Prince Albert

Forest Management Agreement Area

2018 - 2038

FOREST MANAGEMENT PLAN

VOLUME II

February 9, 2018

Version 1.1

Sakâw Askiy Management Inc.

FOREST MANAGEMENT PLAN - VOLUME II

for the

Prince Albert Forest Management Agreement Area

Sakâw Askiy Management Inc.

for the 20-year period from April 1, 2018 to March 31, 2038

I hereby certify that I have prepared this ***Volume II: Forest Management Plan*** *to the best of my professional skill and judgment in accordance with the requirements of the Ministry of Environment, Forest Service Branch.*

______________________________	February 9, 2018
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Submitted by:	______________________________	February 9, 2018
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I recommend that this ***Volume II: Forest Management Plan*** *be approved for implementation and certify that it has been prepared in accordance with the requirements of the Ministry of Environment, Forest Service Branch and other relevant government policies and obligations, including any agreements with Aboriginal people.*

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Executive Summary

Sakâw Askiy Management Inc. (Sakâw) holds the Prince Albert Forest Management Agreement (PA FMA) with the Government of Saskatchewan, and coordinates management of the FMA area between a unique partnership of six forest companies and two First Nations partners. Wood harvested in the PA FMA area is currently used to support lumber/OSB mills operating in Meadow Lake, Big River, Glaslyn, Carrot River and several other smaller facilities.

As a FMA holder, Sakâw is required, under the *Forest Resources Management Act,* to prepare a 20-Year Forest Management Plan (FMP) every ten years. This FMP covers the 20-year period from April 1, 2018 to March 31, 2038.

The Saskatchewan Ministry of Environment's Forest Management Planning Document (August 2007), was used as the basis for preparation of this **Volume II Document**. The recently approved 2017 Forest Management Planning Standard has also influenced the contents and structure of this Volume II.

FMPs in Saskatchewan provide strategic direction for forest resource management over a 20-year timeframe. Preparation of this 20-year FMP required development of three primary products.

1. Volume I of the FMP provides background and contextual information on the FMA area and describes historical forest management practices. Volume I was completed in May 2014;
2. The Forest Estate Modeling Report describes the process of determining an appropriate Harvest Volume Schedule (HVS) using ecosystem-based management principles. This report is included as Appendix C of this document;
3. Volume II of the FMP provides a strategic plan of how forest management activities will be undertaken, along with a tactical plan that identifies approximate locations where harvesting will be implemented during the term of the plan. This document provides high level guidance for the preparation of Operating Plans in the FMA area, while also providing measurable indicators to assess consistency with strategic objectives.

The PA FMA area consists of 3.35 million ha of land with approximately 1.83 million ha being considered productive forest. Approximately 1.7 million ha of this area is productive forest available for forest management (i.e., lands that are not located in Parks, Recreation Areas, Indian Reserves, Patent Lands, etc.). The PA FMA area is subdivided into 3 Planning Units (west, central, east) where harvesting limits have been developed to distribute the harvest spatially and proportionally amongst the available stand types. Multiple Sakâw shareholders operate within these units in defined operating areas, and follow operational plans developed by Planning Facilitators / Sakâw. Additional management units based on ecological characteristics were also developed to support the application of ecological management objectives.

A total of 33 FMA area-specific Values, Objectives, Indicators, and Targets (VOITs) were developed by Sakâw for this FMP, to deliver the above management objectives. The VOITs are built around the Canadian Council of Forest Minister's (CCFM) six broad criterion for sustainable forest management; 1) Biological Diversity; 2) Ecosystem Condition and Productivity; 3) Soil and Water; 4) Role in Global Ecological Cycles; 5) Economic and Social Benefits; and 6) Society's Responsibility.

The VOITs are attached to this document as Appendix A. Regular reporting of these indicators will allow Sakâw to assess how the FMP is being implemented and whether expected outcomes are being achieved.

In addition to VOITs and other measures for assessing whether forest management objectives are being achieved, each of Sakâw's shareholders is responsible for pursuing voluntary certification of their forest management practices. All shareholders are currently certified under the Sustainable Forestry Initiative (SFI) program. As part of the certification process, each shareholder has developed an Environmental Management System (EMS) consistent with the ISO 14001 standard. An EMS helps organizations identify, manage, monitor, and control their environmental performance as part of their overall management system.

A detailed description of information and methods used to determine the available timber supply for the Prince Albert FMA area is included in Appendix C of this document. Determination of the harvest volume schedule (HVS) was carried out using a computer model to explore the application of harvest and silviculture treatments to the PA FMA area forest inventory, within a set of constraints established to meet old and very old seral stage retention targets, address species at risk issues (e.g., woodland caribou harvest deferral areas), and meet other socio-economic and stakeholder requirements.

Forest estate modeling explored several management strategies (candidate scenarios) and associated sustainable rates of harvest over a 200-year planning horizon, while considering both timber and non-timber objectives. Through consultations with the Planning Team and the Public Advisory Group, the management strategy that best fit the desired outcomes was selected as the preferred management scenario (PFMS). This scenario was used as an input to the 20-year tactical plan that identifies where harvesting could occur and where it will not occur during the term of the FMP.

The PFMS included Natural Forest Patterns (NFP) guidance [in-block retention, old seral, interior old seral, and harvest event size distribution], caribou habitat management, several additional non-timber management strategies (riparian, visuals, recreation, etc.), production of at least 600,000m^3/year of pulp in the short term, and cut-to-length utilization for softwood (tree-length for hardwood). For the term of this FMP, this scenario is able to support the current softwood sawlog HVS of 1,265,000m^3/year and an increased hardwood HVS of 1,126,000m^3/year, while also meeting the government requested pulp harvest of 600,000 m^3/year. The scenario assumes all stands regenerate to be similar stand types as pre-harvest conditions (no managed stand gains, no stand conversion). The utilization standard assumed in the PFMS is shown in the table below.

Utilization standards used during modeling of PFMS

Product	Fibre Leaves forest	Stump Height (cm)	Minimum Top Diameter inside Bark (cm)	Minimum Merchantable Height (m)	Log Length (m)
SWD Sawlog	CTL	30	10	5.35	2.6
SWD Pulp	Tree length	30	8	5.35	2.4
Hardwood	Tree length	30	8	5.35	Full tree

While managing the FMA area for timber production, Sakâw commits to working collaboratively with other users of the land base to provide for the maintenance and protection of biodiversity and other non-timber values such as: water quantity and quality, archaeological and cultural resources, traditional use areas, visually sensitive areas, botanical forest products such as berries and mushrooms, as well as outfitting, trapping, hunting, fishing, tourism, and mineral exploration and development.

Development of a 20-year tactical plan is a key component of this FMP. The tactical plan is designed to provide a general representation of where harvesting could occur over the next two decades (shown as Tactical Plan Areas), and where harvesting will not occur (shown as reserves or deferral areas). To support harvesting within Tactical Plan event areas, approximately 2,460 km of new road construction is estimated to be required over 20 years with, only a portion of which will remain long term.

The boreal forests found in the PA FMA area are often influenced by natural disturbances from insects, disease, and wildfires. Sakâw has developed response strategies to incorporating natural disturbance into its forest management planning and implementation.

Sakâw shareholders will work co-operatively with Sakâw's General Manager to follow the strategic direction set out in this FMP. Upon approval of this plan, a Management Implementation Team (MIT) will be formed to monitor and guide implementation of the plan. The MIT will be comprised of Sakâw's General Manager, Sakâw shareholders, and representatives of the Forest Service, other ministry branches, and a Public Advisory Group. The MIT will develop terms of reference that, among other things, will outline responsibilities for reviewing the implementation of this FMP and performance against the targets established in it.

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List of Acronyms and Abbreviations

AHPP	Aquatic Habitat Protection Permit
BMP	Best Management Practice
CBFA	Canadian Boreal Forest Agreement
CCFM	Canadian Council of Forest Ministers
CDC	Conservation Data Centre (Saskatchewan)
cm	Centimetre
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRA	Commercial, Recreational, and Aboriginal
CSG	Cover Species Group
CTL	Cut-to-length
CWPP	Community Wildfire Protection Plan
DFO	Department of Fisheries and Oceans Canada
DIB	Diameter Inside Bark
EcoMU	Ecological Management Units
EIS	Environmental Impact Statement
EMS	Environmental Management System
FCA	Fur Conservation Area
FMA	Forest Management Agreement
FMP	Forest Management Plan
FS	Forest Service Branch
FTG	Free to Grow
GIS	Geographic Information System
ha	Hectare
HCB	Heritage Conservation Branch
HVS	Harvest Volume Schedule
HWD	Hardwood
m	Metre
m^3	Cubic Metre
Km	Kilometre
MFLB	Managed Forest Land Base
MIT	Management Implementation Team
MOE	Ministry of Environment
MPB	Mountain Pine Beetle
MU	Management Unit
NFP	Natural Forest Patterns
NRV	Natural Range of Variability
OP	Operating Plan
OSB	Oriented Strand Board
OSD	Old Seral Deferrals (spatial reserves)
PA FMA	Prince Albert Forest Management Area
PAG	Public Advisory Groups
PFLB	Productive Forest Land Base
PFMS	Preferred Forest Management Scenario
PFT	Provincial Forest Type
RAN	Representative Areas Network
RMBP	Resource Management Burn Plan
Sakâw	Sakâw Askiy Management Inc.

SARA	Species at Risk Act
SFI	Sustainable Forestry Initiative
SFM	Sustainable Forest Management
SGR	Silviculture Ground Rules
SKRWG	Saskatchewan Regional Working Group
SWD	Softwood
TOR	Terms of Reference
TPA	Tactical Plan Area
VOIT	Values, Objectives, Indicators, Targets
VSA	Visually Sensitive Areas
WPPP	Wildfire Prevention and Preparedness Plan
WUI	Wildland Urban Interface

1.0 Introduction

Sakâw Askiy Management Inc. (Sakâw) currently holds the Prince Albert Forest Management Agreement (PA FMA) licence, after acquiring it from Weyerhaeuser Canada on November 1, 2010. Sakâw coordinates management of the licence on behalf of its eight member companies. As a holder of a Forest Management Agreement (FMA), Sakâw must prepare a 20-Year Forest Management Plan (FMP) for the Prince Albert Forest Management Agreement area – typically every ten years. This FMP covers the 20-year period from April 1, 2018 to March 31, 2038.

The completion of a 20-Year FMP is required for renewing a FMA licence under the Forest Resources Management Regulations. The Saskatchewan Ministry of Environment Forest Service's Forest Management Planning Document (August 2007) was used as the basis for preparation of this **Volume II Document** but the recently approved 2017 Forest Management Planning Standard has also influenced this document's contents and structure, thus it is a hybrid of the two standards.

FMPs in Saskatchewan provide strategic direction for forest resource management over a 20-year timeframe. The process of developing this FMP took five years, and resulted in the completion of three primary products:

1. A <u>Volume I Document</u> that provides background and contextual information on the FMA area and describes historical management practices.
2. A <u>Forest Estate Modeling Report</u> that determines an appropriate Harvest Volume Schedule (HVS) using ecosystem-based management principles. This report includes:
    a. Modelling inputs, including the planning inventory, and growth and yield information.
    b. Modelling assumptions used to explore alternative management scenarios relative to established Values/Objectives/Indicators/Targets (VOITs).
    c. A preferred management strategy.
3. A <u>Volume II Document</u> that provides a detailed plan of how forest management activities will be undertaken, along with a tactical plan that identifies approximate locations for where harvesting will be implemented during the term of the plan. (Under the 2017 Forest Management Planning Standard, this would be considered the Volume III document).

This FMP Volume II document provides high level guidance that guides the preparation of Operating Plans in the FMA area, and measurable indicators to assess consistency with strategic objectives.

1.1 The Prince Albert FMA Area

The PA FMA area consists of 3.35 million ha of land with approximately 1.83 million ha being considered productive forest (Figure 1). Approximately 1.7 million ha of this area is productive forest available for forest management (e.g. not in Parks, Recreation Areas, Indian Reserves, Patent Lands, etc.).

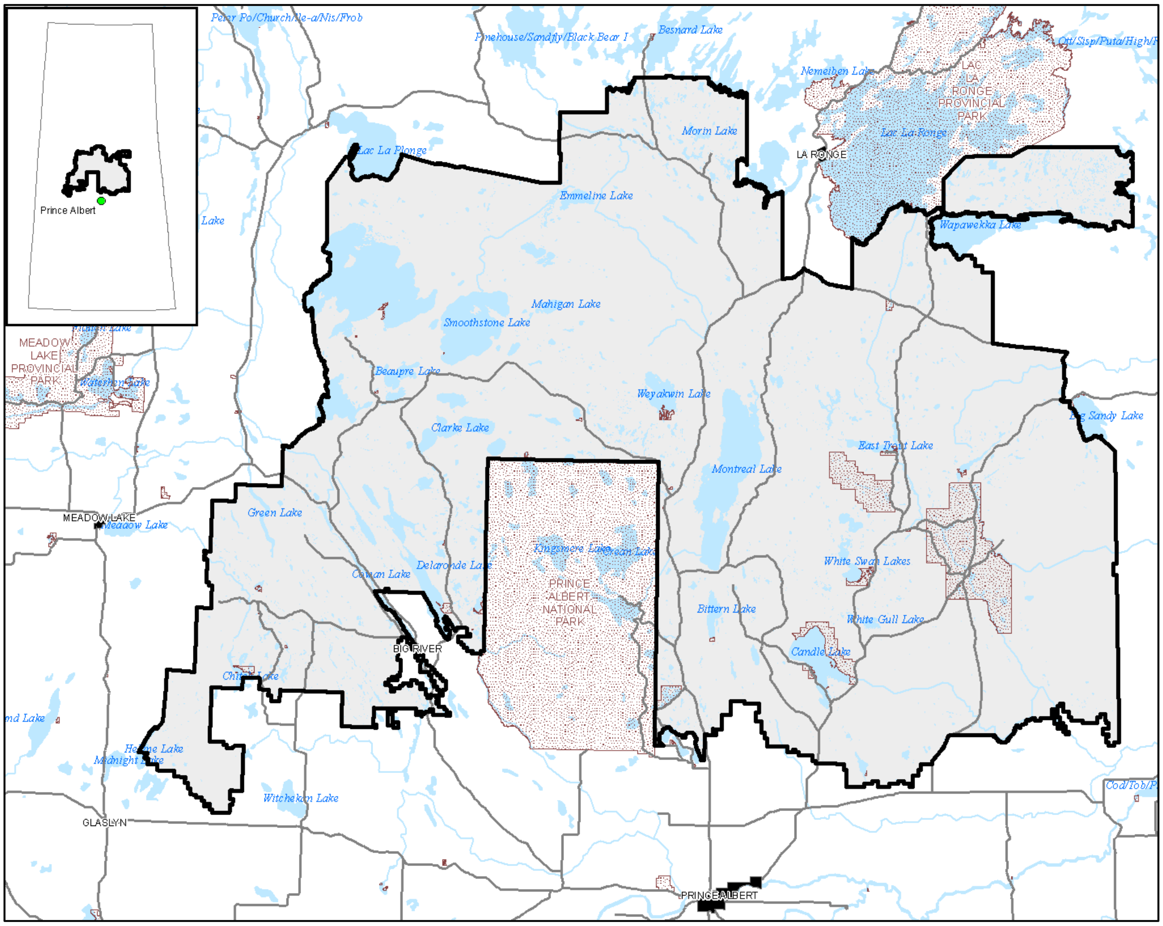

Figure 1. Location and extent of the PA FMA area.

The FMA area represents about 8.5% of the boreal forest in Saskatchewan[1] and is comprised of upland forest, muskeg, brush land, rock and water. The upland forest is the area suitable for timber production and is a patchwork of different vegetation types and ages.

Historical reference points in issuing a FMA licence for this forest area are:

- 1965 A forest management licence between the Province of Saskatchewan and Prince Albert Pulp Company was signed when a pulp mill in Prince Albert was built.
- 1981 The Province of Saskatchewan became the holder of the FMA and the associated Prince Albert Pulp Company assets
- 1986 Weyerhaeuser Canada acquired the FMA and associated assets.
- 2005 Weyerhaeuser Canada announced the closure of its assets associated with the PA FMA and closure ultimately occurred April 2006.
- 2010 November 1 Sakâw acquired the PA FMA from Weyerhaeuser Canada on behalf of its eight member companies.

[1]The total area of the boreal forests in Saskatchewan is ~41 million ha (http://www.borealcanada.ca/Saskatchewan-e.php).

Sakâw Askiy is Cree for "forest land". Sakâw holds the FMA with the Government of Saskatchewan and coordinates management of the FMA area between eight member companies. It is a unique partnership of six (6) forest companies with Saskatchewan operations and two (2) First Nations partners.

The shareholders are:

1. A.C. Forestry Ltd. (Agency Chiefs Tribal Council)
2. Carrier Forest Products Ltd.
3. Edgewood Forest Products Inc.
4. L&M Wood Products Limited Partnership
5. Meadow Lake Mechanical Pulp Inc.
6. Montreal Lake Business Ventures Ltd. (Montreal Lake Cree Nation)
7. NorSask P.A. Forestry Inc. (NorSask Forest Products)
8. Tolko Industries Ltd, Meadow Lake Division

Sakâw brings together industrial partners with proven track records in business and sustainable forest management (SFM), and the traditional knowledge and investment interests of area First Nations. Almost 44% of the total allocated volume is owned or controlled by Aboriginal interests. Table 1 provides the current volume allocation by licensee.

Table 1. 2010-2018 volume allocations in the Prince Albert Forest Management Area

Allocation Holder	Softwood Allocation (m^3/year)	Hardwood Allocation (m^3/year)	Pulp Allocation (m^3/year)	Total Allocation
A.C Forestry	200,000	200,000	--	400,000
Carrier Forest Products	375,000	--	--	375,000
Edgewood Forest Products	75,000	--	--	75,000
L&M Forest Products	75,000	--	--	75,000
Meadow Lake Mechanical Pulp	--	95,000	--	95,000
Meadow Lake OSB (Tolko)	--	600,000	--	600,000
Montreal Lake Business Ventures	200,000	40,000	--	240,000
NorSask Forest Products	175,000	--	--	175,000
Sakâw Totals	**1,100,000**	**935,000**	**--**	**2,035,000**
Third Party Operators	150,000	12,000	--	162,000
Northern Village of Green Lake	15,000	--	--	15,000
Paper Excellence	--	--	661,000	661,000
PA FMA Area Totals	**1,265,000**	**947,000**	**661,000**	**2,873,000**

1.2 Planning Process

A multi-year planning process based on public and Aboriginal group input, as well as staged deliverables and approvals, was used to complete this FMP An overview of the process is outlined below (Figure 2) and was supported by monthly meetings of the Core Planning Team (see Acknowledgement section on page iii).

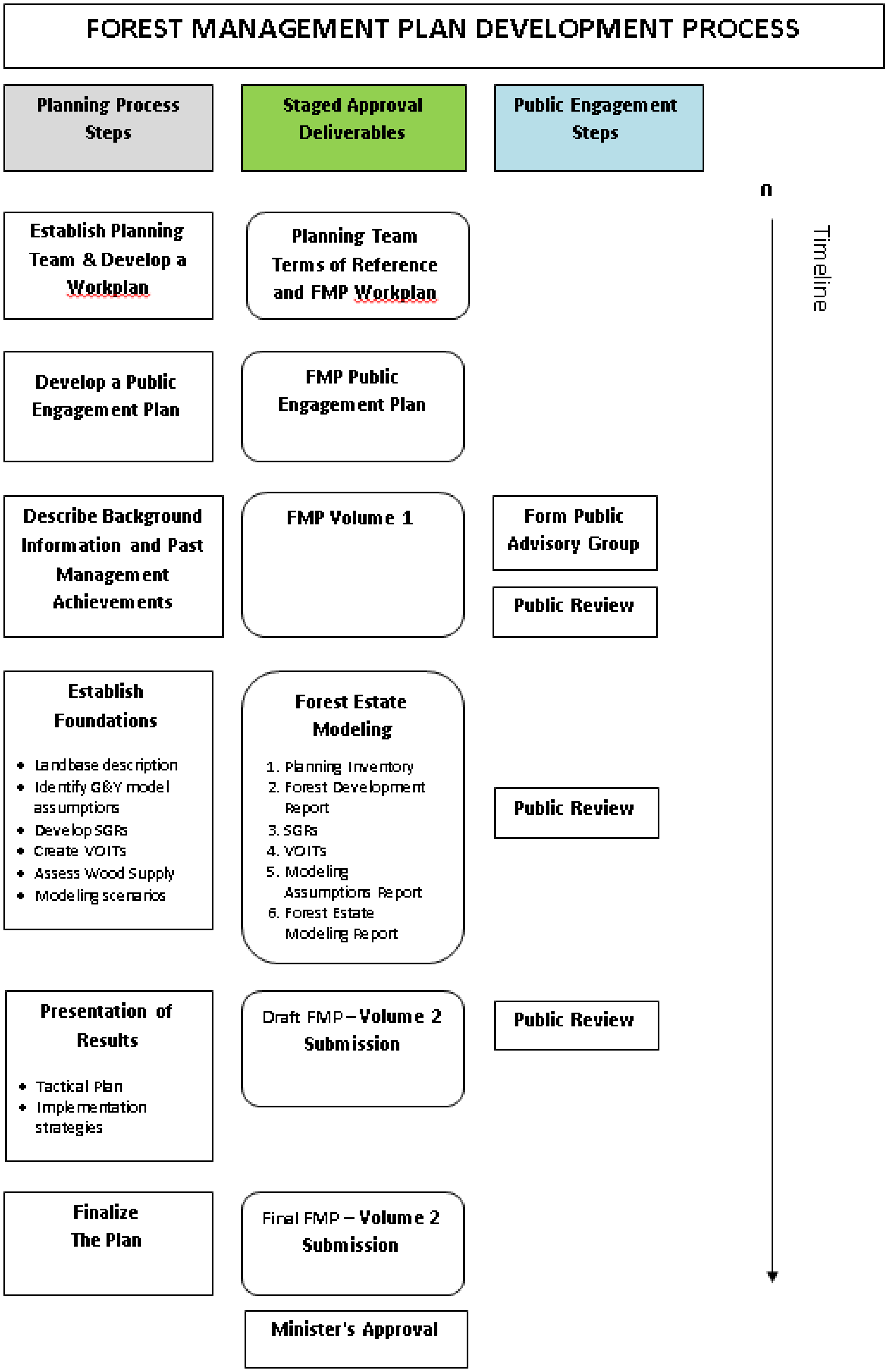

Figure 2. FMP development process from the 2007 FMP Standard (2017 Std differs)

2.0 Forest Characterization

2.1 Ecology

The FMA area overlaps four (4) of Saskatchewan's eleven (11) ecoregions[2] - Mid-Boreal Upland, Mid-Boreal Lowland, Boreal Transition, and Churchill River Upland (Figure 3). The largest ecoregion in the FMA area is the Mid-Boreal Upland (71%) and is a major timber producing region of the province. Forested zones consisting of white and black spruce, jack pine, balsam poplar, and balsam fir with a mixture of trembling aspen dominate this ecoregion. The landscape is characterized by steep escarpments, rolling glacial till plains and level plateaus. In amongst these features are relatively level large peat land areas. The dominant soil structure is characterized by loamy to sandy loam soils.

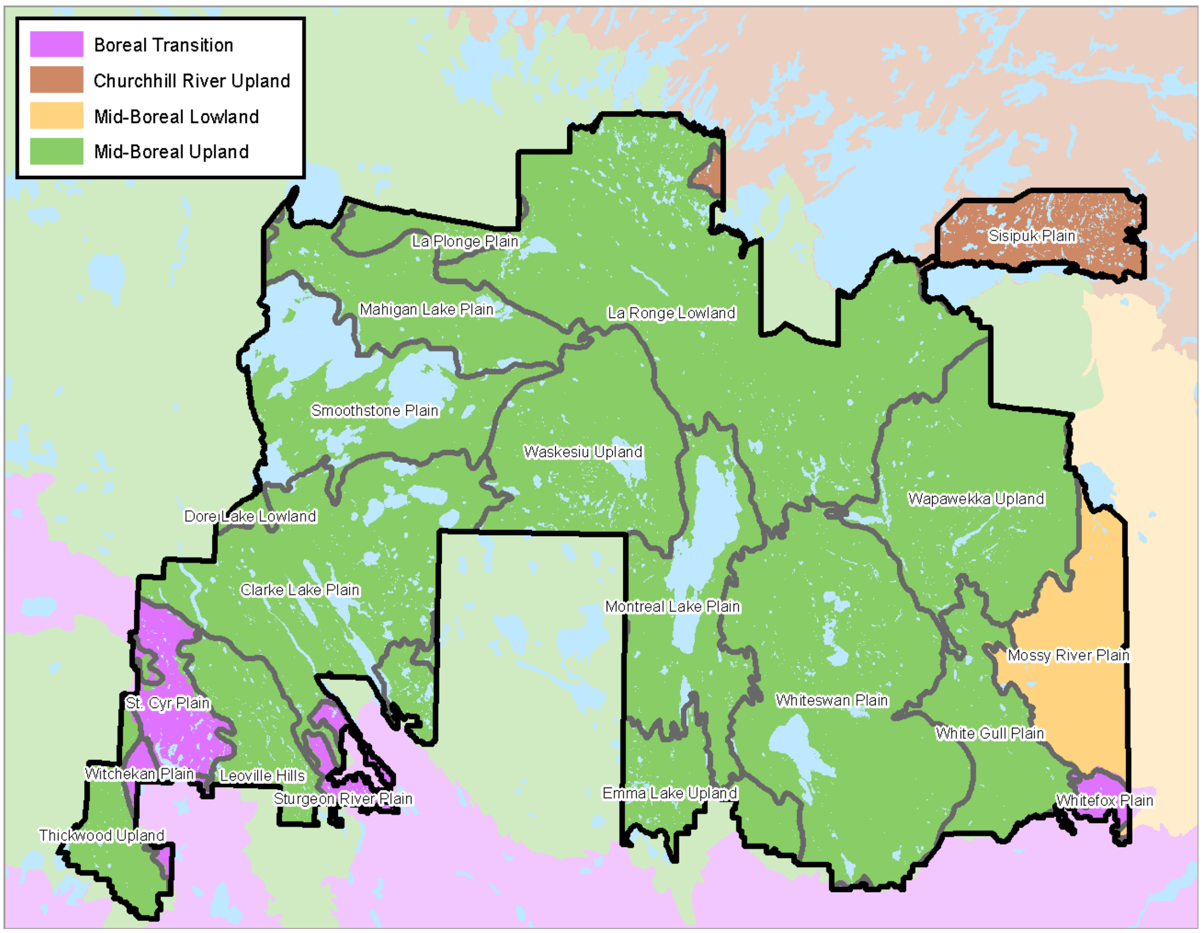

Figure 3. Ecoregions and ecodistricts of the PA FMA

2.2 Land Base Definition

Four key land base definitions are made:

1. **Total FMA Area**: the gross area within the legal FMA area boundaries (3,349,533 ha).

[2] 2012 Saskatchewan Conservation Data Center/Canadian Plains Research Center (Ecoregions of Saskatchewan 1998)

2. **Productive Forest Land Base (PFLB)**: the subset of the total area that is crown forested land. It is defined by removing non-forested areas and all Permanent Exclusions (Indian Reserves, private land, patent lands, community lands, dispositions/leases, etc.) from the gross FMA area (1,788,697 ha).
3. **Managed Forest Land Base (MFLB)**: the subset of the PFLB that contributes toward meeting both timber and non-timber values (excludes Parks, Representative Area Networks [RAN], and Recreation Areas). It was defined by removing Parks, RANs, and Recreation Areas from the PFLB (1,703,907 ha).
4. **Net Area:** the subset of the MFLB where harvesting has or could occur in the future. The Net Area excludes areas that are inoperable, uneconomic, or are otherwise off-limits to timber harvesting such as steep slopes, riparian areas, or in-block retention (1,323,142 ha).

Approximately 53% of the total area covered by the PA FMA is productive forest (Figure 4) while the other 47% of the land base is non-productive (e.g. water bodies, flooded lands, pastures, muskeg) or non-FMA areas (e.g. First Nations Reserves, Private land, etc.). Approximately 78% of the MFLB, or 39.5% of the total FMA area, is available for timber harvesting. The land base definition is also illustrated in Figure 5.

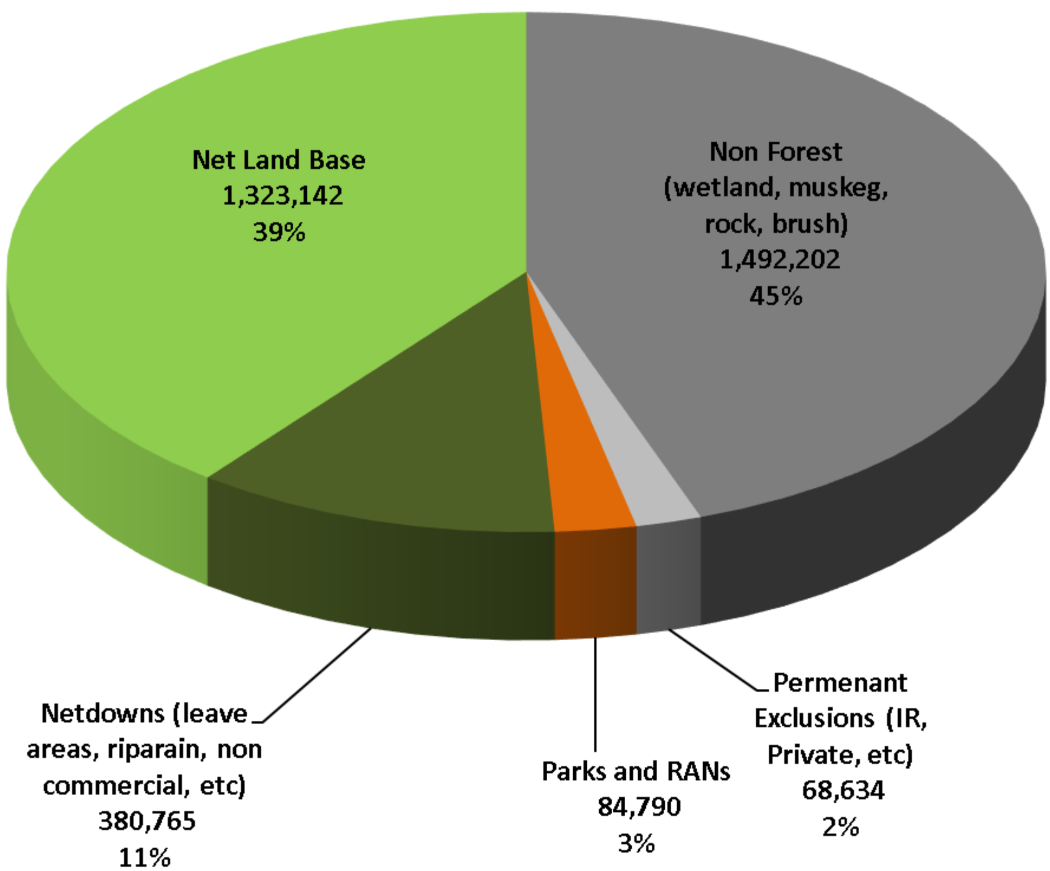

Figure 4. PA FMA area land base summary

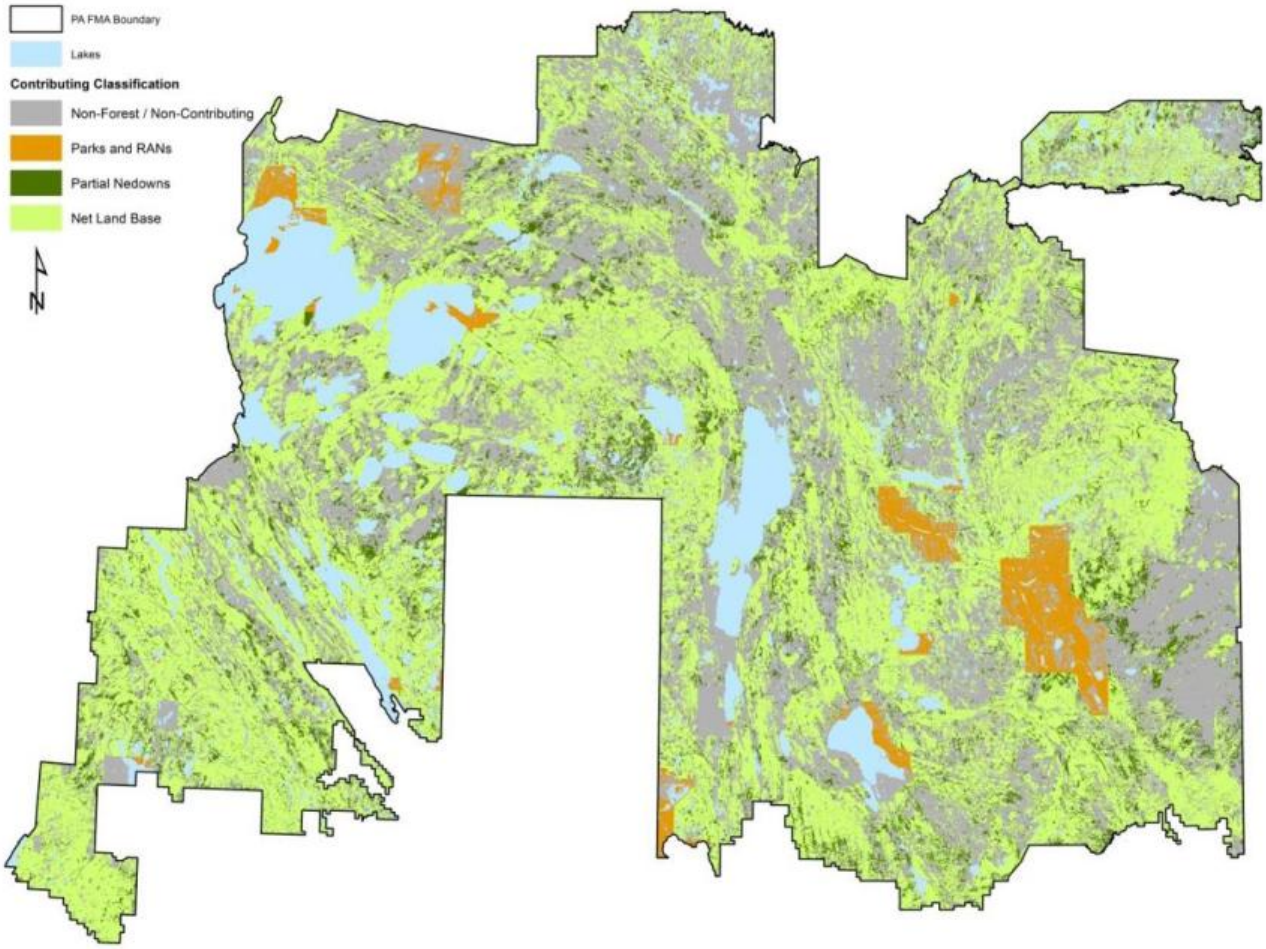

Figure 5. PA FMA area contributing land base overview map

2.3 Timber Profile

Within the net landbase, 61% of the area is occupied by softwood dominated stands (31% jack pine, 25% black spruce, 5% white spruce leading) while the remaining 39% is hardwood dominated stands (37% trembling aspen and 2% white birch leading; Figure 6). All tamarack leading stands have been removed from the net land base.

