2015 Forest Management Plan
Canfor Grande Prairie
FMA # 9900037

Timber Supply Analysis Report

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November 30th, 2015

CANFOR

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EXECUTIVE SUMMARY

Canfor's Forest Management Plan (FMP) for the Grande Prairie Forest Management Agreement area (FMA) # 9900037 requires a timber supply analysis (TSA) to guide forest management decisions. Canfor's FMP vision is to provide a forest management plan framework for crown lands under Canfor's tenure in Alberta that maintains the ecological integrity and biological diversity of forests while being socially acceptable and economically viable. The TSA will address multiple forest values, non-forest values and landscape features that reflect these ecosystem-based guiding principles.

The Preferred Forest Management Scenario (PFMS) and the resulting annual allowable cut (AAC) reflect an amalgamation of information and direction from a number of different sources including government, licensees, First Nations and the public. Input from the various stakeholders in the process is reviewed, collated and assessed for inclusion in the PFMS.

The PFMS is the analysis scenario in which the data and assumptions best reflect current management for the FMA area. This scenario is developed through a series of iterations whereby various management assumptions are tested and refined.

The harvest forecast for both conifer and deciduous volume in the PFMS is shown in Figure 1. In the PFMS, the conifer harvest remains relatively constant over the first 110 years of the planning horizon, starting at approximately 714,000 m^3/yr for the first 10 years before dropping down slightly to 712,000 m^3/yr for the second 10 years. After 20 years, the harvest level increases slightly to approximately 719,000 m^3/yr until year 111 when it increases to reach the long-term sustainable harvest level of approximately 848,000 m^3/yr.

The deciduous harvest averages 564,000 m^3/yr over the first 10 years before dropping down to the long-term sustainable harvest level of approximately 488,000 m^3/yr.

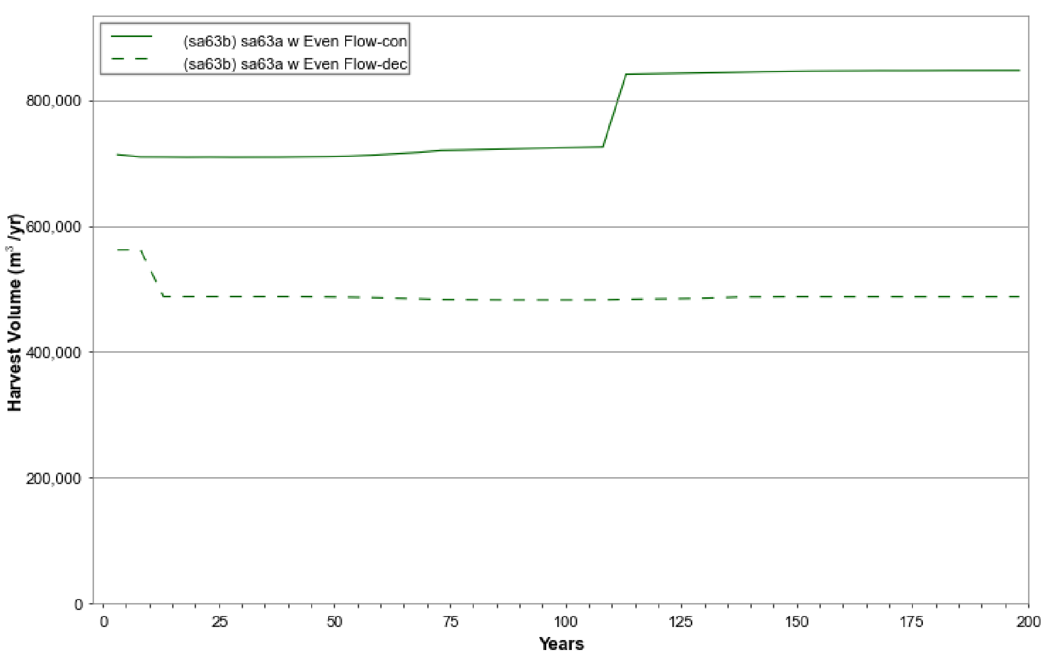

Figure 1: PFMS Harvest Forecast

Recognizing that uncertainty exists in both data and assumptions, we undertook sensitivity or risk analysis to quantify the impact of this uncertainty on the overall harvest level presented in the PFMS. Risk analysis provides information on the degree to which uncertainty in the PFMS data and assumptions might affect the proposed harvest level for the land base. The magnitude of the change in the variable(s) being tested 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 risk factors, it is possible to determine which variables most affect results and provide information to guide management decisions in consideration of uncertainty.

The final PFMS assumptions were developed using the input and results from a number of different scenarios. A number of scenarios were completed leading to the development of the PFMS. The following scenario results are presented in this report:

- Relaxed even flow requirements;
- Strict even flow throughout the entire planning horizon;
- Removal of 75% MPB susceptible pine;
- Removal of watershed constraints;
- No constraints and no genetic gains (base run);
- No Tolko harvesting; and
- Back to natural regeneration.

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ACRONYMS AND ABBREVIATIONS

AAC	Annual Allowable Cut
AESRD	Alberta Environment and Sustainable Resource Development
ALP	A La Peche Caribou Range Plan
AOP	Annual Operating Plan
AU	Analysis Unit
AVI	Alberta Vegetation Inventor
C	Coniferous stand
CAI	Current Annual Increment
CD	Coniferous Leading Mixedwood
D	Deciduous Stand
DC	Deciduous Leading Mixedwood
DID	Digital integrated Disposition
Du	Deciduous Leading with Conifer Understory
ECA	Equivalent Clearcut Area
FLMP	Foothills Landscape Management Forum
FMA	Forest Management Agreement
FMP	Forest Management Plan
FMU	Forest Management Unit
FRI	Fire Return Interval
GBWU	Grizzly Bear Watershed Unit
G&Y	Growth and Yield document
HPS	Health Pine Strategy
IHL	Initial Harvest Level
LAD	Landbase Assignment Document
LL	Lower Limit
LS	Little Smoky Caribou Range Plan
LTHL	Long-Term Harvest Level
m^3	cubic metres
MAI	Mean Annual Increment
MHA	Minimum Harvest Age
MPB	Mountain Pine Beetle
NRV	Natural Range of Variation
PFI	Peak Flow Index
PFMS	Preferred Forest Management Scenario
Pusk	Puskwaskau
RSF	Resource Selection Values
SDT	Strata Description Table
SELES	Spatially Explicit Landscape Event Simulator
SFMP	Sustainable Forest Management Plan
SHS	Spatial harvest system
SPH	Stems Per Hectare
TFLB	Total Forested Landbase
TGLB	Total Gross Landbase
THLB	Timber Harvesting Land Base
TSS	Timber Supply Subunit
UL	Upper Limit
VPH	Volume per Hectare
YR	Year

1.0 INTRODUCTION

Canfor's Forest Management Plan (FMP) for the Grande Prairie Forest Management Agreement area (FMA) # 9900037 (Figure 2) requires a timber supply analysis (TSA) to guide forest management decisions. Canfor's FMP vision is to provide a forest management plan framework for crown lands under Canfor's tenure in Alberta that maintains the ecological integrity and biological diversity of forests while being socially acceptable and economically viable. The TSA will address multiple forest values, non-forest values and landscape features that reflect these ecosystem-based guiding principles.

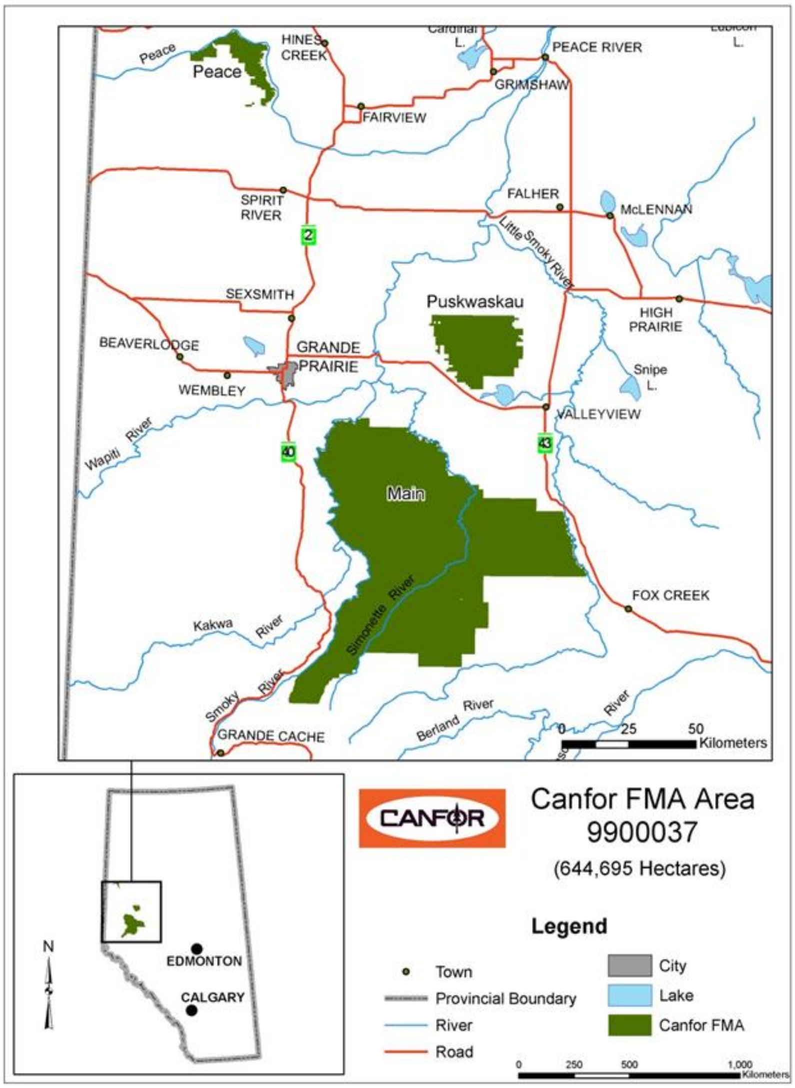

Figure 2: Grande Praire FMA Area Location Map

For the Grande Prairie FMA area, FMU G15, the FMP was developed in accordance with the Alberta Forest Management Planning Standard (April 2006, Version 4.1), which provides a guide for determining the contributing landbase available for timber harvesting.

Landbase assignment defines the landbase available for timber harvesting on the FMA area. This assignment is based on the forest management planning standard, operating ground rules, the most up-to-date landbase exclusions, and economic and technical considerations. The landbase assignment reflects the cooperation of three forest companies possessing timber rights within the FMA area: Canfor; Tolko Industries Ltd. (Tolko); and Ainsworth Engineered (Ainsworth) – now Norbord, and consultation with Alberta Environment and Sustainable Resource Development (AESRD).

The Landbase Assignment document was originally submitted May 30th, 2012 at which time the timber supply analysis was initiated. Due to delays resulting from the development of the Little Smoky and A La Peche Caribou Range Plan, the Landbase Assignment document was updated and re-submitted July 31st, 2014 (FMP Appendix F) and agreement in principle was received from AESRD on September 11th, 2014.

The Landbase Assignment document was updated and re-submitted July 31st, 2014 and includes the following updates from the 2012 version:

- The effective date of the analysis has been moved from May 1, 2010 to May 1, 2014. Harvested blocks to this date have been reflected and the inventory ages have been updated to 2014.
- In order to remove sliver polygons and reduce the fragmentation of the data set, seismic lines have been removed spatially from the data set. The area associated with seismic lines has been applied as a yield curve reduction based on the area occupied by seismic lines within each yield group.
- As part of a provincially sponsored Mountain Pine Beetle (MPB) Rehabilitation Research Program, previously planned cutblocks in the Peace Block that are no longer considered to be economically viable due to the effect of MPB have been identified as potential rehabilitation opportunities under this program. These blocks have been removed from the THLB.
- Consistent with updating the effective date of the analysis, landbase dispositions (DIDs) have been updated to May 1, 2014. The new DIDs layer has been spatially amalgamated with the existing clearings information from the AVI to produce a single clearings layer. The previous DIDs add-on step in the netdown has been modified to reference this new updated layer.

Agreement in Principle on the Landbase Assignment Document was received on September 11th, 2014. A few minor updates to the Landbase Assignment document have been made and a revised copy has been submitted concurrent with the FMP. Edits to the Landbase Assignment Document include:

- Additional clarification in the field descriptions in the data dictionary;
- Regeneration transitions (Table 3-8) have been updated to reflect vegetation management to enhance habitat value in the Caribou zones;
- Update Caribou Zone Table (Table 6-26); and
- Minor edits throughout.

Overall, the Grande Prairie FMA area covers 644,694 hectares, a reduction of 4,464 hectares from the 2003 FMP.

1.1 Process Overview

The Preferred Forest Management Scenario (PFMS) and the resulting annual allowable cut (AAC) reflect an amalgamation of information and direction from a number of different sources including government, licensees, First Nations and the public. Input from the various stakeholders in the process is reviewed, collated and assessed for inclusion in the PFMS.

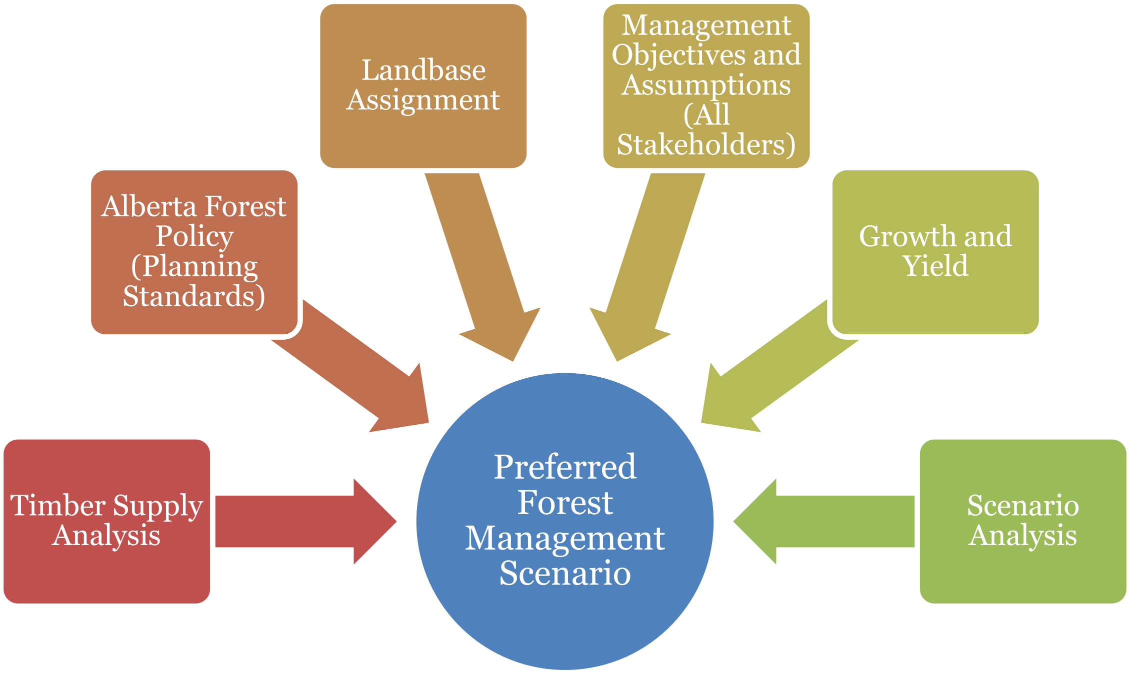

Figure 3: Process Overview

This document represents a component (Appendix J) of the Forest Management Plan and describes the modeling assumptions used in the timber supply analysis as well as the results and conclusions of the analysis. The Landbase Assignment document (FMP Appendix F) and the Growth and Yield document (FMP Appendix D and Appendix E) represent key components of this analysis.

1.2 Effective date

The effective date of the timber supply analysis is May 1, 2014. All datasets used in this document were considered up-to-date and correct as of the effective date. This includes updates for disturbances as well as deletions due to oil and gas and other developments. Please refer to the Landbase Assignment document for a complete accounting of these factors.

2.0 MODELLING ASSUMPTIONS AND INPUTS

The following sections detail the modelling assumptions and inputs used in the PFMS. The Risk and Sensitivity Analysis Section (Section 3.2.1) examines the impacts of variations to some of these assumptions.

2.1 Forest Inventory and Growing Stock

The Alberta Vegetation Inventory (AVI) is the primary dataset for assessing stand composition and volume across the FMA area. The AVI provides a continuous geo-spatial coverage over the three planning parcels: Peace, Puskwaskau, and Main.

The AVI for the Grande Prairie FMA area is current to May 1, 2010. The inventory updates were completed over a 2.5-year period (initiated in 2009 and completed in 2011); the final product was standardized to AVI version 2.1.1 specifications. This inventory has been updated for disturbances up to the effective date of May 1, 2014

The Resource Information Management Branch of AESRD audited the inventory and advised Canfor that the inventory meets the standards for an AVI as stated in the audit report of 08/09/2011 (Appendix A of the Landbase Assignment document). All AVI related information was supplied by GreenLink Forestry Inc.

Canfor's AVI was interpreted from 1:30,000 color IR aerial photography acquired over three years from 2006 to 2008 (Appendix A of the Landbase Assignment document). The southern portion of the main parcel was flown in the summer during leaf-on conditions. The remainder of the main parcel as well as the Puskwaskau and Peace parcel was flown in the spring during leaf-off conditions.

2.1.1 Deciduous Understory (Du) Stands

Deciduous-leading stands with a conifer understory are modelled as yield group 6 in the forest estate model. As described in section 2.8 of *Canfor's 2012 Forest Management Plan Growth and Yield Report*, yield group 6 is modelled differently depending on the conifer density class of the existing stand. Stands with a density class of 3 or 4 (100 to 500 conifer stems per hectare) are modeled as a DC stand and stands with density class of 5 to 7 (>500 conifer stems per hectare) are modelled as a CD stand. These stands are identified separately in the forest estate model and are transitioned post-harvest as described in Table 3.

Additionally, sections 2.2.4, 2.2.5, and 2.2.6 in the Landbase Assignment document briefly describe the coniferous understory (Du) identification methods and understory density classes that were used to define which yield group the stand was assigned.

2.1.2 Stand Age Update

The field [AGE_2014] is the final stand age used in the analysis. This age is based on the [STD_AGE] field from the AVI with the updates described below. [STD_AGE] reflects the 2010 stand age from the AVI. Section 3.3 in the Landbase Assignment document describes that [STD_AGE] was updated for all regenerated stands as follows [STD_AGE] = 2010 - [STD_ORIGIN]. For natural stands [STD_AGE] reflects the photo interpreted or field sampled stand age of the dominant forest layer. [STD_AGE] is derived from the origin of the oldest layer for combined stands, but for Du stands, [STD_AGE] is based on the origin of the coniferous understory in the AVI (if a third story was present then [STD_AGE] is based on the third story origin). This is the age used in the forest estate model and determines which stands contribute to forest cover constraints such as seral stage.

[AGE_2014] was updated as follows:

- [AGE_2014] = [STD_AGE] + 4
- [AGE_2014] = 2014 - [LOG_YEAR] WHERE [LOG_YEAR] between 2010 and 2015
- [AGE_2014] = 0 WHERE [AGE_2014] IS NULL

[LOG_YEAR] reflects an amalgamation of harvest dates from Canfor's harvest block update layer:

- [LOG_YEAR] = [SC_DATE]::integer/10000 WHERE [SC_DATE]::integer/10000>1899
- [LOG_YEAR] = 2015 WHERE [SC_DATE]::integer> 20140501 and [SC_DATE]::integer<20150000
- [LOG_YEAR] = [HS_DATE]::integer/10000 WHERE [SC_DATE]='18991230' and [HS_DATE]::integer>20140501
- [LOG_YEAR] = 2015 WHERE [SC_DATE]='18991230' and [HS_DATE]::integer>20140501 and [HS_DATE]::integer<=20150000

2.2 Forest Estate Model

Forest estate modelling was conducted using the spatially explicit optimization model Patchworks. Patchworks[1] 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 200 year planning horizon.

Optimization models such as Patchworks make harvest scheduling decisions based on achieving the best overall balance between competing objectives. Targets are established with threshold values and penalties for violating those objectives. In general, non-timber management objectives have very high penalties relative to harvesting targets to ensure that the model does not violate these objectives in favor of achieving harvest volume objectives. However in certain situations non-timber penalties were relaxed in order to achieve the desired outcome. These situations are described in detail in the sections below.

2.3 Timber Harvesting Landbase Definition

The Landbase Assignment document describes the process, data and assumptions used in defining the timber harvesting landbase (THLB). This process systematically removes area that is unlikely to support current or future timber harvesting activities. Table 1 provides a summary of the removals and the final THLB.

[1] *Patchworks version 1.3 was used in this analysis.*

Table 1: Summary of the FMA Area Netdown

Classification Type	Total (ha)[2]	Netdown Values (NDNAME)	Landbase Class
Total Gross Landbase (TGLB)	***644,694***		
Reductions to Non-forest:			
Natural Non-vegetated	9,378	NatNonVeg	X
Anthropogenic non-vegetated	5,298	AnthNonVeg	X
Anthropogenic vegetated	8,253	AnthVeg	X
Non-forest vegetated	19,472	NonForVeg	X
Clearings	7	Clearings	X
Total Non-forest Reductions:	**42,409**		**X**
Total Forested Landbase (TFLB):	***602,285***		***C***
Reductions to Forested Landbase:			C
Steep Slopes	11,759	SteepSlope	C
Gravesites	6	Grave	C
DRS	1,122	DRSDeletion	C
Parabolic Sand Dunes RPE	5,565	ParabolicSandDunes	C
Trumpeter Swan Buffers	3,164	Swan	C
Riparian Buffers	23,498	RiversBnd, RiversLakes, Streams	C
YG 13 Subjective Deletions	55,109	LowProd1	C
YG/TPR Subjective Deletions	2,777	LowProd2, LowProd3	C
Deciduous - A Overstory over No Understory	13,551	AoverNothing	C
Gravel Pits	389	GravelPits	C
Wildlife Licks	329	WildlifeLicks	C
Recreation Leases	190	RecLeases	C
Additional Clearings / DIDs	2,430	ClearingsDIDs	C
Not Satisfactorily Restocked	115	NSR	C
Rehabilitation Blocks	441	MPBRehab	C
Isolated Landbase	1,264	THLB_ISLAND	C
Total Forested Landbase Reductions:	**121,709**		**C**
Timber Harvesting Landbase (THLB):	***480,576***	***THLB***	***H***

2.3.1 Seismic Lines

Existing forest inventories do not include seismic lines as individual polygons, as the seismic line width is often less than the minimum width that can be captured digitally as a polygon. The Foothills Landscape Management Forum (FLMF) provided buffered seismic line data within the caribou management zone.

Outside the caribou management zone, lineal seismic lines were buffered based on photo measurement samples within the three main operating areas or parcels: Peace; Puskwaskau; and Main. One section per township from each of the operating areas was sampled and an average buffer width for each operating area was calculated. The calculated averages are: 5.3 m in the Peace, 5.5 m in Puskwaskau and 6.1m in Main. These buffers were applied to the lineal seismic line data and added to the resultant database.

Predictably, seismic areas account for a considerable amount of area and intersections across the FMA area. In order to better address the spatial validity of the blocking and sequencing process these areas

[2] *This table can be replicated in the SCHEDULE_B resultant by summarizing [AREA] / 10,000 and the [NDNAME] field.*

were removed from the landbase contributing to timber supply through an aspatial volume reduction as described in Section 2.4.1 below. As such, the reduction for existing seismic lines is not included in the netdown table above

2.4 Growth and Yield

The models, model inputs, and analytical procedures used to derive the yield tables for the Grande Prairie FMA area timber supply analysis are documented in the Canfor 2012 Forest Management Plan Growth and Yield Report (Ecora, 2012) (FMP Appendix D) and the Annex: Canfor 2012 Forest Management Plan Growth and Yield Report (Canfor, 2015) (FMP Appendix E). Canfor received a letter of agreement in principle from AESRD on October 1, 2012.

Yield curves were developed for 17 yield groups for the natural forested landbase, which were based on a modification of the 2003 FMP yield group stratification. The regenerating landbase was stratified into yield strata based on 3 cutblock assignment rules: pre-1991 cutblocks (R1), post-1991 cutblocks (R2) and future cutblocks (R3).

2.4.1 Seismic Lines

As described above, seismic lines were removed from the spatial data set and applied as a percent reduction to the yield curves. This process allows us to better address the spatial validity of the blocking and sequencing process and reduces the number of polygons to consider while ensuring that the timber supply impacts of these disturbances are accurately reflected in the analysis. Furthermore, this approach allows for the regeneration of seismic lines as adjacent areas are harvested and does so without unnecessarily fragmenting the resultant data set.

The 8,632 ha of THLB occupied by seismic lines has been addressed through yield curve reductions as shown in Table 2. These percent reductions have been applied to both the coniferous and deciduous component of each individual yield group

Table 2: Seismic Line Summary

Yield Group	THLB Area (ha)	Seismic Line Area (ha)	Percent Yield Curve Reduction (%)
CD-PlHw	1,202	15	0%
CD-SwHw	7,286	85	1%
C-Pl	18,558	145	1%
C-Sb	1,414	5	1%
C-Sw	17,817	156	0%
DC-HwSx	1,521	7	1%
D-Hw	4,135	9	0%
NAT-1	6,149	102	0%
NAT-10	14,862	371	0%
NAT-11	20,178	350	2%
NAT-12	11,688	279	2%
NAT-14	0	0	2%
NAT-15	19,750	527	2%
NAT-16	21,875	354	2%
NAT-17	19,627	339	3%
NAT-2	27,841	436	2%
NAT-3	74,680	1,305	2%
NAT-4	3,426	64	2%
NAT-5	7,955	204	2%
NAT-6	95,925	1,857	2%
NAT-7	13,804	206	2%
NAT-8	27,919	619	3%
NAT-9	17,467	379	2%
Total	**480,576**	**8,632**	**1%**

2.4.2 Transitions

Canfor's yield group transitions (Table 3) describes the regeneration transition of the natural stand yield groups (1-17) to the regenerated strata. This table has been updated to reflect vegetation management to enhance caribou habitat within the caribou habitat zones.

Table 3: Yield Group Transitions

Natural Yield Group		Regenerated Stratum		Caribou Management Area	
Code	Description	Base	Genetic	Base	Genetic
1	AW+(S)-AB	D-Hw1-B		D-Hw1-B	
2	AW+(S)-CD	D-Hw2-B		D-Hw2-B	
3	AW/SW/PBSW/BWSW	DC-HwSx-B	DC-HwSx-G	C-Sw-B	C-Sw-G
4	BW/BWAW+(S)	D-Hw4-B		D-Hw4-B	
5	FB+OTH	C-Sw-B	C-Sw-G	C-Sw-B	C-Sw-G
6	H+(S)/S	CD-SwHw-B/ DC-HwSx-B	CD-SwHw-G/ DC-HwSx-G	C-Sw-B	C-Sw-G
7	PB+(S)	D-Hw7-B		D-Hw7-B	
8	PL/PLFB+(H)	C-Pl-B	C-Pl-G	C-Pl-B	C-Pl-G
9	PLAW/AWPL	CD-PlHw-B		C-Pl-B	C-Pl-G
10	PLSB+OTH	C-Pl-B	C-Pl-G	C-Pl-B	C-Pl-G
11	PLSW/SWPL+(H)	C-Pl-B	C-Pl-G/C-Sw-G	C-Pl-B	C-Pl-G/C-Sw-G
12	SBLT(G)	C-Sb-B		C-Sb-B	
13	SBLT/LTSB(M/F/U)	removed from landbase			
14	SBPL/SBSW/SBFB	C-Sb-B	C-Pl-G/C-Sw-G	C-Sb-B	C-Pl-G/C-Sw-G
15	SW/SWFB+(H)-AB	C-Sw-B	C-Sw-G	C-Sw-B	C-Sw-G
16	SW/SWFB+(H)-CD	C-Sw-B	C-Sw-G	C-Sw-B	C-Sw-G
17	SWAW/SWAWPL	CD-SwHw-B	CD-SwHw-G	C-Sw-B	C-Sw-G

Yield group 6 represents deciduous stands with an understory of coniferous (Du). As described in section 2.1.1 above and section 2.8 of *Canfor's 2012 Forest Management Plan Growth and Yield Report*, yield group 6 is modelled differently depending on the conifer density class of the existing stand. Du stands are identified separately in the forest estate model and are transitioned post-harvest as described in Table 3 above.

2.4.3 Mortality

There are no explicit stand mortality or natural succession assumptions built into the forest estate model. Stands remain on their existing yield curve until they are harvested.

2.4.4 Genetically Improved Stock

Yield curves were generated for all yield groups both with and without the application of genetically improved stock. This enabled an analysis of the impacts of using genetically improved stock in regenerating stands. Through this process it was determined that there would be a shortage of genetically improved pine seed in the foreseeable future. Based on this, genetically improved stock was applied to all future managed stands with the exception of yield group 9 as shown in Table 3 above. By not applying genetically improved stock in yield group 9 it is anticipated that the remaining pine stocking requirements can be met. The reforestation strategy (FMP Appendix G) contains further information on the use of genetically improved stock on the FMA area.

2.5 Mountain Pine Beetle Strategy

Canfor's current Healthy Pine Strategy (HPS) assumes no mortality or loss of MPB-affected stands. Canfor has made significant progress in implementing the HPS and through this has managed to drastically limit the spread of MPB throughout the FMA area. Harvest levels have kept pace with the expansion of the MPB infestation such that all stands are harvested before they become un-merchantable. Canfor intends to continue with this MPB strategy and will meet the objectives of the planning standard.

Based on Canfor's yearly flights there are few stands that have been completely killed by MPB; where there are MPB infestations the percentage of dead pine is very sporadic, thus it's difficult to apply one standard that fits for all pine stands across the FMA area.

This plan reflects Canfor's continued commitment to implement the HPS approach and target the removal of 75% of the volume from susceptible merchantable stands as defined below. Canfor continues to utilize MPB-affected volume.

Based on this, the PFMS includes a target to harvest 75% of the susceptible pine volume over the first 10 years of the planning horizon and will not include any mortality assumptions resulting from MPB.

2.5.1 MPB Harvest Priority Ranking Definition

Harvest priority rankings are used to determine the volume of timber that exists in susceptible stands and reflects a combination of stand susceptibility and economic criteria that influence priorities for harvesting stands affected by mountain pine beetle (MPB). Harvest priority rankings range between 0 and 10 and reflect a combination of yield group, pine percent, height, density class and piece size as shown in Table 4 and Table 5. Basic harvest priority is calculated according to the criteria in Table 4. These values are then adjusted according to the piece size criteria in Table 5. Harvest priority rankings are used to identify and target 75% of the susceptible volume over the first 10 years of the planning horizon. Susceptible volume is defined as the volume in stands with a harvest priority ranking > 0.

Overall, stands with the following criteria are given a harvest priority of 0 regardless of the other attributes of a stand:

- Stand height less than 16m;
- Density class 'A';
- Pine percent in all layers less than 30;
- Conifer piece size less than 0.20 m^3 / tree;
- Yield group not in 8, 9, 10, 11 and 14 (pine types); and
- Stands with a harvest year between 2010 and 2014.

Table 4: Basic Harvest Priority Ranking

Yield Group	Height	Density Class	Pine Percentage (%)	Piece Size (m^3/tree)	Yield Group Priority	Height Priority	Harvest Priority
all	<16	all	all	all	0	0	0
all	all	A	all	all	0	0	0
all	all	all	<30	all	0	0	0
all	all	all	all	<0.2	0	0	0
not in (8,9,10,11,14)	all	all	all	all	0	0	0
8	16 to 19	D	>=30	all	4	1	0
	16 to 19	B, C,	>=30	all	4	1	5
	>19	B, C, D	>=30	all	4	2	6
9	16 to 19	B, C, D	>=30	all	3	1	4
	>=19	B, C, D	>=30	all	3	2	5
10	16 to 19	D	>=30	all	2	1	0
	16 to 19	B, C,	>=30	all	2	1	3
	>19	B, C, D	>=30	all	2	2	4
11	16 to 19	B, C, D	>=30	all	3	1	4
	>=19	B, C, D	>=30	all	3	2	5
14	16 to 19	D	>=30	all	1	1	0
	16 to 19	B, C,	>=30	all	1	1	2
	>19	B, C, D	>=30	all	1	2	3

Table 5: Piece Size Add On

Piece Size Range (m^3/tree)	Rank Add On
<0.20	set to 0
0.20 to < 0.22	0
0.22 to < 0.3	1
0.30 to < 0.40	2
0.40 to < 0.50	3
>=0.50	4

2.6 Minimum Harvest Age Criteria

Minimum harvest age (MHA) criteria define the youngest age at which the model is permitted to harvest a stand and is used to prevent the model from harvesting stands before they are economically viable. In scheduling stands, the model will select harvest ages that best achieve the overall objectives, but will never harvest a stand that is younger than the MHA. Minimum harvest ages are defined for each unique yield group in the model and for this analysis utilize a combination of piece size, age and volume criteria depending on the broad cover type as shown in Table 6. The MHA for a yield group is the youngest age at which all of the criteria from Table 6 are met.

Table 6: Minimum Harvest Age Criteria

Broad Cover Group	Yield Groups[3]	Age (yrs)	Minimum Conifer Volume (m^3/ha)	Minimum Conifer Piece Size (m^3/tree)
C	r0_05_b, r0_05_g, r0_08_b, r0_08_g, **r0_09_b, r0_09_g**, r0_10_b, r0_10_g, r0_11_b, r0_11_pl_g, r0_11_sw_g, r0_12_b, r0_14_pl_g, r0_14_sb_b, r0_14_sw_g, r0_15_b, r0_15_g, r0_16_b, r0_16_g, r1_05_b, r1_05_g, r1_08_b, r1_08_g, r1_10_b, r1_10_g, r1_11_b, r1_11_pl_g, r1_11_sw_g, r1_12_b, r1_14_pl_g, r1_14_sb_b, r1_14_sw_g, r1_15_b, r1_15_g, r1_16_b, r1_16_g, r2_c_pl_b, r2_c_pl_g, r2_c_sb_b, r2_c_sw_b, r2_c_sw_g, r2_c_pl_b_nsr, r2_c_pl_g_nsr, r2_c_sw_b_nsr, r2_c_sw_g_nsr, r3_c_pl_b, r3_c_pl_g, r3_c_sb_b, r3_c_sw_b, r3_c_sw_g	N/A	100	0.22
CD	r0_17_b, r0_17_g, r1_17_b, r1_17_g, r2_cd_plhw2_b, r2_cd_plhw2_b_nsr, r2_cd_plhw_b, r2_cd_swhw_b, r2_cd_swhw_g, r2_cd_plhw2_b_nsr, r2_cd_swhw_g_nsr, r3_cd_plhw_b, r3_cd_swhw_b, r3_cd_swhw_g	100	N/A	0.22
DC	r0_03_b, r0_03_g, r1_03_b, r1_03_g, r1_09_b, r1_09_g, r2_dc_hwsx_g, r3_dc_hwsx_b, r3_dc_hwsx_g,	100	N/A	0.22
D	r0_01_b, r0_02_b, r0_04_b, r0_07_b, r1_01_b, r1_02_b, r1_04_b, r1_07_b, r2_d_hw_b, r2_d_hw_b_nsr, r3_d_hw1_b, r3_d_hw2_b, r3_d_hw4_b, r3_d_hw7_b	60	N/A	N/A
Du	r0_06_cd_b, r0_06_cd_g, r0_06_dc_b, r0_06_dc_g, r1_06_cd_b, r1_06_cd_g, r1_06_dc_g,	100	N/A	0.22

Due to the many other objectives in the model, actual average harvest ages are generally higher than the minimums as the model seeks to optimize the long-term productivity of the land base and harvest close to the biological rotation age of the stands. Section 3.1 includes a description of the actual average harvest age for the PFMS confirming this fact.

2.7 Deciduous Reconciliation Volume

Deciduous harvest volumes on the FMA area over the last five to 10 years have been considerably lower than the deciduous volume allocation. Tolko and Norbord have both identified an underutilization of their allocated volumes from their last quadrants. Tolko identified a significant amount of reconciliation volume due to the fact that they have not been operating since 2008 and that they would like the volume to be reconciled over a ten-year period. Based on this the deciduous licensees have applied to reconcile some of the unutilized allocation forward into the first 10 years of the planning horizon. AESRD directed the companies to model the reconciliation volume in the FMP timber supply analysis to ensure that it did not impact long-term deciduous or coniferous harvest levels.

Initial timber supply scenarios proved that reconciling the full amount of underutilized volume over a ten-year period did affect the long-term sustainable levels. Through the modeling exercise, a maximum

[3] *09 yield groups have been moved to the 'C' MHA criteria based on the high percentage of pine within this yield group.*

reconciliation volume was identified in which Norbord and Tolko split proportionally based on their approved deciduous timber allocations.

Based on this the model targets 565,000 m^3/yr of deciduous volume over the first 10 years of the planning horizon. After 10 years the deciduous harvest drops down to a long-term sustainable even flow level.

2.8 Harvest Deferrals

Harvesting in CD and DC stands is deferred for the first 10 years of the planning horizon. Harvesting in Du stands is deferred for the first 20 years of the planning horizon. These are set up as softer targets in the model whereby the model may violate these objectives in favor of maintaining timber supply. The amount of harvest in CD, DC and Du stands in the PFMS has been reviewed by the licensees and deemed to be reasonable. These deferrals reflect licensee current plans with respect to harvesting in these stand types and support the implementation of the MPB harvest priorities.

Additionally, through an operational review of preliminary modeling results a number of blocks were being scheduled in long, narrow mature THLB stands adjacent to existing recent harvesting. A review of these stands indicate that these generally occurred in areas where block boundaries did not extend all the way up to riparian buffers, leaving a strip of mature timber as shown in the pink polygons in Figure 4 below. These isolated patches of THLB were identified by selecting mature forest adjacent to recent cutblocks with a perimeter to area ratio greater than 25 and deferring these areas for one rotation (70 years) under the assumption that they will be available for harvest in subsequent rotations. Overall approximately 7,000 ha of THLB was deferred.

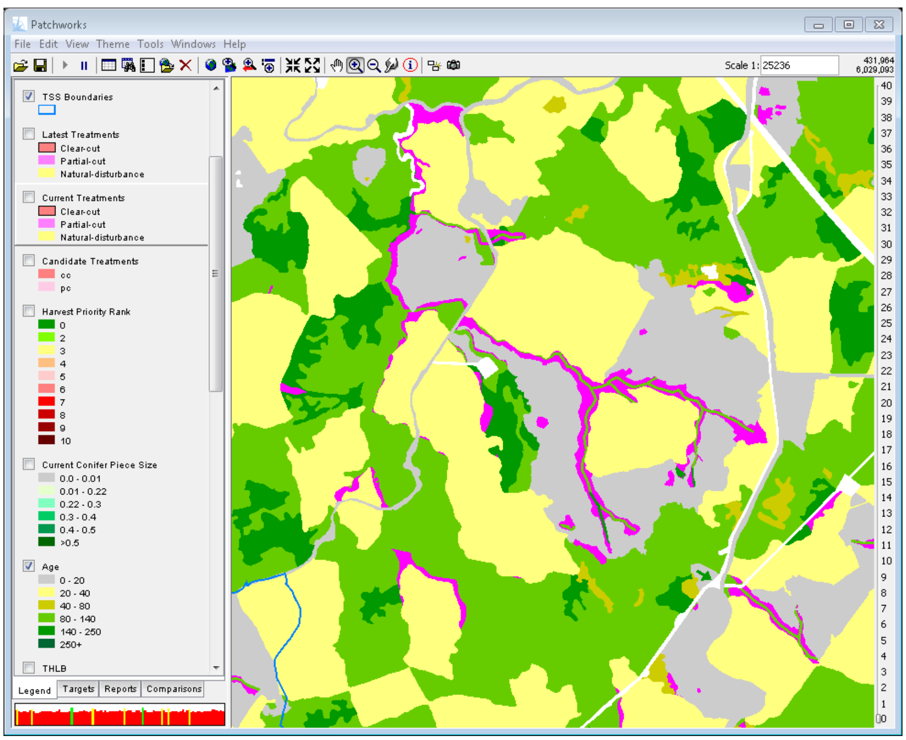

Figure 4: Isolated Patches

2.9 Harvest Flow Objectives

Harvest flow objectives refer to the limitations placed on how the model may allocate harvest volume from period to period and whether harvest volumes may increase or decrease from period to period or whether they must stay constant (even flow). Much of the analysis carried out through the development of the PFMS utilized a soft even flow constraint where the model targeted a specific harvest level but was allowed to deviate slightly from that target from period to period. However, a much harder even flow constraint was applied for the final PFMS whereby a target harvest level was selected such that the model deviated only slightly from that level throughout the planning horizon. This ensures that the PFMS meets the planning standard requirement 5.8 whereby the harvest flow cannot vary from the planning horizon average by more than +/-5%. Many of the scenarios tested, as well as the final PFMS include the deciduous reconciliation volumes discussed above. This results in a target of 565,000 m^3/yr of deciduous volume over the first 10 years of the planning horizon. Even flow targets for deciduous apply once the 10 year reconciliation period has ended.

2.10 Operational Considerations

Through an operational review of the of preliminary harvest schedules, a series of operational objectives were applied in order to group harvesting activities within certain timber supply subunits through a particular period of time. These were accomplished by restricting or eliminating harvesting activities within particular timber supply subunits in particular periods as shown in Table 7. In some timber supply subunits only annual operating plan (AOP) volumes were permitted. The model was allowed to schedule harvesting in all of the green-shaded cells while harvesting was restricted in the red-shaded cells. These access constraints were developed over several iterations of the spatial harvest sequence where the timber supply impacts were assessed for each iteration. Access constraints were designed to minimize any timber supply impact.

Table 7: Timber Supply Sub-Unit – Operational Access Restrictions

Timber Supply Sub-Unit	Conifer Harvest Access By Period				Deciduous Harvest Access By Period			
	1	2	3	4	1	2	3	4
Bolt-1	AOP	OFF						
Bolt-2								
Bolt-3	AOP	OFF						
Bolt-4			OFF	OFF				
Bolt-5			OFF	OFF				
Bolt-6			OFF	OFF				
Bolt-7			OFF	OFF				
DN-1								
DN-2			OFF	OFF				
DN-3			OFF	OFF				
DN-4								
DN-5-								
DN-6			OFF	OFF				
DN-7	OFF	OFF						
DN-8			OFF	OFF				
DN-9			OFF	OFF				
DS-1								
DS-2								
DS-3								
DS-4								
DS-5								
DS-6								
DS-7								
EN-1								

Timber Supply Sub-Unit	Conifer Harvest Access By Period 1	2	3	4	Deciduous Harvest Access By Period 1	2	3	4
EN-2								
EN-3							OFF	OFF
EN-4								
EN-5	OFF	OFF						
EN-6								
EN-7	OFF	OFF					OFF	OFF
ES-1								
ES-2								
ES-3								
ES-4			OFF	OFF				
ES-5			OFF	OFF	OFF	OFF		
LN-1	OFF	OFF					OFF	OFF
LN-2	OFF	OFF					OFF	OFF
LN-3	OFF	OFF					OFF	OFF
LS-1								
LS-2								
LS-3	OFF	OFF						
LS-4								
LS-5	OFF	OFF						
Peace-1			OFF	OFF	OFF	OFF		
Peace-2			OFF	OFF	OFF	OFF		
Pusk-E		OFF						
Pusk-W		OFF						
SIM-1	OFF	OFF					OFF	OFF
SIM-2							OFF	OFF
SIM-3							OFF	OFF
Sim-4							OFF	OFF
SM-1	AOP	OFF						
SM-2								
SM-3			OFF	OFF				
SM-4	OFF	OFF						
SM-5	AOP	OFF						
SM-6								
SM-7								
SM-8			OFF	OFF				
Wask-1	OFF	OFF						
Wask-2	OFF	OFF						
Wask-3	OFF	OFF						

2.11 Block Size Requirements

Cutblock size targets have been applied in the forest estate model in an attempt to create a distribution of cut block sizes that are more consistent with operational targets regarding cutblock size. This was achieved through the harvest deferrals discussed above as well as through the application of three different cut block size targets:

- No cutblocks < 5ha in size for the first 20 years of the planning horizon. This target was given a relatively high weight but the model was allowed to create a small number of cut blocks smaller than 5ha which is consistent with current operations. The results section provides a description of the area and number of cutblocks by size class.
- A maximum of 120 cutblocks per year between 5 and 10 ha. This target was given a high weight for the first 20 years and was relaxed for the remainder of the planning horizon.

- A maximum of 20 cutblocks per year between 10 and 30 ha. This target was given a high weight for the first 20 years and was relaxed for the remainder of the planning horizon.

These targets are applied in addition to the patch size targets discussed below and the model must create openings that work to achieve both objectives.

2.12 Non-Timber Objectives

The following sections describe the non-timber objectives that were considered and applied in the model.

2.12.1 Seral Stage

Seral stage targets are based on the natural range of variation (NRV) and the assumption that all native species and ecological processes are more likely to be maintained if managed forests are made to resemble forests created by natural disturbance agents, such as wildfires and wind. If anthropocentric disturbance regimes mimic naturally occurring disturbances we are more likely to achieve biodiversity objectives over the long-term.

Historically in Alberta, the Boreal and Foothills Natural Regions experienced frequent wildfires that ranged in size from small spot fires to large fires covering thousands of hectares. Natural burns generally contained unburned patches of forest, which result in a landscape of even-aged regenerating stands containing older patches of remnant forest. The implementation of a fire suppression policy circa 1950, timber harvesting and other industrial activities all had an impact on the makeup of the forest in the FMA area. Effective fire suppression within Canfor's FMA area resulted in an average annual burn rate of 12.5 ha/year between 1986-2000 (Canfor, 2001).

In the initial timber supply runs, seral stage targets were taken from the last timber supply analysis and were based on work completed by Olympic Resource Management (ORM, 2000). This work tied seral stage targets to the seral stage distributions resulting from historic natural disturbance regimes based on a fire return interval of 40 years for the Boreal Natural Region and 60 years for the Foothills Natural Region.

In a review of these assumptions AESRD staff suggested that these FRI values may be too low to reasonably reflect the pre-suppression natural fire regimes for these areas. Based on this feedback Canfor undertook a separate analysis of the effects of different fire return intervals on seral stage targets using the Spatially Explicit Landscape Event Simulator (SELES) model.

The Spatially Explicit Landscape Event Simulator (SELES) model was used to investigate the effect of natural disturbances and succession on the landbase. The model tests hypotheses about landscape dynamics and characterizes natural disturbance regimes in order to determine the natural range of variability of forest seral stage distributions and supports the development of seral stage targets for the timber supply analysis. The following describes the process used to determine the seral stage distribution for the FMA area under historic natural disturbance regimes.

SELES Model Development

A literature review was completed as well as consultation completed with natural disturbance expert Craig Delong in order to determine natural disturbance regimes for both the Boreal and Foothills Natural Regions. Multiple iterations of the SELES model were run with 1,000 one-year intervals for each landscape. These resulted in a mean fire return interval containing a confidence interval that provided a maximum and minimum natural range of variation for the five seral stages including Pioneer, Young, Mature, Over Mature, and Old.

The SELES model was developed using the timber supply analysis dataset and was converted into ASCII files for the 3 fields of interest: age, species, and yield group. The model includes 2 landscape events: succession and fire. The succession event ages each forested stand each year with no limits for maximum stand age or species change over time. The fire event is dependent on user-defined inputs: average fire size, fire cycle or FRI, and mean fires per year (Table 8). It was not dependent on any other variables such as aspect, elevation or species. Mean fire size was sourced from relevant literature for the area and the formula to calculate mean fires per year was sourced from the 'v5_fire2' fire model.

Mean Fires Per Yr = Forest Size / (FireCycle * MeanFireSize)

Table 8: SELES Fire Input Assumptions

Ecozone	Parcel	Forest Size (ha)	Mean Fire Size (ha)	Fire Cycle (yrs)	Mean Fires Per Yr (calculated using above equation)
Boreal	Pusk	64,756	10	40, 60, 80	162, 108, 81
Lower Foothills	Main_f	293,470	20	60, 80, 100	245, 183, 147

For each ecozone / fire cycle combination, 20 - 1,000 year iterations were run to determine summary statistics for seral stage distributions (minimum, maximum, median, mean, and standard deviation). The impact on timber supply was examined by using alternative percentage values for each seral stage age range.

Seral Stage Definitions

The five seral stage categories identified in Table 9 have defined age ranges depending on the yield group to which a stand belongs. These age ranges reflect total stand age and have been adjusted from previous analyses to include the years to breast height and to be consistent with the yield curves used in the forest estate model. These seral stage ranges were used to summarize the results of the fire return interval modelling.

