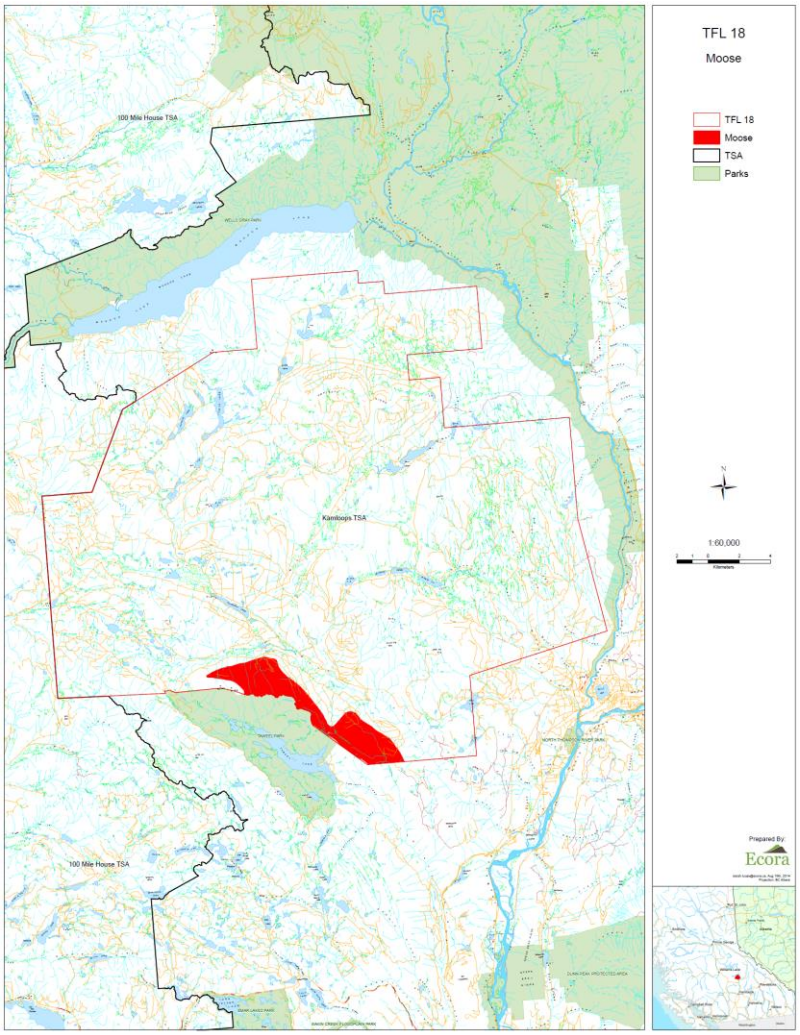

Figure 4.3 Moose Winter Range

4.6 Visually Sensitive Areas

The visual landscape inventory (VLI) classifies areas into visually sensitive areas which are areas identified as viewscapes that are visible from communities, public use areas, travel corridors, and viewpoints where the maintenance of visual quality is important.

Visual sensitive units (VSUs) are delineated and classified into a visual sensitivity class (VSC). Under FPPR section 9.2 “Objectives set by government for visual quality”, each VSC corresponds to a visual quality objective (VQO) category as follows, reflecting varying degrees of acceptable levels of disturbance:

- VSC 1 is in either the preservation or retention category,
- VSC 2 is in either the retention or partial retention category,
- VSC 3 is in either the partial retention or modification category,
- VSC 4 is in either the partial retention or modification category, and
- VSC 5 is in either the modification or maximum modification category.

Visual resource management will be modeled in the base case according to the *Procedures for Factoring Visual Resources into Timber Supply Analyses* (MoF 1998). Maximum allowable denudation percentage (base on VQC and VAC from Table 4 of MoF 1998 is used to set the disturbance limit in the timber supply analysis (Table 4.3).

The visually effective green-up (VEG) heights are calculated for each VQO polygon. The average slope of each polygon was calculated using a digital elevation model. Using this average slope value, VEG height was looked up in Table 6 of MOF 1998. Table 4.3 below shows VEG height for each VQO polygon.

Table 4.3 Disturbance Limits and Vegetation Height

vqo_key	area	vac	vqc	avg_slp	denude	veg_ht
3	40	M	PR	31	10	6.0
4	141	M	PR	25	10	5.5
5	241	M	PR	35	10	6.0
6	7	M	PR	15	10	4.0
7	546	M	M	28	20	5.5
9	508	M	PR	24	10	5.0
11	140	M	PR	42	10	7.0
12	34	M	PR	31	10	6.0
13	290	L	PR	24	5	5.0
22	821	L	PR	27	5	5.5
23	7	L	M	36	15	6.5
24	97	M	M	30	20	6.0
25	639	M	M	23	20	5.0
26	252	M	M	31	20	6.0
28	422	L	M	36	15	6.5
29	194	M	PR	36	10	6.5
32	8	H	M	9	25	3.5
34	111	L	M	32	15	6.0
35	41	M	PR	37	10	6.5
36	121	M	PR	21	10	5.0
38	15	M	PR	13	10	4.0
39	50	H	M	15	25	4.0
40	9	M	PR	39	10	6.5
41	32	M	PR	28	10	5.5
49	55	L	PR	27	5	5.5
50	98	M	PR	24	10	5.0
52	6	M	PR	18	10	4.5

Visually sensitive areas are shown by VQO category in Figure 4.4.

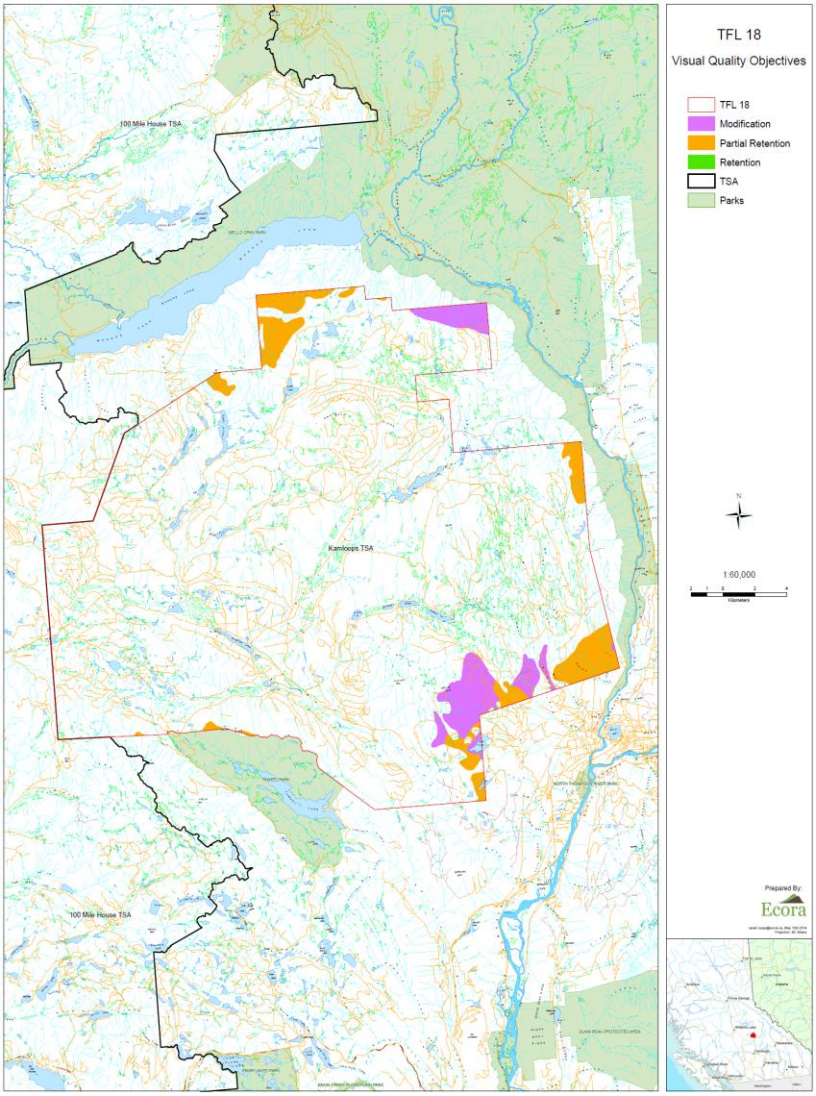

Figure 4.4 Visually Sensitive Areas

The KLRMP requires that areas outside of visually sensitive polygons be managed to modification visual objectives. This will be met by applying an integrated resource management constraint to all THLB stands that do not fall in another disturbance constraint. This will be applied at the BEC subzone/variant level (there are seven zones on the TFL). No more than 25% of the productive forest land base in each zone can be less than three metres in height.

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 a number of alternative harvest flows possible. In this analysis, the harvest levels will reflect the following objectives:

- Attempt to maintain the current AAC 290,000 m3/year for ten years or, failing that, find the highest initial harvest level that can be sustained for ten years;
- 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 Planned Harvest Blocks

Canfor has provided short term cut blocks that are expected to be harvested. These are scheduled for harvest in the timber supply model in the first period.

5.4 Initial Harvest Rate

If possible, the initial harvest rate will be set at the current AAC of 290,000 m^3/year before dropping to the mid-term harvest level.

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 at least 200 m^3/ha.

Alternative MHA limits will be examined in sensitivity analyses.

5.6 Non-recoverable Losses

Past performance has demonstrated that when natural disturbances do occur in the TFL, Canfor has been aggressive in salvaging damaged timber. As a result, very little un-salvaged losses are incurred. Canfor has determined that un-salvaged losses for fire and wind throw have remained consistent with figures from the last MP.

Losses associated with the 2 current outbreaks will be modeled as a onetime reduction in volume for those areas that are not salvaged (Table 5.1). Losses attributed to MPB and other insects are addressed within the timber supply model as described in the following sections.

Table 5.1 Non-recoverable Loss (NRL) Estimates

Damaging Agent	NRL (m^3/year)
Fire	300
Wind throw	500
MPB	n/a modeled explicitly
Sx/Bl Bark beetles	
Spruce budworm	
Total	**800**

5.7 Mountain Pine Beetle Impacts

The MPB epidemic has generally run its course (though a significant amount of merchantable dead pine remains) on the TFL and salvage is expected to be concluded over the next several years. The mature pine component from the inventory was used to identify affected stands. Proposed harvest blocks provided by Canfor have been designed to maximize salvage and are scheduled for harvest in the timber supply model. MPB-impacted stands that get harvested are regenerated on the applicable managed stand yield table. The remaining pine stands will deteriorate to a non-merchantable condition and will not be salvaged. To model this, they will be regenerated on the same natural stand yield curve with a 15-year regeneration delay.

5.8 Spruce/Balsam Bark Beetle and Budworm Impacts

Mature spruce / balsam stands in the Kamloops TSA were surveyed in 1996/7 and again in 2014 to measure the mortality due to insect pests including western balsam budworm, balsam bark beetle, spruce beetle and MPB.

Table 5.2 shows a summary of these results by selected BGC zones where sampling was focused on balsam-leading mature (>= age class 6) stands (source: Lorraine MacLauchlan, Entomologist at MFLNRO). These surveys represent the standing dead mortality.

Table 5.2 Mortality Summary in Balsam Leading Stands by Biogeoclimatic Zone

BGC	Ave. mortality in 1997	Ave. mortality in 2014	Change in % mortality	Annual % change
ESSFdc2	14.4	28.6	14.5	0.8
ESSFwc2	17.6	29.2	12.0	0.7
SBSmm	7.2	13.5	2.3	0.1

For the base case, the natural stand yield tables for spruce and balsam leading stands will have their spruce/balsam volume component reduced by 0.8% per year starting in 2006 - the year or aerial photography that was used for the inventory. No mortality reductions will be applied to existing or future managed stands.

5.9 Disturbing the Non-contributing Land Base

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:

- Calculating the annual natural disturbance area required to achieve the natural disturbance return intervals within each BEC zone in the Biodiversity Guidebook; and
- Imposing an annual natural disturbance on the non-THLB that is roughly equivalent to the areas calculated above.

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 5.3.

Table 5.3 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.

6. 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.

6.1 Growth and Yield Models

Stands harvested prior to 1964 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 1964 are classified as managed stands with yield projections produced using the Table Interpolation Program for Stand Yields Version 4.3 (TIPSY4.3).

6.1.1 VDYP vs. TIPSY for Existing Stands

VDYP is calibrated to project stands according to the average volume yields observed in British Columbia. In contrast, TIPSY projects stand growth according to the full potential of the site. As a result, VDYP returns lower volumes for a given species and site quality than TIPSY, and the decision between models is an important one. Planting activity was the primary criterion used to determine the age at which stands will be modeled with TIPSY. An analysis completed for the previous Management Plan showed the net area of stands established after 1960 and the proportion of this area reported as planted in silviculture records. Although these data are not reliable for exact information, they can be used to draw some general conclusions. Planting was first performed on a substantial proportion of harvested area in 1964, on stands that are now 52 years old. After 1971, planting was consistently conducted on more than 50% of harvested areas. This 8-year period can be considered a transition between natural and managed stand conditions.

The correct choice of model for these stands is ambiguous, and TIPSY was chosen under the assumption that these stands may have received stand tending management during the 1970s and 1980s. The risk associated with an error in this assumption is small since stands in the 45-52 year age range cover only 1,012 ha, which represents 3.2% of stands 52 years old or younger, and 1.9% of the net area of TFL18.

6.2 Analysis Unit Aggregation

Analysis units (AUs) 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 modeled using its own yield curve – there is no aggregation of existing natural stands into AUs.

Stands harvested after 1964 (including future stands) will be grouped into AUs by TEM BGC zone and site series using definitions from the previous MP as shown in Table 6.1. AU groupings are assigned to stands that are currently managed and also to natural stands for modelling their growth after harvesting.

Table 6.1 Analysis Unit Definitions

AU	BGC/SS Description
1	ESSFvv/all
2	ICHmw3/04
3	ESSFwc2/02/09
4	ESSFdc2/01
5	ICHmw3/01
6	ICHmw3/06
7	ESSFwc2/01

AU	BGC/SS Description
8	ICHmk2/01
9	SBSdw1/08/09
10	SBSdw1/01
11	SBSmm/01
12	ESSFwc2/08
13	ESSFwc2/05
14	ICHmk2/03
15	ESSFdc2/05
16	SBSmm/08
17	SBSmm/05
18	ICHmw3/05

6.3 Natural Stands

Consistent with the previous Information Package, natural stands are defined as those without a harvesting history or those harvested prior to 1964. These stands will be modeled using VDYP7.