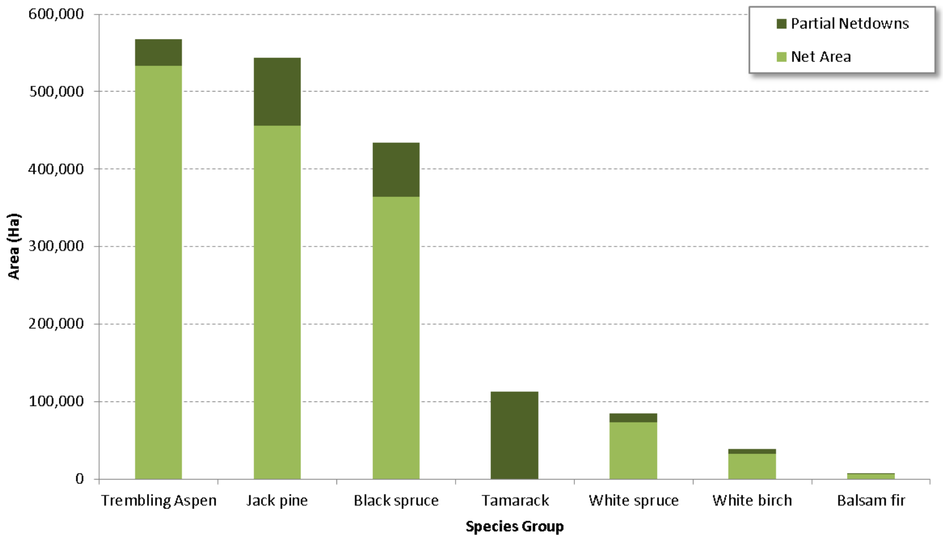

Figure 6. Species distribution on the MFLB by land base type

The majority of the land base is comprised of age classes younger than 50 years or between 80 and 140 years (Figure 7). The significant area in older age classes suggests that disturbance from fire has been reduced by suppression activities, leading to landscapes that are generally older than what they would be without fire suppression.

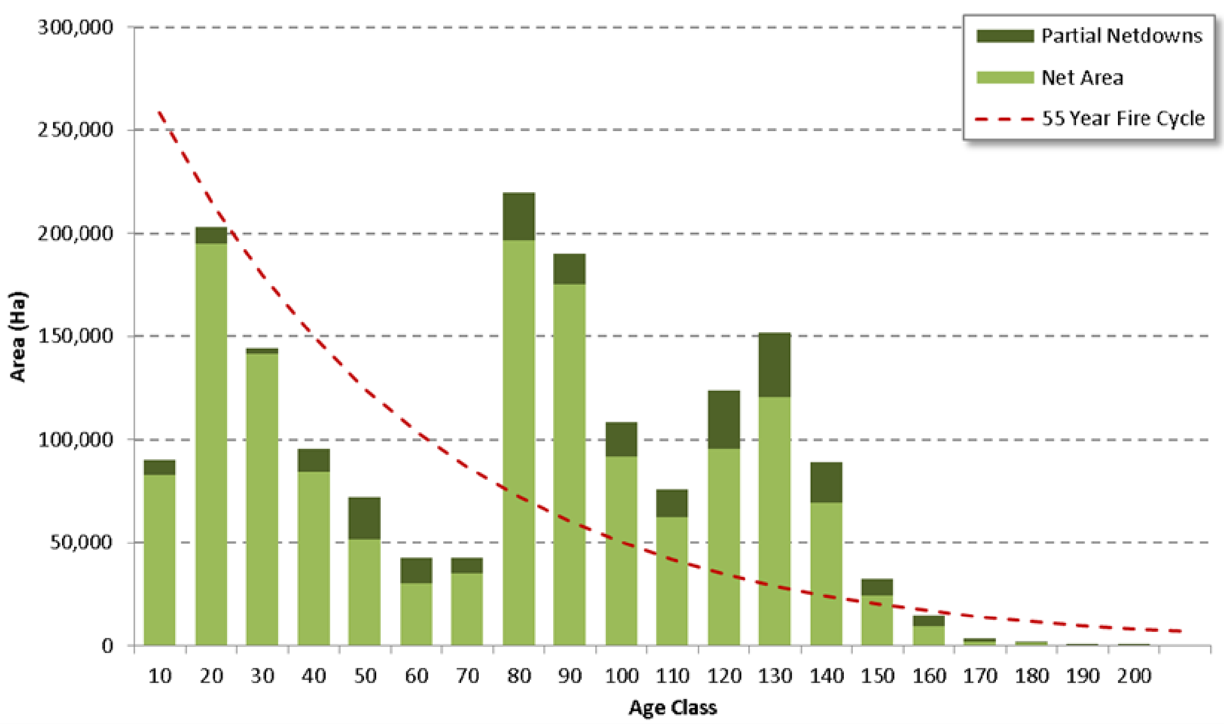

Figure 7. Current Age class distribution by land base type vs. expected distribution from a 55 year fire cycle

2.4 Planning Units

The PA FMA area is subdivided into operating zones specific to each softwood shareholder (15 zones, Figure 8) and additional overlapping zones specific to hardwood shareholders (9 zones, Figure 9). These zones identify, for any given hectare on the FMA area, which shareholder has rights to the softwood and which shareholder has rights to the hardwood. These zones are also used to identify Planning Facilitators who lead the development of integrated operational plans in a given area.

The operating zones were established in 2012 through an operating zone negotiation process where harvest allocations were matched to the mature available volume across the FMA area such that each shareholder had an equal opportunity to access timber (subject to various expectations). These zones are subject to adjustment over time to ensure each shareholder maintains an equal opportunity for harvesting their allocation.

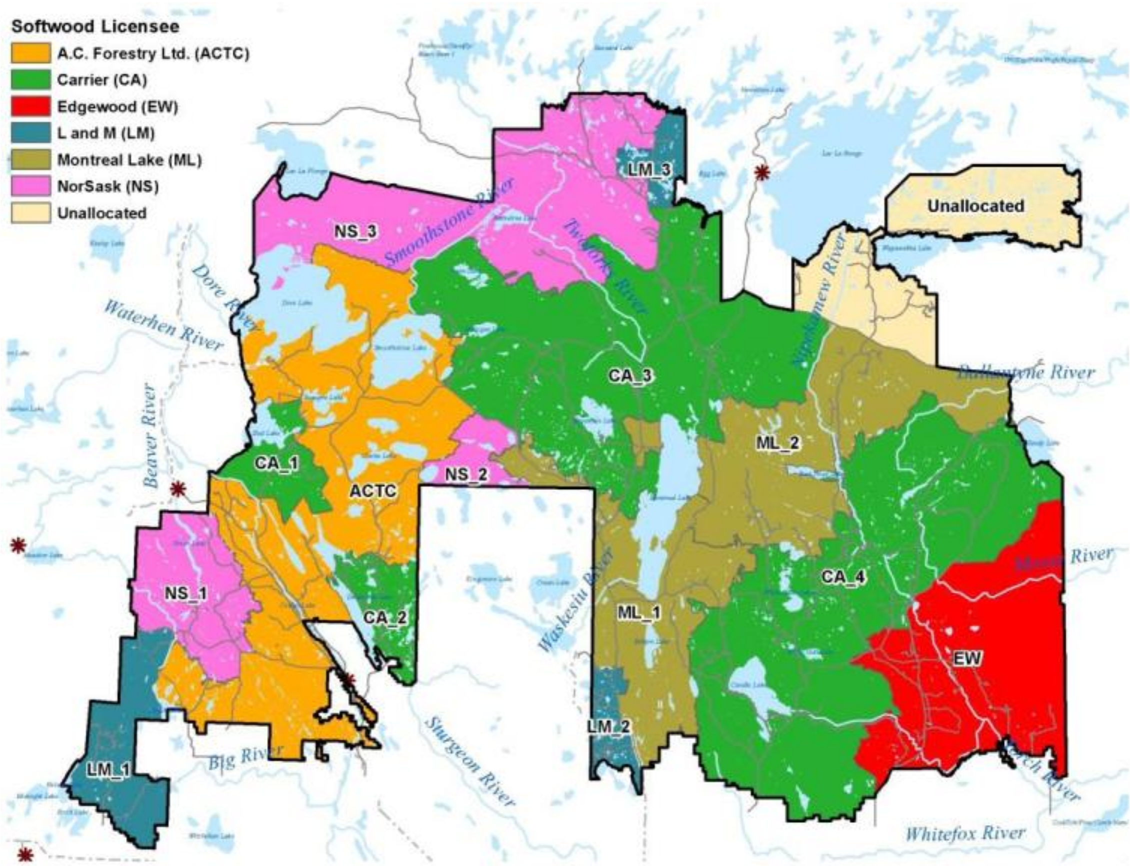

Figure 8. Softwood Operating Zones by licensee.

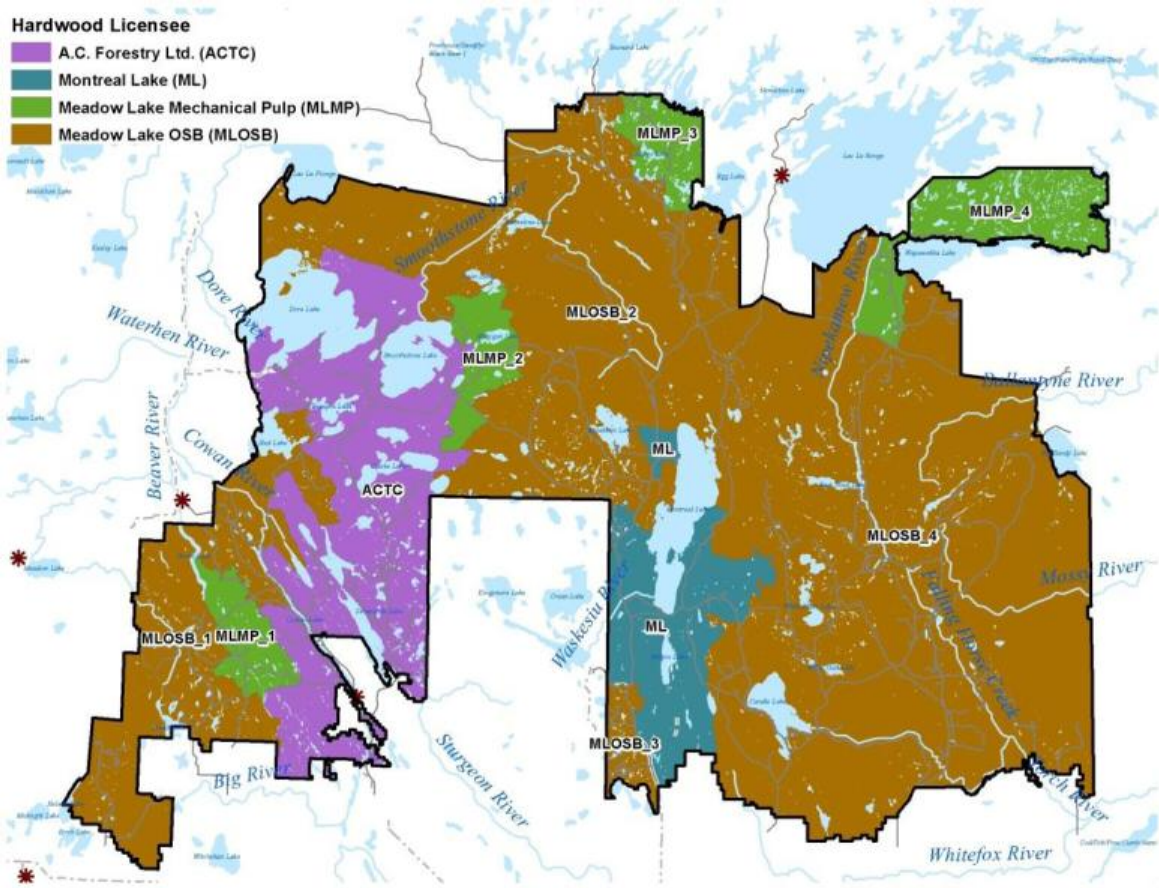

Figure 9. Hardwood Operating Zones by licensee.

For the purpose of tracking harvest distribution over time and space, three Planning Units have been defined (West, Central, East) and are shown in Figure 10 below using softwood operating areas as the background.

Additional management units based on ecological characteristics were developed in the FMA area to support the application of ecological management objectives such as landscape level old forest retention. Ecodistricts in the PA FMA area were grouped into Management Units and are shown in Figure 11 below.

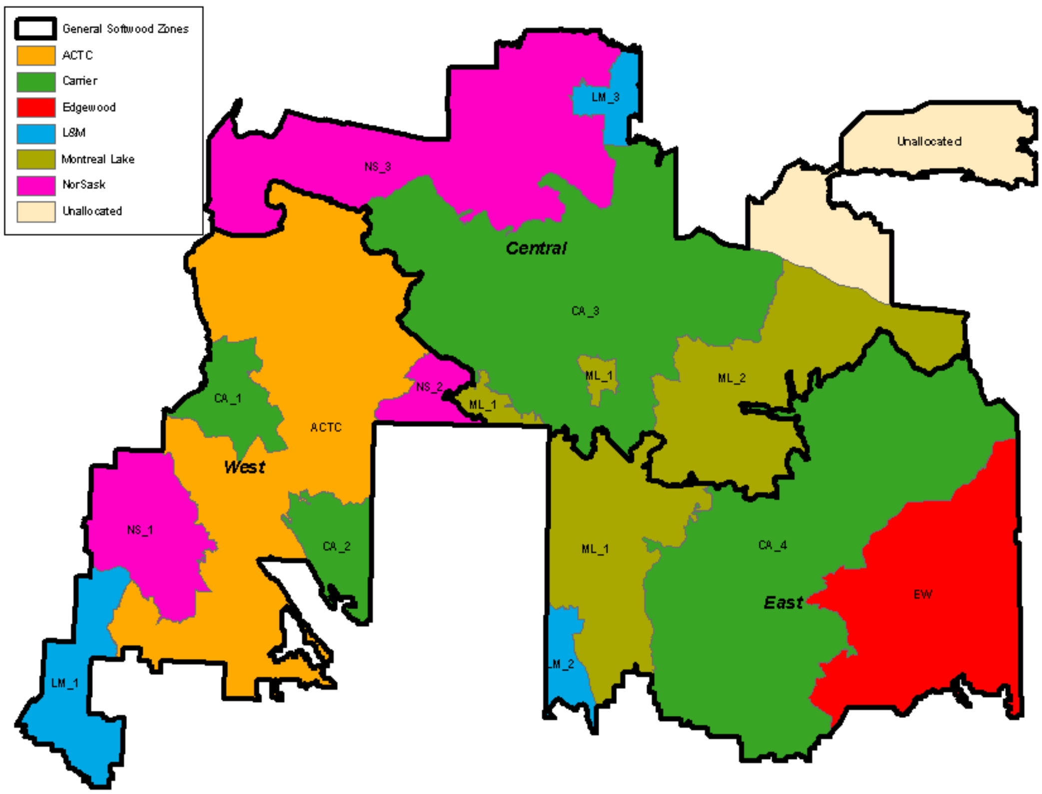

Figure 10. FMA Area Planning Units (West, Central, East) displayed over softwood operating zones

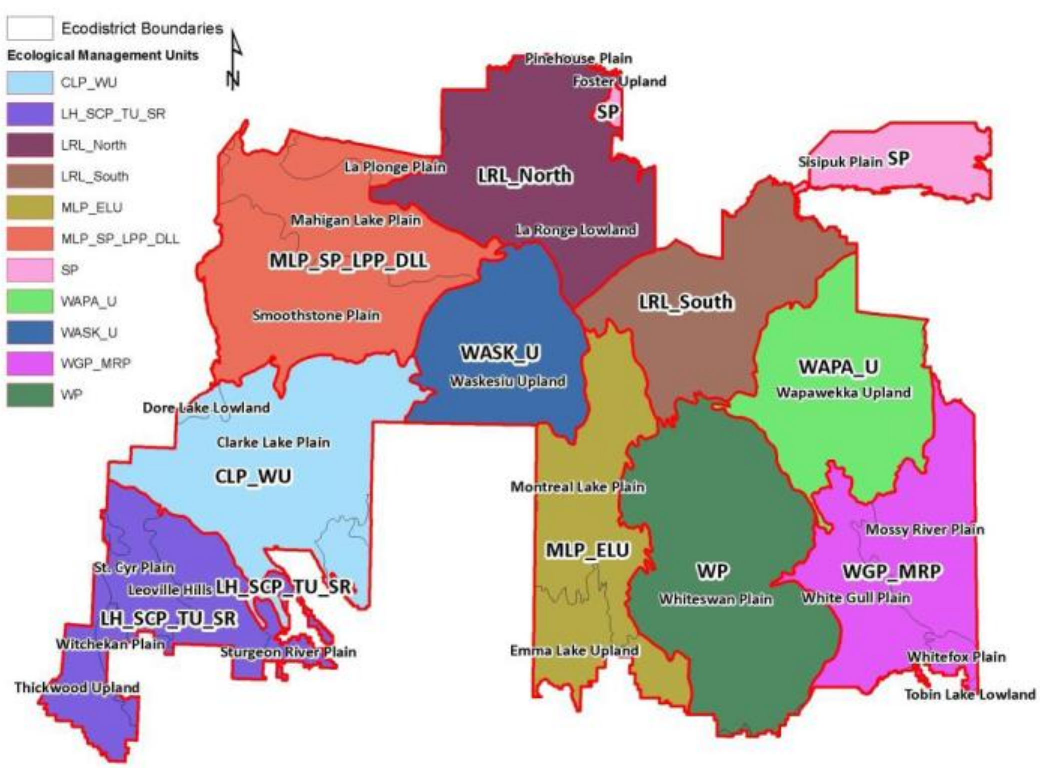

Figure 11. Ecological Management Units (based on Ecodistricts)

3.0 Forest Management Principles and Objectives

3.1 Principles

Collectively, Sakâw's shareholders are committed to the following Forest Management Principles:

1. Ecosystem Based Management
    a. An approach to managing human activities that seeks to ensure the coexistence of healthy, functioning ecosystems and human communities. The intent is to maintain spatial and temporal characteristics of ecosystems such that species and ecological processes can be sustained, and human wellbeing supported and improved.
2. Adaptive Management/Continual Improvement
    a. A structured, iterative process of decision-making in the face of uncertainty, with an aim to reduce uncertainty over time through monitoring, learning, and then adapting improved practices.
3. Sustainable Forest Management
    a. Forest management that sustains social, economic, and ecological values in the present and for future generations. This includes both commercial and non-commercial forest values such as recreation, aesthetics, and water resources.
    b. Resource extraction or use to meet current needs will not compromise the ability of future generations to meet their needs.
4. Public Involvement and Transparency
    a. A process of seeking out input on resource management issues and practices from stakeholders, Aboriginal peoples, and the public and then working to resolve any issues that are identified.
5. Accountability to government and stakeholders
    a. Compliance to applicable federal, provincial, and local laws, statutes, and regulations.
    b. Compliance to FMP commitments and strategies developed in conjunction with government and stakeholders.

As outlined in Sakâw's shareholder agreement, each of Sakâw's shareholders is responsible for pursuing voluntary certification of their forest management practices. All shareholders are currently certified under the Sustainable Forestry Initiative (SFI) program. (http://www.sfiprogram.org/).

SFI Inc. is an independent, non-profit organization responsible for maintaining, overseeing and improving a sustainable forestry certification program that is internationally recognized and is the largest single forest standard in the world. The SFI Standard is based on principles and measures that promote SFM and consider all forest values. It includes unique fiber sourcing requirements to promote responsible forest management on all forest lands in North America.

As part of the certification process, each shareholder has developed an Environmental Management System (EMS) consistent with the ISO 14001 standard. An EMS helps organizations identify, manage, monitor, and control their environmental performance as part of their overall management system. The system is based on the principle of continual improvement.

3.2 General Management Objectives

Consistent with the principles outlined above, general management objectives provide high level guidance for the development of specific management objectives, indicators, and targets (Section 3.3). The following are general management objectives of this FMP:

1. Manage the FMA area to provide short- and long-term economic benefits to communities and the province, while also protecting environmental values, cultural heritage, traditional land use, and other non-timber values present on the FMA area (visual aesthetics, recreation, hunting, trapping, etc.).
2. Manage the land base to provide forest age classes, stand types, and spatial patterns that approximate those produced historically by natural disturbances (i.e. a 55 year fire cycle). This coarse filter approach to maintenance of biodiversity is expected to address the habitat needs of the vast majority of species on the FMA area.
3. Where the general maintenance of historic forest ages, types, and spatial patterns are not expected to provide sufficient habitat for a specific species, develop a detailed strategy to address species needs (i.e. caribou, rare plant communities).
4. Work collaboratively with First Nations and Métis people, stakeholders, and other users of the FMA area.
5. Consider the long-term outcomes associated with management actions, including the impacts of a changing climate.

Specific objectives, indicators and targets aimed at delivering these general management objectives are found in the following section on VOITs.

3.3 Values, Objectives, Indicators and Targets

The Sakâw planning team met over a period of several years to discuss VOITs for the FMA area, and helped inform the development of the VOITs in the new Forest Management Planning Standard. While the VOITs largely follow the new Forest Management Planning standard, they also include numerous customizations specific to the PA FMA area. The VOITs are built around the Canadian Council of Forest Minister's (CCFM) broad criterion for SFM[3]: 1) Biological Diversity, 2) Ecosystem Condition and Productivity, 3) Soil and Water, 4) Role in Global Ecological Cycles, 5) Economic and Social Benefits, and 6) Society's Responsibility.

Table 2 provides VOIT terms and descriptions while Table 3 summarizes the indicators falling under each of the CCFM Criterion that will be tracked during the term of the FMP. Refer to Appendix A for full details on all 33 indicators and their reporting requirements.

Regular (e.g. annual) reporting of these indicators will allow an assessment of how the plan is being implemented and whether expected outcomes are being achieved.

[3] See Canadian Council of Forest Ministers criteria and indicators (CCFM Criteria and Indicators) and the CAN/CSA Z809 standard (R2013) (CSA Standard for Sustainable Forest Management).

Table 2. VOIT terms and descriptions

Term	Description
Value	An FMA area-specific characteristic or quality considered by an interested party to be important.
Objective	A broad statement describing a desired future state or conditions of an FMA area-specific value.
Indicator	A variable that measures the state or condition of a FMA area-specific value and for which one or more targets are set.
Target	A specific statement describing a desired future state or condition of an indicator.

Table 3. Summary of indicators to be tracked as part of the VOITs

Criterion	Indicator(s)
1.0 Biological Diversity	1. Age class distribution on the FMA area's Managed Forest Land Base (MFLB) 2. Amount of old and very old forest by species group within each of the FMA area's Ecological Management Units (EcoMU) 3. Size distribution of harvest events created or influenced by harvesting initiated after April 1, 2018 4. Area of retention left in harvested areas (excluding salvage harvest) 5. Softwood component in Hardwood (H) Cover Species Group (CSG) maintained 6. Area of CSG (H, HS, SH and S stand types) regenerated and predicted at rotation age relative to the harvested area of the same CSG 7a. Area of moose habitat within the FMA area 7b. Area of fisher habitat within the FMA area 7c. Caribou habitat in the FMA area 8. Percentage of planted seedlings from wild seedlots and improved seedlots
2.0 Ecosystem Condition and Productivity	9. Percent of harvested areas that are free-to-grow within the 14 year assessment window 10a. Cumulative area (ha) of Managed Forest Land Base (MFLB) converted to other land uses by the licensee (e.g. roads, landing strips/pads, gravel pits, etc.) 10b. Cumulative area (ha) added to the Managed Forest Landbase (MFLB) through road reclamation of permanent roads, afforestation, etc. 11. Area (ha) of net land base impacted by stand-replacing natural disturbance (fire/wind/insect/disease) 12. Proportion of each natural disturbance event >100 ha that is salvage harvested 13. Harvested volume/ha relative to yield curves estimates 14. Adherence to approved utilization standard 15. Percent of harvested areas falling within approved tactical plan areas
3.0 Soil and Water	16. Harvest blocks comply with provincial standards for soil disturbance 17. Harvest blocks comply with provincial standards for road reclamation 18. Watercourse crossings comply with provincial and federal legislation 19. Harvest blocks comply with FMA area riparian management standards
4.0 Role in Global Ecological Cycles	20. Event duration
5.0 Economic and Social Benefits	21. Utilization of approved HVS volumes (actual harvest vs. HVS) 22. Stakeholder/public engagement occurs at various levels of forest management planning using established public advisory group (PAG) or other forums 23. Spatially identified non-timber resources and forest use activities 24. Distribution of harvest area by planning units and species groupings
6.0 Society's Responsibility	25. Number of Aboriginal communities involved in review of operational/strategic plans in the FMA area

Criterion	Indicator(s)
	26. Spatial identification and operational protection of known culturally significant Aboriginal sites
	27. Incorporation of Aboriginal traditional knowledge into the planning process
	28. Economic contribution from forest industry associated with the PA FMA area
	29. Engage and inform the public, stakeholders, and Aboriginal peoples on FMP implementation
	30. FMP and Operating Plan are made publicly available

3.4 FMP Registry

Approval conditions and commitments from the previous FMP have been reviewed by the Planning Team and those that remain relevant are included in the FMP Registry shown below. Along with the VOITs discussed above, these commitments will be tracked during the term of this FMP unless stated otherwise.

Table 4. FMP Approval Conditions and Commitments carried forward from the previous FMP

Condition Code	Condition/Commitment	Measurement Criteria (old FMP)	Comments
3.6.c	Establish a 1 ha buffer around known listed plant occurrences.	Provide a protective buffer around known plant sightings.	Ongoing. Currently no known occurrences of listed plant species in FMA area.
Rare and endangered species	Work with the ministry to develop approaches for the early identification and protection of rare and endangered species. Co-operate with the ministry in development of management and recovery plans for rare and endangered plant and wildlife species found on the FMA area. Support early establishment of a woodland caribou management board by the ministry. This board should include Sakâw and other concerned stakeholders, and work to develop management plans to protect and maintain this vulnerable species.	If found at the planning or operations stage, Saskatchewan Conservation Data Centre (CDC) - listed species are identified and a management strategy put in place. The ministry is working on a recovery strategy for woodland caribou.	Maintain list, have field crews watch for occurrences of listed species.

4.0 Management for Timber Values

4.1 Silviculture Ground Rules (SGR's)

Silviculture Ground Rules (SGRs) identify the current and expected future forest conditions, silviculture systems, management options, regeneration standards, and acceptable alternative harvest, renewal and stand tending treatments for a specific stand type. SGRs guide prescriptions for operational treatments (i.e., harvest, renewal and stand tending), and actively managed areas which experience stand-replacing natural disturbance. They also provide linkages between stand development types, silviculture regimes, and modelling assumptions.

Ten SGRs were developed to represent the range of stand types occurring on the net land base. Summary information for each SGR including the reference ID, stand type, area, typical treatment type, and rotation age are provided in Table 5 below.

More detailed information for each SGR is provided in Appendix B in the form of reference sheets that can be provided to operational staff. Each SGR's sheet contains details of Transitions, Treatment Options, and Regeneration Targets.

Table 5. Silviculture Ground Rules for the PA FMP

SGR ID	Species Group	Stand Type (Dev Type)	Net Area (ha)	Typical Rotation Age (years)	Typical Treatment
1	H	Aspen	389,260	50-60	Clearcut with Retn – Leave for Naturals
2	HS	Aspen/Jack Pine	53,904	60-80	Clearcut with Retn – Scarify and/or Leave for Naturals
3	SH	Jack Pine/Aspen	40,943	70-80	Clearcut with Retn – Scarify
4	HS	Aspen/Spruce	100,329	80-90	Clearcut with Retn – Plant @ 800 sph
5	SH	Spruce Aspen	51,435	80-90	Clearcut with Retn – Plant @ 1200 sph
6	S	Black Spruce	254,999	70-90	Clearcut with Retn – Plant @ 1200 sph
7	S	Jack Pine	299,039	60-80	Clearcut with Retn – Scarify
8	S	Jack Pine/Black Spruce	188,861	70-80	Clearcut with Retn – Scarify
9	S	White Spruce	52,706	70-90	Clearcut with Retn – Plant @ 1200 sph
10	S	Black Spruce/Tamarack	36,431	70-90	Clearcut with Retn – Plant @ 1200 sph

Treatments have been designed to maintain the current proportions of species on the land base in the future, and will be monitored through VOITs 5 and 6. This outcome is also expected in the case of softwood blocks that contain higher levels of hardwood retention for economic reasons (see further discussion below).

No yield gains have been assumed from the use of orchard (improved) seed, improved site productivity for managed stands, or silviculture treatments such as site preparation, planting, thinning and spacing, or fertilizing. It is expected that there are volume gains that can be attributed to managed stand yields as a result of these issues/activities, and quantifying these gains will need to occur during the term of this FMP if they are to be recognized in the next FMP.

Retention of Hardwood Where No Market Exists:

Currently, there are three mills purchasing hardwood logs in the province (Tolko - MLOSB in Meadow Lake, Meadow Lake Mechanical Pulp in Meadow Lake and Weyerhaeuser in Hudson Bay). These mills have multiple options for sourcing hardwood logs – only one of which is the PA FMA – and because of their locations in the province, sourcing logs from the eastern half of the PA FMA is generally the highest cost / least attractive option. This has led to surplus hardwood volume on the eastern side of the PA FMA and challenges for softwood allocation holders in accessing softwood from softwood leading mixedwood stands. To address this issue, softwood allocation holders need flexibility to leave excess hardwood standing in softwood leading harvest blocks located on the east side of the FMA area[1] when they cannot find a viable market for the hardwood.

When this occurs the excess hardwood left behind will be considered 'lost' for the current rotation and the associated volume will be counted against the HVS to ensure it cannot be taken from elsewhere on the FMA area. The areas where excess hardwood is left behind will have active regeneration activities (planting, scarification) occurring aimed at ensuring successful regeneration of these sites to the same softwood leading mixed stand type that was present prior to harvesting. Sakâw commits to active monitoring of these areas to determine if the intended outcomes are being achieved. While it is not ideal to underutilize the range of products present in mixedwood stands, Sakâw believes the management strategy outlined below is a practical, ecologically appropriate solution to this real world situation.

Where softwood shareholders choose to harvest softwood from mixedwood blocks that do not have an economic outlet for the hardwood, the following strategy will be employed to ensure appropriate regeneration of softwood and hardwood will occur and there is little to no stand type conversion over time:

1. Hardwood leading Blocks
    a. Not applicable – these areas would not be entered for softwood harvest.

1. Spruce Mixedwood Blocks (can contain S, SH, HS, H stands but is overall softwood leading)
    a. Overall retention levels in the block will not exceed 50% of standing volume.
        i. Retention can occur as a mix of dispersed trees and clumps/patches of hardwood dominated stands (e.g. H types).
        ii. Hardwood patches >1 ha within the block (i.e. >60% of the volume is hardwood) will be left intact with softwood only extracted from the perimeter. Where planners are confident they can map hardwood dominant areas and exclude them from the block, this will occur – otherwise buncher operators will be tasked with staying out of these stand types. This objective does not apply to the building of inblock haul roads or access trails.

[1] Defined as east of the eastern edge of the national park, extending north to the top of the FMA area.

   iii. The 4% insular retention requirement (representative merchantable timber) will reflect the harvested timber so softwood would need to be retained to meet this objective. The hardwood retention would contribute to the balance of the 9% minimum retention requirement.

b. The harvested portion of the block will be planted as per the SGR's for the softwood stand types present (SGRs 5, 9, 10 – 1200 sph).
c. This is expected to result in spruce regenerating under dispersed mature hardwood that is <10-40% of the original stand (as high as 60% in some localized portions of the block). The UoA EMEND study (2017, Unpublished) has indicated that this can be expected to provide positive outcomes for spruce regeneration productivity.
d. To supplement the ongoing presence of hardwoods, a small portion of the mature hardwood stems (e.g. 5 sph) will be felled in the block and left on site unless it is practical to transport these logs to an end user. This will promote suckering of new hardwood trees in the block and supplement the mature hardwood presence in the stand. Any hardwood felled and left on site will be scattered in a manner that will not limit regeneration treatments (no tight bunches).

2. Jack Pine Mixedwood Blocks (Softwood leading with majority as JP)
   a. Overall retention levels within the block will not exceed 25% of standing volume. Mistletoe management considerations would override this requirement.
      i. Retention can occur as a mix of dispersed trees and clumps/patches of hardwood dominated stands (e.g. H types).
      ii. Hardwood patches >1 ha within the block (i.e. >60% of the volume is hardwood) will be left intact with softwood only extracted from the perimeter. Where planners are confident they can map hardwood dominant areas and exclude them from the block, this will occur – otherwise buncher operators will be tasked with staying out of these stand types. This objective does not apply to the building of inblock haul roads or access trails.
      iii. The 4% insular retention requirement (representative merchantable timber) will reflect the harvested timber so softwood would need to be retained to meet this objective. The hardwood retention would contribute to the balance of the 9% minimum retention requirement.
   b. The harvested portion of the block will be scarified as per the SGR's for the stand types present (SGRs 2, 3, 7, 8).

Using the approach and limits outlined above, elevated levels of hardwood retention are not expected to have negative impacts on FMP VOITs (regeneration success, consistency of stand types over time) or other ecological outcomes. Recognizing that this hardwood volume will be stranded for at least a rotation, the sustainability of the hardwood HVS will also be ensured through counting any stranded volume toward annual harvest levels in HVS accounting.

4.2 Access Management/Roads

Forest road development and maintenance is a vital part of forest management. The PA FMA area road network allows harvested wood to be transported from remote locations to processing facilities; this network also provides access for ongoing forest management and protection activities. However, roads are expensive to construct and maintain, impact habitat continuity, impose environmental and financial liabilities, and can reduce the area of productive forest.

Overall, Sakâw's road access and management strategy is to minimize the amount of open road on the FMA area at any point in time. This policy is enacted by developing roads in a timely manner, ensuring careful design and construction, promptly decommissioning infrequently-used permanent roads, and deactivating and rehabilitating in-block roads within two years of harvest.