Table 9: Seral Stage Age Ranges by Yield Group

Yield Group	Species	Pioneer	Young	Mature	O. Mature	Old	Years to BH
1	AW	0-6	7-26	27-76	77-116	117+	6
2	AW	0-6	7-26	27-76	77-116	117+	6
3	SW	0-15	16-55	56-95	96-135	136+	15
4	BW	0-6	7-26	27-76	77-116	117+	6
5	FB	0-15	16-55	56-115	116-135	136+	15
6	SW	0-15	16-55	56-95	96-135	136+	15
7	PB	0-6	7-26	27-86	87-116	117+	6
8	PL	0-10	11-50	51-90	91-130	131+	10
9	PL	0-10	11-40	41-80	81-130	131+	10
10	PL	0-10	11-50	51-100	101-130	131+	10
11	PL	0-10	11-50	51-100	101-130	131+	10
12	SB	0-20	21-70	71-150	151-170	171+	20
13	SB	0-20	21-70	71-160	161-180	181+	20
14	SB	0-20	21-60	61-120	121-150	151+	20
15	SW	0-15	16-55	56-105	106-135	136+	15
16	SW	0-15	16-55	56-105	106-135	136+	15
17	SW	0-15	16-55	56-105	106-135	136+	15

SELES Results

The mean percentages in each seral stage from the SELES runs are shown in Figure 5. As FRI increases, the percentage in older seral stages also increases. For the Boreal Natural Region, the average percentage in old seral forest varies from 5%, 12% and 21% for FRIs of 40, 60 and 80 years. In the Foothills Natural Region, the average percentage in old seral forest varies from 10%, 18% and 26% for FRIs of 60, 80 and 100 years.

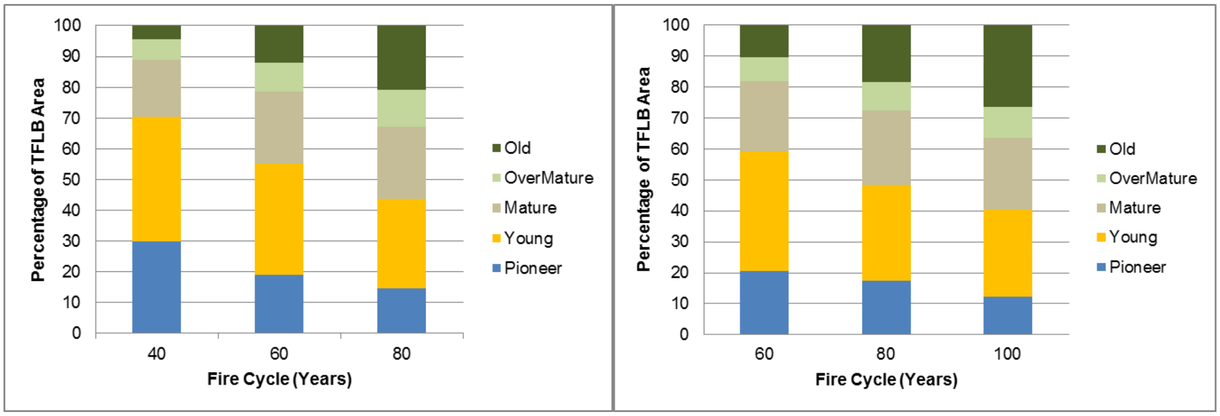

Figure 5: Comparison of Mean Values by FRI Boreal (LHS) and Foothills (RHS) Natural Regions

Each set of SELES runs also have minimum and maximum values around the mean as shown graphically in Figure 6 for the Boreal Natural Region FRI 60 years and Foothills Natural Region FRI 80 years runs.

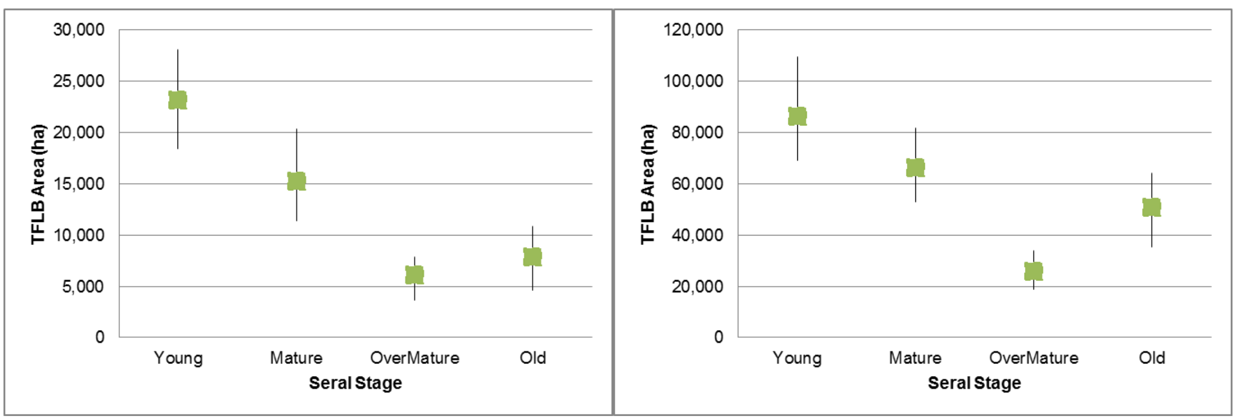

Figure 6: Minimum, Mean and Maximum Area for Boreal FRI 60yrs (LHS) and Foothills FRI 80yrs (RHS) Natural Regions

The seral stage targets used in the last FMP analysis were based on a 40 year FRI in the Boreal Natural Region and 60 years FRI in the Foothills Natural Region. The seral stage distributions used in the last FMP analysis are similar to the corresponding mean FRI values from this SELES analysis suggesting that this approach is consistent with the previous approach. Feedback on these targets suggests that these FRIs may be too low, as a lower FRI indicates more frequent fires on the landbase, which creates less old seral forest. Based on this feedback we have increased the seral stage targets to reflect an FRI of 60 years in the Boreal Natural Region and 80 years in the Foothills Natural Region.

Table 10 summarizes the mean percentages by seral stage from the SELES runs compared to the current targets.

Table 10: Application of SELES Results to Seral Stage Targets

Seral Stage	Current Targets (FRI@40)	Mean FRI (Years) 40	60	80	Low Range NRV FRI (Years) 40	60	80	High Range NRV FRI (Years) 40	60	80	Proposed Change (%)
Boreal Natural Region											
Pioneer	22	30	19	14	41	28	23	21	13	11	-3
Young	44	40	36	29	51	43	35	30	28	23	-8
Mature	25	19	24	24	15	18	17	24	31	26	-2
Over Mature	5	7	9	12	4	6	10	11	12	14	4
Old	4	5	12	21	2	7	16	8	17	27	8

Seral Stage	Current Targets (FRI@40)	Mean FRI (Years) 60	80	100	(Low Range NRV) FRI (Years) 60	80	100	(High Range NRV) FRI (Years) 60	80	100	Proposed Change (%)
Foothills Natural Region											
Pioneer	15	21	17	12	30	28	18	13	9	8	2
Young	42	39	31	28	48	39	34	31	25	19	-11
Mature	25	23	24	23	17	19	18	28	29	30	-1
Over Mature	7	8	9	10	5	7	7	11	12	13	2
Old	10	10	18	26	8	13	23	14	23	31	8

The mean percentages in each seral stage from each FRI have been implemented in *Patchworks* to investigate the timber supply impact. Also summarized in the table are 'low range NRV' and 'high range NRV' percentages that are a combination of maximum and minimum percentages. In the case of low range NRV, maximum percentages are used for pioneer and young stands and the minimum percentages for mature, over mature and old stands. For high range NRV, minimum percentages for pioneer and young were used and maximum percentages for mature, over mature, and old were used.

Results of this analysis demonstrates that the application of maximum and mean NRV values both have significant impacts on timber supply with minimum levels of old seral being the most constraining factor. This stands to reason based on how old seral targets are modelled within Patchworks where minimum values are set and the model will not allow landscape old seral levels to fall below that minimum. By applying mean and maximum NRV values from the SELES analysis as minimums in the timber supply analysis we are saying that over the 200 year planning horizon old values can never fall below the maximum or mean NRV values and that the landscape will never experience the full range of NRV. By applying the minimums of the NRV from SELES as minimums in the Patchworks model we achieve results that are closer to the NRV.

Within the Boreal Natural Region the application of minimum values in the model resulted in an old seral distribution that was closer to the NRV with no further modifications to the targets required.

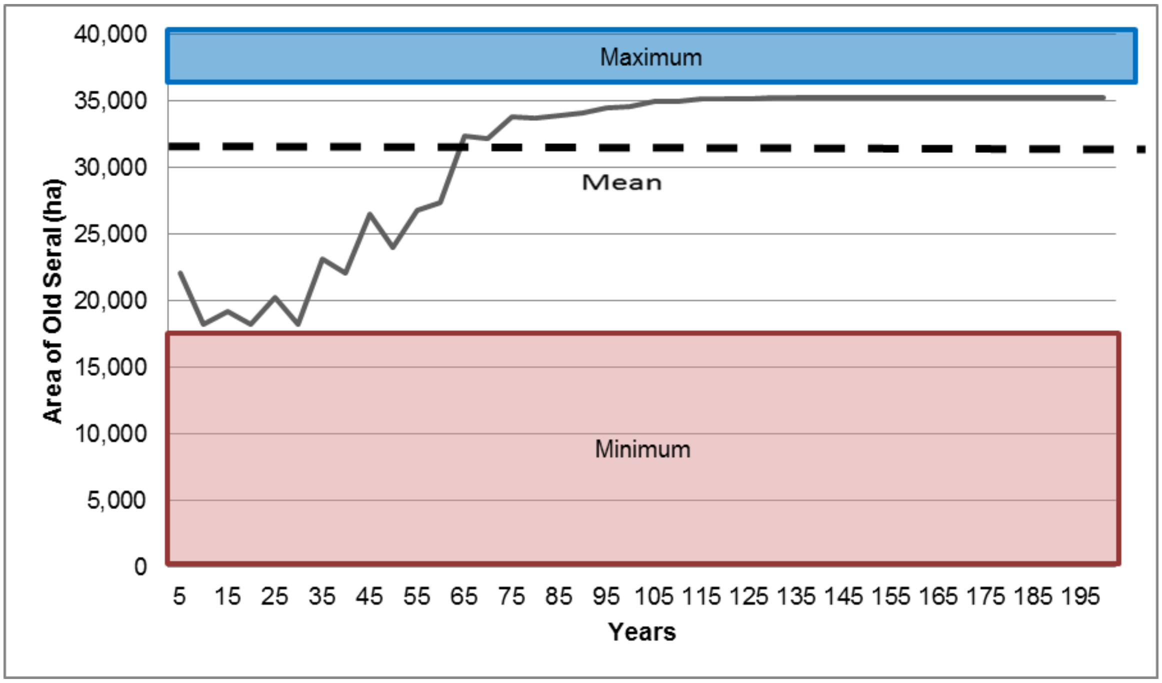

Figure 7: Boreal Natural Region Old Seral Target

However, within in the Foothills Natural Region, old seral levels trended towards the minimum values for the majority of the 200-year planning horizon. In order to create a distribution of old seral values closer to the NRV, the old seral targets were adjusted to be at the mean values but the model was allowed to violate these constraints while always attempting to minimize these violations. This resulted in old seral values closer to the mean but still not high enough. The penalty weight associated with this target was further increased leading to the *mean NRV (relaxed V2)* scenario, which resulted in old seral values closer to the NRV.

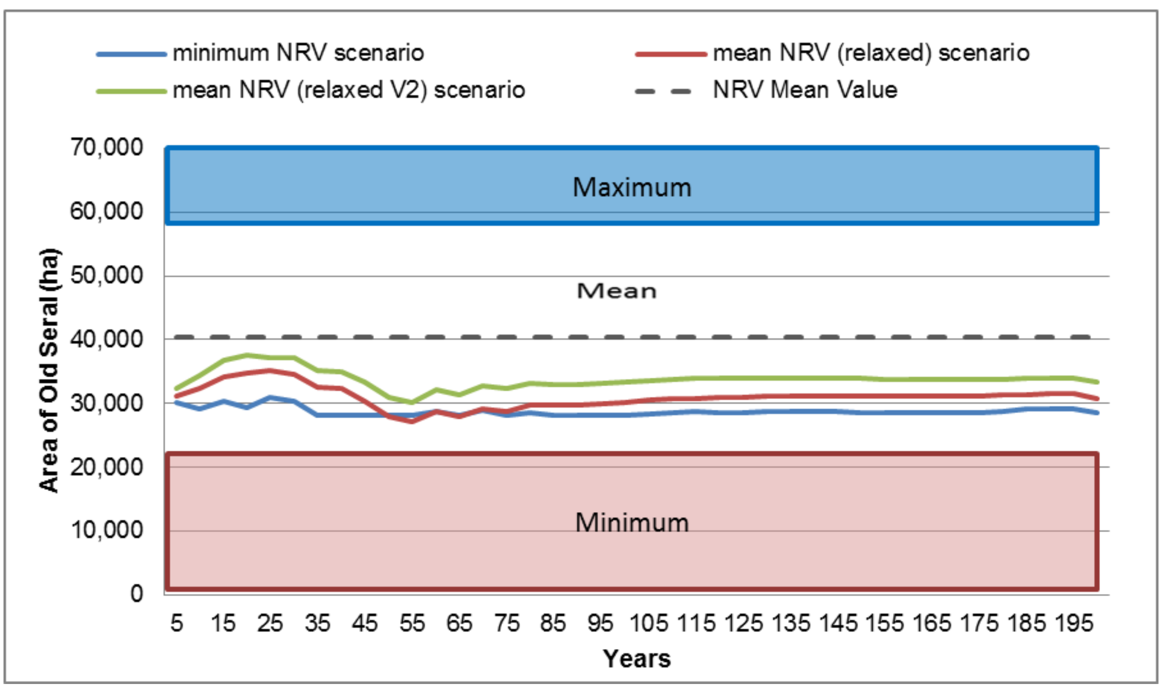

Figure 8: Foothills Natural Region Old Seral Target

2.12.2 Patch Size Objectives

Patch size objectives in the model seek to achieve both the AESRD planning standard requirements for patch size as well as Canfor's SFMP commitments around patch size objectives. The patch size targets shown in Table 11 have been developed for the FMA area as part of Canfor's SFMP requirements and are and monitored through that process. These targets were developed based on an adjacent distance[4] of 40m. The planning standard specifies an adjacent distance of 8m is to be used in assessing patch size objectives however this distance is inconsistent with how the targets for the land base have been developed.

Table 11: SFMP Patch Targets Based on a 40m Adjacent Distance

Reporting Areas	Percent by Area					
	1–100 ha		100–500 ha		500+ ha	
	LL	UL	LL	UL	LL	UL
FMA Area	10	16	14	25	53	82
Peace	14	23	13	25	52	73
Puskwaskau	14	23	13	25	52	73
Main	9	15	14	25	53	83
Notes:						
LL= Lower Limit; UL= Upper Limit						

This concern was discussed with AESRD and the following clarification was provided:

- Planning standard patch size targets were never intended to impact timber supply but rather should be used as a tool to decrease fragmentation on the land base over the long-term.
- The 8m adjacency rule is not intended as a hard and fast rule but is intended to ensure that seismic lines do not break up patches but other anthropocentric linear disturbances (pipe lines, roads etc.) do.
- Canfor has SFMP commitments to meet patch size targets based on a 40m adjacency rule.

Based on the above points we have applied patch targets using a 40m adjacency rule. The model makes harvest scheduling decisions in an attempt to trend towards SFMP-based patch size targets. These targets are applied as soft constraints whereby the model seeks to trend towards achieving these targets in the future. In order to meet the planning standard requirements we have also produced a report on the patch size distribution targets using an 8m adjacency rule. As discussed and agreed by AESRD, this will fulfill the planning standard requirements around young patch size distribution and green-up constraints.

2.12.3 Watershed Resources

The protection of watershed resources involves management for both water yield and water quality. Equivalent clearcut area[5] (ECA) is a measure of the amount of area disturbed within a watershed multiplied by (1 – the *hydrological recovery* factor). ECA modelling in this analysis was originally carried out according to the procedure outlined in the AESRD document titled *The Equivalent Clearcut Area*

[4] *The adjacent distance refers to the maximum distance between two polygons that can be considered part of the same patch. With a 40m adjacent distance, two polygons of that are both less than 20 years of age that are 39m apart can be considered part of the same patch. If these two polygons are 41m apart they are considered two separate (and smaller) patches. The ESRD Planning Standard specifies that an adjacent distance of 8m must be used in assessing patch size distribution.*

Method of Watershed Assessment for Forest Management Plans (2011). This document equates hydrological recovery to the percent of the culmination mean annual increment (MAI) that a stand has achieved where full recovery is achieved. For example if a 100 ha block with a culmination MAI of 4.2 m^3/ha/yr has regenerated and has a mean annual increment of 3.4 m^3/ha/yr this stand would have an ECA of 19.04 ha or 17% of the original block area (100 ha * (1 – (3.4 m^3/ha/yr / 4.2 m^3/ha/yr)). Once a stand achieves full hydrological recovery at culmination the stand continues to grow in a fully recovered state even though the MAI falls below culmination MAI.

However, in reviewing this approach, many stands were taking a considerable amount of time to achieve full recovery and this was resulting in significant timber supply impacts when ECA constraints were enforced. Following a review of these results an alternative approach was provided by AESRD that utilized the culmination of current annual increment (CAI) using gross biological volumes as a measure of hydrological recovery. Figure 9 shows a comparison of the two approaches for the r3_SX curves. In this example the stand achieves full recovery at age 51 using the CAI approach. Using the MAI approach this stand does not achieve full recovery until age 102.

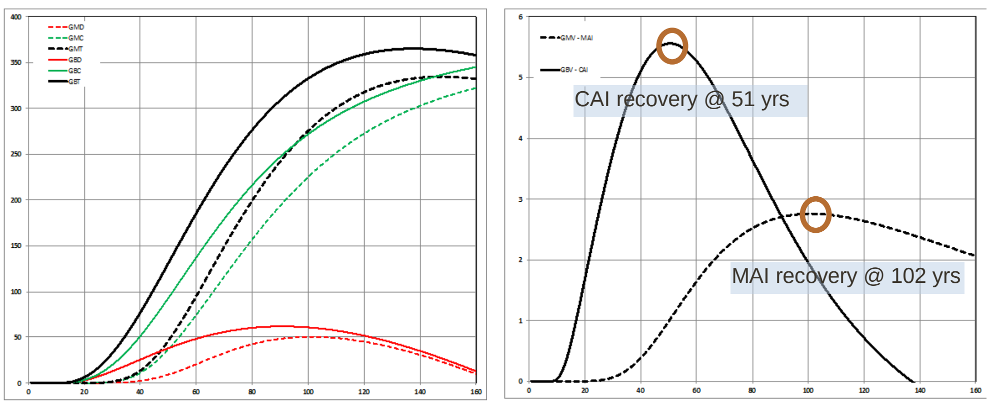

Figure 9: Comparison of MAI versus CAI Approach to Recovery

In order to implement this approach gross biological volume curves needed to be developed[6]. Current annual increment was then calculated for each yield curve and the percent recovery then calculated as the 1- (current CAI / max CAI). Percent recovery is multiplied by stand area for each stand and these values are summed up for each watershed to determine the ECA for a particular watershed at a particular point in time.

ECA targets have been set up for each watershed in the FMA area. As directed by AESRD, the ECA index for each watershed is based on the sum of ECA values divided by the gross watershed area (pers. Comm. 25-Oct-2012). Threshold values are established for each watershed at the 50% ECA index value, the lower limit of the high risk category identified in the 2011 AESRD ECA document.

Fifty percent ECA targets have been enforced in the PFMS.

[6] *Considerable additional work would have been required to generate gross biological volume curves for R0, R1 and DHw R2. As many of these stands will have already achieved full hydrological recovery this would have been of limited benefit to the analysis. Based on this we have developed ECA (recovery) curves using gross merchantable volume where gross biological volume curves are not available. Generally speaking this will result in stands taking longer to achieve full recovery but the impact should be negligible assuming these stands are already recovered.*

2.12.4 Caribou Management Objectives

Canfor has developed caribou management strategies that are applied to this FMP. Canfor recognizes that upon completion of the Little Smoky and A La Peche (LS/ALP) Caribou Range Plan that these strategies will be reviewed and adjusted if necessary to meet the range plan requirements. Canfor's management strategies, outlined below, will assist the Federal and Alberta governments to maintain healthy caribou population in the LS and ALP herds through deferrals, and harvesting in the fragmented areas first which does not increase the disturbance percent.

Three caribou zones have been proposed: Conservation (Zone 1), Expansion (Zone 2) and Support (Zone 3). The following factors have been included in the PFMS with respect to caribou habitat management:

- Conservation Zone (1):
  - No harvest in the Conservation Zone for 10 years and harvest up to 5% of the THLB area per year after year 10. Canfor anticipates that most of the volume will be comprised of timber salvage received from the energy sector and not from development of harvest blocks; and
  - Reduction of forage for alternate prey through implementation of vegetation management following harvest.
- Expansion Zone (2):
  - Harvest in the Expansion Zone will be scheduled based on a MPB priority; however, will focus on the already fragmented areas within the Expansion Zone for a minimum of 5 years;
  - Defer harvest in timber supply sub-units south of the Deep Valley (DS-3, DS-4 and DS-5) for 5 years within the Expansion Zone. These sub-units are relatively intact, but do contain highly susceptible pine that will be at risk to MPB infestation;
  - Defer harvest in four additional timber supply sub-units (DS-1, DS-2, DS-6 AND DS-7) for 10 years within the Expansion Zone; and
  - Reduction of forage for alternate prey through implementation of vegetation management following harvest.
- Support Zone (3):
  - Reduction of forage for alternate prey through implementation of vegetation management following harvest.

2.12.5 Carbon Sequestration

Forests are a large carbon pool in the carbon cycle. Carbon fluxes into and out of this pool are both natural and anthropogenic. Forest managers recognize their role in managing the anthropogenic impacts and influencing the natural ones. Strategies to manage direct impacts include prompt tree regeneration (Indicator 2.1.1a) and minimizing the conversion of forested land to non-forested (Indicator 2.2.1). Forest fuel management is a method of influencing natural negative carbon fluxes by reducing fire risk.

Science about the role of forests and forest products in the carbon cycle is evolving. Models for calculating a forest carbon budget are being developed, both provincially and regionally, that are linked to forest inventory and timber supply models. Their use in forest planning can indicate whether a specific forest is expected to be a net carbon source or sink over the period normally used for wood-supply forecasts. The company is involved in Alberta Innovation Carbon Baseline Project, which will provide more information on how management strategies impact carbon fluxes from the forest as well as forest operations. Ongoing monitoring of developments on forest carbon will ensure the company is at the forefront of developments.

As part of Canfor's sustainable forest management plan (SFMP) (FMP Appendix H), Canfor has committed to monitoring the uptake and storage of carbon on the FMA area. As such, carbon curves for each yield group have been developed using the Canadian Forest Service CFS-CBM-3- model. These curves are incorporated into the timber supply model such that indicators tracking above ground biomass, below ground biomass, dead organic matter and soil biomass are included as outputs for each timber supply scenario. Canfor has targeted to achieve 100% of the carbon stored in each of the carbon pools as defined by the PFMS forecast.

2.12.6 Old Interior Forest

Old interior forest is a habitat requirement for certain species. Harvesting and other disturbances such as fire have historically reduced the amount of old growth habitat and have fragmented larger old growth stands that would meet the habitat requirements of those species. According to Annex 4 of the Alberta Forest Management Planning Standards, old interior forest is defined as: "A forested area greater than 100 hectares in size located beyond edge effect buffer zone along the forest edge. For interior forest objective use a common age definition for all cover classes to prevent breaking up forest patches that have a common origin date" (AESRD, 2006). Canfor has identified baseline old interior forest targets and developed forecast projections based on the PFMS. These results are discussed further in Section 3.1.11 below. There were no constraints for old interior forest applied in the forest estate model.

2.12.7 Barred Owl

Barred owls require old mixedwood forest throughout their range in Alberta. They are large owls that nest in cavities, typically very old hardwood trees or standing snags. This requirement for old mixedwood habitat and the large size of their home range make them a suitable indicator for other old-mixedwood associates. By maintaining enough suitable habitat for a barred owl pair to exist it is likely that many other species that require this habitat on a smaller scale will also benefit.

The coarse filter approach to ecosystem management, works on the assumption that if suitable habitat is available, the species associated with that habitat will be able to thrive. The management choices will ensure that habitat types available prior to operations will remain available through time. Constraints with respect to barred owls have not been applied in the model. However, the area of suitable barred owl habitat has been forecasted into the future based on the PFMS and using AESRD's barred owl habitat model (derived from Russell, 2008). These results are discussed further in Section 3.1.11 below.

2.12.8 Grizzly Bear

High quality grizzly bear habitat is relatively free from human disturbance. It requires a mosaic of open and forested stands covering large areas. This eliminates high rates of human-caused mortality and allows for seasonal variation in the availability and abundance of resources. In areas where human populations and resource development encroach on grizzly bear habitat, it is critically important to minimize the impacts and where possible mimic ideal habitat characteristics.

Risk to Grizzly bears is generally linked to two attributes: road density and habitat quality. The proximity of good quality habitat to roads increases the risk of human caused mortality. Grizzly bear Habitat State modelling identifies areas of habitat sinks and sources and helps focus the implementation of management strategies in areas of higher risk. Constraints with respect Grizzly bears have not been applied in the model. However, AESRD has used the Habitat State model to model the predicted change in habitat state through time on Canfor's FMA area based on the PFMS. These results are discussed further in section 3.1.12.

2.12.9 Distribution of Forest Type

Tree species composition, stand age, and stand structure are important variables to the biological diversity of a forest ecosystem. Ensuring a diversity of tree species within their natural range of variation improves ecosystem resilience and productivity, and positively influences forest health. This guides forest managers in maintaining the natural forest composition in an area and lends itself to long-term forest health and productive forests that uptake carbon. Canfor has targeted to "Maintain the current baseline percent distribution of forest types (treed conifer, treed broadleaf, treed mixed) >20 years old into the future" (Canfor, 2014). Reports on the distribution of forest types have been incorporated into the forest estate model and are included in the PFMS Results section below. There were no constraints for the distribution of forest types applied in the forest estate model.

3.0 PREFERRED FOREST MANAGEMENT SCENARIO

The preferred forest management scenario (PFMS) is the analysis scenario in which the data and assumptions best reflect current management for the FMA area. This scenario is developed through a series of iterations whereby various management assumptions are tested and refined. The PFMS assumptions are all documented in Section 2.0 above. The following sections provide a summary of the process used in determining the final management scenario.

3.1 Analysis Results

The harvest forecast for both conifer and deciduous volume in the PFMS is shown in Figure 10 and Table 12 below. Table 12 reports average harvest level over time periods: the first 10 years, the second 10 years, between year 21 and 110 and year 111 to year 200. The conifer harvest remains relatively constant over the first 110 years of the planning horizon, starting at approximately 714,000 m^3/yr for the first 10 years before dropping down slightly to 712,000 m^3/yr for the second 10 years. After 20 years the harvest level increases slightly to approximately 719,000 m^3/yr until year 111 when in increases to the long-term sustainable harvest level of approximately 848,000 m^3/yr.

The analysis shows that no substantial mid-term decline is required following the completion of the MPB strategy. This is primarily due to Canfor's focus on prioritizing operations to combat active MPB infestations in consultation with AESRD as well as AESRD level one activities. These efforts have been effective in minimizing the non-recoverable losses associated with the MPB infestation and protecting the remaining pine growing stock. Based on these efforts the overall impact of the MPB has been substantially less than was previously anticipated and therefore the analysis results do not include any future losses of MPB growing stock. Consequentially, no mid-term reduction in timber supply is anticipated.

The deciduous harvest averages 564,000 m^3/yr over the first 10 years before dropping down to the long-term sustainable harvest level of approximately 488,000 m^3/yr.

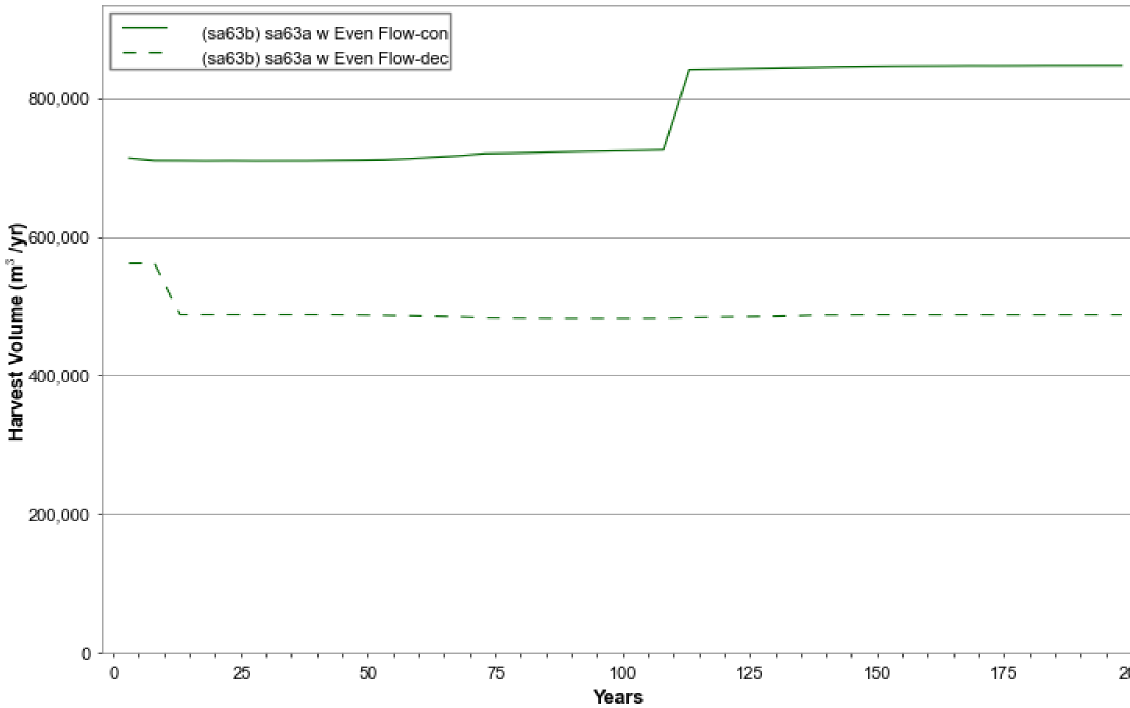

Figure 10: PFMS Harvest Forecast

Table 12: PFMS Harvest Forecast

Scenario	Conifer Harvest (1000's of m^3/yr)				Deciduous Harvest (1000's of m^3/yr)			
	1-10	11-20	21-110	111-200	1-10	11-20	21-110	111-200
PFMS	714	712	719	848	564	490	487	489

Figure 11 shows the distribution of the total merchantable growing stock between conifer and deciduous volume with each component maintaining a relatively stable condition over time. As existing natural stands are harvested the growing stock declines until it reaches a relatively steady state over the latter portions of the planning horizon.

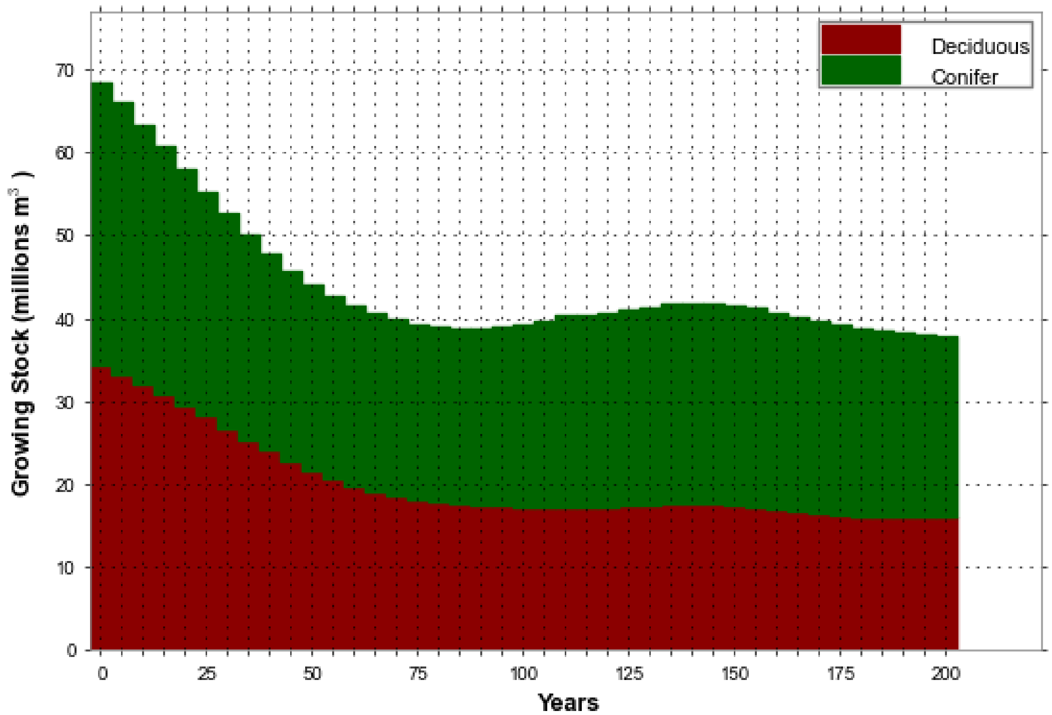

Figure 11: THLB Operable Confer and Deciduous Growing Stock

Figure 12 and Figure 13 show the average harvest age and average volume per hectare (VPH) harvested. With a focus on MPB harvest in the first 10 years, the average harvest age is initially lower. As harvesting moves into older existing natural stands the average harvest age increases. During the transition into the harvest of future managed stands and the development of a more even and regulated age class distribution, the average harvest age declines to around the 90-year mark.

Average VPH harvested remains relatively constant throughout the planning horizon. However, as harvesting transitions into more productive, genetically improved future managed stands the average VPH harvested increases slightly.

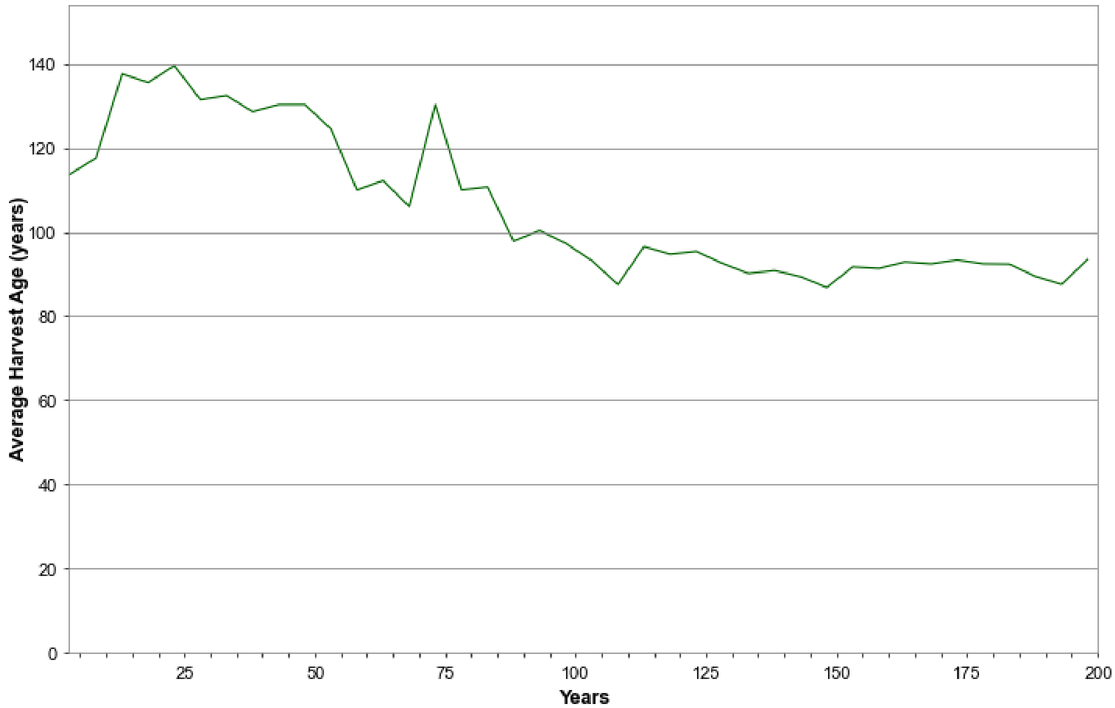

Figure 12: Average Harvest Age

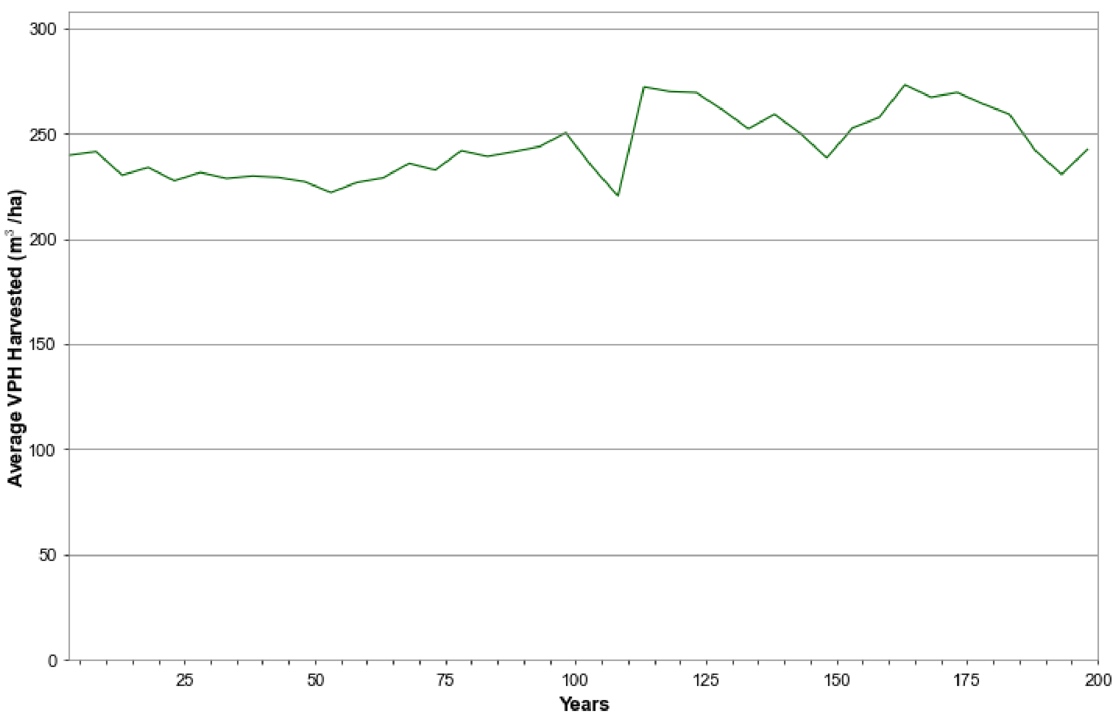

Figure 13: Average Volume per Hectare Harvested

As discussed above, the forest estate model includes soft constraints to minimize the harvest in CD and DC stands for the first 10 years and Du stand for the first 20. As shown in Figure 14 both the coniferous and deciduous volumes include a minor component from CD and DC stands in the first 10 years. Very little Du volume is harvested in the first 20 years. These graphs were reviewed by both Canfor and the deciduous licensees and deemed to be reasonable.

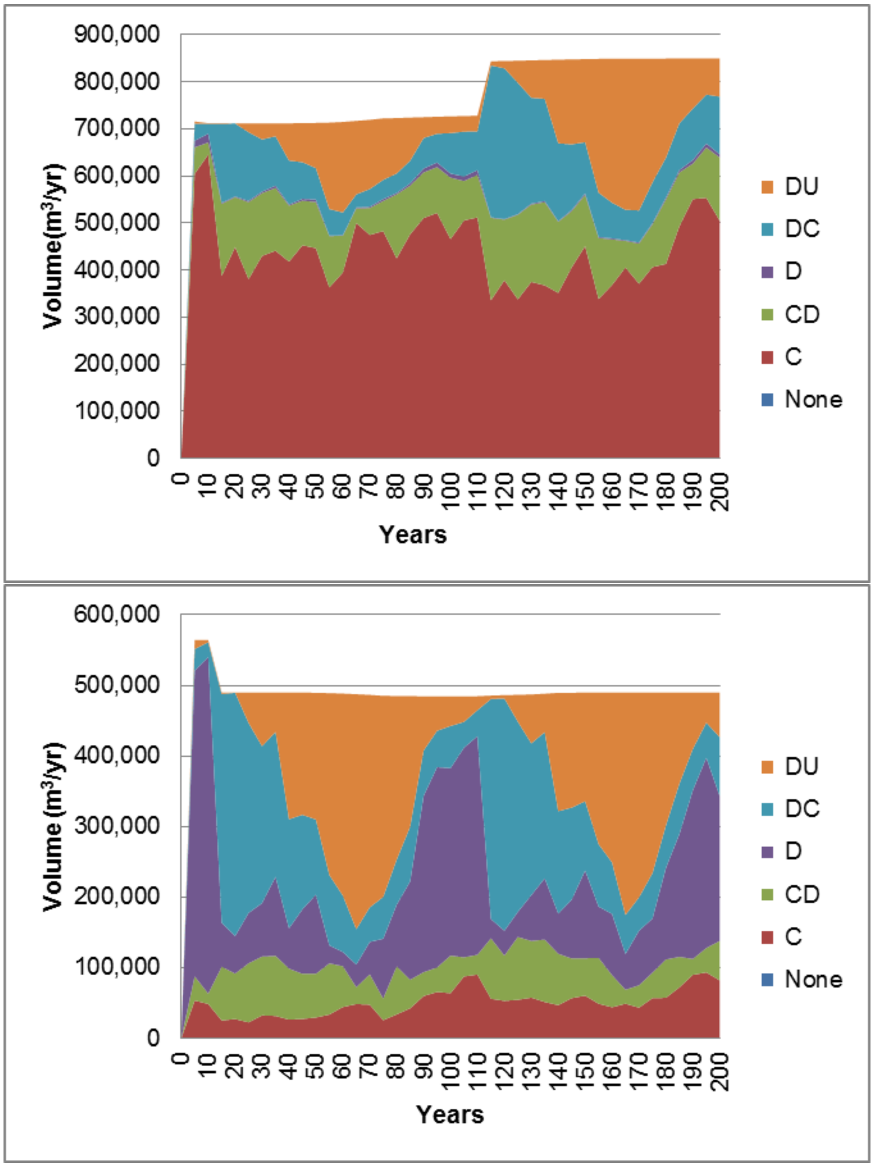

Figure 14: Conifer (Top) and Deciduous (Bottom) Harvest Volume by Broad Cover Group

Minimum cut blocks size constraints have been applied in the forest estate model to minimize the number of blocks less than 5 ha in size as well as the blocks between 5 and 10 ha. As shown in Figure 15, the model is largely able to achieve these objectives. The model forecasts a significant increase in small blocks in year 25 and beyond. However, the degree to which this represents an actual operational challenge as opposed to an artifact of the data assembly process in unclear. Subsequent timber supply analyses should be cognizant of this issue and future plans should seek to minimize THLB fragmentation as this plan has done.

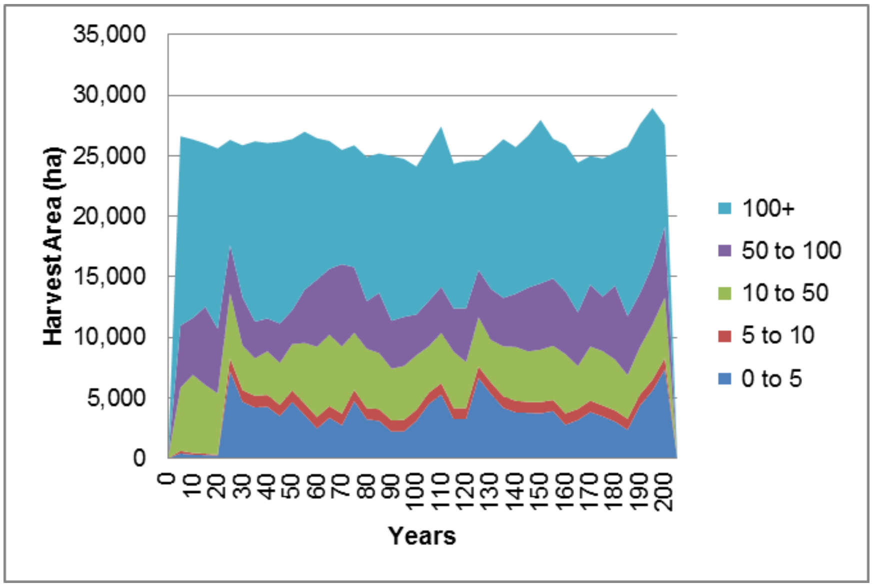

Figure 15: Harvest Area by Cutblock Size Class

Average conifer piece size represents an important economic metric. As shown in Figure 16 and Figure 17, this analysis forecasts a significant decline in average piece size after 50 years. With the significant uncertainty associated with projecting piece size this far into the future there are no specific actions to take with respect to this plan. Canfor is committed to monitoring the forecasted decline in piece size over the next fifty years. Canfor is aware that the use of Gypsy to project future piece size is not exact, and therefore Canfor is continuously monitoring harvest profile at the operational and strategic planning levels. As a company, Canfor is able to adjust market sales and deliveries based on the products that each division is able to produce, which is directly related to available piece size. The ability to adjust and have some flexibility in regards to products being produced and market demand between divisions will help Canfor manage for any future potential decline in piece size. The projected decline of approximately 0.43 m^3/tree to 0.33 m^3/tree over the next fifty years is not of significant concern to Canfor as this is still an acceptable piece size for the Canfor Grande Prairie sawmill.

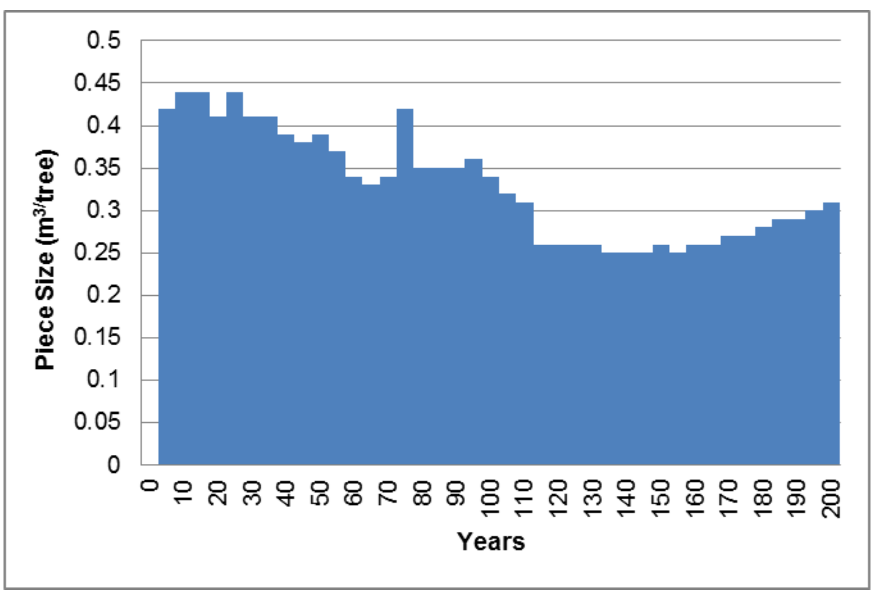

Figure 16: Average Conifer Piece Size

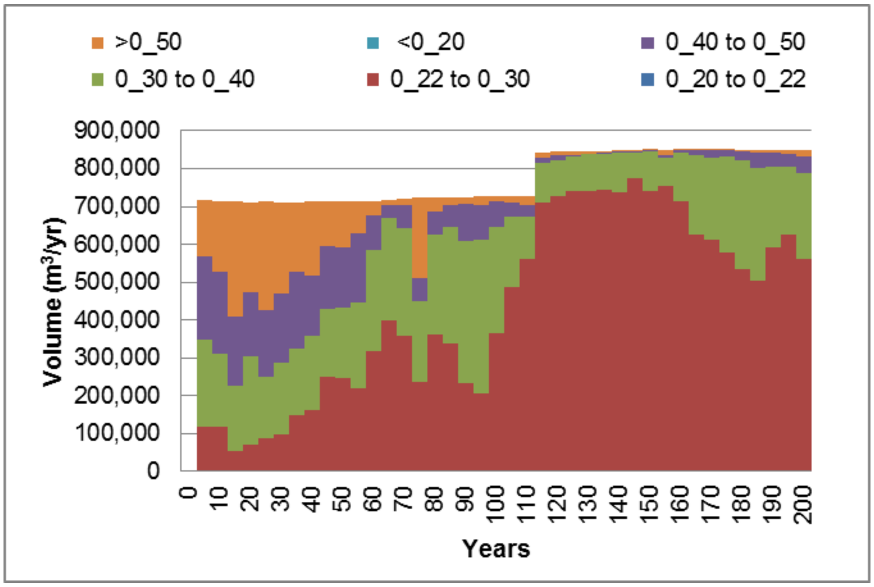

Figure 17: Piece Size Category Harvested

3.1.1 Spatial Harvest Schedule

The 10-year spatial harvest sequence (SHS) for the PFMS is shown in Figure 18. Appendix I contains SHS maps for the remainder of the first 80 years of the planning horizon.