The forest inventory was based on aerial photography acquired in 2006 (or 2007). Photo interpretation was completed in 2009. 72 Phase II samples were established in the 2011 field season.

The Phase II adjustment removes the dead pine volume from stands (in the mature pine strata only). This volume needs to be modeled for timber supply purposes, so using the Phase II volumes in this case is problematic. Phase II adjustments should be used for the remaining mature strata.

The Phase II immature strata included stands between 15 and 50 years of age. Most of the stands in this age range have regenerated following harvesting and will be modeled as managed stands using TIPSY.

The Balsam UI strata will be adjusted using the addendum to the Phase II adjustment report. This raises the problem of how to deal with the remainder of the mature balsam strata. It might be necessary to drop the three Phase II plots that fell within the IU area and recompile the adjustment statistics for the non-IU mature balsam stands.

Interpretation of the Phase II results is made difficult by the insect caused mortality that has occurred on the TFL from the time of the photography (2006/7) to the Phase II adjustment year (2011).

6.4 Managed Stands

Managed stand assumptions are divided into:

- Existing managed stands;
- Future managed stands; and
- Balsam IU stands.

6.4.1 Site Productivity Estimates

Four productivity estimates are available for each stand:

- from the VRI, based on interpreted height and age;
- in a spatial dataset produced from the J.S. Thrower Potential Site Index project[1];
- based on the MFLNRO SIBEC database; and
- from an overlay on the provincial site index tile spatial dataset.

Natural stand yield tables will be based on the VRI site index. One of the remaining three options would be more appropriate for generating managed stand yield tables. Table 6.2 summarizes these different productivity estimates for TFL 18 by leading species.

Table 6.2 Site Productivity Estimates by Species

Leading Species	VRI Site Index	PSI	Site Index Tile	SIBEC 2013	THLB (ha)
ac	20.5	20.5	20.5	20.5	7
at	20.0	20.0	18.9	20.0	833
bl	12.6	16.6	16.2	14.5	14,362
cw	12.2	12.2	16.2	15.0	872
ep	20.6	20.6	17.9	20.6	82
fd	17.7	20.8	22.1	19.1	3,672
hw	14.6	14.6	16.5	19.2	390
pl	17.8	20.6	19.3	19.1	14,895
se	17.9	20.3	17.9	17.7	30
sw	15.4	19.7	17.7	15.4	14
sx	15.0	18.5	15.7	15.7	22,419

VRI site index can be read – for each stand – directly from the forest inventory files. It is calculated based on photo-interpreted age and height (for stands 30 years of age or older) or estimated directly (for younger stands). TFL 18 has improved estimates of potential site index (PSI) (J.S. Thrower & Associates Ltd. 2002) which was provided as a separate spatial layer. The provincial site index tile is also a separate spatial layer. SIBEC 2013 estimates are looked up using BGC Zone/Subzone/Variant, site series (from the TEM) and leading species (from the VRI).

Confining the discussion to those leading species that make up a significant proportion of the TFL, PSI estimates are higher for Bl, Pl and Sx, and slightly lower for Fd. The most significant difference (2.8 m) is with Sx. However, because the PSI estimate for spruce is based on a conversion equation - and that it is out of line with the remaining three SI estimates - it needs to be treated cautiously. Given that, it is reasonable to use the site productivity layer for the base case and the PSI estimates in a sensitivity analysis.

[1] Potential Site Index Estimates for the Major Commercial Tree Species on Tree Farm Licence 18

6.4.2 Existing Managed Stands

Existing managed stand assumptions for TIPSY are shown in Table 6.3. All AU's were planted after harvesting with the exception of the deciduous component which is assumed to naturally regenerate. Genetic gains are described in a section below. Standard operational adjustment factors (OAFs) are used at 15% for OAF1 and 5% for OAF2. Regeneration delay is 0 years for ESSF and 1 year for everywhere else. The species composition and average stems of existing stands are averaged into each AU from the RESULTS forest cover inventory layer.

Table 6.3 Existing Managed Stand Yield Assumptions

AU	SI	Stems	Sp1	Sp1%	Sp2	Sp2%	Sp3	Sp3%	Sp4	Sp4%	Sp5	Sp5%
1	14.7	1206	SX	73	BL	24	PLI	3				
2	22.1	1265	FDI	45	PLI	20	SX	18	CW	14	BL	3
3	11.6	1466	SX	79	BL	14	PLI	7				
4	16.6	1242	SX	45	PLI	21	BL	17	SE	17		
5	21.4	1275	PLI	56	FDI	20	SX	19	BL	4	CW	1
6	20.5	1218	SX	64	PLI	28	FDI	3	CW	3	BL	2
7	16.5	1275	SX	62	PLI	21	BL	16	FDI	1		
8	21.0	1179	PLI	49	FDI	24	SX	20	BL	6	CW	1
9	19.8	1209	PLI	58	SX	38	FDI	4				
10	19.1	1220	PLI	47	SX	38	FDI	12	BL	3		
11	18.8	1198	PLI	50	SX	38	BL	7	FDI	5		
12	16.2	1452	SX	92	BL	5	PLI	3				
13	16.2	1312	SX	44	PLI	42	BL	12	FDI	2		
14	21.8	1191	PLI	59	FDI	35	SX	4	PW	2		
15	16.7	1387	PLI	74	SX	16	FDI	8	BL	2		
16	19.3	1117	SX	48	PLI	30	BL	19	FDI	3		
17	18.5	1246	PLI	47	SX	42	FDI	7	BL	4		
18	21.2	1333	PLI	56	SX	44						

6.4.3 Future Managed Stands

Future managed stand assumptions for TIPSY are shown in Table 6.4. The planting species mix and density are provided by Canfor silvicultural personnel and are expected to continue into the future. Standard operational adjustment factors (OAFs) are used at 15% for OAF1 and 5% for OAF2. Regeneration delay is 0 years for ESSF and 1 year for everywhere else.

Table 6.4 Future Managed Stand Yield Input Assumptions

AU	SI	Stems	Sp1	Sp1%	Sp2	Sp2%	Sp3	Sp3%
1	12.1	1500	Sx	100				
2	20.1	1400	Pl	61	Fd	38	Sx	1
3	11.6	1450	Pl	80	Sx	20		
4	15.5	1500	Sx	70	Pl	29	Fd	1
5	20.2	1400	Fd	50	Sx	31	Pl	19
6	20.2	1400	Fd	50	Sx	40	Pl	10

AU	SI	Stems	Sp1	Sp1%	Sp2	Sp2%	Sp3	Sp3%
7	15.4	1450	Sx	80	Pl	20		
8	20.8	1400	Sx	74	Pl	18	Fd	8
9	18.7	1400	Sx	75	Pl	20	Fd	5
10	19.0	1250	Sx	40	Pl	40	Fd	20
11	18.2	1250	Sx	55	Pl	44	Fd	1
12	14.3	1450	Sx	100				
13	15.6	1450	Sx	80	Pl	20		
14	21.2	1400	Pl	70	Fd	30		
15	16.0	1500	Sx	75	Pl	25		
16	15.2	1400	Pl	50	Sx	50		
17	18.0	1250	Sx	50	Pl	50		
18	20.9	1400	Fd	70	Pl	10	Sx	20

6.4.4 Balsam Intermediate Utilization Stands

Intermediate Utilization (IU) spruce and balsam stands cover approximately 8,700 ha of TFL18 (12% of the gross TFL area). To address the uncertainty associated with volumes and growth & yield of these stands, Canfor initiated a series of growth and yield projects including:

- Growth and Yield of Residual Balsam Stands on TFL 18 (J.S. Thrower, 2003): identifies the area, summarizes results from sampling and provides statistics on attributes (site index, species composition, diameter, volume) compared to the inventory;
- Yield Table Projections for Residual Balsam Stands on TFL 18 (J.S. Thrower, 2004): provides yield tables associated with these stands; and
- Analysis of IU Balsam Addendum to TFL 18 VRI Statistical Analysis (Forest Analysis Ltd. 2012): assesses the accuracy of the Phase I inventory volumes to the sampling done in 2003.

For stands identified as Balsam IU, yield tables using VDYP7 with unadjusted VRI inputs will be used in the base case and yield tables using adjusted VRI attributes as described in J.S. Thrower, 2004 will be used in a sensitivity analysis.

6.4.5 Regeneration Delay

Regeneration delay (RD) is a measure of the time between harvest and establishment of new trees. Based on the previous Information Package, the average regeneration delay in the ESSF is 0 years and the remainder of the TFL (SBS and ICH) is 1 year.

6.4.6 Operational Adjustment Factors

Operational adjustment factor (OAF) 1 is used to represent reduced yield due to gaps in stocking; competition from non-commercial brush; endemic disease and insect losses; and other factors such as wind throw, top damage and snow press. The OAF 2 is used to represent decay, waste and breakage. OAF 1 is a constant reduction factor that shifts the yield curve down whereas the influence of OAF 2 increases with age and therefore alters the shape of the curve. The standard OAF 1 of 15% and OAF 2 of 5% for all species have been used for the TFL.

6.4.7 Previously Fertilized Stands

There are 554 ha of stands fertilized in 1997 identified from the fertilization information in RESULTS. These stands were linked with the harvest year from RESULTS openings to calculate an area-weight average age of fertilization. A separate set of managed stand yield curves have been generated in TIPSY to capture the increase in growth from fertilization. Fertilization year was calculated at an average of 15 years for these stands. Standard Ministry fertilization responses and effectiveness defaults in TIPSY were used.

6.5 Non-satisfactorily Regenerated Stands

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 will be applied to these stands.

6.6 Utilization

Yield curves have been generated using the standard utilization levels based on leading species as shown in Table 6.5

Table 6.5 Utilization Levels

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

6.7 Genetic Gains

Canfor has been participating in an on-going tree improvement program by planting genetically improved stock since 2004 to increase regeneration volume for stands on the TFL. The seed planning and registry (SPAR) system was used to summarize the genetic worth (GW) of seedlings ordered from 2004 to 2014. Information prior to 2004 was not available and it is assumed that all seedlings before 2004 have a zero associated GW.

Existing genetic gain (GG) was determined by averaging each species' GW by the number of seedlings ordered from each seed source class per year and pro-rating for the area planted before and after 2004. A summary of the harvest history shows that 63% of blocks were harvested pre-2004 and 37% were harvested from 2004 - 2014. Table 6.6 shows the average GG by species that have been applied to existing managed stand yield tables (averages by species from 2004 - 2014).

Table 6.6 Genetic Gain Assumptions (2004 - 2014)

Year	Fd					Pli						
	Class A Seedlings Planted (x 1000)	**GW**	**Class B Seedlings Planted**	**GW**	**Av.**	**Class A Seedlings Planted (x 1000)**	**GW**	**Class B+ Seedlings Planted (x 1000)**	**GW**	**Class B Seedlings Planted (x 1000)**	**GW**	**Av.**
2004								456.7	3			3
2005			258.3		0			77.8	3			3
2006			60.4		0	36	7	233.4	3	128.2		2
2007												
2008			43.3		0							
2009						90.5	7	734.3	3			3
2010	3.9	27	27.3		3	2	15	286.5	3			3
2011												
2012	70.5	19	27.3		14					1031.4		0
2013	111.7	25.37	85.9		14	7	16	1053	3			3
2014	55.5	19	269		3	310	16	26	3	441.5		6
	2004 - 2014 Fd Average				**5.3**	**2004 - 2014 Pli Average**						**3.0**
Year	**Sx**					**Cw**						
	Class A Seedlings Planted (x 1000)	**GW**	**Class B+/B Seedlings Planted (x 1000)**	**GW**	**Av.**	**Class A Seedlings Planted (x 1000)**	**GW**	**Class B+ Seedlings Planted (x 1000)**	**GW**	**Class B Seedlings Planted (x 1000)**	**GW**	**Av.**
2004	400.7	12			12							
2005	222.9	7			7							
2006	284.3	18			18					4		0
2007	133.1	16			16							
2008												
2009	645.5	14	73.3		12.57							
2010	215.7	15			15							
2011												
2012	281.7	15			15							
2013	1170.4	16.05			16							
2014	2462.1	15.96			16							
	2004 - 2014 Sx Average				**15.0**	**2004 - 2014 Cw Average**						**0**

For future managed GG by species, estimates of future GG were sourced from the Forest Genetics Council (FGC) of BC business plan (available online at http://www.fgcouncil.bc.ca/). For each seed planning zone (SPZ) and tree species the 'Species Plans' in Appendix 3 include information on GG and seed availability/use. Future estimates for each species are area-weight averaged by SPZ as shown in Table 6.7. These GG estimates are applied to future managed stand yield tables.

Table 6.7 Future Genetic Gains Assumptions (2015+)

Species	Seed Planning Zone (SPZ)	SPZ Code	Elevation Range	Seed Planning Unit (SPU)	Area (ha)	Future GG (%)	GG by species (%)
Lodgepole pine (PLI)	Prince George	PG	High	26	65,456	3	3
	Prince George / Nelson	PGN	High	26	8,841	3	
Western white pine (PW)	Kootenay Quesnel	KQ	All	15	11,018	0	0
Interior spruce (SX)	Prince George / Nelson	PGN	High	42	74,296	16	16
Interior Douglas-fir (FDI)	Cariboo Transition	CT	Low	43	65,456	18	19
	Quesnel Lakes	QL	Low	37	8,841	26	

6.8 Silviculture Systems

Clear cutting is the predominant silviculture system used on the TFL.

6.9 Other Reductions

The deciduous component of conifer leading stands is modeled as a reduction as currently deciduous stands are un-utilized. Future WTR is modeled as a 6.1% reduction. If deciduous and WTR are both in a given stand, they are assumed to be overlapping and not additive as it is assumed that WTRs will be placed into deciduous patches where possible.