Active hauling is avoided when road conditions are very wet or soft to avoid damage to the roadbed. Lower haul weights are used to avoid damage when conditions are not suitable to support full hauling weights.

Public traffic is permitted on active roads that are maintained to a standard which ensures the safe passage of logging trucks and public vehicles. Grading, snow removal, re-gravelling, and dust control are performed by the Ministry of Highways on Provincial Highways in a manner that ensures safety in bad weather and minimizes soil erosion into watercourses. Inactive roads are not maintained to the same standard as active roads and public use is at their own risk.

New road developments proposed in the FMA area over the next 20 years (general locations) are shown in the Tactical Plan and summarized in Figure 18. Where suitable funding can be acquired, there is a desire to permanently decommission some roads in the FMA area to improve woodland caribou habitat. The process for identifying these roads and completing the work has yet to be determined.

4.3 Timber Utilization Specifications

The following utilization specifications were used to compile the yield curves employed in the Forest Estate Modeling work (Table 6), and will be used during the term of the FMP unless alternatives are approved in operating plans. In some cases, softwood (SWD) sawlogs are harvested using tree length systems which provides additional volume relative to cut-to-length (CTL) practices. However the CTL system was applied in yield curve development to be conservative.

Table 6. Utilization standards used during modeling of HVS

Product	Fibre Leaves forest	Stump Height (cm)	Minimum Top Diameter inside Bark (cm)	Minimum Merchantable Height (m)	Log Length (m)
SWD Sawlog	CTL	30	12.5	5.35	2.6
SWD Sawlog	CTL	30	10	5.35	2.6
SWD Pulp	Tree length	30	8	5.35	2.4
Hardwood	Tree length	30	8	5.35	Full tree

Note: Sawlogs utilized the 10cm top diameter in the scenario that established the proposed HVS

It is possible that one or more softwood allocation holders in the FMA area may request to operate using a 12.5 cm minimum top diameter (inside bark) during the FMP term. This type of request would need to be made in an Operating Plan submission. To support decision making around this issue, a scenario was modeled where all softwood sawlog harvest was shifted to 12.5cm minimum top diameter inside bark and the volume lost from sawlog yield was shifted to pulp yield. Adjustment factors were determined for each yield strata and stand age and applied in the model. Average adjustment values for currently merchantable stands by yield group on the net landbase are shown below and reflect a landbase average of 19%. Due to older ages being harvested in the short term, the modeled scenario showed a short term impact of 14.6%.

Table 7. Yield group volume changes associated with shifting from 10cm top to 12.5cm top dib

Yield Group	Area (ha)	Volume Bucked with 10.01 cm Log (m^3)	Volume Bucked with 12.51 cm Log(m^3)	Volume Switched to Pulp(m^3)	AreaWt Average Age (yrs)	%Diff (Wtd Avg on Vol)
1 H_HW_B_Density	36,042	1,084,765	1,045,517	39,248	93	4%
2 H_HW_CD_Density	154,772	4,830,157	4,417,924	412,233	93	9%
3 HS_HjP_B_Density	2,755	126,928	117,337	9,591	96	8%
4 HS_HjP_CD_Density	9,174	678,834	623,521	55,313	90	8%
5 SH_jPH_B_Density	2,603	148,565	132,075	16,490	103	11%
6 SH_jPH_CD_Density	6,694	648,325	489,545	158,780	94	24%
7 HS_HxS_B_Density	11,833	948,058	878,920	69,138	104	7%
8 HS_HxS_CD_Density	45,854	3,462,005	3,195,781	266,224	107	8%
9 SH_SxH_B_Density	7,156	637,606	590,897	46,709	115	7%
10 SH_SxH_CD_Density	23,873	2,999,847	2,785,737	214,110	111	7%
11 S_bS_1_Site	119,507	8,997,948	6,292,842	2,705,106	114	30%
12 S_bS_23_Site	50,149	5,279,776	4,310,342	969,434	105	18%
13 S_jP_12_Site	13,190	604,002	325,784	278,218	94	46%
14 S_jP_3_Site	111,520	11,842,205	9,464,501	2,377,703	91	20%
15 S_jPbS_12_Site	18,461	1,344,761	962,591	382,171	95	28%
16 S_jPbS_3_Site	97,834	9,201,221	6,942,118	2,259,103	96	25%
17 S_wSbF_1_FMZ	12,287	1,738,936	1,615,084	123,851	127	7%
18 S_wSbF_23_FMZ	19,842	3,006,849	2,862,402	144,447	117	5%
19 S_tL_11_Comp	25,120	1,193,088	798,625	394,464	107	33%
Total	768,666	58,773,876	47,851,544	10,922,332	**101**	**19%**

The softwood sawlog HVS impact associated with a shift to 12.5cm top utilization, resulted in a 14.6% decrease in softwood sawlog HVS (e.g. short term FMA area average impact) and a corresponding volume increase to the pulp HVS. Hardwood HVS was not impacted (see Table 9 for details).

4.4 Harvest Volume Schedule

Forest estate modeling was employed to assess timber supply and forecast forest related indicators over time. Determining a sustainable timber supply involves consideration of a wide range of physical, biological, social, and economic factors that can influence the acceptable rate of timber harvesting within a management unit. These factors encompass both the timber and non-timber values found in forests, and ensure that timber harvesting objectives are balanced with non-timber objectives, including wildlife, biodiversity, and recreational opportunities.

The following briefly summarizes key inputs used to construct the PA FMA area Forest Estate Model (see Appendix C for details):

1. **Inventory** - The inventory for the PA FMA area was completed by Weyerhaeuser Saskatchewan from 1999 to 2005, and submitted to Saskatchewan Environment in 2006. It follows the Saskatchewan Forest Vegetation Inventory format. The inventory was updated for the 2018-2038 FMP to reflect changes (harvesting, fires, etc.) to 2017 and to address other issues such as data gaps.
2. **Land Base Classification–**The FMA land base (3.35 million ha) was classified into areas not available for timber harvesting (non-crown, non-forest, non-productive), and areas where harvest has or could occur in the future (Net Area). Non-commercial species, steep slopes, isolated areas, riparian reserves, and stand level retention requirements were identified and are all examples of forested areas not available for timber harvesting. Through this exercise, the net land base was estimated at approximately 1.323 million ha (39.5% of the total area). See Section 2.2 or Appendix C for details.
3. **Growth and Yield** - Natural stand yield curves were compiled by Timberline in 2008 from ~6500 temporary sample plots stratified into 10 development types (species combinations). Development types were further stratified by stand density, site productivity, and geographic zone. Yields were re-compiled in 2014 using the same plot data to reflect different harvesting practices, and changes to merchandizing assumptions which shifted the softwood pulp/sawlog distribution toward less pulp. The same 10 development types were used to produce 19 yield groups which reflect differences in density, site productivity, and geographic zone. Except for pure black spruce stands, all curves reach a terminal age and begin to decline at 1% per year until reaching zero volume. During modelling, stands were assumed to terminate after declining to 25% of their peak volume, and to restart at 20-50 years old to emulate succession patterns and advanced regeneration. Succession occurred for hardwoods between 170-190 years old, and for softwoods between 180-200 years old.
4. **Management Assumptions**
    a. **Silviculture Treatments** were predominantly clearcut with retention (modified clearcut). Stands were regenerated back to stands belonging to the same yield group (no shifting of stand types, no managed stand yield gains). Subsequent harvests had a 0.62% yield reduction to reflect area lost to permanent roads.
    b. **Natural Disturbance Assumptions –** Catastrophic (stand replacing) natural disturbance caused by fire, blowdown, insect and disease was not modeled. Instead, a re-planning threshold (i.e. 10% of the total net area) is used for accounting for natural disturbance. During the tem of FMP implementation, if the accumulated disturbed area reaches the threshold it will trigger a reanalysis of appropriate harvest levels (see Appendix A, Indicator 11).
    c. **Non-Timber Objectives**
        i. **In-block Retention** – An average of 9% of harvest events are to be maintained in the form of insular and proximal retention (Appendix A, Indicator 4; Appendix D) but only 4% is assumed to be incremental to other factors already recognized in the analysis.
        ii. **Old and Very Old Seral Retention** – A minimum target percent of the MFLB within each ecological management unit and species group must be old + very

old seral, and a minimum target percent must be in very old seral condition (Appendix A, Indicator 2; Appendix D).

iii. **Event Size –** Event size targets were established to help the model create a diversity of harvest opening sizes on the landbase - similar to historical natural disturbance.

iv. **Caribou** – Specific high value caribou habitat areas were identified and classified into Caribou Management Zones. Harvest in Zone 1 has been deferred for 20 years. Harvesting will continue for 10 years in Zone 2 then subsequently be deferred for 20 years. Harvesting will be prioritized in areas that are already disturbed and fire salvage will be avoided adjacent to treed peatland and peatland complexes. The full caribou zone will have disturbance limited to 35% (See VOIT 7c for allowable variances).

v. **Lakeshore and Visual Management –** visually sensitive lakes and hillsides, and the Montreal River canoe route were buffered by 300 m and disturbance was limited to 1/3 of the areas under 30 years of age at any point in time. See Section 5.3.3 for more detail.

A forest estate model constructed with these assumptions was used to explore management strategies (candidate scenarios). The scenarios explored the sustainable rates of harvest over a 200-year planning horizon while considering both timber and non-timber objectives. Through consultations with the Planning Team and the PAG, the management strategy best fitting the desired outcomes was selected as the preferred scenario. This scenario was used to inform the 20-year tactical plan which provides an overview of Tactical Plan area during the term of the plan.

The final preferred scenario included NFP guidance (in-block retention, old seral, interior old seral, harvest event size distribution), deferred harvest in Caribou Management Zones, disturbance limits in the SK2 Central Caribou zone portion of the FMA area, dedicated pulp stands, and cut-to-length utilization for softwood (tree-length for hardwood). This scenario is able to support the current softwood sawlog HVS of 1,265,000m^3/year, an elevated hardwood HVS of 1,126,000m^3/year, and a pulp harvest of 600,000m^3/year (Figure 12) – which includes 200,000 m^3/yr coming from dedicated pulp stands. These dedicated stands were approximated for modeling.

Long-term harvest rates are lower than short-term levels because fire suppression has allowed the age class distribution in the FMA area to become unnaturally old. Current stands therefore contain higher volumes per hectare than future managed stands. It is the management intent of the FMP to generate age classes more in line with a landscape which experiences natural fire disturbance. The long-term harvest levels for softwood may increase as better information is obtained on volumes generated from managed stands (those regenerated after harvesting).

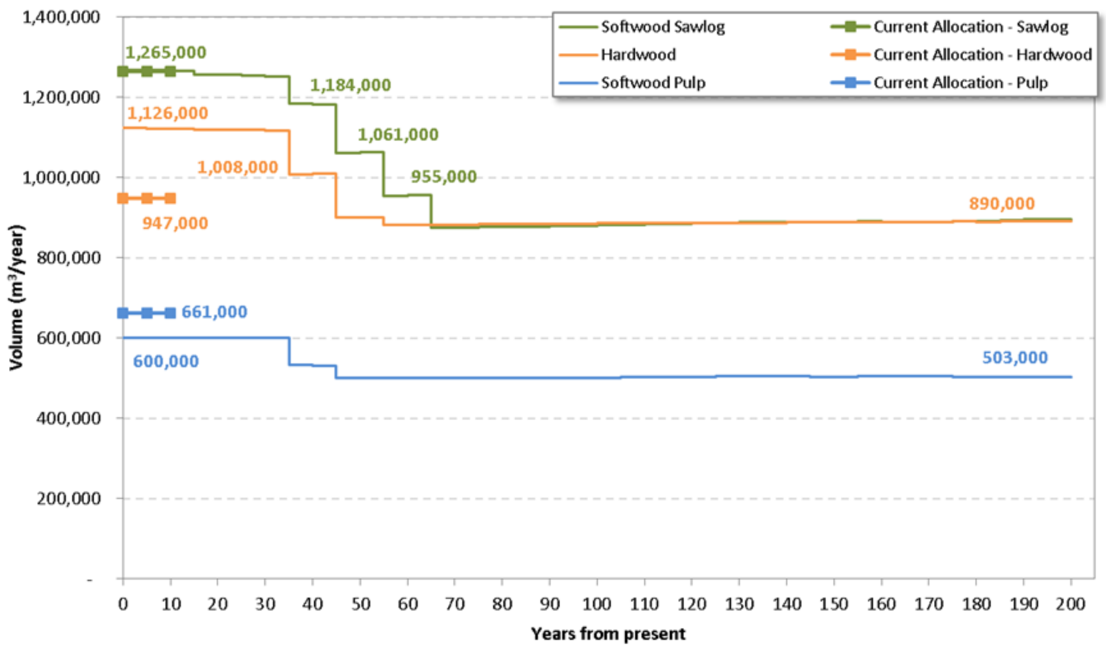

Figure 12. Preferred Scenario Harvest Volume Schedule (HVS) for hardwood, softwood sawlogs, and softwood pulp

The recommended HVS for the 2018-2038 FMP is indicated in Table **8**.

Table 8. Recommended harvest levels for the 2018-2038 FMP (Preferred Scenario)

Hardwood Harvest (m3/year)	Softwood (m3/year)			Grand Total (m³/year)
	Sawlog Harvest (10 cm Top)	Softwood Pulp Harvest	Total	
1,126,000	1,265,000	600,000	1,865,000	2,991,000

Table 9. Alternative Scenario: Softwood Sawlog 12.5 cm Top Diameter Utilization

Hardwood Harvest (m3/year)	Softwood (m3/year)			Grand Total (m³/year)
	Sawlog Harvest (12.5 cm Top)	Softwood Pulp Harvest	Total	
1,126,000	1,080,000	785,000*	1,865,000	2,991,000

* Differs from Nov 10, 2017 FEM report (pg 58). The model managed to achieve slightly higher total softwood harvest compared to the 2017 Composite Scecneraio but it has been adjusted here to maintain concervatism/comparability in the results.

4.5 Dedicated Pulp Stands

This plan provides for a third of the 600,000 m³/yr of pulp harvest to come from dedicated stands where all softwood volume in these stands would flow to the pulp allocation holder. The stands would be those with the highest pulp percentage and smallest piece size in the net landbase – typically poor site black spruce or jack pine stands. See the Forest Estate Modeling Report for an example definition of these stands.

The specific stands associated with providing this 200,000 m^3/yr have not been spatially identified in the plan based on the understanding that if the pulp mill were to open and require the stands, they would be identified at that time. Should the pulp mill reopen and request access to these stands, pulp mill planners will need to work with Sakâw to map out harvest blocks consistent with the stated profile.

A breakdown of the pulp volume is provided in Table 10 (Preferred Scenario) and Table 11 (Alternate Scenario) below.

Table 10. Pulp HVS breakdown with 10.0 cm sawlog top diameter (Preferred Scenario)

Dedicated Small Diameter Pulp Stands (m^3/year)	Sawlog Degrade (m^3/year)	Sawlog Tops 10.0-8.0 cm (m^3/year)	Grand Total (m^3/year)
200,000	216,212	183,788	600,000

Table 11. Pulp HVS Breakdown with 12.5 cm Sawlog Top Diameter (Alternate scenario)

Dedicated Small Diameter Pulp Stands (m^3/year)	Sawlog Degrade (m^3/year)	Sawlog Tops 12.5-8.0 cm (m^3/year)	Grand Total (m^3/year)
200,000	216,212	368,788	785,000

Note: Sawlog degrade was defined as any log segment that contained a frost crack, fork, or crook in it while any remaining pulp was due to small dimensions (diameter or log length). Degrade was estimated to make up 54.1% of pulp volume (independent of dedicated pulp stands) using the PA FMA temporary sample plots that were >15m tall. The large number of small dimension pulp logs contain very little volume compared to the far fewer larger logs that represent the degrade pulp volume.

5.0 Management for Non-Timber Values

Sakâw recognizes the importance of non-timber values within the FMA area and commits to working collaboratively with other users of the land base to provide for these values.

5.1 Maintenance of Biodiversity

Maintaining species and genetic biodiversity on the FMA area is a key driver of this FMP. Maintaining forest types and spatial patterns similar to those produced by natural disturbances, at stand and landscape levels, is expected to maintain habitat diversity, and therefore, promote ecological diversity at a species and genetic level. This 'coarse-filter' approach makes managing for biodiversity practical, as it eliminates the need to separately manage for individual wildlife and plant species and communities.

Landscapes in the FMA area are comprised of matrices of upland forests, bogs, fens, marshes, brush, rock, and water which provide a diversity of landscape patterns, ecosystems and wildlife habitats at many scales. These landscapes are made even more diverse by the influence of disturbance events such as wildfire, wind-throw, pathogens, and insect infestations. Historically, fire is the largest disturbance agent in the boreal forest. Before industrialization and the introduction of fire suppression, it is estimated that fires burned through central/western Saskatchewan's boreal forest every 33 to 65 years (Andison, 2007) – with 55 years identified as an average. More recently, fire suppression has succeeded in reducing the extent of fire events on the landscape today, and has resulted in considerably longer fire return intervals. The reduced rate of burning / forest renewal by forest fires has generally resulted in a shift to older forests across the FMA area (see Figure 7 for the current forest age class distribution). Further study of natural fire cycles specific to the PA FMA area is planned to occur during the term of this FMP.

One of the objectives of this FMP is to shift the forests age class structure toward what would be found under natural disturbance regimes. Implementing management strategies which create forest landscape patterns characteristic of a 55-year fire cycle are expected to support biodiversity at the landscape scale.

Forest management in the FMA area will work to achieve this thorough the management of:

1. Extent of old and very old seral stage stands - a minimum percent of the area of each species group in each ecological management unit (Figure 11) will be maintained as old or very old seral stands. A minimum percent of this area will be managed for retention of very old seral stage forest by species group. See VOIT #1, Indicator #2 in Appendix A for additional information regarding this forest management target, Appendix D for a rationale on the targets themselves, and section 6.4 for a description of how this was addressed in the Tactical Plan.
2. Extent of old interior habitat - 20% of the old/very old forest stand area in the FMA area will be managed to provide 'interior' habitat. The spatial configurations of old seral reserves (harvest deferrals) have been confirmed to meet this objective for the term of the plan.
3. Harvest event sizes - A range of harvest event sizes will be implemented in an attempt to emulate natural disturbance patterns. The full scale of disturbance events created by natural fires will not be created through forest harvesting due to the need to manage for other values important to society (recreation, guide/outfitters, trapping), and limitations of harvesting only mature, merchantable forest stands (e.g. no events >8000 ha). See Figure 13 below for targets and VOIT #3 in Appendix A for details.

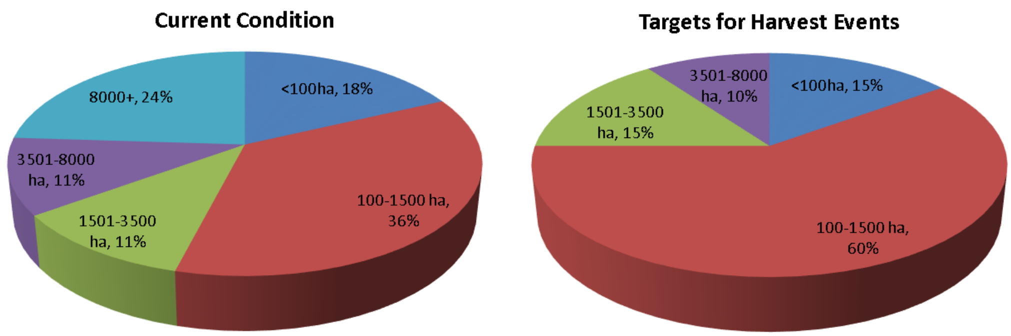

Figure 13. Size range of historical disturbance events compared to proposed harvest event size range

4. In-block retention levels – an important component of the coarse filter approach is retention of trees within harvest areas. Although the level of retention varies within and between cutblocks, Sakâw will maintain an average of 9% of the area within harvest events as insular and proximal retention (Appendix A, Indicator 4). A rationale behind this target can be found in Appendix D.

5.2 Wildlife

The health, abundance, and resilience of wild plant and animal populations is largely dependent on access to sufficient food, water, cover, and space resources to carry out all components of their life cycle. In combination, these resources comprise habitat. While it is obvious that all living organisms require food and water, wild plants and animals also require cover to protect them from the elements and to carry out other life functions (e.g., nesting, predator avoidance, and space to forage and find mates). Individual plants require less space than individual animals, and large animals require more space (i.e., larger ranges) than small animals.

The types of wild plant and animal species that occupy each habitat vary as the quantity, type, and distribution of the four habitat components vary. To maintain healthy plant and animal populations on the PA FMA area in similar distributions to those found naturally, it is important to maintain similar amounts and types of habitat as currently exist.

Sakâw is committed to the protection of important wildlife habitat in the PA FMA area, and is actively engaged in maintaining up-to-date information on habitat and species requirements for the region. This information will be used as effectively as possible across all levels of forestry activity, from strategic planning analysis through to implementation of operational practices.

This FMP uses a multi-scale and hierarchical habitat conservation strategy in the PA FMA area. The foundation of this strategy is the implementation of a coarse filter approach to biodiversity maintenance and management combined with more specific fine-scale habitat protection for species that are endangered, threatened, or of special concern. See Section 5.1 for measures to coarse-scale measures to maintain a diversity of forest age classes and spatial patterns on the land base.

Biodiversity conservation and protection is also applied at a local scale through planning and operational practices such as riparian management, stand level retention, road rehabilitation, access management, and green-up requirements between harvests. Because these site specific operational practices are applied throughout the FMA area, they provide a link between coarse-filter landscape management and fine-filter habitat protection methods. Riparian buffers are applied at various widths depending on stream classification, to protect and maintain riparian habitat. Permanent road construction is minimized as much as possible and temporary roads are deactivated promptly after harvesting operations to minimize long-term habitat fragmentation.

Fine-scale biodiversity conservation and management on the PA FMA area is implemented through specific habitat protection measures such as leaving buffers around critical habitat. Generally, Sakâw implements these fine-filter conservation practices with guidance from provincial and/or federal agencies.

Woodland caribou, moose, and fisher are examples of species that are of high importance within the PA FMA area. Woodland caribou is a species whose survival is deemed to be at risk, moose is an important source of food for sustenance, and fisher are trapped for economic benefits. Each of these species has specific habitat indicators and targets which are presented in Appendix A (VOITs 7a, 7b, and 7c).

MOE has identified a number of wildlife and plant species as sensitive to disturbance. Operationally, Sakâw will direct staff to watch for these species during all field activities, and to report all observations to MOE. Designated buffer distances from nesting sites, stick nests, staging areas, roosting sites, and from sensitive wildlife and plant species themselves are specified by MOE in the Saskatchewan Activity Restriction Guidelines for Sensitive Species (June 2015)[4]. The list of federal and provincial plant species of concern which require protection of known locations is contained in the Conservation Data Centre (CDC) Saskatchewan Tracked Vascular Plants Taxa List[5] (September 2015).

The location of known nest and other sensitive plant and wildlife sites will be protected by restricting the timing of harvest and buffering them with no-harvest areas. Retention of individual wildlife trees and clumps/islands of trees within harvested areas will provide important refugia for sensitive plant and wildlife species, and potential future nesting sites for raptors, owls and other species.

Other site-specific wildlife features such as mineral licks and active bear dens will also be protected within no-harvest buffers when they are identified.

5.2.1 Species at Risk

In Saskatchewan, *The Wildlife Act* and *The Wild Species at Risk Regulations,* as well as the federal *Species at Risk Act* (SARA), provide the mechanisms for protecting wildlife and plant species at risk. The intent of the legislation is to prevent native species from becoming extirpated or extinct; to provide for the recovery of extirpated, endangered or threatened species; and to encourage the management of other species to prevent them from becoming threatened or endangered.

[4] http://www.environment.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=a3782315-6e7f-49c6-b7a2-f62f677986b6&MediaID=063526ea-0037-411f-891d-4c4862ede211&Filename=Saskatchewan+Activity+Restriction+Guidelines+for+Sensitive+Species.pdf&l=English Sept 12, 2015

[5] http://www.biodiversity.sk.ca/SppList.htm

Fine-scale habitat management will be used by Sakâw shareholders to accommodate habitat protection for species at risk (endangered, threatened, special concern). Where species at risk or their critical habitat is identified, Sakâw will work with MOE on strategies that aim to protect the species and associated critical habitat.

Currently, 16 listed at-risk species have the potential to occur within the PA FMA region during at least some portion of the year; these species are listed in Table 12.

Table 12. At-Risk Species with potential to occur on the PA FMA

Category	Common Name	Scientific Name	Status	Listing Authority
Amphibians	Northern Leopard Frog	*Rana pipiens*	Special Concern	SARA
Arthropods	Monarch Butterfly	*Danaus plexippus*	Special Concern	SARA
Birds	Canada Warbler	*Cardellina canadensis*	Threatened	SARA
	Common Nighthawk	*Chordeiles minor*	Threatened	SARA
	Olive-sided Flycatcher	*Contopus cooperi*	Threatened	SARA
	Peregrine Falcon	*Falco peregrinus anatum*	Special Concern	SARA
	Piping Plover	*Charadrius melodus*	Endangered	SARA; SK Wildlife Act
	Red Knot	*Calidris canutus*	Endangered	SARA
	Rusty Blackbird	*Euphagus carolinus*	Special Concern	SARA
	Short-eared Owl	*Asio flammeus*	Special Concern	SARA
	Whooping Crane	*Grus americana*	Endangered	SARA; SK Wildlife Act
	Yellow Rail	*Coturnicops noveboracensis*	Special Concern	SARA
	Bank Swallow	*Riparia riparia*	Threatened	SARA
	Barn Swallow	*Hirundo rustica*	Threatened	SARA
	Bobolink	*Dolichonyx oryzivorus*	Threatened	SARA
	Horned Grebe	*Podiceps auritus*	Special Concern	SARA
	Western Grebe	*Aechmophorus occidentalis*	Special Concern	SARA
Mammals	American Badger	*Taxidea taxus taxus*	Endangered	SARA
	Little Brown Bat	*Myotis lucifugus*	Endangered	SARA
	Northern Long-Eared Bat	*Myotis septentrionalis*	Endangered	SARA
	Woodland Caribou	*Rangifer tarandus*	Threatened	SARA

In addition to the above listed at-risk species, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has recommended to Environment Canada that a number of additional species historically present in the PA FMA region be considered for listing under SARA. These species include Plains Bison, Wolverine, Western Tiger Salamander, Gypsy Cuckoo Bumble Bee, and the Yellow-banded Bumble Bee. Two other bird species proposed by COSEWIC for listing under SARA nest in the Arctic or far north, but are known to migrate over the PA FMA area; these bird species are the Red-necked Phalarope and the Buff-breasted Sandpiper.

The boreal population of woodland caribou is listed by SARA as 'threatened' and is a key species of concern in the PA FMA area. Environment Canada developed a recovery strategy for woodland caribou in 2012, and the Province of Saskatchewan is currently preparing a Range Plan for the species (SK2 Central draft released Nov 2017). The population of caribou within the PA FMA area is the Boreal Plain Range (SK2) population. Sakâw has developed an interim management strategy until the complete provincial woodland caribou recovery strategy can be finalized. Sakâw's strategy is described below in Section 5.2.2.

5.2.2 Woodland Caribou Strategy

Sakâw's interim strategy for woodland caribou management aims to limit fragmentation in specific regions of the FMA area currently deemed to be high value habitat, target replacement habitat areas for the future, and manage disturbance levels across the full caribou habitat area in the FMA area.

This plan is based heavily on the Pasquia-Porcupine FMP Caribou Plan. Pasquia-Porcupine worked with the Canadian Boreal Forest Agreement (CBFA) Saskatchewan Regional Working Group (SKRWG) to develop a caribou habitat plan for their FMA area[6,7]. This plan is an appropriate guide for the PA FMA area plan as it engaged Provincial and Aboriginal governments, First Nations, Métis and local communities, and stakeholder groups, and involved extensive professional expert investigation. It also followed the CBFA's Methodological Framework for Caribou Action Planning and was ultimately approved by MoE as part of the FMA areas' FMP. Similar to the Pasquia-Porcupine FMP Caribou Plan, within the PA FMA area SK2 caribou zone Sakâw will:

1. Follow NFP management principles (i.e., range of event sizes; use a get in/ get out approach to road construction and decommissioning; implement in-block and landscape level retention practices);
2. Actively restore disturbed habitat through reclamation of in-block roads and prompt reforestation of harvested areas;
3. Manage caribou habitat based on habitat potential through 3 classified Caribou Habitat Management Zones (Table 13; Figure 14; Appendix A, VOIT #7c);
4. Strive to limit habitat disturbance to ≤35% over the mapped caribou zone in the PA FMA area; and
5. Use best management practices (BMPs) to mitigate impacts of timber harvesting on caribou.

The proposed Caribou Habitat Management Zones (Table 13; Figure 14) were developed using input provided by Fish and Wildlife Branch staff (Gigi Pittoello, Tim Trottier), previous woodland caribou tracking and collaring work done by Parks Canada and the Government of Saskatchewan, and feedback from Sakâw operational and strategic planners. These zones and associated management guidelines are different from the Caribou Habitat Management Areas identified in the Gov't of Saskatchewan's 2017 Range Plan.

6 Saskatchewan Regional Working Group of the Canadian Boreal Forest Agreement. *Recommendation for the Pasquia Porcupine Forest Management Area*. March 2016.

7 Weyerhaeuser and Edgewood Forest Products. *Volume II Strategic Direction for the Pasquia-Porcupine FMA 2015-2035 Twenty Year Forest Management Plan*. February 1, 2016.

Table 13. Caribou Habitat Management Zones on the PA FMA Area

Caribou Habitat Management Zone	Management Practices
1: Current High Value Habitat	• Harvesting deferred for 20 years • Restoration of existing and prioritized linear features as identified and funded by the government
2: Near Term and Future Habitat	• Harvesting to occur to complete areas in years 1-10 and then harvest will be deferred in years 11-30 • New linear features reclaimed within 2 years after harvest • Restoration of existing and prioritized linear features as identified and funded by the government
3: FMA Area Range (FMA Area SK 2 Central)	• Limit disturbance to ≤35-40% of the gross FMA area • Disturbance defined as <30 years old • Disturbance buffers defined based on risk of impact

Deferring large areas for extended periods of time is an important caribou restoration tool as it reduces new disturbance and associated predation and allows caribou to disperse and change habitats based on their seasonal and calving period requirements[8] [9] [10] [11] [12].

The long-term vision for woodland caribou management is one of managing age classes and spatial patterns on the landscape to provide a continual supply of sufficient, suitable habitat over time.

[8] Metsaranta, M. *Assessing the length of the post-disturbance recovery period for woodland caribou habitat after fire and logging in west-central Manitoba.* Rangifer, Special Issue 17, 2006.

[9] Mcloughlin, P.D., K. Stewart, C. Superbie, T. Perry, R. Greuel, K. Singh, A. Truchon-Savard, J. Henkelman and J. Johnstone. *Population dynamics and critical habitat of woodland caribou in the Saskatchewan Boreal Shield.* Interim Project Report, Department of Biology, University of Saskatchewan, 2016.

[10] Arsenault, A.A. and M. Manseau. *Land management strategies for the long-term persistence of boreal woodland caribou in central Saskatchewan*. Rangifer, Special Issue 19, 2011.

[11] Dyke, C. *Spatial and temporal characterization of woodland caribou (Rangifer tarandus caribou) calving habitat in the boreal plains and boreal shield ecozones of Manitoba and Saskatchewan.* Thesis, Natural Resources Institute, University of Manitoba, 2008.

[12] Proulx ,G. *Late-winter habitat use by boreal woodland caribou (Rangifer tarandus caribou) in Northwestern Saskatchewan.* Canadian Wildlife Biology and Management, 2 (1), 2013.

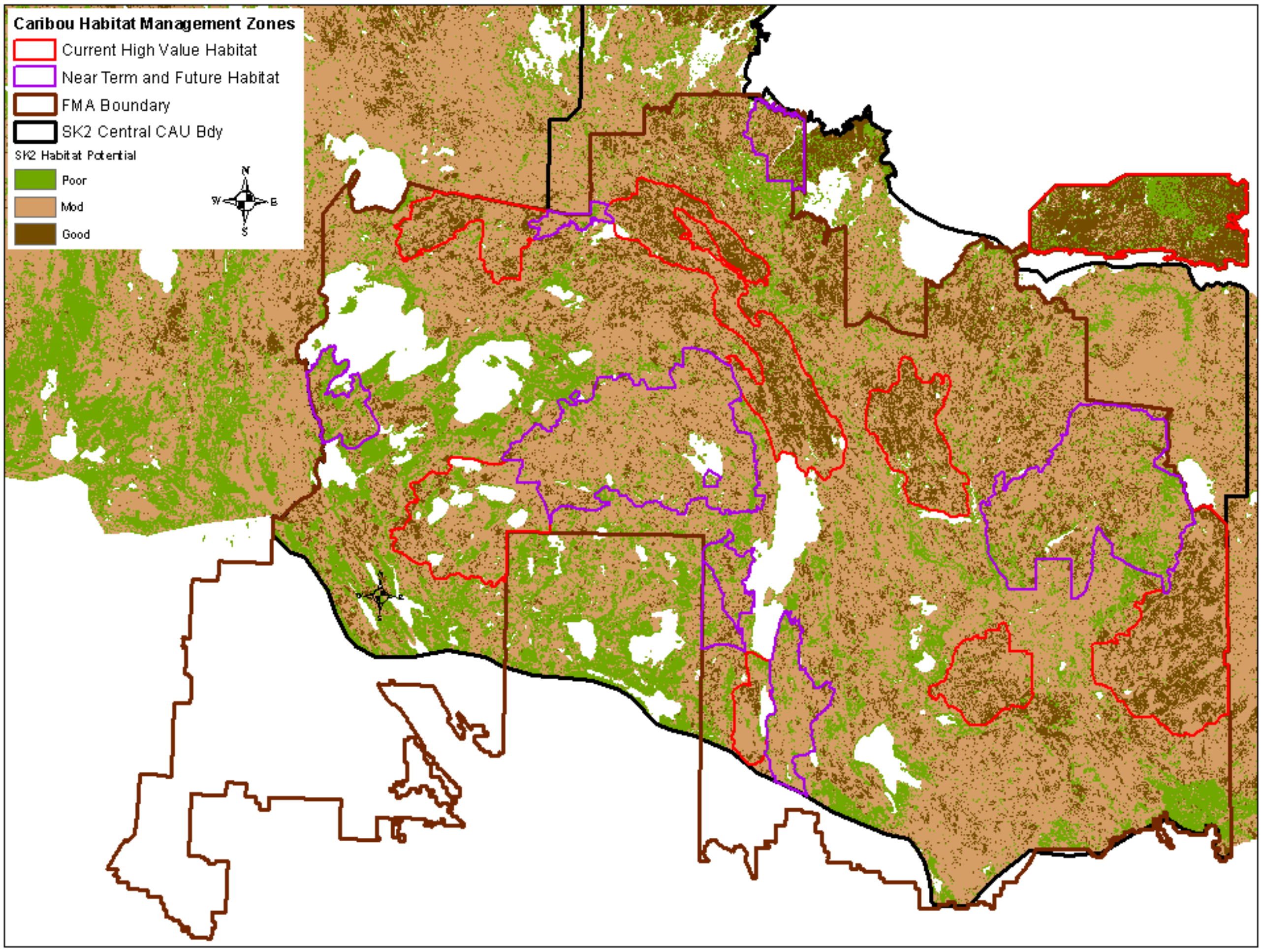

Figure 14. Caribou Management Zones for the PA FMA Area 2018-2038 FMP on top of Habitat Potential Theme

Assessing Disturbance

The definition of 'disturbed' is integral to the calculation of the disturbed area target used in the plan. Sakâw is adapting the federal definition of 'disturbed' to suit the natural disturbance regime specific to the boreal forests found in the FMA area. Disturbed areas will be linear and patch openings <30 years old. Stands that are >=30 years old provide less attractive forage for moose and deer[13]; thus, reducing the amount of alternative prey and predators in the area[14]. Linear and patch disturbances >30 years old do not offer the same travel and line of sight advantages compared to new disturbances[15]. Studies have also shown that terrestrial lichens recover within 21-30 years after a fire in jack pine stands and that a higher biomass of lichens regenerates in reforested harvest areas than naturally burnt and regenerated stands[16]. Using 30 instead of 40 years, as was used in the federal Caribou Recovery Strategy, also serves

[13] Timmermann, H.R. and J.G. McNicol. *Moose habitat needs.* The Forestry Chronicle, 1988.