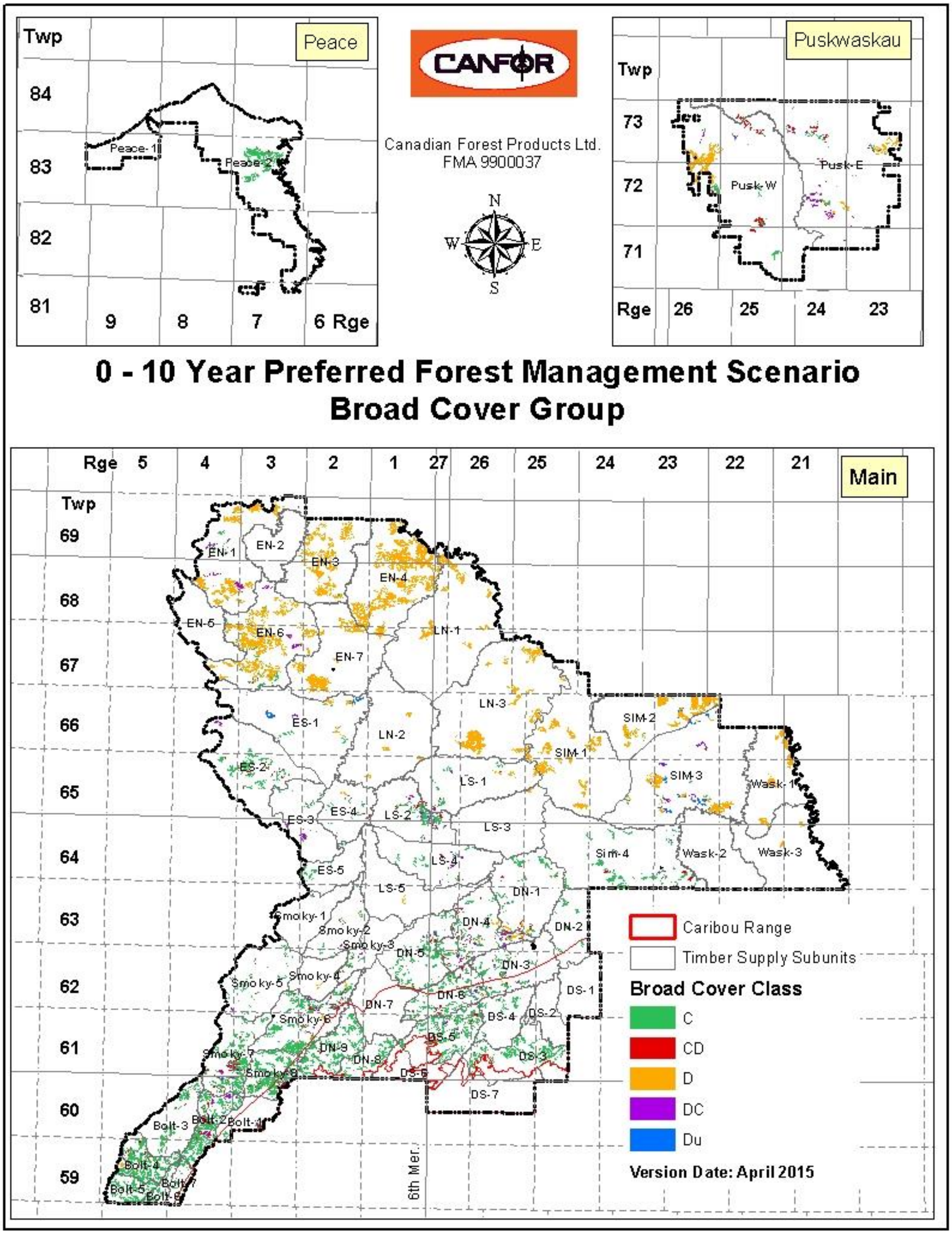

Figure 18: 10-Year Spatial Harvest Sequence

3.1.2 Long Run Sustained Yield

Table 13 describes the long run sustained yield (LRSY) for each yield group at time zero. The total LRSY for the THLB at time zero is 1.22 million m^3/year based on the current distribution of natural and managed stands. Through the 200-year planning horizon the LRSY will increase as the stands are converted to more productive managed stands.

Table 13: Long Run Sustained Yield

Yield Group	M.A.I (m3/ha/yr)	THLB (ha)	LRSY (m3/year)
r0_01_b	2.5	6,078	**15,348**
r0_02_b	3.1	27,487	**84,158**
r0_03_b	2.5	2,928	**7,353**
r0_03_g	2.5	62,764	**157,639**
r0_04_b	2.5	3,372	**8,439**
r0_05_b	1.8	4,217	**7,665**
r0_05_g	1.8	2,733	**4,968**
r0_06_cd_b	2.4	728	**1,783**
r0_06_cd_g	2.4	16,359	**40,063**
r0_06_dc_b	2.5	2,624	**6,591**
r0_06_dc_g	2.5	69,816	**175,352**
r0_07_b	2.2	13,698	**30,016**
r0_08_b	2.7	8,271	**22,353**
r0_08_g	2.7	13,676	**36,961**
r0_09_b	3.0	5,295	**16,026**
r0_09_g	3.0	6,532	**19,771**
r0_10_b	2.3	3,554	**8,211**
r0_10_g	2.3	9,101	**21,027**
r0_11_b	3.0	2,735	**8,202**
r0_11_pl_g	3.0	5,860	**17,570**
r0_11_sw_g	3.0	6,773	**20,309**
r0_12_b	1.3	11,602	**15,432**
r0_14_pl_g	1.4	10,083	**13,986**
r0_14_sb_b	1.4	3,304	**4,583**
r0_14_sw_g	1.4	5,709	**7,918**
r0_15_b	2.0	4,582	**9,049**
r0_15_g	2.0	15,518	**30,647**
r0_16_b	2.0	2,007	**3,964**
r0_16_g	2.0	15,560	**30,729**
r0_17_b	2.4	2,314	**5,666**
r0_17_g	2.4	36,119	**88,453**
r1_01_b	2.5	46	**117**
r1_02_b	3.1	131	**402**
r1_03_b	2.5	31	**79**
r1_03_g	2.5	7,812	**19,621**
r1_04_b	2.5	49	**123**
r1_05_b	1.8	98	**178**
r1_05_g	1.8	870	**1,581**
r1_06_cd_b	2.4	1	**4**
r1_06_cd_g	2.4	3,652	**8,930**
r1_06_dc_g	2.5	1,921	**4,826**
r1_07_b	2.2	57	**126**
r1_08_b	2.9	728	**2,131**
r1_08_g	2.9	2,234	**6,539**
r1_09_b	3.2	212	**684**
r1_09_g	3.2	4,263	**13,773**
r1_10_b	2.7	155	**413**

Yield Group	M.A.I (m3/ha/yr)	THLB (ha)	LRSY (m3/year)
r1_10_g	2.7	1,042	**2,770**
r1_11_b	3.1	274	**839**
r1_11_pl_g	3.1	270	**829**
r1_11_sw_g	3.1	1,944	**5,966**
r1_12_b	1.3	9	**13**
r1_14_pl_g	1.5	7	**11**
r1_14_sb_b	1.5	22	**34**
r1_14_sw_g	1.5	68	**103**
r1_15_b	2.2	79	**172**
r1_15_g	2.2	1,331	**2,895**
r1_16_b	2.2	159	**345**
r1_16_g	2.2	1,416	**3,079**
r1_17_b	2.4	32	**79**
r1_17_g	2.4	6,283	**15,365**
r2_cd_plhw2_b	3.7	852	**3,137**
r2_cd_plhw2_b_nsr	3.5	48	**168**
r2_cd_plhw_b	3.7	301	**1,109**
r2_cd_swhw_b	2.9	241	**706**
r2_cd_swhw_g	2.9	6,193	**18,137**
r2_cd_swhw_g_nsr	2.5	850	**2,141**
r2_c_pl_b	3.9	4,498	**17,610**
r2_c_pl_b_nsr	3.3	33	**111**
r2_c_pl_g	3.9	13,721	**53,721**
r2_c_pl_g_nsr	3.3	303	**1,010**
r2_c_sb_b	1.5	1,414	**2,072**
r2_c_sw_b	3.0	1,971	**5,956**
r2_c_sw_b_nsr	2.5	38	**96**
r2_c_sw_g	3.0	15,096	**45,605**
r2_c_sw_g_nsr	2.5	711	**1,804**
r2_dc_hwsx_g	4.5	1,521	**6,789**
r2_d_hw_b	3.1	4,125	**12,630**
r2_d_hw_b_nsr	2.6	10	**26**
r3_cd_plhw_b	3.6	1,166	**4,171**
r3_cd_swhw_b	2.9	95	**273**
r3_cd_swhw_g	3.0	669	**1,986**
r3_c_pl_b	3.2	2,480	**7,923**
r3_c_pl_g	3.3	2,637	**8,745**
r3_c_sb_b	1.5	138	**202**
r3_c_sw_b	2.8	177	**489**
r3_c_sw_g	2.9	2,433	**6,959**
r3_dc_hwsx_b	3.4	45	**151**
r3_dc_hwsx_g	3.5	1,909	**6,587**
r3_d_hw1_b	2.5	25	**62**
r3_d_hw2_b	3.1	223	**682**
r3_d_hw4_b	2.5	5	**13**
r3_d_hw7_b	2.2	49	**107**
R999	-	0	**-**
Total		**480,576**	**1,223,437**

3.1.3 Harvest Area By Base 10 Strata

Table 14 shows the harvest area in each planning period using the base 10 strata group. This plan only uses 7 of the base 10 strata.

Table 14: Harvest Area (ha) By Base 10 Strata

Period	Base 10 Strata						
	CD-PlHw	CD-SxHw	C-Pl	C-Sb	C-Sw	DC-HwSx	D-Hw
5	416	141	1,661	121	750	143	2,092
10	243	6	1,800	76	746	87	2,314
15	235	952	351	90	1,263	2,018	297
20	64	715	498	183	1,288	2,140	237
25	201	1,042	351	311	1,030	1,991	340
30	176	947	448	235	1,242	1,770	358
35	182	936	545	552	921	1,531	572
40	299	910	568	451	855	1,840	293
45	187	817	678	786	618	1,703	444
50	163	977	724	688	641	1,515	571
55	77	1,736	328	581	985	1,554	136
60	115	1,485	859	86	1,003	1,629	116
65	84	409	877	472	1,028	2,179	195
70	258	538	1,300	44	801	1,895	261
75	220	379	989	360	653	2,058	515
80	251	842	1,333	160	264	1,666	465
85	209	466	1,285	356	400	1,583	737
90	238	442	1,326	93	814	805	1,274
95	255	409	1,184	162	956	569	1,413
100	363	418	912	226	998	646	1,257
105	244	370	615	227	1,647	579	1,471
110	169	427	692	215	1,693	543	1,747
115	166	898	414	270	1,017	1,945	157
120	42	731	698	415	746	2,085	198
125	136	971	486	306	931	1,895	203
130	149	916	689	310	876	1,753	391
135	183	1,036	714	489	709	1,610	534
140	377	811	822	354	653	1,742	385
145	191	779	918	406	833	1,666	543
150	199	821	1,045	434	854	1,314	926
155	110	1,566	574	370	806	1,322	536
160	115	1,310	959	374	452	1,406	564
165	180	412	1,134	277	453	2,119	313
170	283	530	1,033	293	390	1,997	471
175	248	436	909	206	810	1,919	425
180	239	779	971	174	785	1,446	667
185	179	582	1,022	150	1,115	1,249	855
190	163	422	929	239	1,557	1,024	1,187
195	150	566	836	322	1,650	832	1,435
200	310	498	780	305	1,394	1,025	1,197

3.1.4 Seral Stage and Patch Size Objectives

Seral stage and patch size targets have been enforced in the forest estate model. Seral stage targets are applied to each Natural Region and patch size targets are applied to each FMA area parcel. As discussed above, seral stage targets are applied to the pioneer and young as maximum threshold levels and to old as minimum threshold levels and are applied to the total forested landbase (TFLB) area. No constraints have been applied to mature and over-mature seral stages as these objectives will be largely achieved by meeting the other 3 objectives.

Figure 19 and Figure 20 show the TFLB area seral stage distribution for the Boreal and Foothills Natural Regions.

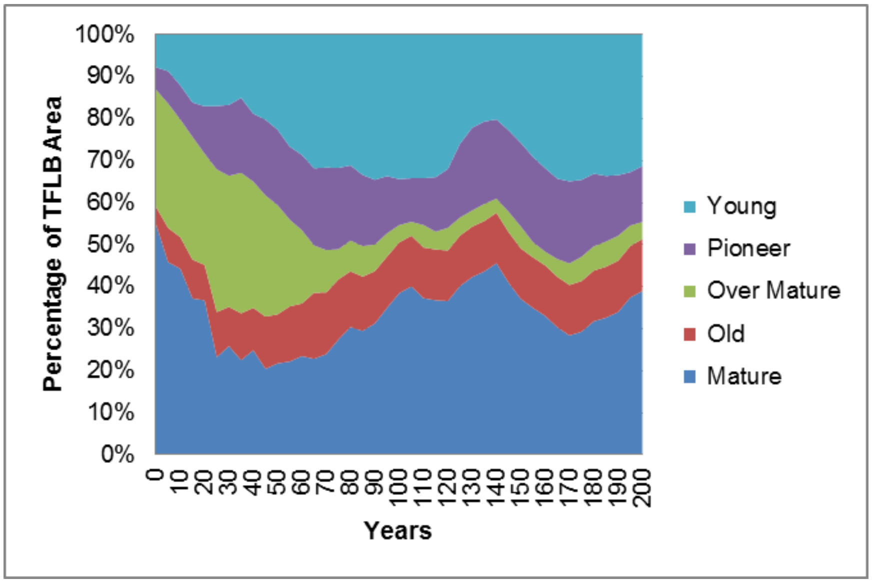

Figure 19: Boreal Seral Stage TFLB Area Percentage Distribution

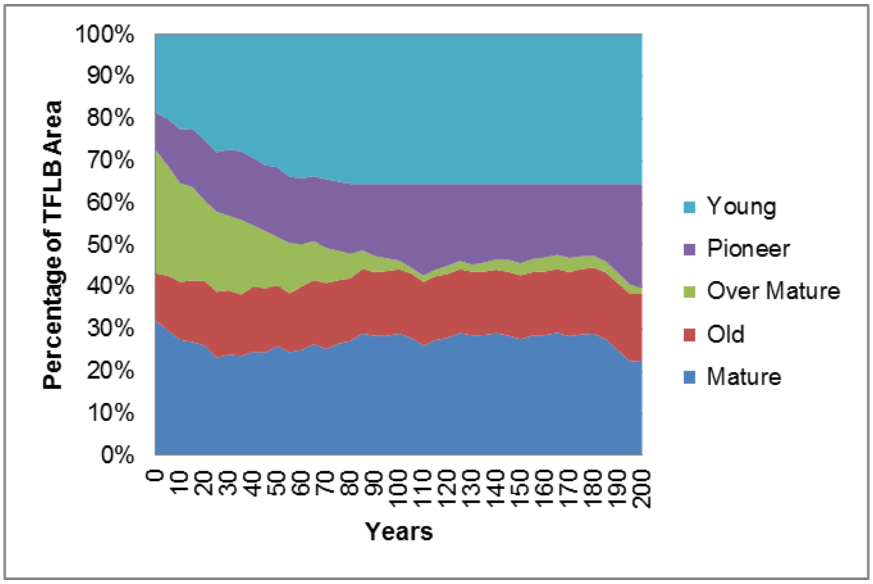

Figure 20: Foothills Seral Stage TFLB Area Percentage Distribution

Targets for the distribution of seral stages within the THLB portion of the landbase are not enforced in the model. However, Figure 21 and Figure 22 show the distribution of seral stages within the THLB.

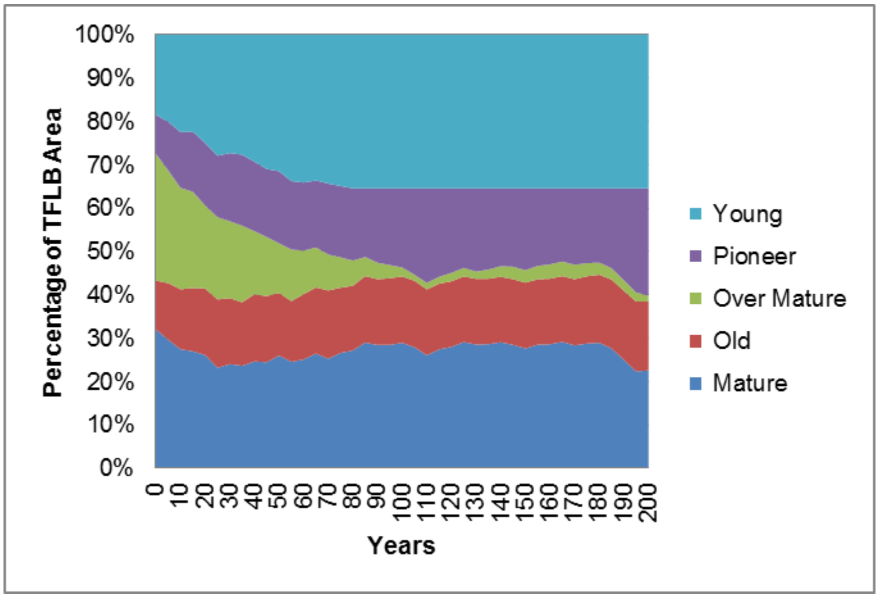

Figure 21: Boreal Seral Stage THLB Area Percentage Distribution

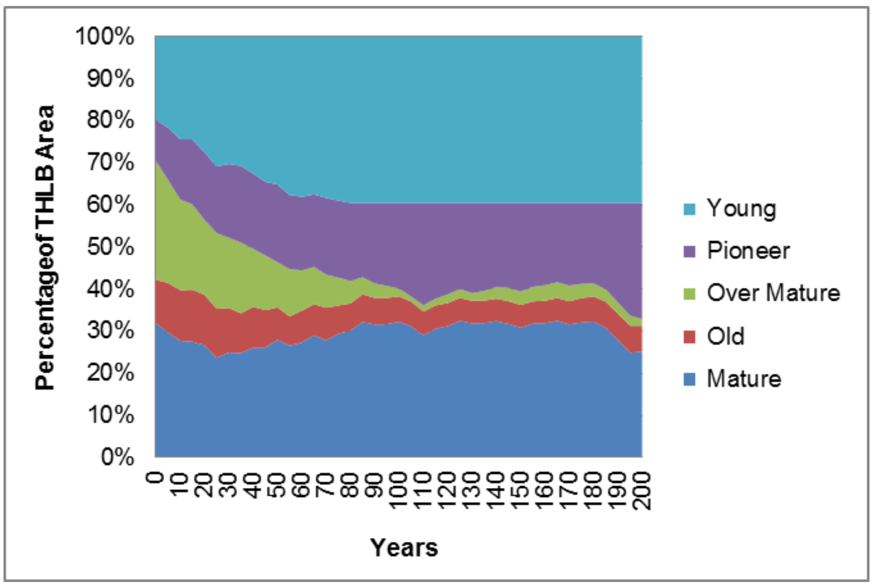

Figure 22: Foothills Seral Stage THLB Area Percentage Distribution

Figure 23 shows a map of the current seral stage distribution across the FMA. Maps showing the forecasted seral stage distribution are shown in Appendix II.

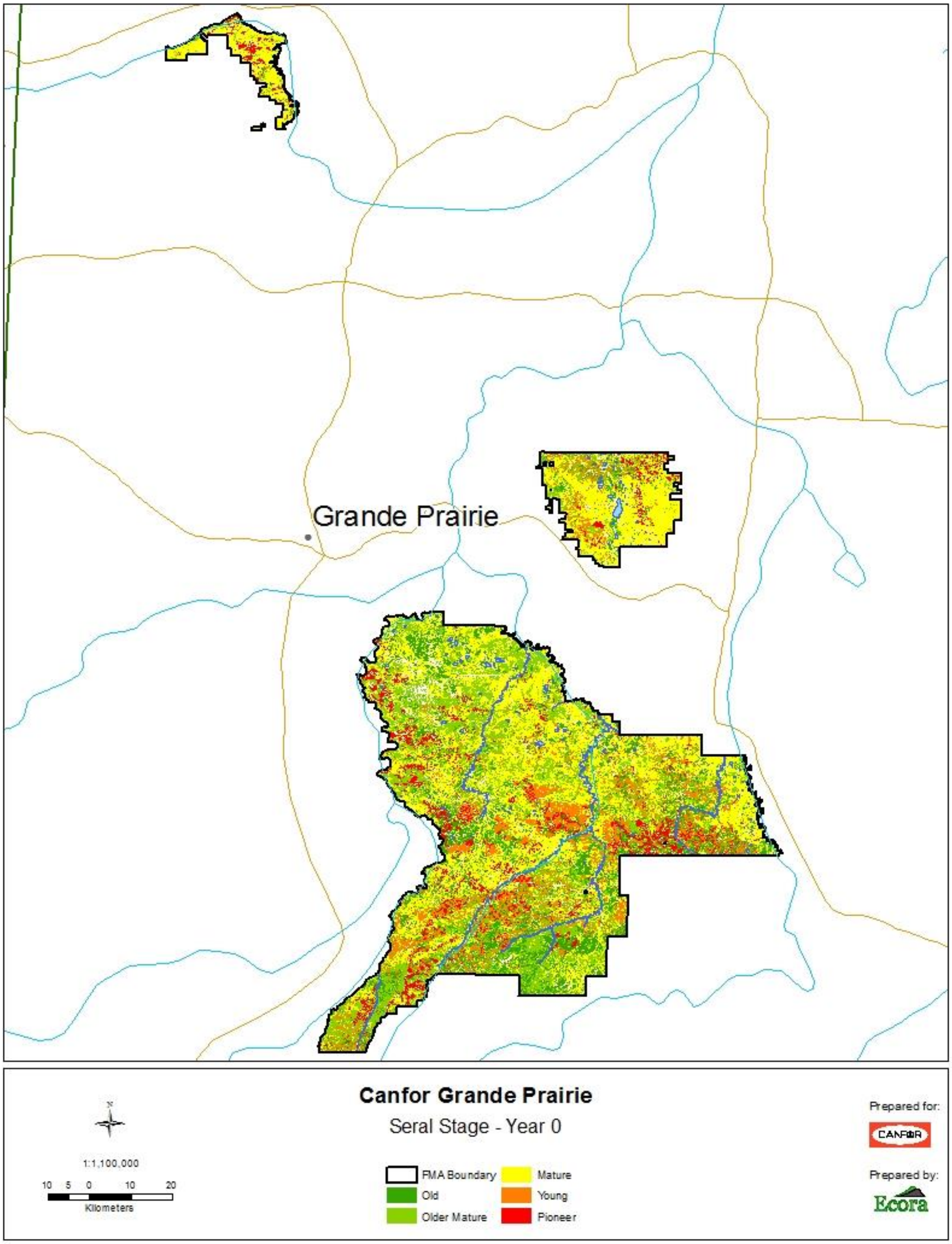

Figure 23: Current Seral Stage Distribution Map

SFMP Patch Size Indicator (40m Adjacent Distance)

Patch targets have been developed through Canfor's SFMP that mimic the natural range of variability. These targets are based on a 40 m adjacent distance and the targets have been enforced in the PFMS. Consistent with Canfor's SFMP commitments with respect to this indicator, the targets are achieved gradually over time. Patch targets are enforced individually within each FMA area parcel. Figure 24 shows the patch size distribution across the entire FMA area whereas Figure 25, Figure 26, and Figure 27 show the patch size distribution within each FMA area parcel.

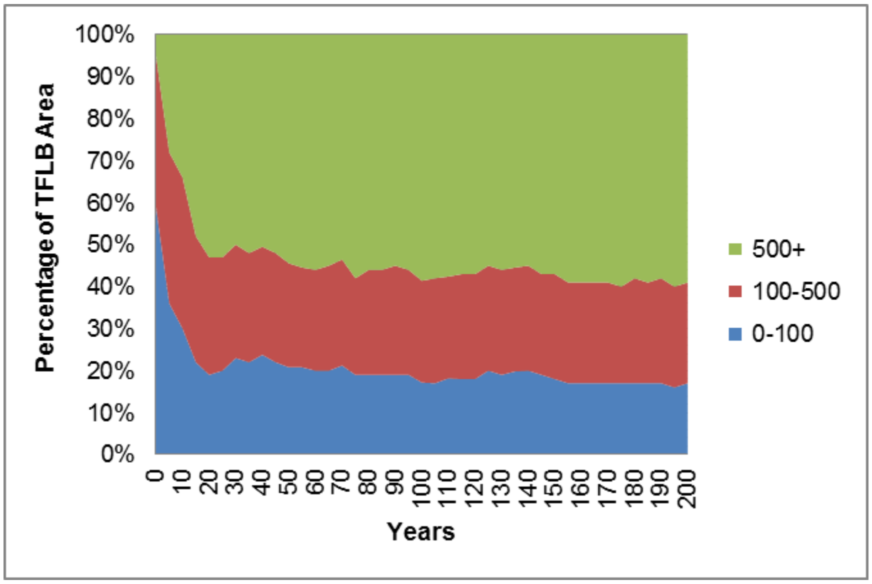

Figure 24: Patch Size Distribution across the FMA (40m Adjacent Distance)

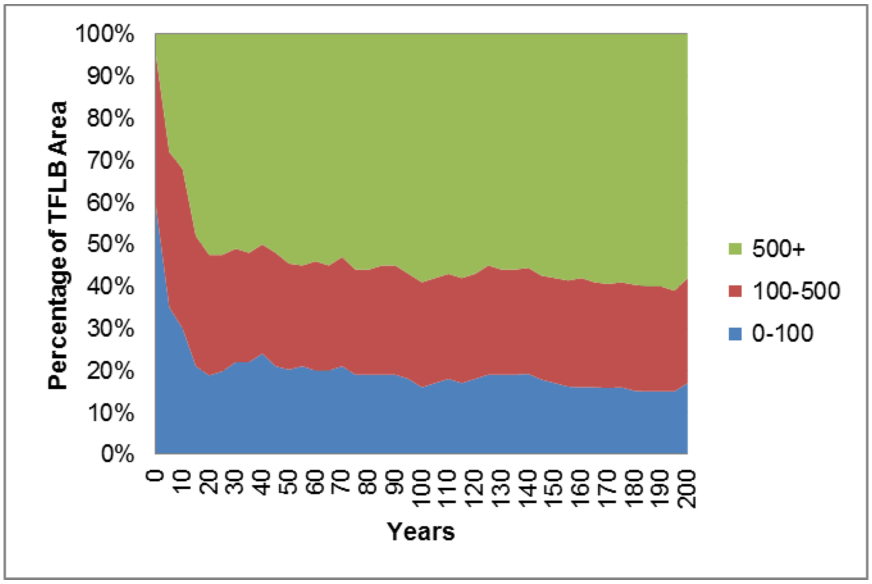

Figure 25: Main Parcel – Patch Size Distribution (40m Adjacent Distance)

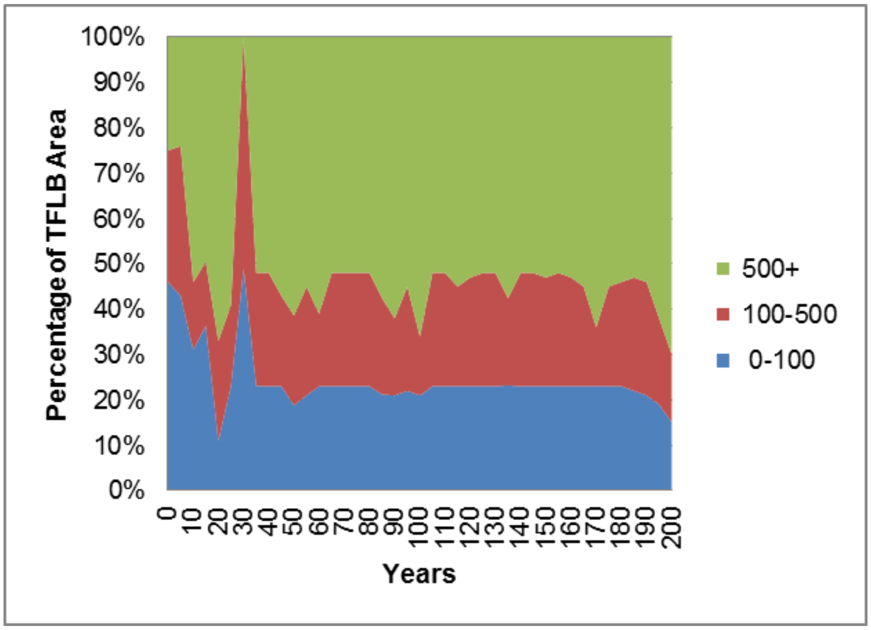

Figure 26: Peace Parcel – Patch Size Distribution (40m Adjacent Distance)

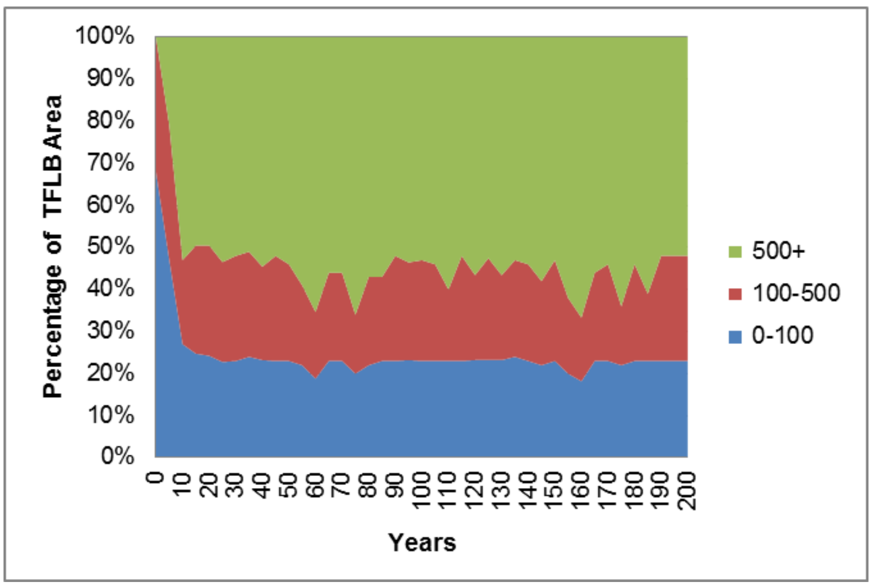

Figure 27: Puskwaskau Parcel – Patch Size Distribution (40m Adjacent Distance)

Figure 28 shows the current patch size distribution for the FMA based on a 40m adjacent distance. Appendix III includes maps showing the patch size distribution at key points during the 200-year planning horizon.

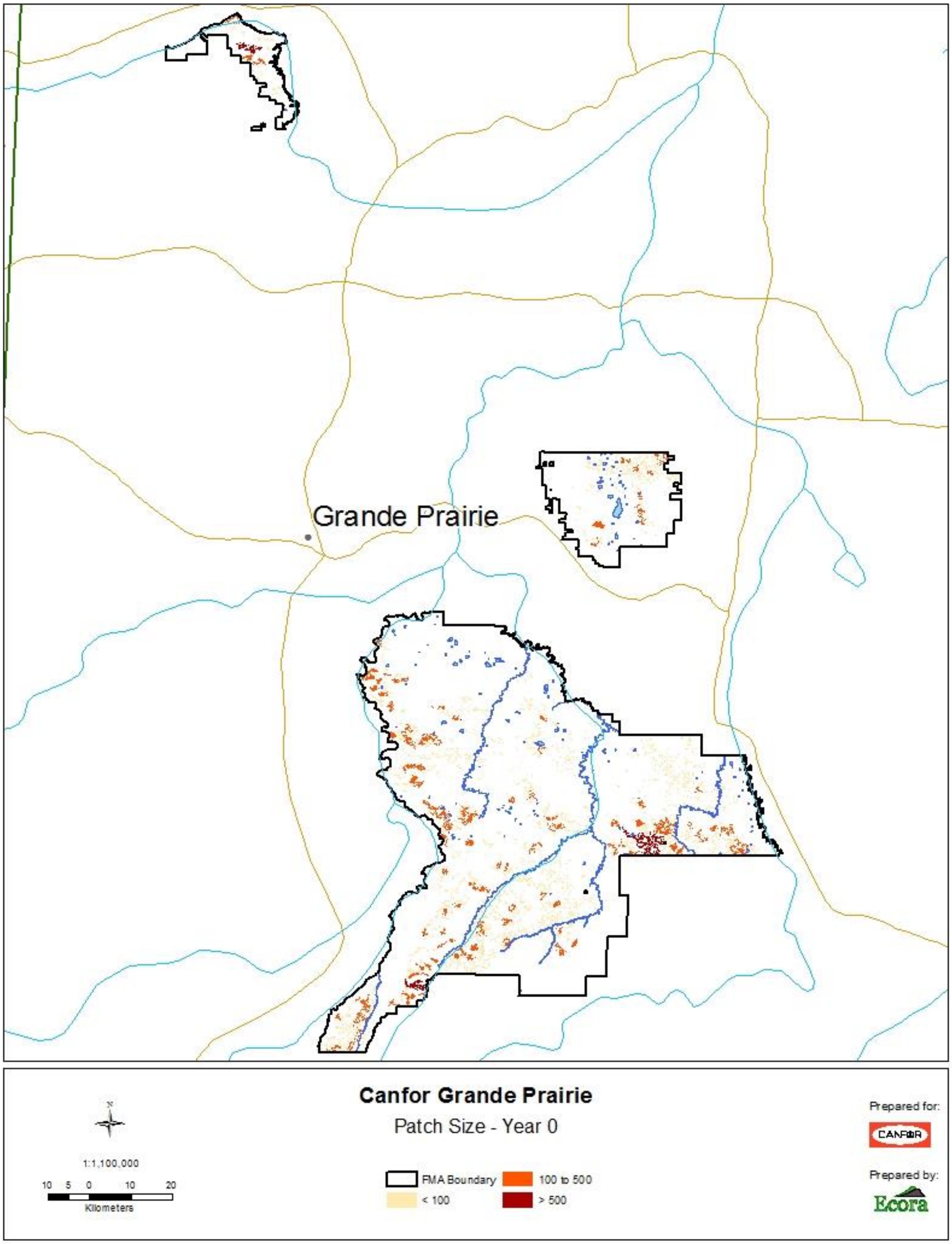

Figure 28: Current Patch Size Distribution Map (40m Adjacent Distance)

AESRD Patch Size Indicator (8m Adjacent Distance)

As per the planning standards, the following presents patch size targets using an 8m adjacent distance. Figure 29 shows the patch size distribution across the entire FMA area whereas Figure 30, Figure 31 and Figure 32, show the patch size distribution within each FMA area parcel.

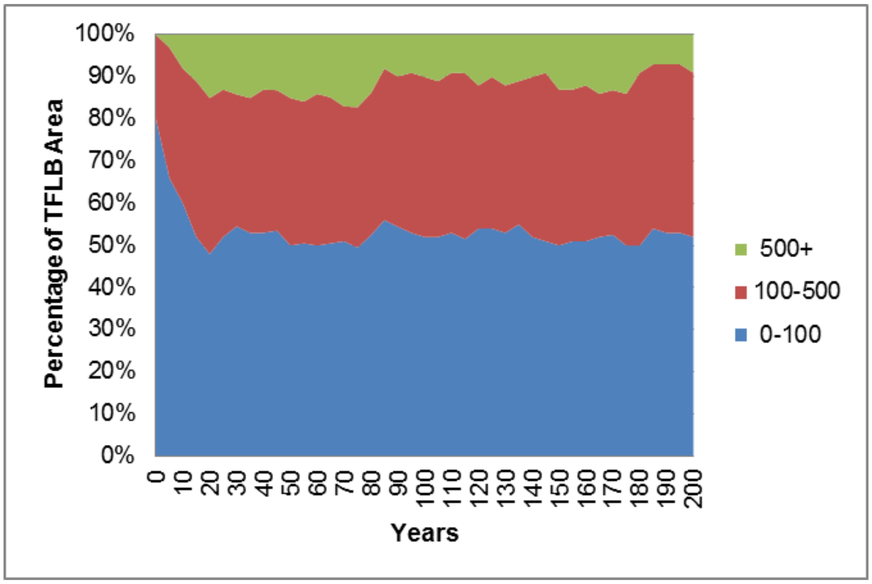

Figure 29: Patch Size Distribution across the FMA (8m Adjacent Distance)

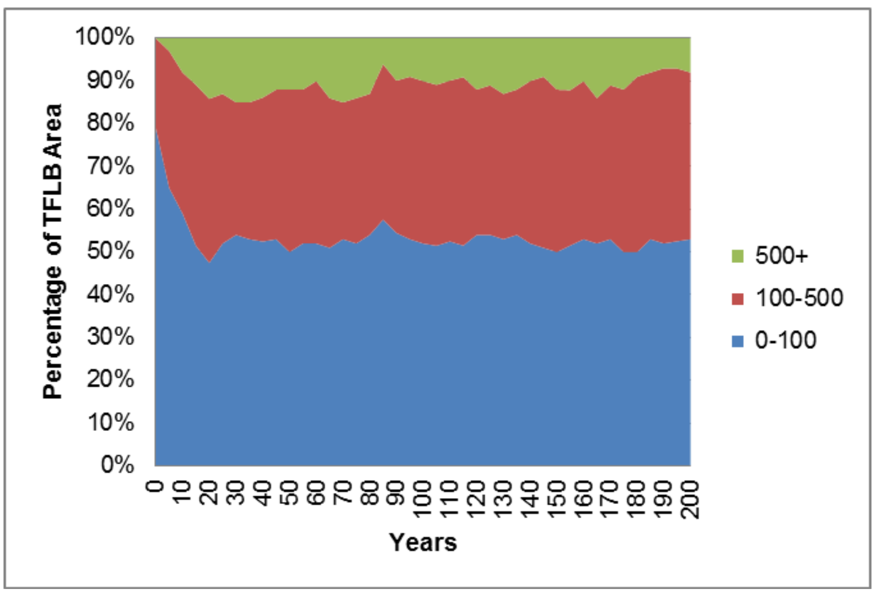

Figure 30: Main Parcel – Patch Size Distribution (8m Adjacent Distance)

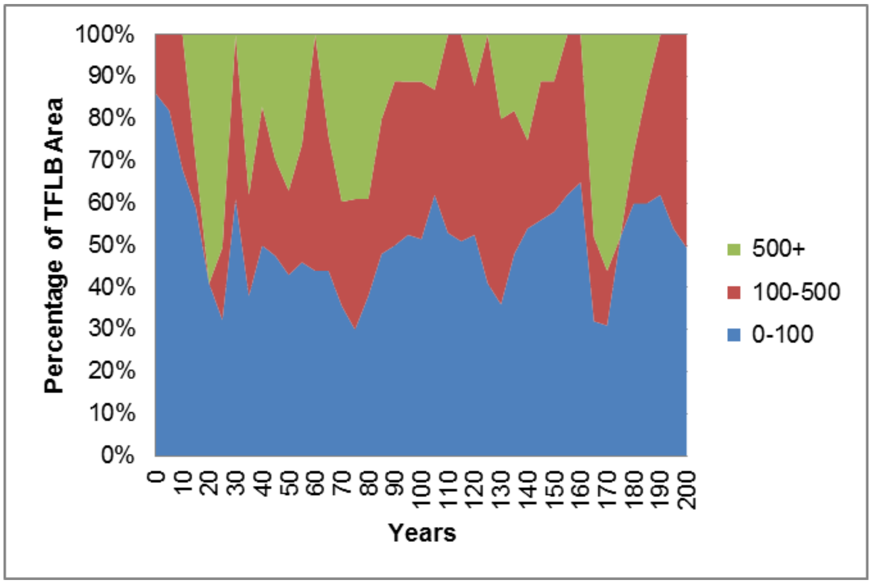

Figure 31: **Peace Parcel – Patch Size Distribution (8m Adjacent Distance)**

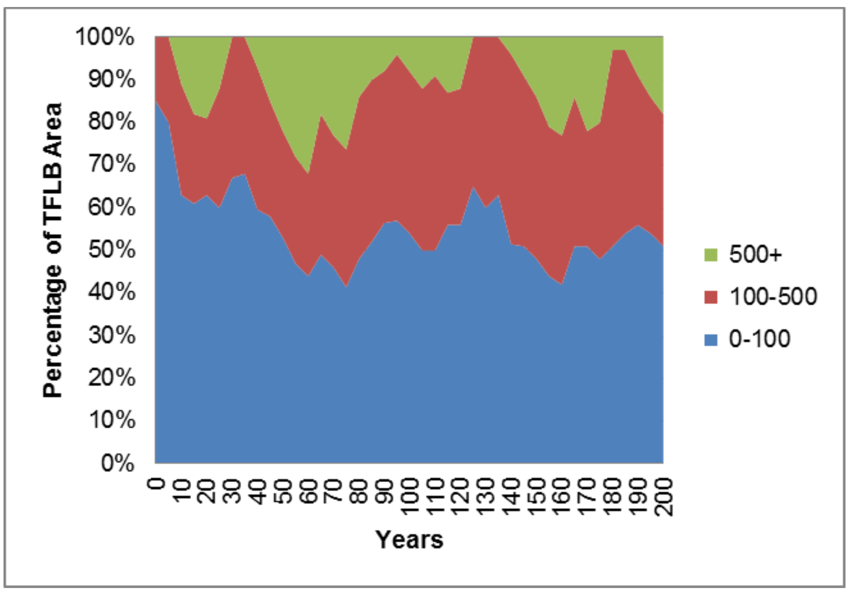

Figure 32: **Puskwaskau Parcel – Patch Size Distribution (8m Adjacent Distance)**

3.1.5 Watershed Objectives

As discussed above, ECA objectives have been refined in consultation with AESRD to utilize CAI-based recovery curves. The PFMS includes targets whereby watershed ECA values remain below the 50% high-risk threshold. Table 15, Figure 33, Figure 34, and Figure 35 show the watershed risk ratings at time 0 (current status) and after 10, 20, 50, 100 and 200 years. It is important to note that the targets have been established in the model in an attempt at preventing any watersheds from reaching the high-risk category. However, because the targets in Patchworks are not absolute there are some situations in which a watershed may enter the high-risk category. In these rare situations the overall ECA % only exceeds the 50% threshold by a couple tenths of a percentage and quickly recovers back into the moderate threshold.