7. 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 7.1 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 7.1 Sensitivity Analyses

Sensitivity	Range Tested
Alternative Harvest Flows	Unconstrained and Non-Declining
Minimum Merchantable volume	200 m3/ha in base case 125 m3/ha, 160 m3/ha, 215 m3/ha
Lakeshore Management	Enforce all KLRMP LMZ's
Site Productivity	Use PSI
VDYP Phase 2 / Balsam IU	Implement VDYP Adjustments
Insect mortality	Remove spruce / balsam mortality
Pine Genetic Gain	Increase to 15%

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Tree Farm Licence #18
Management Plan #11
Timber Supply Analysis Report

Presented To:

Canadian Forest Product Limited

Dated: January 2017

ECORA File No.: KE-13-076

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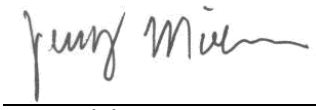

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Version Control and Revision History

Version	Date	Prepared By	Reviewed By	Notes/Revisions
1.1	13 October 2016	J. Miehm	Canfor	
1.2	15 October 2016	J. Miehm	MFLNRO	for public review
1.3	15 January 2017	J. Miehm		final

Executive Summary

Background

Tree Farm Licence #18 (TFL 18) is located west of the Thompson River near Clearwater, and falls within the Clearwater Forest District. The TFL is a contiguous unit covering an area of 74,266 hectares. Of this, 68,435 hectares is productive forest land. Canadian Forest Products Ltd. (Canfor) must complete a timber supply analysis for TFL 18 in conjunction with the Management Planning process that is required by legislation and the terms of their licence. The next step in the timber supply analysis process is the preparation of a base case timber supply forecast. Those results are presented in this document, along with the results of many sensitivity analysis runs that examine the timber supply impacts of changes in management assumptions and model input.

Insect-caused mortality and deterioration is clearly the major issue influencing timber supply from TFL 18. Salvage of beetle-impacted pine stand – which supported the uplift AAC of 290,000 m^3/year for the past ten years – is drawing to close. Very little merchantable pine remains on the TFL. However, forest health problems have grown worse with an increase of spruce and balsam bark beetle (and budworm) to epidemic levels. The long-anticipated decline in harvest level will be deeper and more prolonged than expected.

Findings and Conclusions

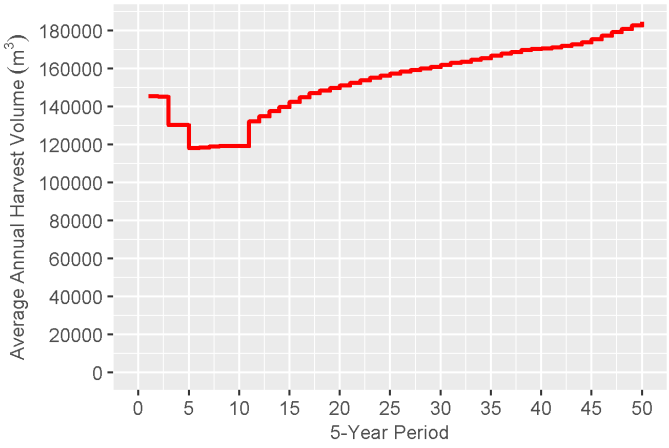
The base case timber supply scenario has been run for TFL 18. The timber flow objectives and other criteria laid out in the Information Package have been adhered to.

The base case reflects current management performance as of 2015. The analysis incorporates the following:

- Integrated resource management (IRM) requirements managed at the BEC subzone/variant level;
- Maintenance of landscape level biodiversity through the designation of OGMA's;
- Protection of moose winter range as specified in the KRLMP;
- Rate of harvest limitation in visually sensitive areas to managed visually effective green-up;
- Recognition that a significant number of MPB-impacted pine stands have become unmerchantable and will break up and regenerate naturally;
- Modeling of continuing mortality in mature spruce and balsam stands;
- Ecosystem-based analysis units and silvicultural prescriptions; and
- Application of current genetic gains to managed stand yields;

The highest initial harvest level that could be sustained for ten years was 145,000 m^3/year. It falls over the next to 130,000 in the second decade, and falls again to the mid-term level for of just below 119,000 m^3/year for three decades. After that point, the harvest level climbs steadily from 132,000 m^3/year to 184,000 m^3/year. The average harvest level over this range is 161,000 m^3/year. The chart below shows this harvest level pattern.

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. Sensitivity runs were conducted to examine: alternative harvest flow, different threshold for minimum merchantable volume per hectare, the impact of KLRMP-recommend guidelines for lakeshore management zones; site productivity estimate based field data collected on the TFL rather than on the regional SIBEC estimates; adjustments to the VRI based on fieldwork completed in 2011; and more optimistic estimate of genetic gains that will be realized in pine.



As the analysis was underway and preliminary results were reviewed, Canfor was able to reconsider their management options in light of the strategic timber supply situation on TFL 18. While the base case, as presented, is an accurate reflection of current operational practice, it is not necessarily the most appropriate starting point for an AAC determination for the next ten years. Canfor proposes relaxing two of the base case assumptions:

1. Reduce the minimum harvestable volume from 200 m^3/hectare to 160 m^3/hectare; and
2. Drop the rule that the drop in harvest level from one decade to the next can be no more than 10%.

The figure below shows an alternative harvest flow pattern based on these two changes. An initial uplift harvest level of 221,000 m^3/year can be sustained for 10 years with impacting the midterm minimum harvest level determined in the base case. A significant portion of the increased harvest volume will come from spruce / balsam stands that have been impacted by bark beetle and budworm. At the current operability limit of 200 m^3/hectare in the base case, some of these stands are breaking up and regenerating naturally. The problem is reduced – though not eliminated – if the harvest volume threshold is relaxed to 160 m^3/hectare.

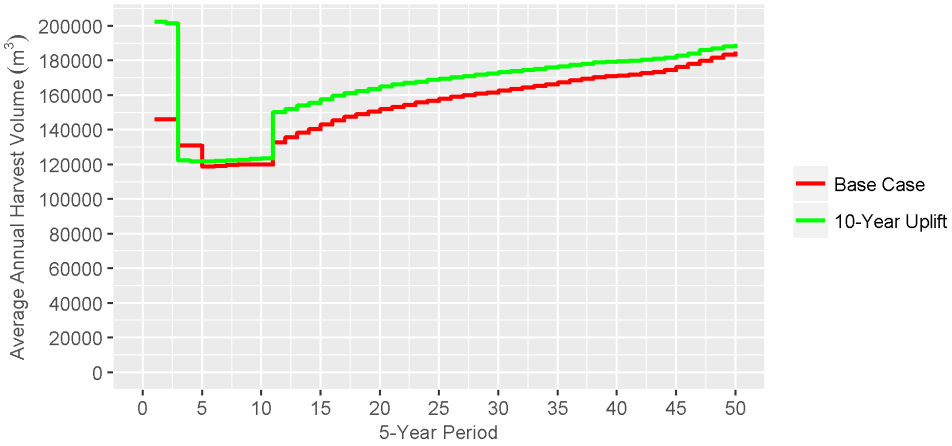


Table of Contents

List of Tables in Text

List of Figures in Text

Appendices

Acronyms and Abbreviations

AAC	Allowable Annual Cut
AU	Analysis Unit
BEC	Biogeoclimatic Ecosystem Classification
BEO	Biodiversity Emphasis Option
CFLB	Crown Forested Land Base
ECA	Equivalent Clearcut Area
ERA	Ecosystem Representation Analysis
FPPR	Forest Planning and Practices Regulations
FRPA	Forest and Range Practices Act
FSP	Forest Stewardship Plan
FSW	Fisheries Sensitive Watershed
IWA	Interior Watershed Assessment
IWAP	Interior Watershed Assessment Procedures
KLRMP	Kamloops Land and Resource Management Plan
LRDW	Land and Resource Data Warehouse
M	Modification VQO Classification
MFLNRO	Ministry of Forests, Lands and Natural Resource Operations
MHA	Minimum Harvest Age
MOE	Ministry of Environment
MOF	Ministry of Forests
MP	Management Plan
MPB	Mountain Pine Beetle
NDT	Natural Disturbance Type
NRL	Non-Recoverable Losses
NSR	Not Sufficiently Restocked
OAF	Operational Adjustment Factor
OGMA	Old Growth Management Areas
PFLB	Productive Forest Land Base
PSI	Potential Site Index
PR	Partial Retention VQO Classification

RESULTS	Reporting Silviculture Updates and Land status Tracking System
RMA	Riparian Management Area
RMZ	Riparian Management Zone
RRZ	Riparian Reserve Zone
TEM	Terrestrial Ecosystem Mapping
TFL	Tree Farm Licence
THLB	Timber Harvesting Land Base
TIPSY	Table Interpolation Program for Stand Yields
TSA	Timber Supply Area
VDYP	Variable Density Yield Prediction Growth and Yield Model
VEG	Visually Effective Green-up Height
VLI	Visual Landscape Inventory
VQO	Visual Quality Objectives
VRI	Vegetation Resource Inventory
VSU	Visually Sensitive Unit
WTP	Wildlife Tree Patch

1. Introduction

Canadian Forest Products Ltd. (Canfor) must complete a timber supply analysis for Tree Farm Licence #18 (TFL 18) in conjunction with the Management Planning process that is required by legislation and the terms of the licence. An Information Package describing the spatial data, yield forecasts and management assumption that would underpin the timber supply analysis was prepared and submitted to the Ministry of Forest, Lands and Natural Resource Operations (MFLNRO) and was also advertised for public review. It was accepted by MFLNRO in April 2016 as an adequate basis upon which to prepare timber supply forecasts for the TFL.

The next step in the timber supply analysis process is the preparation of a base case timber supply forecast. Timber supply is the quantity of timber available for harvest over time. Timber supply analysis is the process of assessing and predicting the current and future supply from a management unit. This has been done using Patchworks, a forest estate model that facilitates the preparation of data, application of management practices and other rules, and produces outputs describing the harvest flow and the future condition of the landbase with respect to timber and other resource values. The results are presented in this document (the Analysis Report), along with the results of many sensitivity analysis runs that examine the timber supply impacts of changes in management assumptions and model input.

This Analysis Report will be circulated for public review in conjunction with a draft of Management Plan (MP) #11 for the TFL. The MP will include a history of the TFL and a summary of the feedback received; the final versions of the Information Package and Analysis Report will be included as Appendices.

Once this second public review process is complete, these documents will be submitted to the Chief Forester to assist in making an AAC determination for the TFL. This information will be used by the Chief Forester of British Columbia in determining a permissible harvest level for TFL 18. Upon completion of that review, the AAC Rationale document will be appended to the finalized version of Management Plan #11.

2. Land Base Description

TFL 18 is located west of the Thompson River near Clearwater and falls within the Clearwater Forest District. The TFL is a contiguous unit covering an area of 74,266 hectares. Of this, 68,395 hectares is considered to be productive forest land. Figure 2.1 shows the location of the TFL.

TFL 18 is located entirely within the Clearwater Landscape Unit, which has a low biodiversity emphasis. All areas of the TFL are classified as Schedule "B" lands; there are no private lands or Timber Licences within the TFL boundary. Canfor is only one of several licencees operating in the Clearwater Landscape Unit.

The Kamloops Land and Resource Management Plan (KLRMP) is the 'higher-level plan' that guides planning and operations in the area. This analysis is consistent with the KLRMP and subsequent land use orders (LUOs) for the plan area.

The timber supply analysis completed for Management Plan #10 for (TFL 18) was completed in 2004, followed by the allowable annual cut (AAC) determination effective March 9th, 2006 in which the AAC was set at 290,000 m^3/year. The harvest level was set well above historical levels for the TFL in order to salvage deteriorating pine stands that had been killed by the mountain pine beetle (MPB).

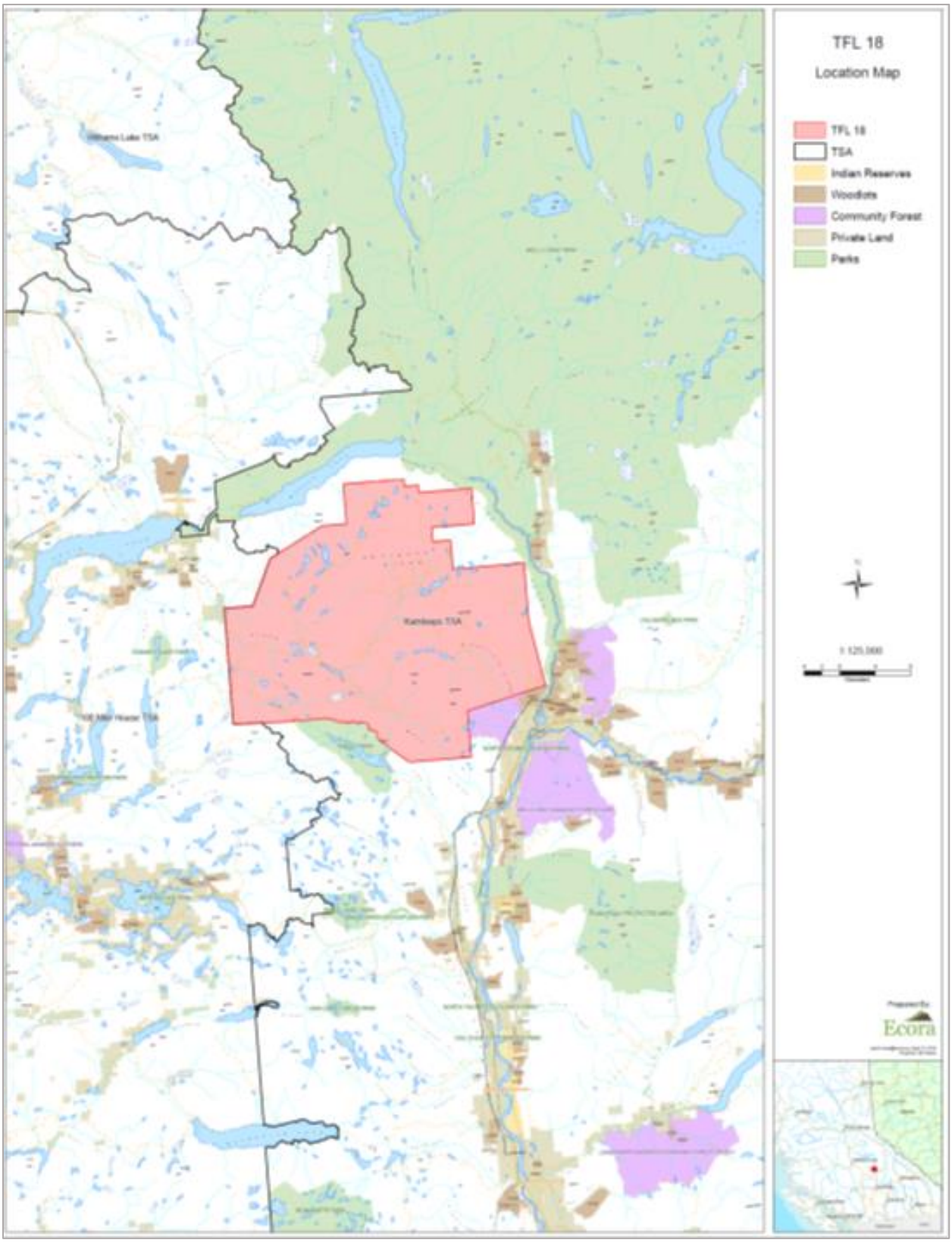


Figure 2.1 TFL 18 Location

3. Timber Flow Objectives

Forest cover objectives and the biological capacity of the net THLB will dictate the harvest level. There are however, a number of alternative harvest flows possible as many management objectives must be met.