[14] Wasser, S.K., J.L. Keim, M.L. Taper and S.R. Lele. *The influences of wolf predation, habitat loss, and human activity on caribou and moose in the Alberta oil sands*. Frontier Ecological Environment, 9(10), 2011.

[15] Skatter, H.G., J.L. Kansas, M.L. Charlebois, and B. Balicki. *Following wildfire in the boreal shield of Saskatchewan: Early seral forage availability for Woodland Caribou (Rangifer tarandus caribou).* Canadian Wildlife Biology and Management, 3(1), 2014.

[16] McMullin, R.T, I.D. Thompson, and S.G. Newmaster. *Lichen conservation in heavily managed boreal forests*. Conservation Biology, 27(5), 2013.

to better align the desired 'natural' age class structure for the FMA area (assumed to be a 55 yr fire cycle) with areas considered disturbed. It would skew the age class structure away from historical natural conditions if only 35% of the gross landbase can be in a disturbed state (i.e. roads, <40 years old stands, or with 500m buffer of either of these).

The federal Caribou Recovery Strategy uses a single 500m buffer width around disturbed areas when calculating the amount of disturbance, to recognize there is less desirable habitat and increased predation success next to disturbed areas. Sakâw has chosen to use a range of buffer sizes because disturbances of varying types and ages impact caribou differently[17]. Sakâw is ranking disturbances based on the perceived risk to caribou and buffering them according to the risk rating (Table 14, Table 15). The types of risks associated with each type of disturbance and the intensity of the disturbance is used to guide risk rating assignments (Table 12 and 13). Predation is considered the main limiting factor on caribou in the SK2 caribou range[18] [19].

Table 14. Disturbance risk rating and buffer distance

Risk Rating	Buffer Distance (m)
High (1)	500
Medium (2)	250
Low (3)	100
Negligible (4)	0

Table 15. Linear disturbance risk rating and buffer distance

Disturbance Type	Risks to Caribou	Risk Rating	Applied Buffer
Highways **Rail Lines** **Utility Lines with brushing <7 yrs.**	Vehicle collision; increased access for hunters, predators and alternative prey; decreased predator search time; noise	1	500
Groomed snowmobile trails	Increased access for hunters, predators and alternative prey; noise; packed snow allows for increased mobility	2	250
Low traffic highways/all season roads	Vehicle collision (lower); increased access for hunters, predators and alternative prey	2	250
Utility lines with brushing >7 yrs.	Limited increased access for predators and alternative prey; limited predator search time advantage	2	250
Secondary and Tertiary haul roads	Limited increased access for hunters, predators and alternative prey	3	100
Trails, in-block roads	Very limited access for hunters; less advantage for alternative prey and predators; revegetation occurring	4	0

[17] Sorensen, T., P.D. McLoghlin, D. Hervieux, E. Dzus, J. Nolan, B. Wynes, and S. Boutin. *Determining sustainable levels of cumulative effects for boreal caribou*. Journal of Wildlife Management, 72(4), 2010.

[18] Wittmer, H.U, A.R.E. Sinclair, and B.N. McLellan. *The role of predation in the decline and extirpation of woodland caribou*. Oecologia, 144, 2005.

[19] Rettie, W.J. and F. Messier. *Hierarchical habitat selection by woodland caribou: its relationship to limiting factors*. Ecography, 23(4), 2000.

Table 16. Patch Disturbance Risk Rating and Buffer Distance

Disturbance Type	Risks to Caribou	Risk Rating	Applied Buffer
Permanent logging camps, mine sites, communities, etc.	High noise levels; increased likelihood of caribou avoidance; no access barriers	1	500
Fresh harvest block <7 years old	Good habitat for alternative prey; decreased predator and hunter search time	1	500
Spruce leading harvest blocks 7-20 years old **Other leading species harvest blocks 2-14 years old**	Good habitat for alternative prey; limited predator search advantage; spruce is slower growing so needs additional time	2	250
Spruce leading harvest blocks >20 years old **Other leading species harvest blocks >14 years old**	Lower habitat potential for alternative prey; limited predator search advantage	4	0

In addition to the 20-year deferral areas, NFP strategies, and limiting disturbance, Sakâw will implement the following BMPs in their forest management across all caribou zones:

- Use winter roads whenever practical to limit linear feature creation[9 11 15];
- Reclaim roads as soon as practical after harvest[1520];
- Reclaim other roads near any roads currently being reclaimed where funding and approvals are provided by the government;
- Avoid fire salvage adjacent to treed peatland/peatland complexes [1121];
- Log large patches instead of multiple smaller ones[21];
- Prioritize harvesting in areas already disturbed[15 21];
- In Zone 2, use planting prescriptions that promote rapid re-establishment of caribou habitat[9]; and
- Manage access to limit hunters and poachers on roads[22].
- Within MoE identified critical calving habitat areas, strive to reduce sensory disturbances between April 1- July 15.

Caribou management on the FMA area will follow the province's Range Plan when it is finalized.

[20] Smith, K.G., E.J. Ficht, D. Hobson, T.C Sorensen, and D. Hervieux. *Winter distribution of woodland caribou in relation to clear-cut logging in west-central Alberta*. Canadian Journal of Zoology, 78, 2000.
[21] James, A.R.C., S. Boutin, D.M. Herbert, and A.B. Rippin. *Spatial separation of caribou from moose and its relation to predation by wolves*
[22] Brown, K.G. *Ecology of woodland caribou in central Manitoba: implications for forestry practices.* Thesis, Department of Biology, University of Saskatchewan, 2001.

5.3 Other Non-Timber Values

5.3.1 Water Resources

The PA FMA area is located within three large watersheds with relatively flat topography, although individual lakes and rivers may have steep banks or slopes to the water's edge. The majority of the FMA area, including most of the west, central, and northern portions of it, is located within the Churchill River watershed. The eastern and south-eastern portions of the FMA area are mostly located in the Saskatchewan River watershed, and a relatively small area in the south-west corner of the FMA area is located in the North Saskatchewan River watershed.

Results from a recent baseline water quality study of the Candle Lake sub-watershed (part of the Saskatchewan River watershed) published by the Saskatchewan Water Security Agency (2015) found that water quality in Candle Lake was acceptable for aquatic life and recreational use based on a comparison of Candle Lake water quality to Saskatchewan's Surface Water Quality Objectives[23]. The Candle Lake sub-watershed is located in the south-eastern portion of the PA FMA area, and has been subject to forest harvesting, road development, and high levels of recreational use for the past 70 years or more.

Water quality within the FMA area is maintained by complying with conditions related to riparian area management, as specified in Aquatic Habitat Protection Permits and FMA area standards. These stand-level protection measures are enhanced by the implementation of landscape level forest retention rules (Section 5.1). These rules mitigate the cumulative effects of forest management activities on the quantity and timing of stream flows within a watershed. Tree retention areas moderate the effect of harvest on stream flow and timing, by intercepting precipitation before it reaches the forest floor. They also extend the length of spring snow melt by reducing the intensity of the sun on exposed snow.

Lakes and streams within the FMA area will be protected through protecting riparian areas as described in the PA FMA Area Standards and Guidelines[24] for riparian area management (summarized in Table 17 below).

Table 17. Summary of waterbody types and riparian area harvest standards

Waterbody Type	Category	Riparian Prescription
Large (>5 ha) Lakes, Rivers, Streams	Category 1	10m No Harvest/No Equipment zone, plus a 30m limited harvest zone (can be partially harvested)
High Slope (>15%) Areas on Small (<5 ha) Lakes or Ponds	Category 2	Limited harvest zone to the top of the slope (max 40m) with no equipment in the first 10m adjacent to the waterbody.
Low Slope (<15%) Areas on Small (<5 ha) Lakes or Ponds	Category 3	10m limited harvest zone with no equipment allowed within this zone.
Intermittent Streams	Category 4	Leave single of clumped leave trees adjacent to the stream and ensure no equipment enters the stream channel. Crossings can occur on frozen ground or with appropriate crossing structures.

[23] Saskatchewan Surface Water Quality Objectives, June 2015 https://www.wsask.ca/Global/Water%20Info/Surface%20Water/epb%20356%20-%20surface%20water%20quality%20objectives%20interm%20edition%20june%202015.pdf

[24] Prince Albert Forest Management Agreement Area Standards and Guidelines, http://sakaw.ca/FMA%20Standards%20and%20Guidelines%20%20PA%20April%202011.pdf

Ephemeral Streams and Wetlands	Category 5	Do not obstruct or impede surface or subsurface flow.

To maintain the integrity of the riparian environment and ensure that no deleterious substances enter or impact watercourses, all crossings will be constructed, maintained and reclaimed in compliance with conditions specified in Aquatic Habitat Protection Permits. Sakâw also completes self-assessments for crossings as per federal (DFO) requirements on waterbodies that support commercial, recreational, or Aboriginal fisheries. Forestry operations such as harvesting and silviculture activities will be conducted in a manner that protects the riparian environment (i.e. machine free zones).

5.3.2 Archaeological Resources, Traditional Use Areas, and Culturally Significant Sites

Digital spatial files of planned harvest blocks and road locations from Operating Plans will be provided to the Heritage Conservation Branch (HCB) of the Saskatchewan Ministry of Parks, Culture, and Sport for assessment of archaeological and heritage resource potential. Based on location, topography, known heritage resource information, and professional judgment, HCB rates each block and road for heritage site potential. A qualified professional archaeologist is then engaged to carry out field surveys if soil disturbance (road construction) occurs within the specified minimums identified in the screening. If found, planned forestry activities are modified to avoid disturbing the sites.

In addition to the HCB annual review, sites of archaeological or cultural significance may be identified during the Operating Plan consultation process. Consultation with First Nations and Métis communities, and discussions with the HCB will identify appropriate management actions for such sites.

In the event that new sites of archaeological importance are identified during forestry activities, they will be reported to the HCB as per provincial requirements. Sakâw shareholders will undertake any mitigation measures that may be required and will track areas of importance in their GIS system (VOIT #26).

5.3.3 Visually Sensitive Areas

The current visually sensitive areas (VSAs) have been identified using input from the public and MoE (Figure 16). Designated areas are visible from communities, public recreation areas, major highways, and high value recreational-use lakes and rivers. The locations of new VSAs may be identified during development of Sakâw's Operating Plans, based on the planners' knowledge of the area and concerns brought forward during public engagement and Aboriginal consultation processes.

Operating Plans define visual quality objectives for each area with the goal of conserving aesthetic values in the VSAs. Sakâw's shareholders will then undertake harvesting and other forest management activities consistent with those objectives. Strategies to achieve the objectives include limiting the extent of disturbed forest, reducing the size of openings, and using retention to act as visual screening.

Section 4.4 describes how visuals were modeled during HVS calculation.

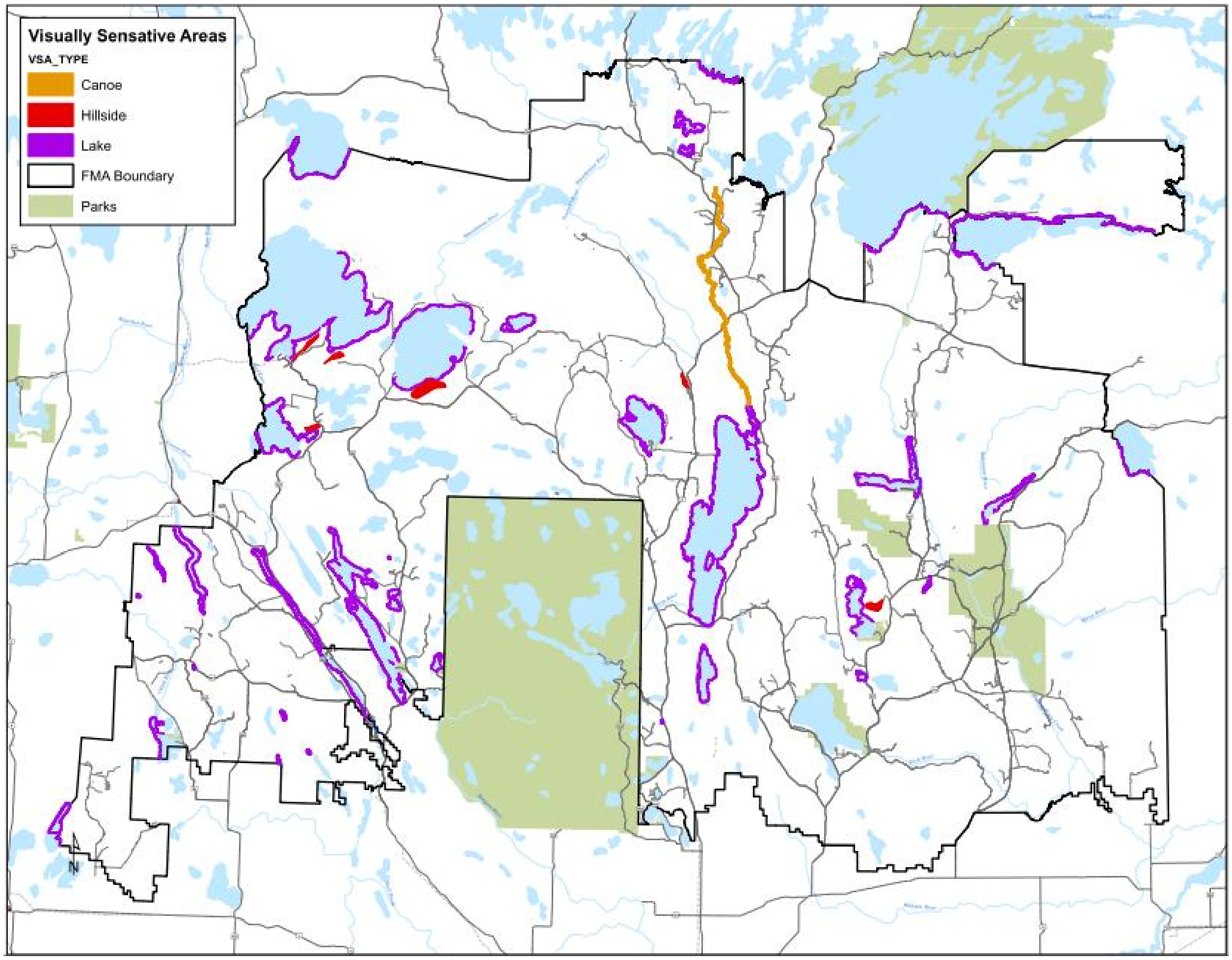

Figure 15. Visually Sensative Areas in the PA FMA area current to 2018

5.3.4 Non-Timber Botanical Forest Products

Non-timber botanical forest products include berries, mushrooms, and floral products. Currently there are no significant commercial harvests of non-timber botanicals in the FMA area. Most harvesting of non-timber botanicals is for personal use, including traditional use by Aboriginal peoples.

In addition to natural disturbance events such as wildfire, forest harvesting and renewal techniques practiced by Sakâw shareholders will maintain the presence of these resources within the FMA area. The abundance and location of non-timber botanical resources will vary over time, as the location of disturbance events and time between events varies.

Traditional or pre-existing road access to these resources will vary over time as roads are built and reclaimed to conserve other resources. Refer to Section 4.2 for more information on Access Management.

If commercial tenures for botanical non-timber resources are issued, Sakâw shareholders will work with the tenure holders in accommodating their interests where possible, and where consistent with the other requirements of this FMP.

5.3.5 Outfitting (Hunting, Fishing, Tourism)

Sakâw will consult regularly with hunting, fishing, and other guide service operators in the FMA area through the development of Operating Plans. Consultation around harvest areas and access management will provide outfitters with the opportunity to identify mitigation opportunities relative to their interests.

Accommodation measures may include adjusting harvest areas, leaving retention in specific locations, and measures to manage access. Appropriate measures will be determined at the Operating Plan stage.

5.3.6 Trapping

The PA FMA area entirely or partially overlays 31 individual Fur Conservation Areas (FCAs). FCAs are typically associated with nearby communities and are managed through the Northern Saskatchewan Trappers Association. Fur licences are granted to registered members to trap in portions of their local FCA. The 31 FCAs are used by trappers from predominantly Aboriginal communities located on or adjacent to the FMA area.

Sakâw will consult regularly with trappers operating in the FMA area through the development of Operating Plans. The primary points of contact will be the chairperson of each local trapper's association. Consultation will provide trappers with knowledge of shareholder planned forest operations and the opportunity to identify mitigation measures to reduce the potential impacts of forestry operations on individual trappers and the trapping community.

Accommodation measures may include retention of high value trapping habitat within harvesting events, and the maintenance of traditional access. Damage and loss of traps will be avoided through a clear understanding between the trapper and the responsible Sakâw shareholder about where and when timber harvesting or road building is scheduled to take place.

5.3.7 Recreational Use

A wide variety of recreational activities occur on the forested lands of the PA FMA area, including snowmobiling, skiing, hiking, camping, fishing, and hunting. Several snowmobile clubs exist within and adjacent to the FMA area. Many of these groups have invested considerable effort to develop trail networks within the forest. The FMA area is also extensively used during the summer months by campers, cabin owners, anglers and local residents.

Recreation areas with land base dispositions from the province are not included in the timber harvesting land base. Sakâw will attempt to minimize impacts on recreational use of the FMA area's forests and road or trail infrastructure. Before undertaking harvest activities which may impact recreation areas, Sakâw will assess the potential impact from harvesting, and work to minimize it through harvest design and timing. Minimization measures may include buffering, increased use of retention within harvest areas, and controls on harvest timing.

Sakâw will also work with snowmobile clubs to avoid using roads with high snowmobile use in the winter wherever possible, and attempt to design harvest areas with minimal impacts on existing trail systems.

Visually Sensitive Areas (VSAs) have been designated on lakes with high levels of recreational use. Where VSAs exist, Sakâw shareholders will undertake harvesting and other management activities consistent with protection and maintenance of aesthetic values (see Section 5.3.3).

Public engagement during development of Operating Plans will be the primary means of identifying concerns about recreational values and potential mitigation options.

5.3.8 Resorts and Tourism

Sakâw's shareholders will work with resort owners and other tourism operators to mitigate impacts on the forest resources and values on which these businesses depend. Potential mitigation measures can include visual buffers, leave areas, maintenance of access, restrictions on harvest timing, etc. Sakâw will use the Operating Plan public engagement process to seek input from resort owners and other tourism operators.

5.3.9 Cabins

Legally established cabins will be buffered by up to 100 meters as required to maintain a visual buffer from harvest areas. Access to cabins will also be maintained at a level similar to or better than that which existed prior to harvesting, unless it is inconsistent with the other requirements of this FMP or management for other values requires Sakâw to do otherwise. Cabin owners will be informed of Sakâw's planned activities through the Operating Plan engagement process.

5.3.10 Commercial, Recreational and Aboriginal Fishing

The *Fisheries Act* (Canada) was amended in 2012 to manage threats to the sustainability and ongoing productivity of Canada's commercial, recreational, and Commercial, Recreational, and Aboriginal (CRA) fisheries. Amendments also provided the Department of Fisheries and Oceans Canada (DFO) with enhanced compliance and protection tools and provided clarity, certainty, and consistency of regulatory requirements across the country. One of the key amendments to the Act involved merging two sections into a single provision (Section 35 (1)):

"No person shall carry on any work, undertaking, or activity that results in serious harm to fish that are part of a CRA fishery, or to fish that support such a fishery."

Under the amended Act DFO's regulatory role is focused on managing threats related to habitat degradation and loss, and flow alterations that have potential to impact CRA fisheries. Authorization must be obtained from DFO under the *Fisheries Act* to proceed with any development or project that may result in localized effects to fish populations or fish habitat. DFO's policy interpretation of serious harm to fish includes:

1. the death of fish;
2. permanent alteration to fish habitat; or
3. destruction of fish habitat.

Implementation and compliance with the Riparian Management Standards (Section 5.3.1) will provide protection of riparian areas and associated fish bearing streams during forest harvesting activities. However, a *Fisheries Act* Authorization may be required from DFO before constructing roads or installing culverts or bridges on fish-bearing or spawning watercourses on the FMA area. Sakâw commits to obtaining and complying with the terms and conditions of any *Fisheries Act* Authorization required by DFO for projects and activities. Compliance by Sakâw shareholders with conditions specified in *Fisheries Act* Authorizations and in provincially issued Aquatic Habitat Protection Permits (AHPP) will ensure that no impacts occur from road development activities to fish habitats or fish populations that support CRA fisheries.

5.3.11 Livestock Grazing Leases

Sakâw shareholders will work with livestock grazing lease holders when harvesting in grazing lease areas, and seek to minimize impacts to natural grazing lease barriers and other grazing lease resources (e.g., corrals, watering sites). Sakâw's planned harvesting and road building activities will be communicated to lease holders through the Operating Plan engagement process.

5.3.12 Below Ground Resource Exploration and Development

As exploration and development of below ground resources occurs in the FMA area, Sakâw shareholders will avoid unnecessary increases in road density through coordinated road development with oil and gas, mineral exploration companies, and developers. Sakâw's planned road developments will be made publicly available on the corporation's website (www.sakaw.ca) to provide road access and proposed forest harvesting information to potential below ground resource developers.

6.0 Tactical Plan

A 20-year tactical plan is designed to communicate where harvesting may occur over the next two decades (shown as Tactical Plan Areas[25]), and where harvesting will not occur (shown as reserves or deferral areas).

6.1 Development Approach

The Tactical Plan Areas (TPAs) have been generated through a combination of forest estate modelling outputs and planner input. The following provides a high level overview of the process:

1. **Forest Estate Modelling Output** – The starting point of the tactical plan was the "Preferred scenario" (full details in Section 7 of the Forest Estate Modelling report), with spatial constraints to generate a cohesive spatial distribution of harvest (i.e. road routes turned on to minimize road maintenance costs). In the first decade, approximately 19,900 ha/year were scheduled for harvest while 18,800 ha/year were scheduled for harvest in the second decade; both decades provided the same harvest volume.

2. **Aggregate model selections into decadal events –** The model's harvest selections were grouped into decade one and decade two and turned into an 'Event' (polygons in a common decade within 500 m of each other became an Event). Events that were less than 10 ha but adjacent to a bigger polygon from the opposite decade were assigned the decade of the bigger polygon.

3. **Adjustments Made by Operational Planners**– Operational planners will generate Tactical Plan Areas around the modeled harvest events. These larger areas often go well beyond what might be logged but capture the range of mature timber that might be harvested once field work has been completed. The GDA's are coarse polygons that generally capture mature timber but also capture non forested area and immature stands in and around the mature timber.

6.2 Tactical Plan Areas

Tactical Plan Areas (TPAs) are shown on the maps in Appendix E and described below.

The FMA area is divided into three distinct planning units - West, Central, and East (Figure 16) for reporting Tactical Plan Areas and roads. The area associated with GDA's in each planning unit and decade is shown in Figure 17. The areas far exceed the expected area of actual harvest (19,000-20,000 ha/year maximum on the full FMA area).

[25] GDAs are made up of both harvested areas with internal retention and matrix areas where no harvesting occurs. Harvested areas must be within 500m of each other to be part of the same GDA.

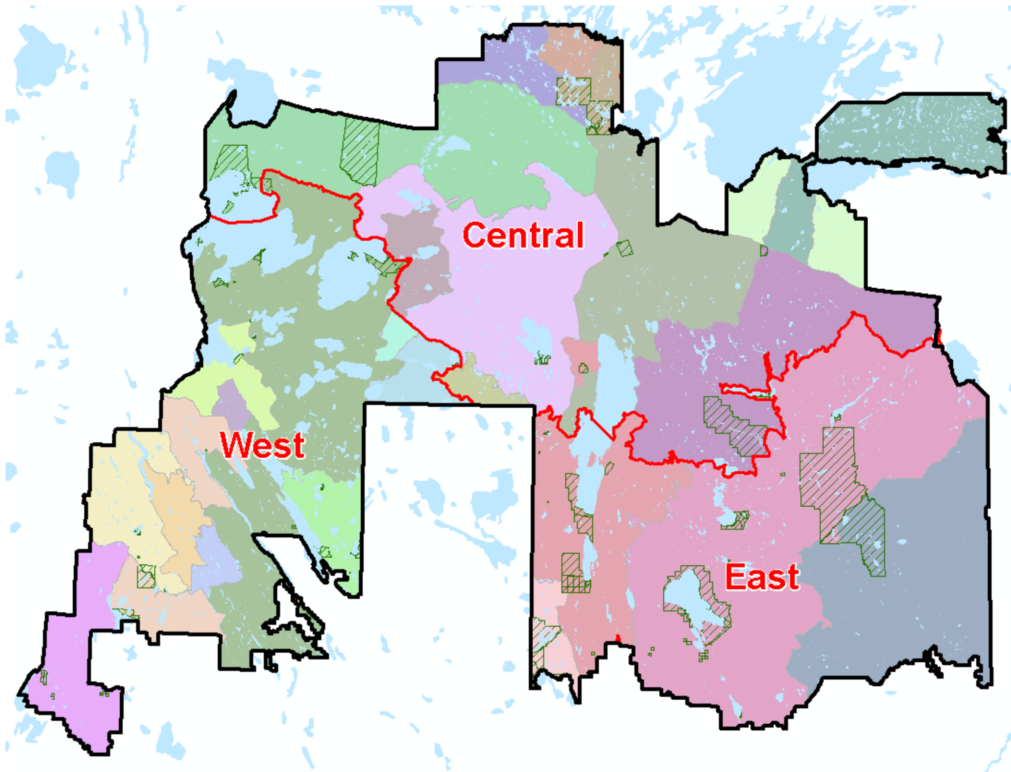

Figure 16. Planning Units on top of softwood + hardwood operating zone unique combinations (e.g. Carrier SWD + MLOSB HWD)

WEST

The West planning unit is dominated by hardwood and mixed wood stand types. This unit was the most heavily impact by the 2011 wind event and has had regular harvest activity in the last 10 years due to its proximity to mills in Meadow Lake and Big River. This unit contains several lakes with high recreation and residential value. Visual quality is an important social value in this unit. Agency Chief's Tribal Council bands use this unit for traditional use values. Outfitting and trapping are prevalent. The West has the highest outfitting use (most productive deer habitat and hunting tags) and is heavily developed by outfitters (e.g. trails). Caribou habitat management is only relevant in the north end of this unit where hardwood presence is lower.

CENTRAL

The Central planning unit is dominated by jack pine and mixed wood stand types. This unit was the most heavily impact by the 2015 wildfires. The Lac La Ronge Indian Band and Montreal Lake Cree Nation use this unit for traditional use values. Outfitting and trapping are prevalent. There are extensive caribou deferral zones present in this unit. This zone has the most remote and inaccessible areas on the FMA area. Of all the zones, it sees the least amount of public use but has the most traditional use by trappers, and mushroom and berry pickers.

EAST

The East planning unit is dominated by jack pine and mixed wood stand types. This unit contains the highest concentration of provincial parks and sees extensive recreational use. Visual quality is an important social value in this unit. The community of Montreal Lake Cree Nation is within this unit and they use its lands for traditional use values. Outfitting and trapping are prevalent. There are caribou deferral zones present in this unit. Lake water quality is a common public concern in this unit. Recreational fishing, especially in stocked waterbodies (lakes and rivers), is highest in this area.

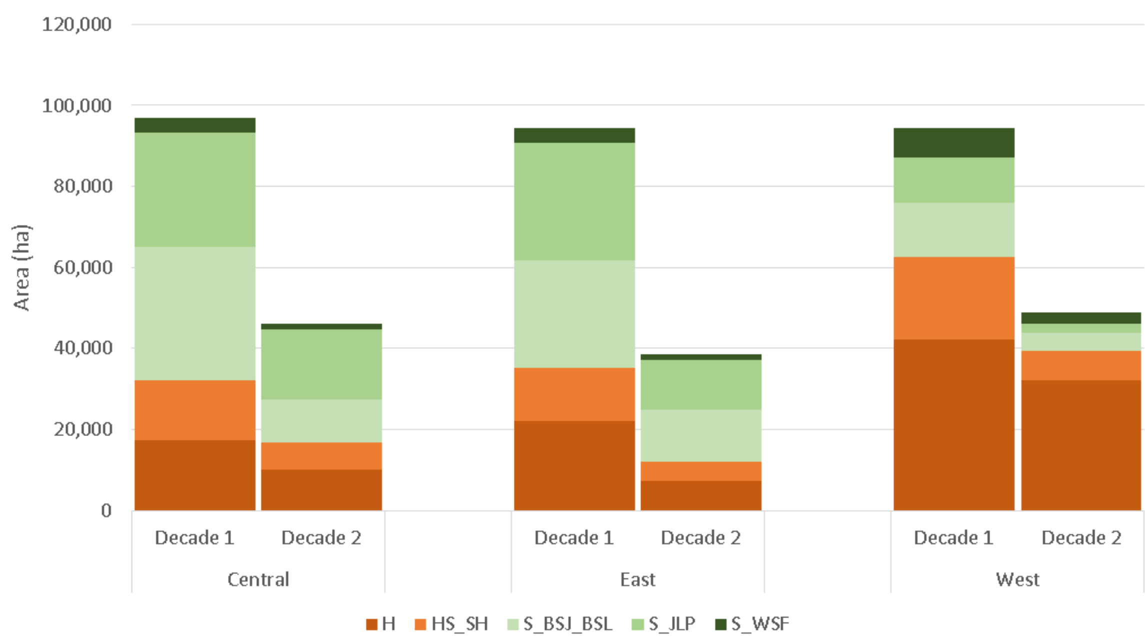

Figure 17. Net productive area of mature timber within the tactial plan GDAs by planning unit

It should be noted that the event areas mapped in Appendix E are significantly larger than the areas reported here because they include non-forest areas (water, muskeg, brush) and immature forest that fall within the GDAs. Only a subset of each GDA will be harvested. Planners will use the mapped tactical plan area as a starting point to develop final harvest areas during the term of the FMP.

6.3 Proposed Roads

To support harvesting within GDAs, approximately 2,311 km of new road construction has been mapped (See Tactical Plan maps in Appendix E for locations) but it is likely that only a subset will be necessary once more focused harvest plans are developed. Figure 18 indicates the length of mapped road by harvest zones and decade. The road construction lengths and mapped locations shown are current best estimates of how access will be achieved to harvest in GDAs (some of which may not get utilized). Actual locations will be determined through field work, and shown in detail on Operating Plan maps during the term of the FMP.

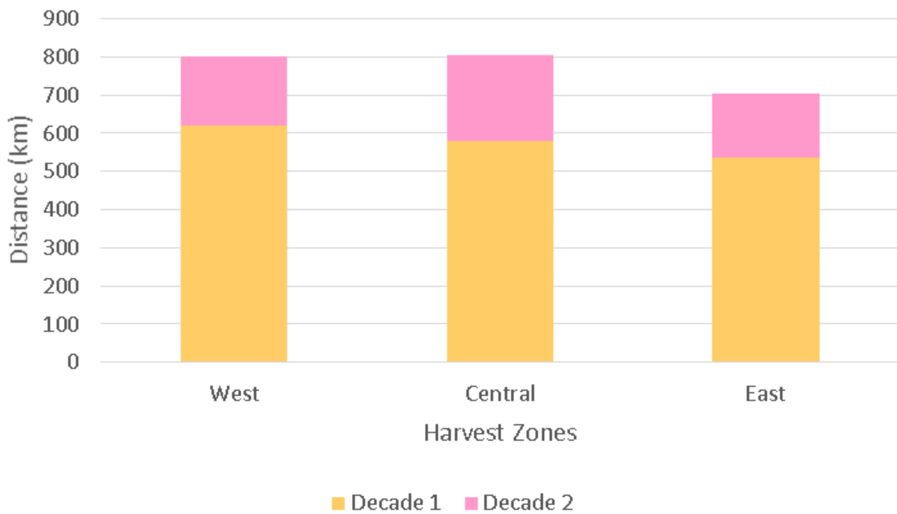

Figure 18. Tactical Plan potential road construction distance by Planning Units and decade.

6.4 Old Seral Deferrals

As described in Section 5.1, old and very old seral stands will be maintained across the FMA area for five different species groups and 11 geographic Ecological Management Units (EcoMU) (Figure 11). In order to make these 55 targets manageable for forest planners, the areas to be retained on the land base have been spatially identified on the Tactical Plan maps (Appendix E) and are described here as Old Seral Deferrals (OSDs). Due to existing age classes for a given species or geographic area, not all of the 55 targets can be met immediately with old seral stands. Recruitment stands have been identified to ensure that the target is met as soon as possible.

Table 18. Percent of old forest required by species group

Group Species Label	Description	Provincial Forest Type* (PFT)s included	% Old + Very Old	% Very Old
H	Hardwood stands	AOH, TAB	10%	5%
HS-SH	Mixedwood stands	HPM, HSM, SMW, PMW	8%	4%
S(BSJ_L)	Black Spruce leading softwood stands	BSJ, BSL	6%	3%
S(JLP)	Jack Pine leading softwood stands	JLP	6%	3%
S(WSF)	White Spruce/Balsam Fir leading softwood stands	WSF	7%	3%

To identify the areas to be retained as OSDs, a spatial model was built to select stands to meet the target retention areas in each species/EcoMU combination as described below. Selections were then reviewed and adjusted by forest planners to incorporate knowledge of the land base not in the model.