Table 15: Watershed Risk Level (%) Forecast

Watershed	Gross Watershed Area (ha)	ECA (%) By Reporting Period					
		2014	10 Years	20 Years	50 Years	100 Years	200 Years
0	4,365	9%	8%	8%	2%	8%	10%
1	1,229	1%	1%	2%	10%	8%	10%
2	2,504	0%	1%	2%	10%	1%	3%
3	2,667	0%	0%	1%	6%	1%	3%
4	5,046	6%	9%	20%	19%	7%	14%
5	8,129	0%	0%	2%	12%	1%	3%
6	2,663	18%	16%	17%	4%	9%	12%
7	12,090	2%	4%	8%	21%	4%	6%
8	883	1%	1%	16%	45%	1%	4%
9	7,876	3%	2%	21%	16%	4%	4%
10	7,824	14%	15%	15%	6%	9%	10%
11	25,293	2%	2%	11%	13%	4%	5%
12	2,408	8%	7%	26%	12%	7%	9%
13	1,252	7%	6%	4%	4%	7%	7%
14	3,155	12%	12%	20%	7%	3%	4%
15	7,647	15%	15%	26%	12%	16%	17%
16	1,245	26%	21%	45%	7%	21%	25%
17	532	0%	6%	18%	19%	1%	1%
18	4,683	11%	10%	14%	9%	12%	10%
19	1,968	0%	0%	0%	50%	3%	2%
20	5,490	13%	13%	13%	36%	11%	14%
21	20,088	8%	7%	13%	20%	6%	6%
22	4,546	7%	8%	10%	41%	3%	3%
23	5,684	21%	28%	40%	15%	26%	27%
24	12,547	16%	15%	20%	14%	12%	15%
25	3,427	9%	14%	43%	24%	12%	18%
26	25,283	8%	5%	5%	19%	7%	9%
27	12,660	16%	10%	11%	11%	17%	20%
28	7,572	11%	14%	16%	35%	10%	14%
29	3,678	17%	18%	31%	7%	16%	19%
30	9,366	12%	16%	17%	36%	12%	18%
31	48,698	6%	6%	20%	22%	6%	6%
32	5,577	8%	12%	10%	26%	10%	14%
33	7,525	11%	8%	16%	12%	12%	13%
34	6,606	29%	17%	13%	8%	22%	17%
35	5,506	21%	14%	12%	19%	17%	20%
36	3,682	47%	45%	43%	7%	33%	28%
37	8,502	29%	28%	38%	18%	24%	25%
38	11,428	5%	3%	5%	21%	10%	11%
39	6,004	22%	19%	16%	13%	16%	14%
40	9,292	21%	18%	16%	27%	16%	20%
41	6,255	40%	35%	44%	6%	29%	29%
42	11,343	11%	9%	5%	32%	7%	9%
43	4,046	37%	39%	42%	8%	37%	42%
44	3,206	31%	32%	28%	15%	27%	37%
45	7,645	19%	15%	11%	15%	20%	29%
46	1,816	7%	16%	19%	16%	13%	27%
47	4,485	14%	11%	7%	17%	15%	25%
48	4,725	16%	26%	22%	17%	22%	29%
49	5,112	14%	13%	12%	32%	9%	9%
50	2,267	25%	22%	27%	11%	20%	19%
51	222	1%	0%	0%	40%	2%	11%
52	11,497	24%	22%	23%	16%	14%	18%
53	5,237	20%	31%	25%	23%	23%	38%

Watershed	Gross Watershed Area (ha)	ECA (%) By Reporting Period					
		2014	10 Years	20 Years	50 Years	100 Years	200 Years
54	5,419	11%	7%	4%	25%	8%	29%
55	4,898	35%	40%	39%	10%	32%	35%
56	8,225	27%	38%	32%	16%	20%	30%
57	3,341	20%	34%	37%	24%	25%	41%
58	2,791	10%	6%	44%	25%	20%	50%
59	2,058	1%	11%	16%	13%	17%	26%
60	5,479	11%	18%	46%	19%	21%	50%
61	24,360	14%	18%	17%	23%	19%	20%
62	8,174	2%	6%	19%	19%	9%	40%
63	12,823	16%	30%	34%	10%	25%	25%
64	12,909	1%	10%	32%	9%	25%	28%
65	41,212	28%	39%	33%	16%	27%	26%
66	6,285	16%	38%	40%	12%	27%	34%
67	1,627	0%	0%	1%	6%	6%	2%
68	2,744	15%	50%	40%	17%	41%	31%
69	12,192	19%	48%	46%	6%	43%	27%
70	1,903	23%	29%	17%	26%	19%	26%
71	8,471	17%	13%	11%	19%	13%	14%
72	6,655	14%	13%	15%	20%	12%	12%
73	8,675	15%	14%	9%	31%	9%	8%
74	26,677	16%	16%	13%	20%	13%	10%
75	1,272	34%	31%	19%	17%	9%	9%
76	169	42%	41%	26%	0%	2%	2%
77	2,466	2%	2%	1%	41%	5%	6%
78	231	1%	0%	0%	28%	5%	6%
79	1,288	4%	2%	2%	5%	6%	5%
80	2,507	19%	14%	16%	14%	23%	24%
81	1,548	18%	8%	2%	23%	20%	25%
82	675	3%	0%	0%	24%	7%	7%
83	7,072	7%	5%	3%	5%	12%	12%
84	1,173	1%	0%	0%	4%	9%	11%
85	794	4%	2%	1%	20%	8%	8%
87	13,763	11%	9%	7%	18%	19%	20%
88	8,012	11%	17%	13%	23%	19%	18%
89	2,326	9%	8%	4%	23%	13%	14%

Watershed Risk Class Definitions		
Low 0 to 30%	Moderate 30 to 50%	High >50%

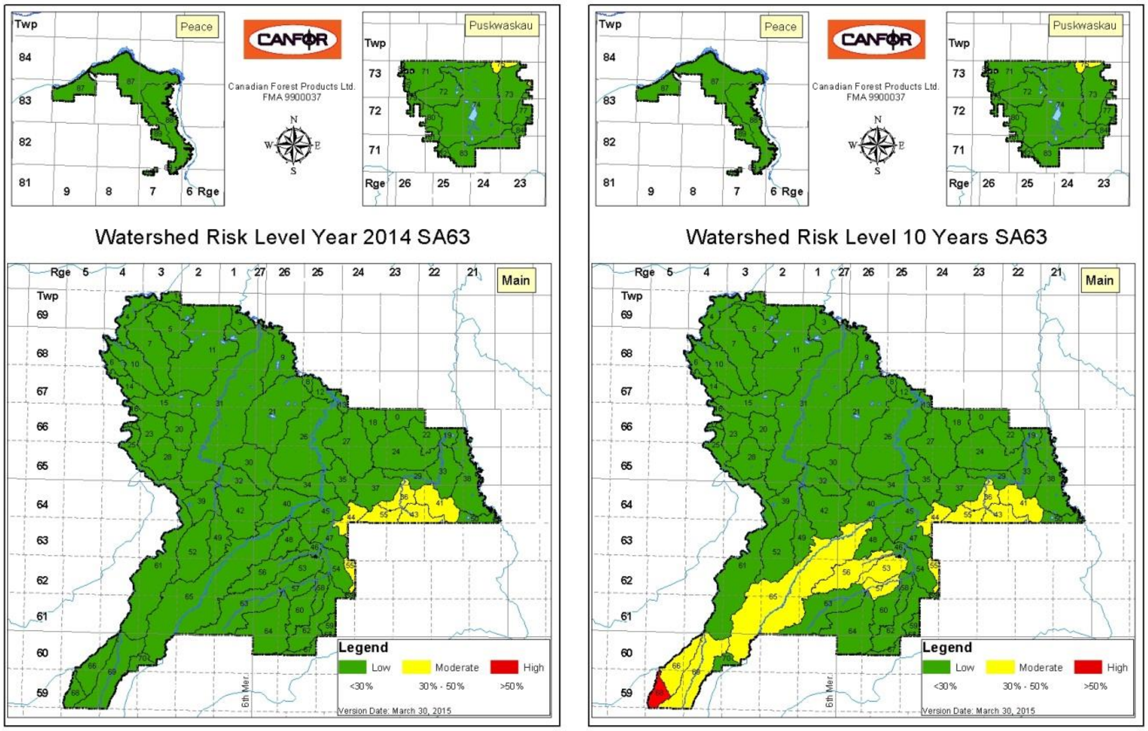

Figure 33: Watershed Risk Level Map (Current Status and After 10 Years)

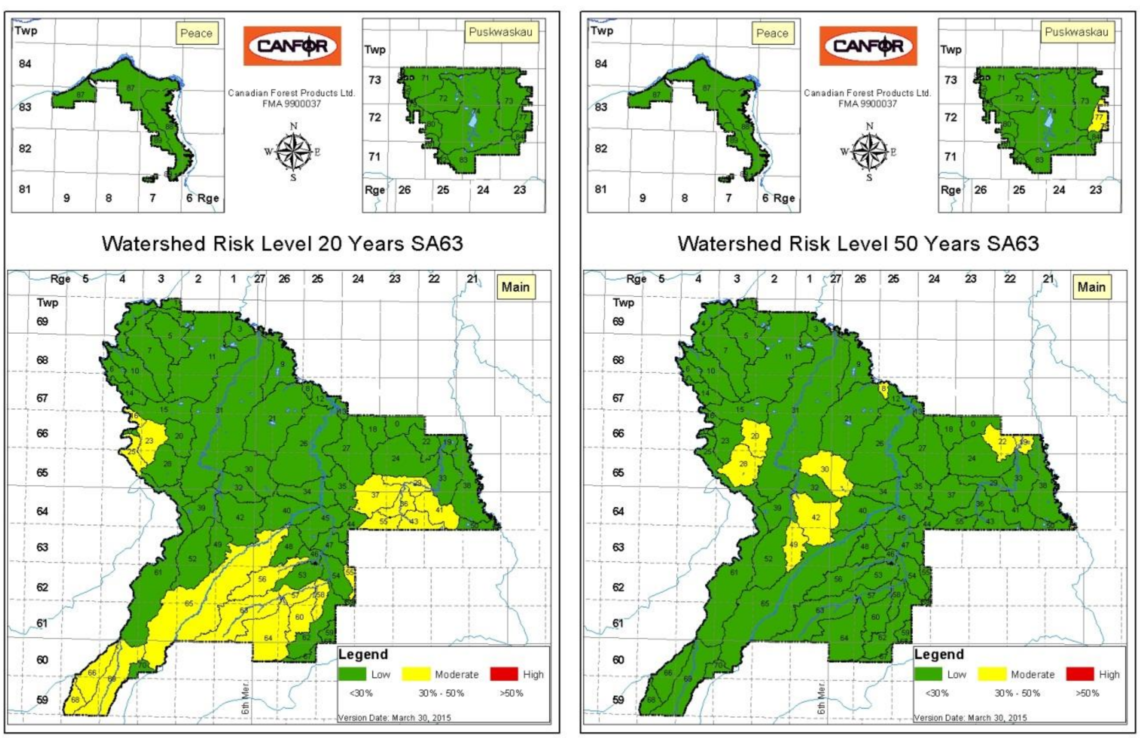

Figure 34: Watershed Risk Level Map (After 20 and 50 Years)

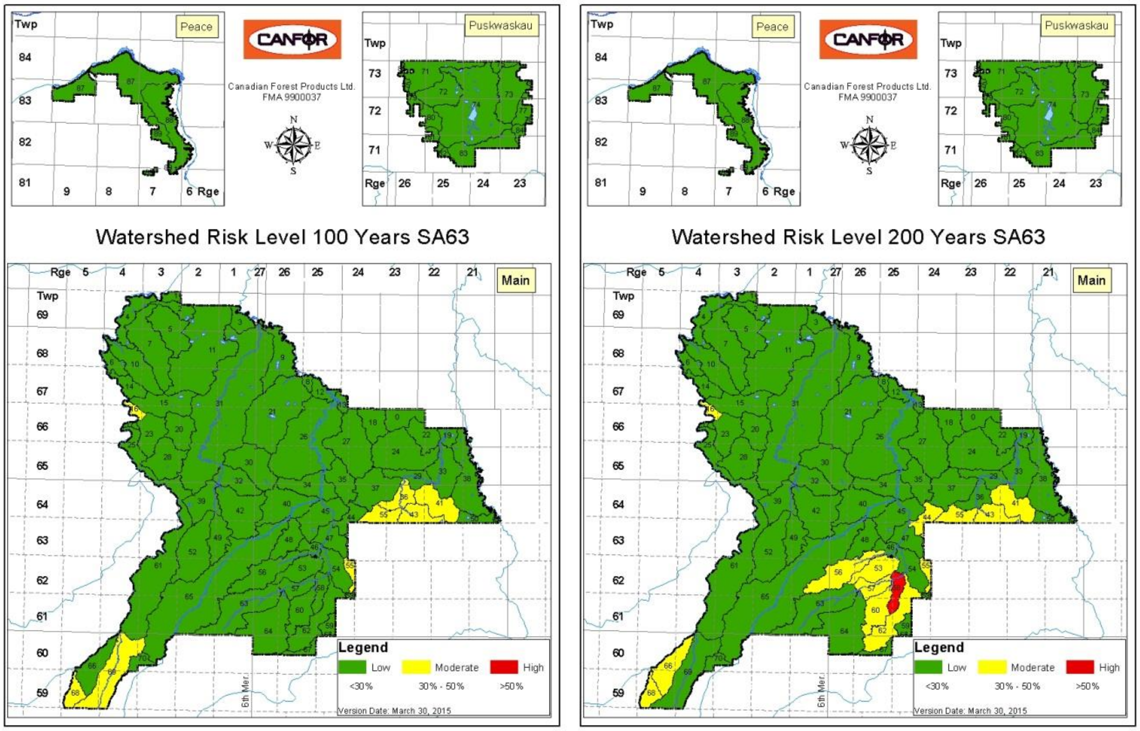

Figure 35: Watershed Risk Level Map (After 100 and 200 Years)

3.1.6 Caribou Objectives

As discussed above, caribou objectives are established for each individual caribou zone. The following section summarizes key metrics regarding the management for caribou habitat in these zones including the impacts of vegetation management in enhancing caribou habitat.

__Conservation Zone (1)__

With limited harvesting activity in this zone the age class distribution gets progressively older over time (Figure 36).

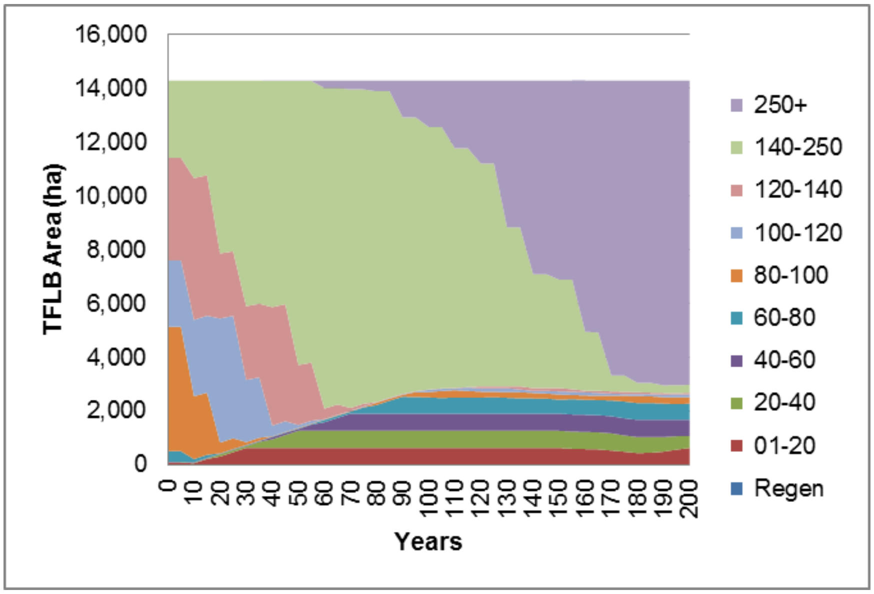

Figure 36: TFLB Age Class Distribution in Caribou Zone 1

Limited harvesting also results in a reduction in alternate prey habitat through vegetation management, as shown in Figure 37 and Figure 38.

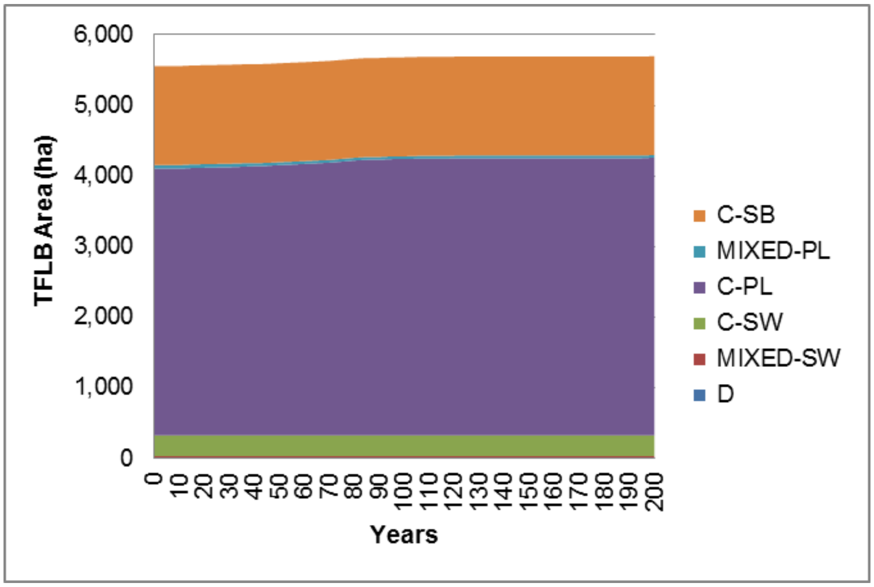

Figure 37: TFLB Cover Class in Caribou Zone 1

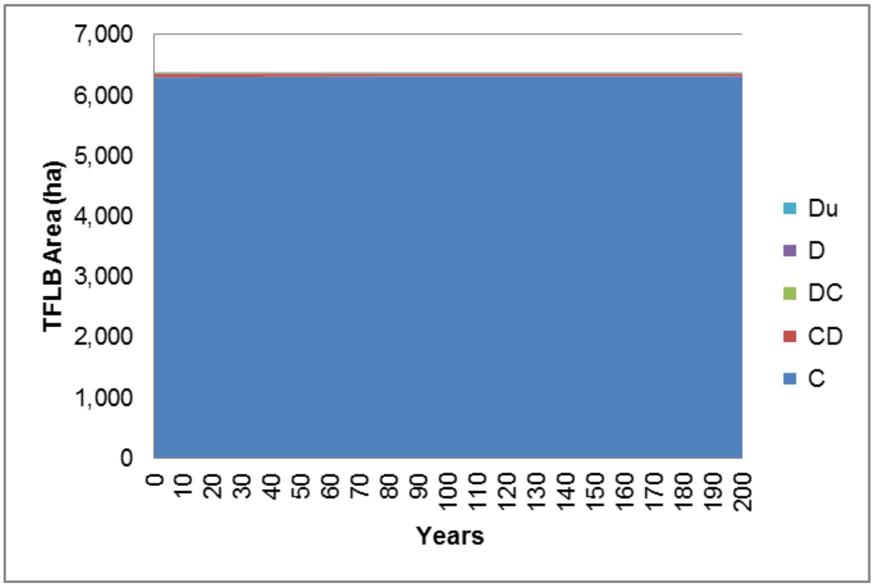

Figure 38: TFLB Broad Cover Group in Caribou Zone 1

Expansion Zone (2)

Increased activity in this zone relative to zone 1 results in a slightly younger age class distribution over time as is shown in Figure 39.

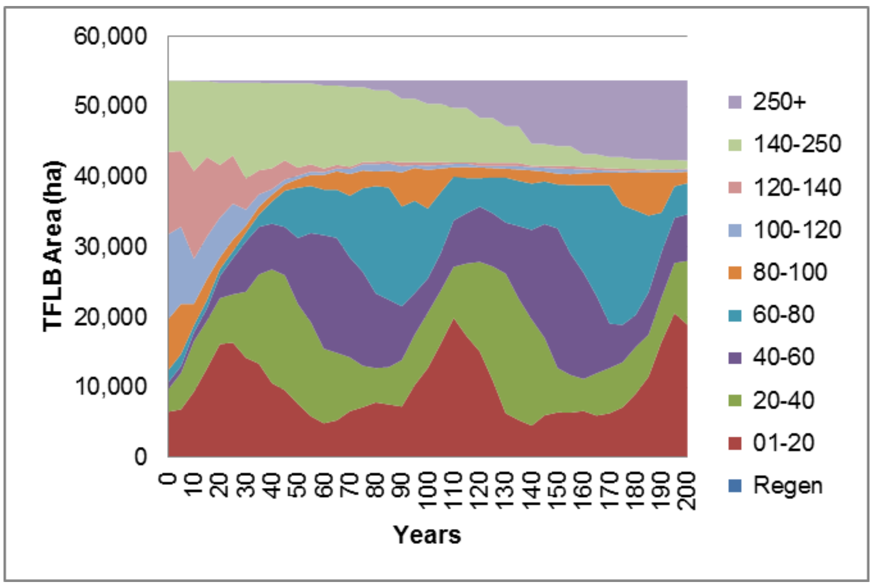

Figure 39: TFLB Age Class Distribution in Caribou Zone 2

Increased management activity in this zone results in a long-term decrease in alternate prey habitat through vegetation management as is shown in Figure 40 and Figure 41.

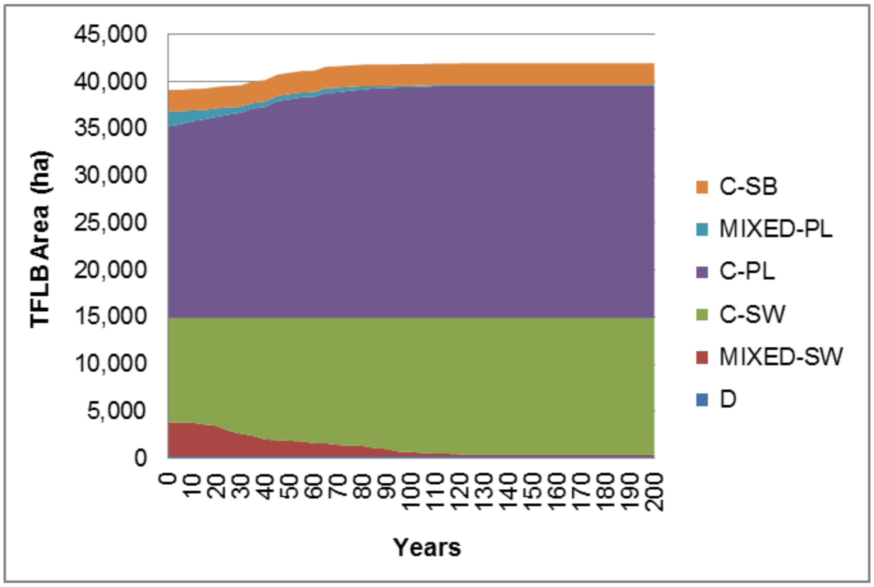

Figure 40: TFLB Cover Class in Caribou Zone 2

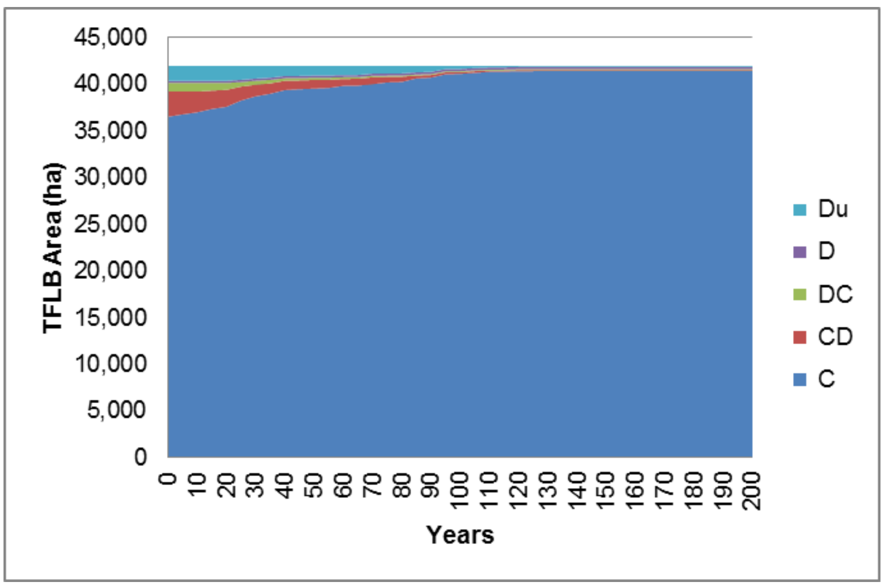

Figure 41: TFLB Broad Cover Group in Caribou Zone 2

Support Zone (3)

Similar to the expansion zone, harvesting activity transitions this zone into a more even age class distribution (Figure 42).

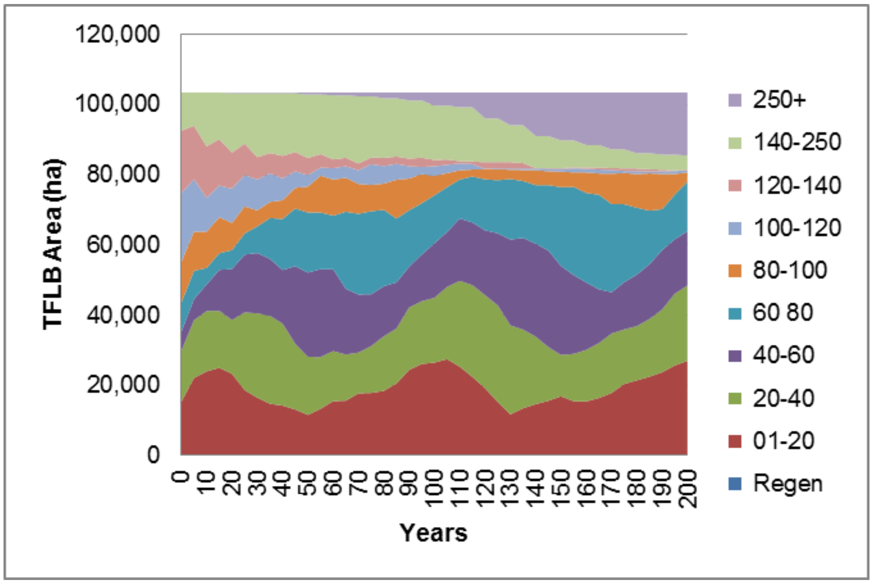

Figure 42: TFLB Age Class Distribution in Caribou Zone 3

Vegetation management in this zone results in a significant reduction in alternate prey habitat as demonstrated in Figure 43 and Figure 44.

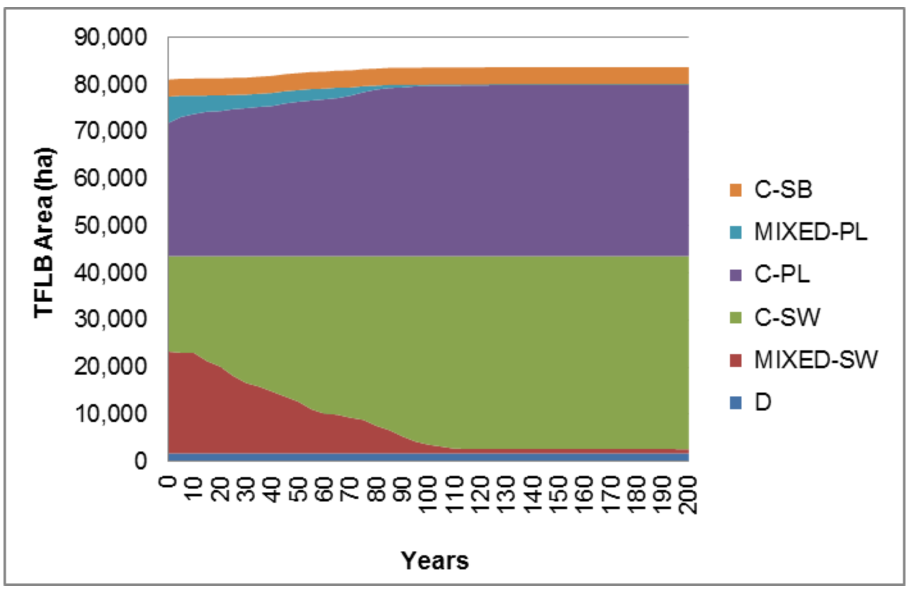

Figure 43: TFLB Cover Class in Caribou Zone 3

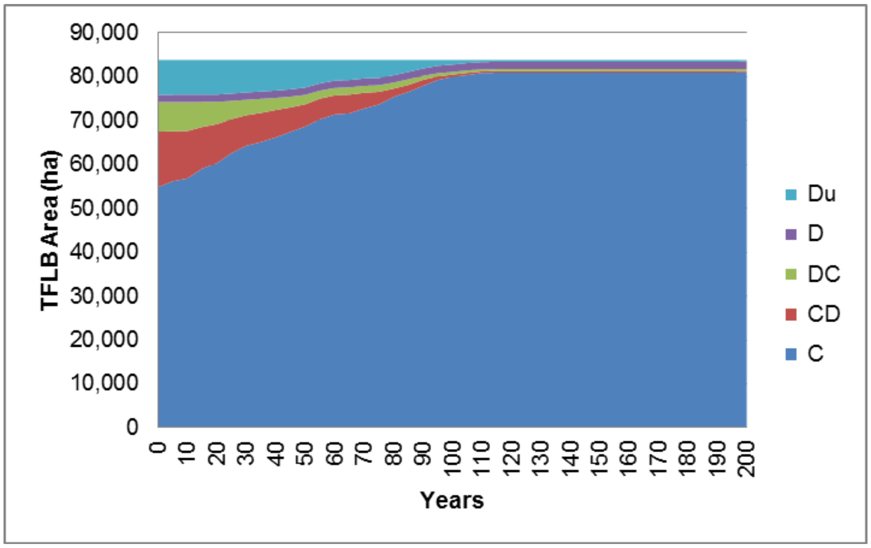

Figure 44: TFLB Broad Cover Group in Caribou Zone 3

3.1.7 Age Class Distribution

Figure 45 shows the age class distribution of the TFLB area for the entire FMA area. Figure 46 shows the THLB area age class distribution.

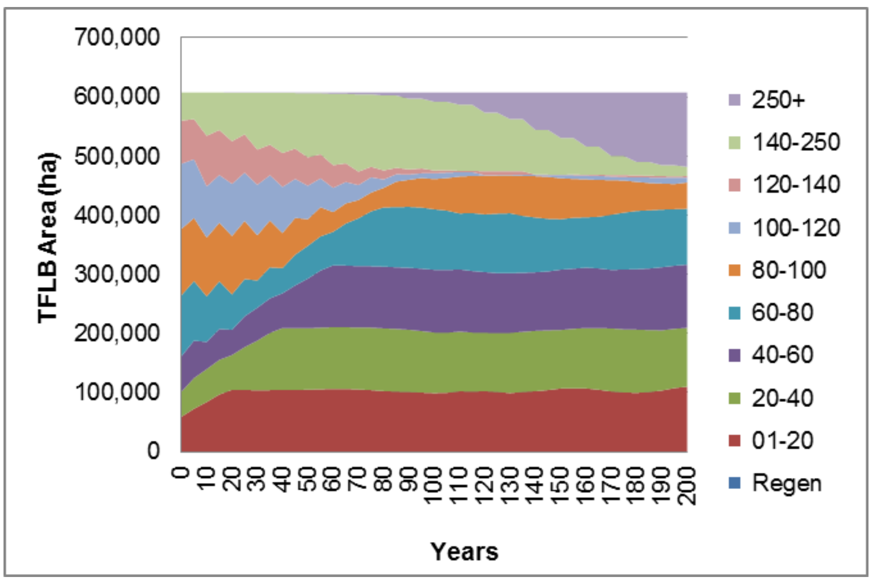

Figure 45: TFLB Age Class Distribution – Entire FMA

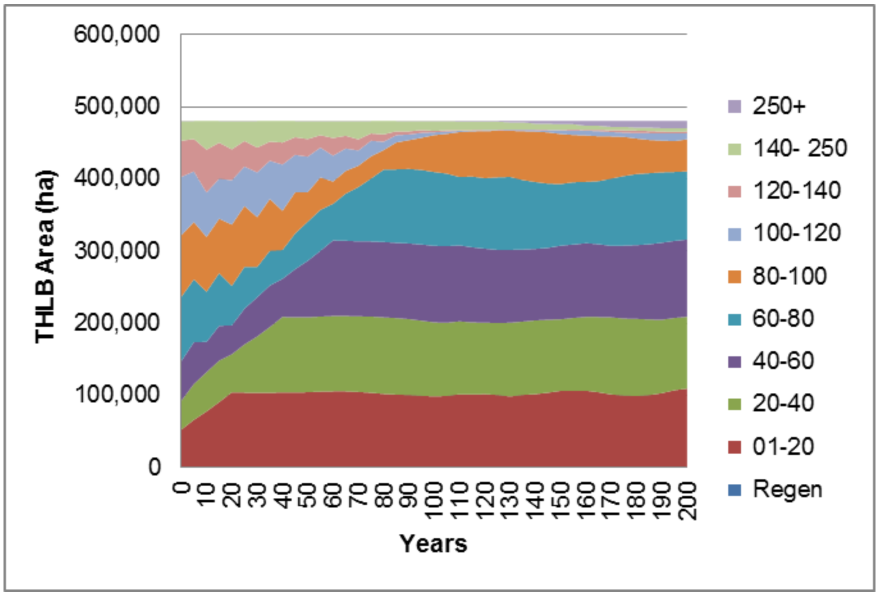

Figure 46: THLB Age Class Distribution – Entire FMA

Figure 47 and Figure 48 show the age class distribution of the TFLB area and the THLB area for the Foothills Natural Region.

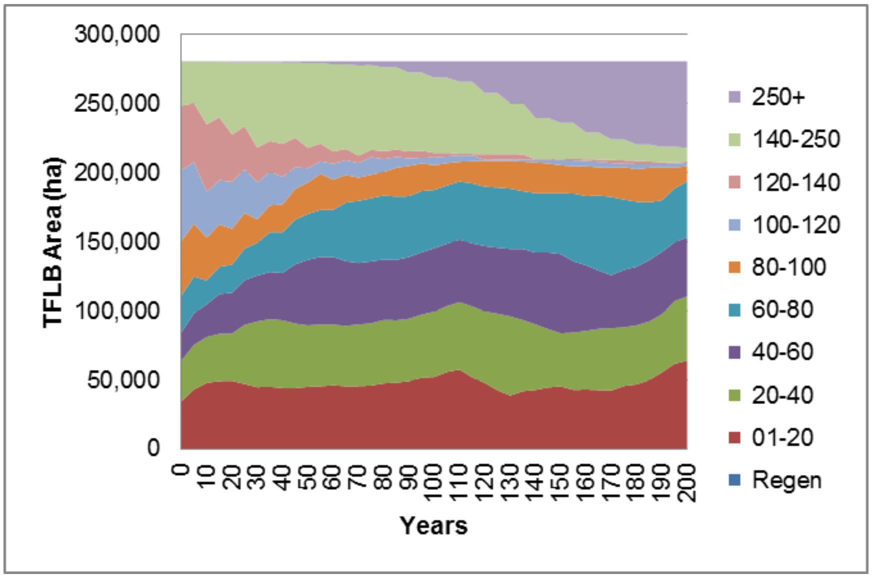

Figure 47: TFLB Age Class Distribution – Foothills Natural Region

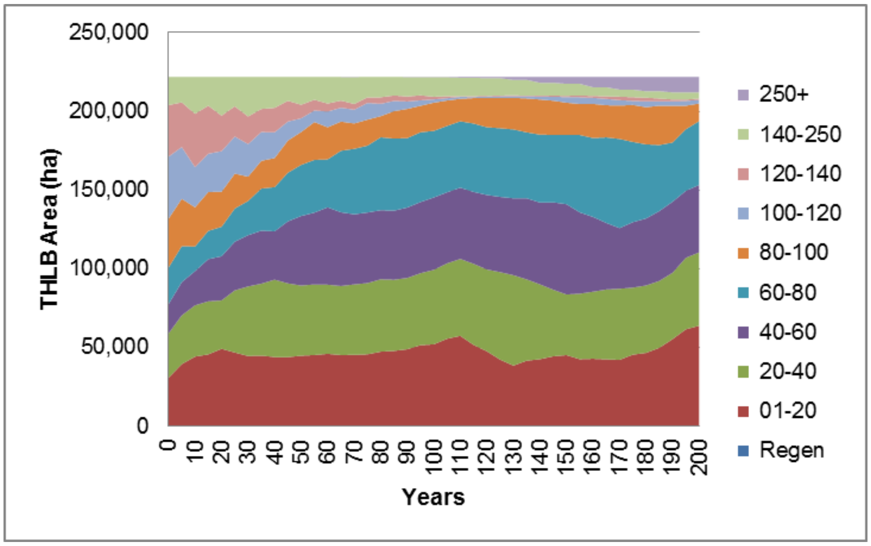

Figure 48: THLB Age Class Distribution – Foothills Natural Region

Figure 49 and Figure 50 show the age class distribution of the TFLB area and the THLB area for the Boreal Natural Region.

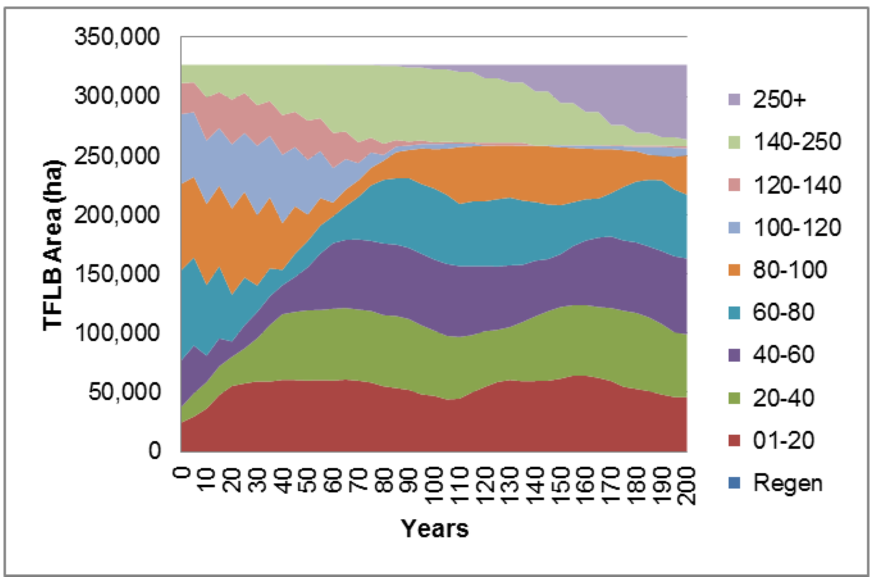

Figure 49: TFLB Age Class Distribution – Boreal Natural Region

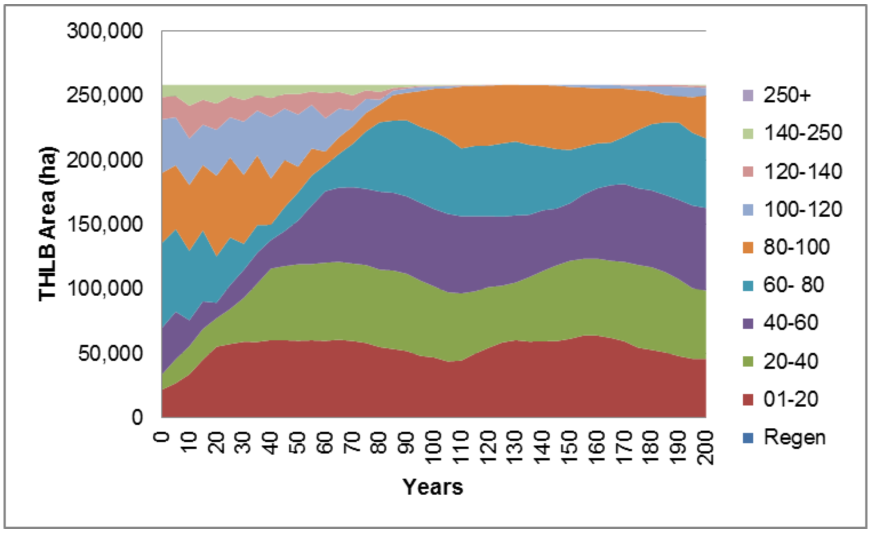

Figure 50: THLB Age Class Distribution – Boreal Natural Region

Figure 51 and Figure 52 show the age class distribution of the TFLB area and the THLB area for the Main parcel.

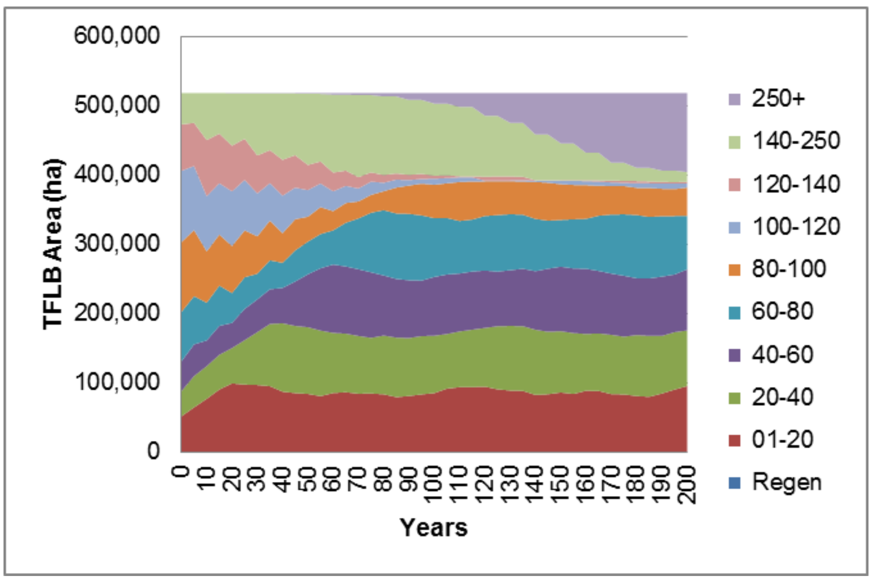

Figure 51: TFLB Age Class Distribution – Main Parcel

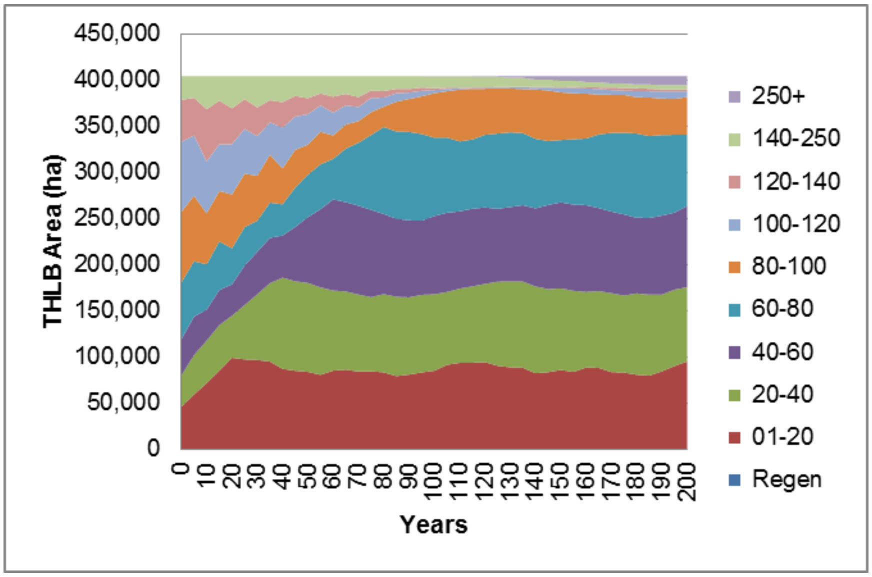

Figure 52: THLB Age Class Distribution – Main Parcel

Figure 53 and Figure 54 show the age class distribution of the TFLB area and the THLB area for the Peace parcel.

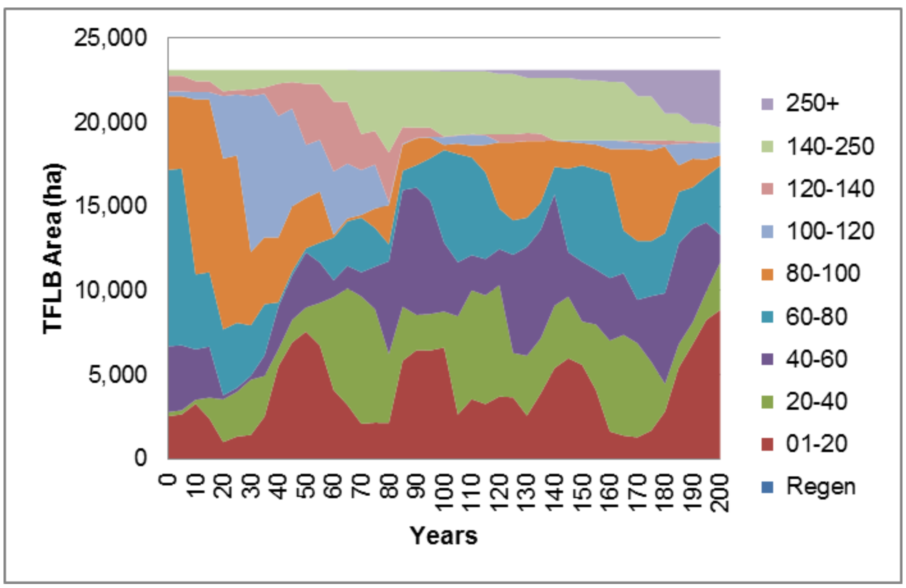

Figure 53: TFLB Age Class Distribution – Peace Parcel

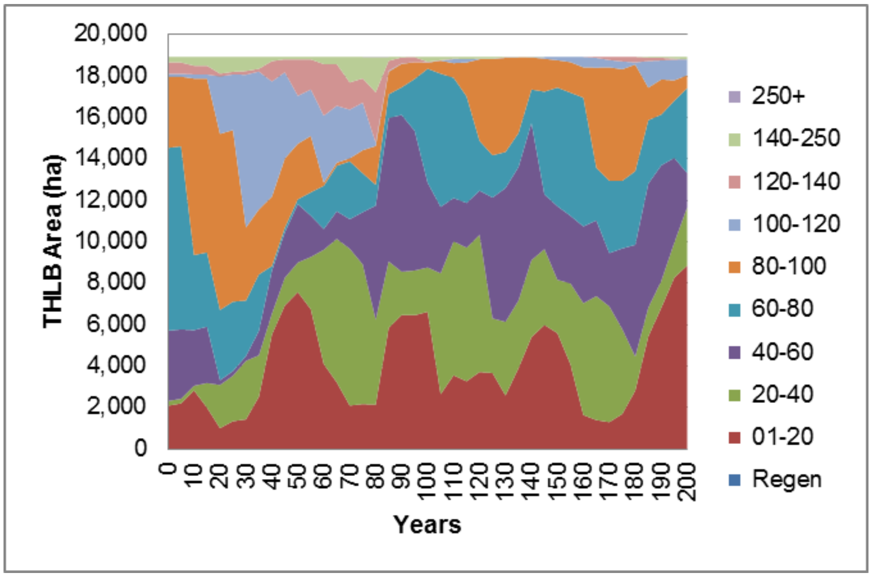

Figure 54: THLB Age Class Distribution – Peace Parcel

Figure 55 and Figure 56 show the age class distribution of the TFLB area and the THLB area for the Puskwaskau parcel.

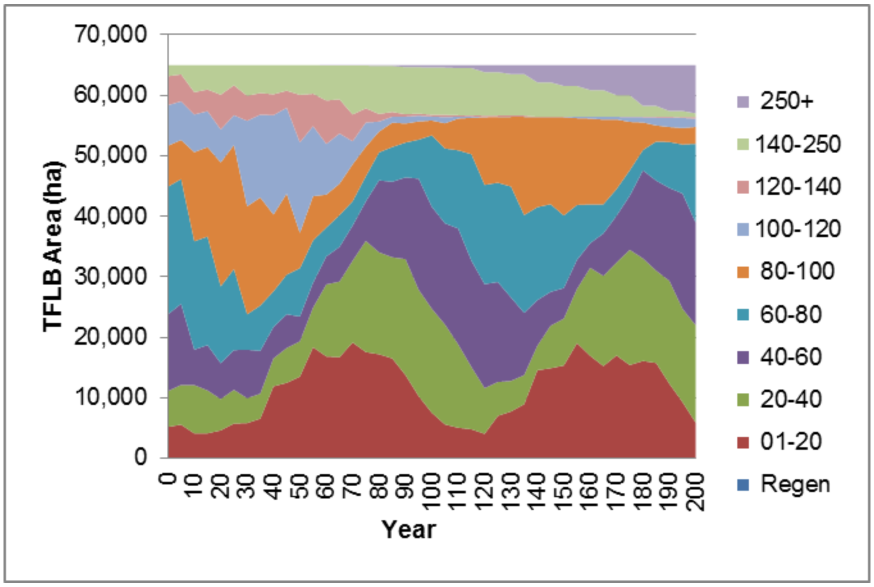

Figure 55: TFLB Age Class Distribution – Puskwaskau Parcel

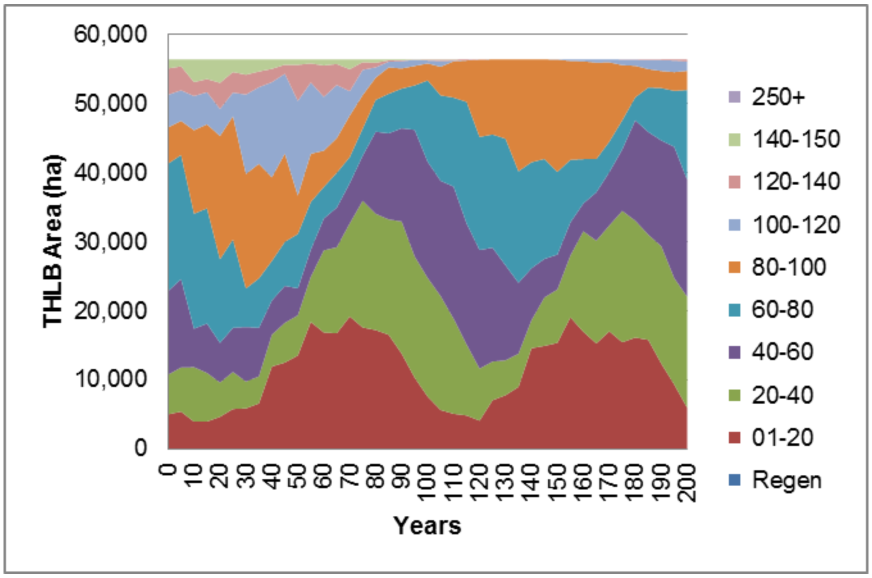

Figure 56: THLB Age Class Distribution – Puskwaskau Parcel

3.1.8 Age Class Distribution by Harvest Area

Figure 57 to Figure 62 show the age distribution of the stands harvested for each of the time periods listed.