In this analysis, the proposed harvest flow reflects a balance of the following objectives:

- Determine an initial harvest rate (for 5 or 10 years) that captures the remaining MPB-impacted stands, as well as spruce/balsam stands that are suffering increasing mortality due to bark beetle outbreaks;
- Attempt to minimize the mid-term 'falldown' harvest level;
- Decrease the periodic harvest rate in no greater than 10% steps when declines are required to meet other resource objectives on the landbase;
- Achieve an even-flow long term supply over a 250-year time horizon; and
- Maintain a growing stock level at the end of the planning horizon that will support continuing operations.

The current AAC for TFL 18 is 290,000 m^3/year, but it has been accepted at the outset of the project that, with the substantial conclusion of pine salvage operations, this harvest level can no longer be achieved.

In addition, an allowance must be made for non-recoverable losses. Since the timber supply analysis is based on the net harvest plus NRLs, the initial gross harvest level for all scenarios in this analysis has been increased by 800 m^3/year to account for these losses. (Unsalvaged loss calculations are described in the Information Package.)

4. Land Base Information

The land base classification (netdown) process starts with the gross area of the land base and removes area in a stepwise fashion according to detailed classification criteria. Table 4.1 show the derivation of the productive and timber harvesting land bases. A detailed description of the netdown process can be found in the Information Package appended to this document.

Table 4.1 Timber Harvesting Land Base Determination

	Total Area (ha)	Area Removed (ha)	Net Area (ha)
Total			**74,266**
Non Crown		-	
Camp	3	3	
Non Forest	13,066	3,621	
Roads	2,268	2,217	
Park	31	30	
Crown Forest Land Base			**68,395**
Riparian - Streams	2,330	1,999	
Riparian - Lakes	305	175	
Riparian - Wetlands	2,510	1,879	
Unstable Terrain	44	16	
Environmentally Sensitive Areas	939	612	
Permanent Sample Plots	6	6	
Deciduous-Leading Stands	1,216	217	
Non-Merchantable Stands	22,275	5,147	
Old Growth Management Areas	7,763	4,508	
Wildlife Tree Patches	1,031	524	
Recreation Sites	48	6	
Timber Harvesting Land Base			**53,306**

A map showing the location of the THLB and each netdown category is included in Appendix I.
The netdown process also classifies the land base 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 non-timber resource management; and
- THLB: the productive land base that is expected to be available for harvest over the long-term.

Figure 4.1 show the age class distribution of the THLB and the productive, non-contributing land base. The unusually large amount of THLB in the youngest age class is the result of dead, unmerchantable pine stands regenerating to natural stands with a 15 year regeneration delay.

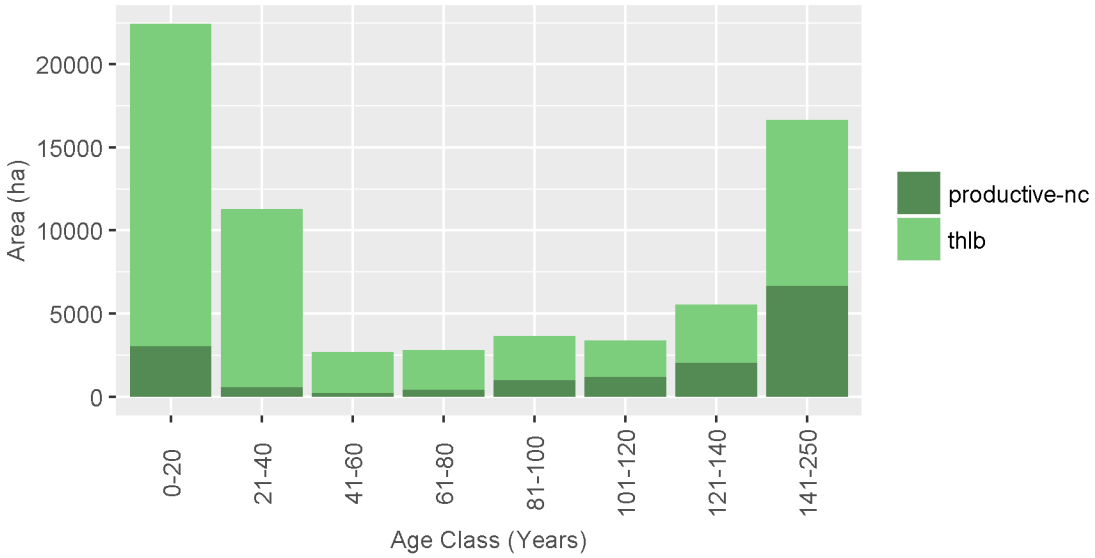


Figure 4.1 Age Class Distribution

Figure 4.2 shows the landbase (THLB and productive, non-contributing) broken down by leading species.

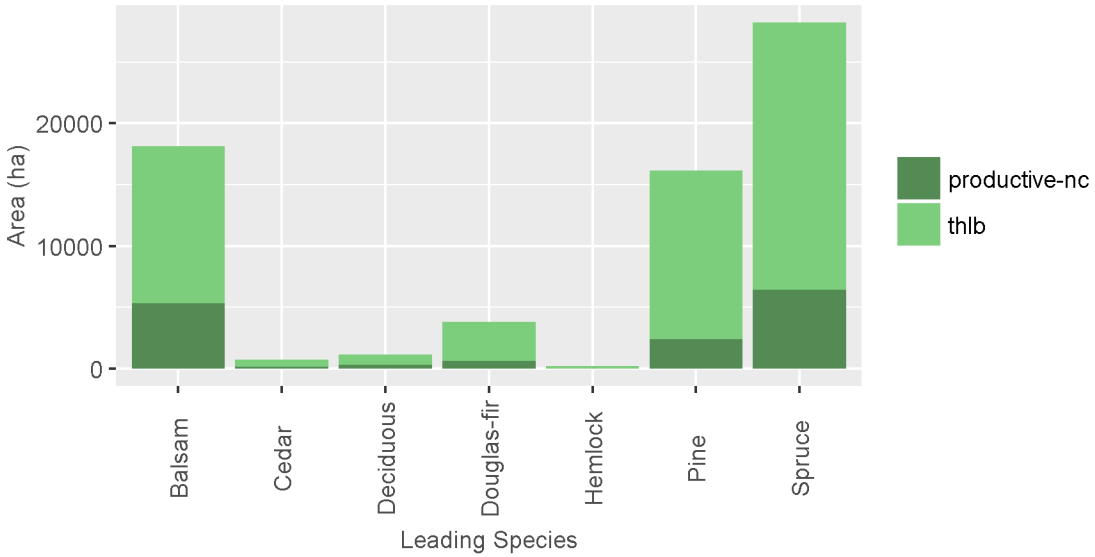


Figure 4.2 Leading Species Distribution

And finally, Figure 4.3 show the landbase categorized into 5-metre site index classes.

Figure 4.3 Site Index Distribution

5. Timber Supply Analysis Methods

5.1 Model Description

Patchworks is a spatially explicit harvest scheduling optimization model developed by Spatial Planning Systems in Ontario. It has been used to develop spatially explicit harvest allocations to explore the trade-off between a broad range of conflicting management and harvest goals. Patchworks is a multiple-objective goal-programming model and can be described as consisting of two components:

1. A GIS interface with map viewer and viewer functions; and

2. A harvest scheduler that runs continuously in the background - searching for improvements in the allocation to improve the value of the objective function. The model seeks a solution that maximizes the value of the total objective function. The objective function will be made up of both the traditional (management plan) objectives and the additional requirements and indicators. In areas of timber management, the harvest schedule will be optimized (both the current and future forecasted land base) for timber flow requirements and to minimize the environmental risk, as measured by the established indicators.

5.2 Timber Supply Modelling

Timber supply analysis for the full two hundred and fifty (250) year planning horizon to ensure that short and medium term harvest targets do not compromise long term growing stock stability. This was modeled in fifty five-year periods. Modelled harvest levels included allowances for non-recoverable losses (NRLs). Harvest figures reported here include this amount (800 m^3/year)

6. Timber Supply Analysis

This section provides an overview of the options that have been evaluated in the timber supply analysis.

6.1 Base Case Timber Supply Analysis

The base case timber supply scenario has been run for TFL 18 using the Patchworks forest estate model. The criteria laid out in the accepted Information Package have been adhered to.

The base case reflects current management performance as of 2015. The analysis incorporates the following:

- Integrated resource management (IRM) requirements managed at the BEC subzone/variant level;
- Maintenance of landscape level biodiversity through the designation of OGMA's;
- Protection of moose winter range as specified in the KRLMP;
- Rate of harvest limitation in visually sensitive areas to managed visually effective green-up;
- Recognition that a significant number of MPB-impacted pine stands (3,649 hectares of THLB and 1,736 hectares of productive non-contributing) have become unmerchantable and will break up and regenerate naturally;
- Modeling of continuing mortality in mature spruce and balsam stands;
- Ecosystem-based analysis units and silvicultural prescriptions; and
- Application of current genetic gains to managed stand yields;

The highest initial harvest level that could be sustained for ten years was 145,000 m^3/year. It falls over the next to 130,000 in the second decade, and falls again to the mid-term level for of just below 119,000 m^3/year for three decades. After that point, the harvest level climbs steadily from 132,000 m^3/year to 184,000 m^3/year. The average harvest level over this range is 161,000 m^3/year. Figure 6.1 shows this harvest level pattern.

A separate long-run sustained yield calculation has been made. The conifer volume component of future managed stands yield tables was used. For each of the 18 analysis units, the culmination MAI was determined. This was multiplied by the THLB area in each AU to find the LRSY for that AU. The sum of the LRSY values for each AU is the theoretical LRSY for the TFL = 206,341 m^3/year. These calculations are shown in Table 6.1.

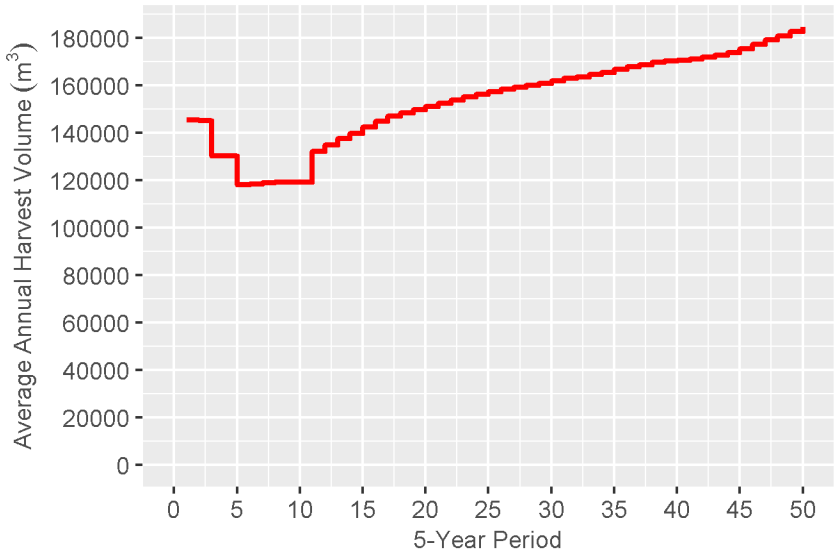


Figure 6.1 Base Case Harvest Level

Table 6.1 Long-Run Sustained Yield Calculation

Analysis Unit	THLB Area (ha)	Culmination MAI (m^3/ha/year)	Long-Run Sustained Yield (m^3/year)
201	1,481	2.8	4,113
202	593	4.1	2,433
203	3,297	1.8	5,778
204	2,005	3.5	7,078
205	2,667	4.5	12,069
206	855	4.6	3,930
207	14,730	3.6	52,757
208	4,455	5.4	23,886
209	217	4.6	997
210	718	4.2	3,005
211	14,323	4.2	60,556
212	683	3.4	2,344
213	3,820	3.7	13,967
214	620	4.7	2,901
215	752	3.8	2,824
216	962	3.1	2,959
217	895	4.1	3,695
218	230	4.6	1,049
Total	**53,306**		**206,341**

The modelled long-term harvest level does not reach the theoretical LRSY for three reasons.

1. Not all of the THLB is harvested in the base case scenario. Minimum harvest age was set at the earliest age at which the stand reaches a volume of 200 m^3/ha of coniferous volume. However, some stands that would not meet this target have been retained in the THLB because the deciduous component of the stand volume was included when making the netdown decision. These stands reach 200m^3/ha in total volume, but not in coniferous volume.

2. Some stands are harvested before they reach culmination MAI in order to meet harvest targets in the short and medium term. For the base case, a slightly higher weight was place on short- / medium-term targets (as opposed to long-term harvest level objectives).

3. Some stands are retained well past culmination age in order to meet other resource objectives (primarily visual quality).

For comparison, the LRSY for just those stands actually harvested in the base case is 197,000 m^3/year.

The initial Patchworks run was carried out with equal weights assigned to the harvest level in all planning periods. Once the natural harvest flow was established, ten year targets were set at those levels in order to meet the Ministry's '10% per decade' step-down guidance. High weights were then assigned to meeting those targets for the first 50 years (i.e. through the midterm period) while ensure that these harvest levels did not jeopardize other resource objectives. Additional 'alternative harvest flow' scenarios have been run and presented in later in this report.