1. **Computer Generated Old Seral Selections**:
    a. Target Area Determination:
        i. Determine the MFLB area of each EcoMU/species group combination.
        ii. Calculate the area to be retained per species (% of the MFLB) for each unit (Table 18) using general targets of 10% for H, 8% for HS-SH, 6% for BS or JP, and 7% for WS.

Table 19. Area targets for old seral selection by Ecolgoical MUs and species groups

NFP MU	SPECIES GROUP	TOTAL AREA (HA)	OLD+VO TARGET(HA)	VERY OLD TARGET(HA)
CLP_WU	H	80,939	8,094	4,047
	HS_SH	42,639	3,411	1,706
	S_BSJ_BSL	64,617	3,877	1,939
	S_JLP	14,156	849	425
	S_WSF	13,012	911	390
LH_SCP_TU_SR	H	122,131	12,213	6,107
	HS_SH	26,207	2,097	1,048
	S_BSJ_BSL	28,375	1,703	851
	S_JLP	18,084	1,085	543
	S_WSF	10,236	717	307
LRL_NORTH	H	17,662	1,766	883
	HS_SH	20,533	1,643	821
	S_BSJ_BSL	61,916	3,715	1,857
	S_JLP	39,808	2,388	1,194
	S_WSF	2,566	180	77
LRL_SOUTH	H	17,702	1,770	885
	HS_SH	16,844	1,347	674
	S_BSJ_BSL	43,305	2,598	1,299
	S_JLP	47,672	2,860	1,430
	S_WSF	3,514	246	105
MLP_ELU	H	31,717	3,172	1,586
	HS_SH	21,625	1,730	865
	S_BSJ_BSL	47,016	2,821	1,410
	S_JLP	25,102	1,506	753
	S_WSF	3,861	270	116
MLP_SP_LPP_DLL	H	39,032	3,903	1,952
	HS_SH	35,974	2,878	1,439
	S_BSJ_BSL	64,122	3,847	1,924
	S_JLP	20,665	1,240	620
	S_WSF	10,280	720	308
SP	H	3,310	331	165
	HS_SH	4,248	340	170
	S_BSJ_BSL	29,003	1,740	870
	S_JLP	17,886	1,073	537
	S_WSF	789	55	24
WAPA_U	H	27,045	2,704	1,352
	HS_SH	26,829	2,146	1,073
	S_BSJ_BSL	63,783	3,827	1,914
	S_JLP	44,223	2,653	1,327
	S_WSF	2,176	152	65
WASK_U	H	17,578	1,758	879
	HS_SH	19,210	1,537	768
	S_BSJ_BSL	68,006	4,080	2,040
	S_JLP	35,931	2,156	1,078
	S_WSF	3,332	233	100
WGP_MRP	H	24,214	2,421	1,211
	HS_SH	11,543	923	462
	S_BSJ_BSL	45,564	2,734	1,367
	S_JLP	42,467	2,548	1,274
	S_WSF	3,198	224	96
WP	H	25,287	2,529	1,264
	HS_SH	29,879	2,390	1,195
	S_BSJ_BSL	100,306	6,018	3,009
	S_JLP	62,328	3,740	1,870
	S_WSF	4,461	312	134

b. Modelling: Patchworks was setup to select old seral areas instead of harvest blocks. A hierarchy of accounts was created to ensure that areas selected as OSDs were old or very old. If the targeted area was not available, the model would first recruit mature, then immature, then young stands, until the desired area was achieved. Planners had made some previous selections for OSDs and these areas were prioritized along with Partial Exclusion areas (non-net land base), Caribou Management Zones, VSAs, and moderate and high blowdown areas, while avoiding Operating Plan blocks and selecting a maximum of 9% from harvest areas (for in-block retention). A key reason for using Patchworks to select the OSDs was to have spatial controls over selections; it was desirable to have larger continuous clumps over small scattered areas where possible. Table 20 shows how OSD patch size targets were implemented in the model and the results achieved. Note: the intent of the targets were generally to create larger contiguous patches.

Table 20 Spatial patch size targets for OSD selections.

Area (ha)	Target
1-2	<5%
2-50	< 20%
50-100	< 20%
100-500	> 20%
500-1000	>20%
1000+	> 20%

Polygons separated by <10m were treated as a common patch.

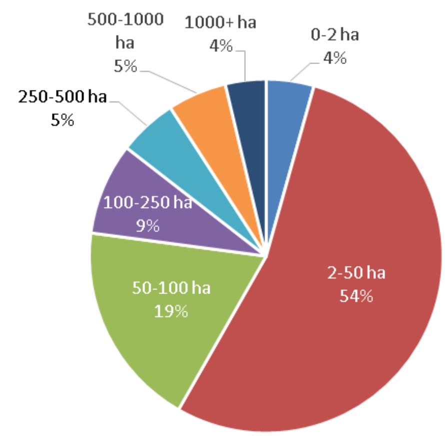

Figure 19. Resulting distribution of OSDs

A summary of the selected OSD areas for each of the 55 EcoMU/species combination is shown in Figure 20. The figure indicates the seral stage of the selected stands. The vast majority of selected areas were very old, old, or mature seral stands. In most cases, the selected mature stands will become old during the term of the FMP. The graph shows that a significant area of younger stands were selected in the Wapawekka Uplands due to the large 2015 fire causing predominately young forest conditions. Table 21 provides a detailed area breakdown of the OSD selections. Figure 11 provides a map of the EcoMUs, and OSDs are mapped on the Tactical Plan (Appendix E).

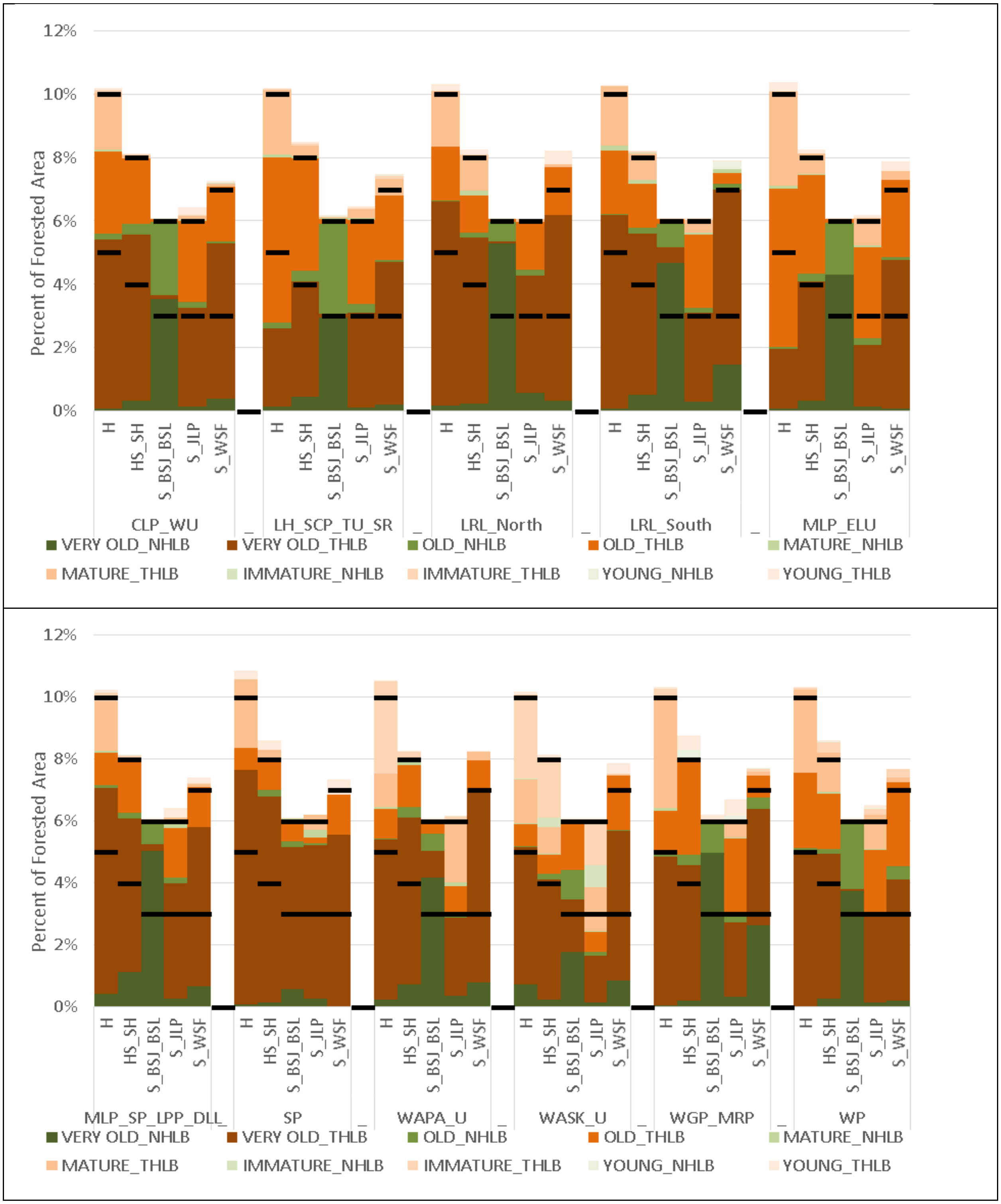

Figure 20. OSD Selections (stacked bars) and targets (black lines) by MU and species group

Table 21. Summary of old seral selections by Managment Unit - Species Group and landbase type

MU/Group Species	VERY OLD		OLD		MATURE		Immature		Young		Total
	Excluded	Net	Excluded	Net	Excluded	Net	Excluded	Net	Excluded	Net	
CLP_WU											
H	84	4,293	144	2,108	50	1,438	2	77	1	57	8,253
HS_SH	137	2,244	135	880	0	46	0	5	1	2	3,451
S_BSJ_BSL	2,292	64	1,501	51	0	0	2	8	2	0	3,919
S_JLP	22	439	25	364	4	16	0	3	0	36	910
S_WSF	53	634	10	223	0	12	3	2	0	5	943
LH_SCP_TU_SR											
H	175	3,006	240	6,348	104	2,493	1	40	1	41	12,449
HS_SH	120	949	96	921	21	82	1	17	0	14	2,222
S_BSJ_BSL	840	31	801	52	4	7	0	0	10	5	1,751
S_JLP	24	538	49	482	7	50	0	10	0	7	1,167
S_WSF	21	459	8	208	0	54	0	10	3	1	764
LRL_North											
H	31	1,135	8	298	1	309	0	0	0	37	1,818
HS_SH	52	1,075	30	238	32	226	0	5	0	32	1,691
S_BSJ_BSL	3,273	42	379	51	0	5	0	2	0	0	3,753
S_JLP	230	1,473	75	598	0	36	0	0	0	0	2,413
S_WSF	9	150	0	39	0	2	0	0	0	12	211
LRL_South											
H	16	1,080	2	358	23	333	0	4	0	2	1,819
HS_SH	89	855	30	233	23	140	1	6	0	4	1,382
S_BSJ_BSL	2,030	212	313	69	0	0	0	5	1	7	2,637
S_JLP	144	1,331	83	1,095	34	194	0	0	0	21	2,902
S_WSF	52	193	7	12	4	0	0	0	8	1	277
MLP_ELU											
H	26	602	16	1,586	28	931	0	12	0	85	3,286
HS_SH	70	815	56	673	2	138	0	0	4	29	1,786
S_BSJ_BSL	2,019	4	767	55	1	2	0	0	0	8	2,857
S_JLP	40	488	49	719	18	213	0	0	0	23	1,549
S_WSF	4	180	4	94	0	10	0	0	0	13	305
MLP_SP_LPP_DLL											
H	159	2,604	26	408	30	625	0	107	2	39	3,999
HS_SH	406	1,780	66	621	0	26	0	20	3	0	2,921
S_BSJ_BSL	3,222	142	467	48	0	0	0	2	7	5	3,893
S_JLP	53	773	35	330	24	43	0	0	4	60	1,324
S_WSF	69	526	2	132	0	11	0	1	0	20	761
SP											
H	3	250	0	24	0	73	0	0	0	9	359
HS_SH	5	283	9	37	1	17	0	0	0	12	365
S_BSJ_BSL	162	1,331	55	201	13	0	0	0	0	2	1,764
S_JLP	48	885	13	34	40	88	0	0	0	0	1,108
S_WSF	0	44		10		0	0	0	0	4	58
WAPA_U											
H	66	1,393	11	256	16	294	2	800		3	2,842
HS_SH	198	1,440	92	365	20	32	0	60	0	7	2,214
S_BSJ_BSL	2,660	551	361	269	4	6	3	6	0	2	3,862
S_JLP	151	1,119	57	389	64	857	0	77	2	7	2,723
S_WSF	17	137	0	20	0	6	0	0	0	1	180
WASK_U											
H	127	780	3	126	7	246	8	473	0	17	1,787
HS_SH	44	748	32	117	10	165	55	376	0	17	1,565
S_BSJ_BSL	1,208	1,143	664	1,069	0	20	0	0	0	5	4,109
S_JLP	45	544	44	236	12	511	256	520	0	16	2,183
S_WSF	28	160	2	57	0	1	0	1	0	12	263
WGP_MRP											

MU/Group Species	VERY OLD		OLD		MATURE		Immature		Young		Total
	Excluded	Net	Excluded	Net	Excluded	Net	Excluded	Net	Excluded	Net	
H	14	1,158	14	348	18	855	0	78	0	20	2,505
HS_SH	25	504	40	344	0	12	0	0	32	55	1,012
S_BSJ_BSL	2,262	4	417	61	0	1	0	0	0	86	2,830
S_JLP	137	1,021	123	1,029	16	232	0	0	65	219	2,843
S_WSF	84	121	12	23	0	4	0	3	1	0	247
WP											
H	2	1,282	10	615	4	676	0	12	3	1	2,605
HS_SH	80	1,400	42	538	15	377	0	103	6	8	2,570
S_BSJ_BSL	3,744	70	2,185	52	0	0	0	1	4	15	6,070
S_JLP	96	1,711	94	1,247	33	678	17	104	12	72	4,064
S_WSF	9	174	20	120	0	7	0	13		0	343

Management Implementation:

- The spatially identified OSDs will be maintained in Sakâw's geographic information system and shown on Operating Plan maps.
- Harvesting and road building will avoid impacting OSDs (subject to variances discussed in Appendix A, VOIT #2).
- Where OSDs have been identified within GDAs, the specific location of the retention in the area is flexible as long as the retained stands are of a similar or older age and species than the mapped and selected OSD.
- Retained OSDs can also contribute toward in-block retention requirements if they are internal to a harvest area.

Interior Old Seral Conditions

The plan worked to ensure a minimum 20% of the old and very old forest on the landbase remained in an 'interior' condition (i.e. not influenced by forest edge conditions).

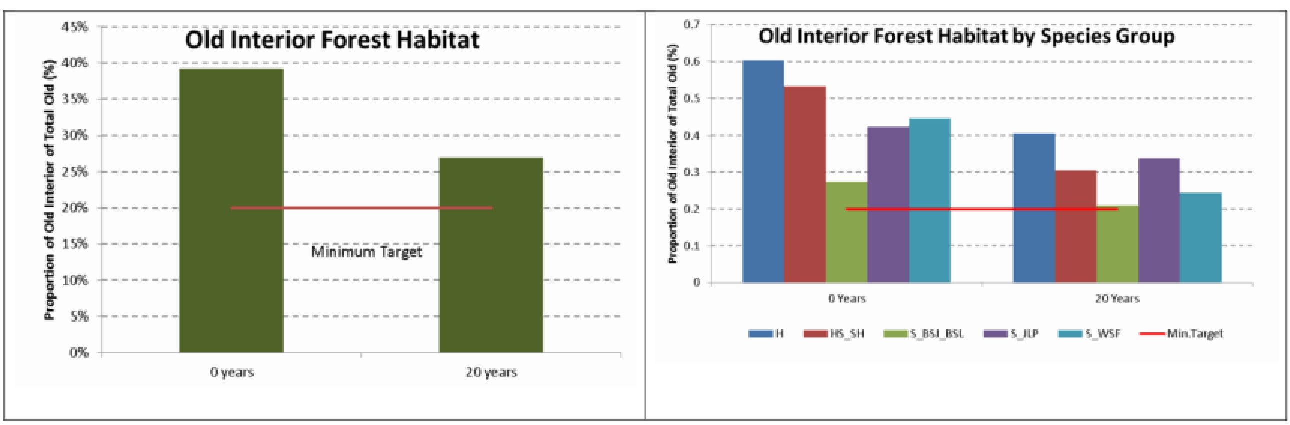

Figure 21. Interior old/very old forest at time zero and in 20 years from now (forecast from forest estate modeling)

7.0 Natural Disturbance in the FMA Area

The boreal forests found in the FMA area are often influenced by natural disturbances from insects, disease, and wildfires. Sakâw has developed the following response strategies to incorporating natural disturbance into its forest management planning and implementation.

7.1 Wildfire Management

Wildfires are the single largest source of natural disturbance in Saskatchewan's boreal forest. Past fires have had a major influence on the mosaic of forest types and associated biodiversity within the FMA area.

Saskatchewan's Fire and Forest Insect and Disease Policy Framework (2003) was developed to provide direction for Ministry staff and forest management licensees on how wildfires, insects and disease outbreaks will be managed on the landscape. This Policy framework recognizes that the boreal forest is a fire dependent ecosystem and brings a fundamental shift from fire control and suppression to wildfire management and planning. Where opportunities exist to support forest resource management objectives fire will be used to protect, maintain, and enhance forest resources. The forest insect and disease component of the policy framework is discussed in Section 7.2.

Forest harvesting that mimics natural disturbance can help maintain forest types and biodiversity (Section 5.1) where fires are being actively suppressed. Emulation of fire characteristics through harvesting practices will be employed based on the best scientific information available.

7.1.1 Forest Protection

The fire season in Saskatchewan falls between April 1 and October 31 each year but the Wildfire Act Regulations allow for the season to be extended beyond this. However, due to predicted changes associated with global climate change, it is anticipated that this window will expand and that more extreme fire conditions will likely occur.

The Wildfire Act provides the legal framework for the protection and management of Saskatchewan resources in relation to wildfire. MOE is responsible for fire suppression efforts within Saskatchewan's provincial forests. Sakâw supports the Province's approach to wildfire management, and will align its wildfire management practices with the spirit and intent of *The Wildfire Act* and *The Wildfire Regulations*.

Under *The Wildfire Act* and *Regulations*, Sakâw's responsibilities include the following:

1. <u>Submission of an Annual Wildfire Prevention and Preparedness Plan</u>

   Sakâw will submit a Wildfire Prevention and Preparedness Plan (WPPP) to MOE annually. The plan will be submitted before the start of the fire season (April 1), and contain the information specified under Section 9(1, 2, &3) of *The Wildfire Regulations*. This information includes, but is not limited to:

   - a description of forest management activities to be conducted, including the number of people, types of equipment, and anticipated schedule and location of activities;
   - names of key contact personnel, emergency contact information, and process for communicating and reporting;
   - maps showing the locations of work activities, camp layouts, road access, fuel types, water sources, and location of wildfire suppression equipment;
   - a complete description of methods to be used to reduce or prevent fire starts;

- a description of procedures to be used for notifying MOE in the event of a fire occurrence, or change in scheduling or location of forest management activities;
- a description of measures to be taken to protect infrastructure and assets from a wildfire threat;
- a description of the way forestry operations or activities will be modified or suspended in response to daily wildfire danger ratings;
- a complete description of the personnel resources available for wildfire suppression, their fire suppression training history, and an inventory of wildfire suppression equipment available;
- an action plan for initial fire suppression response; and
- a description of emergency response plans, including escape routes, safety zones, and evacuation plans.

2. Compliance with the Wildfire Prevention and Preparedness Plan

   Sakâw shareholders will exercise due diligence during forest management operations and activities and will comply with all aspects of the approved WPPP and *The Wildfire Regulations*. Sakâw will rely on qualified professional advice about personnel training and safety. Sakâw shareholder's crews and contractors will be provided with fire suppression and response training as required by the WPPP. Sakâw shareholders will also impose altered work schedules and/or self-induced shutdowns where local forest conditions are considered to have extreme fire risk.

3. Responsibility for Initial Fire Suppression Response

   The Ministry has overall responsibility for fire suppression and response but Sakâw shareholders commit to initiating fire control activities as required under Section 19(3) of *The Wildfire Act* where they are actively operating Sakâw will immediately notify MOE of the status and location of the fire, and continue fire suppression efforts if safe to do so until the fire is extinguished or Sakâw is relieved by MOE.

4. Designation of High Fire Risk Activities and Additional Fire Prevention Measures

   Sakâw's shareholders acknowledge that MOE may designate certain activities to be of high fire risk, and/or require that additional fire prevention measures be instituted when fire risk is high. Sakâw will comply with these determinations.

5. Burning of Logging Slash or Wood Residue

   Sakâw's shareholders will assess potential fire risk in harvest areas and implement fuel abatement measures to reduce the risk of wildfires and prepare harvested blocks for tree planting. Sakâw will prepare a Resource Management Burn Plan (RMBP) as required by *The Wildfire Act* and *Regulations* for review and approval by MOE. Disposal of logging slash or wood residue by burning will be done outside of the wildfire season. The location and dates of planned burns will be provided to MOE in the RMBP before any burning takes place.

7.1.2 Values at Risk

The Province has established Wildfire Management Zones to direct the approach and intensity of fire suppression responses to wildfires. Many factors are considered when deciding which actions to take on wildfires. The majority of the PA FMA area is within the "***Full Response Zone***" which dictates initial attack and sustained action to control and suppress fire. Any wildfires threatening human life, communities and infrastructure will be top priority, with *every* fire assessed to determine the most appropriate response, based on the level of threat. Ongoing consideration of values and costs will be undertaken to ensure continued fire action is warranted.

The Wildland Urban Interface (WUI) is an area where structures are built close to, or within the forest. The consequence of wildfires within these areas is often very severe. Sakâw will consider WUI areas within the FMA area during harvest planning in these areas with the goal of enhancing wildfire prevention and preparedness of forest communities.

Sakâw supports the Province's FireSmart initiative and principles, and will engage as a stakeholder in development of any Community Wildfire Protection Plans (CWPPs) that are initiated on the PA FMA area. A CWPP is a plan developed by communities in areas considered to be at-risk from wildland fires. The plan provides strategic direction to businesses and residents to mitigate the potential effects of wildfire by reducing fire fuel sources within and adjacent to the community.

When a wildfire occurs within the FMA area, Sakâw will work with the province to update the status of values at risk such as decked wood, logging equipment, year 1 planned blocks and plantations. In broad terms, the decade 1 event areas shown on the Tactical Plan are to be considered priority areas for protection.

7.2 Insects and Disease

At a provincial level the surveillance, monitoring, and management of insects and disease are completed by MOE. Information on most of the key pests found in Saskatchewan forests is available on the MOE website[26]. When this FMP was being prepared the province was monitoring populations of jack pine budworm (building outbreak), eastern spruce budworm (declining), forest tent caterpillar (building outbreak), and large aspen tortrix (whose cycles follow those of the tent caterpillar quite closely). MOE are also collaborating with the Alberta Government on mitigation strategies for the mountain pine beetle (MPB) infestation, which has a leading edge inside the Cold Lake Air Weapons Range, Alberta (personal communication Rory McIntosh, MOE Forest Service Entomologist, November 2017).

Sakâw and its shareholders will contribute to the province's insect and disease management strategy as outlined below.

7.2.1 Defoliators (Lepidoptera Species)

This order of insects is characterized by the butterflies and moths whose life cycles follow complete metamorphosis with distinct egg, larval, pupal and adult stages. Impacts to forest vegetation occurs during the larval feeding stages (i.e., caterpillar phase) when these insects feed on fresh succulent foliage. During outbreak populations these insects can "back feed" on older foliage thereby increasing the impact and

[26] Saskatchewan Ministry of Environment, Forest Pest Fact Sheets
http://www.publications.gov.sk.ca/deplist.cfm?d=66&c=4537

stress on trees. Significant growth reduction and tree mortality can occur if trees are repeatedly exposed to larvae over several years.

The two main forest insects that defoliate **softwoods** are:

1. eastern spruce budworm; and
2. Jack pine budworm.

The two main forest insect defoliators of **hardwoods** are:

1. forest tent caterpillar; and
2. large aspen tortrix.

These species follow a very similar life cycle and Sakâw will employ similar strategies and tactics when managing for them. Sakâw will monitor the impacts of forest defoliators in the FMA area through forest health observations made during regular planning and operational activities. The main treatment options that Sakâw will use to mitigate the impacts of defoliators are as follows:

- **No Action** will be taken in the case of low risk of mortality or significant growth loss.
- **Mapping and Monitoring** will occur when pocket(s) of infestation are detected that warrant an ongoing assessment of potential impact. Such areas will be mapped and their locations provided to MOE. In the event that defoliating insect populations reach outbreak levels, Sakâw will collaborate with MOE to monitor and record population levels.
- **Removal (Harvest) of Host Trees**: Where it makes sound forest management sense and is economically feasible, Sakâw will harvest affected and/or susceptible host tree species to control defoliator populations by removing nearby food supplies. Populations will be monitored post-harvest to determine if further action is required.
- **Biological Control**: *Bacillus thuringiensis* var. *kurstaki* (Btk) is considered by MOE as an acceptable biological control agent for forest defoliating insects. Btk is a naturally-occurring soil bacterium used as a microbial insecticide for caterpillar control. It is not harmful to humans, birds, pets, fish, honey bees, beetles, spiders, etc. Sakâw will work with MOE staff if the province decides that biological control with Btk is warranted.

7.2.2 Bark Beetles and Engravers – Coleopteran Species

The impact of bark beetles and engravers is characterized by wood boring beetles entering the cambium layer of softwood species. Adult beetles create galleries in the cambium layer where they lay their eggs. Once the eggs hatch, the larvae feed on the nutrient rich cambium layer, which results in girdling and killing of the host tree.

The four primary Coleopteran species that can impact large areas of the boreal forest are:

1. Terminal weevil (Pissodes terminalis);
2. White pine weevil (Pissodes strobi); and
3. Mountain pine beetle (Dendroctonus ponderosae)
4. Bark and Engraver beetles

7.2.2.1 Terminal and White Pine Weevil

Terminal weevils are pests of open growing young pine and spruce trees, and can cause considerable deformity to a tree's main stem. They can cause a major impediment to the successful regeneration of pine and spruce trees. Sakâw will monitor the presence and impacts of weevils in plantations through regularly scheduled silviculture surveys. In the event that impact levels are deemed unacceptable, a site specific mitigation strategy will be developed by qualified professionals. According to recent MOE surveys, terminal and white pine (spruce) weevils are anticipated to remain at background levels in the near term (personal communication Rory McIntosh, Forest Entomologist, Dec 5, 2017).

7.2.2.2 Mountain Pine Beetle (MPB)

In addition to spruce budworm, the most significant and potentially devastating forest insect threat to Saskatchewan's forests is MPB, which at present is only found naturally in Saskatchewan in the Cypress Hills Inter-provincial Park area in association with lodgepole pine. In British Columbia this insect has killed millions of hectares of lodgepole pine forest and is moving eastwards. In 2006 and again in 2009, MPB breached the Rocky mountain Geophysical divide and scattered beetles as far east as the Slave Lake area of central Alberta. Since 2009 MPB has slowly spread through the Lodgepole/Jack pine hybrid zone and in 2010 research led by scientists at the University of Alberta, confirmed that MPB had attacked and colonized pure Jack pine in the eastern boreal forests in Alberta (Cullingham et al 2011).. Small numbers of MPB have since been captured in pheromone-baited trap-trees near Cold Lake, Alberta in 2015 (on the Alberta side of the Primrose Lake Air Weapons Range), but no significant attacks on Jack pine have been recorded yet. However in 2017, one baited tree was found to be positive only 27 km from the AB/SK border. MOE continues to collaborate with the Government of Alberta and has increased monitoring efforts in Saskatchewan near the Alberta border (personal communication Rory McIntosh, Forest Entomologist November 16, 2017).

MPB poses a risk to all pine forests, but because pine stands in the northern prairie and boreal regions are sparser and have lower volumes than lodgepole pine stands in British Columbia and adjacent Alberta expected losses in the boreal pine forests of Alberta, Saskatchewan, and Manitoba will likely be less than those experienced in British Columbia. Even under outbreak conditions average stand-level losses in the boreal forest are unlikely to exceed 30% of stems or 40-60% of standing volume (Nealis and Peter 2008, p 16).

Given the context of the impacts of the MPB in adjacent provinces, its spread represents a moderate threat to the PA FMA area. At the time of writing this report, no MPB treatment has been required.

Sakâw will be vigilant in detection of MPB infestations if they appear in the FMA area. Field crews and contractors will be educated on how to verify the presence of the bark beetle (red attack trees with pitch tubes, identification of beetle), and make reports to ministry staff.

In addition, Sakâw will harvest the forest profile in an attempt to remove decadent (old) pine stands which are ideal habitat for MPB. This will help create a less desirable host environment for MPB.

The Saskatchewan government has stepped up its monitoring program for MPB in the last 5 years, with a focus in Alberta at the eastern leading edge of the infestation spread. Two mass dispersal events occurred in 2006 and 2009, when the beetle breached the Rocky Mountains in British Columbia.

Currently, MOE has established and monitors a bait station program (one bait site per Township) throughout the western part of Saskatchewan, including inside the Cold Lake Air Weapons Range.

7.2.2.3 Bark and Engraver Beetles

Bark and Engraver beetles typically colonize stressed or old coniferous trees. The impact of bark beetles and engravers is characterized by beetles entering the cambium layer of softwood species. Adult beetles are attracted to stressed, down, or old conifers and bore into the stem of the tree creating galleries under the bark in the cambium layer where they lay their eggs. Once the eggs hatch, the larvae feed on the nutrient rich cambium layer, which results in girdling and killing the host tree.

Sakâw will ensure, to the extent practical with no pulp market, that harvest operations are conducted so as to minimize the amount of logging debris, slash piles and other potential habitat that may increase populations on a local scale.

7.2.3 Dwarf Mistletoe

Lodgepole pine dwarf mistletoe (*Arceuthobium americanum*) is a native obligate parasitic seed plant. It is one of most serious diseases of pines in western North America. Damage to host trees includes deformity, growth loss and mortality. This disease generally spreads slowly through the forest over many years. However, long-range dispersal can occur from movement of seeds by mammals and birds.[27]

Brandt et al. (1998) completed an aerial survey of the distribution of severe infestations of dwarf mistletoe in western Canada. Maps in this report show that the PA FMA area is highly infected. No quantitative data were collected in this study; however, the presence of the dwarf mistletoe in jack pine is visually quite pervasive and extensive.[28]

Sakâw considers dwarf mistletoe a ***low to moderate risk*** to the FMA area's forests because trees typically live following infection, and the spread of infection is slow. The impact of dwarf mistletoe is typically greater on drier forest sites occupied by pine, and log quality is negatively impacted.

[27] Saskatchewan Ministry of Environment , Forest Pest Fact Sheet

[28] Personal communication Rory McIntosh, Forest Entomologist, April 10, 2014

Because it is an obligate parasite, removing the host also removes the problem. For Sakâw, the most practical treatment for dwarf mistletoe is achieved through silvicultural practices such as:

- harvesting infected trees;
- buffering healthy pine plantations from areas of infected forest; and
- removing infection sources (residual trees > 1 m in height) from within harvested pine stands.

In alignment with Sakâw's ecosystem-based approach to forest management, the dwarf mistletoe parasite is an integral part of the boreal forest ecosystem. Complete eradication of the species is not the objective, nor the intended end result.[29] Sakâw will assess dwarf mistletoe infection in regenerating post-harvest areas when implementing the provincial regeneration assessment standards.

7.2.4 Armillaria Root Rot

Armillaria is a genus of soil borne fungi that causes root disease and mortality in a wide variety of plant species, but is of particular concern with commercial conifers in the FMA area, including spruce, pine, and fir.

Armillaria is not a significant threat to the FMA area's forest because its presence is considered during regular forest management practices. Sakâw will address the presence of Armillaria root rot, when necessary, at the forest operations level. Potential strategies include uprooting tree stumps post-harvest to expose and kill the Armillaria, or planting and managing for tree species that are less susceptible to the disease.

Sakâw will conduct silviculture assessments to follow up on the effectiveness of any root rot treatment strategies, in order to successfully achieve a free-growing stand.

7.3 Reassessment of Harvest Volume Schedule

Sakâw will reassess the HVS every 10 years and incorporate the effects of natural disturbances, previous 10-year history of forest fires, wind-throw, and major insect infestations or outbreaks that could affect the FMA area wood supply. Reassessment of the HVS every 10 years is an effective way of mitigating the risk that natural disturbances could compromise the sustainability of harvesting in the FMA area.

Reassessment of HVS may occur sooner than 10 years if more than 10% of the net area is impacted by stand replacing natural disturbance within the term of the FMP (see Indicator # 11 in Appendix A for details). This reassessment would focus on updating the HVS and would be consistent with the FMP Standard (Section 1-53).

[29] Background Document – Dwarf Mistletoe: Ecology and Management, Forest Service, Saskatchewan Environment, Rory L. McIntosh – March 2004.

8.0 Strategy for Plan Implementation

Sakâw shareholders will work co-operatively with Sakâw's General Manager to follow the strategic direction set out in this FMP. The General Manager will serve as the primary contact with the Forest Service. Upon approval of this plan, a Management Implementation Team (MIT) will be formed to monitor and guide implementation of the plan.

8.1 Management Implementation Team

The MIT will be comprised of Sakâw's General Manager, Sakâw shareholders, and representatives from the Forest Service (Area Forester, FMP Coordinator, FMP Analyst), other ministry branches, and the Public Advisory Group. The team will be chaired by Sakâw's General Manager and develop terms of reference consistent with FMP Standard (section 1-54) requirements that includes roles and responsibilities for:

- Participating at public meetings
- Reviewing operating plans for consistency with the tactical plan, and
- Assessing progress made on FMP registry commitments and VOITS

8.2 Operating Plans

Operating Plans are the primary tool for implementing this FMP. Consistent with MOE's requirements, Operating Plans will be developed to provide detailed information on proposed land base activities including harvesting and renewal, road building, and road deactivation. This plan must be approved by the MOE Forest Service and involves extensive engagement with First Nations and Métis communities, other rights and tenure holders, and the public. Providing detailed, site specific information allows individuals and groups to assess how proposed activities may affect their individual rights or interests. Comments received from individuals or groups will be recorded, considered by Sakâw shareholders as they finalize the plan, and presented to MOE for consideration during approval of Sakâw's plan.