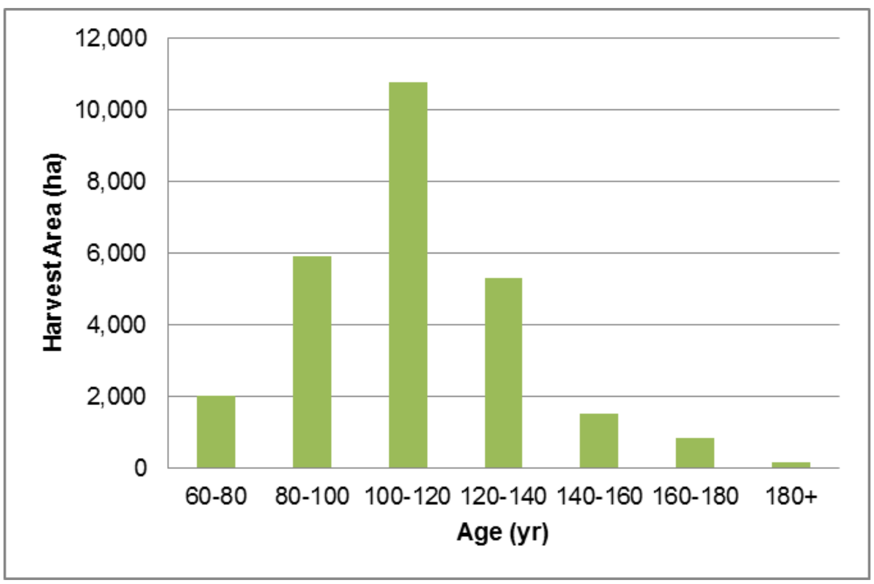

Figure 57: Year 5 - Harvest Area by Age Class

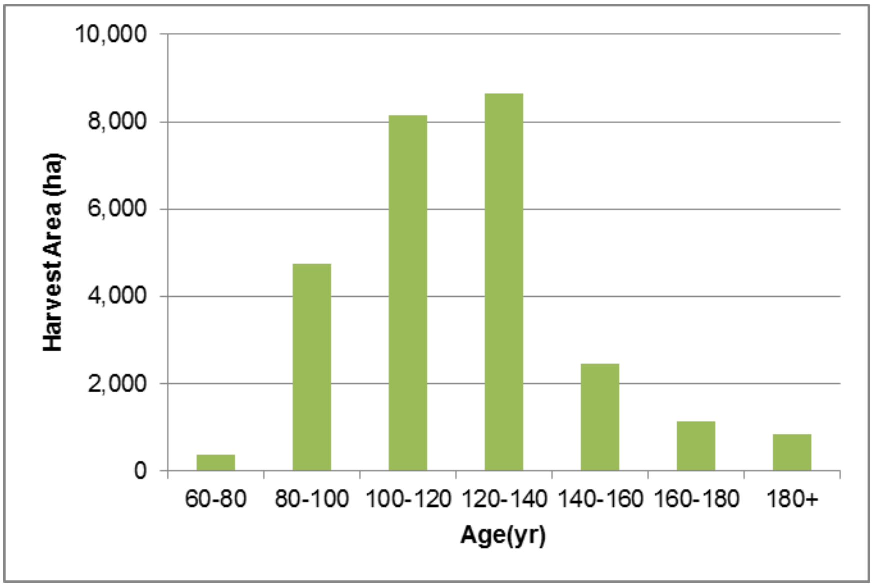

Figure 58: Year 10 - Harvest Area by Age Class

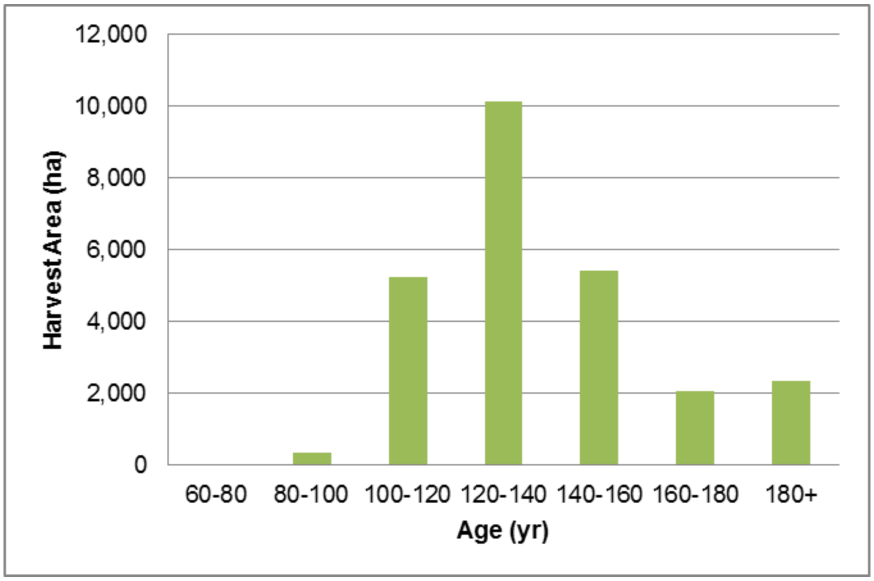

Figure 59: Year 20 - Harvest Area by Age Class

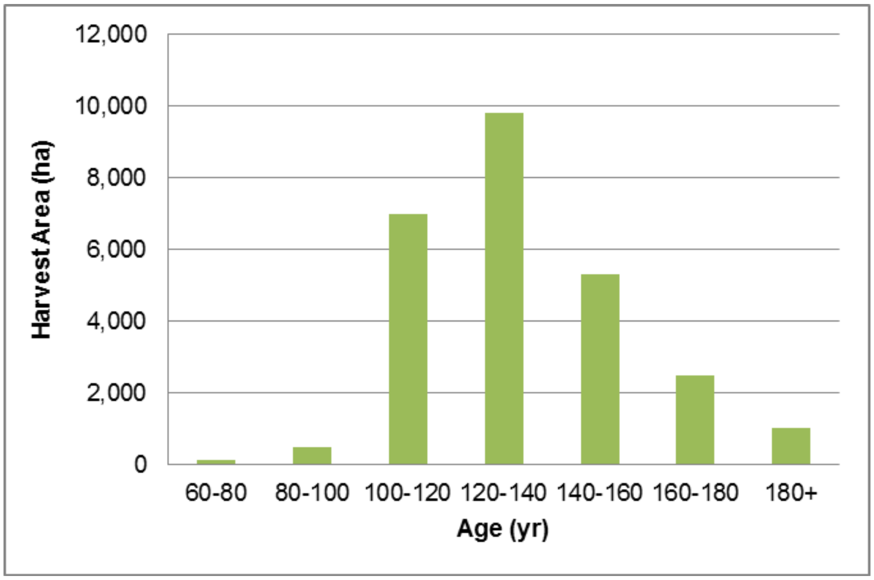

Figure 60: Year 50 - Harvest Area by Age Class

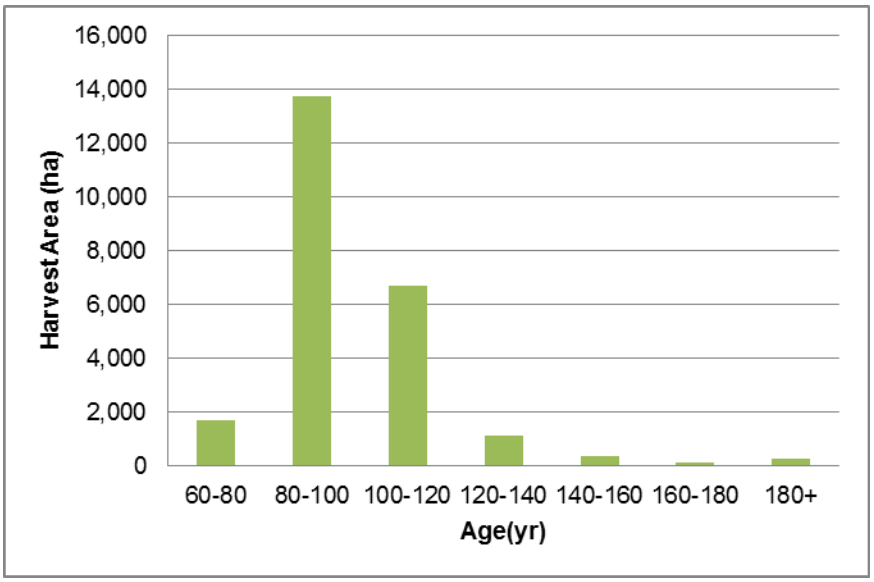

Figure 61: Year 100 - Harvest Area by Age Class

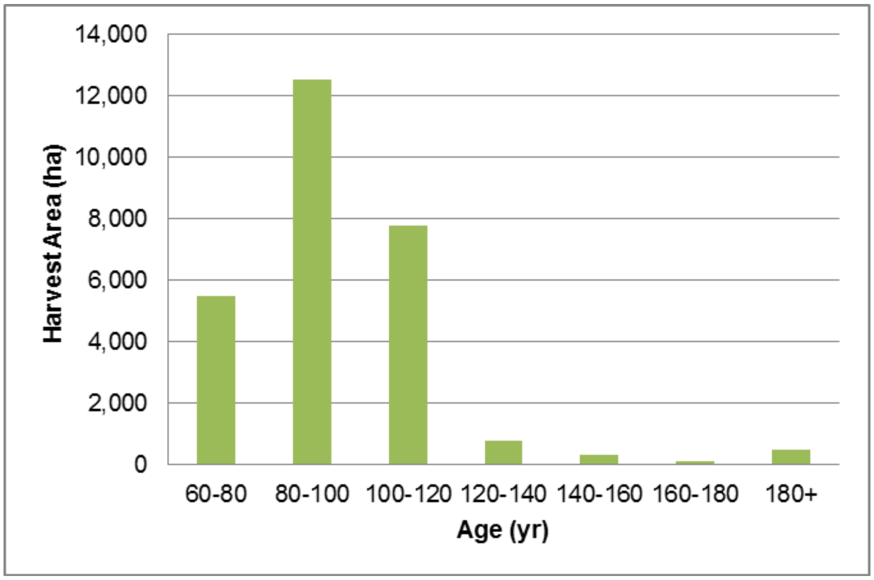

Figure 62: Year 200 - Harvest Area by Age Class

3.1.9 Carbon Sequestration

As part of their SFMP, Canfor has committed to monitoring the uptake and storage of carbon on the FMA area. Figure 63 shows the change in carbon stored in each of the carbon pools incorporated into the forest estate model.

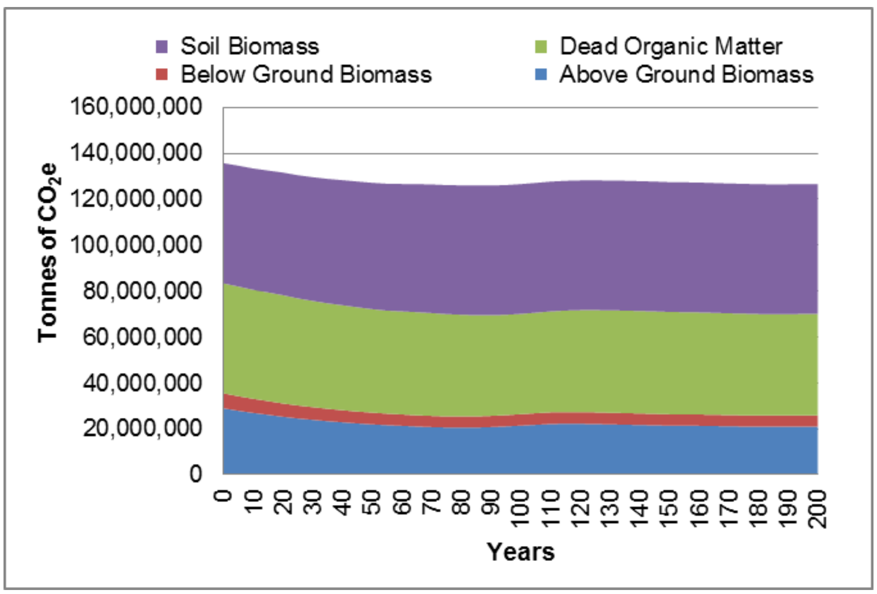

Figure 63: Carbon Pool

3.1.10 Old Interior Forest

Figure 64 shows the current status of the old interior forest within the FMA. Appendix IV shows old interior forest forecasts through various points in the 200 year planning horizon

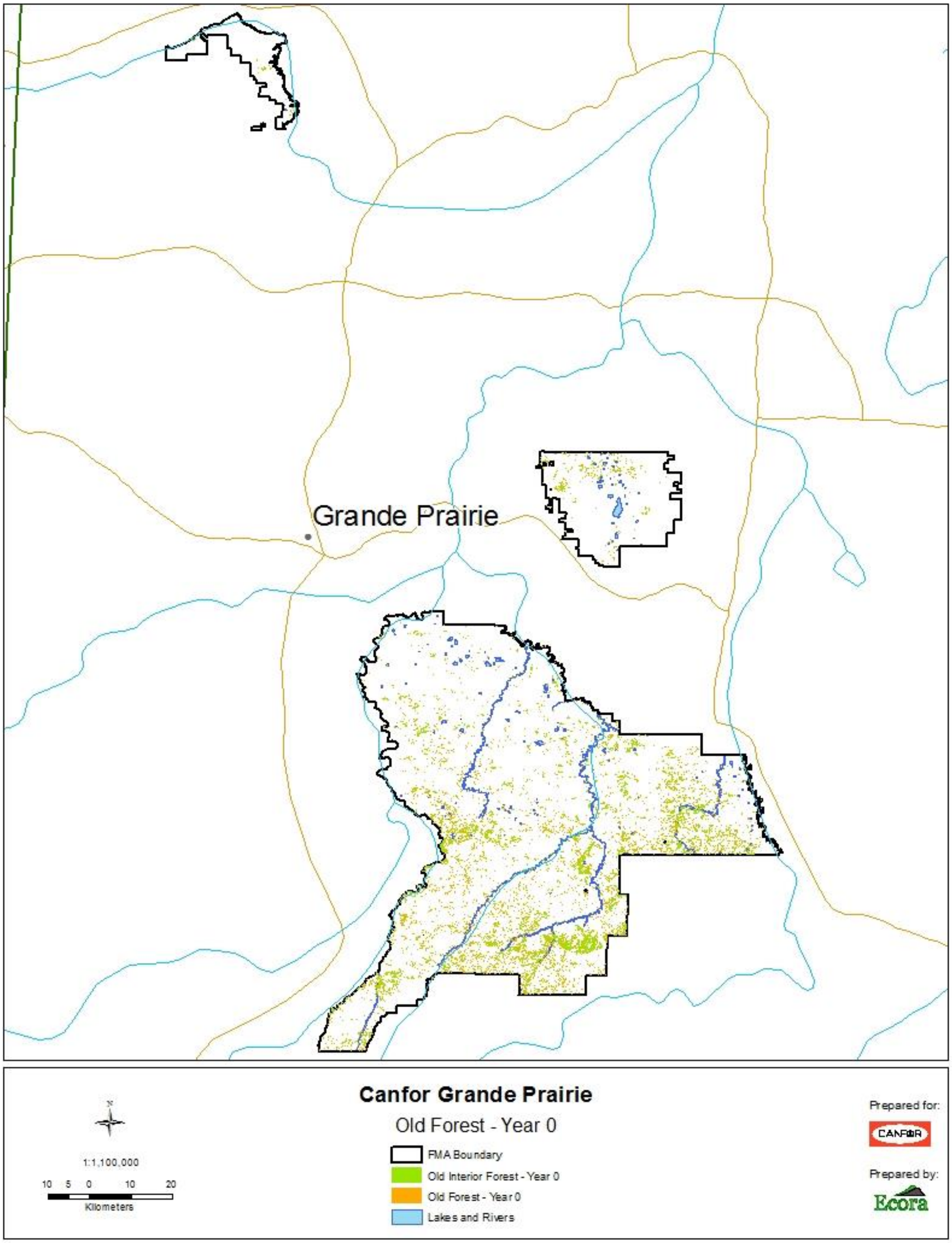

Figure 64: Old Interior Forest – Current Status

3.1.11 Barred Owl

Table 16 shows the average resource selection function (RSF) values for the barred owl habitat over the next 100 years with Figure 65 showing the current RSF values. These RSF numbers are aggregated to create a binary 0/1, or no habitat for the barred owl. The calculation of RSF in the model is based upon a number of factors that include presence/absence of hardwood and softwood forest and the age of these forest stands. Stands with an RSF value of 0.17054 or higher are deemed to be suitable barred owl habitat. In addition to this value selection, raster cells are compiled into 500ha units to ensure that sufficient area of suitable habitat exists within a particular area. To generate this table the average value of the RSF was calculated from the model's raster grids.

These assumptions have been derived from the report *Habitat selection of barred owls (Strix varia) across multiple spatial scales in a boreal agricultural landscape in north-central Alberta* (Russell, 2008) and have been refined for this analysis in consultation with Mr. Russell.

Table 16: Average Resource Selection Values (RSF) for Barred Owl

Year	Average RSF
2015	0.336
2025	0.334
2065	0.288
2115	0.288

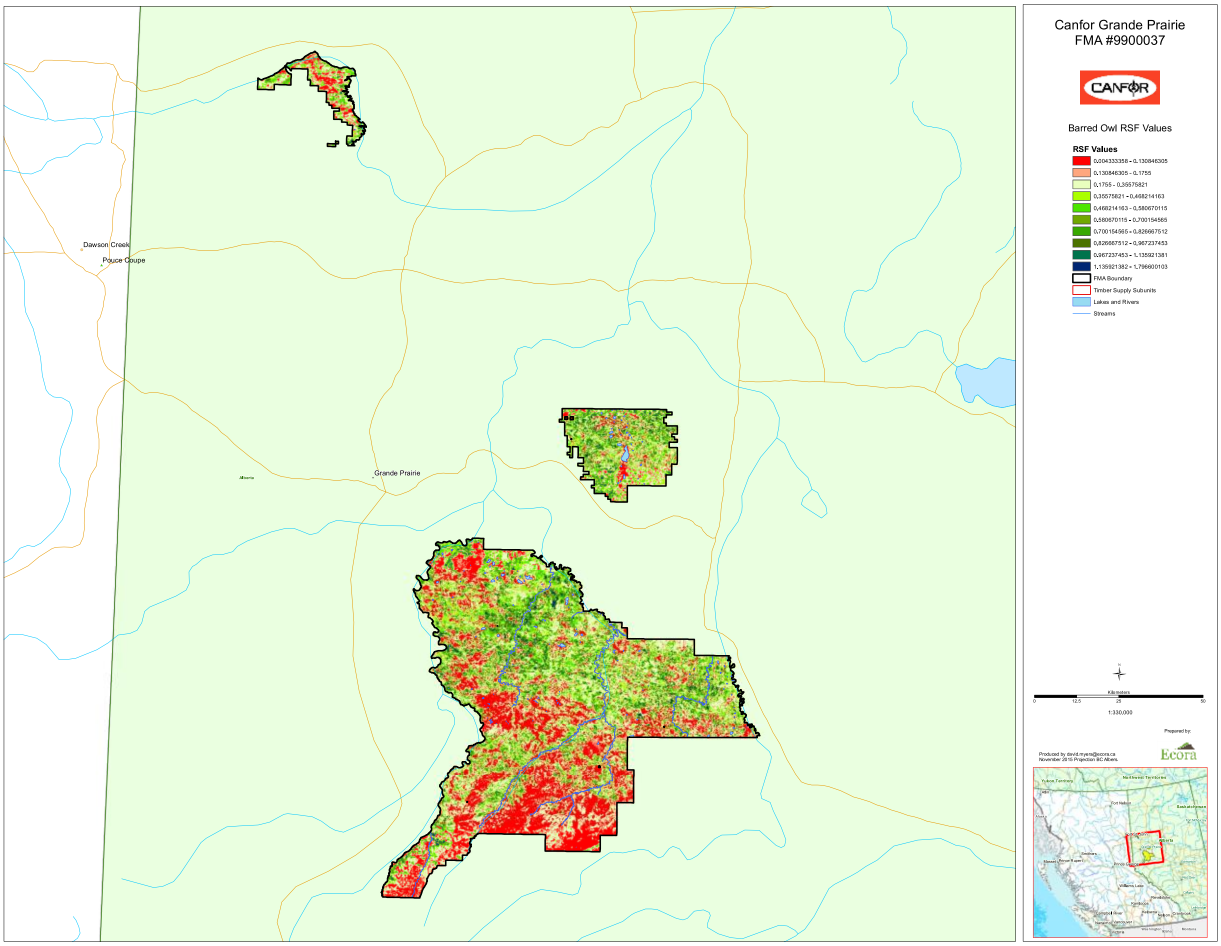

Figure 65: Barred Owl Habitat RSF Values– Current Status

Figure 66 shows the current status of potential barred owl habitat within the FMA area. Appendix V shows the potential barred owl habitat forecasts through various points in the 200 year planning horizon.

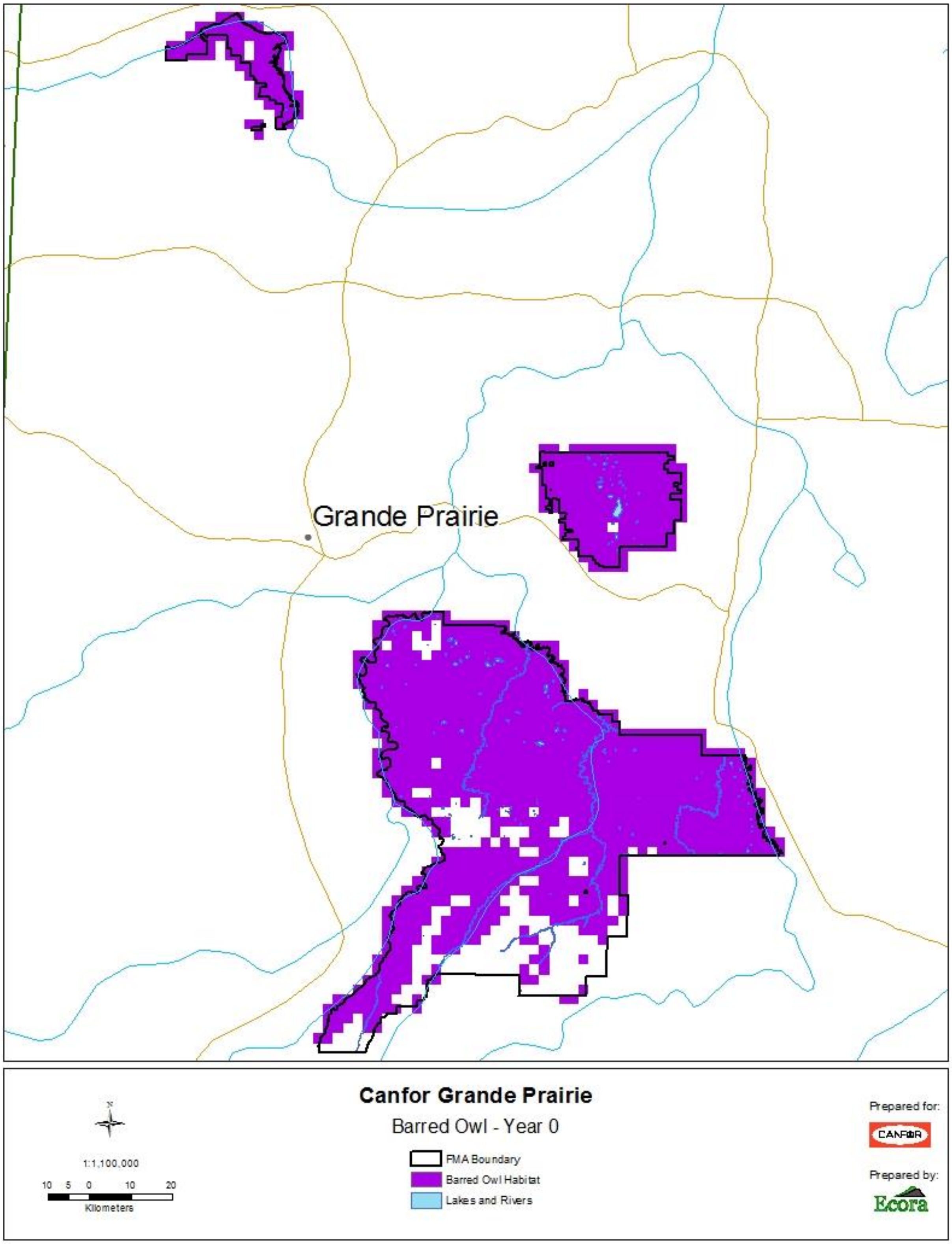

Figure 66: Barred Owl Habitat Potential – Current Status

3.1.12 Grizzly Bear

The six Grizzly bear watershed units (G15A, G15B, G20, G22, G30, and G32) located within the primary and secondary Grizzly bear habitat areas within Canfor's FMA area were assessed using the Habitat State model. The six Grizzly bear watersheds are described in Table 17. The model indicated that there will be a predicted increase in sink habitats in all but one of the Grizzly bear watershed units (GBWU) after the first 10 years of harvest (G30 is a very small area located within the caribou zone planned for deferral). Although there is a significant increase in the amount of primary habitat created through time in G22 to offset the amount of area that changes to a sink, the overall changes in habitat state across the FMA area result in a 6.1% increase in sink habitats after 10 years. The total habitat changes are described in Table 18, Figure 67 and Figure 68.

Table 17: Changes in Grizzly Habitat State by GBWU Based on 10-Year Spatial Harvest Sequence

GBWU	Total Area (km^2)	Change in Habitat State (km^2)				
		Primary Sink	Secondary Sink	Non-critical Habitat	Secondary Habitat	Primary Habitat
G15A	295	6	10	-16	-2	2
G15B	219	31	3	-11	-31	9
G20	569	24	11	-18	-31	15
G22	802	19	13	-30	-27	26
G30	5	0	0	0	0	0
G32	23	1	0	0	-2	1

Table 18: Changes in total habitat state based on 10 year spatial harvest sequence

Habitat	Change (km^2)	Percent of Total (%)
Primary Sink	81	4.2
Secondary Sink	36	1.9
Non-critical Habitat	-76	-4
Secondary Habitat	-93	-4.9
Primary Sink	53	2.8

Figure 67 shows the current status of grizzly bear habitat and the habitat available in 10 years time within the FMA area. Appendix VI shows the resource availability and risk related to road density and habitat quality.

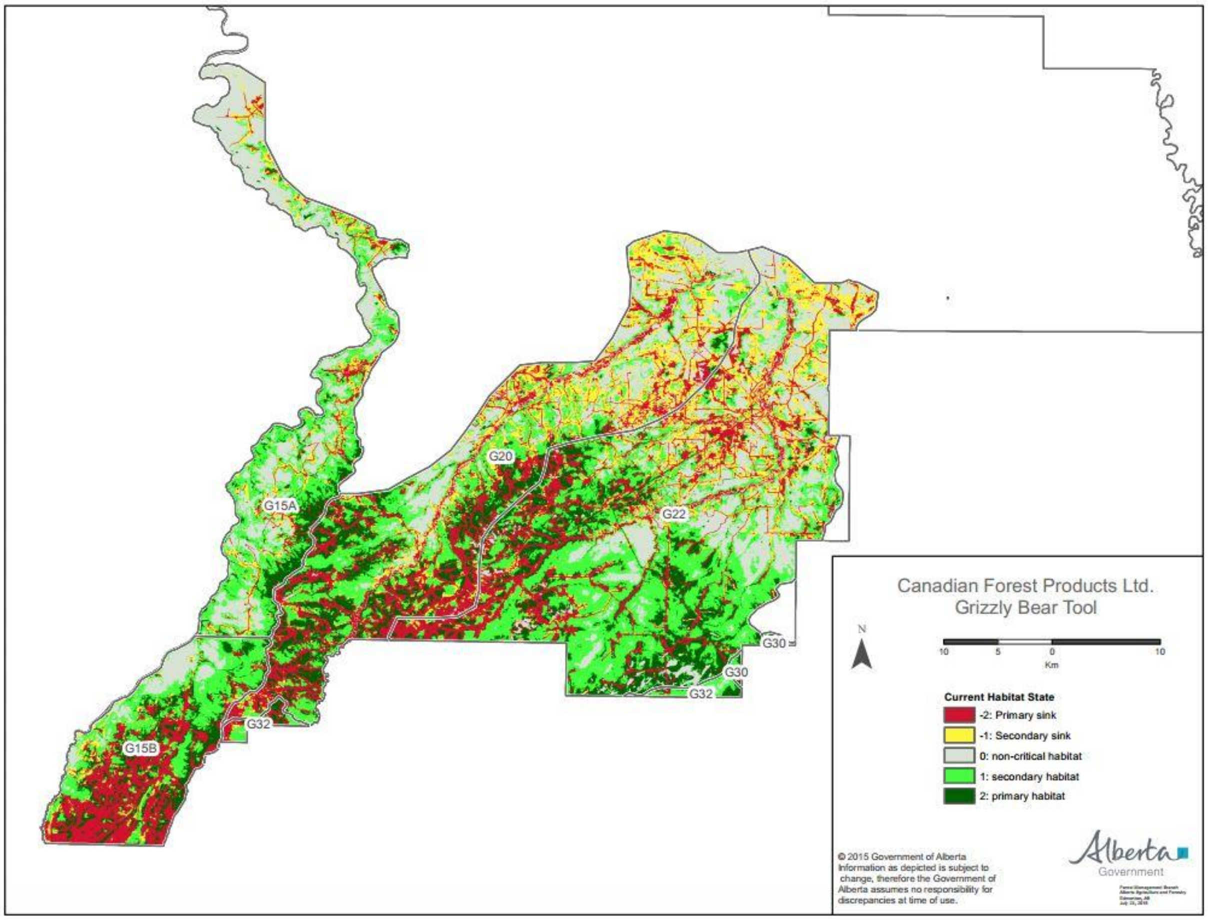

Figure 67: Current Grizzly Bear Habitat (AERSD, 2015)

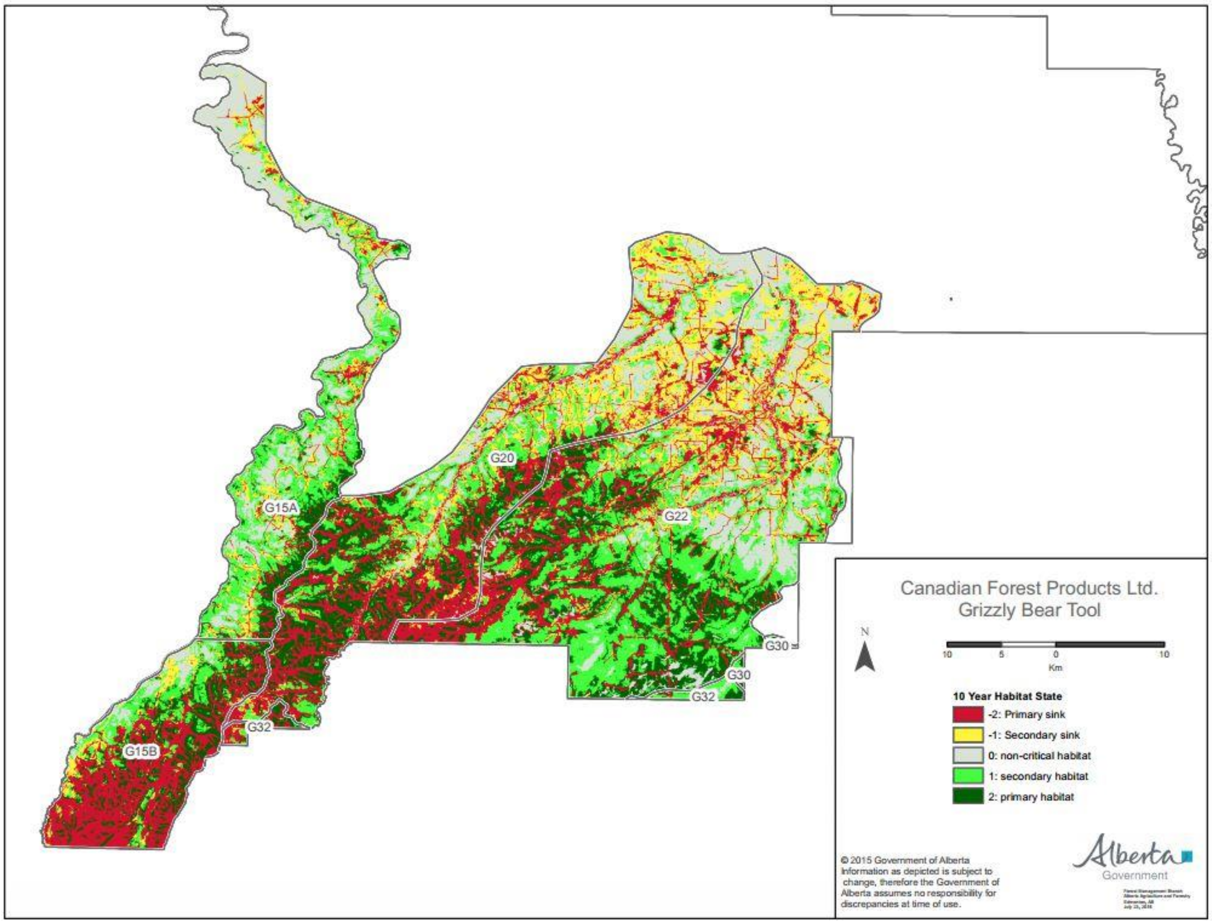

Figure 68: 10 Year Grizzly Bear Habitat (AESRD, 2015)

3.1.13 Distribution of Forest Types

Through vegetation management options to reduce caribou alternate prey habitat and the transition of Du stands to CD following harvest, the overall distribution of THLB by broad cover group changes over time. Figure 69 illustrates those changes.

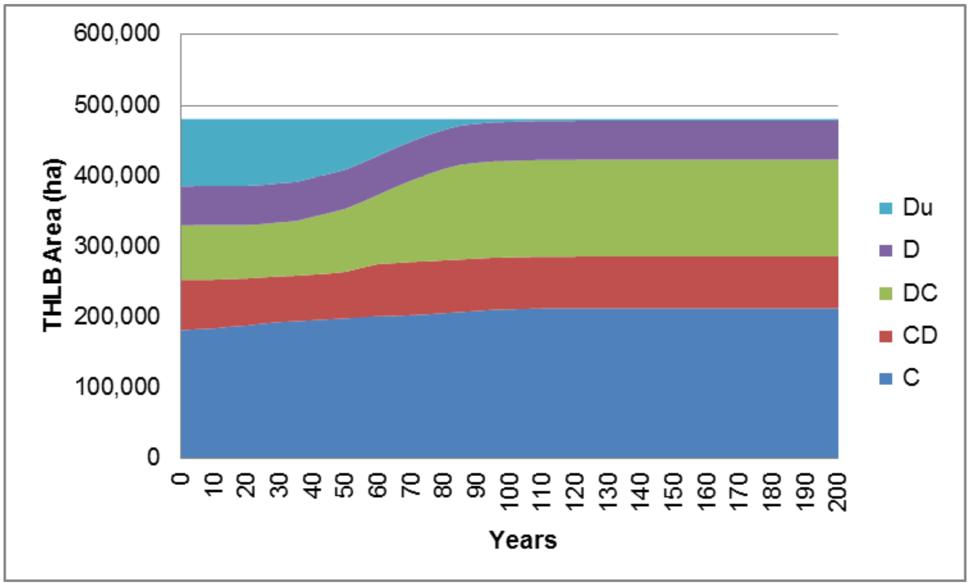

Figure 69: THLB Area by Broad Cover Group

Similarly, Figure 70 shows the changes in cover class over time.

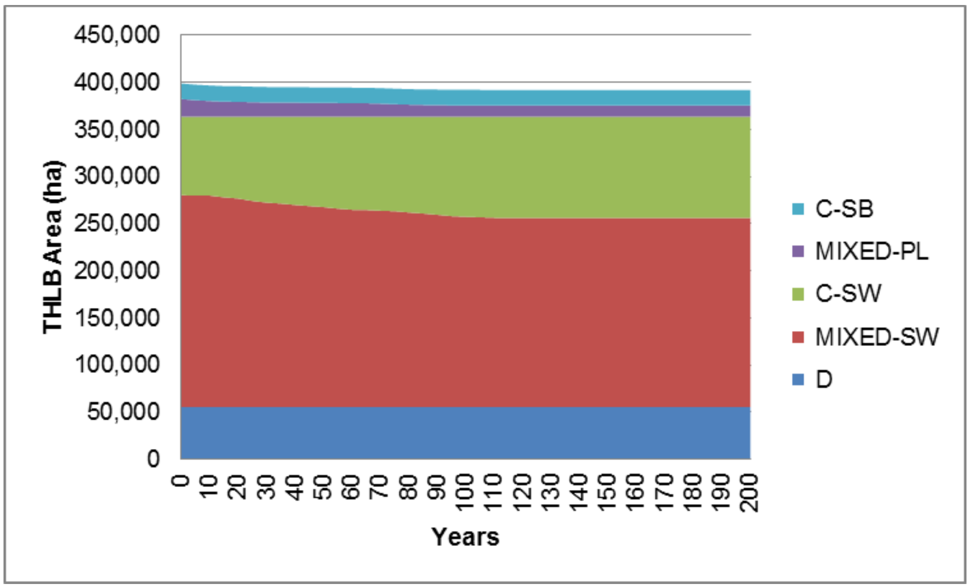

Figure 70: THLB Area by Cover Class

The transitions of cover class and seral stage for each major time step are explored in Table 19 to Table 24. Similar to the figures above, the overall distribution of TFLB area by cover class changes over time. Corresponding with the vegetation management options for reducing caribou alternate prey habitat, the amount of mixedwood stands decreases with time and there is a corresponding increase in the areas with cover class C_PL and C_SW.

Table 19: TFLB Area (ha) by Cover Class and Seral Stage (Current Status)

Cover Class	Current Status Seral Stage					
	Pioneer	Young	Mature	Over Mature	Old	Total
C_PL	12,251	16,828	22,666	30,501	9,179	91,424
C_SB	1,523	234	14,241	1,784	910	18,691
C_SW	11,508	17,468	25,876	23,524	17,283	95,659
D	4,080	718	24,799	41,502	3,136	74,233
MIXED_PL	1,765	4,737	3,972	8,435	1,328	20,237
MIXED_SW	6,694	28,444	149,198	48,672	8,191	241,199
None[7]	120	81	756	14,689	45,196	60,842
Total	**37,941**	**68,509**	**241,507**	**169,107**	**85,221**	**602,285**

Table 20: TFLB Area (ha) by Cover Class and Seral Stage (Year 10)

Cover Class	Year 10 Seral Stage					
	Pioneer	Young	Mature	Over Mature	Old	Total
C_PL	20,655	27,924	13,469	22,117	9,407	93,573
C_SB	1,327	775	13,074	2,454	1,061	18,691
C_SW	10,895	23,979	20,651	17,849	22,617	95,992
D	17,135	9,402	8,587	32,105	7,005	74,234
MIXED_PL	1,251	5,109	2,400	7,886	1,442	18,089
MIXED_SW	4,472	23,704	140,109	57,848	14,732	240,866
None[7]	59	61	272	17,271	43,179	60,842
Total	**55,793**	**90,954**	**198,563**	**157,531**	**99,444**	**602,285**

Table 21: TFLB Area (ha) by Cover Class and Seral Stage (Year 20)

Cover Class	Year 20 Seral Stage					
	Pioneer	Young	Mature	Over Mature	Old	Total
C_PL	12,339	40,303	9,360	19,169	13,248	94,419
C_SB	1,293	1,578	11,482	2,881	1,458	18,691
C_SW	25,734	22,708	17,180	12,868	20,710	99,200
D	1,511	27,271	3,655	31,118	10,679	74,233
MIXED_PL	1,030	3,240	4,830	6,354	1,789	17,243
MIXED_SW	26,963	16,612	126,366	52,819	14,899	237,657
None[7]		59	220	12,230	48,333	60,842
Total	**68,869**	**111,770**	**173,093**	**137,438**	**111,115**	**602,285**

[7] *None = Non Productive C_SB (YG 13)*

Table 22: TFLB Area (ha) by Cover Class and Seral Stage (Year 50)

Cover Class	Year 50 Seral Stage					
	Pioneer	Young	Mature	Over Mature	Old	Total
C_PL	9,821	37,864	28,131	5,725	14,123	95,664
C_SB	7,621	3,544	3,157	2,183	2,187	18,691
C_SW	27,728	37,213	24,924	5,716	12,664	108,245
D	3,068	8,204	31,539	5,108	26,314	74,234
MIXED_PL	2,111	3,712	5,981	2,569	1,625	15,997
MIXED_SW	43,579	53,679	34,687	83,439	13,228	228,612
None[7]			201	2,775	57,866	60,842
Total	**93,928**	**144,216**	**128,619**	**107,516**	**128,007**	**602,285**

Table 23: TFLB Area (ha) by Cover Class and Seral Stage (Year 100)

Cover Class	Year 100 Seral Stage					
	Pioneer	Young	Mature	Over Mature	Old	Total
C_PL	20,023	43,196	21,821	1,026	12,169	98,235
C_SB	1,188	7,789	6,261	83	3,370	18,691
C_SW	26,387	43,307	35,945	1,129	11,836	118,604
D	13,042	13,556	16,902	6,887	23,848	74,233
MIXED_PL	1,624	2,736	5,395	2,165	1,506	13,427
MIXED_SW	15,088	78,013	98,504	5,949	20,701	218,254
None[7]				123	60,719	60,842
Total	**77,352**	**188,597**	**184,828**	**17,361**	**134,149**	**602,285**

Table 24: TFLB Area (ha) by Cover Class and Seral Stage (Year 200)

Cover Class	Year 200 Seral Stage					
	Pioneer	Young	Mature	Over Mature	Old	Total
C_PL	16,357	45,558	23,613	593	12,240	98,361
C_SB	1,134	7,656	4,368	548	4,985	18,691
C_SW	48,256	37,682	21,357	192	12,345	119,833
D	12,972	15,747	18,874	2,941	23,700	74,234
MIXED_PL	1,586	2,531	5,132	2,351	1,700	13,301
MIXED_SW	20,039	70,330	97,250	8,712	20,694	217,025
None[7]					60,842	60,842
Total	**100,343**	**179,504**	**170,595**	**15,337**	**136,506**	**602,285**

3.1.14 Strata Description Table

As described in the planning standard, an output of the timber supply analysis includes a strata description table that should contain a summary of the timber types, harvest ages and compartment harvested within the first 20 years of the PFMS. This summary table is over 4,000 lines long and therefore has been provided as a separate file as part of the digital deliverables. Table 25 provides a summary of harvest area by compartment and broad cover group for the first 20 years of the planning horizon.

Table 25: Summary of the Strata Description Table

Timber Supply Subunit (TSS)	Harvest Area (ha) By Broad Cover Group					
	C	CD	D	DC	Du	Total
bolt-1	192	30		16		238
bolt-2	2,268	229	8	331		2,836
bolt-3	1,276	183	31	151	5	1,646
bolt-4	1,570	103	35	26		1,734
bolt-5	869					869
bolt-6	386					386
bolt-7	229	0				229
dn-1	858	228	74	120	15	1,295
dn-2	193	5	0			198
dn-3	671	62	15	75		823
dn-4	1,098	461	156	399	2	2,115
dn-5	1,187	135		178		1,500
dn-6	1,096	93	20	86		1,294
dn-7	355	149	10	343		857
dn-8	641					641
dn-9	1,419	40	0	0		1,459
ds-1	288	7		40		334
ds-2	1,346	111	4	120	4	1,586
ds-3	3,027	33		2		3,062
ds-4	1,691	3		7		1,701
ds-5	3,681	179		61		3,920
ds-6	902	4		0		906
ds-7	290	0				290
en-1	398	304	2,005	970		3,676
en-3	90	106	1,887	197		2,279
en-4	38	40	4,716	338		5,133
en-5	14	59	466	166		704
en-6	633	208	3,688	1,213		5,742
en-7	265	585	1,269	2,611		4,730
es-1	618	393	283	1,380	160	2,834
es-2	1,200	610	40	1,093		2,944
es-3	251	129		260	26	666
es-4	118	21	26	5	0	169
es-5	268	5				272
ln-1	260	525	884	3,550		5,220
ln-2	231	641	170	2,281		3,323
ln-3	122	69	1,703	1,045		2,939
ls-1	430	125	141	342		1,037
ls-2	623	143	7	261		1,035
ls-3	181	58	32	99		370
ls-4	247	32		75		354
ls-5	23	20	32	61		136
peace-1	0					0
peace-2	732	7	263			1,002
pusk-e	263	377	415	317		1,372
pusk-w	492	522	1,437	795		3,246
sim-1	482	355	1,438	243		2,518

Timber Supply Subunit (TSS)	Harvest Area (ha) By Broad Cover Group					
	C	CD	D	DC	Du	Total
sim-2	211	123	1,462	106	56	1,959
sim-3	563	783	880	1,266	290	3,781
sim-4	2,179	790		470	1	3,441
smoky-1	232	79	24	146		481
smoky-2	378	125	19	203		725
smoky-3	142	37	3	14		196
smoky-4	120	63	103	56		343
smoky-5	321	26	5	28	3	383
smoky-6	1,833	254	103	487	12	2,689
smoky-7	1,905	255	28	342		2,530
smoky-8	1,680	47	4	41		1,773
wask-1	107	235	690	269		1,301
wask-2	559	842	29	703	24	2,156
wask-3	387	329	99	434		1,249
Total	**44,126**	**11,377**	**24,702**	**23,825**	**598**	**104,629**

3.2 Development of the PFMS

The final PFMS assumptions were developed over several months using the input and results from a number of different scenarios. The results of many of these scenarios are shown in Table 26 below. In many cases each scenario builds on the results of a previous scenario as analysis results are reviewed and assumptions adjusted. The connection between individual scenarios is generally referenced within the scenario name whereby the new scenario number (i.e. sa63b) is referenced in brackets and the originating scenario is listed along with the change made (i.e. (sa64) sa63 w no Tolko Harvest)). Table 27 provides a more detailed description of each scenario. Through this iterative process we have arrived at the final set of PFMS assumptions, which have been documented in Section 2.0 above.

Table 26: Scenario Summary Table

Scenarios Description	Conifer Harvest Volume (1000's of m^3/yr)				Deciduous Harvest Volume (1000's of m^3/yr)			
	1-10	11-20	21-110	111-200	1-10	11-20	21-110	111-200
(sa63b) sa63a w Even Flow (PFMS)	**714**	**712**	**712**	**798**	**564**	**490**	**490**	**488**
(sa46a) sa45 w watersheds on	672	655	633	768	564	516	482	471
(sa47b) sa45 w 200yr block target	707	699	695	797	561	523	516	500
(sa48) sa45a less blocks < 30ha (20yrs)	729	722	716	801	564	562	519	509
(sa48a) w relax 30ha block targets after 20yrs	732	725	720	802	564	565	520	511
(sa48b) sa48a incr. block pen. for first 20yrs	729	725	721	802	563	562	520	511
(sa49) s48b w 70 yr deferral	720	717	713	802	562	565	520	511
(sa50) sa49 w ECA on at year 21	667	640	621	763	549	512	479	465
(sa51) sa50 w soft ECA (100)	717	713	710	801	565	565	519	510
(sa52) sa50 w incr. ECA penalty(5000)	699	694	688	790	563	542	510	500
(sa53) sa49 w no TSS min harv	718	714	710	801	564	561	519	510
(sa54) sa53 w op TSS V1	721	717	713	802	562	565	520	511
(sa55) sa54 w op TSS V2	719	716	713	802	563	562	519	510
(sa56) sa55 w 75% MPB priority	739	714	710	801	565	565	519	510
(sa57) sa56 w relax MPB priority / op TSS V3	723	717	714	802	564	565	520	511
(sa58) sa57 w op TSS V4	720	717	714	802	563	565	520	511
(sa59) sa57 w op TSS V5	723	717	713	802	560	564	519	511
(sa60) No ECA	722	717	713	802	561	548	520	511
(sa61) sa60 w 50% ECA Max	717	715	712	801	561	537	520	511
(sa62) sa60 w rev. transitions.	722	717	714	802	561	548	520	512
(sa63) sa61 w rev. transitions	721	717	714	802	562	548	520	512
(sa63a) sa63 w 565K decid P1/P2	722	717	714	802	564	550	520	512
(sa63c) sa63b w NO MPB priority	711	713	713	798	564	490	490	488
(sa64) sa63 w no Tolko Harvest	708	710	709	800	184	525	525	510
(sa65) sa65 w NO Constraints	742	740	738	803	564	562	557	548
(sa66) sa63 w Even Flow	703	705	706	711	489	490	490	487
(sa67) sa64 w Decid operationalization	710	709	708	800	184	525	525	509
(sa68) sa63b w Back to Natural	728	729	553	617	564	490	481	481
(sa68b) sa68 w Even Flow Back to Natural	725	725	603	606	564	489	481	482

Table 27: Scenarios Used in the Development of the PFMS

Scenario	Description and Key Features
sa1-sa45a	Scenarios sa1-sa45 were used to develop and refine targets including caribou zones, patch size, block size and location, mountain pine beetle, natural disturbance, species composition transition, growing stock, operational constraints by TSS, conifer harvest flow, deciduous harvest flow. Many of these scenarios were based on old versions of the caribou targets and are of limited relevance to the current PFMS.
sa46a	Based on sa45 but utilizes old MAI-based ECA constraints.
sa47b	Based on sa45 with a 200-year block size constraint.
sa48	Based on sa45a with a target minimizing the number of blocks < 30 ha for the first 20 years
sa48a and sa48b	These two scenarios are refining the secondary block size target of sa48 through sa48a with a relaxed block size constraint
sa49	Sa48b with a 70 year deferral on isolated THLB
sa50	Sa49 with ECA constraints (MAI-based) on after year 20.
sa51 and sa52	Sa50 with relaxed ECA constraints
sa53	sa49 with revised Caribou TSS constraints - no minimum TSS volume targets only maximums
sa54 and sa55	sa53 with revisions to the operational TSS restrictions.
sa56	sa55 with increased MPB priority target (recalculated 75% based on current GS)
sa57	sa56 with relaxed MPB priority and op TSS V3
sa58	sa57 with changes to smoky-5 and bolt-2 targets
sa59, sa60 and sa61	sa58 with no D harvest in the peace blocks for first 10 years. Variations of the operational TSS restrictions.
sa62	sa60 with revised transitions
sa63	sa61 with revised transitions. Includes full CAI-based ECA constraints
sa63a	sa63 with the increased penalty on 565,000 decid target
sa63b	**sa63a with even flow. Selected as the PFMS.**
sa63c	sa63b with no MPB priority target
sa64	sa63 with the No Tolko (Norbord allocated volume only)
sa65	Base Scenario: No constraints on with exception of the isolated THLB harvest deferral. No genetic gains.
sa66	Even flow harvest for conifer and deciduous. No deciduous reconciliation volume.
sa67	sa64 with Decid operationalization
sa68	sa63b back to natural with step up
sa68b	sa63b Even Flow back to natural
sa69	Sa63b using an 8m adjacent distance. Same harvest schedule but with different patch metric calculations.

The scenario forecasts completed for this analysis are focused on evaluating complete scenarios that are practical and reasonable. All scenarios utilize the classified landbase and yield projections that have received Alberta's agreement-in-principle unless otherwise stated in the sections below. The scenarios listed in Table 27 show a logical progression and evolution modeling assumptions culminating in the selection of scenario sa63b as the PFMS. These scenarios assess various management options, which have been documented and archived. The following sections provide a summary of the key alternative scenarios tested leading to selection of the preferred scenario and include a rationale for the various technical protocols that were evaluated and modified between scenarios.

3.2.1 Alternative Scenarios

As discussed above, a number of scenarios were completed leading to the development of the PFMS. These scenarios are listed in Table 26 and Table 27 above. The following sections provide additional detail for a few of the key scenarios tested.

Relaxed Even Flow Requirement

Much of the scenario analysis was completed using a relaxed or less strict even flow requirement. This allowed harvest levels to vary more from period to period and as a result the harvest forecast more closely mimics the actual availability of harvest volume throughout the planning horizon. As shown in Figure 71 and Table 28 this increased flexibility results in slight increases to the conifer harvest in the short-term and a more gradual increase towards the long-term sustainable harvest level.

Applying a strict even flow constraint to the deciduous harvest after the 10-year reconciliation increase forces a larger reduction to the period 3 deciduous harvest. This reduction in harvest in period 3 and 4 means that less of the over mature and stagnant deciduous stands are converted to more productive younger stands and as a result the mid-term harvest level is lower.