Pine salvage operations are largely complete on the TFL; little recoverable pine volume remains. As a percentage of the total harvest volume, pine represent 12% over the next 20 year and 31% over the remainder of the planning horizon, as shown in Figure 6.2.

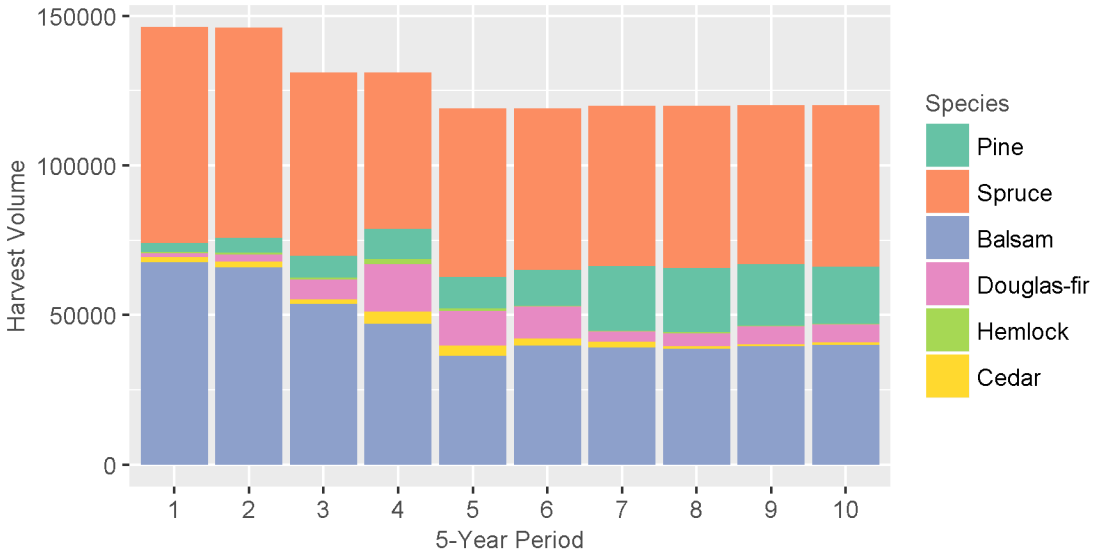


Figure 6.2 Base Case Harvest – Species Breakdown

Only a small amount of pine is harvested initially. This proportion increases slowly over the 50 years shown in the chart above. Most of the harvest is composed of spruce and balsam stands in the first five-year period. This

proportion decreases as volume is lost to insect damage. The highest proportion of 'lesser species' in the harvest occurs in periods 3 through 6. Douglas-fir, hemlock and cedar are a small part of the inventory, but they are unaffected by insect pests.

The proposed harvest levels lead to the growing stock pattern shown in the figure below. Some natural stands on the THLB remain unharvested at the end of the planning horizon because they do not reach 200m^3/ha of coniferous volume, or because they are needed order to satisfy non-timber resource constraints. The slight rebound in natural stand harvest that occurs after period 35 is the result of spruce balsam stands that break up and regenerate naturally.

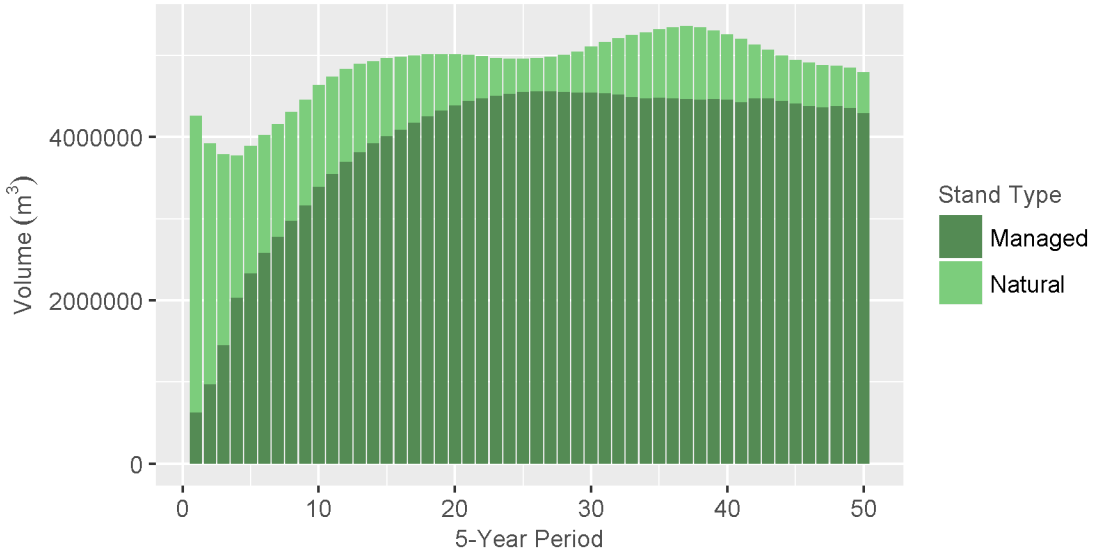


Figure 6.3 Base Case Growing Stock Trend

In order to prevent the model from harvesting excessively at the end of the planning horizon, a growing stock constraint of 4.8 million cubic metres was enforced.

Average annual harvest area averages 479 hectares over the first decade. It reaches a maximum of 665 ha/year at the end of the planning horizon. After period 10 it is stable at between 450 and 550 ha/year – though climbing slightly above that level over the last five 5-year periods. The figure below shows this pattern.

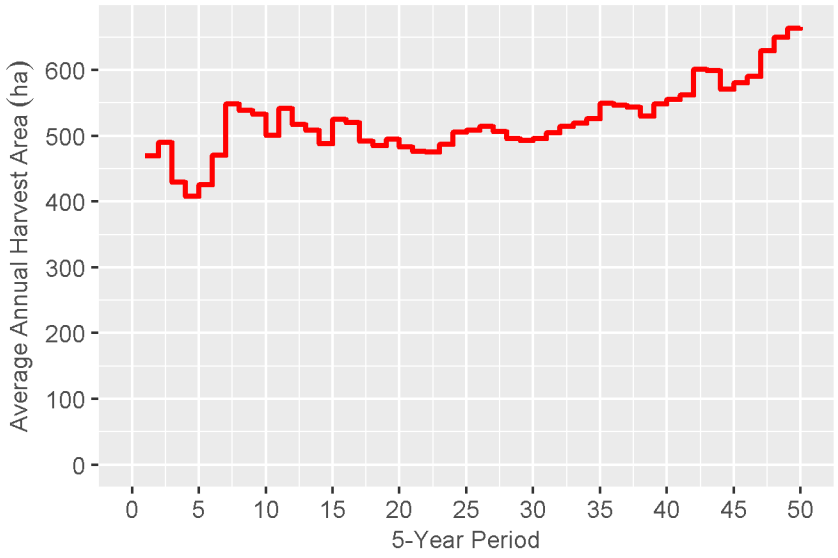


Figure 6.4 Base Case – Average Annual Harvest Area

Average harvest age is high initially (216 years on average over the first decade). By the fourth decade it has fallen to its minimum value of 68 years. It climbs slightly over the next 150 years to 108 years before falling slightly at the end of the planning horizon. The increase at that point is a modelling artifact – spruce/balsam stands that regenerated naturally still have an age assigned based on their original (pre-2014) year of establishment. Apart from this, harvest age is stable for most of the planning horizon after the fourth decade.

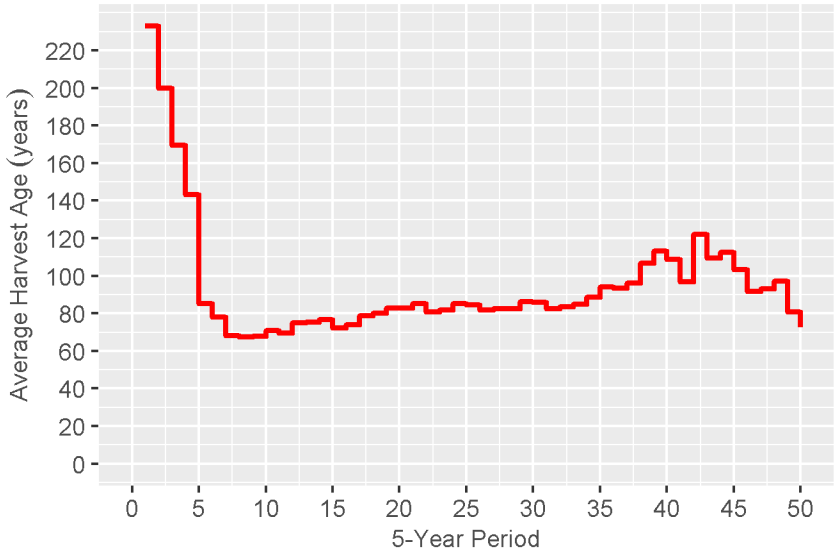


Figure 6.5 Base Case – Average Harvest Age

The age class distribution of the harvest is further broken down in the figure below. Most of the existing old growth timber is harvested over the first two decades (i.e. first four five-year periods). The spruce/balsam stands that naturally regenerate are more apparent on this chart than the previous one. They are the '121+' stands that get harvested in the second half of the planning horizon. In addition, some old growth is retained on the THLB to meet

other resource constraints. For the portion of the planning horizon after year 50, most of the harvest area is in the '60–80' and '80–100' year age classes.

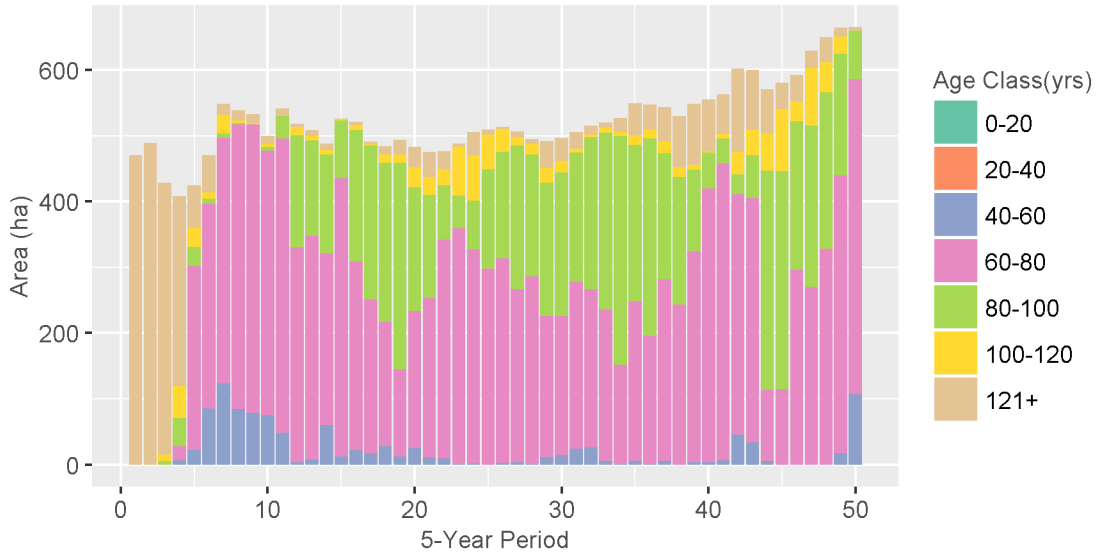


Figure 6.6 Base Case Harvest Age Class Distribution

Harvest volume per hectare (VPH) averages 294 m^3/ha over the first three decades, and then falls to a minimum of 221 m^3/ha in the fourth decade. It recovers steadily to 327 m^3/ha at 115 years, and averages 308 m^3/ha for the rest of the planning horizon.

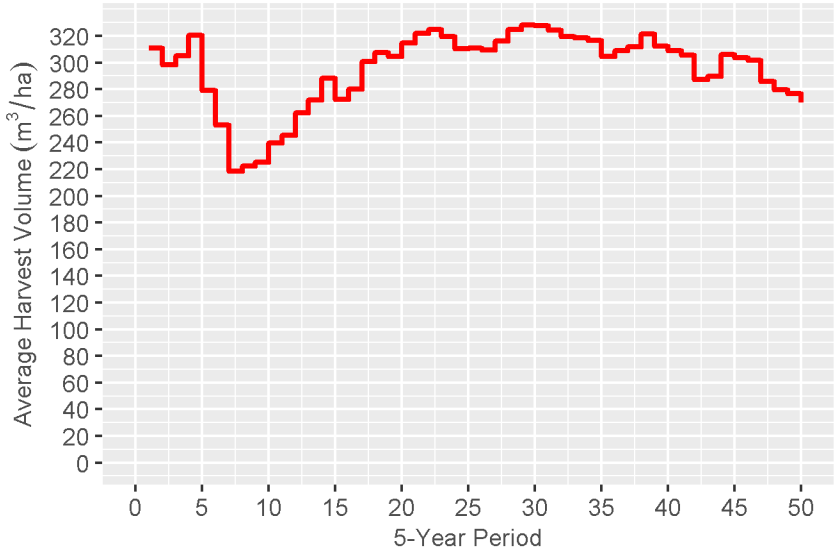


Figure 6.7 Base Case Harvest – Average Volume per Hectare

The chart above shows average harvest VPH. The one below shows how much volume is harvested in each volume class. The only stands that are harvested below the volume threshold are those indicated in the logging plans for the first five-year period. At the end of the mid-term period, most of the harvest comes from stands

between 200 and 250 m^3/ha. After the 50-year point – and until the final 50 years of the planning horizon, an increasing portion of the harvesting occurs in stands that have at least 300 m^3/ha in merchantable volume. After year 200, more of the harvest volume comes from stands in the 200-250 m^3/ha range.