This FMP also provides significant strategic direction to planners preparing the Operating Plans. For example, harvest locations will almost always be located within Tactical Plan blocks (VOIT 15), and harvesting will strive for large events whenever possible (VOIT 3) while avoiding harvest of old seral deferral areas (VOIT 2) and Caribou habitat management (VOIT 7c).

Sakâw's currently approved Operating Plan is available on the Sakâw website (www.sakaw.ca).

8.3 Consultation and Information Sharing

8.3.1 First Nations and Métis Engagement

Identifying, managing and potentially accommodating Aboriginal rights is a required part of resource management activities. Discussion about this management plan with First Nations and Métis communities has sought to identify where Aboriginal rights and traditional use may be affected by plan activities, and has sought to minimize them. Engagement with First Nations and Métis communities will also occur regularly during the term of the plan as part of the Operating Plan development. Additional opportunities for input occur when Sakâw seeks out traditional knowledge from First Nations and Métis groups (VOIT

#27) or if Aboriginal representatives become members of the Public Advisory Committee for the FMA area.

The ministry's duty to consult process is directed by The Government of Saskatchewan's First Nation and Métis Consultation Policy Framework (CPF). The CPF was approved by Cabinet in June 2010 and provides direction to all government ministries, Crown corporations and agencies.

The CPF applies to actions/decisions of government that have the potential to adversely impact the exercise of:

- Treaty and Aboriginal rights, such as the right to hunt, fish, and trap for food on unoccupied Crown lands and other lands to which First Nations and Métis have a right-of-access for these purposes; and
- Traditional uses of lands and resources, such as the gathering of plants for food and medicinal purposes and the carrying out of ceremonial and spiritual observances and practices on unoccupied Crown lands and other lands to which First Nations and Métis have a right-of-access for these purposes.

The duty to consult is triggered at a low threshold, which means that government consults on the basis of a "potential adverse impact" to a community's ability to exercise established and credibly claimed Treaty and Aboriginal rights and traditional uses. The duty to consult is not limited to project specific decisions/actions with immediate impacts on land and resources. "Strategic, higher level decisions" like FMPs, which guide future decisions, may also have the potential to adversely impact Treaty and Aboriginal rights and traditional uses.

During the development of the FMP, the Forest Service identified and contacted 29 potentially impacted First Nation and Métis communities. These 29 communities were first notified in 2013 of the commencement of the Prince Albert FMA Area 20-Year FMP development and will have been contact a total of six times, throughout the FMP development, at the completion of the FMP.

Further consultation opportunities will be provided (annually) by the ministry as Sakaw seeks to operationally implement these FMP strategies via Operating Plans.

8.3.2 Stakeholders and Other Tenure Holders Consultation

Sakâw shares the PA FMA area with other tenured rights holders. For example, other rights holders include outfitters who have rights to harvest wildlife, and snowmobilers who have rights to develop and use recreational trails. Sakâw shareholders must consider these other rights holders when conducting forest management activities. Sakâw has consulted with other tenure and rights holders in the development of this plan and considered the comments received.

Engagement with stakeholders has also occurred during the development of this FMP, and will occur regularly during the term of the plan as part of the Operating Plan development process. Additional opportunities for input exist if stakeholder representatives become members of the Public Advisory Committee for the FMA area.

8.3.3 Public Consultation

This plan has been presented to the public for comment in a series of open houses held throughout the FMA area for each of the Volume 1, Timber Supply Results, and Volume 2, and made available for comment on the Sakâw website. The public engagement reports from each of these engagement sessions is available on the Sakâw FMP website (http://www.sakaw.ca/fmp_working_documents.html) and the Volume 2 document is included here as Appendix F.

Engagement with the public will also occur regularly during the term of this FMP, as part of Operating Plan development.

8.3.4 Public Advisory Group

The Public Advisory Group (PAG) formed at the initiation of this FMP process has provided important input into the development of this plan. This group met 10 times over 5 years and participated in 2 field trips in the FMA area to look at riparian practices, stand level retention, regeneration success, and harvesting practices.

Sakâw will maintain a PAG with members who represent the variety of interests present within the FMA area. Two way communication with the group will continue, with education on forest management activities and outcomes, and input on topics such as protecting non-timber values of interest.

This PAG will meet a minimum of 2 times per year (VOIT #22). Summaries of these meetings will be provided on the Sakâw website.

8.3.5 Sustainable Forest Management Certification

Sakâw's shareholders intend to maintain third-party SFM certification for their operations within the FMA area. Certification provides the public with independent, third-party verification that forest management activities of Sakâw's shareholders are being conducted in a sustainable manner appropriate to the PA FMA area.

8.4 Management Challenges in the Prince Albert FMA Area

8.4.1 Economic challenges

In some of the FMA area the productive forest is found as distinct islands within a matrix of wetlands. Constructing permanent roads across these wetlands is cost prohibitive and would cause a high level of environmental impact. As a result some of the harvest opportunity in the PA FMA area is restricted to winter only. Finding "summer ground" can be a challenge for Sakâw shareholders. The amount of "winter only" harvesting opportunities creates an economic challenge for Sakâw stakeholders, especially shareholder contractors.

This economic challenge could be exacerbated by climate change, which is expected to reduce the duration of winter conditions.

8.4.2 Environmental challenges

*8.4.2.1 **Water quality, water quantity, and timing of flows***

Water is one of the highest priority issues for public as it can directly impact their daily life (flooding of property, supply of drinking and irrigation water, etc.). Risks to water values can vary by the type of waterbody (small steam vs large lake), when an impact occurs (high flow / low flow), and the proximity of the impact to values (fish habitat, water intakes, etc.).

The PA FMA area is generally of low relief without significant slopes, creating a low risk of sediment having an impact on water quality, particularly when appropriate riparian management strategies are utilized. In addition, the high ratio of wetland to productive forest can also reduce the risk of forest management impacting water quantity and timing of flow because of the buffering provided by water bodies.

Standards to ensure riparian areas are properly protected and stream crossings are properly constructed and maintained are in place. VOITs 18 and 19 measure Sakâw's compliance with these standards.

8.4.2.2 Natural disturbance emulation

Natural disturbance emulation is a primary challenge facing Sakâw and its shareholders. The boreal forest is a fire dominated landscape and the many wildlife species found in the boreal forest have adapted to the natural frequency and scale of fire disturbance, and the stand and forest structures it creates.

The challenge to Sakâw shareholders is to have their forest management practices emulate natural forest patterns, including the size and scale of historic disturbances. There is no intention to create extremely large disturbance events (>8000 ha) through forest harvesting but even large events approaching this size (4000-8000 ha) are likely to prove difficult due to the presence of people and non-timber values. The size distribution of harvest events created during the term of the Plan will be tracked under VOIT 3.

8.4.2.3 Access management, and road and trail density

Harvesting differs significantly from natural disturbance in the roads created to access timber. Many species, most significantly caribou, are negatively affected by the development of roads and trails. For species such as caribou it is important that the density of roads, trails and similar features be minimized. Once roads are built, public use of them for recreation often begins and then they become difficult to remove from the landbase.

Road access and road/trail density within the FMA area will be mapped and monitored as part of several new indicators. Key indicators that will control negative environmental factors and cumulative impacts related to roads are event duration (VOIT 20), size distribution of harvest events (VOIT 3), and disturbed area in caribou habitat (VOIT 7c).

8.5 Climate Change Considerations

Central Canada, Saskatchewan, is predicted to experience larger and faster impacts of climate change than other areas of Canada and the rest of the world.[30] Climate change has the potential to positively and negatively impact the forests and hydrology of the PA FMA area. Recent reports[31,32]indicate that climate

[30] Johnston, M., T. Williamson, E. Wheaton, V. Wittrock, H. Nelson, H. Hesseln, L. Vandamme, J. Pittman, and M. Lebel. *Climate Change Adaptive Capacity of Forestry Stakeholders in the Boreal Plains Ecozone*. Prepared for the Government of Canada's Climate Change Impacts and Adaptation Program, 2008.

[31] Barrow, E.M. (2009) Climate Change Scenarios for Saskatchewan; http://www.parc.ca/pdf/research_publications/summary_docs/SD2009-01.pdf

[32] Sauchyn, D. et. al. (2009) Saskatchewan's Natural Capital in a Changing Climate: An Assessment of Impacts and Adaptation; http://www.parc.ca/pdf/research_publications/summary_docs/SD2009-02.pdf

has already begun to change in Saskatchewan, demonstrated by some of the warmest annual temperatures on record in 1998, 2001, 2002, 2003, and 2004[33].

The predicted annual climate change conditions for Saskatchewan over the next 3-7 decades were calculated based on the Intergovernmental Panel on Climate Change (IPCC) scenarios[31]. By 2020 the Saskatchewan forested area will have predicted temperatures increase by 1-3 degrees. By 2050 the predicted increase is 2-5 degrees, and 2-7 degrees by 2080[31]. Precipitation levels are expected to vary over time from slight decreases, (1-5%) by 2020 and (0-2%) by 2050, to an overall increase of 10-12% by 2080.

The expected seasonal distribution of these conditions is significant. Increased temperatures will be most evident in the winter. Precipitation increases only in the winter and spring (up to 30%), mostly as rain. Summer precipitation decreases (as much as 10% in summer and 5% in the fall), delivered via short intense storms[31 32 34]. This is expected to result in longer, warmer summers that are drier in the mid- to late stages of the season. The predicted changes in Saskatchewan's climate will affect the hydrology, soil moisture, fire regime, and ultimately the plant communities growing within each ecosystem.

The main impact climate change will have on the landscape will be an increase in frequency and duration of droughts. Due to precipitation falling as rain in the winter, there will be reduced snow pack to fuel the base flow of watercourses on which many ecosystems rely. On a provincial scale, average long-term predictions are for reductions in stream flows[35]. The increase in precipitation occurring in the winter and spring will result in spring flood events and will not be enough to counter increased evapotranspiration caused by the longer, hotter, and more arid summer and fall seasons[30]. The result will be forest ecosystems limited in growth, reproduction and overall health due to lack of water (soil and surface). Studies are predicting future droughts will be like the drought experienced in the Prairies from 2001-2003, but more often and severe[34].

The second most important impact of climate change will be the fire regime. Changing climate and weather patterns dramatically alter wildfire activity. Based on predicted conditions, Saskatchewan could potentially have the largest increase in fire danger in North America[36]. New fire regimes could form bringing increased annual area burned, extended fire seasons, and increased fire frequency and severity[37]. The area burned in Canada is expected to increase 25% by 2030, and 74-140% by the end of the 21st century.

Plant communities will be affected by climate change in two ways. Increased CO_2 levels and CO_2 enrichment has the potential to enhance plant growth by increasing water use efficiency and CO_2 fertilization[34]. The warming climate will also extend the growing season and increase the amount of heat

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[33] Hogg, E.H. and P.Y. Bernier. Climate change impacts on drought-prone forests in western Canada. The Forestry Chronicle, 81(5), 2005.

[34] Qualtiere, E. *Impacts of climate change on the western Canadian southern boreal forest fringe*. Report prepared for Alberta Sustainable Resource Development, 2011.

[35] Pomeroy, J.W., Fang, X., Williams, B. (2009) Impacts of Climate Change on Saskatchewan's Water Resources

[36] Parisien, M-A., V. Kafka, N. Flynn, K. Hirsch, B. Todd, and M. Flannigan. *Fire behavior potential in central Saskatchewan under predicted climate change*. Prairie Adaptation Research Collaborative, 2005.

[37] Weber, M.G. and M.D. Flannigan. *Canadian boreal forest ecosystem structure and function in a changing climate: impact on fire regimes*. Environmental Reviews, 5(3-4), 1997.

units experienced in the PA FMA area. It can be expected that areas not affected by drought could experience an increase in productivity, potentially up to 40-60%[38]. Plant communities on the boundaries of their species ranges will be negatively affected by the warming climate because the rate of current climate change is faster than experienced in the past 100,000-200,000 years. Species migration and adaptations to the changing climate will likely not be fast enough to address the changes. Many plant communities will be affected by the above dramatic climate changes, but for the purpose of this document the effect on forest ecosystems will not be examined further.

8.5.1 Impact of Climate Changes on Forest Values

Warmer winters, increased precipitation in winter and spring, longer drier summers, and an increase in storm intensity and frequency may result in positive and negative influences on forest ecosystems (Table 22).

Table 22. Potential impacts of climate change on the PA FMA area forests

Positive Impacts	Negative Impacts
• More favourable growing conditions where sites are not moisture limited • Lengthened growing season • CO_2 enhanced growth	• Increased drought stress for vegetation on sites that are moisture limited • Increased fire frequency and intensity • Increased insect and disease outbreaks • Increased wind and mechanical (ice and snow) damage • Increased flooding and mass wasting events

It is important to understand how the FMP strategies outlined in this document could be negatively impacted by climate change. Vulnerabilities have been summarized relative to FMP indicators and targets in the table below. The single largest vulnerability is expected to be an increase in fire on the landscape, which can impact the management of age classes and volumes on the land base. This risk factor is being addressed by revisiting sustainable harvest levels every 10 years (with updated information) or sooner if significant areas are disturbed within the FMP term (see Section 7.3).

Table 23 Vulnerabilities of FMA area to potential climate change.

Indicator(s)	Potential Climate Change Impact	Response
1. Age class distribution on the FMA area's MFLB	An increase in disturbance (fire, wind, insect and disease) may alter age class distribution.	1. Monitor and report on area disturbed by fire, wind, insect and disease each year.
2. Proportion of the MFLB that is old or very old by species group within each of the FMA area's Ecological MUs	An increase in disturbance (fire, wind, insect and disease) may reduce the amount of old or very old age classes.	2. Update old/very old spatial reserve strategy if disturbance appears to have severely impacted old/very old reserves.
7. Area of Moose Habitat within the FMA area 8. Area of Fisher Habitat within the FMA area 9. Caribou Habitat in the FMA area	Increased disturbance (fire, wind, insect, disease) may reduce suitable habitat on the land base.	1. Monitor and report on area disturbed by fire, wind, insect and disease each year. 2. Increase forest resiliency by managing age class distribution.
12. Percent of harvested areas regenerated and assessed as free to grow (FTG) within the 14 year assessment window	1. Reduced regeneration success may occur on moisture limited sites because of drier summer conditions (drought).	1. Monitor and report on regeneration failures due to drought, fire, or other natural disturbances.

[38] Johnston, M. and T. Williamson. *Climate change implications for stand yields and soil expectation values: a northern Saskatchewan case study*. The Forestry Chronicle, 81(5), 2005.

Indicator(s)	Potential Climate Change Impact	Response
	2. Delays or setbacks in stand regeneration associated with impacts from increased disturbance (fire, wind, insect, disease).	2. Examine the potential for climate based seed transfer rules (use of seed that is more climatically suitable).
13. Cumulative area (ha) of net land base converted to other land uses by the licensee (e.g. roads, landing strips/pads, gravel pits).	Increased temperatures during the winter could reduce the ability to freeze in winter roads or result in earlier break-up.	1. Monitor the length of the harvest season each winter. 2. Examine the potential for more permanent roads for timber access.
15. Cumulative area of net land base impacted by stand-replacing natural disturbance (fire, wind, insect, disease)	Increase in the area impacted by stand replacing events such as fire, wind, insect, disease.	1. Monitor and report on area disturbed by fire, wind, insect and disease each year. 2. Support initiatives to decrease human caused fires on the FMA.
28. Spatial distribution of harvest volume 29. Distribution of harvest area within softwood operating zones and stand types	Increase in the area impacted by stand replacing events resulting in an increase in salvage operations. These salvage operations may not follow the planned spatial distribution.	1. Monitor and report on area disturbed by fire, wind, insect and disease each year. 2. Monitor the area that is salvage logged in the FMA.

9.0 Monitoring and Reporting

Monitoring and reporting are important components of Sakâw's forest management planning and operations processes. Ongoing assessments of progress will allow Sakâw to adjust forest management practices to meet short-term operational objectives and long-term FMP goals, objectives, and commitments.

Sakâw will conduct an annual monitoring program to document and report progress on the implementation of activities to meet objectives and commitments made in this FMP, as well as applicable regulatory requirements. Monitoring and reporting will be carried out under three categories:

- Operational Activities Summary,
- Silviculture Effectiveness
- Values, Objectives, Indicators, Targets (VOITs); and
- FMP Registry.

9.1 Operational Activities Summary

Operation activities monitoring will summarize the area harvested, the areas of reforestation activities, and the amount of roads built and reclaimed. Activities will be summarized as per the data submission standard.

9.2 Silviculture Effectiveness Monitoring

The outcomes of stocking and Free to Grow surveys will be reported and identify any non-compliances found in the surveys. Actions proposed to address the non-compliances will also be provided.

9.3 Values, Objectives, Indicators, Targets

A total of 33 VOITs were developed by Sakâw for this FMP, and are included in Appendix A. Regular reporting of these indicators will allow an assessment of how the FMP is being implemented and whether expected outcomes are being achieved. Appendix A provides details for each VOIT and how often each indicator will be reported on.

9.4 Forest Management Plan Registry

Pre-existing approval conditions and commitments will also be tracked and reported on. A total of 2 previous FMP approval conditions and commitments considered relevant for this FMP are presented in Table 4.

10.0 FMP Amendment Process

Sakâw has developed this FMP using the best information currently available, but it is not possible to cover every eventuality when developing a FMP due to the natural variability of forest ecosystems and the unpredictability of natural events. It is also impossible to account for changing and evolving social demands and changing market conditions.

Although it is not anticipated that this FMP will require an amendment or revision before its 10-year renewal in 2028, the FMP will be amended should any of the following circumstances take place:

- Catastrophic events (e.g., mill closures, government removal of area from the FMA area) or natural disturbance events (e.g., wildfire, wind-throw, mortality due to insect or disease infestations) affecting the forest resource exceeding the re-planning threshold, or regulatory changes to caribou management that severely limit harvesting;
- Sakâw shareholder utilization standards change significantly from those used in determining the HVS;
- Deviations to the tactical plan are required beyond the acceptable allowance; or
- Unanticipated circumstances arise that render the current plan at risk of not meeting the public interest on the FMA area.
- Operational planning or practices significantly deviate from the strategies/assumptions used to determine the HVS and a negative impact on the HVS is expected.

Sakâw will maintain an FMP Amendment Log for the duration of the FMP. All amendments, as well as the results of stakeholder consultation associated with the amendments, will be documented in the log.

If consultation on an FMP amendment is required, a work plan and public engagement plan will be developed for approval by the MoE Forest Service.

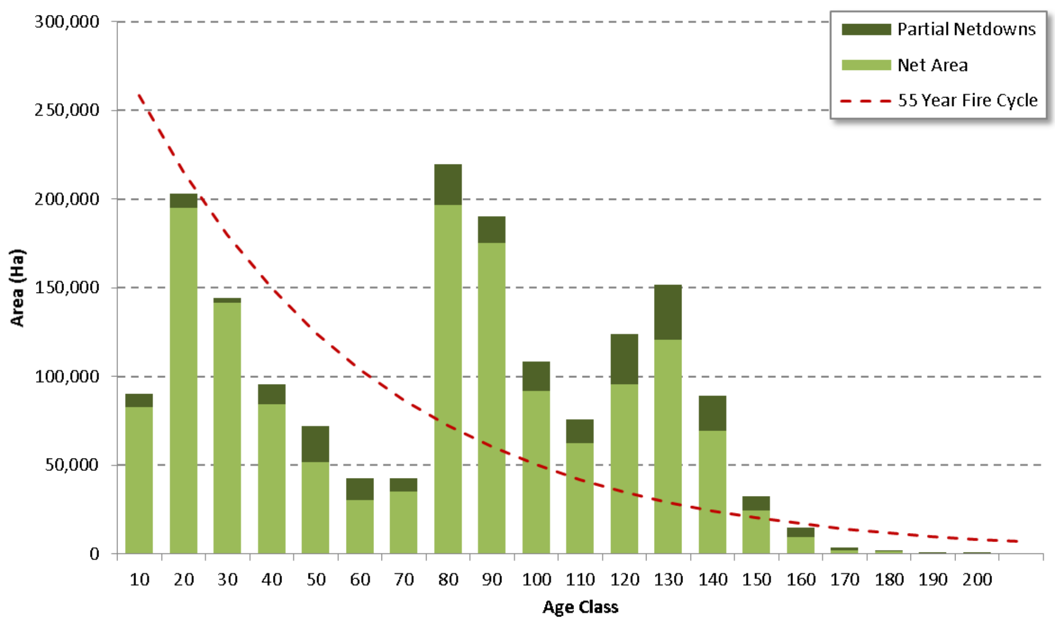
Appendix A Values, Objectives, Indicators and Targets

Indicator 1. Age class distribution on the FMA area Managed Forest Land Base (MFLB)

Criterion	1.0 Biological Diversity
Element	1.1 Ecosystem Diversity
Value	1.1.1 Natural Range of Variation
Objective	1.1.1.1 Conservation of the biological diversity of Saskatchewan's forests

Target:

Shift of the MFLB age class distribution of the FMA area towards the age class distribution associated with a 55 year fire cycle represented by the dashed line (a negative exponential curve) on the graph below.



Target Acceptable Level of Variance:

N/A

Timeframe to Achieve Target:

Shifting of the age class distribution is expected to begin immediately with current harvesting directed at older stands. However, it will take decades to make any significant progress toward the target age class distribution.

Strategy to Achieve Target:

Sakâw shareholders will harvest older stands first where they are not being retained to meet the old plus very old seral stage requirements.

Source of Management Data:

Most current PA FMA area forest inventory as updated annually for stand age (growth) and depletions from natural stand replacing disturbances and harvesting.

Monitoring and Reporting:

Reporting will be done every 5 years with assessment done after 10 years (2028).

Monitoring will include gathering harvest and other stand replacing disturbance datasets. Updates to the forest inventory will be done annually and include recognition of new stand ages (growth) and depletions from natural disturbance (ex. fire, wind, flood) and harvesting.

Reporting will compare the current age class distribution to the 2018 age class distribution shown above. As data becomes available, inclusion of previous year's data to indicate trends is recommended. Results will be provided in both tabular and graphical form.

Reporting will be for the MFLB (excluding parks, Representative Area Network [RAN] areas, recreation reserves, and similar areas excluded from management by Sakâw).

An example reporting table is provided below.

Monitoring Year:	**20__**					
Age class	2018 Age Class Distribution		20__ age class distribution		Long-term Target Distribution	
	Area (ha)	%	Area(ha)	%	Area (ha)	%
10	90,443	5.3%			232,494	14%
20	203,142	11.9%			201,544	12%
30	144,141	8.5%			174,714	10%
40	95,783	5.6%			151,456	9%
50	71,773	4.2%			131,294	8%
60	42,776	2.5%			113,816	7%
70	42,329	2.5%			98,664	6%
80	219,724	12.9%			85,530	5%
90	190,309	11.2%			74,144	4%
100	108,532	6.4%			64,274	4%
110	75,754	4.4%			55,717	3%
120	124,085	7.3%			48,300	3%
130	151,896	8.9%			41,870	2%
140	89,117	5.2%			36,297	2%
150	32,603	1.9%			31,465	2%
160	14,799	0.9%			27,276	2%
170	3,461	0.2%			23,645	1%
180	1,897	0.1%			20,497	1%
190	453	0.0%			17,769	1%
200	439	0.0%			15,403	1%
210	105	0.0%			13,353	1%
220	212	0.0%			11,575	1%
230	71	0.0%			10,034	1%
240	0	0.0%			8,699	1%
250	0	0.0%			7,541	0%
260	64	0.0%			6,537	0%
Total	**1,703,908**	**99.90%**			**1,703,908**	**101.00%**

Indicator 2. Amount of old and very old forest by species group within each of the FMA area's Ecological Management Units (EcoMU)

Criterion	1.0 Biological Diversity
Element	1.1 Ecosystem Diversity
Value	1.1.1 Natural Range of Variation
Objective	1.1.1.1 Conservation of the biological diversity of Saskatchewan's forests

Target(s):

The following table shows the targets for the MFLB in each Ecological Management Unit to be old or very old by species group.

Species Group Label	Description	% Old + Very Old	% Very Old
H	Hardwood stands	10%	5%
HS-SH	Mixedwood stands	8%	4%
S(BSJ+BSL)	Black Spruce and Jack Pine/Tamarack leading softwood stands	6%	3%
S(JLP)	Jack or Lodgepole Pine leading softwood stands	6%	3%
S(WSF)	White Spruce/Balsam Fir leading softwood stands	7%	3%

See Data Sources section below for definitions. The selected approach to meeting this target is a spatially defined set of reserve areas, identified in the tactical plan, where harvesting will not occur.

Target Acceptable Level of Variance:

Modifications to the approved spatial reserves can be made under the following circumstances:

1. A similar, suitable replacement is identified (same stand type, same ecological unit, similar or older age class); or
2. A replacement stand not meeting these criteria is agreed to by the Area Forester or Management Implementation Team (MIT); or
3. The reduction in a particular reserve area is less than 1 ha in size, and cumulatively this does not amount to more than 20 ha per EcoMU-Species combination over the term of the plan.

Unless the level of disturbance exceeds the replanning threshold (Section 7.3), impacts to the spatial reserves as a result of wildfire, wind or other catastrophic disturbance will not result in non-compliance and replacement areas need not be identified until the next FMP.

Timeframe to Achieve Target:

The spatial reserves meet target area requirements immediately but in some cases include younger stands that will reach target old/very old ages in the next few decades. These younger stands were included in the reserves due to a lack of old/very old stands and/or their location, proximity, additional values present, etc. made them desirable to include.

Strategy to Achieve Target:

Sakâw has established a set of spatially defined old and very old forest reserves designed to meet the percent requirements. Harvesting and road building will be excluded from these areas for the term of the plan. These reserve areas were selected and agreed to as part of the FMP process (shown on tactical plan maps).

The methodology used to develop the reserve areas is documented in the tactical plan section of the FMP document (Section 6.4, Old Seral Deferrals (OSD)).

Sakâw will track any modifications made to the spatial reserves during the term of the plan. Modifications can be made under the circumstances described under Variances above.

Source of Management Data:

Old and very old forest for species groups are defined as follows:

Cover Species Group	Young	Immature	Mature	Old	Very Old
H and HS (Hardwoods)	0 – 20	21 – 70	71 – 90	91 – 110	> 110
jP leading stands	0 – 20	21 – 70	71 – 90	91 – 110	> 110
S and SH (Softwoods not jP)	0 – 20	21 – 80	81 – 100	101 – 120	> 120

Initial retention areas were established using the 2017 FMP Planning File that contains inventory information, land base definitions, and the EcoMUs (see section 6.4).

Ongoing assessment will use Sakâw's GIS Layer identifying the old and very old seral retention areas.

Monitoring and Reporting:

Monitoring and reporting is to be done annually on the impacts to (intrusion into) the mapped retention areas. Annual reporting will summarize any areas impacted by harvesting or road building, and any impacts from natural disturbances. It will also summarize any offsetting additional reserves put in place.

Report will be completed through GIS analysis of the reserve areas relative to the previous years harvested area information (harvest areas and road right-of-ways) and any natural disturbance events.

Current Status of Indicator:

Refer to Section 6.4 for details of the initial old and very old seral retention areas.

Indicator 3. Size distribution of harvest events created or influenced by harvesting initiated after April 1, 2018

Criterion	1.0 Biological Diversity
Element	1.1 Ecosystem Diversity
Value	1.1.1 Natural Range of Variation
Objective	1.1.1.1 Conservation of the biological diversity of Saskatchewan's forests

Target and Acceptable Level of Variance:

Harvest event size distribution, as measured after 10 years (2028), will be as follows:

Harvest event size (ha)	Target % of Area Harvested	Acceptable Variance
<100	10%	+-10%
100-1500	65%	+-10%
>1500-3500	15%	+-10%
>3500-8000	10%	+-5%
>8001	0%	0%

Targets for large event sizes are low because it is expected that natural disturbance events will still create larger event sizes on the landbase.

Timeframe to Achieve Target:

The average harvest event size is to be achieved over a 10 year period, as more time than that is needed to implement larger events. Harvesting occurring prior to 2018 can contribute to event statistics where harvest during the plan term influences the event's size.

Event size distribution can change radically from year to year as old harvesting becomes >10 years old and new areas are harvested.

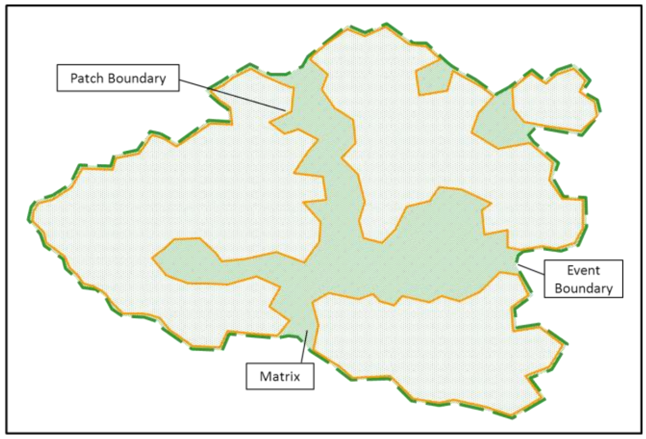
Strategy to Achieve Target:

Event planning will be a key focus of operational planning and be guided by the objective of minimizing active/open roads on the FMA area (get in, get out) to the extent practical. As it is expected to be difficult to meet the larger event size targets through harvesting, an ongoing focus is to be placed on identifying suitable areas for large events. MOE is currently developing guidelines for event planning at the operational level which Sakâw will follow once they are in effect.

Source Management Data:

Data for areas harvested in the FMA area that are ≤10 years of age at the time of assessment (but limited to harvesting implemented since Apr 1, 2018 or previous harvesting that is part of an event influenced by harvesting since Apr 1, 2018).

Harvesting event sizes are calculated using the total (gross) area of harvested areas under 10 years old found within 500m of each other plus the unharvested matrix between these blocks. Non-forested areas falling within the matrix areas are to be excluded from the event area.



Event example (harvest patch + matrix = event)

Monitoring and Reporting:

Monitoring will be completed annually to provide ongoing feedback (based on the Operating Year). After 10 years (in 2028), a comparison relative to the target size distribution will occur.

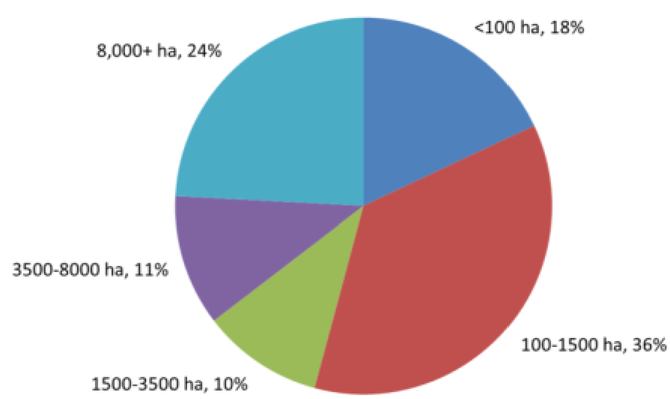
An example reporting table is provided below.

Monitoring year: 20__							
Harvest event size (ha)	Target % area	2018/2019	2019	2020	2021	2022	2023
<100	10%						
100-1500	65%						
1501-3500	15%						
3501-8000	10%						
>8001	0%						

Current Status of Indicator:

Event planning is a new concept for management on the FMA area. Events were introduced in the 2017/18 Operating Plan.

GIS analysis of the current forest inventory suggests that historical event sizes are heavily skewed to large events.



Event size distribution for all decadal Events – 2014 condition

Indicator 4. Area of retention left in harvested areas (excluding salvage harvest)

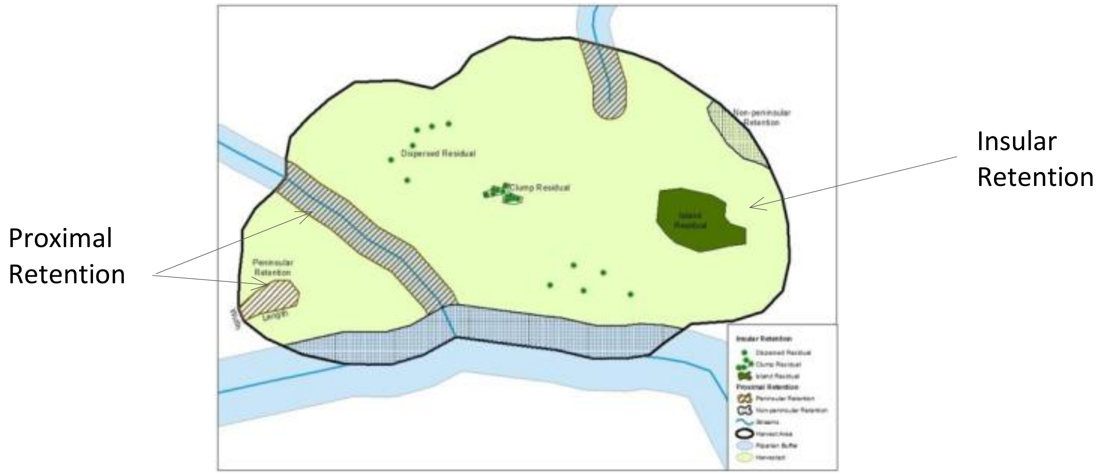
Criterion	1.0 Biological Diversity
Element	1.1 Ecosystem Diversity
Value	1.1.1 Natural Range of Variation
Objective	1.1.1.1 Conservation of the biological diversity of Saskatchewan's forests

Targets:

For events that contain at least 20ha of harvested area (no retention is required if <20 ha):

- Total Event Retention must be at least 9% of the harvested event area and made up of insular or proximal retention.
    - Insular Retention to be at least 4%
        - This retention must be trees in islands or clumps or singles with no connection to the external block boundary.
        - This retention must be representative, merchantable timber (i.e. similar stand types to what was harvested).
    - Proximal Retention to make up the remainder
        - This retention must be forest within/adjacent to the harvest area and connected to the block boundary.
        - Retained stands must be merchantable (≥ 60 m^3/ha) or if not merchantable, be approved by the Forest Service to meet the functional requirements of structural retention. Ideally, this forest captures riparian areas, wetland edges, springs, snags, species refuges, connectivity, or other forest left for non-timber values.
- Targets to be met on each event at the completion of harvesting, (e.g. variation can occur at the block level but not at the event level).

Salvage areas are excluded from the target, as retention in these areas is addressed by indicator 16. Areas with forest health concerns (i.e. mistletoe) preventing the retention of insular retention are also excluded from this target.