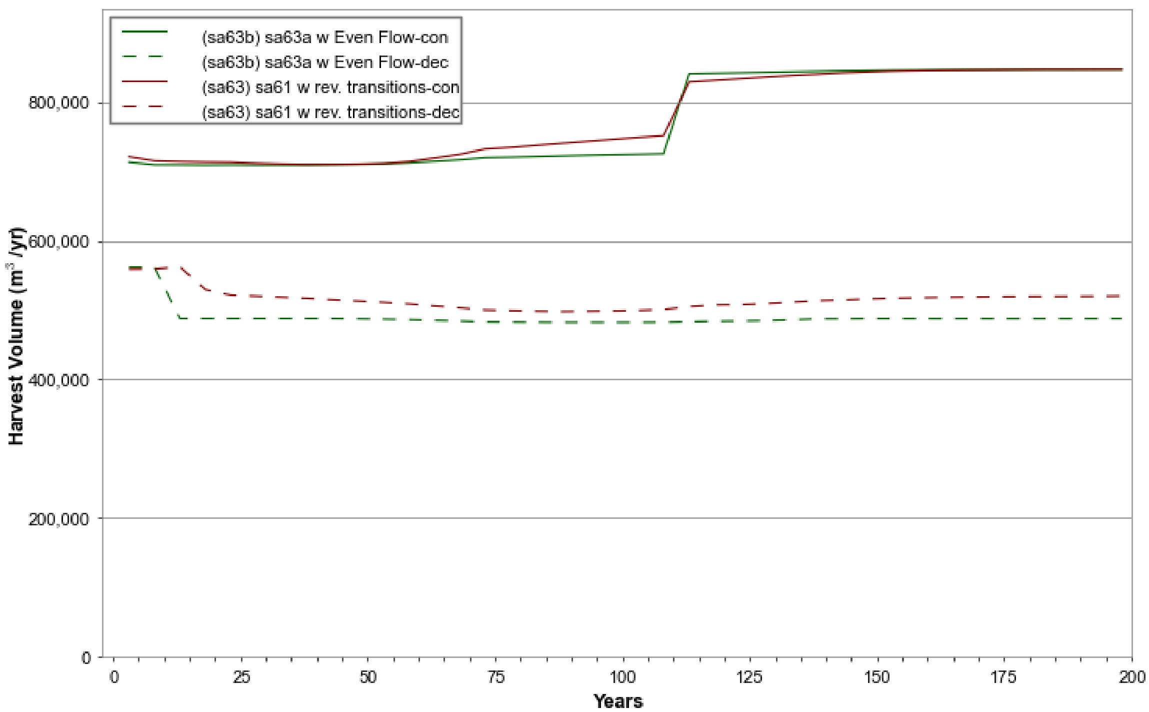

Figure 71: Relaxed Even Flow – Harvest Forecast

Table 28: Relaxed Even Flow – Harvest Forecast

Scenario	Conifer Harvest (1000's of m^3/yr)				Deciduous Harvest (1000's of m^3/yr)			
	1-10	11-20	21-110	111-200	1-10	11-20	21-110	111-200
(sa63b) sa63a w Even Flow (PFMS)	714	712	719	848	564	490	487	489
(sa63) sa61 w rev. transitions (relaxed even flow)	721	717	729	845	562	548	509	518

Strict Even Flow

In the strict even flows scenario shown in Figure 72 and Table 29 all harvest increases or decreases in harvest are removed. The increase in conifer volume after year 110 and the deciduous reconciliation volume increase are both removed. As a result the conifer volume remains very close to the lowest point of the PFMS. Similarly, the deciduous volume remains relatively constant at an average level of approximately 488,000 m^3/yr.

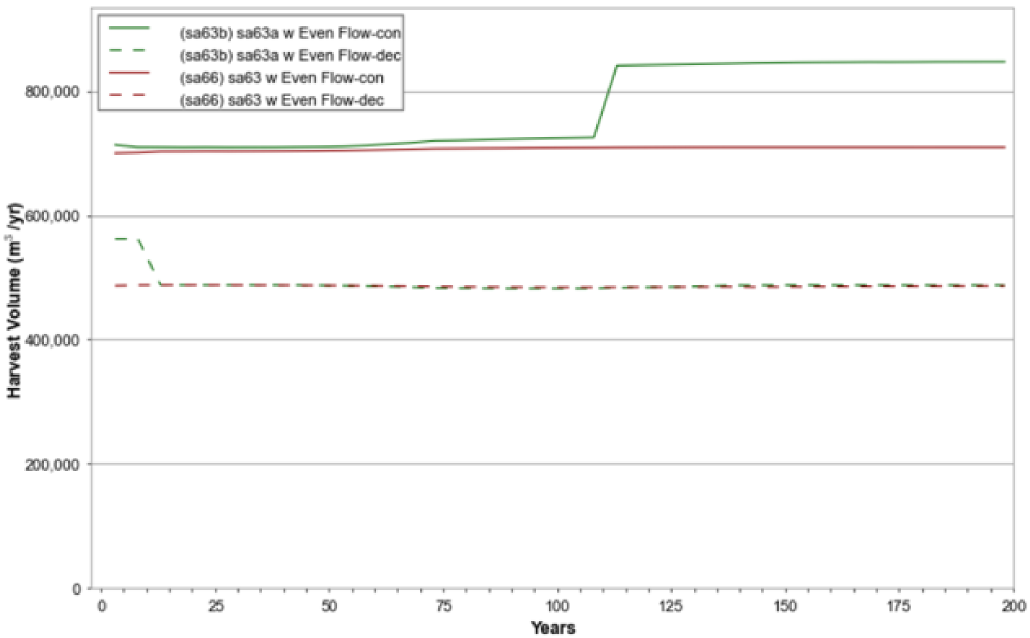

Figure 72: Strict Even Flow – Harvest Forecast

Table 29: Strict Even Flow – Harvest Forecast

Scenario	Conifer Harvest (1000's of m^3/yr)				Deciduous Harvest (1000's of m^3/yr)			
	1-10	11-20	21-110	111-200	1-10	11-20	21-110	111-200
(sa63b) sa63a w Even Flow (PFMS)	714	712	719	848	564	490	487	489
(sa66) sa63 w Even Flow (Strict Even Flow)	703	705	708	712	489	490	488	487

MPB Strategy

The PFMS includes a target to harvest 75% of the MPB susceptible pine growing stock within the first 10 years. This scenario tests the impacts of removing this requirement. A shown in Figure 73 and Table 30 the impact of this is negligible.

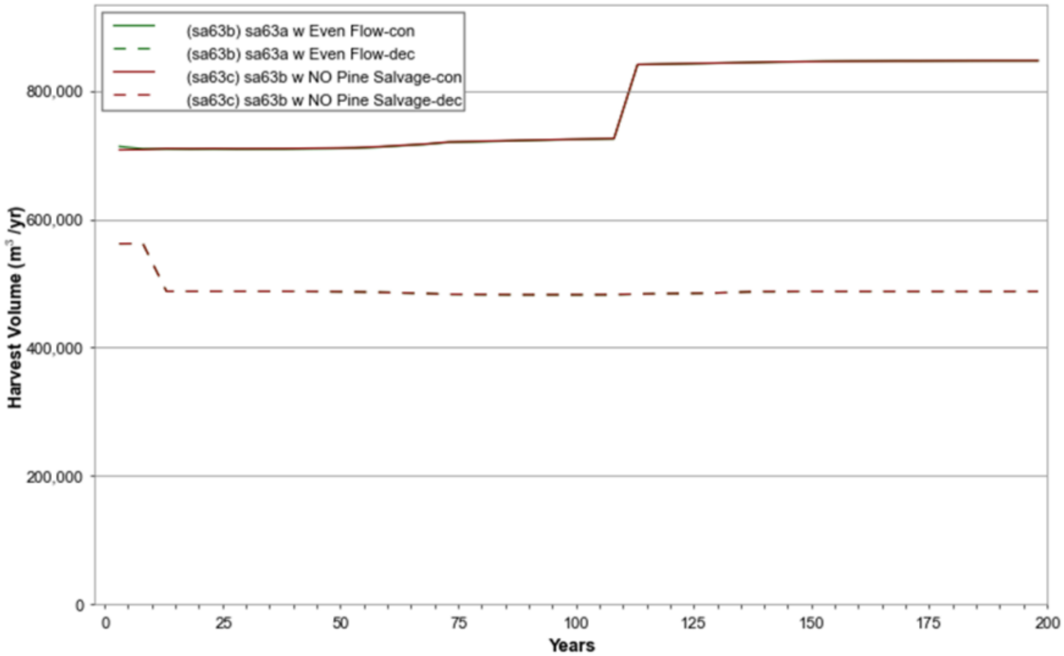

Figure 73: Remove MPB Priority Target – Harvest Forecast

Table 30: Remove MPB Priority Target – Harvest Forecast

Scenario	Conifer Harvest (1000's of m^3/yr)				Deciduous Harvest (1000's of m^3/yr)			
	1-10	11-20	21-110	111-200	1-10	11-20	21-110	111-200
(sa63b) sa63a w Even Flow (PFMS)	714	712	719	848	564	490	487	489
(sa63c) sa63b w No Pine Priority Target	711	713	720	848	564	490	487	489

Remove Watershed Objectives

The impact of removing the maximum of 50% watershed ECA objectives is shown in Figure 74 and Table 31. The *No ECA* scenario was originally run without the even flow harvest targets and therefore scenario sa61 is included to quantify the impacts. Overall, removing the ECA objectives results in a slight increase of between 2,000 m^3/yr and 5,000 m^3/yr of conifer volume throughout the planning horizon. Removing ECA constraints allows for an 11,000 m^3/yr increase in average deciduous harvest only for the 2nd 10-year period.

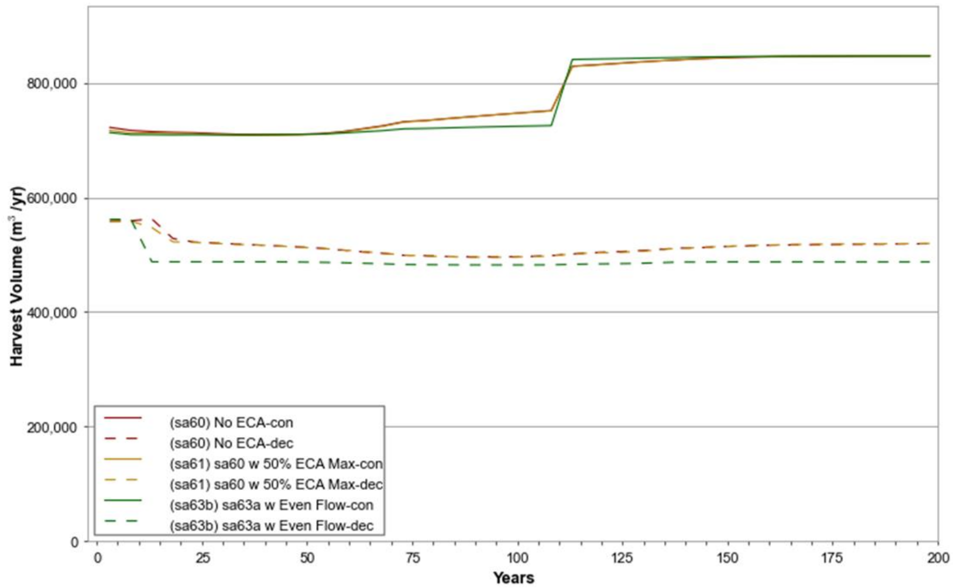

Figure 74: Remove Watershed Objectives – Harvest Forecast

Table 31: Remove Watershed Objectives – Harvest Forecast

Scenario	Conifer Harvest (1000's of m^3/yr)				Deciduous Harvest (1000's of m^3/yr)			
	1-10	11-20	21-110	111-200	1-10	11-20	21-110	111-200
(sa63b) sa63a w Even Flow (PFMS)	714	712	719	848	564	490	487	489
(sa60) No ECA	722	717	713	802	561	548	520	511
(sa61) sa60 w 50% ECA Max	717	715	712	801	561	537	520	511

Base Run

In the base run all constraints and the use of genetically improved stock have been removed. Removing constraints will generally have a positive impact on timber supply. This is partially offset by the negative impact of removing the use of genetically improved stock. Consequently the positive impact on conifer timber supply, as shown in Figure 75 and Table 32, is not as large as might be expected if the removal of constraints were assessed in isolation.

Over the first 110 year of the planning horizon conifer harvest increases by an average of approximately 28,000 m^3/yr. After year 10, the deciduous harvest level increases by an average of 62,000 m^3/yr.

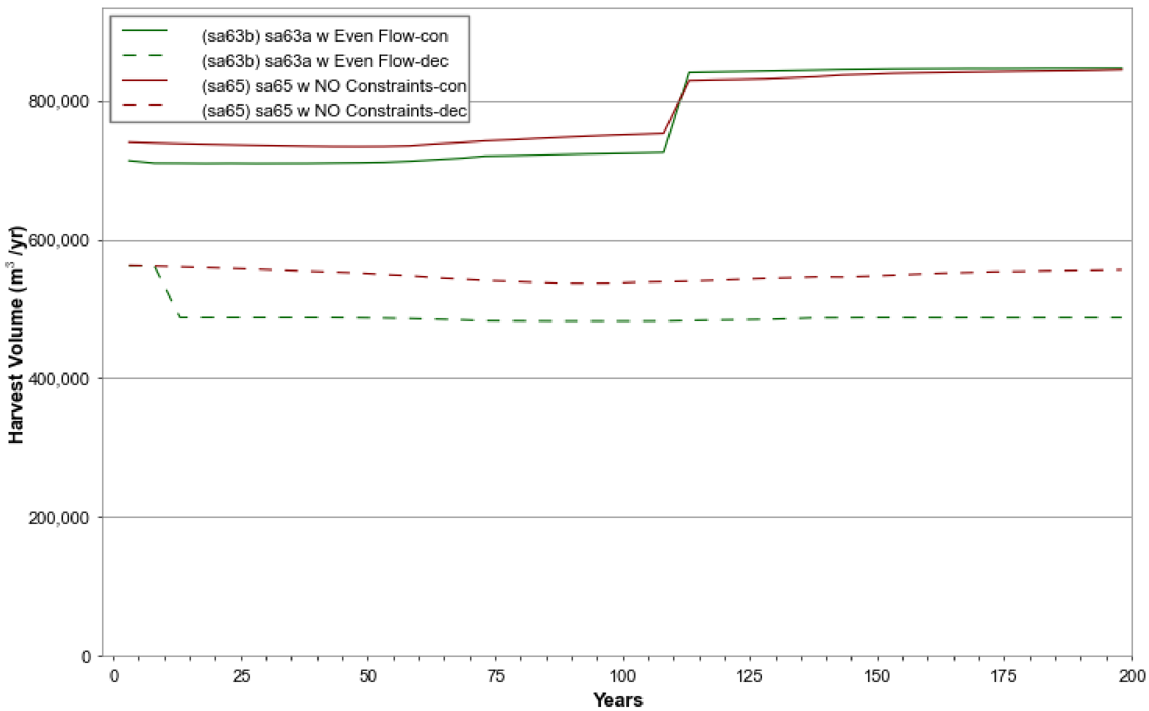

Figure 75: Base Run – Harvest Forecast

Table 32: Base Run – Harvest Forecast

Scenario	Conifer Harvest (1000's of m^3/yr)				Deciduous Harvest (1000's of m^3/yr)			
	1-10	11-20	21-110	111-200	1-10	11-20	21-110	111-200
(sa63b) sa63a w Even Flow (PFMS)	714	712	712	798	564	490	490	488
(sa65) No Constraints (Base Run)	742	740	738	803	564	562	557	548

3.2.2 Risk Assessment Scenarios

Recognizing that uncertainty exists in both data and assumptions we undertake sensitivity or risk analysis to attempt to quantify the impact of this uncertainty on the overall harvest level presented in the PFMS.

Risk analysis provides information on the degree to which uncertainty in the PFMS data and assumptions might affect the proposed harvest level for the land base. The magnitude of the change in the variable(s) being tested 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 risk factors, it is possible to determine which variables most affect results and provide information to guide management decisions in consideration of uncertainty.

Whereas the previous section presents potential alternative implementations of the PFMS, this section addresses risk and uncertainty associated with the data and assumptions included in the PFMS.

No Tolko Harvest

The rate of deciduous harvest represents one of the biggest sources of uncertainty in this analysis. Tolko's tenure on the FMA area represents a significant portion of the total deciduous allocation for the FMA area and when the reconciliation volumes are considered the component increases substantially. Tolko has not operated on the FMA area in several years and there are currently no concrete plans as to when they might restart operations.

To this end the following scenario assumes no Tolko harvest over the first 10 years (maximum of 184,000 m^3/yr). As shown in Figure 76 and Table 33 the reduction in deciduous harvest for the first 10 years has no significant impact on conifer volumes and only a slight mid-term impact on the deciduous volumes. As this scenario was originally run without an even flow requirement scenario sa63 has been included for comparison.

A second variation of this scenario was also run in which the harvest from D stands was focussed into the EN-1, EN-6 and EN-7 over the first 10 years. As shown below, this can be achieved with minimal impact to timber supply.

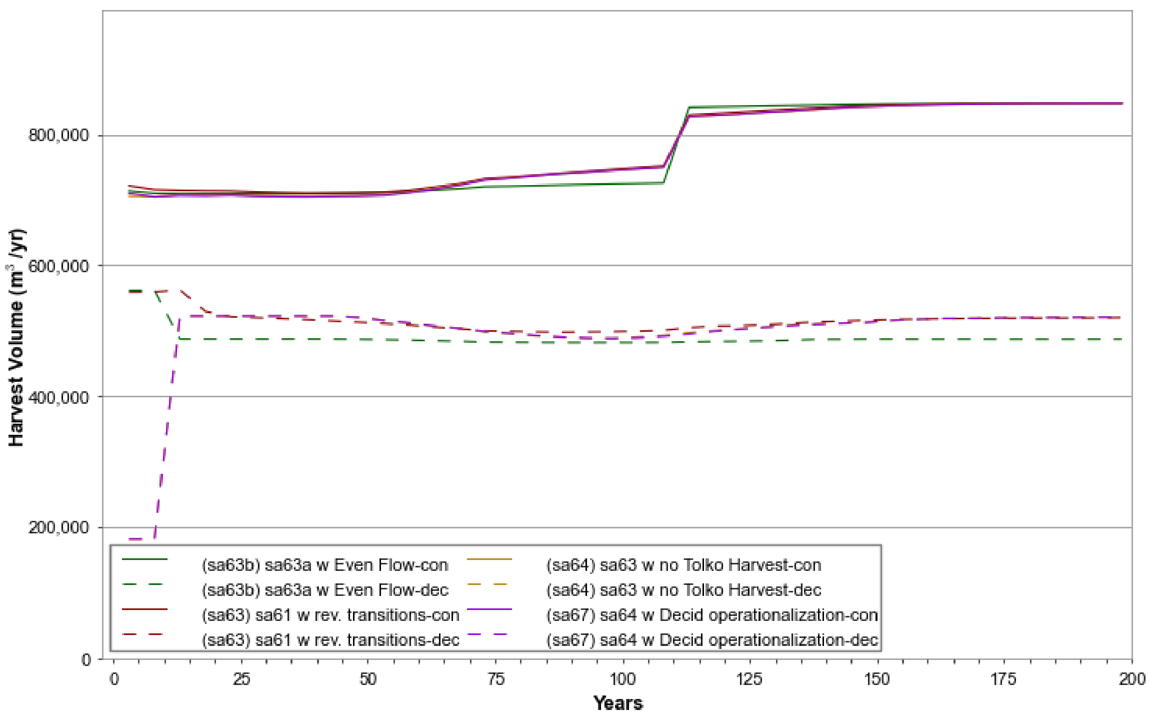

Figure 76: No Tolko Harvest – Harvest Forecast

Table 33: No Tolko Harvest – Harvest Forecast

Scenario	Conifer Harvest (1000's of m^3/yr)				Deciduous Harvest (1000's of m^3/yr)			
	1-10	11-20	21-110	111-200	1-10	11-20	21-110	111-200
(sa63b) sa63a w Even Flow (PFMS)	714	712	719	848	564	490	487	489
(sa63) sa61 w rev. transitions	721	717	729	845	562	548	509	518
(sa64) sa63 w no Tolko Harvest	708	710	726	843	184	525	508	516
(sa67) sa64 w Decid operationalized	710	709	725	843	184	525	508	516

Back to Natural

The back to natural scenario assumes that stands regenerate back to the same natural stand yield curve that they originated from. Managed stand yield curves are generally more productive than natural stand yield curves and also include genetic gains. As a result the PFMS conifer volume can be maintained for 20 years before falling dropping down considerably in the mid and long-term as is shown in Figure 77 and Table 34. Deciduous volumes are less affected as the majority of deciduous stands use natural regeneration and the regenerated stand yields are very similar to the natural stand yields.

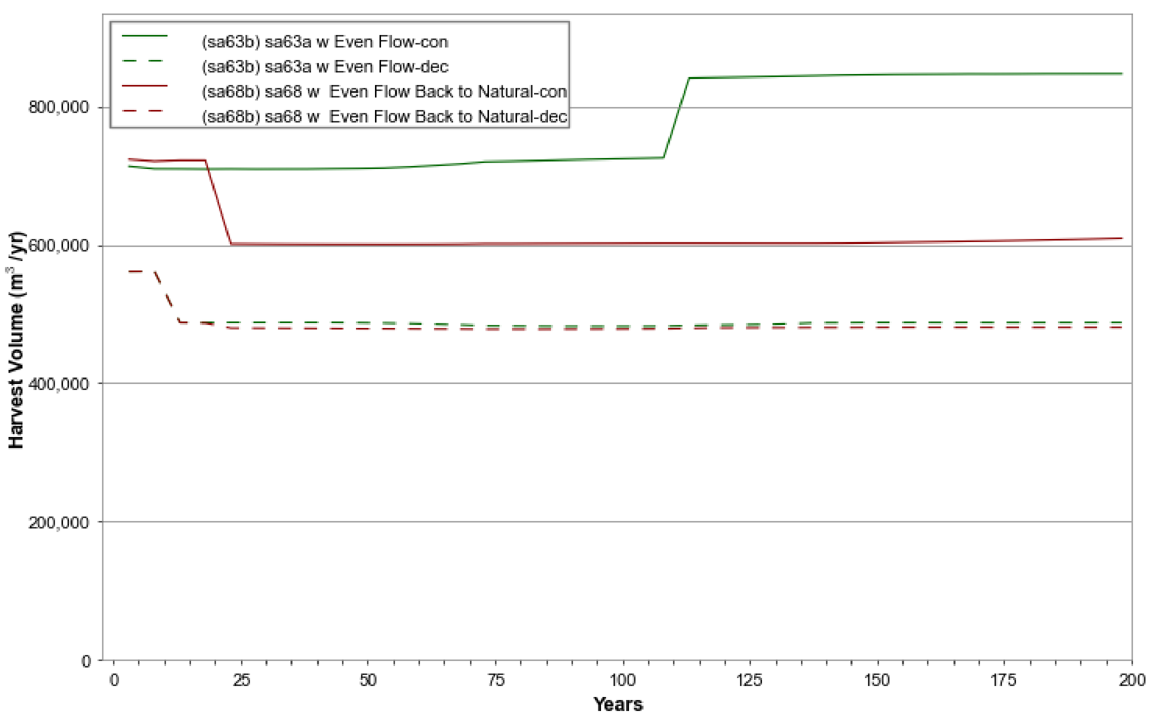

Figure 77: Back to Natural – Harvest Forecast

Table 34: Back to Natural – Harvest Forecast

Scenario	Conifer Harvest (1000's of m^3/yr)				Deciduous Harvest (1000's of m^3/yr)			
	1-10	11-20	21-110	111-200	1-10	11-20	21-110	111-200
(sa63b) sa63a w Even Flow (PFMS)	714	712	719	848	564	490	487	489
(sa68b) sa68 w Even Flow Back to Natural	725	725	604	607	564	489	481	483

4.0 AAC RECOMMENDATIONS FOR THE PFMS

Table 35 contains the AAC recommendations and volume allocations for the FMA based on the analysis results of the PFMS.

Table 35: Timber Allocation for All Forest Operators

Timber Allocations for all Forest Operators
Timber Allocation Past and Present (Alberta standard 5.12 Table 1)

Historical Allocation								
Company Name	**Disposition Number**	**FMU**	**Landbase Management Type**	**Effective Date of AAC**	**Deciduous AAC (%)**	**Decid. AAC (m^3/yr)**	**Coniferous (Conifer) AAC (%)**	**Conifer AAC (m^3/yr)**
Canfor	FMA 9900037	G15	FMA	May 2009 to May 2014	-	-	98.6%	705,000
Tolko	-	G15	CTP	May 2009 to April 2014	-	-	1.4%	10,000
	G150001	G15	DTA	May 2003 to April 2013	25.3%	114,712	-	-
	G150002	G15	DTA	May 2004 to April 2024	37.1%	167,817	-	-
Norbord	G150003	G15	DTA	May 2005 to April 2025	37.6%	170,000	-	-
				Total		**452,529**		**715,000**

Proposed Allocations								
Company Name	**Disposition Number**	**FMU**	**Landbase Management Type**	**Effective Date of AAC**	**Deciduous AAC (%)**	**Decid. AAC (m^3/yr)**	**Coniferous (Conifer) AAC (%)**	**Conifer AAC (m^3/yr)**
Canfor	FMA 9900037	G15	FMA	May 2014 to April 2024	-	-	98.6%	704,104
	-	G15	CTP	May 2014 to April 2024	-	-	1.4%	10,000
Tolko	G150001 G150002	G15	DTA	May 2014 to April 2024	68.5%	386,422	-	-
Norbord	G150003	G15	DTA	May 2014 to April 2024	31.5%	177,877	-	-
				Total		**564,299**		**714,104**

Production							
Disposition Number	**Cut Control Period**	**Periodic Cut Control AAC**	**Quadrant Date**	**Previous Quadrant Production (m^3)**	**Quadrant Conifer Under-Production (m^3)**	**Quadrant Decid. Under-Production (m^3)**	**Quadrant AAC**
FMA 9900037	1	3,525,000	May 2009 to April 2014	3,234,727	290,273	-	705,000
CTP	1	50,000	May 2009 to April 2014	0	50,000	-	10,000
Tolko	2	573,560	May 2008 to April 2013	* Unknown	* Unknown	1,966,623	114,712
	2	839,085	May 2009 to May 2014				167,817
Norbord	2	850,000	May 2009 to May 2014	708,541		141,459	170,000

* Unknown : Refer to Tolko Timber Production audit

5.0 REFERENCES

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APPENDIX I – SPATIAL HARVEST SEQUENCE MAPS