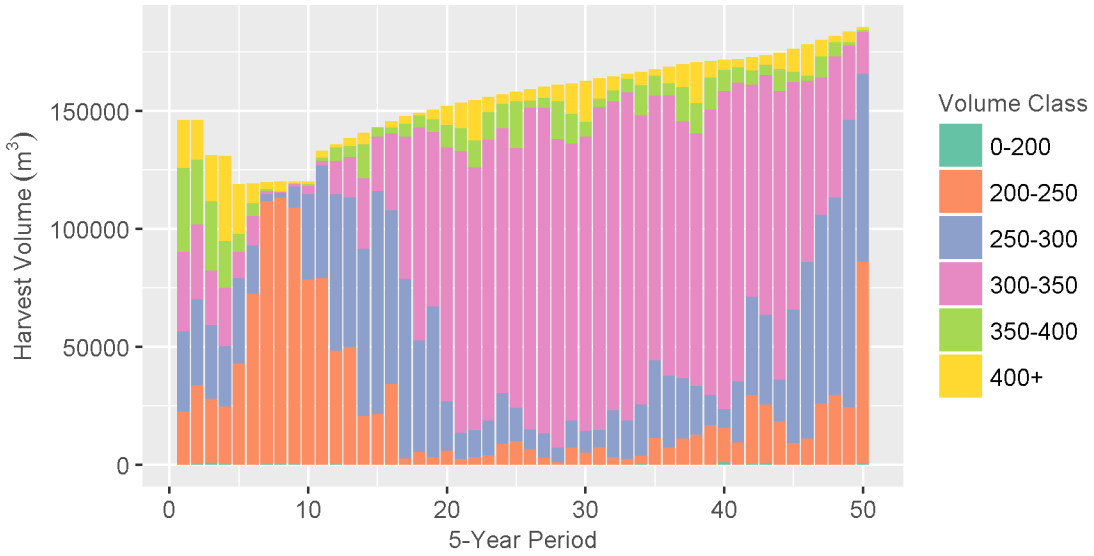


Figure 6.8 Base Case – Harvest Volume Class

A final assessment of the sustainability of the proposed harvest level and be mad be reviewing the age class distribution forecast for the THLB. This is shown in the chart below. A stable age class distribution is achieved at 80 years into the planning horizon.

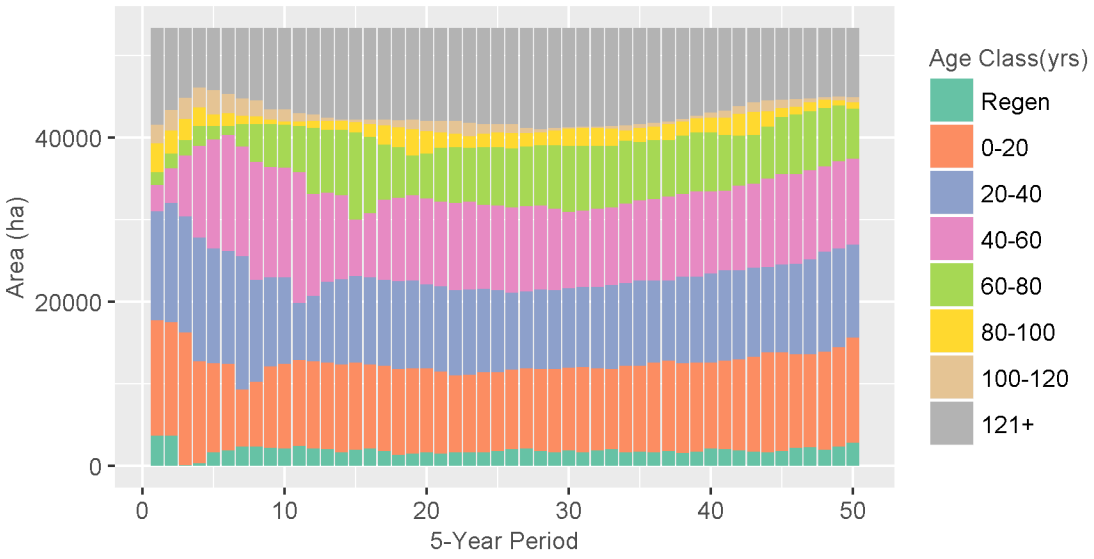


Figure 6.9 Base Case – THLB Age Class Distribution

7. 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 7.1 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 7.1 Sensitivity Analyses

Sensitivity	Range Tested
Alternative Harvest Flows	Unconstrained and Non-Declining
Minimum Merchantable volume	200 m^3/ha in base case 125 m^3/ha, 160 m^3/ha, 215 m^3/ha
Lakeshore Management	Enforce all KLRMP LMZ's
Site Productivity	Use PSI
VDYP Phase 2 / Balsam IU	Implement VDYP Adjustments
Insect mortality	Remove spruce / balsam mortality
Pine Genetic Gain	Increase to 15%

7.1 Alternate Harvest Flows

The base case presented a harvest flow scenario that places a higher weight on meeting short and medium-term harvesting objectives. For the sake of comparison – and in order to better understand the timber supply dynamics of the TFL – two alternative harvest how scenarios are presented here. The 'Unconstrained' scenario set a high harvest target and applied an even weight to that objective across the entire planning horizon. This shows the schedule that leads to harvest volume being maximized across the entire planning horizon. The 'Non-declining' scenario was established by increasing a flat-line harvest level over the first fifty years until the harvest objective could not be met. Previous model runs had already established that harvest level could be raised after the 50-year point in the planning horizon.

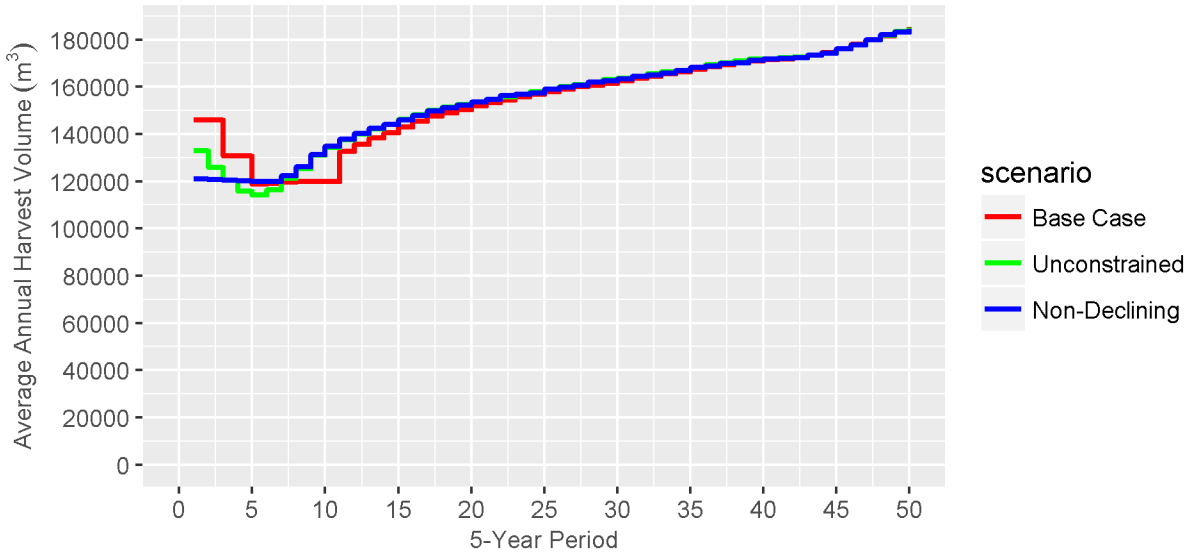


Figure 7.1 Alternative Harvest Flow Scenarios

7.2 Minimum Harvest Volume

The base case used a 200 m^3/ha minimum harvest volume. Three sensitivity runs have been completed to test the impact of different volume thresholds – 215, 160 and 125 m^3/ha. The netdown was also rerun so that stands that could not achieve these volumes per hectare were not included in the THLB. The size of the THLB at each of these volume limits is listed in Table 7.2.

Table 7.2 THLB (ha) at Different Volume/Hectare Thresholds

Operability Volume Limit (m^3/ha)	THLB (ha)
215	52,821
200	53,306
160	54,296
125	55,021

Figure 7.2 shows the harvest flow pattern for each of these scenarios.

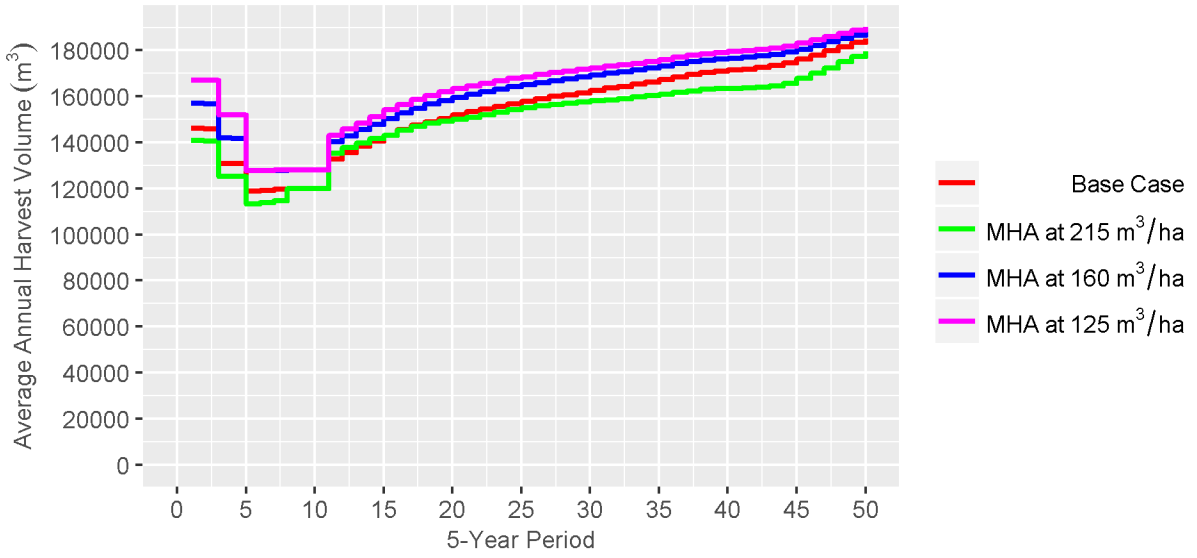


Figure 7.2 Alternative Minimum Harvest Age Scenarios

The results are what would be expected. Higher volume thresholds reduce the size of the THLB and depress harvest levels in the long term. In the short term, lower volume threshold allow more of the deteriorating spruce / balsam stands to be harvested before they break up and naturally regenerate.

7.3 KLRMP Lakeshore Management

The Lakes Local Resource Use Plan (LRUP) for the Clearwater District includes the Lakeshore Management Guidelines that specify practices within 200 meters of specified lakes. These lakeshore management zones are managed based on visual quality objectives (VQO) by lake class. Table 4.2 of the Information Package shows the VQO category that was applied around each lake.

Because these remain guidelines rather than legislative requirements, they have not been applied in the base case. This sensitivity analysis shows the impact of maintaining all other base case assumptions, but also managing these lakeshore zones to their respective VQO objectives. As Figure 7.3 shows, the impact on the base case harvest level in the short-, medium- and long-term is minimal.

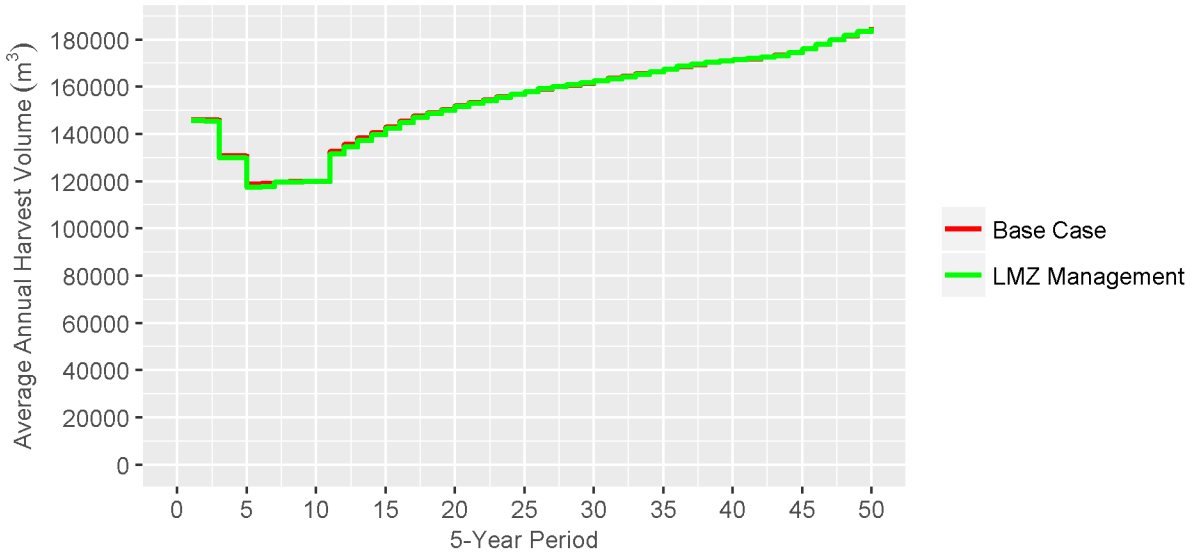


Figure 7.3 KLRMP Lakeshore Management Zone Scenario

7.4 Site Productivity

The site index adjustment work completed by J. S. Thrower and Associates in 2002 (Potential Site Index Estimates for the Major Commercial Tree Species on Tree Farm Licence 18) was the source of productivity data for constructing managed stand yield tables for the last timber supply analysis. It was accepted by the Chief Forester at that time. For the base case analysis, SIBEC estimates of site index were used to develop managed stand yield tables. The difference between the two sets of SI estimates is, broadly speaking, one metre in pine stands and three metres in spruce stands.

As Figure 7.4 show, the impact of using PSI estimate for has a significant impact on harvest levels in the medium and long term.