Target Acceptable Level of Variance:

1. Retention at the block level can vary widely as the target is measured at the event level.
2. Under achievement of the 9% event target is unacceptable unless for salvage or forest health reasons.
3. Overachievement of the 9% event target is acceptable for ecological or stakeholder reasons. Where excess retention occurs for economic reasons, it must be consistent with the criteria described in section 4.1 (Hardwood Retention for Economic Reasons).
4. Under achievement of the 4% insular retention target is unacceptable unless for salvage or forest health reasons. Overachievement is acceptable.

Timeframe to Achieve Target:

Targets to be assessed and achieved in the year following the completion of events.

Strategy to Achieve Target:

Sakâw shareholders will prescribe insular retention of 4% for each event to be harvested and it will be retained at time of logging. Each event will be targeted for 9% total retention.

Sakâw shareholders will get feedback from annual monitoring results and will vary levels of insular retention as necessary to achieve the target of 9% total retention in each event.

Source of Management Data:

Harvested areas and insular retention will be mapped using imagery. Where individual trees are retained and not visible on the imagery, photos of the retention and an estimate of trees/ha retained will be provided by Sakâw shareholders if they are to be counted.

Where proximal retention is used along the perimeter of the blocks, shareholder planners are expected to submit mapped retention areas to Sakâw for tracking in the GIS database.

Monitoring and Reporting:

The previous years' harvesting activities and retention will be reported on each year based on satellite imagery. Once all harvest blocks in an event are completed, the mapped harvest and retention areas will be used to assess the % retention (area retained/area harvested).

Insular retention for each harvested event will be measured by interpreting remotely sensed data for all harvested areas (e.g. aerial photographs, lidar, gps tracking of falling pattern, etc.) and/or post-harvest field assessment. Single trees will contribute based on basal area retained. For example, if 30 m^2 of basal area was retained in a harvest area and the average basal area for the stand was 15 m^2/ha, then the single trees would contribute 2 ha of retention toward the event total.

An example table for annual reporting is provided below.

Monitoring Year:	**20__**						
Event ID	**Event completed?**	**Harvest area (ha)**	**Clump/Island Insular retention (ha)**	**Single tree insular retention basal area equivalent (ha)**	**Total insular retention (ha) (%)**	**Total proximal retention (ha)**	**% Retention** **(Insular + Proximal)/ Harvest Area**
Total/Average							

Current Status of Indicator:

Historical practice in the FMA area is to leave an average of 3% retention. Retention often exceeds this level due to features like riparian areas or market issues.

Indicator 5. Softwood component in Hardwood (H) Cover Species Group (CSG) maintained

Criterion	1.0 Biological Diversity
Element	1.1 Ecosystem Diversity
Value	1.1.1 Natural Range of Variation
Objective	1.1.1.1 Conservation of the biological diversity of Saskatchewan's forests

Target:

Average softwood stocking density in FTG surveys on blocks that were H stands prior to harvest exceeds 200 stems per ha of softwood. Calculation based on the weighted average stocking in 5 years of harvest blocks.

H stands are defined as those containing ≥75% hardwood in the inventory. As most H stands are only surveyed for establishment at 7 years and then declared early FTG, Sakâw and the Forest Service will develop adjustment factors for estimating sph at FTG (14 yrs) from those present at year 7.

Target Acceptable Level of Variance:

Overachieving softwood densities is not a concern unless it compromises the objective of maintaining the pre-harvest stand type. There is no variance allowed for under achieving the target on blocks logged during the term of this plan. Stands logged and regenerated under previous FMPs are not subject to the target.

Timeframe to Achieve Target:

Reported annually starting in the 2018-19 operating year. Assessed once 5 years of harvesting has occurred and the harvested areas have regenerated to FTG ages (14 years). Only blocks logged after April 1, 2018 will be held to meeting the target.

Strategy to Achieve Target:

Renewal prescriptions in operating plans will adhere to the Silviculture Ground Rules (SGRs). If monitoring identifies that the target is not being achieved, Sakâw shareholders will target increased softwood. This could be accomplished through intensified softwood planting programs, using seed trees, direct seeding, intensified understory protection or other methods.

Source of Management Data:

Cutover summaries and forest inventory data identify the harvest areas that were H types prior to logging. FTG surveys completed on these areas will provide the density of softwood and hardwood stems for this H Cover Species Group.

Monitoring and Reporting:

Monitoring is to be undertaken each year following the completion of FTG silviculture surveys. Each surveyed area (previously H) will have a total number of hardwood and softwood stems per hectare identified. The total number softwood stems will be calculated for the surveyed area and then divided by the total area areas to get the weighted average softwood sph for all H types in the survey year. Where a new inventory is completed, it may be leveraged to assess this indicator.

Annual results will be averaged each 5 years, in 2023 and 2028.

Current Status of Indicator:

At the FMA area level, an average of 16% of the volume in H stand types comes from softwood species – as calculated using the merchantable yield curves for H stand types (see table 5 of Forest Estate Modeling Report). A density of 200 sph of softwood is assumed to approximate this volume because if reflects a density just less than the threshold which begins to define the boundary between H and HS is the MGM modeling work completed by Lane Gelhorn (see table below).

Stand type projections for 80 years after establishment based on stand densities at FTG.

	Hardwood Densities (sph)										Spruce Mixed @ 80 yrs	
Softwood (sph)	30000	20000	15000	10000	5000	4000	3000	2000	1500	1000	750	500	250
1500	SH	SH	SH	SH	SH	SH	SH	S	S	S	S	S	S
1250	SH	HS	HS	SH	SH	SH	SH	S	S	S	S	S	S
1000	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S
800	HS	HS	HS	HS	SH	SH	SH	SH	SH	S	S	S	S
600	HS	HS	HS	HS	HS	HS	HS	SH	SH	SH	S	S	S
500	HS	H	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	S
350	H	H	H	HS	HS	HS	HS	HS	SH	SH	SH	SH	S
200	H	H	H	H	H	H	H	HS	HS	HS	SH	SH	S
100	H	H	H	H	H	H	H	H	H	HS	HS	HS	SH

Indicator 6. Area of CSG (H, HS, SH, and S stand types) regenerated and predicted at rotation age relative to the harvested area of the same CSG

Criterion	1.0 Biological Diversity
Element	1.1 Ecosystem Diversity
Value	1.1.1 Natural Range of Variation
Objective	1.1.1.1 Conservation of the biological diversity of Saskatchewan's forests

Target:

The harvested area proportions of Cover Species Groups (CSG) H, HS, SH, and S should be the same as the regenerated area proportions (predicted at rotation) for that same CSG over a 5 year period.

Target Acceptable Level of Variance:

A 5% variance in the proportion of CSG harvested vs regenerated is acceptable. For example if 1000 ha were logged in the period being assessed, and 500 ha (50%) was in H stands prior to logging, the area of H stands regenerated (predicted at rotation) should be between 450 ha (45%) and 550 ha (55%).

Timeframe to Achieve Target:

Immediately, but the first assessment cannot occur until 5 years of harvesting has occurred and the area regenerates to FTG ages (14 years). Assessment of practices in previous FMPs will be undertaken during this FMP term.

Strategy to Achieve Target:

The SGRs (Section 4.1) are designed to ensure the distribution of stand types on the land base remain the same before and after harvesting. Planting prescriptions in operating plans will adhere to the SGRs. If monitoring identifies that the objective is not being achieved, Sakâw shareholders will revise their prescriptions accordingly.

Source of Management Data:

Harvest areas are tracked in the GIS system and pre-harvest stand types are identified from the forest inventory. FTG surveys will provide stem densities for hardwood and softwood species (note – where H stands are declared FTG early, an adjustment factor will be developed and applied to estimate the sph that would be present at FTG (14 yrs). SGRs provide predictions of CSG type at rotation for a range of hardwood and softwood densities at FTG age.

Since the first assessment cannot occur until 5 years of harvesting has occurred and areas have regenerated to FTG ages (14 years), the results of FTG surveys on areas harvested before this FMP came into effect will need to be used for assessing achievement of this target. For example, for the 2018/19 operating year, FTG survey results for areas harvested in 2011/2012 will be used.

Monitoring and Reporting:

Monitoring and reporting will be undertaken each year following FTG survey completion.

For the blocks surveyed in a given year, GIS will be used to attribute the areas with the pre-harvest stand type(s). E.g. H ≥75% hardwood (HWD), HS 50%-75% HWD, SH 25-49.9% HWD, S<25% SWD.

FTG survey results (density of SWD and HWD stems) will be used to predict CSG types at rotation using the tables provided in the SGRs. The areas of each CSG type will then be tallied.

Annual results will be averaged each 5 years, in 2023 and 2028.

Annual reporting will be for performance assessment only. Five year averages, 2023 and 2028, will be used for compliance assessment.

An example table for annual reporting is provided below.

Monitoring Year:	**20__ (Harvest from year____)**		
CSG Type	**Harvested Area (ha)**	**Area Predicted at Rotation (ha)**	**Difference (%)**
H			
HS			
SH			
S			
Total			0%

Current Status of Indicator:

Sakâw shareholders' operations are generally consistent with SGRs. Softwood is replanted at 800 or 1200 stems per hectare, or scarification is used.

Indicator 7a. Area of moose habitat within the FMA area

Criterion	1.0 Biological Diversity
Element	1.2 Species Diversity
Value	1.2.1 Quantity and Quality of Forest Habitat
Objective	1.2.1.1 Maintain habitat for identified forest dwelling species

Targets:

Every five years report the amount of moose cover habitat and browse habitat available in the FMA area relative to the amount predicted by forest estate modeling (see target areas under 'Current Status of Indicator' below).

Target Acceptable Level of Variance:

Habitat areas should be within 15% of the forecasted area where under industry control. Impacts from large scale natural disturbances are allowable variances.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

The 5 year monitoring report will identify the amount of moose browse and moose cover habitat present in the FMA area. This information will provide opportunity to discuss whether moose habitat is being adequately managed and whether modifications to forest management practices are required.

Source of Management Data:

The most current FMA area forest inventory, updated annually for stand age (growth) and depletions from natural disturbance (e.g. fire, wind, flood) and harvesting.

The data package for the PA FMA area (page 27) defines moose browsing habitat as stands < 20 years old, and moose cover habitat as stands > 50 years old belonging to species groups WSF, BSL, BSJ, JLP, PMW, SMW, HSM, and HPM.

Monitoring and Reporting:

Monitoring is to be undertaken every 5 years. GIS analysis will classify each stand in the FMA area as moose browse habitat, moose cover habitat, or neither. The area of moose browse habitat and the area of moose cover habitat within the FMA area will then be summarized.

An example table for reporting is provided below showing model predicted values for the first 5 years of the plan.

Monitoring Year:	**2023**	
Habitat Type	**Current Area Available (ha)**	**Predicted Habitat Area (ha)**
Moose Browse		302,216
Moose Cover		925,469

Each 5 years, 2023 and 2028, a map will also be produced.

Current Status of Indicator:

2017 Estimates from Forest Estate Modeling:

Period		**0**	**1**	**2**	**3**	**4**
Year		**0**	**5**	**10**	**15**	**20**
Moose Habitat	Cover	968,408	925,469	848,632	818,789	797,129
	Browse	260,117	302,216	305,086	361,733	282,115

Indicator 7b. Area of fisher habitat within the FMA area

Criterion	1.0 Biological Diversity
Element	1.2 Species Diversity
Value	1.2.1 Quantity and Quality of Forest Habitat
Objective	1.2.1.1 Maintain habitat for identified forest dwelling species

Targets:

Every five years report the amount of fisher habitat available in the FMA area relative to the amount predicted by forest estate modeling (see target areas under 'Current Status of Indicator' below).

Target Acceptable Level of Variance:

Habitat areas should be within 15% of the forecasted area where under industry control. Impacts from large scale natural disturbances are allowable variances.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

The 5 year monitoring report will identify the amount of fisher habitat present in the FMA area. This information will provide opportunity to discuss whether fisher habitat is being adequately managed and whether modifications to forest management practices are required.

Source of Management Data:

The most current FMA area forest inventory, updated annually for stand age (growth) and depletions from natural disturbance (e.g. fire, wind, flood) and harvesting.

The data package for the PA FMA area (page 27) defines fisher habitat as stands 50-120 year old belonging to species groups WSF, BSL, BSJ, SMW, and HSM and should be tracked in the following patch size categories <5,000ha, 5,000-10,000 ha, >10,000 ha.

Monitoring and Reporting:

Monitoring is to be undertaken every 5 years. GIS analysis will classify each stand in the FMA area for its value as fisher habitat or not. The area will then be summarized by patch size. Stands identified as fisher habitat and located within 500m distance of each other will be considered to be within the same habitat patch.

Each five years, 2023 and 2028, a digital map of fisher habitat will be produced.

An example table for reporting is provided below showing model predicted values for the first 5 years of the plan.

Monitoring Year:	**2023**		
Habitat Type	**Patch Size**	**Area of habitat within patches (ha)**	**Area predicted by Forest estate model (ha)**
Fisher	0-5000		231,085
	5001-10000		42,231
	>10000		10,974

Current Status of Indicator:

2017 Estimates from Forest Estate Modeling:

Period			**0**	**1**	**2**	**3**	**4**
Year			**0**	**5**	**10**	**15**	**20**
Fisher Habitat	0-5000ha	patches	251,085	231,056	217,636	205,606	208,450
	5K-10,000 ha	patches	49,325	42,231	52,872	32,100	29,361
	>10,000 ha	patches	59,163	10,974	0	0	0
	Total		359,573	284,261	270,508	237,706	237,811

Indicator 7c. Caribou habitat within the FMA area

Criterion	1.0 Biological Diversity
Element	1.2 Species Diversity
Value	1.2.1 Quantity and Quality of Forest Habitat
Objective	1.2.1.1 Maintain habitat for identified forest dwelling species

Targets:

1. No harvesting to occur within Caribou Habitat Management Zones – 'Current High Value Habitat' Deferrals.
2. No harvesting to occur within Caribou Habitat Management Zones – 'Near term and Future Habitat' after the first 10 years of the FMP.
3. Less than or equal to 35% of the gross area of the PA FMA area SK2 Range may be classified as disturbed at any time.

Note: Sakaw Caribou Habitat Management Zones are not the same as the Caribou Habitat Management Areas identified in the Government of Saskatchewan's range plan.

Target Acceptable Level of Variance:

Harvesting of blocks In Zone 1 is not allowed unless small incursions (<10 ha total 2018-2028) are necessary to address forest health, safety, or other non-timber values, or as otherwise approved by the Area Forester). Harvesting of blocks in Zone 2 is not allowed after the first 10 years of the FMP unless small incursions are necessary to address forest health, safety, or other non-timber values, or as otherwise approved by the Area Forester). Road building is allowed in all zones as necessary to access stands outside of the Caribou Management Zone 1.

Disturbance levels can exceed 35% by as much as 5% (total of 40%) during the term of the plan as long as there is a 30 year trend toward recovery to the 35% level. Short term variance is needed because of the significant recent wildfire activity in the FMA area. Approximately 125,000 ha of fire area will be recovering in the first 2-3 years of the plan.

Timeframe to Achieve Target:

Immediate implementation of Caribou Habitat Management Zones Disturbance targets considering variances are expected to be met throughout the plan timeline.

Strategy to Achieve Target:

No new harvesting will be planned within Caribou Management Zone 1.

No new harvesting will be planned after 10 years in Zone 2. Harvesting in the first 10 years will be focused in disturbed areas (close to existing road or young stands) to the extent that the tactical plan allows for this, and completing harvest so road systems can be reclaimed.

Restoration of existing linear features will occur where prioritized and funded by the government. Road building will be avoided whenever a reasonable alternative exists. In Zone 2 any linear features built during the first 10 years of the plan will be restored within 2 years after harvest.

Source of Management Data:

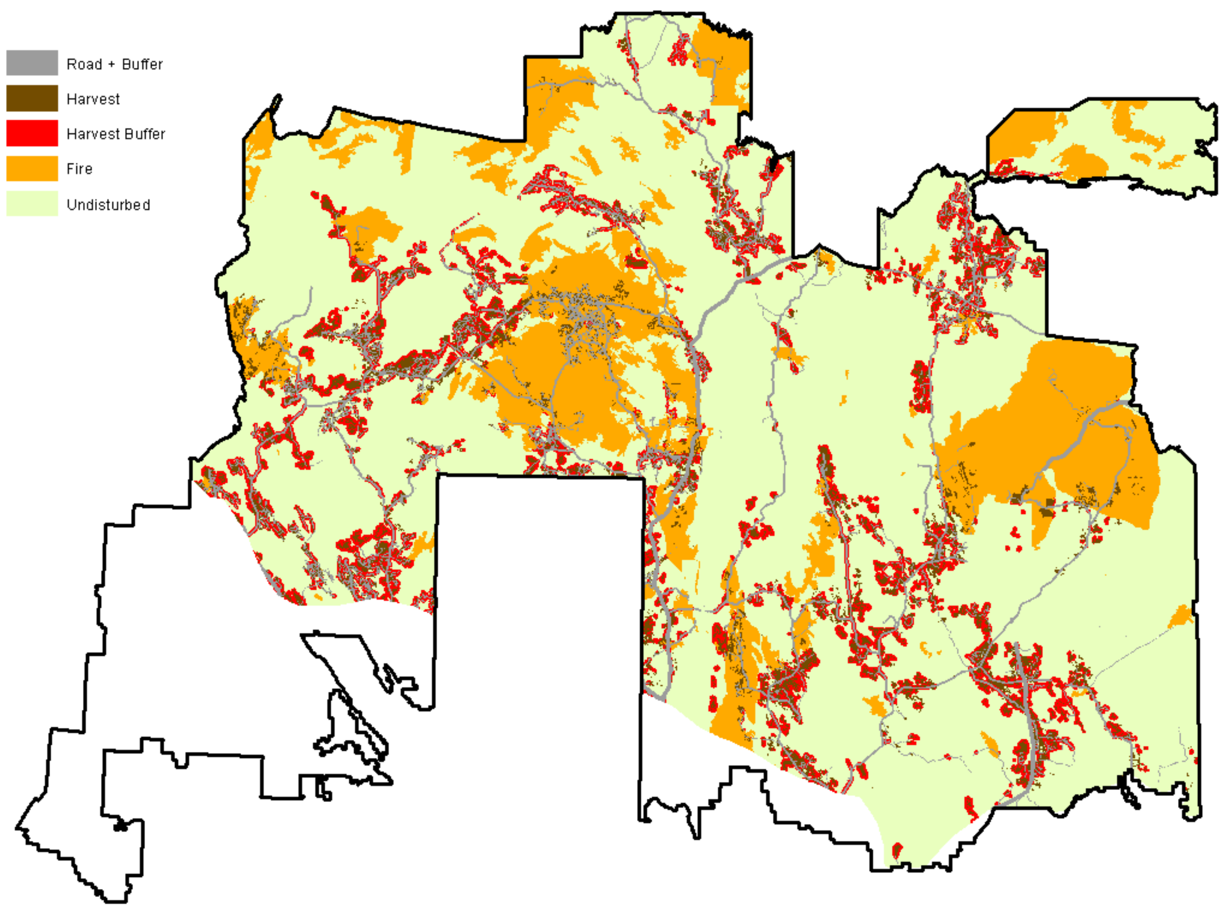
GIS layer of the Caribou Management Zones, and disturbed areas since the start of the FMP term. Roads and other linear corridors from Sakâw's GIS system.

Monitoring and Reporting:

Annually, the area harvested inside the Caribou Management Zones and the total disturbed area will be summarized and reported. Definitions for disturbance and associated buffers (roads and harvesting) can be found in section 5.2.2. Disturbance will be assessed for compliance every 5 years.

Current Status of Indicator

This is a new indicator; the Caribou Management Zones are established with the approval of this plan. The current disturbance level is at 34.8% using the assumptions put forward in this FMP.



Disturbance Classification in 2017

Class	**Area (Ha)**	% of Area
Linear Buffers	177,822	6.2%
Harvested Areas	122,172	4.3%
Fire Disturbance	498,176	17.5%
Harvest Buffers	194,677	6.8%
Undisturbed	1,861,688	65.2%
Grand Total	**2,854,537**	100.0%
% Disturbed	34.8%	

Indicator 8. Percentage of planted seedlings from wild seedlots and improved seedlots

Criterion	1.0 Biological Diversity
Element	1.3 Genetic Diversity
Value	1.3.1 Natural Genetic Diversity
Objective	1.231.1 No loss of natural genetic diversity through forest management activities

Targets:

100% of seedlings planted are produced from non-genetically modified seed sources and the use of improved seed stock is maximized.

Target Acceptable Level of Variance:

No variance allowed on genetically modified seed. Improved seed is encouraged but has not been assumed to be used in this FMP so is use can range from 0 -100%.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Sakâw shareholders will purchase seedlings only from those growers verifying that no genetic modifications are present in the seedlings being purchased, and that seed sources are limited to seed collected from natural sources and/or seed collected from improved stock.

Sakâw shareholders will continue to use existing stores of improved (plus) seed and attempt to procure additional improved seed from the current orchard or other sources.

Source of Management Data:

Sakâw shareholder seedling purchase or production records. Seedling purchases will record seed source.

Monitoring and Reporting:

Monitoring is to be undertaken each year following planting season.

Review of planting records will classify the number of seedlings purchased and their seed source as 1) collected from natural sources, 2) collected from improved stock, or 3) genetically modified stock.

Reporting will occur annually and be summarized each 5 years, in 2023 and 2028.

An example table for annual reporting is provided below. This reporting table is also suggested for indicator 11.

Monitoring Year:	**20__**								
Year	Total number seedlings planted	Seed collected from natural sources (A)		Seed collected from improved stock (B)		Seed collected from (C) genetically modified stock		% Wild Stock	% Imprv Stock
		# of seedlings planted	% of total seedlings planted	# of seedlings planted	% of total seedlings planted	# of seedlings planted	% of total seedlings planted		
2018 /19									
2019									
2020									
2021									
2022									
2023									
…									

Current Status of Indicator:

100% of all seedlings currently used by Sakâw shareholders are grown from wild seedlots.

Almost all white spruce seed currently used by Sakâw shareholders is improved (plus) seed picked from a seed orchard near Prince Albert formerly owned by Weyerhaeuser, and being stored at PRT's Prince Albert nursery. There are also stores of improved jack pine seed from this orchard in storage at PRT, although that species is currently not being planted on the FMA area.

This orchard is now held privately and is no longer being maintained, so future cone collections are uncertain.

Indicator 9. Percent of harvested areas that are free-to-grow (FTG) within the 14 year assessment window

Criterion	2.0 Ecosystem Condition and Productivity
Element	2.1 The stability, resilience and rates of biological production in the forest ecosystem
Value	2.1.1 Natural Ecosystem Processes
Objective	2.1.1.1 Maintain the stability, resilience and rates of biological production in forest ecosystems

Targets:

100% of blocks will meet FTG standards as set out in SGRs and the Forest Regeneration Assessment Standard.

Target Acceptable Level of Variance:

Up to 2% of the area harvested by harvest year can exceed the 14 year timeframe to achieve FTG status.

Timeframe to Achieve Target:

Blocks have up to 14 years after harvest to meet FTG standards.

Strategy to Achieve Target:

Sakâw shareholders will undertake planting and other silvicultural treatments as necessary to achieve FTG status within 14 years of harvest. These treatments are described in the SGRs (Section 4.1)

Sakâw shareholders will conduct interim assessments of previously harvested blocks by 7 years after harvest, and as necessary to identify any additional treatments required to ensure FTG status will be achieved within the allowable period.

Source of Management Data:

Sakâw shareholder's harvesting and free growing assessment records.

Monitoring and Reporting:

Each year starting in 2025, FTG assessments will be conducted in areas harvested up to 14 years earlier. The surveys will indicate if the areas or portions of them are FTG or not, under rules set out in the Forest Regeneration Assessment Standard. The percentage of area found not to meet FTG standards will be reported.

Data will be summarized for the previous five year period. Both annual and five year reporting will be used for assessment purposes.

An example table for reporting is provided below. The table begins with 2011, which was the first year of operations by Sakâw shareholders.

Monitoring Year:	**20__**		
Year of harvest	**Area of blocks where harvest recorded as completed**	**Year by which FTG must be achieved**	**% of Area achieving FTG status** as of monitoring year
2011-12		**2025**	0
2012		**2026**	0
2013		**2027**	0
2014		**2028**	0
2015		**2029**	N/A
2016	N/A	**2030**	N/A
…			

Current Status of Indicator:

No free growing assessments are due by Sakâw till 2025.

Indicator 10a. Cumulative area (ha) of Managed Forest Land Base (MFLB) converted to other land uses by the licensee (e.g. roads, landing strips/pads, gravel pits etc.).

Criterion	2.0 Ecosystem Condition and Productivity
Element	2.1 The stability, resilience and rates of biological production in the forest ecosystem
Value	2.1.1 Natural Ecosystem Processes
Objective	2.1.1.1 Maintain the stability, resilience and rates of biological production in forest ecosystems

Targets: <300 ha of net land base converted to other land uses by the licensee (e.g. roads, landing strips/pads, gravel pits, etc.) annually.

Target Acceptable Level of Variance:

A 25% variance is allowed around the annual limit, and a 5% variance is allowed on 5 year cumulative totals.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Sakâw shareholders will minimize loss of forest lands to roads, landing strips/pads, gravel pits, etc. by designing harvest and other developments to achieve an appropriate balance of harvesting efficiency and loss of forest lands to roads and other permanent structures. All in-block spur roads will be reclaimed according to standards within 2 years of harvest. Inter-block roads are reclaimed when harvesting along the given road system is complete.

Source of Management Data:

Sakâw records of permanent access development.

Monitoring and Reporting:

Monitoring is to be undertaken each year to report on the amount of permanent access created during the previous year.

Permanent structures will be roads, gravel pits, etc. having a projected lifespan of >5 years. Class 1 and 2 roads are considered permanent access structures. Gravel borrow pits < 0.1ha, and winter roads where the soil has not been significantly compacted or exposed will not be considered permanent structures.

The area attributed to permanent access is to be that portion of the right-of-way that will not be able to grow trees. This is assumed to be the road's running surface and ditches (Class 1 - 12m, Class 2 - 10m width).

An example reporting table is provided below.

Monitoring Year:	**20__**			
Year	**Area of managed forest land base converted to other land uses in the previous harvesting year**			
	Class 1 Road	**Class 2 Road**	**Gravel Pit, etc.**	**Total**
2018-2019				
2019				
2020				
2021				
2022				
2023				
2024				
2025				
2026				
2027				
2018-2027				

Current Status of Indicator:

Development of permanent access is minimized by Sakâw with approximately 75-200 ha being built per year. All permanent access created by Sakâw shareholders is recorded within Sakâw's GIS system.

Indicator 10b. Cumulative area (ha) added to the Managed Forest Landbase (MFLB) through reclamation of permanent roads, afforestation, etc.

Criterion	2.0 Ecosystem Condition and Productivity
Element	2.1 The stability, resilience and rates of biological production in the forest ecosystem
Value	2.1.1 Natural Ecosystem Processes
Objective	2.1.1.1 Maintain the stability, resilience and rates of biological production in forest ecosystems

Targets:

≥ 0 ha per year rehabilitation of permanent access structures or afforestation.

Note: Afforestation is the act of establishing productive forests on lands considered non-productive. An example is planting abandoned fields. There is little expectation that Sakâw's shareholders will be undertaking road reclamation or afforestation projects that are not required by government.

Target Acceptable Level of Variance:

No variance.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Sakâw shareholders may choose to undertake rehabilitation of permanent access structures no longer required for forest management to improve caribou habitat, and/or may choose to undertake other afforestation efforts.

Rehabilitation and afforestation will increase the forested land base and will benefit forest dwelling species and timber supply.

Source of Management Data:

Sakâw GIS records of reforestation and afforestation efforts.

Monitoring and Reporting:

Monitoring is to be undertaken annually and report on any afforestation efforts or rehabilitation of permanent access structures. Areas of overlap will be considered as being rehabilitated or afforested.

An example reporting table is provided below. This table is also suggested for indicator 13.

Monitoring Year:	**20__**			
Year	**Area of managed forest land base reclaimed in the previous harvesting year**			
	Class 1 Road	**Class 2 Road**	**Gravel Pit, etc.**	**Total**
2018-2019				
2019				
2020				
2021				
2022				
2023				
2024				
2025				
2026				
2027				
2018-2027				

Current Status of Indicator:

Sakâw has completed no afforestation or rehabilitation of permanent roads to date.

Indicator 11. Area (ha) of net land base impacted by stand-replacing natural disturbance (fire, wind, insect, disease).

Criterion	2.0 Ecosystem Condition and Productivity
Element	2.1 The stability, resilience and rates of biological production in the forest ecosystem
Value	2.1.1 Natural Ecosystem Processes
Objective	2.1.1.1 Maintain the stability, resilience and rates of biological production in forest ecosystems

Targets:

Maximum of 132,300 hectares (10%) of net land base disturbed by natural disturbance each 10 years (April 1, 2018 to March 31, 2028)

"Disturbed" is defined as a stand replacing event >10 ha, where there is loss or death of ≥50% of the volume in a stand).

Target Acceptable Level of Variance:

No variance. Once the threshold of 10% of the net land base is met, a new HVS assessment is triggered to examine the sustainability of the current HVS in light of significant losses from natural disturbances.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

<u>Determine net land base area:</u>

Annually, Sakâw shareholders will track the area of 'stand replacing' natural disturbance events greater than 10 hectares in area. Using GIS analysis the area of net land base impacted within the total FMA area will be determined. (See Section 2.2 Land Base Definitions)

<u>Determine how much of the net land base area is significantly impacted:</u>

As resources allow, Sakâw shareholders will refine the net land base impacted calculation to establish the actual area of 'stand replacing' disturbance within it. Undisturbed or not significantly disturbed areas within it will be determined and GIS analysis used to calculate the area of "significantly disturbed" net land base.

Source of Management Data:

Inventory of natural disturbances and the actual pattern of disturbance intensity may be obtained from the Province or directly collected by Sakâw.

Monitoring and Reporting:

Monitoring is to be undertaken each operating year, to assess and reporting on disturbances occurring during the previous year. Monitoring will also to determine if a re-assessment of the HVS is required.

Sakâw will, for each natural disturbance event during the previous year, record and report the extent of the disturbance. In following years, for each natural disturbance event, Sakâw will, as information becomes available, report the actual area of net landbase within the events extent that is significantly affected. Productive forest shall be considered significantly affected by natural disturbance when the losses to total stand volume meet or exceed 50%.

An example reporting table, with some example data included, is provided below.

Monitoring Year: 2018-2019					
Year of Natural Disturbance	**Event ID (natural disturbance events >10ha)**	**Total FMA area (ha)**	**Net land base area (ha) A**	**"Significantly disturbed" net land base area** (reduction of volume ≥50%) **B**	**Lesser of columns A and B**
2018-2019					
2019-2020					
…					
Cumulative area of natural disturbance within the net land base 2018-2028					

Current Status of Indicator:

The 2015 Philion fire's gross boundary included 68,834 ha of net land base (all ages) and was included in the planning inventory when timber supply was assessed for this FMP.

Indicator 12. Proportion of each natural disturbance event >100 ha that is salvage harvested

Criterion	2.0 Ecosystem Condition and Productivity
Element	2.1 The stability, resilience and rates of biological production in the forest ecosystem
Value	2.1.1 Natural Ecosystem Processes
Objective	2.1.1.1 Maintain the stability, resilience and rates of biological production in forest ecosystems

Target:

A contiguous area (where possible) covering at least 20% of each stand replacing disturbance event will be reserved from all harvesting activities for a rotation. Where possible, the area reserved from harvest will be free of roads, trails and skid trails and made up of timber representative of the stand types/ages impacted by the disturbance. For example, if 25% of a fire impacted immature stands, 25% of the unsalvaged area can be immature.

Within salvage areas, follow standard retention practices (Indicator 4) using live trees where possible. Where there are insufficient live residuals, burned or damaged timber can be used to meet the residual target and left in clumps and islands to address safety concerns.

A natural disturbance event is defined as a largely contiguous area of stands with >50% stand mortality covering at least 100 ha.

Target Acceptable Level of Variance:

Where continuous areas of retention cannot be found, a collection of smaller areas is appropriate.

The presence of existing roads/trails can limit the ability to define retention areas that are free of roads and trails.

Forest health issues like mistletoe may limit the ability to leave 9% retention in/and around salvage areas.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

When salvage harvesting in natural disturbance events > 100 ha, a contiguous area (where possible) covering at least 20% of the area will be left unharvested.

9% of salvage harvest area will be left as retention, with live trees preferred over dead stands.

Source of Management Data:

Mapping of salvage harvest areas and the retention areas associated with them.

Monitoring and Reporting:

Monitoring is to be undertaken each year to identify natural disturbance events (>100 ha) and the percent salvage harvested. Disturbance events <100 ha can be ignored.

An example reporting table is provided below.

Monitoring Year:						
Natural Disturbance Event Area (ha)	**Type of Damage (fire, wind, insects, disease)**	**Area Salvage Harvested (ha)**	**Insular Retention (%)**	**Area of Contiguous Retention (ha)**	**% of Continuous Retention**	**Meets ≥20% Retention (Y/N)**

Current Status of Indicator:

Sakâw is currently leaving 20% retention in blowdown salvage blocks.

Indicator 13. Harvested volume/ha relative to yield curve estimates

Criterion	2.0 Ecosystem Condition and Productivity
Element	2.1 The stability, resilience and rates of biological production in the forest ecosystem
Value	2.1.1 Natural Ecosystem Processes
Objective	2.1.1.1 Maintain the stability, resilience and rates of biological production in forest ecosystems

Targets:

Harvested volumes are within 15% of the volume estimates predicted by FMP yield curves for hardwood, softwood sawlogs, and softwood pulp.

Target Acceptable Level of Variance:

Harvested volumes/ha are within ± 15% of the yields used during timber supply modeling.

Timeframe to Achieve Target:

To be assessed using 5 years averages.

Strategy to Achieve Target:

None.

Source of Management Data:

Mapped areas of harvest and retention.

Forest inventory strata and associated yield curves.

Scaled volume linked to specific harvest blocks where harvesting is complete, plus some recognition of scattered single tree inblock retention where necessary.

Monitoring and Reporting:

Monitoring is to be undertaken every 5 years. It is necessary to have a reasonable sample of blocks for the assessment to be meaningful.

Predicted volumes as provided by approved yield curves will be linked to harvest block areas using forest inventory strata/current stand ages and then total volume (hardwood, softwood, pulp) for all harvest blocks will be determined. Mapped retention areas should be excluded from the calculation areas. The average predicted volume/ha harvested can then be calculated as total volume/total area. This will be compared to actual delivered volumes from harvested areas/total area (HWD, Softwood Sawlog, Softwood Pulp). Where utilization changes occur, this will need to be considered when reporting.

An example summary table, as would be provided in an annual report, is provided below.