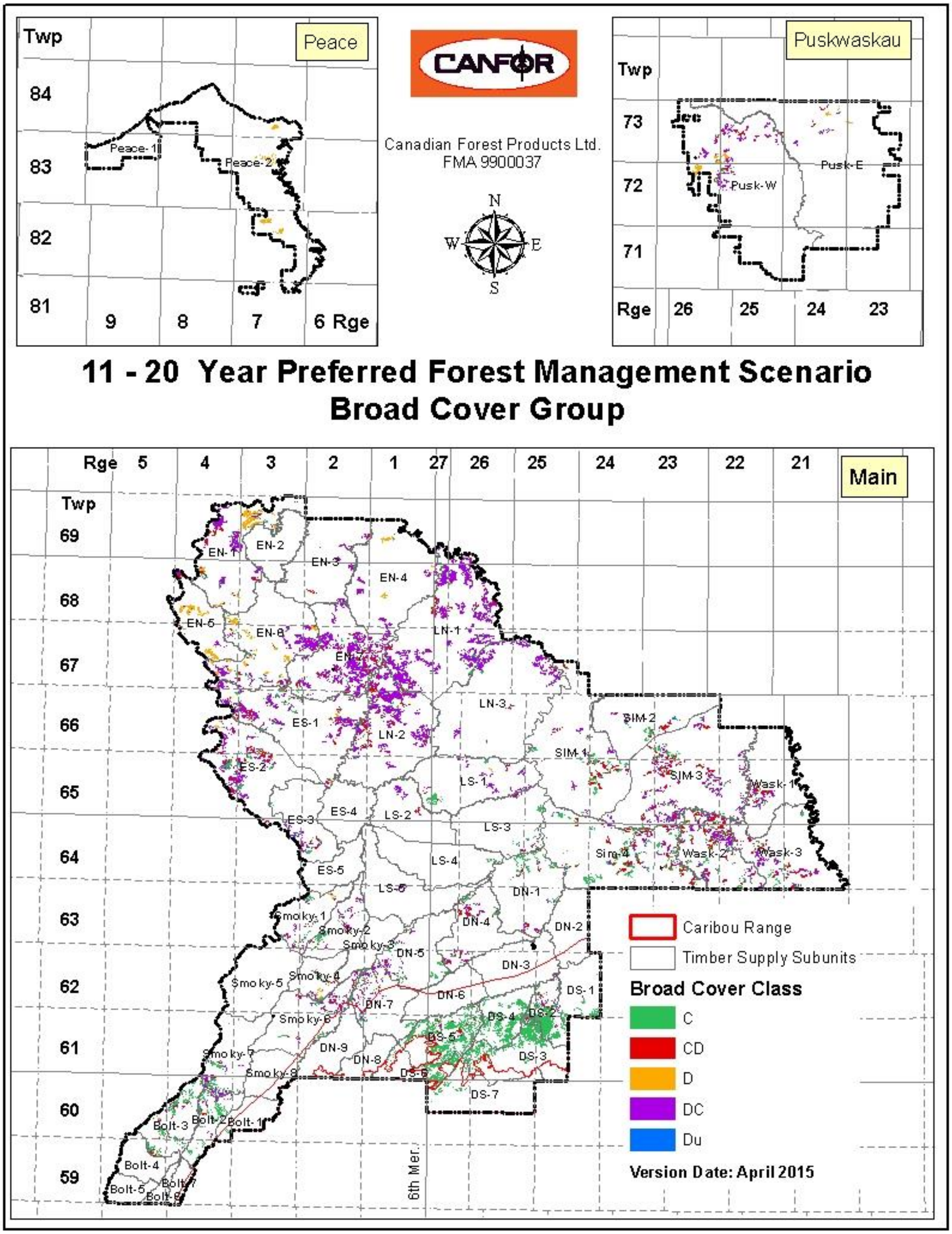

Figure 78: Spatial Harvest Sequence – Year 11 to 20

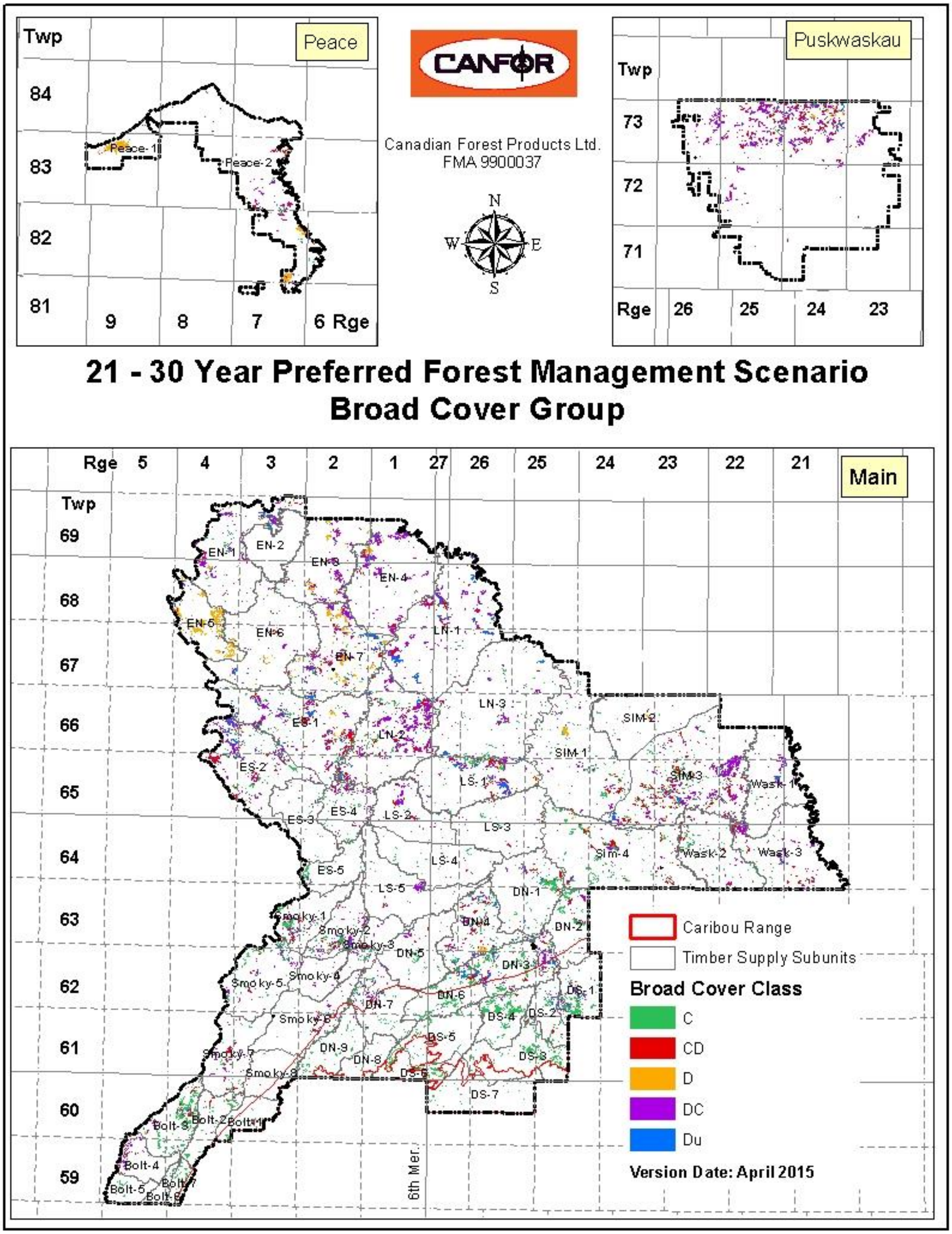

Figure 79: Spatial Harvest Sequence – Year 21 to 30

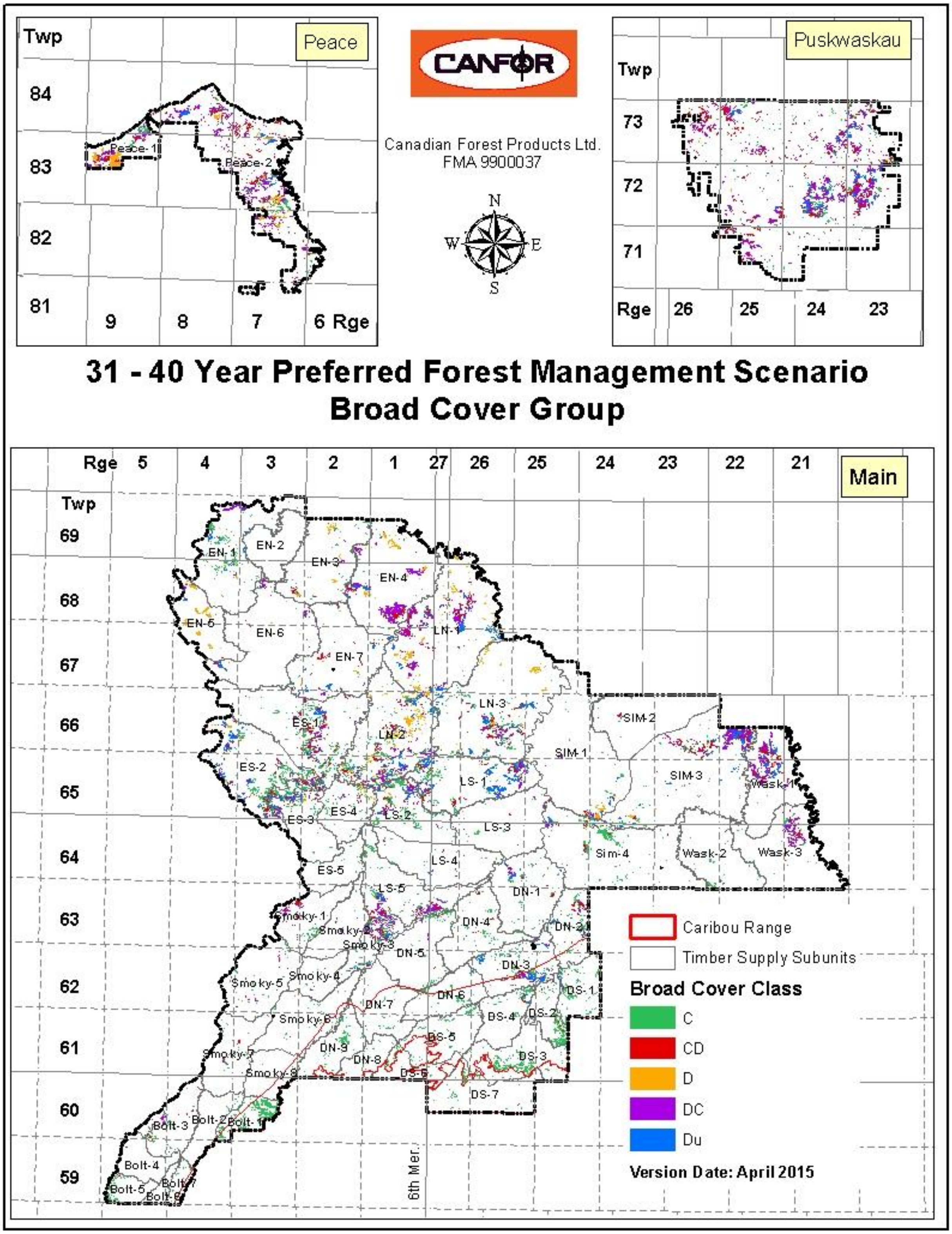

Figure 80: Spatial Harvest Sequence – Year 31 to 40

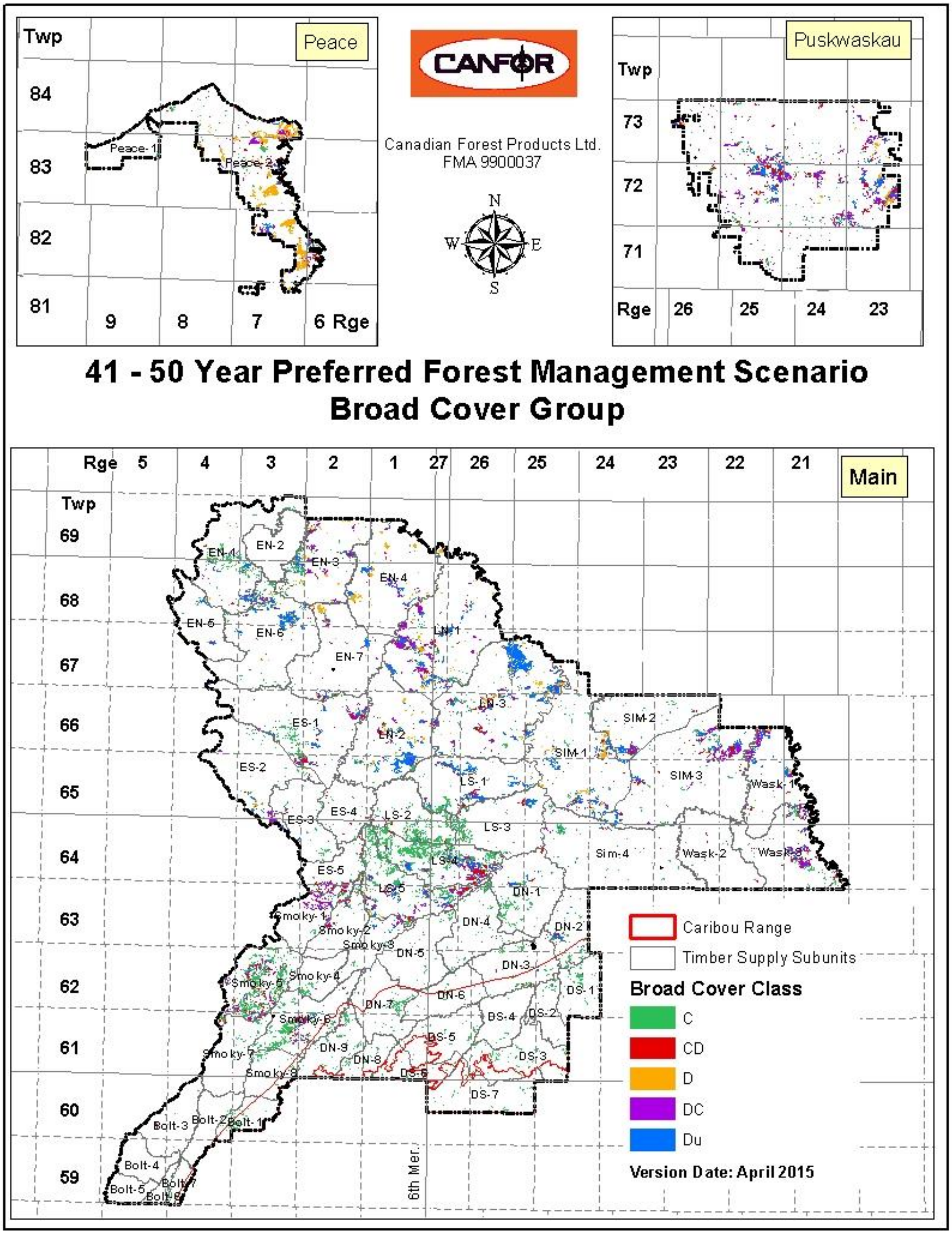

Figure 81: Spatial Harvest Sequence – Year 41 to 50

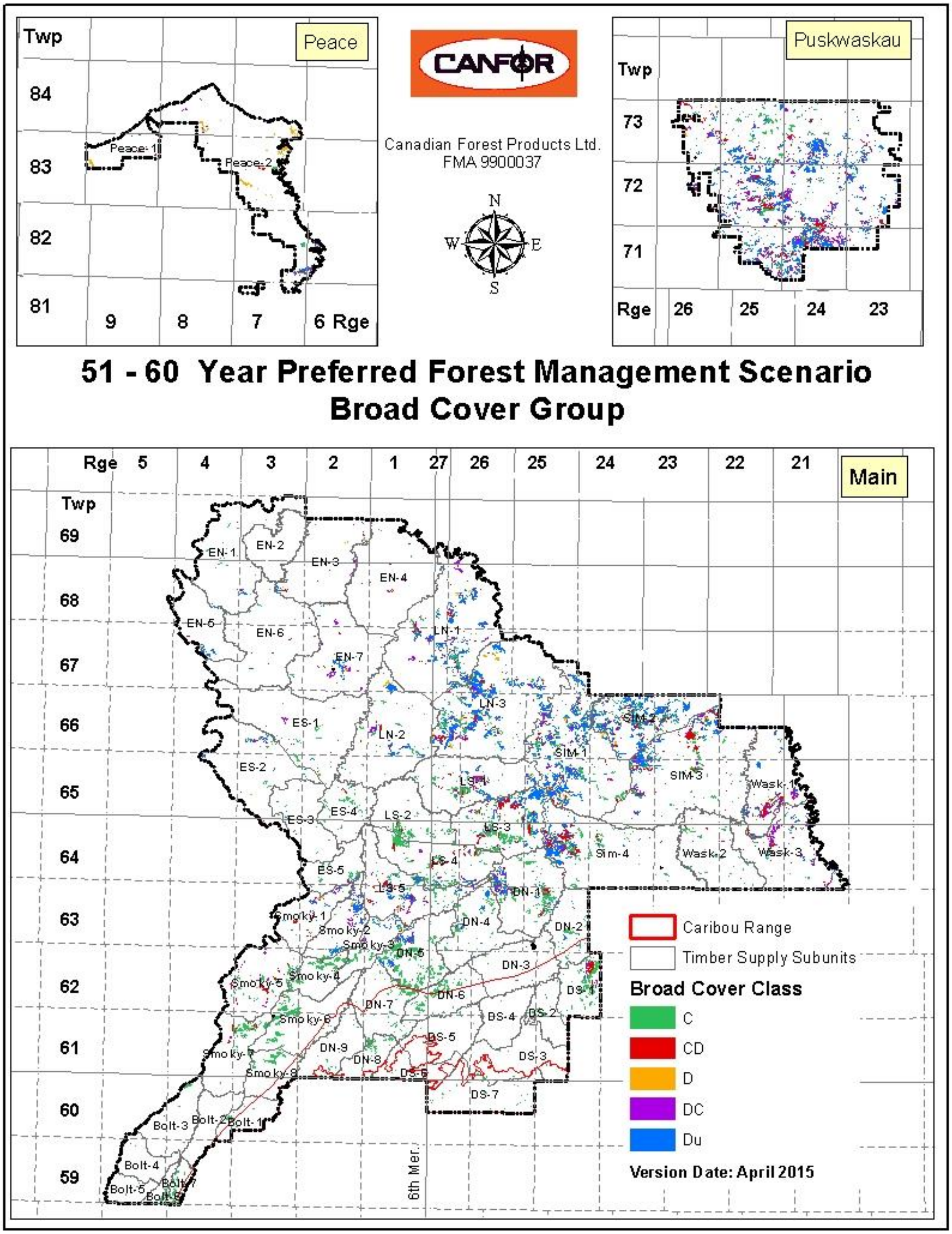

Figure 82: Spatial Harvest Sequence – Year 51 to 60

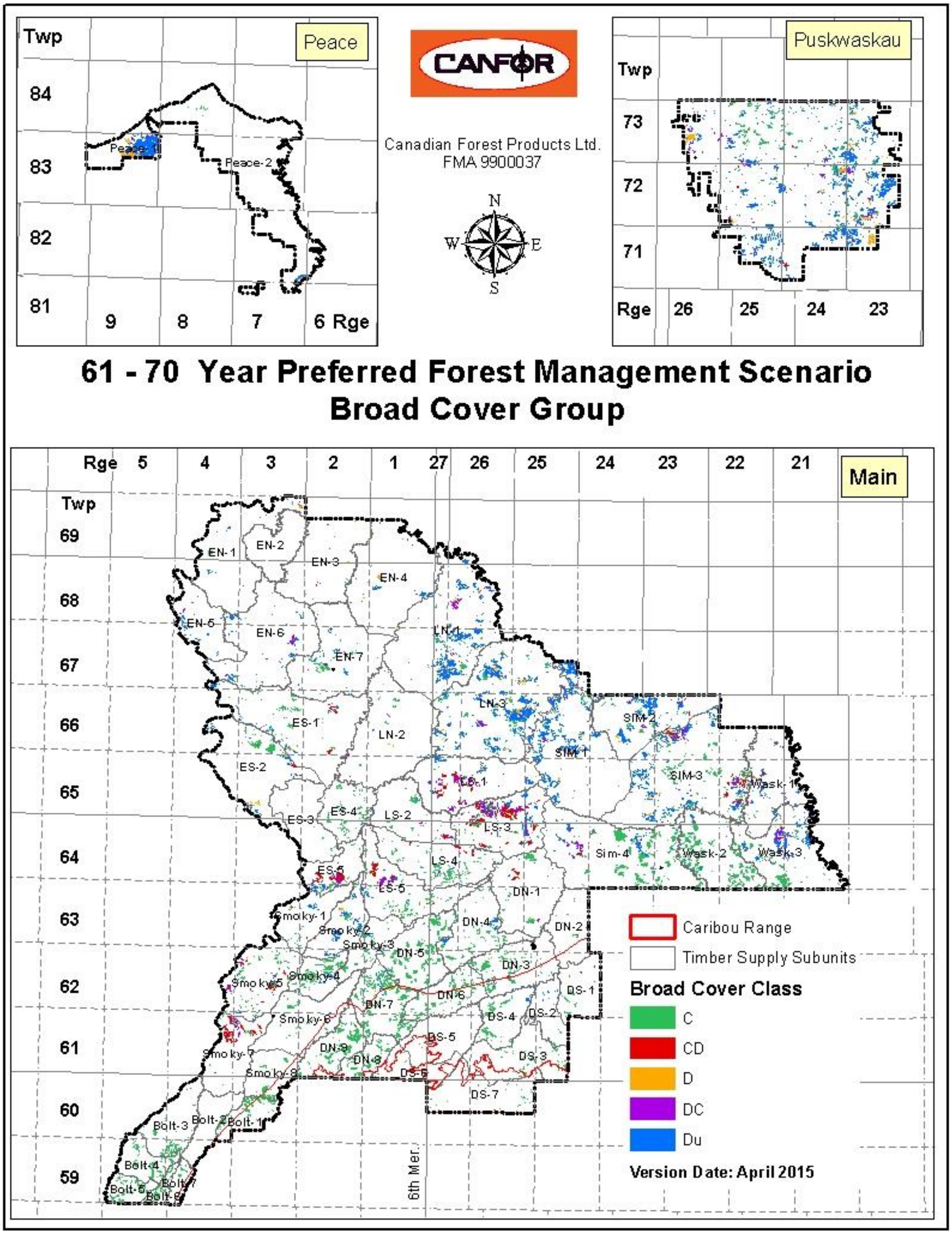

Figure 83: Spatial Harvest Sequence – Year 61 to 70

APPENDIX II – SERAL STAGE MAPS

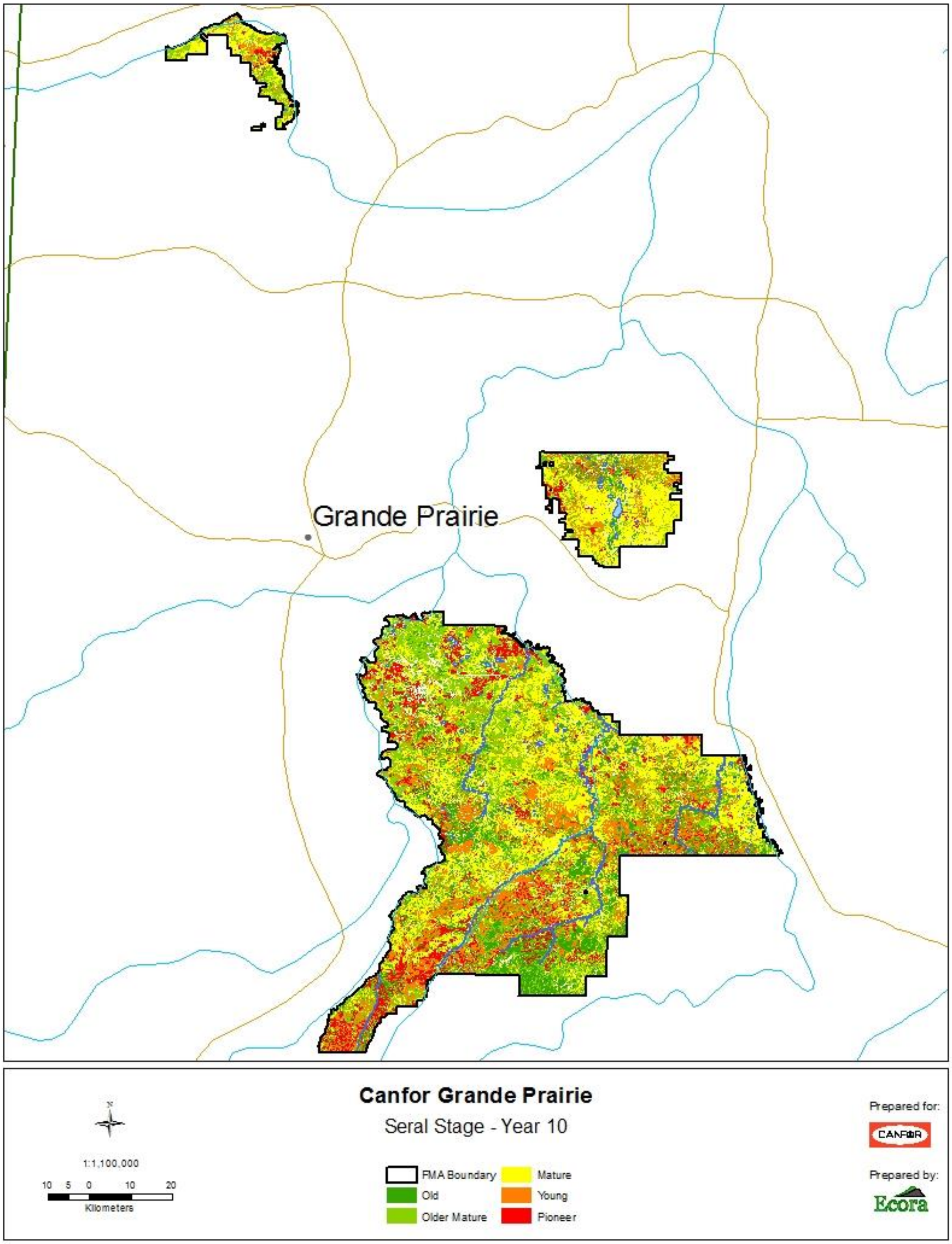

Figure 84: Seral Stage Distribution – Year 10

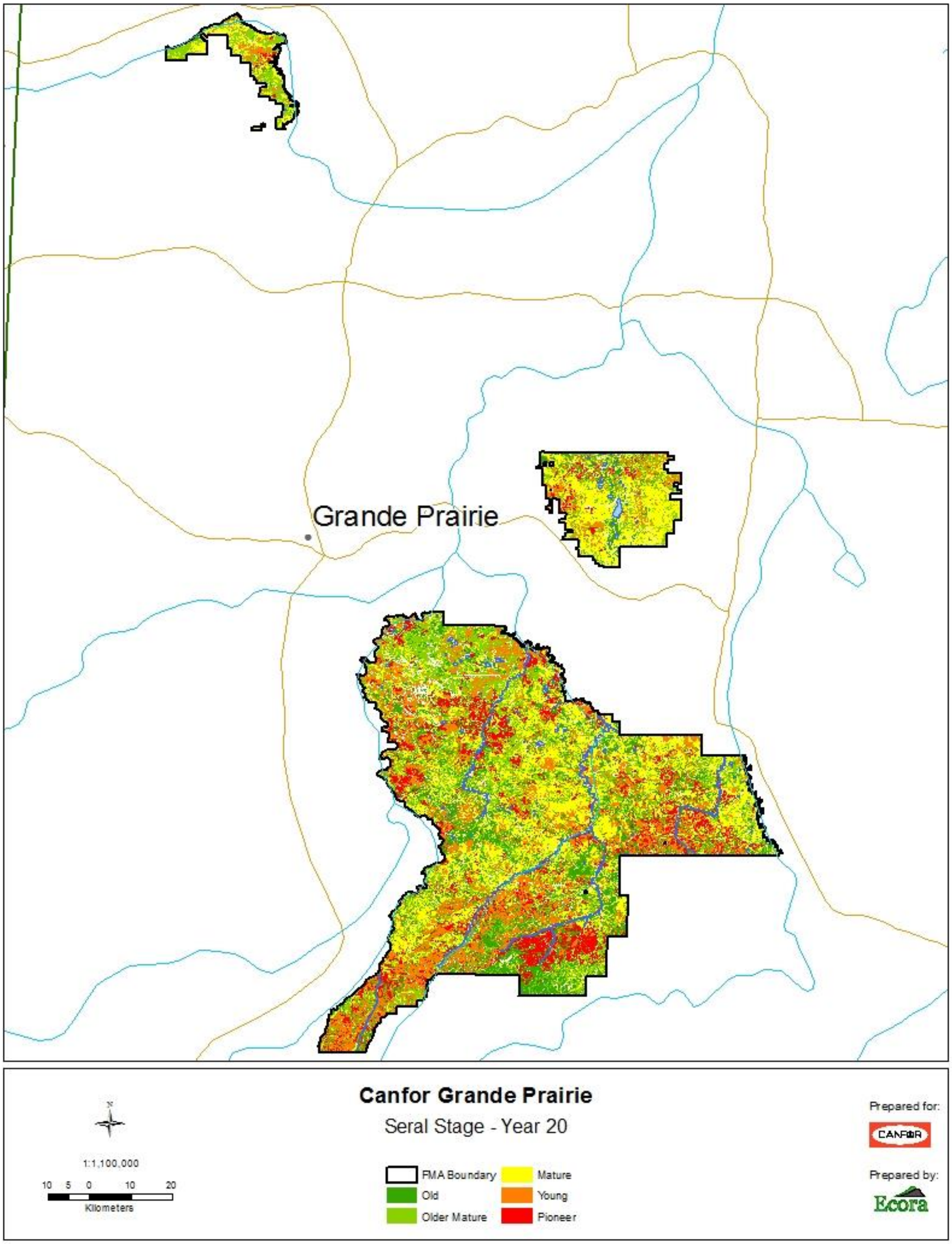

Figure 85: Seral Stage Distribution – Year 20

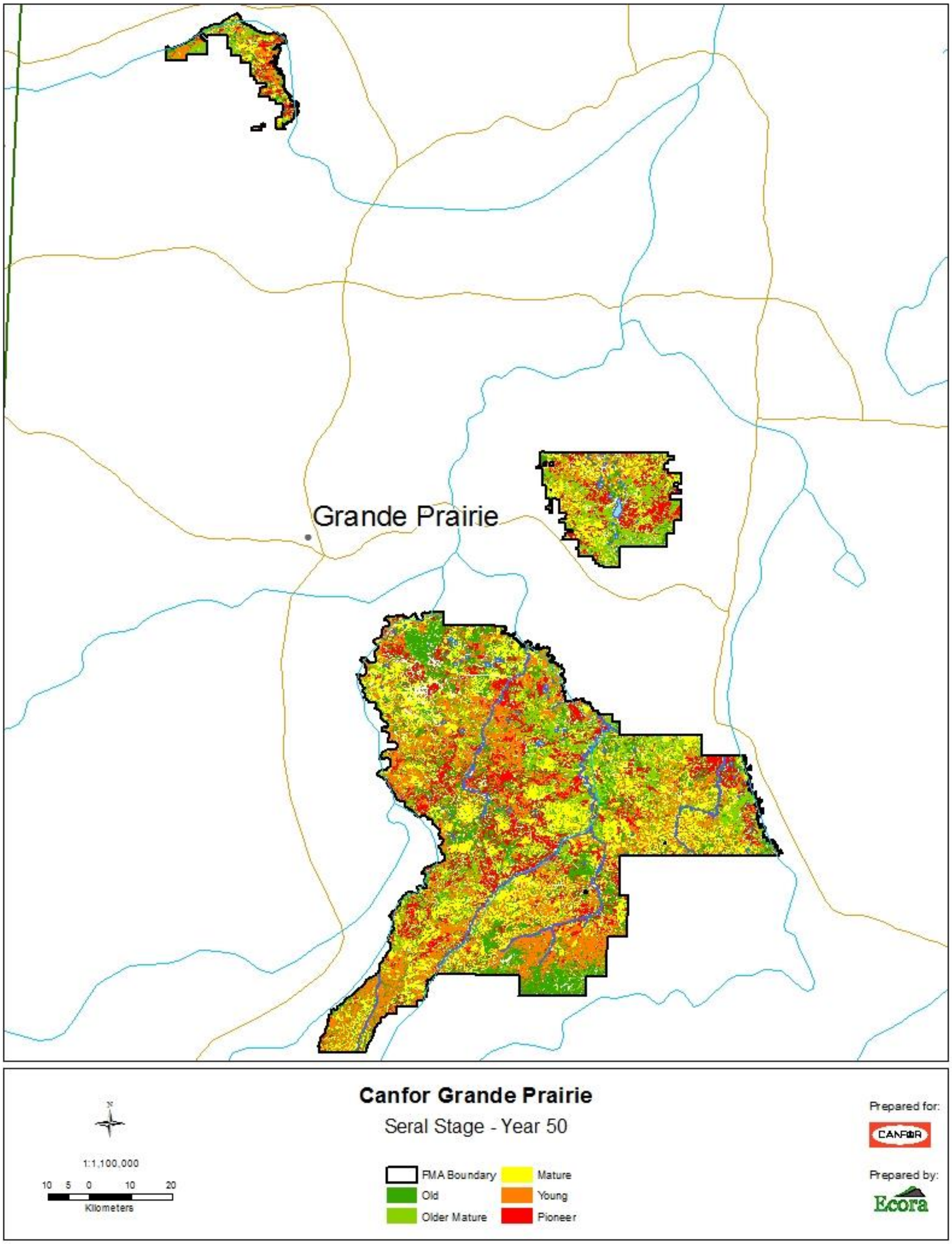

Figure 86: Seral Stage Distribution – Year 50

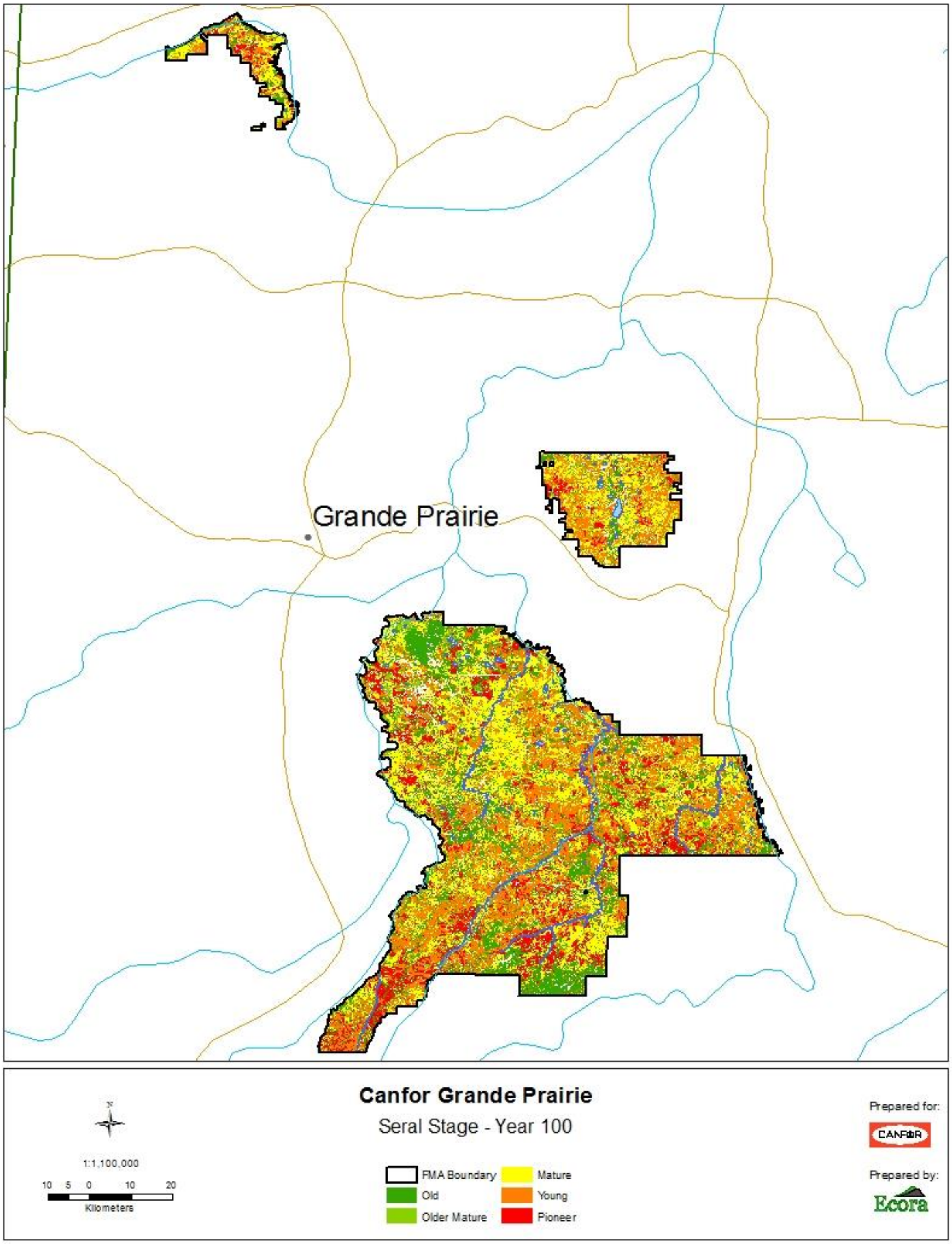

Figure 87: Seral Stage Distribution – Year 100

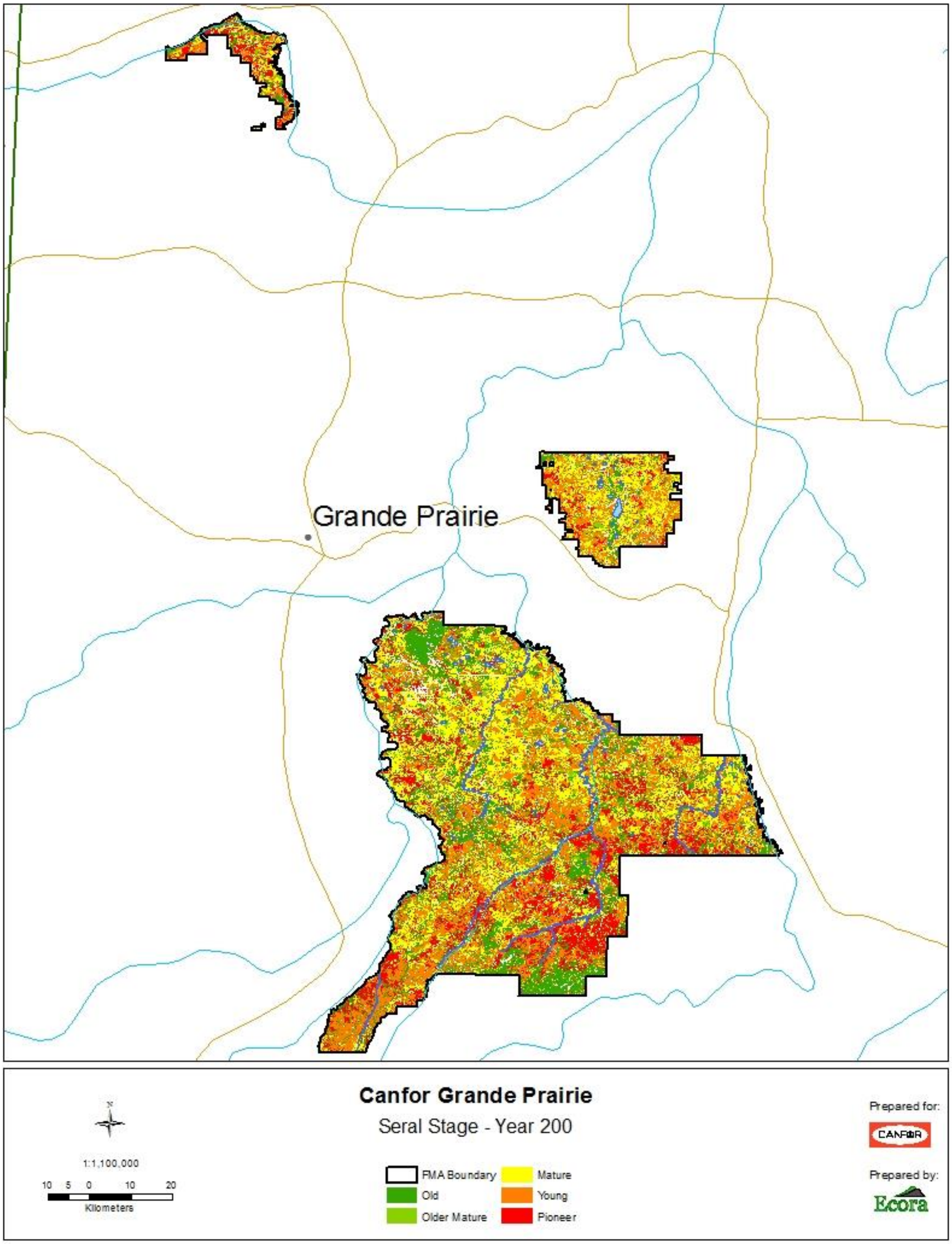

Figure 88: Seral Stage Distribution – Year 200

APPENDIX III – PATCH SIZE MAPS

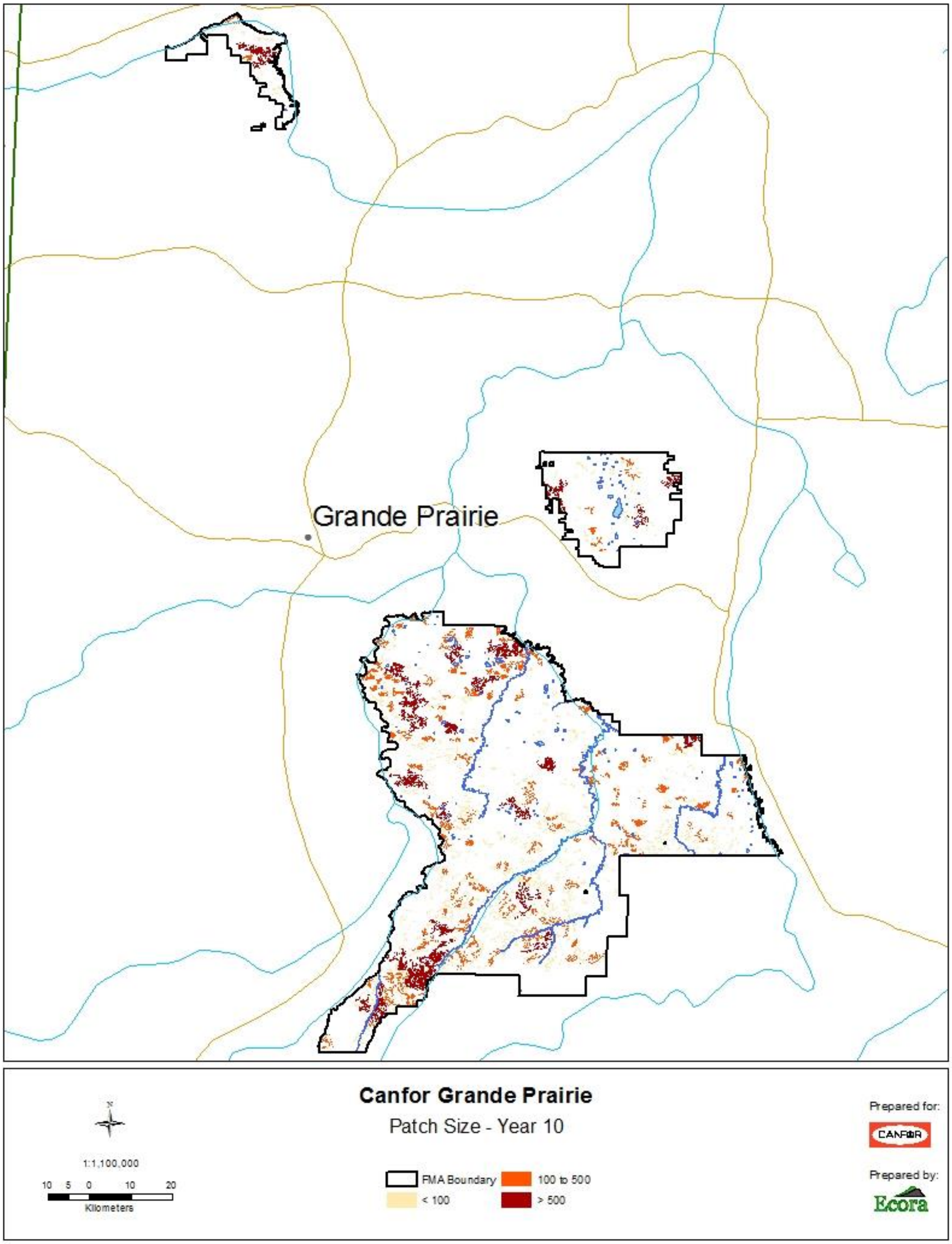

Figure 89: Patch Size Distribution – Year 10

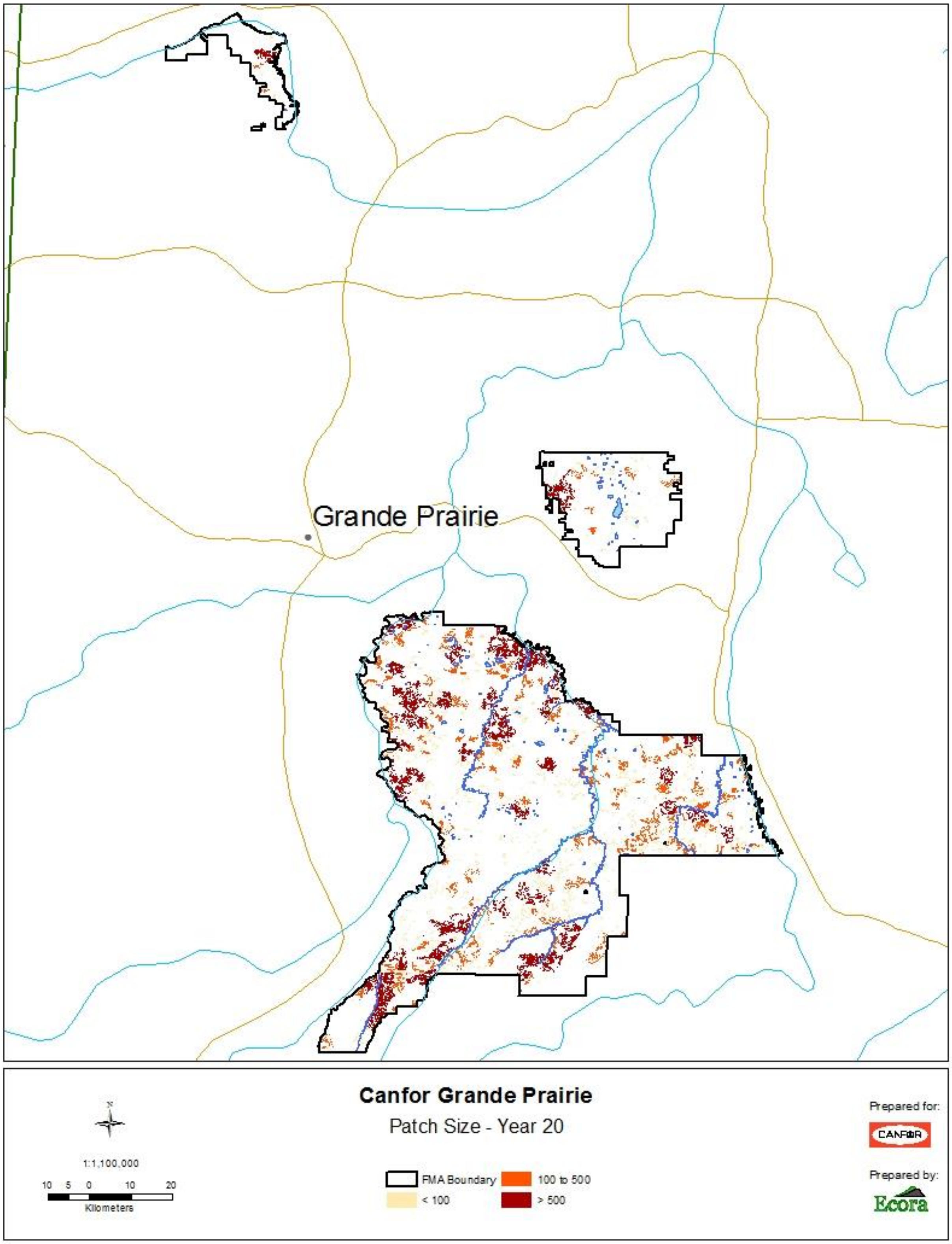

Figure 90: Patch Size Distribution – Year 20

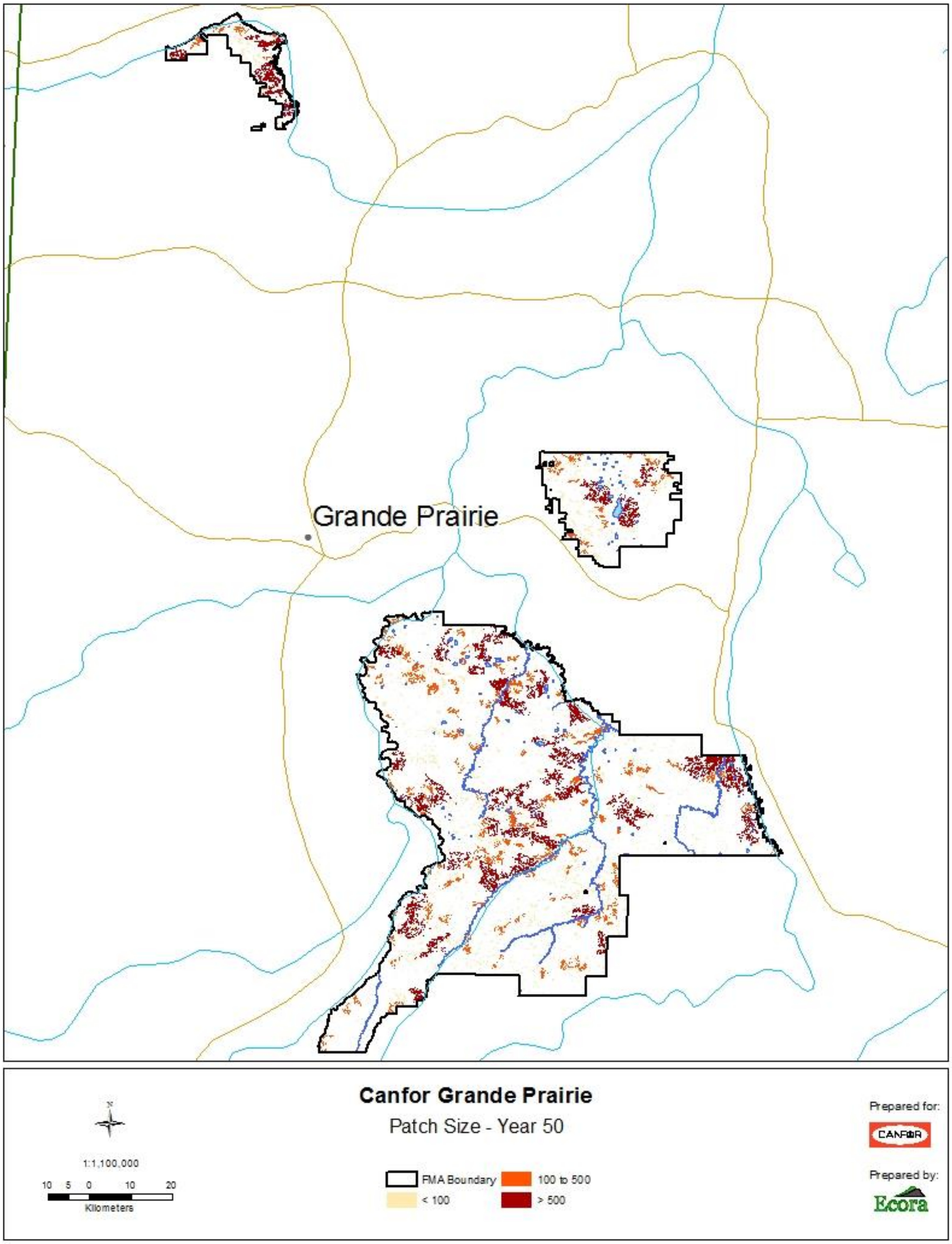

Figure 91: Patch Size Distribution – Year 50

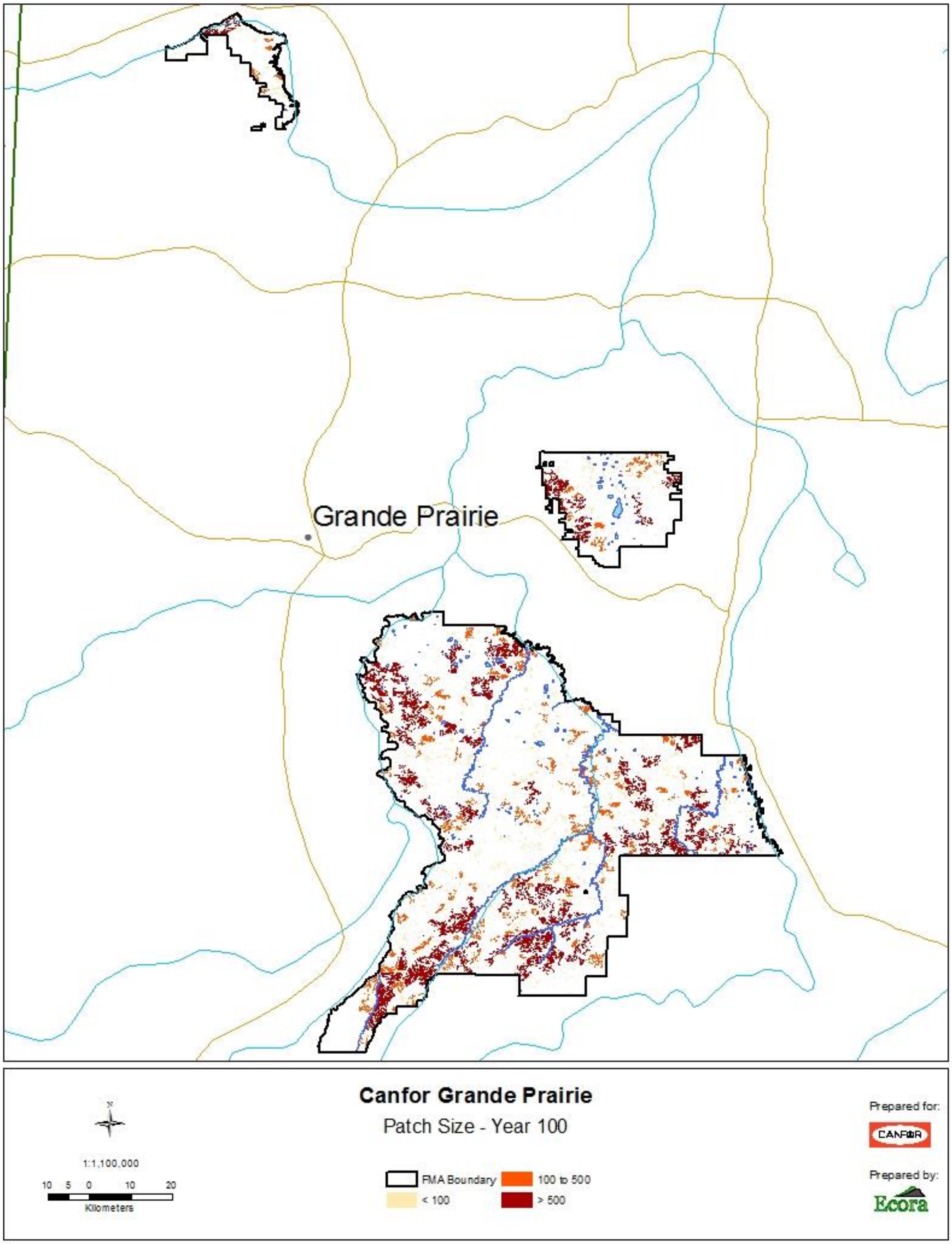

Figure 92: Patch Size Distribution – Year 100

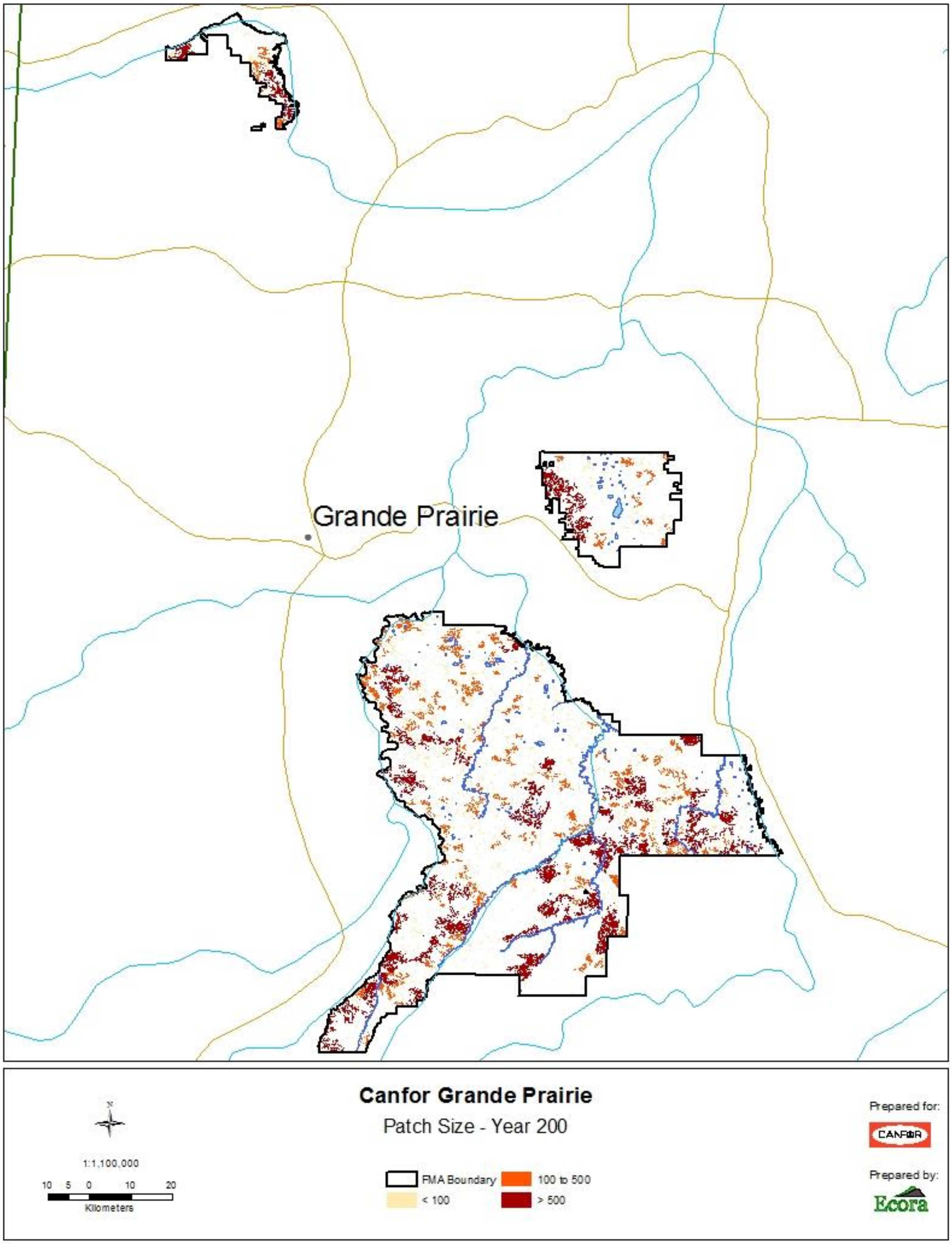

Figure 93: Patch Size Distribution – Year 200

APPENDIX IV – OLD INTERIOR FOREST MAPS

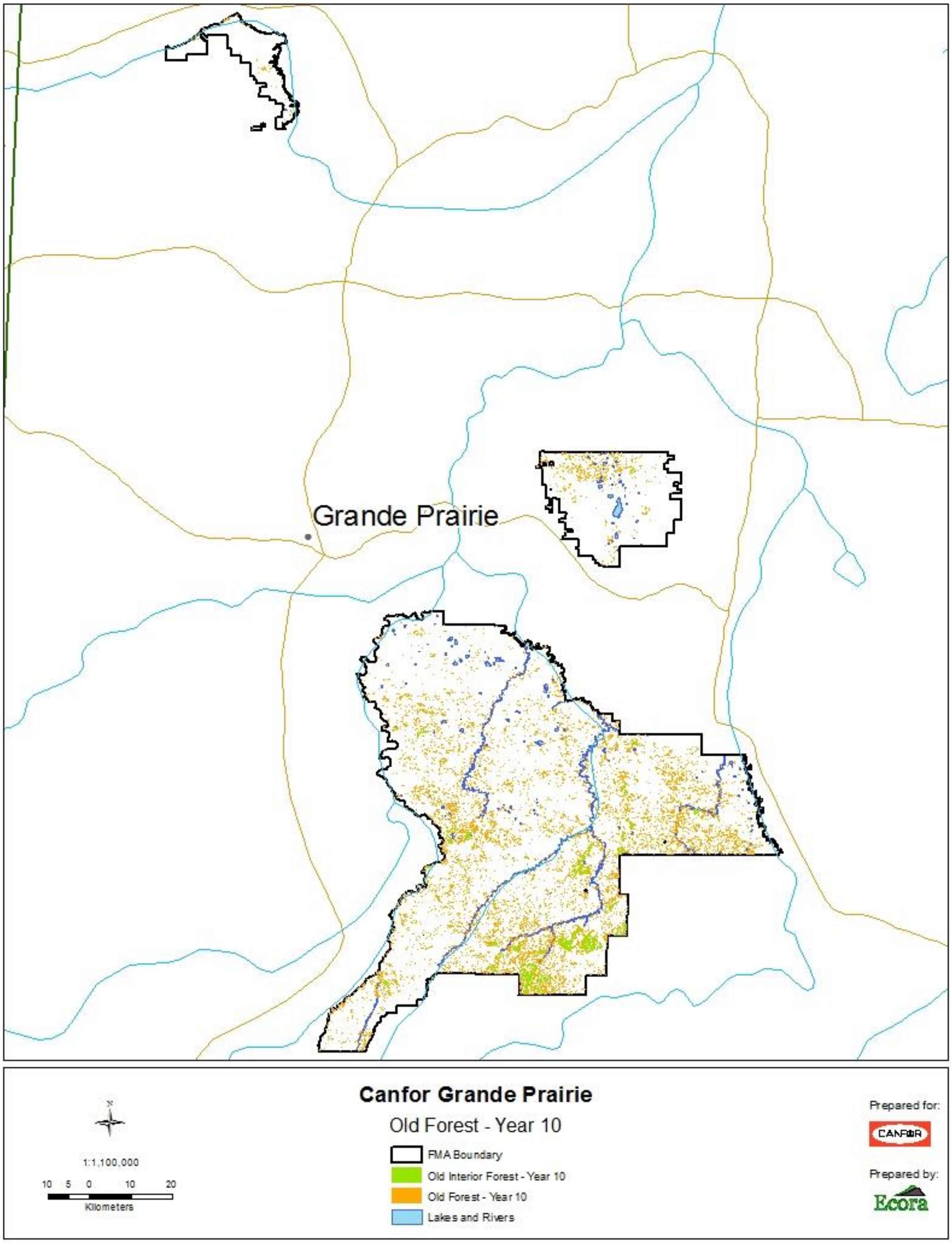

Figure 94: Old Interior Forest – Year 10

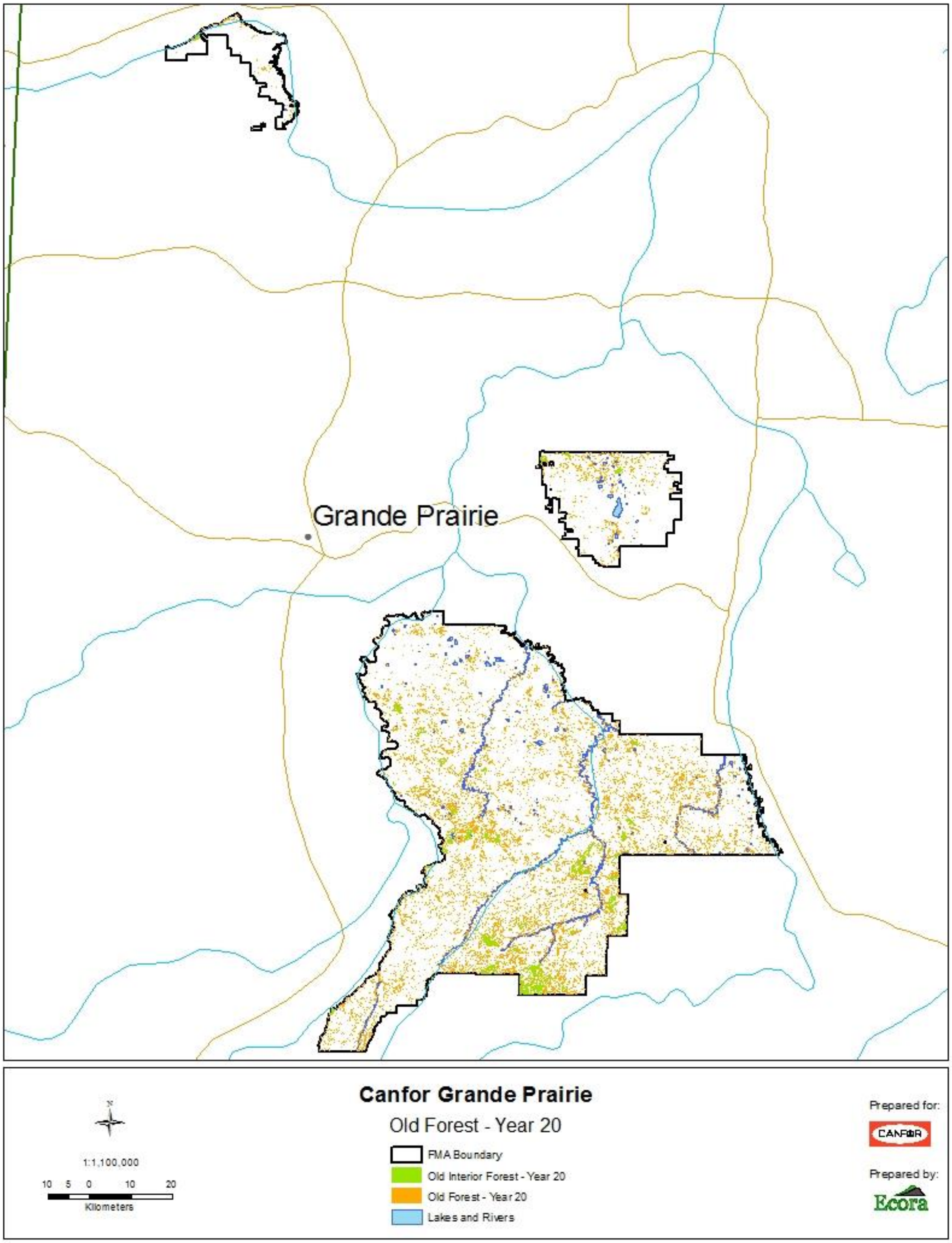

Figure 95: Old Interior Forest – Year 20

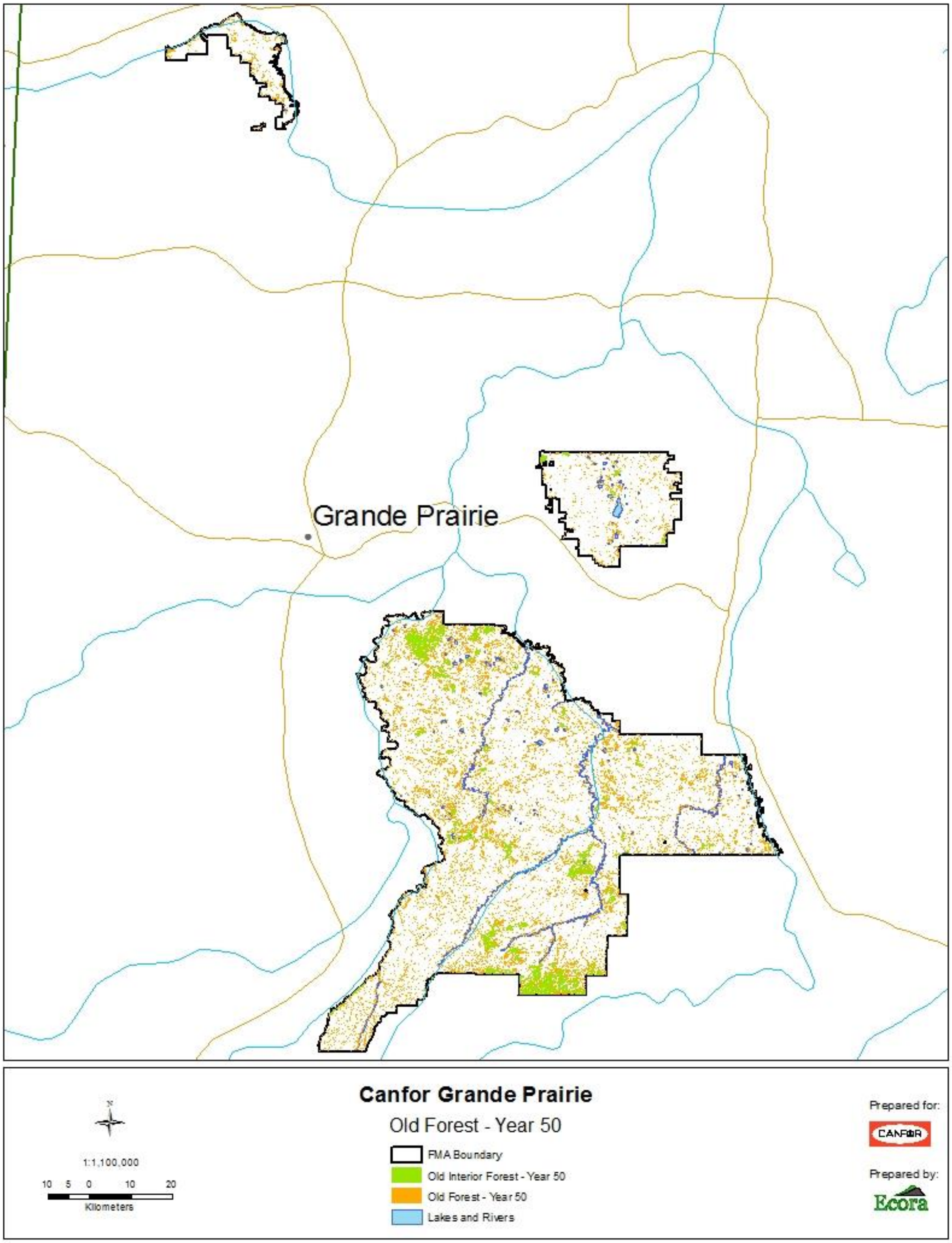

Figure 96: Old Interior Forest – Year 50

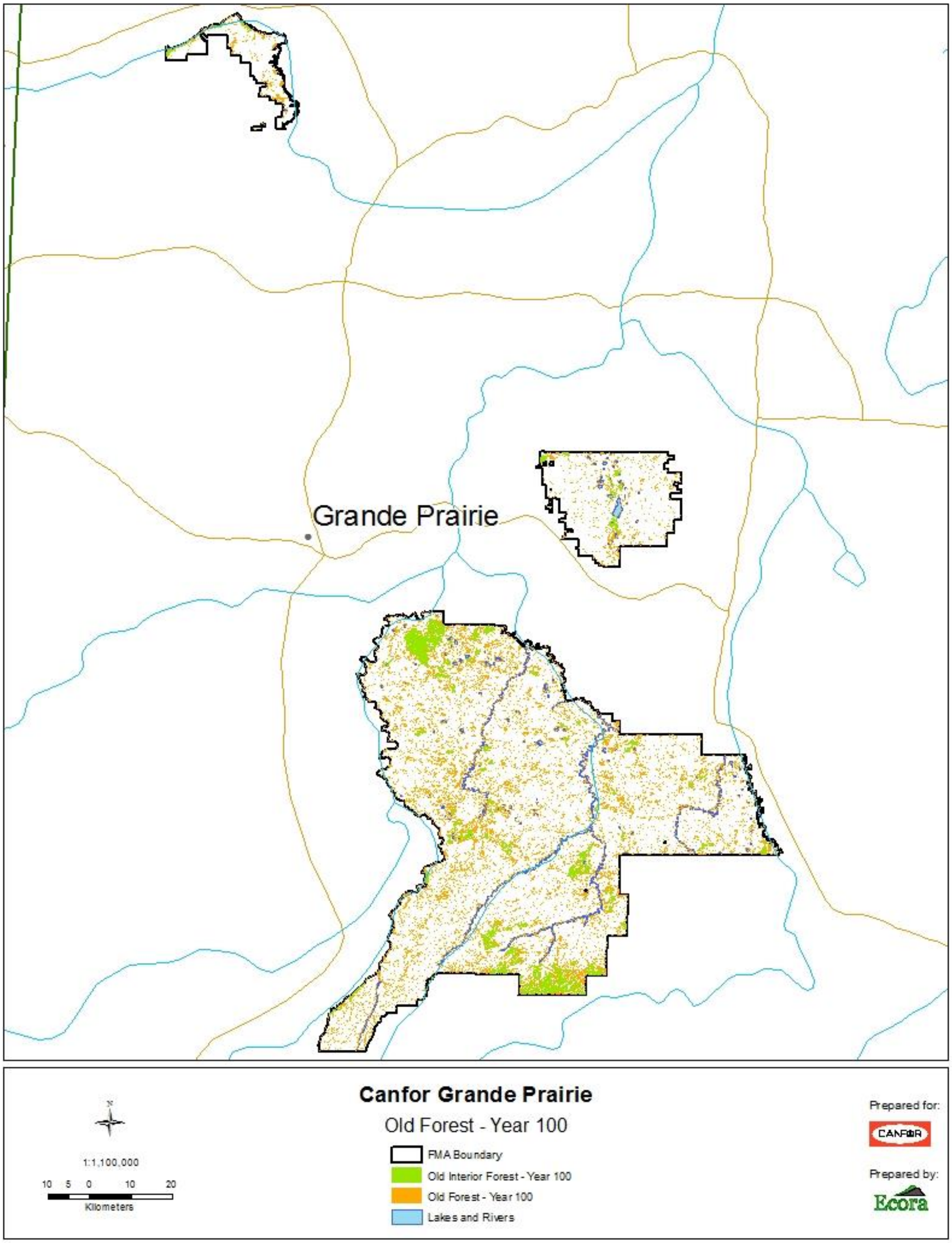

Figure 97: Old Interior Forest – Year 100

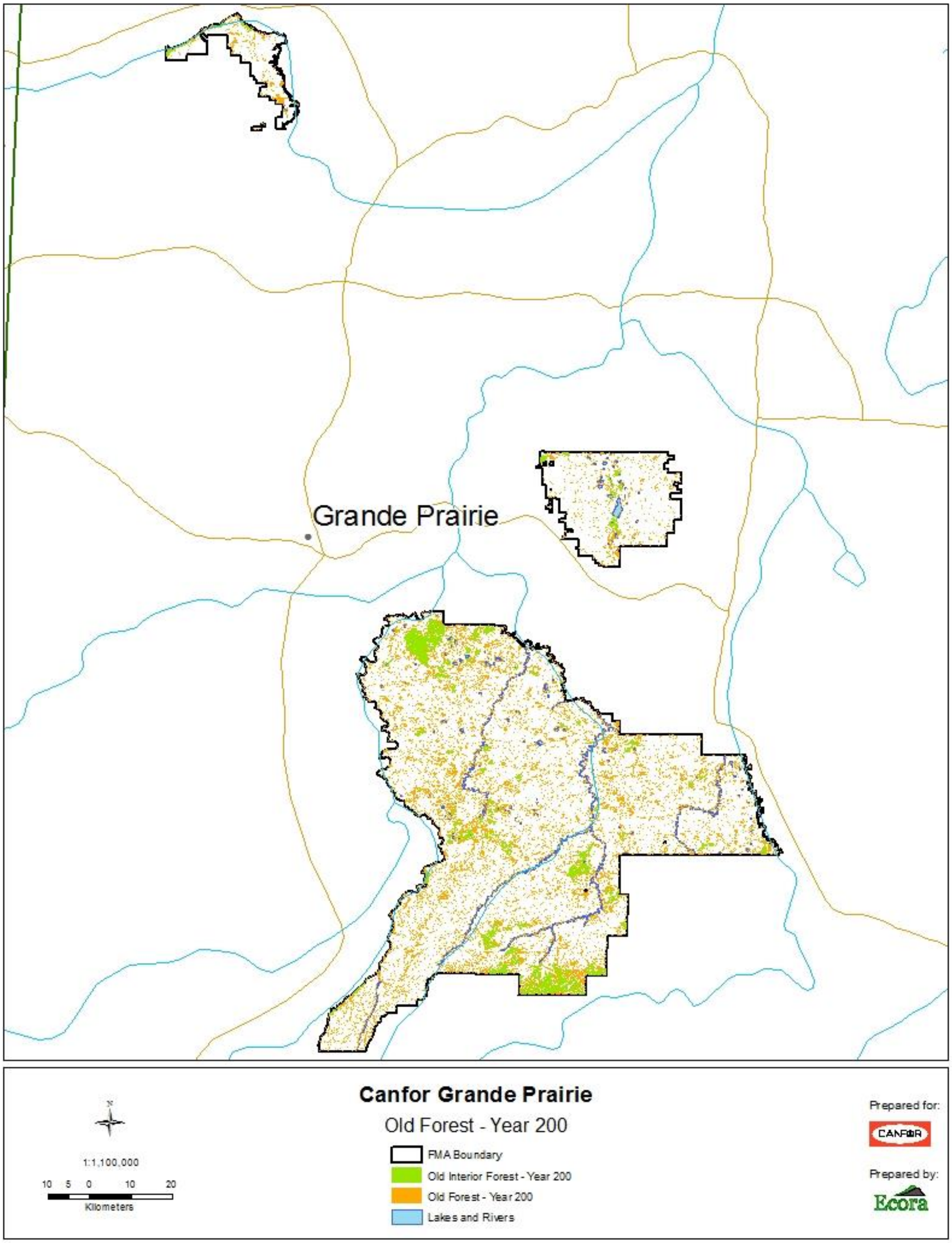

Figure 98: Old Interior Forest – Year 200

APPENDIX V – BARRED OWL MAPS

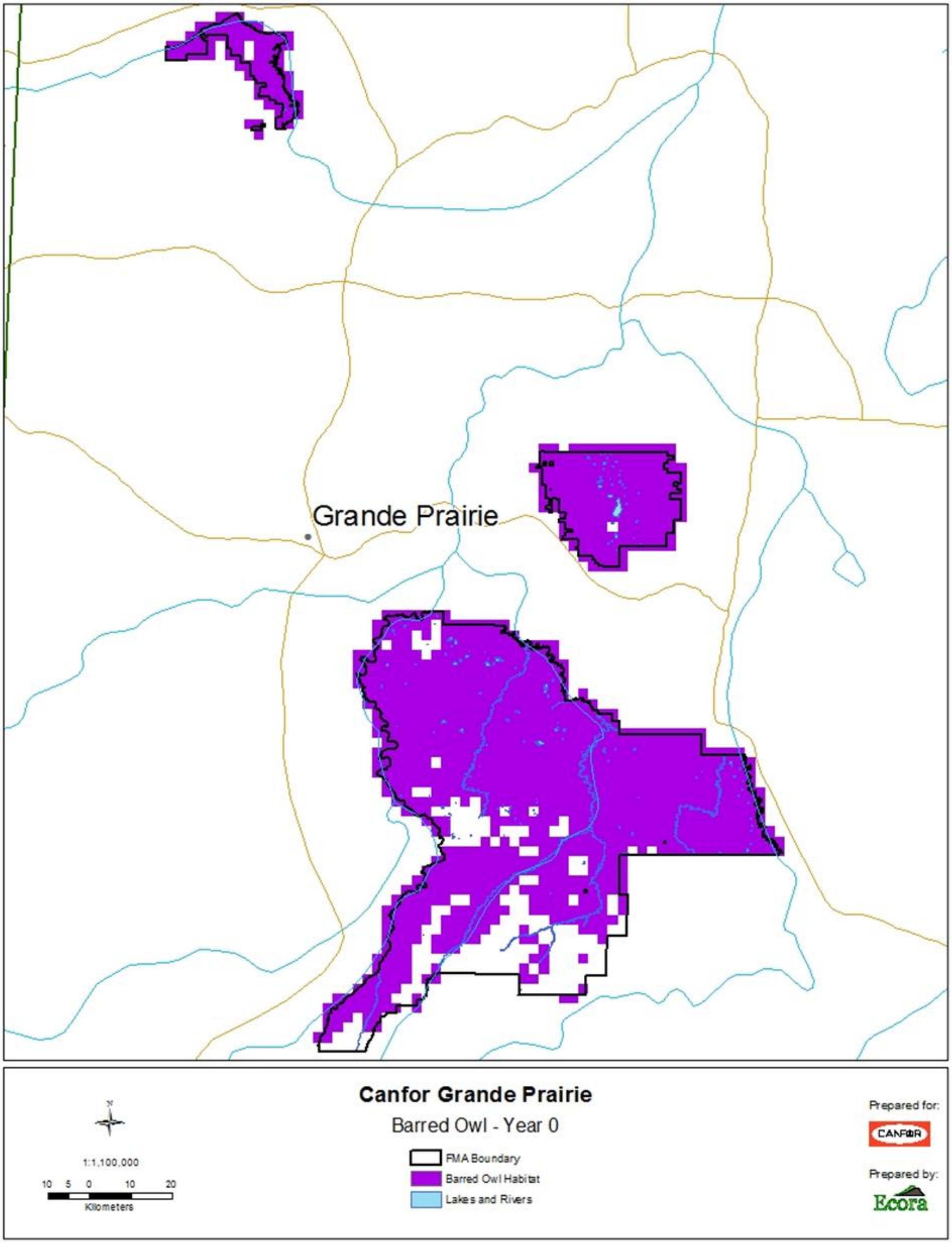

Figure 99: Potential Barred Owl Habitat – Current Status

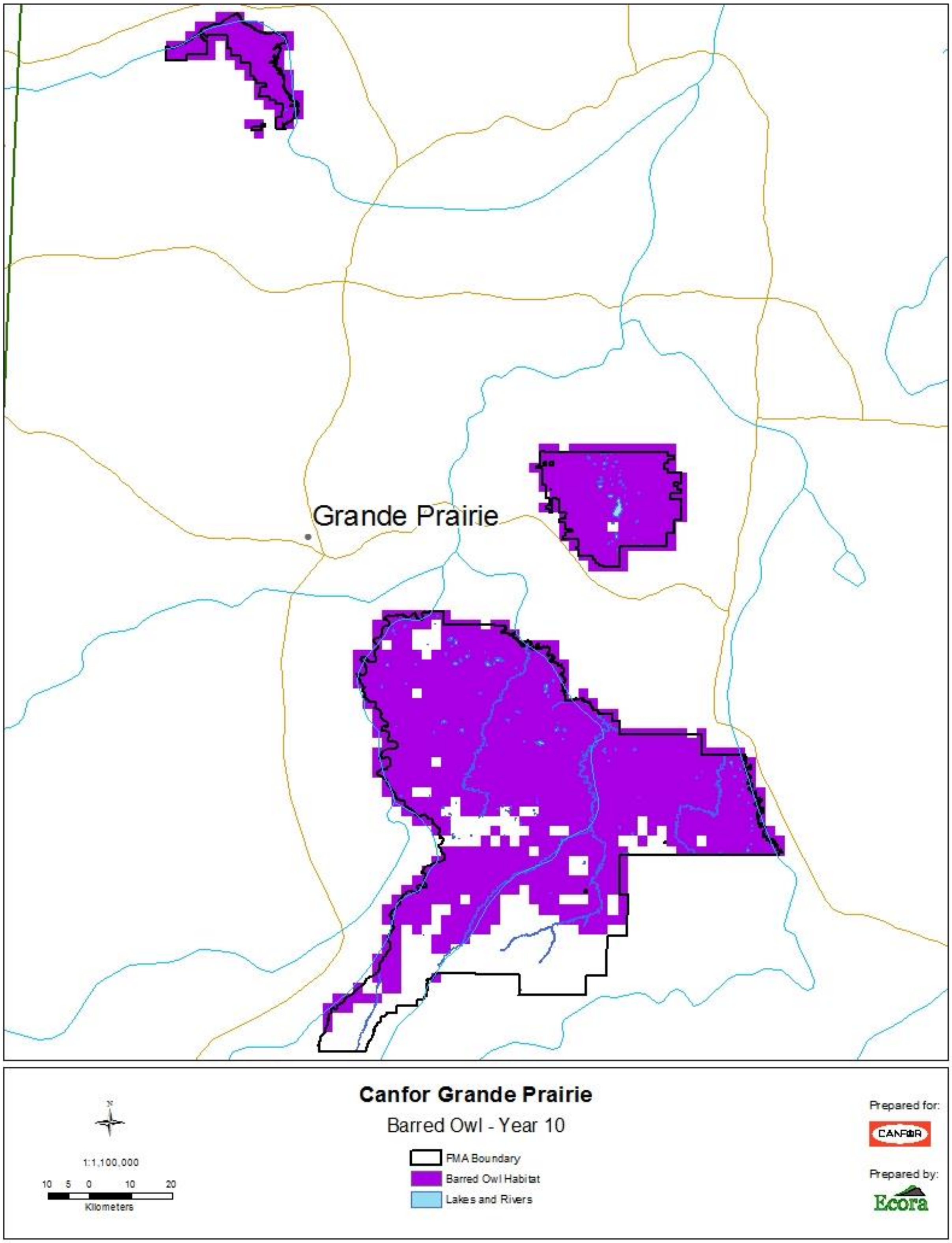

Figure 100: Potential Barred Owl Habitat – Year 10

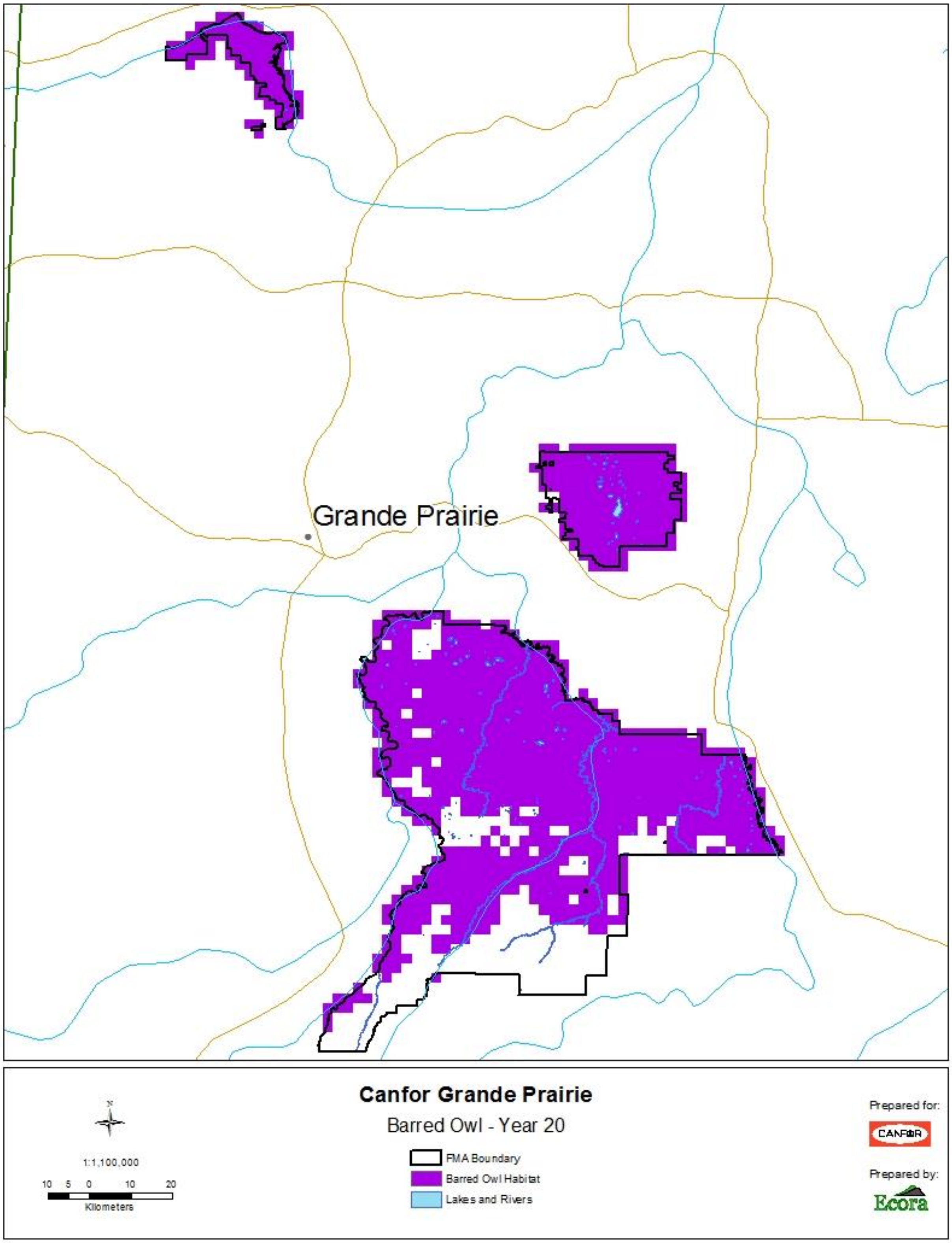

Figure 101: Potential Barred Owl Habitat – Year 20

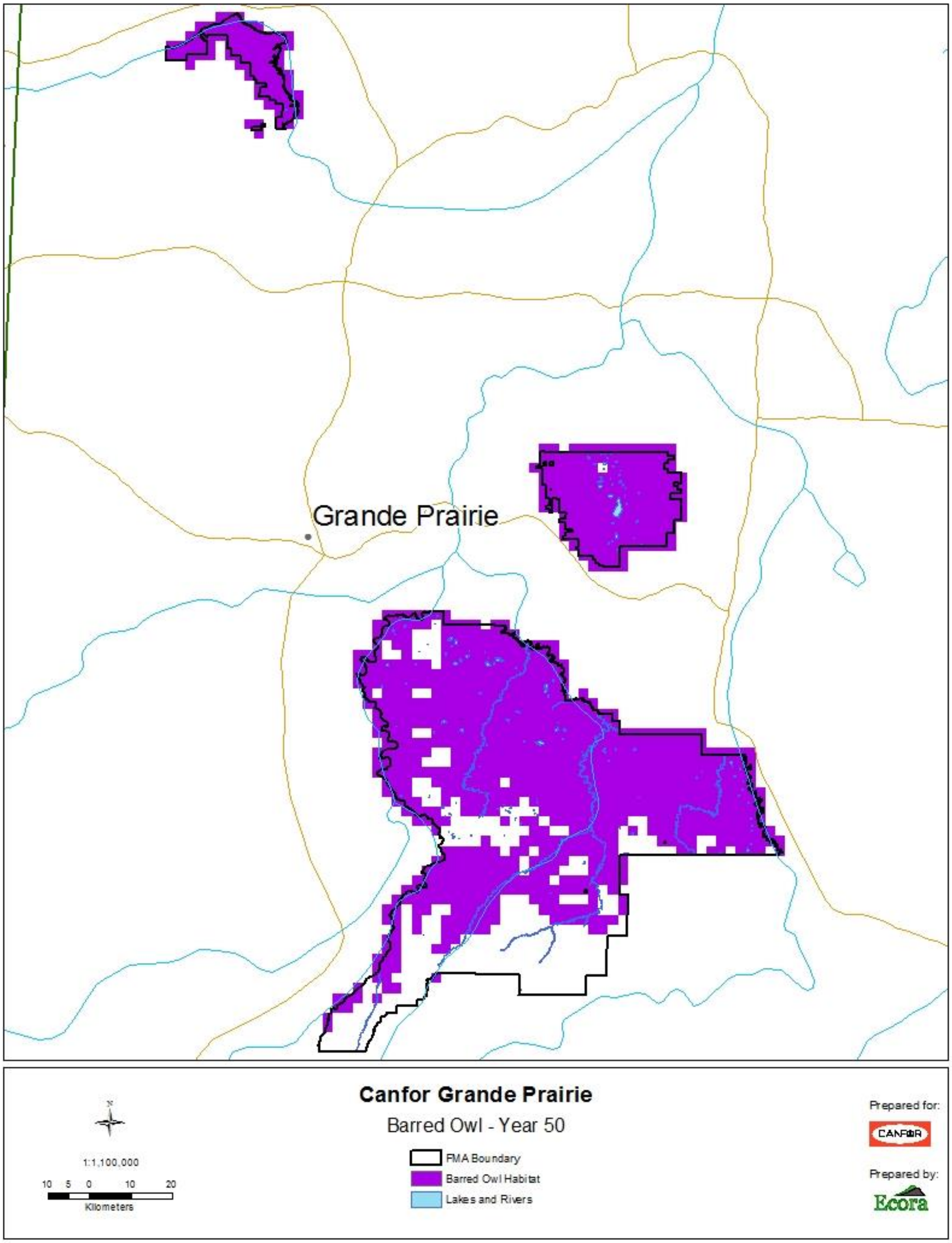

Figure 102: Potential Barred Owl Habitat – Year 50

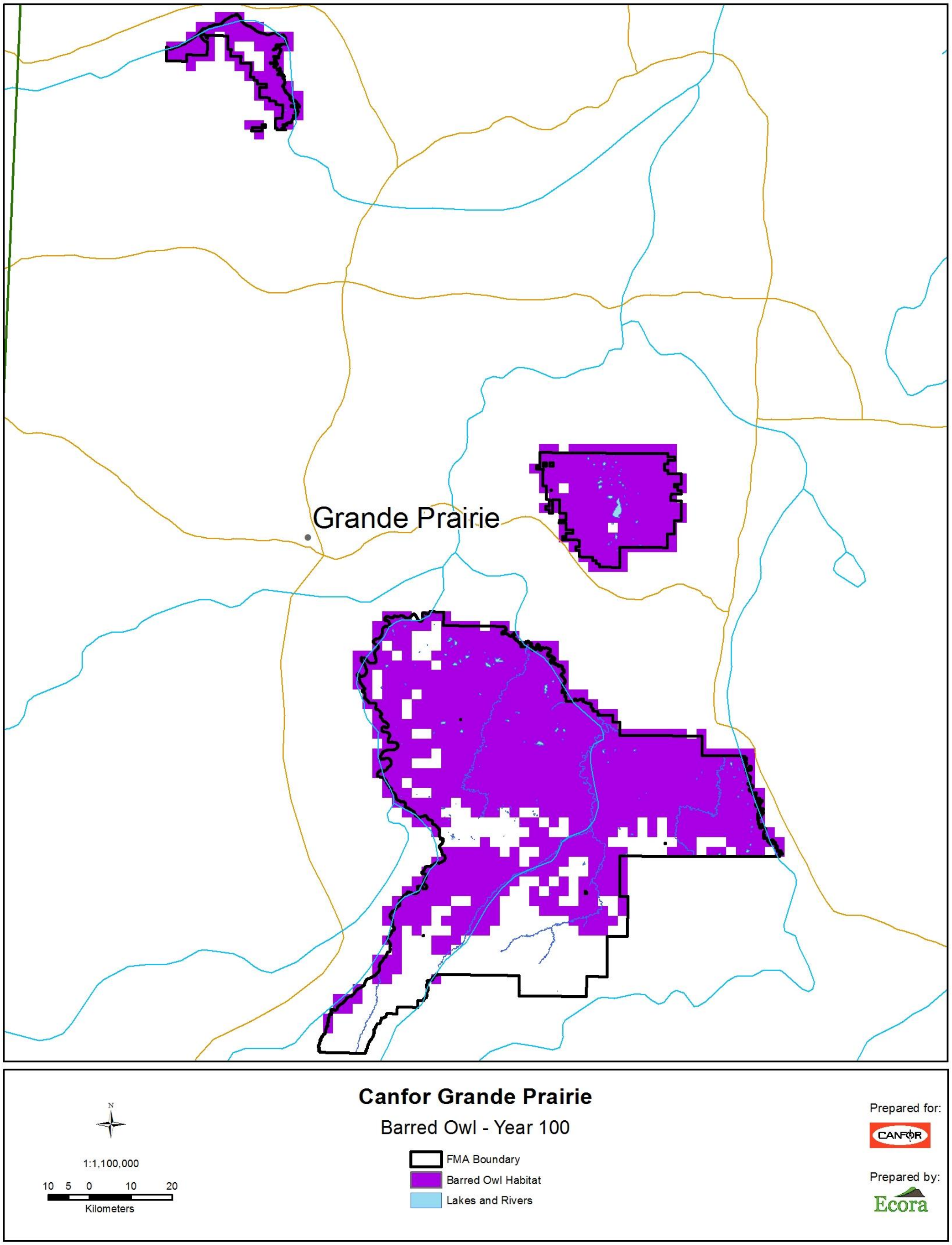

Figure 103: Potential Barred Owl Habitat – Year 100

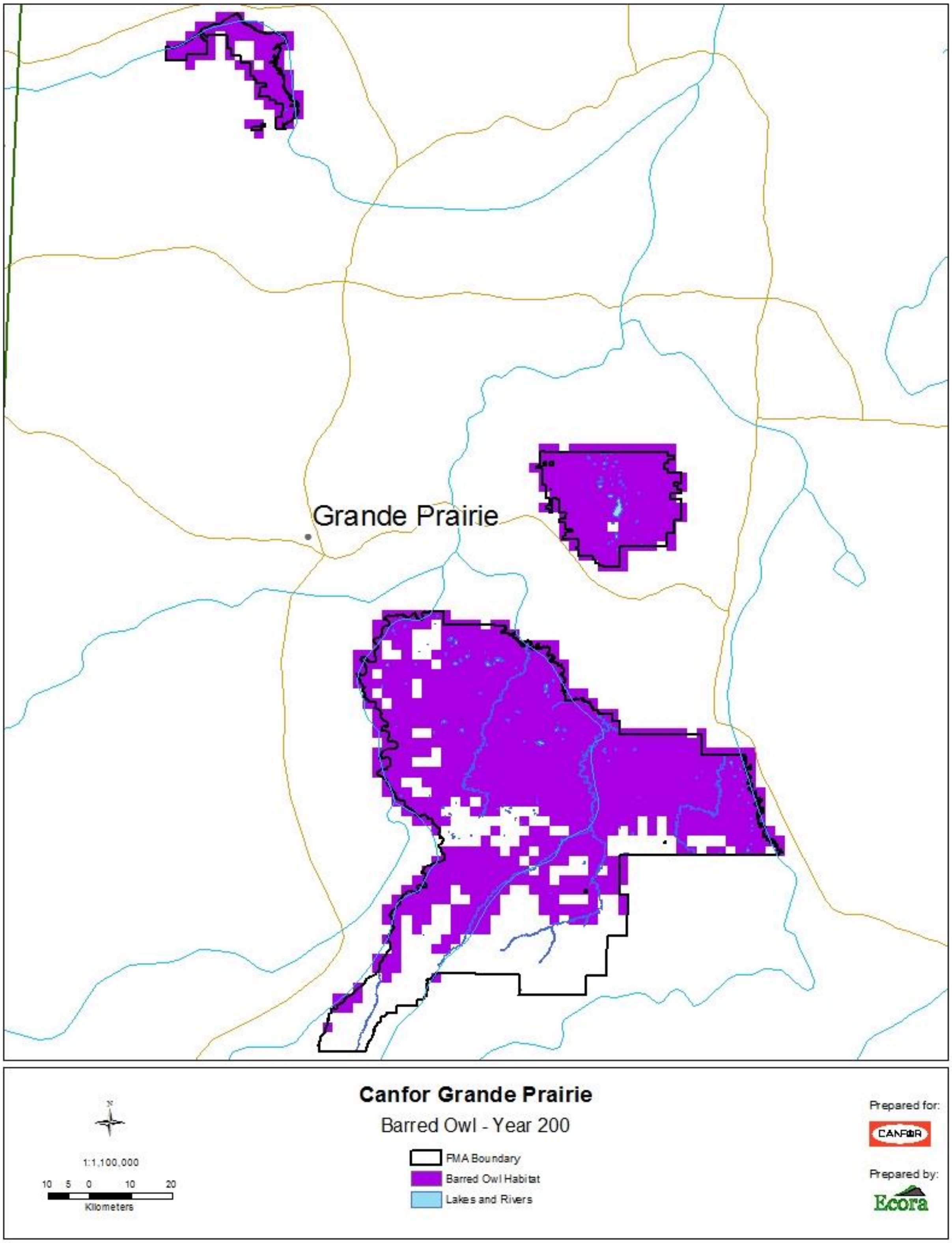

Figure 104: Potential Barred Owl Habitat – Year 200

APPENDIX VI – GRIZZLY BEAR MAPS

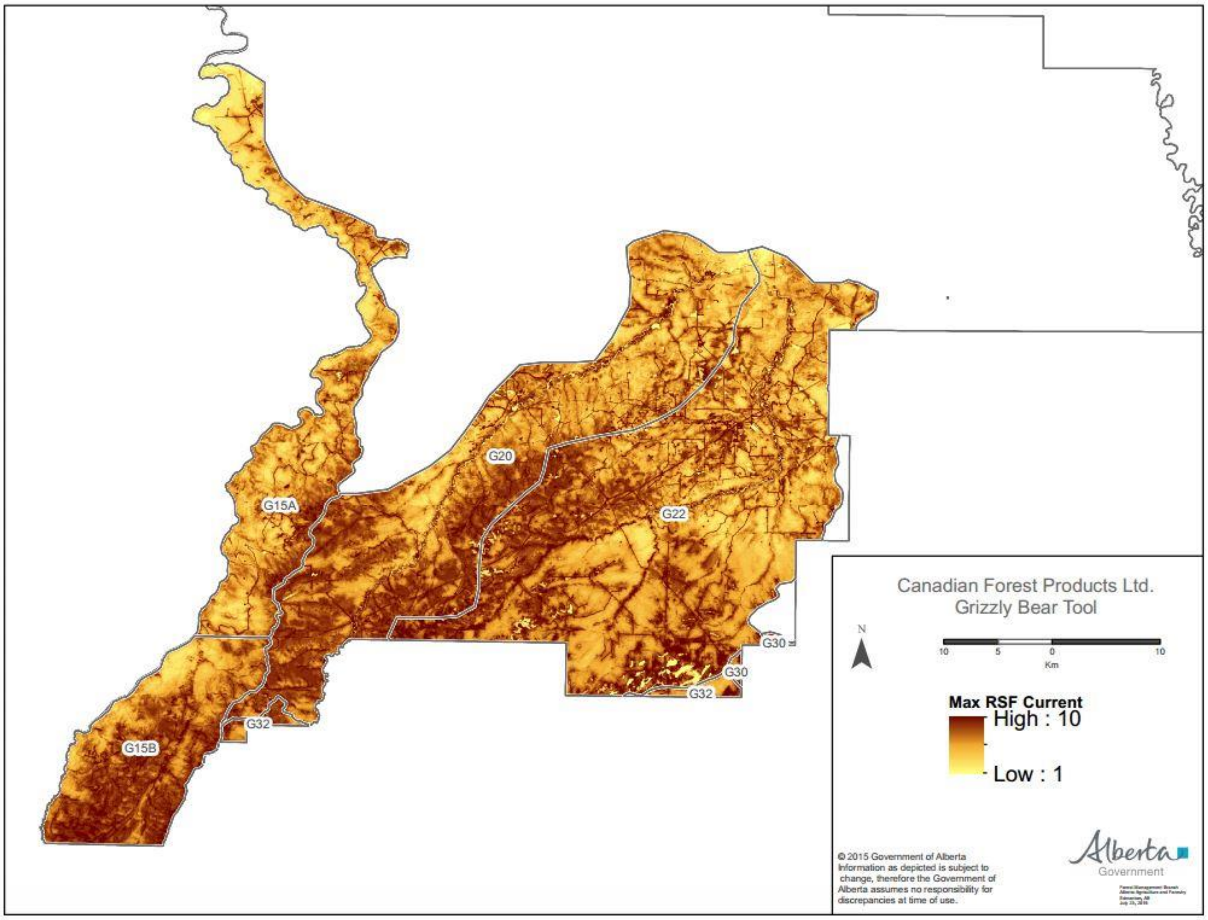

Figure 105: Current Resource Availability (AESRD, 2015)

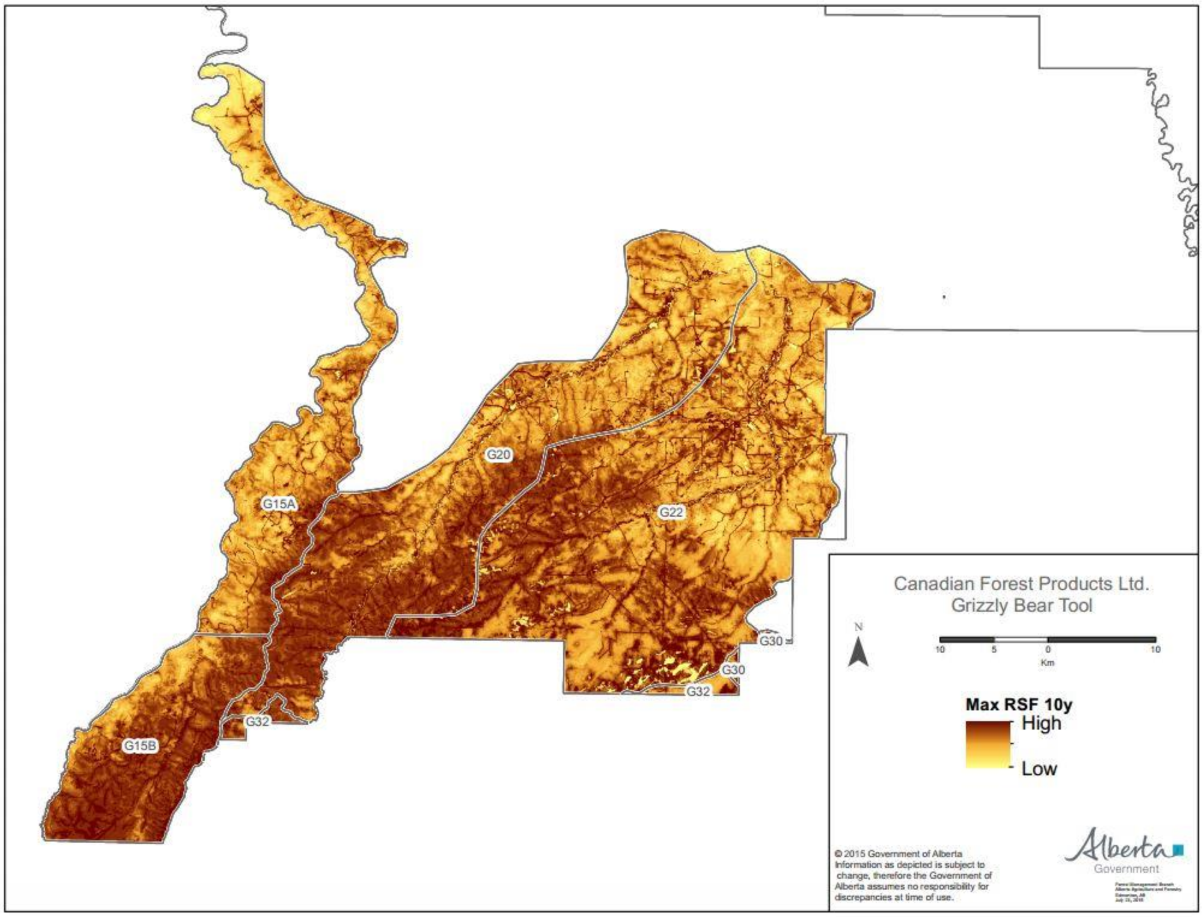

Figure 106: 10 year Resource Availability (AESRD, 2015)

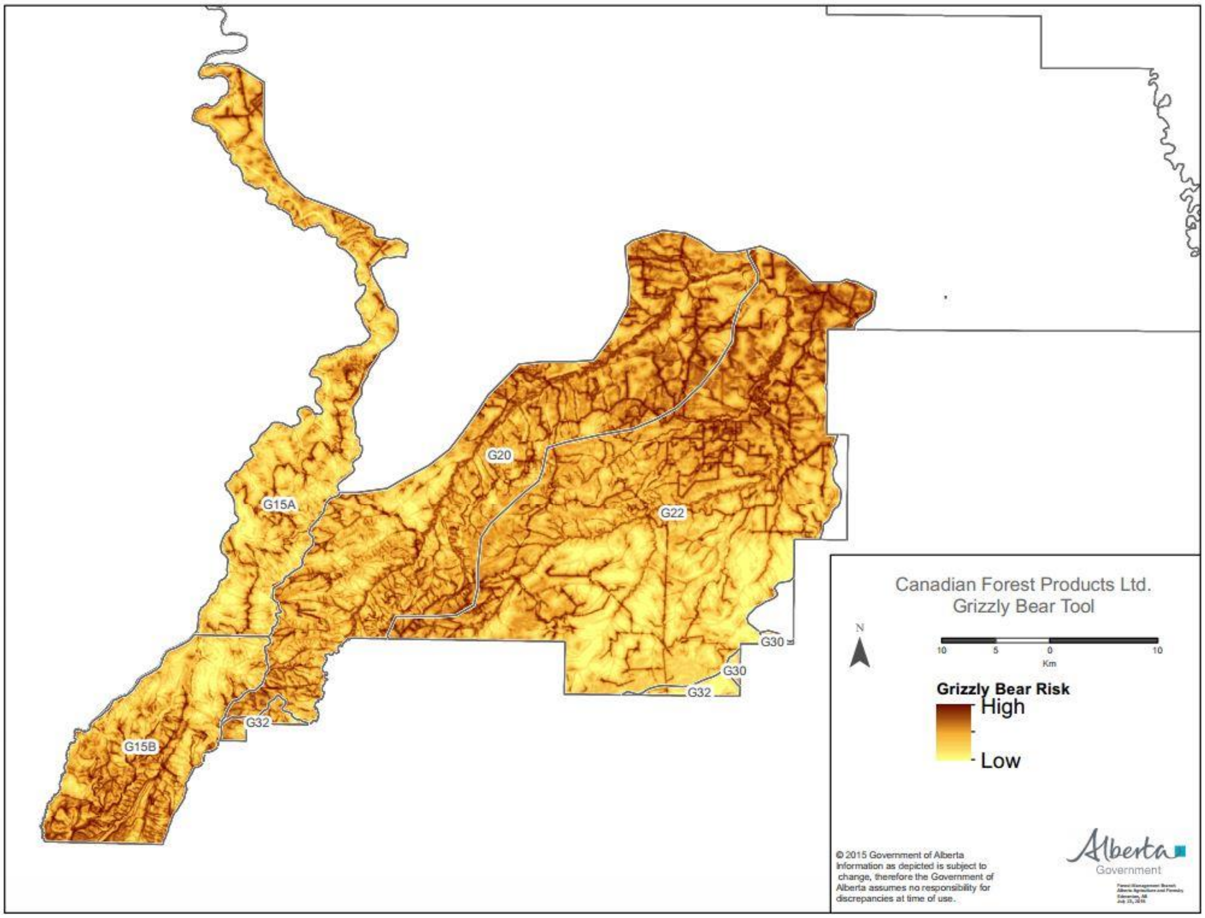

Figure 107: Current Grizzly Bear Habitat Risk (AESRD, 2015)

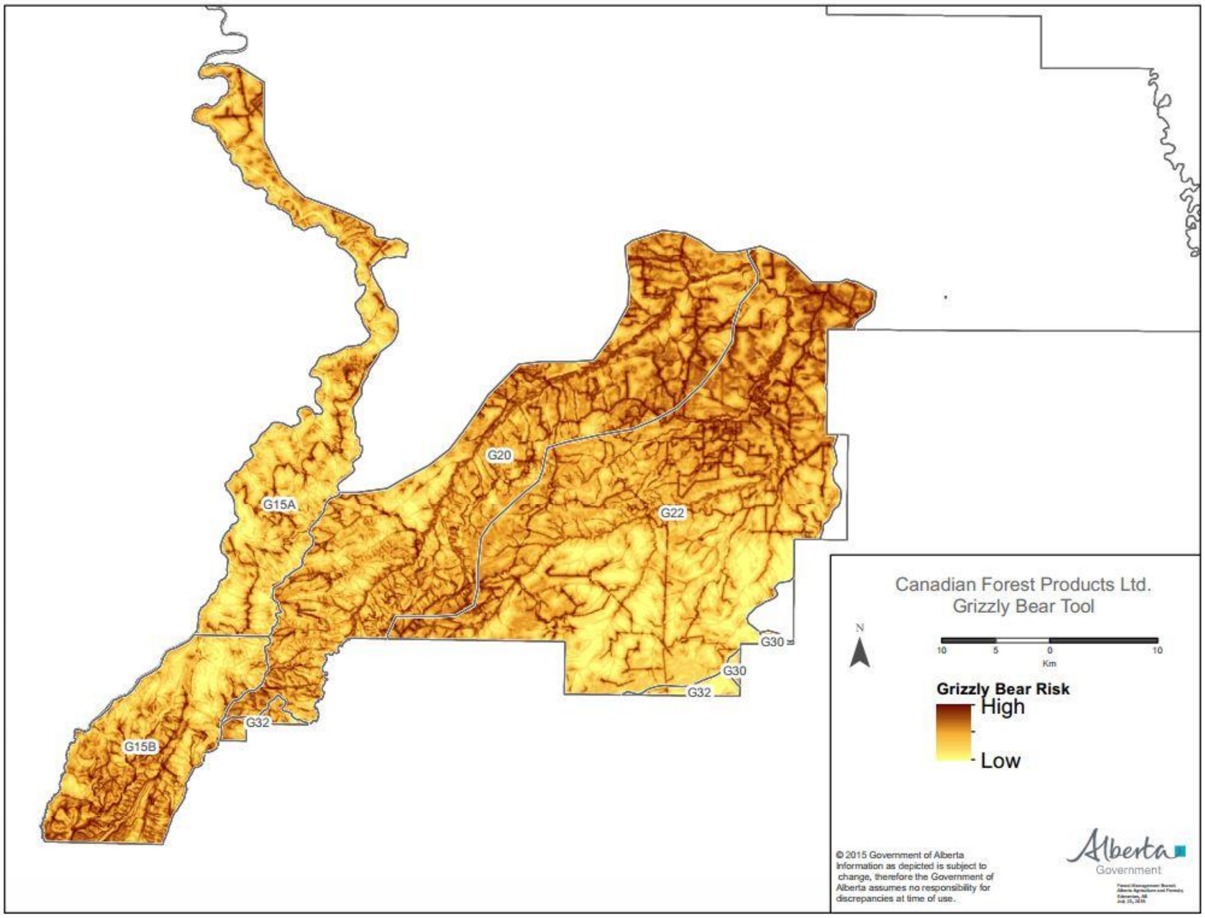

Figure 108: 10 Year Grizzly Bear Habitat Risk (AESRD, 2015)

Appendix VII – SHS Data Dictionary

Field Name	Field Type	Values	Field Description
Scen	char	sa63b	Scenario Name
STD_BCG	char	C,CD,D,DC,Du	Broad Cover Group
YLDGROUP	char	r0_01_b, r0_02_b, r0_03_b, r0_03_g, r0_04_b, r0_05_b, r0_05_g, r0_06_cd_b, r0_06_cd_g, r0_06_dc_b, r0_06_dc_g, r0_07_b, r0_08_b, r0_08_g, r0_09_b, r0_09_g, r0_10_b, r0_10_g. r0_11_b, r0_11_pl_g, r0_11_sw_g, r0_12_b, r0_14_pl_g, r0_14_sb_b, r0_14_sw_g, r0_15_b, r0_15_g, r0_16_b, r0_16_g, r0_17_b, r0_17_g, r1_01_b, r1_02_b, r1_03_b, r1_03_g, r1_04_b, r1_05_b, r1_05_g, r1_06_cd_b, r1_06_cd_g, r1_06_dc_g, r1_07_b, r1_08_b, r1_08_g, r1_09_b, r1_09_g, r1_10_g, r1_11_b, r1_11_sw_g, r1_14_sw_g, r1_15_b, r1_15_g, r1_16_b, r1_16_g, r1_17_b, r1_17_g, r2_c_pl_b, r2_c_pl_b_nsr, r2_c_pl_g, r2_c_pl_g_nsr, r2_c_sw_b, r2_c_sw_b_nsr, r2_c_sw_g, r2_c_sw_g_nsr, r2_d_hw_b, r3_c_pl_b r3_c_pl_g	Yield Group r0 =All forested stands without cutblock information are natural stands r1= Stands with cutblock information that were harvest prior to March 1, 1991 r2= Stands with cutblock information that were harvest after to March 1, 1991 until May 1,2010 r3 = Stands with Cutblock information that were harvest after May 1,2010, current planned blocks and all future harvesting 01-17 = Yield Groups C-PL,C-SW = Regen Yield Groups B = Base No genetic Gain G = Genetic Gain