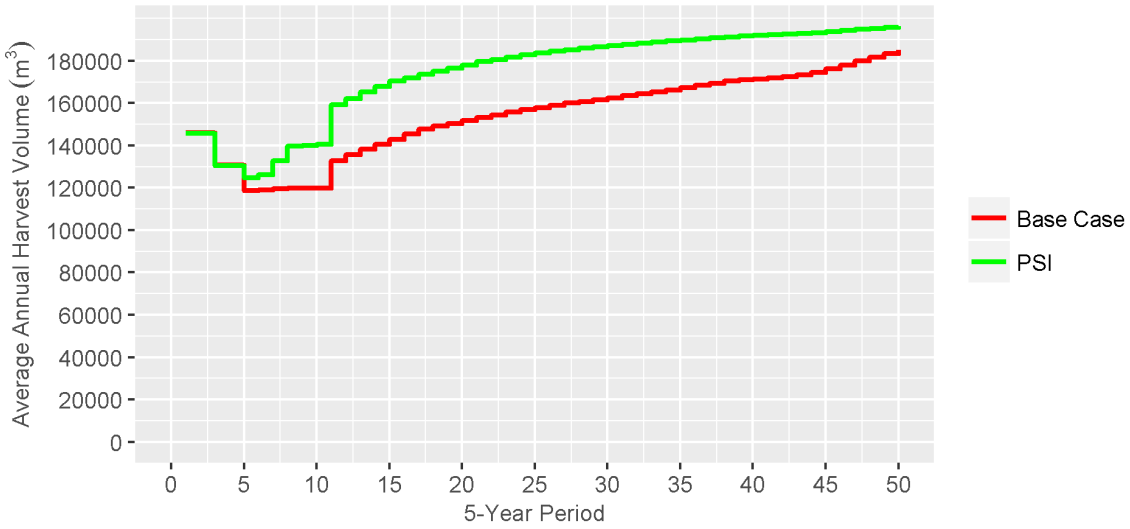


Figure 7.4 Potential Site Index (PSI) Scenario

7.5 Spruce / Balsam Mortality

The question of mortality in spruce and balsam stands was the subject of considerable discussion during review of the Information Package. It is difficult to know how to relate estimates of insect-caused mortality to the VRI data (which includes only live volume for non-pine species). In the end, it was agreed that the spruce / balsam component of Sx/Bl leading stands would be reduced by 0.8% annually starting in 2006. Stand that fell below 200 m^3/hectare were unavailable for harvest in the base case. When the volume fell to 125m^3/hectare, the stand was naturally regenerated with a 15-year regeneration delay.

This sensitivity analysis removes that mortality. That is not to suggest that the fact of Sx/Bl mortality is in doubt. However, the base case mortality estimate is based on limited field data. Furthermore, it is not clear that the volume being 'killed' by this assumption is entirely unrecoverable. By showing the 'no mortality' scenario, the impact of the base case mortality assumptions can be better evaluated.

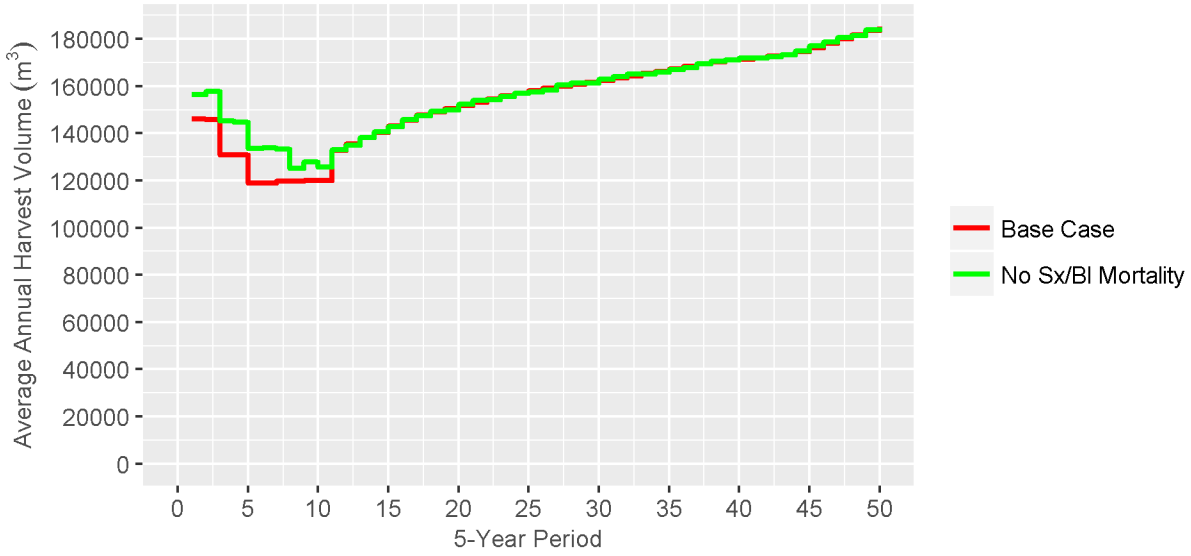


Figure 7.5 No Sx/Bl Mortality Scenario

7.6 VRI Phase 2 Adjustment / Balsam IU

This has been a difficult sensitivity analysis to run and interpret. Natural stand yield tables were rerun using the Phase II adjustment factors. It has been assumed that this adjustment adequately captures MPB mortality on the TFL. In the base case, pine stands that were not in current harvest plans were immediately regenerated to natural stand with a 15 year regeneration delay. That has not been done for this sensitivity analysis. Also, no mortality has been assumed in Sx/Bl stands. The resulting harvest flow pattern is shown in Figure 7.6.

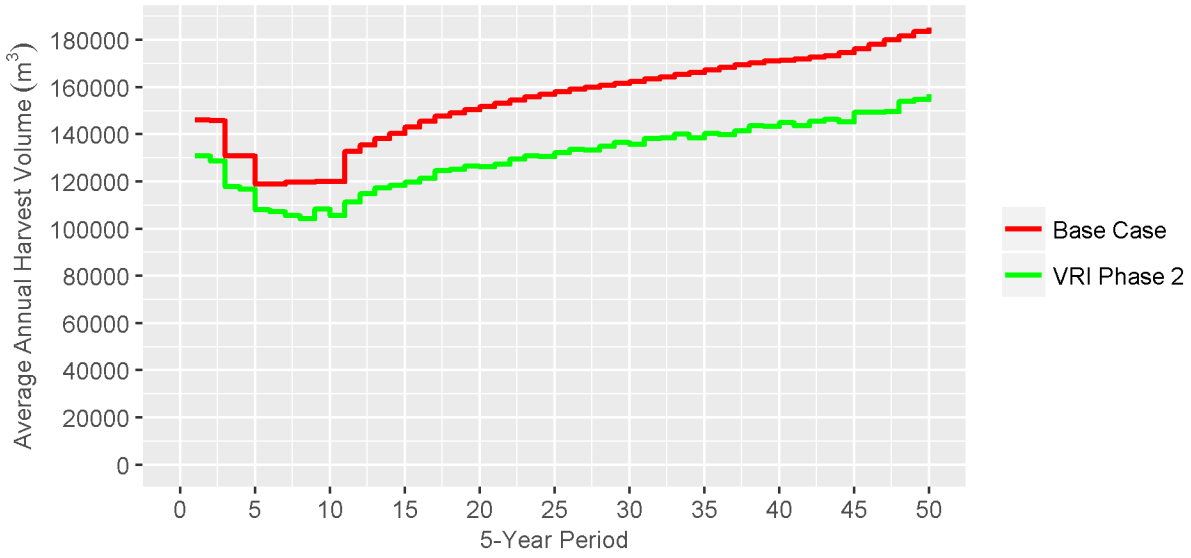


Figure 7.6 VRI Phase 2 Adjustment

The short-term reduction in harvest level was expected – but the long-term drop was not. The latter affect results from stands not reaching 200m^3/hectare of conifer volume after the adjustment is applied. These stands do not get harvested over the entire planning horizon and this area is essentially lost from the THLB.

7.7 Pl Genetic Gain

In the base case, the genetic gain estimate for future pine stands was 3%. MFLNRO advises that significantly better Class A seed will shortly be available for pine. This sensitivity Increases genetic gain to 15% for future pine. Figure 7.7 shows the change in harvest level that results.

Figure 7.7 Genetic Gain at 15% for Future Pine

7.8 Preferred AAC Scenario

As the analysis was underway and preliminary results were reviewed, Canfor was able to reconsider their management options in light of the strategic timber supply situation on TFL 18. While the base case, as presented, is an accurate reflection of current operational practice, it is not necessarily the most appropriate starting point for an AAC determination for the next ten years. Canfor proposes relaxing two of the base case assumptions:

1. Reduce the minimum harvestable volume from 200 m^3/hectare to 160 m^3/hectare; and
2. Eliminate the rule that the drop in harvest level from one decade to the next can be no more than 10%.

The rationale for making the changes is discussed in Section 8. Figure 7.8 shows this alternative harvest flow pattern. During the initial 10-year harvest uplift period, many spruce balsam stands that would otherwise break up and regenerate are harvested and converted to managed stands. The is an additional benefit to this conversion in the period after 50 years – these managed stands reach a harvestable condition much sooner that the post break-up stands would have.

To be clear – the base case shown in Figure 7.8 assumes a minimum harvestable volume of 200 m^3/hectare. The uplift scenario uses a volume threshold of 160 m^3/hectare.

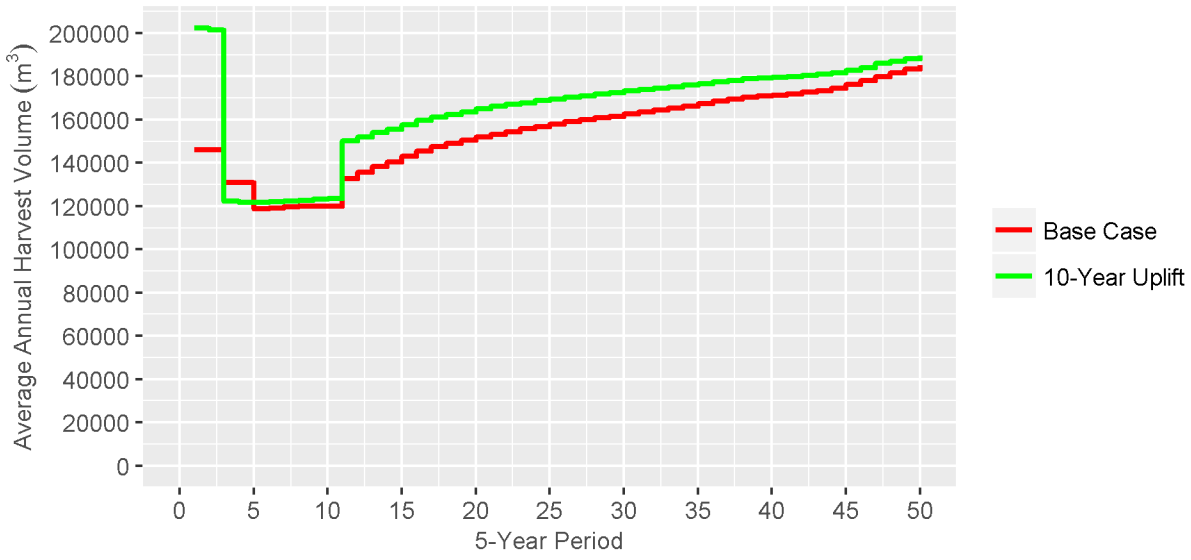


Figure 7.8 Initial Harvest Uplift Scenario

Figure 7.9 show the growing stock trends – for both managed and natural stands – that result from this harvest scenario.

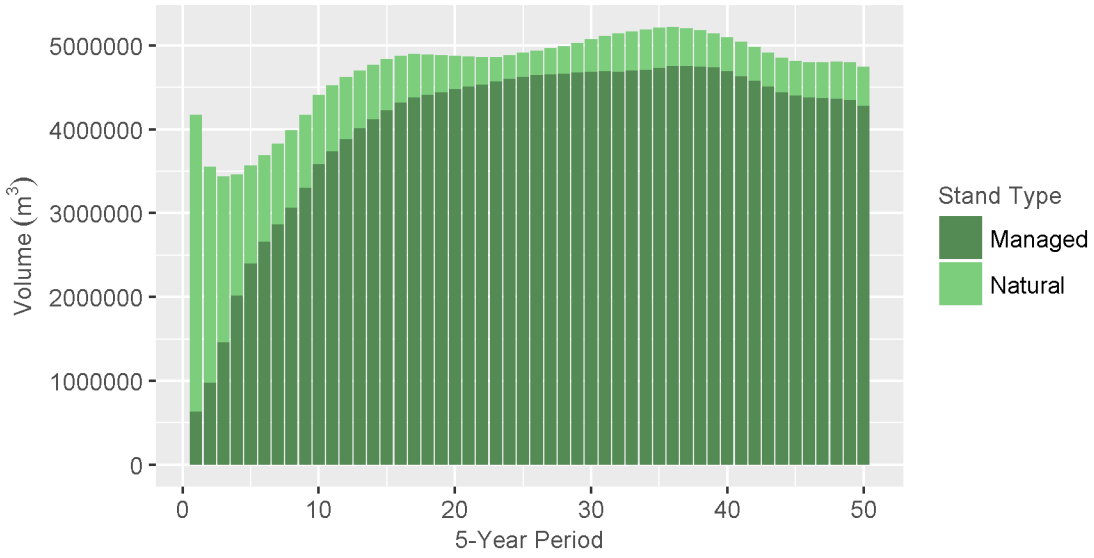


Figure 7.9 Harvest Uplift Scenario – Growing Stock Trends

Figure 7.10 shows the species composition of the harvest volume for this scenario over the first 50 years of the planning horizon.

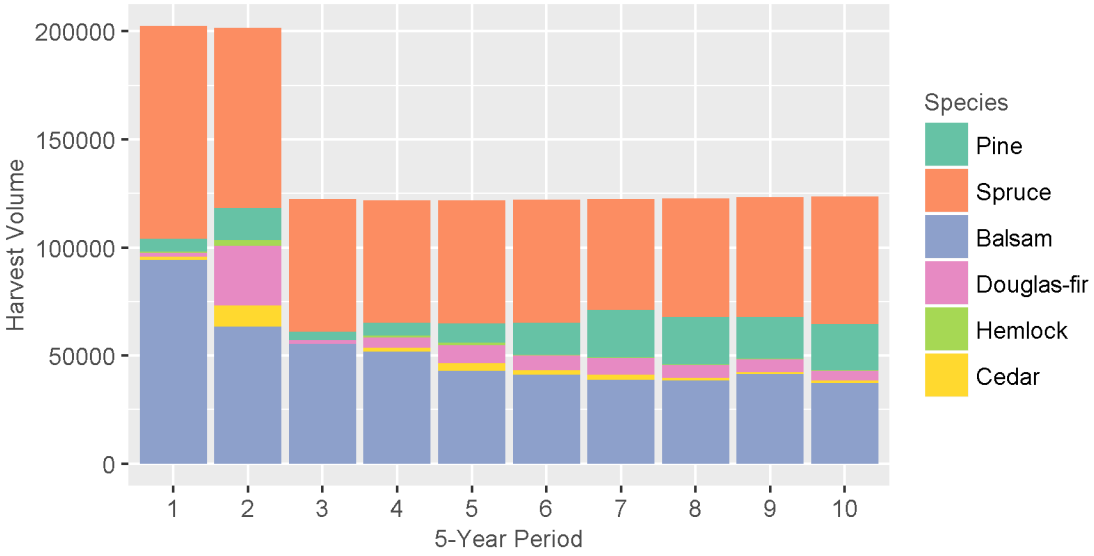


Figure 7.10 Harvest Uplift Scenario – Harvest Species Breakdown

8. Discussion

8.1 Harvest Level

The availability of timber for short- and medium-term harvest on TFL 18 has been reduced dramatically since the last timber supply review was completed for MP#10. At that time, various initial harvest levels between 240,000 and 290,000 m^3/year were considered. The higher end of this range was selected during the AAC determination process, in the expectation that it would most effectively remove at-risk pine stands and minimize the impact of the spreading MPB epidemic on timber supply. It has been a successful strategy, and little mature pine remains to be harvested. In spite of these efforts, 3,649 hectares of mature pine stands have been deemed unrecoverable: the will break up and regenerate naturally. The initial harvest level found in the base case is 145,000 m^3/year. Different initial harvest levels are possible, and alternatives have been presented in the sensitivity analyses.