NEW_YLDGRO	char	r3_c_pl_b, r3_c_pl_g , r3_c_sb_b, r3_c_sw_b, r3_c_sw_g, r3_cd_plhw_b, r3_cd_swhw_b, r3_cd_swhw_g, r3_d_hw1_b, r3_d_hw2_b r3_d_hw4_b, r3_d_hw7_b, r3_dc_hwsx_b, r3_dc_hwsx_g	Future Yield Groups r3 = Stands with Cutblock information that were harvest after May 1,2010, current planned blocks and all future harvesting
TSS	char	bolt-1, bolt-2, bolt-3, bolt-4, bolt-5, bolt-6, bolt-7, dn-1, dn -2, dn -3, dn -4, dn -5, dn -6, dn -7, dn -8, dn -9, ds-1, ds -2, ds -3, ds -4, ds -5, ds -6, ds -7, en-1, en -2, en -3, en -4, en -5, en -6, en -7, es-1, es -2, es -3, es -4, es -5, ln-1, ln -2, ln -3, ls-1, ls -2, ls -3, ls -4, ls -5, peace-1, peace-2, pusk-e, pusk-w, sim-1, sim-2, sim-3, sim-4, smoky-1, smoky-2, smoky-3, smoky-4, smoky-5, smoky-6, smoky-7, smoky-8, wask-1, wask-2, wask-3	Timber Supply Sub-unit
SSI_RANK_N	integer	0-10	MPB Harvest Priority (10 Highest)
CARI_ZONE	char	Zone 1, Zone 2, Zone 3, Zone 4	Caribou Habitat Zone Zone 1 = Conservation Zone 2 = Expansion Zone 3 = Support Zone 4 = Not used
CURRENTTRE	char	cc (clearcut)	Current Treatment
HARV_AGE	integer	60-334	Harvest Age
HARV_YEAR	integer	2019,2024,2029,2034,2039,2044,2049,2054,2059,2064,2069,2074,2079,2084	Harvest Year
ALC_HAUL	real	35-190	Norbord Inc. Haul Time
TOLKO_HAUL	real	127-331	Tolko Haul Time
MVNET_CON	real	3.2-311.5	Conifer Volume (m3/ha)

Field Name	Field Type	Values	Field Description
MVNET_DEC	real	3.2-311.5	Deciduous Volume (m3/ha)
PS_CON	real	0.21-1.42	Piece Size conifer (m3/tree)
DECADE	integer	1-7	Decade (10 year increments)
PERIOD	integer	1-14	Period (5 year increments)
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Field Name	Field Type	Values	Field Description
		S141419, S141509, S141563, S141603, S141669, S141673, S141817,S141849, S141962, S141998, S142179, S142215, S142260, S142286, S142292, S142420, S142453, S142615, S142641, S142813, S142936, S143022, S143121, S143172, S143693, S150106, S150219, S150248, S150282, S150333, S150569, S150936, S151132, S151156, S151226, S151306, S151350, S151508, S151580, S151632, S151638, S151768, S151770, S151812, S151899, S151921, S152068, S152084, S152292, S152650, S152702, S152854, S170125, S171381, S172474, S180608, S182919, S192169, S192226, S192250, S192357, S192459, S192792, S192820, S192883, S192941, S200181, S201245, S201251, S202470, S210145, S210345, S210555, S210735, S210891, S210937, S211152, S211188, S211188P, S211365, S211438, S211715, S211883, S212052, S212693, S212999, S213336, S213578, S220335, S220428, S220513, S220626, S220644, S221039, S221275, S221364, S221452, S221874, S221982, S222083, S222088, S222228, S230223, S230548, S230569, S230665, S230686, S230701, S230706, S230719, S230807, S230824, S230872, S231044, S231066, S231127, S231422, S231531, S231616, S231631, S231664, S231699, S231789, S231858, S231885, S231890, S231958, S232051, S232084, S232108, S232132, S232939, S232981, S250256, S250367, S251356, S252140, S252237, S252324, S252455, S252606, S253219, S253479, S253502, S253594, S261932, S263053, S263149, S263313, S271931, S273019, S273041, S273057, S273199, S273493, S273547, W700196, W700234, W700248, W701211, W701250, W701258, W701296, W710611, W711197, W710736, W711276, W711387, W711465, W712309, W712611, W712619, W712654, W712808, W712915, W721871, W723134, W733476, W733669	
LOG_YEAR	real	0,5,10,70,2010,2011,2012,2013,2015,2014	Year the block was logged (Combined with Harvest Deferral Information) Stands with values < 2000 indicate number of years of harvest deferral
MANAGEDARE	real	0.0001-1302.33	Managed Area
AREA	real	0.0001-715.87	Area