The previous timber supply analysis did not foresee the mid-term harvest level falling below 187,000 m^3/year in the worst-case scenario. That analysis did not anticipate the outbreak of spruce and balsam bark beetle and budworm. The additional mortality caused by these pests (in spruce and balsam stands) has significantly reduced the mid-term timber supply. In the base case, the mid-term harvest level is 119,000 m^3/year. Unlike the initial harvest level – where some flexibility exists – there are few options for changing the mid-term harvest level. The only sensitivity run that made a significant difference was the one in which minimum harvest age was set at the point at which each stand reached 125 m^3/hectare. This scenario may not be operationally realistic.

In other situations (on other tenures) one option for increasing mid-term harvest levels is to reduce harvesting in the short term. That strategy, however, will not be effective for TFL 18. Almost all of the mature pine has been harvested and the remainder has deteriorated to the point that it is no longer operable Spruce- and balsam-leading stands are losing volume at 0.8% (of the Sx/Bl component) annually. Some of these younger stands will not grow into a harvestable condition. Those stands that are currently operable (i.e. they have coniferous volumes greater than 200 m^3/ha) will drop below the volume threshold if they are not harvested in the short term.

Early versions of the base case analysis attempted to find a long-term even-flow harvest level that met all other resource targets (i.e VQO, moose habitat, etc.). This made the mid-term harvest level difficult to model and interpret, as small changes in the long-term harvest target had significant impacts on the mid-term harvest. The best approach found was to set a high long-term harvest volume target, but apply a (relatively) low weight to meeting that objective. The effect, in the base case, is that the harvest level varies between 133,000 m^3 per year at 50 years to 183,000 at the end of the planning horizon. It averages 162,000 m^3/year over this time frame. The primary influences on the harvest level in the long term are the need to:

- maximize the harvest volume across the entire planning horizon;
- respect other non-timber resource values and land base constraints; and
- meet the growing stock objective of 4.8 million cubic metres on the THLB over the last five 5-year planning periods.

The long-term harvest level – even at the end of the planning horizon – is short of the theoretical long-run sustained yield based on the future managed stand yield tables (183,000 m^3/year harvest versus 206,000 m^3/year LRSY. There are three main reasons for this difference:

1. Many existing mature stands have been damaged by insect pests and will not be harvested. They regenerate naturally after a 15-year regeneration delay. Those sites are not occupied by managed stands until the subsequent natural stand reaches a harvestable volume per hectare.

2. The netdown process to determine the THLB used total stand volume (coniferous and deciduous) to net out low productivity stands. Minimum harvest age was set at the same threshold (200 m^3/hectare in the base case), but used coniferous volume only in the calculation. Some stands with a total volume above the threshold don't get harvested because there is insufficient conifer volume.

3. Management of other resource values (moose habitat and visual quality objectives in particular) require that some stands be retained in the THLB until well past their culmination age.

With these caveats, the base case long-term harvest level and the calculated LRSY yield are not inconsistent. The base case also agrees reasonably well with the previous, MP#10 timber supply analysis long-term harvest level when differences in the size of the THLB are taken in to account.

8.2 Sensitivity Analyses

Sensitivity analysis seeks to quantify the degree to which uncertainty in data and assumptions might affect timber supply. The assumption that was of greatest concern was the volume per hectare at which stands first become operable. The base case assumed a limit of 200m^3/hectare. Other limits (125, 160 and 215 m^3/ha) changed the long-term harvest level in proportion to the extent that they changed the size of the THLB. Only the lowest level – 125 m^3/ha – had a significant impact on the THLB.

Changing assumptions about the productivity of managed stands – either through more optimistic assumptions about genetic gain in pine or the use of PSI in lieu of SIBEC – could advance the point at which harvest level begin to rebound after the mid-term falldown. Neither had any impact on the harvest level at the beginning of the mid-term falldown period. It is close to 120,000 m^3/year in both cases.

Phase 2 adjustments to the mature inventory have the potential to impact harvest levels in the short term. However, interpretation of the Phase II results is made difficult by the insect-caused mortality that has occurred on the TFL from the time of the photography (2006/7) to Phase II adjustment year (2011). The Phase II adjustment removes the dead pine volume from stands – but only in the pine strata. The adjustment did not try to account mortality in spruce or balsam stands.

8.3 Forest Health

Insect-caused mortality and deterioration is clearly the major issue influencing timber supply from TFL 18. Changes in assumptions about mortality rates and shelf life greatly impact short- and mid-term timber supply. Given the lack of field and operational data upon which to base these estimates, there is more uncertainty with this issue than with any other assumption regarding TFL management assumptions and practices.

8.4 Higher-Level Plans

Canfor's harvesting and silviculture operations comply with the KLRMP and their FSP for TFL 18. These dictate their 'current practices', and every effort has been made to model current practice when classifying the landbase, forecasting yields and applying management assumptions for this analysis. The KLRMP requires sets on objective of managing to modification visual objectives for all area outside of visually sensitive area polygons. That has been done for this analysis. The plan also sets guidelines for harvesting in lakeshore management zones. Those guidelines were implemented in a sensitivity analysis and found to have no impact on timber supply.

Although Canfor's SRMP commitments were not intended to be constraining on timber supply, the document was thoroughly reviewed to identify any issues that might have strategic timber supply implications. (Most of the document is focused on operational rather than strategic planning matters.). The only relevant items found were related to seral stage distribution, coarse woody debris and equivalent clearcut area (ECA).

Both the seral stage and carbon targets require that "At least 8.5% of THLB fall in three of first five 20-year age classes by year 50" . At year 50, this target is met for four of the first five age classes as shown in Table 8.1 (and Figure 6.9)

Table 8.1 THLB Age Class Distribution at Year 50

Age Class (years)	THLB Area
0-20	21%
20-40	21%
40-60	25%
60-80	12%
80-100	1%
100-120	3%
121+	17%

Coarse woody debris targets have not been modelled directly. The SFMP commits to target of 5m^3/ha in xeric BEC variants, 20m^3/ha in all other variants. Initially, these targets will be easily met by the logging slash that is left on site. CWD estimates have been included in the future managed stand yield tables used for this analysis. Generally (and according to TIPSY), the managed stands on these sites will not generate enough CWD to satisfy SFMP targets on their own prior to reaching rotation age. This is primarily an operational matter. More research would be needed before the strategic timber supply impacts could be modelled in any meaningful way.

The SRMP also commits to managing ECA in specified watersheds. The only such watershed that overlaps the TFL is the Clearwater River. The SFMP limit is 35%. This watershed never exceeds that value; the maximum ECA of 27% occurs at the start of the planning horizon as a result of pine salvage and mortality.

Canfor monitors progress towards SRMP objectives annually. If harvest flow problems were to arise due to conflicts with the SRMP, the matter would be further examined at that time.

8.5 Preferred Scenario

After careful consideration of the base case and sensitivity analysis results, Canfor proposes relaxing two of the base case assumptions:

1. Reduce the minimum harvestable volume from 200 m^3/hectare to 160 m^3/hectare; and
2. Eliminate the rule that the drop in harvest level from one decade to the next can be no more than 10%.

Regarding the MHA issue, the sensitivity analysis presented in 7.2 shows that a relaxed harvest volume limit has the potential to increase timber availability in the short term without jeopardizing mid-term harvest levels. A significant portion of the increased harvest volume will come from spruce / balsam stands that have been impacted by bark beetle and budworm. At the current operability limit of 200 m^3/hectare in the base case, some of these stands are breaking up and regenerating naturally. The problem is reduced – though not eliminated – if the harvest volume threshold is relaxed to 160 m^3/hectare. At an operational level, Canfor has successfully harvested

stands in this volume range at other western Canadian operations. Even on TFL 18 blocks the do not meet the 200 m^3/hectare threshold have been economically harvested.

In addition, Canfor has been targeting some mixed stands for harvesting. These stands meet the 200 m^3/ha criteria on the basis of total volume, but fall just under the 200 m^3/ha threshold as a result of the deciduous component. Current operations are actively targeting these stands, and leaving the deciduous as either clumped or dispersed retention where it is safe to do so. These types of stands are not considered to be in the THLB for the base case scenario of this analysis.

The 10% decadal limit on harvest level reductions is intended to protect local communities and economies from abrupt swings in harvesting activity. However, in the case of TFL 18, that abrupt swing is already underway. The harvest level will fall this year from 290,000 m^3/year to a significantly lower level. That decrease will be greater than 10% for any of the harvesting scenarios examined.

The Vavenby mill will continue to operate at full capacity regardless of a drop in AAC on TFL18. As such, the economic impact resulting from the drop in AAC on the TFL will be somewhat reduced. However, the impact on the local economy can be mitigated somewhat by setting a higher AAC for the next ten years than the one presented in the base case. The sensitivity analysis in Section 7.8 shows that a harvest level of 201,000 m^3/year could be sustained for ten years. A higher initial harvest level could be sustained for a shorter time period. An initial uplift harvest level would also support good forest management as it would convert deteriorating spruce and balsam stands into managed stands.

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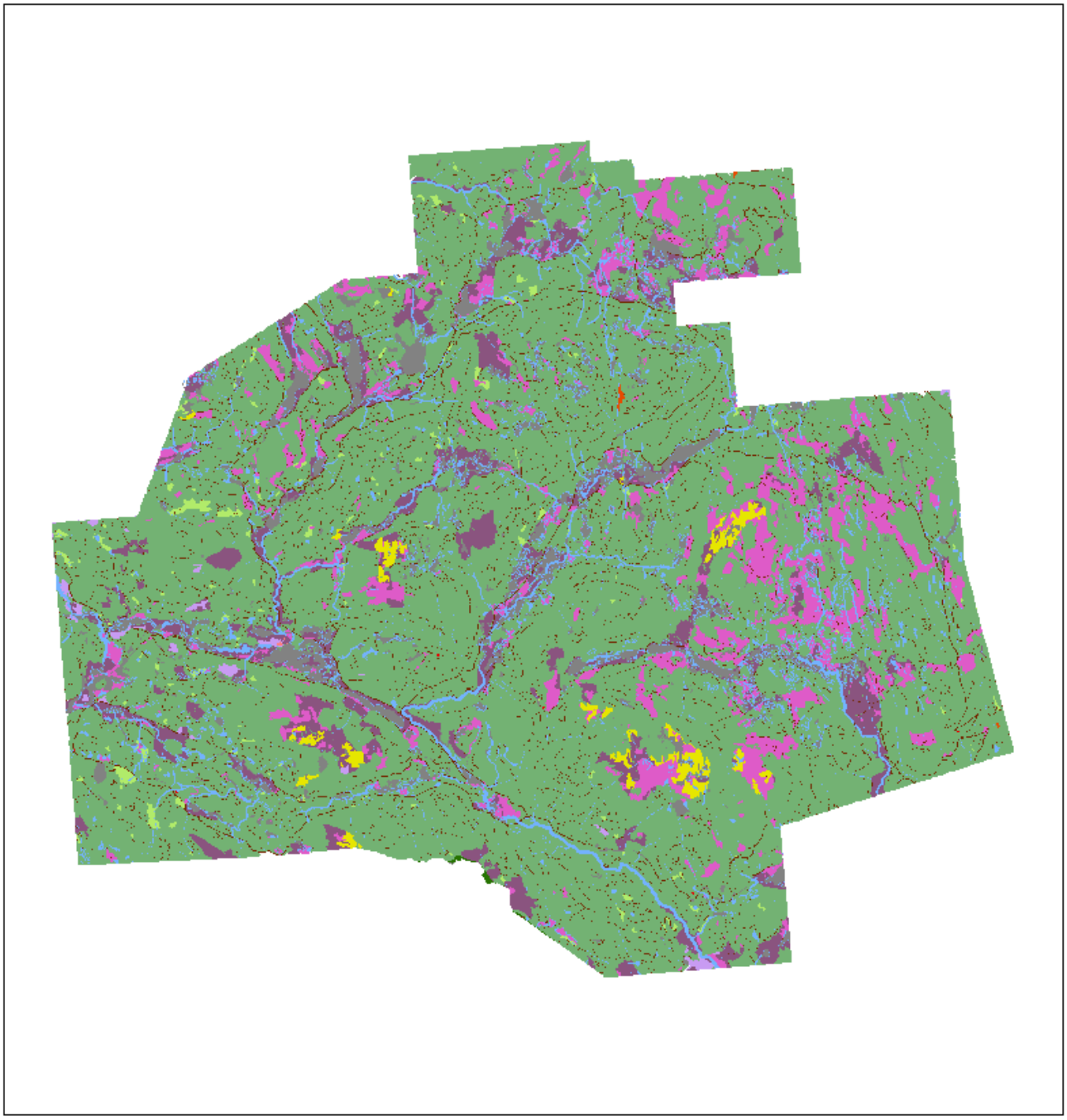
Appendix A

Netdown Map


Camp
Non-Forest
Road
Park
Riparian Area
Unstable Terrain
Environmentally Sensitive Area
Permanent Sample Plot
Deciduous
Non-Merchantable
OGMA
Wildlife Tree Patch
Recreation Site
THLB