Monitoring Year:	**20__**		
Harvesting year	**Actual harvest (m3/ha)**	**Predicted harvest (m3/ha)**	**% difference – actual to predicted**
2018-2019			
2019-2020			
…			
…			
…			
2018 -2022			

Current Status of Indicator:

No data currently exists. Block by block variance is expected to be significant. However it is assumed that across the FMA area, all harvesting combined, the target of 15% maximum variation for all species combined will be achieved.

Indicator 14. Adherence to approved utilization standard

Criterion	5.0 Economic and Social Benefits
Element	5.1 Economic Benefits
Value	5.1.1 Sustainable Economic Benefits over the term of the FMP
Objective	5.1.1.1 Maximize the economic benefits derived from the forest without compromising the integrity of the forest ecosystem.

Targets:

Operating plans adhere to approved utilization standards (or exceed them), and 95% of all blocks inspected for utilization are found to be in compliance over a 5 year period (assessed in 2023 and 2028).

Utilization standards are described in the PA FMA Area Modeling Assumptions document (Table 18) and below.

Timber Product	Maximum stump height	Minimum Merch Ht (m)	Minimum Top dib	Min Log length
Softwood sawlog	30cm	5.35m	10cm	2.6m
Softwood pulpwood	30cm	5.35m	8cm	2.4m
Hardwood	30cm	5.35m	8cm	Tree length

Target Acceptable Level of Variance:

1. Alternative top diameters can be used in place of the default standards where operating plans have approved the change in utilization.
2. Up to 5% of blocks assessed for utilization can be found to be in non-compliance over 5 year periods.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Harvesting contractors will be instructed to meet the utilization standard.

Source of Management Data:

3. Operating Plan text commitments to utilization standards.
4. MOE inspection records assessing utilization.

Monitoring and Reporting:

Monitoring is to be undertaken each year. Sakâw will obtain compliance inspection records for the previous year from the MOE and consolidate any non-compliance related issues. Reporting will show the number of harvested areas inspected for utilization and any proportion found to be in non-compliance annually and cumulatively over 5 year periods. Annual monitoring will be completed but the 5 year average will be used for assessment purposes.

An example reporting table is provided below.

Monitoring Year:	**20__**			
Inspection Year	**# of blocks inspected by the Ministry for utilization**	**# blocks assessed as being in non-compliance for utilization**	**% of blocks assessed as being in non-compliance for utilization**	**Compliance minimum of 95% achieved (Y/N)**
2018/19				
2019				
2020				
2021				
2022				
Inspection period 2018-2022	5 yr average % in compliance			

Current Status of Indicator:

Sakâw generally meets or exceeds utilization standards.

Indicator 15. Percent of harvested areas falling within approved tactical plan areas

Criterion	2.0 Ecosystem Condition and Productivity
Element	2.1 The stability, resilience and rates of biological production in the forest ecosystem
Value	2.1.1 Natural Ecosystem Processes
Objective	2.1.1.1 Maintain the stability, resilience and rates of biological production in forest ecosystems

Targets:

No more than 15% of mapped Sakâw shareholder harvest areas fall outside of identified tactical plan areas (Decade 1 or 2 – see Appendix E). Third party harvesting will be encouraged to fall within the tactical plan blocks where possible.

Target Acceptable Level of Variance:

The target can be exceeded only where approved salvage harvesting is required, or where the inventory data used to create the tactical plan blocks was incorrect and harvesting is following the intent of the plan (these instances do not count toward the target). Harvesting by third parties also does not count toward the target because Sakâw has limited control over their activities.

Timeframe to Achieve Target:

Immediately. The first assessment against the target will take place in five years (2023).

Strategy to Achieve Target:

Sakâw shareholders will plan harvests to fall within those areas selected for harvest in the tactical plan.

Some areas may be harvested outside the tactical plan as necessary to meet shareholder objectives and address any salvage requirements.

Source of Management Data:

Sakâw tactical plan shapefiles (Decade 1 and 2) and actual harvest areas mapped post-harvest (maps shown in Appendix E).

Monitoring and Reporting:

Monitoring is to be undertaken each year and will examine the overlap between tactical plan areas with actual harvest areas from the previous harvesting year (less any exempt areas described under variances above).

Annual reporting will be done for information only. Cumulative results for five year periods will be summarized in 2023 and 2028, and used for assessment purposes.

An example reporting table is provided below.

Monitoring Year:	**20__**			
Year	Total harvested area (ha)	**Total Harvested Area Within Tactical Plan Harvest Polygons (ha)**	**Total Harvested Area Outside of Tactical Plan Harvest Polygons* (ha)**	**% of Actual Harvest Area occurring outside of Tactical Plan harvest polygon**
2018				
2019				
2020				
2021				
2022				
2018-2022				
2023				
2024				
2025				
2026				
2027				
2023-2027				

Less any areas exempt for salvage harvesting or stakeholder reasons

Current Status of Indicator:

This indicator has not been used or tracked previously in the FMA area.

Indicator 16. Harvest blocks comply with provincial standards for soil disturbance

Criterion	3.0 Soil and Water
Element	3.1 Quality and Quantity of Soil and Water
Value	3.1.1 No loss of quality nor quantity of soil and water
Objective	3.1.1.1 Maintain and/or enhance the quantity and quality of soil and water

Targets:

100% of MOE inspected harvest blocks comply with provincial standards for soil disturbance.

Target Acceptable Level of Variance:

Where a non-compliance occurs and is addressed within the timeline identified in the MOE approved action plan, it will not be counted against this target.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Sakâw shareholders and their contractors will operate within the approved standards for soil disturbance and where non-compliances occur, prompt action is taken to complete any MOE approved action plans.

Source of Management Data:

MOE inspection records assessing compliance with soil disturbance standards.

MOE/Sakâw shareholder records of non-compliance action plans and timelines to resolve the issue.

Monitoring and Reporting:

Monitoring will be undertaken each year, based on MOE compliance inspection records for the previous year and Sakâw's records of inspections/followup.

For all inspections that included an assessment of compliance with standards for soil disturbance, Sakâw will record whether the harvest block was initially in compliance or not, and whether non compliances were resolved within the MoE defined timeframe.

Note: This reporting will be for performance assessment only. Legal compliance enforcement action may occur if an inspection finds a Sakâw shareholder in non-compliance with soil disturbance standards.

An example reporting table is provided below.

Monitoring Year:	**20__**		
Inspection Year	**# of harvest blocks inspected by the Ministry**	**# harvest blocks assessed as being in compliance with soil disturbance standards at time of inspection**	**# harvest blocks assessed as being in compliance with soil disturbance standards after approved action plan timelines**
2018-2019			
2019-2020			
…			

Current Status of Indicator:

Sakâw shareholders assess blocks for soil disturbance during their regular harvesting inspection and work with their harvesting contractors to maintain soil disturbance below maximum levels.

Indicator 17. Harvest blocks comply with provincial standards for road reclamation

Criterion	3.0 Soil and Water
Element	3.1 Quality and Quantity of Soil and Water
Value	3.1.1 No loss of quality nor quantity of soil and water
Objective	3.1.1.1 Maintain and/or enhance the quantity and quality of soil and water

Targets:

100% of MOE inspected harvest blocks comply with provincial standards for road reclamation.

Target Acceptable Level of Variance:

Where a non-compliance occurs and is addressed within the timeline identified in a MOE approved action plan, it will not be counted against this target.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Sakâw shareholders and their contractors will operate within the approved standards for road reclamation and where non-compliances occur, prompt action is taken to complete any MOE approved action plans.

Source of Management Data:

MOE inspection records assessing compliance with road reclamation standards.

MOE/Sakâw shareholder records of non-compliance action plans and timelines to resolve the issue.

Monitoring and Reporting:

Monitoring will be undertaken each year, based on MOE compliance inspection records for the previous year and Sakâw's records of inspections/followup.

For all inspections that included an assessment of compliance with standards for road reclamation, Sakâw will record whether the harvest block was initially in compliance or not, and whether non compliances were resolved within the MoE defined timeframe.

Note: This reporting will be for performance assessment only. Legal compliance enforcement action may occur if an inspection finds a Sakâw shareholder to be in non-compliance with road reclamation standards.

An example reporting table is provided below.

Monitoring Year:	**20__**		
Inspection Year	**# of harvest blocks inspected by the Ministry**	**# harvest blocks assessed as being in compliance with road reclamation standards at time of inspection**	**# harvest blocks assessed as being in compliance with road reclamation standards after approved action plan timelines**
2018-2019			
2019-2020			
…			

Current Status of Indicator:

Sakâw shareholders generally consider road reclamation to be part of harvesting as opposed to a separate phase of operations. This management approach generally means all required rehabilitation is kept well up-to-date.

Indicator 18. Watercourse crossings comply with provincial and federal legislation

Criterion	3.0 Soil and Water
Element	3.1 Quality and Quantity of Soil and Water
Value	3.1.1 No loss of quality nor quantity of soil and water
Objective	3.1.1.1 Maintain and/or enhance the quantity and quality of soil and water

Targets:

100 % of MOE inspected watercourse crossings are found in compliance with provincial and federal acts and regulations.

Target Acceptable Level of Variance:

Where a non-compliance occurs and is addressed within the timeline identified in a MOE approved action plan, it will not be counted against this target.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Sakâw shareholders and their contractors will construct and maintain watercourse crossings in accordance with applicable acts and regulations, and where non-compliances occur, prompt action will be taken to complete any MOE approved action plans.

Source of Management Data:

MOE inspection records assessing compliance with watercourse crossing requirements.

Monitoring and Reporting:

Monitoring will be undertaken each year, based on MOE compliance inspection records for the previous year and Sakâw's records of inspections/followup.

For all inspections that included an assessment of compliance with requirements for watercourse crossings, Sakâw will record whether any crossings were initially found to be in compliance or not, and whether they were in compliance at the end of MOE's action plan timeline.

Note: This reporting will be for performance assessment only. Legal compliance enforcement action may occur if an inspection finds a Sakâw shareholder to be in non-compliance with any applicable act or regulation.

An example reporting table is provided below.

Monitoring Year:	**20__**		
Inspection Year	**# of crossings inspected by the Ministry**	**# of crossings assessed as being in compliance with legislation at time of inspection**	**# crossings assessed as being in compliance with legislation at the end of the approved action plan timeline**
2018-2019			
2019-2020			
…			

Current Status of Indicator:

Sakâw shareholders complete culvert inspections on a regular basis and at least 2 times in the season (spring and fall). This aids in ability to address issues as they arise. Any issues found by MoE have been addressed in a timely fashion.

Indicator 19. Harvest blocks comply with the FMA area riparian management standard

Criterion	3.0 Soil and Water
Element	3.1 Quality and Quantity of Soil and Water
Value	3.1.1 No loss of quality nor quantity of soil and water
Objective	3.1.1.1 Maintain and/or enhance the quantity and quality of soil and water

Targets:

100 % of MOE inspected harvest blocks comply with the FMA area standard for riparian area management.

Target Acceptable Level of Variance:

Where a non-compliance occurs and is addressed within the timeline identified in a MOE approved action plan, it will not be counted against this target.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Sakâw shareholders and their contractors will follow the FMA area riparian area standard and where non-compliances occur, prompt action will be taken to complete any MOE approved action plans.

Source of Management Data:

MOE inspection records assessing compliance with FMA area standards for riparian management

Monitoring and Reporting:

Monitoring will be undertaken each year, based on MOE compliance inspection records for the previous year and Sakâw's records of inspections/followup.

For all inspections that included an assessment of compliance with FMA area standards for riparian area management, Sakâw will record whether management of the riparian area was initially found to be in compliance or not, and whether they were in compliance at the end of MOE's action plan timeline.

Note: This reporting will be for performance assessment only. Legal compliance enforcement action may occur if an inspection finds a Sakâw shareholder to be in non-compliance with FMA area riparian area management measures.

An example reporting table is provided below.

Monitoring Year:	**20__**		
Inspection Year	**# of riparian areas inspected by the Ministry**	**# of riparian areas assessed as being in compliance with the FMA area riparian management standard at time of inspection**	**# riparian areas assessed as being in compliance with the FMA area riparian management standard after approved action plan timeline**
2018-2019			
2019-2020			
…			

Current Status of Indicator:

Sakâw shareholders generally pre-ribbon riparian reserve zones prior to harvesting. This due diligence effort greatly reduces risk of non-compliances occurring.

Indicator 20. Event duration

Criterion	4.0 Role in Global Ecological Cycles
Element	4.1 Carbon Cycle
Value	4.1.1 Productive Land Base
Objective	4.1.1.1 Mitigate the impact of the forest and forest activities on the productive land base

Targets:

100% of harvest events approved in operating plans have a duration of 10 years or less, unless otherwise approved by the MOE.

This target is for the "administrative" definition of a harvest event (e.g. for approval in operating plan), whereas the target for event size distribution (Indicator 3) refers to similar ages patches of forest on the landbase aimed at managing landscape patterns. Several of these administrative 'events' may be close enough together to become a single event that helps meet 'event size distribution' targets.

Target Acceptable Level of Variance:

No variance allowed unless approved by the Area Forester or Management Implementation Team (MIT) to address operating conditions (economic or physical) that warrant extended harvest timeframes.

Timeframe to Achieve Target:

Indicator will be implemented immediately once the MOE determines how to incorporate multi-year events into operating plan approvals. The first conformance assessment will occur five years from this date.

Strategy to Achieve Target:

Sakâw shareholders will coordinate removal of all harvest products to occur simultaneously whenever possible to ensure harvesting events are completed within 10 years unless otherwise approved.

Source of Management Data:

Sakâw Operating Plan. Events will be designated within the Operating Plan.

Most current spatial records of harvested areas (depletion). The most current FMA area forest inventory, as annually updated for stand age (growth), natural disturbance, and harvesting.

Harvest locations will be provided by post-harvest mapping, with each area being assigned its actual start and actual end dates.

Monitoring and Reporting:

Monitoring is to be undertaken each year. For each event in operating plans the start and end dates (if occurred) and the proportion of the event completed will be recorded. The start date for an event will be the date harvest started in the first block of the event. The end date for an event will be when initial renewal activities are complete and in-block roads have been reclaimed.

An example reporting table is provided below.

Monitoring Year: 20__					
Annual reporting year		Start Date	End Date	% Complete (by area)	% of harvesting events >10yrs without MIT Approval
2018	E1234 E1254 E1236	Apr 2015 May 2016 Mar 2018	June 2018 - -	100% 80% 20%	0
2019					
2020					
2021					
….					

Current Status of Indicator:

Multi-year event planning was attempted by Sakâw in prior operating plans but only single year approvals were provided by the MOE. The process of submitting and approving multiyear events is under development.

Indicator 21. Utilization of approved HVS volumes (actual harvest vs. HVS)

Criterion	5.0 Economic and Social Benefits
Element	5.1 Economic Benefits
Value	5.1.1 Sustainable Economic Benefits Over the Term of the FMP
Objective	5.1.1.1 Maximize the economic benefits derived from the forest without compromising the integrity of the forest ecosystem.

Targets:

1. An average of 1,126,000 m^3/year of hardwood harvested per each 5 year period.
2. An average of 1,265,000 m^3/year of softwood sawlog harvested per each 5 year period.
3. An average of 600,000 m^3/year of softwood pulpwood harvested per each 5 year period.

Target Acceptable Level of Variance:

Harvest levels cannot exceed the approved HVS over a 5 year average. Harvest levels can underachieve the HVS level by any amount. (This does not preclude the Minister from enacting conditions related to underutilizing HVS in the FMA.)

Note: The variation in harvest from year-to-year is unrestricted, the target is the 5 year average.

Timeframe to Achieve Target:

Immediate. First assessment will occur in five years (2023).

Strategy to Achieve Target:

Sakâw and its shareholders will endeavor to maximize harvest volumes to the levels permitted within the FMA, markets and other economic factors permitting.

Source of Management Data:

Provincial scaling records indicating harvest levels on the PA FMA area.

Monitoring and Reporting:

Monitoring is to be undertaken each year where Sakâw records the total softwood sawlog, pulp, and hardwood volumes logged in the FMA area (shareholders and third parties).

Monitoring will be for performance assessment purposes only.

An example reporting table is provided below.

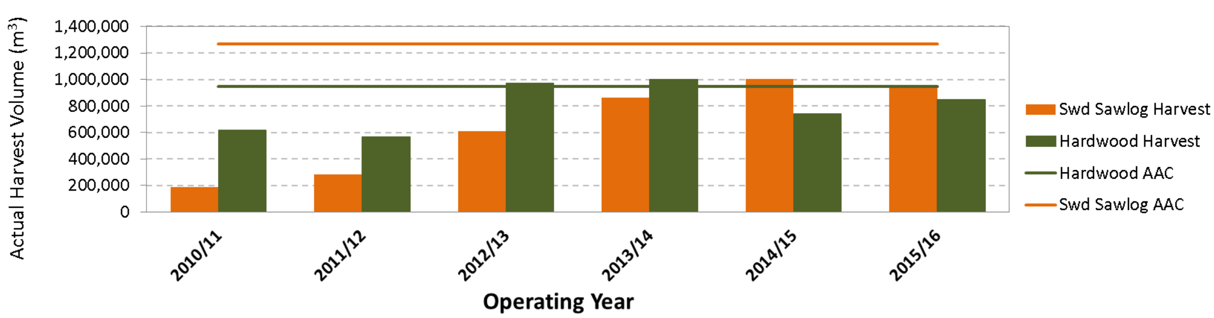
Monitoring Year:	**20__**		
Year	**Product volumes originating from the PA FMA area**		
	Hardwood Harvest (Target 1,126,000 m³)	**Softwood Sawlog Harvest (Target 1,265,000 m³)**	**Softwood pulpwood (Target 340,000 m³)**
2018-19			
2019-20			
2020-21			
2021-22			
2022-23			
Average 2015-2019			

Current status of indicator:

At the FMA area level, softwood sawlogs and hardwood are being harvested consistently, but at levels below the HVS levels. Pulp is only being harvested in very small amounts due to a lack of market demand. This results in significant undercut of softwood.

Year	Harvest Softwood Harvest	Harvest Hardwood Harvest	Harvest Total Harvest	HVS (AAC) Softwood HVS*	HVS (AAC) Hardwood HVS	HVS (AAC) Total HVS	% of AAC Utilized
1999/00	693,494	549,213	1,242,707	1,926,000	947,000	2,873,000	43%
2000/01	1,044,725	504,336	1,549,061	1,926,000	947,000	2,873,000	54%
2001/02	888,989	574,627	1,463,616	1,926,000	947,000	2,873,000	51%
2002/03	1,082,553	633,398	1,715,951	1,926,000	947,000	2,873,000	60%
2003/04	1,299,452	682,518	1,981,970	1,926,000	947,000	2,873,000	69%
2004/05	1,435,179	967,186	2,402,365	1,926,000	947,000	2,873,000	83%
2005/06	1,210,165	805,938	2,016,103	1,926,000	947,000	2,873,000	70%
2006/07	381,258	308,928	690,186	1,926,000	947,000	2,873,000	24%
2007/08	103,807	55,760	159,567	1,926,000	947,000	2,873,000	6%
2008/09	57,261	236,483	293,744	1,926,000	947,000	2,873,000	10%
2009/10	59,480	396,747	456,227	1,926,000	947,000	2,873,000	16%
2010/11	186,354	620,656	807,011	1,926,000	947,000	2,873,000	28%
2011/12	283,459	568,177	851,635	1,926,000	947,000	2,873,000	30%
2012/13	609,629	971,183	1,580,813	1,926,000	947,000	2,873,000	55%
2013/14	861,528	1,001,739	1,863,267	1,926,000	947,000	2,873,000	65%
2014/15	1,003,936	744,404	1,748,340	1,926,000	947,000	2,873,000	61%
2015/16	953,635	850,529	1,804,164	1,926,000	947,000	2,873,000	63%

* Note: Softwood HVS consists of 661,000 m³/year of pulp and 1,265,000 m³/year of sawlog.



Indicator 22. Stakeholder/ public engagement occurs at various levels of forest management planning using established public advisory group (PAG) or other forums

Criterion	5.0 Economic and Social Benefits
Element	5.2 Distribution of Benefits
Value	5.2.1 Fair Distribution of Benefits
Objective	5.2.1.1 To ensure other forest uses are addressed

Targets:

1. Minimum two (2) PAG meetings/year.
2. Minimum of one open house meeting held each year in the communities of Prince Albert, Big River, Candle Lake, Dore Lake, Little Red River, Montreal Lake, Hall Lake, and Weyakwin.

Target Acceptable Level of Variance:

PAG meetings can be dropped at the discretion of the PAG or if insufficient attendees for quorum confirm attendance. At least one PAG meeting will be required annually to report back on FMP annual monitoring. Open houses must occur unless communities decline them or no forest management activities are planned to take place within two years in the community's area of interest.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Sakâw to maintain an active PAG, conducting at least two meetings per year.

Sakâw and shareholders to plan and undertake at least one open house in each community of Prince Albert, Big River, Candle Lake, Dore Lake, Little Red River, Montreal Lake, Hall Lake, and Weyakwin.

Source of Management Data:

Sakâw records of PAG meetings.

Sakâw Operating Plan open house records.

Monitoring and Reporting:

Monitoring is to be undertaken each year. Sakâw will review PAG meeting and open house records to verify conformance with target. If an open house is found not to have occurred, Sakâw is to confirm that either the open house was declined or that no forest management activities will take place within the community's area of interest within the next two years.

An example reporting table is provided below.

Monitoring Year:	**20__**
# of PAG meetings held	
An open houses conducted in each of the communities of Prince Albert, Big River, Candle Lake, Dore Lake, Little Red River, Montreal Lake, Hall Lake, and Weyakwin (Y/N)	

Current Status of Indicator:

Sakâw has an established PAG group and conducts open houses regularly as part of FMP and operating plan development.

Sakâw shareholders conduct open houses in each of the communities of Prince Albert, Big River, Candle Lake, Dore Lake, Little Red River, Montreal Lake, Hall Lake, and Weyakwin on an annual basis.

Indicator 23. Spatially identified non-timber resources and forest use activities

Criterion	5.0 Economic and Social Benefits
Element	5.2 Distribution of Benefits
Value	5.2.1 Fair Distribution of Benefits
Objective	5.2.1.1 To ensure other forest uses are addressed

Targets:

A map/dataset of known non-timber resources and non-timber forest use activities is maintained in the Sakâw GIS dataset.

Target Acceptable Level of Variance:

No variance.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Sakâw will maintain a spatial dataset within its corporate GIS containing records of known legal cabins, VSAs, ski trails, trapper areas and trails, regulated snowmobile trails, sensitive wildlife sites, community areas of interest, known sites of cultural significance, and other information necessary for the appropriate management of non-timber resources and non-timber forest use activities in the FMA area.

Sakâw will maintain a procedure, written or understood, whereby this dataset is edited as information becomes known.

Source of Management Data:

Existing Sakâw GIS records and any information made known to Sakâw and shareholders during the term of the plan.

Monitoring and Reporting:

Monitoring is to be undertaken each year. Sakâw will verify that the known information contained within its GIS is retrievable and that updating has taken place as new information has become known. 'Known' is defined as information provided directly to shareholders or Sakâw.

Production of a map(s) displaying known information will serve as verification that target has been achieved.

Current Status of Indicator:

Sakâw's GIS system contains data on known non-timber values and forest based activities.

Indicator 24. Distribution of harvest area by planning units and species groupings

Criterion	5.0 Economic and Social Benefits
Element	5.3 Sustainability of benefits
Value	5.3.1 No Loss of Benefits
Objective	5.3.1.1 Maintain or enhance benefits

Target:

5 year maximum harvest areas by planning unit and species grouping as shown in the table below. Planning Units are depicted in Figure 10 earlier in the document.

	H/HS (ha)	SH (ha)	S - BS or JP Leading (ha)	S - WS or Other Leading (ha)	Total (ha)
Central	8,311	1,361	20,770	1,600	32,042
East	6,747	984	16,989	2,989	27,710
West	22,297	2,273	8,927	3,453	36,950
Total	37,355	4,618	46,687	8,041	96,702

Species groupings are the CSG types but the Pure Softwood (S) type is broken into two Provincial Forest Types (PFT).

Note: targets were developed directly from the first 20 years of forest estate modeling output from the preferred scenario (approx. 19,340 ha/yr, 154 m3/ha of hwd, swd sawlogs and pulp). Spatial locations and stand types of harvest were selected by the model to optimize timber supply over time and meet non-timber objectives.

Target Acceptable Level of Variance:

Each planning unit and species target combination can be exceeded by up to 5% or 100 ha (whichever is greater) as long as the 5 year total values for each planning unit are not exceeded by more than 5%.

The intent of this indicator and associated targets is to distribute harvesting appropriately across the FMA area and among stand types within a 5 year period. However achieving this objective is secondary to the good design of harvest events consistent with the NFP standard. To support this objective, the Area Forester or MIT can accept variances from target areas if, for example:

- Large (>1500 ha) events are approved by the Area Forester and result in a skewing of species to those found in the event area while the event is being harvested.
- Large (>1500 ha) events are approved by the Area Forester and harvesting must be skewed into one geographic zone in a 5 year period in order to complete the event in the time required.
- Salvage harvesting or caribou management requires a focus on specific stand types or geographic areas and the variance has been approved by the Area Forester.

Timeframe to Achieve Target:

Management consistent with this target will commence immediately and progress will be assessed annually. Formal assessments will occur at 5 year intervals: April 1, 2018 to March 31, 2023, and April 1, 2023 to March 31, 2028.

Strategy to Achieve Target:

Sakâw and Sakâw shareholders will plan harvests and road development focusing upon good event design (e.g. don't isolate wood, get in/get out, close roads) while seeking also to distribute harvest as per the target(s). Distributing harvests as per the target(s) will be considered a secondary priority to good event design.

Annual cutover summaries will provide data to use during each 5 year assessment period. Sakâw and Sakâw shareholders will use this feedback when selecting future harvest blocks so that these harvest distribution targets can be achieved to the maximum extent possible.

Source of Management Data:

Annual cutover summary areas, attributed with CSG and leading species from the forest inventory used during forest estate modeling.

Monitoring and Reporting:

Monitoring is to be undertaken each year. Using GIS, the previous year's harvest areas will be attributed with a planning unit and the species information necessary to assign areas to one of the four species categories. The number of hectares in each of the target categories will be calculated and reported upon.

Annually, and for each 5 year assessment, any deviation from progress towards the target is to be rationalized and the rationalization presented in the annual report.

Example reporting table:

Planning Unit	Stand type	Target (ha)	Actual Area Harvested					
			2018-19	2019-20	2020-21	2021-22	2022-23	Five Year Total (ha)
West	H + HS							
	SH							
	BS or JP							
	WS + Others							
Central	H + HS							
	SH							
	BS or JP							
	WS + Others							
East	H + HS							
	SH							
	BS or JP							

	WS + Others							

Current Status of Indicator:

The concept of a distribution of harvest targets to this level of detail is new to the FMA area. No current status is available as the target is just beginning to inform harvest planning.

Indicator 25. Number of Aboriginal communities involved in review of operational and strategic plans in the FMA area

Criterion	6.0 Society's Responsibility
Element	6.1 Aboriginal and Treaty Rights
Value	6.1.1 To ensure Aboriginal and Treaty Rights are respected within the context of planning and implementing forest activities
Objective	6.1.1.1 To ensure Aboriginal and treaty rights are respected within the context of planning and implementing forest activities

Targets:

All Aboriginal communities whose traditional territory is located within the FMA area are provided an opportunity to review operational and strategic plans annually.

Target Acceptable Level of Variance:

No variance.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Sakâw will maintain a list of the Aboriginal communities whose traditional territory is located within the FMA area and will annually invite each community to view and discuss planning and development occurring within the FMA area.

Sakâw will maintain records of correspondence and other communication with each listed Aboriginal community.

Source of Management Data:

Sakâw and MOE maintain list of Aboriginal communities with traditional territory within the FMA area.

Sakâw records of correspondence and other communication with each listed Aboriginal community.

Monitoring and Reporting:

Monitoring is to be undertaken each year. Sakâw will verify that the opportunity to engage in discussions on planning/development within the FMA area was provided through a review of communication records.

An example reporting table is provided below.

Monitoring Year:	**20__**
Aboriginal community	**Opportunity to view and discuss OPs, FMPs and any new developments within the FMA area made available (Y/N)**

Current Status of Indicator:

Sakâw regularly conducts review meeting with Aboriginal communities for information sharing.

Indicator 26. Spatial identification and operational protection of known culturally significant Aboriginal sites

Criterion	6.0 Society’s Responsibility
Element	6.2 Aboriginal traditional land use and forest based ecological knowledge
Value	6.2.1 Protection of Aboriginal traditional land use and forest based ecological knowledge
Objective	6.2.1.1 To avoid impacting culturally important sites

Targets:

100% of known culturally significant Aboriginal sites are spatially mapped in Sakâw’s GIS system and receive operational consideration during planning of forest management activities.

Target Acceptable Level of Variance:

No variance.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Within its GIS records, Sakâw will maintain a record of known culturally significant sites, their location and type. Sites may be identified by the province, identified by Sakâw, or made known by First Nations during annual review of Operating Plans and other discussions. Harvest planning by Sakâw shareholders will use this information and consider such sites during operational planning.

Source of Management Data:

Sakâw’s spatial dataset of non-timber resources and non-timber forest use activities in the FMA area.

Sakâw Operating Plan.

Sakâw records of actual harvest areas.

Sakâw records of correspondence and other communication Aboriginal individuals and communities.

Monitoring and Reporting:

Monitoring is to be undertaken each year. Sakâw will use GIS analysis to compare locations of known sites of cultural significance to Aboriginal peoples to areas planned for development within the Operating Plan and actual harvest areas from the previous year to confirm whether known sites of cultural significance to Aboriginal peoples have been protected from forest operations.

Current status of indicator:

Known sites have been recorded in Sakâw's GIS system and Sakâw shareholders are using this information to aid in their development planning.

Sakâw is unaware of any known culturally significant Aboriginal sites that have been impacted.

Indicator 27. Incorporation of Aboriginal traditional knowledge into the planning process

Criterion	6.0 Society's Responsibility
Element	6.2 Aboriginal traditional land use and forest based ecological knowledge
Value	6.2.1 Protection of Aboriginal traditional land use and forest based ecological knowledge
Objective	6.2.1.2 To protect forest based traditional ecological knowledge of the Aboriginal communities

Targets:

Document Aboriginal traditional knowledge in a consultation record or a spatial TLU dataset as the information is made available through consultation and engagement.

Target Acceptable Level of Variance:

None.

Timeframe to Achieve Target:

Ongoing as information is made available by Aboriginal communities.

Strategy to Achieve Target:

Engage Aboriginal communities while operational planning and implementing the FMP.

Source of Management Data:

Meeting minutes and records of Aboriginal engagement during planning and implementation of the FMP. Information to be stored in Sakâw's stakeholder database.

Monitoring and Reporting:

Reported annually with the annual report and assessed every 5 years. Due to the sensitive and confidential nature of traditional use, some information may not be shared or documented in a very general nature in the annual report.

Current status of indicator:

No reporting specific to traditional ecological knowledge is currently available but comments have been solicited during the Operating Plan annual review process, and harvesting plans have been adjusted to reflect this type of input.

Indicator 28. Economic contribution from forest industry associated with the PA FMA area

Criterion	6.0 Society's Responsibility
Element	6.3 Forest Community Well-being and Resilience
Value	6.3.1 Sustainable Forest Communities
Objective	6.3.1.1 To contribute to the resiliency of communities

Targets:

The direct and indirect economic activity created by the forest industry in the PA FMA area is estimated and reported.

Target Acceptable Level of Variance:

No variance.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Complete reporting each year.

Source of Management Data:

Volume harvest (m^3) from provincial scaling system.

Economic multipliers (per m^3 harvested) provided by Ministry of the Economy (Narayan Dhital, 2016):

Economic Measure	Direct Impact	Direct and Indirect Impact	Direct, Indirect and Induced impact
GDP ($\$/m^3$)	$145.60	$271.98	$ 318.68
Job (#FTE/m^3)	0.000750	0.001335	0.001530
Labor income ($\$/m^3$)	$65.93	$ 109.89	$ 123.66
Tax ($\$/m^3$)	$38.46	$ 38.46	$ 41.21

Monitoring and Reporting:

Monitoring is to be undertaken each year. The volume harvested in the previous year will be multiplied by an economic multiplier describing the direct, indirect, and induced economic activity associated with a cubic meter of wood moving through the economy.

Monitoring will be used for performance assessment purposes only.

Current status of indicator:

This indicator will be reported for the first time for the 2018-19 operating year.

Indicator 29. Engage and inform the public, stakeholders, and Aboriginal peoples on the implementation of the FMP.

Criterion	6.0 Society's Responsibility
Element	6.4 Fair and Effective Decision-making
Value	6.4.1 Involvement of Stakeholders in FMP Development and Implementation
Objective	6.4.1.1 Improve the engagement of stakeholders in FMP development and implementation

Targets:

Sakâw engages and informs the public, stakeholders, First Nations & Métis people on the implementation of the FMP annually. At a minimum, the PAG is provided with the annual report on performance against the FMP targets.

Target Acceptable Level of Variance:

Where attempts have been made to engage and inform the listed group and they are not interested or reasonably available, variance is acceptable.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Hold an open public meeting in conjunction with a PAG meeting where the results of annual FMP reporting are presented and input received. Reporting also to be made available on Sakâw website.

Source of Management Data:

Sakâw annual VOIT reporting.

Monitoring and Reporting:

Monitoring is to record whether a presentation was held and who was invited/present at the meeting.

Current Status of Indicator:

Sakâw's PAG is currently active, includes members from First Nations, stakeholders, and the general public, and has been engaged in during the development of this FMP. The MIT that will be formed upon approval of the FMP will include a PAG representative.

Indicator 30. FMP and Operating Plan are made publicly available

Criterion	6.0 Society's Responsibility
Element	6.4 Informed Decision Making
Value	6.4.1 Information about and for Forest Management should be Publicly Available
Objective	6.4.1.1 Ensure that the information used for forest management decision making is current, accurate and publicly available

Targets:

FMP and Operating Plans are posted to the Sakâw.ca website.

Target Acceptable Level of Variance:

No variance.

Timeframe to Achieve Target:

Immediate.

Strategy to Achieve Target:

Sakâw will maintain the FMP and the Operating Plans on its website.

Source of Management Data:

The Sakâw website.

Monitoring and Reporting:

Monitoring is to be undertaken each year to assess if appropriate data is available on Sakâw's website.

Monitoring will be used for performance assessment purposes only.

Current Status of Indicator:

The Sakâw website currently provides public access to approved FMP and Operating Plans.

Appendix B Silviculture Ground Rules

SILVICULTURE GROUND RULES PREAMBLE

Silviculture ground rules (SGR) identify the current and expected future forest conditions, silviculture systems, management options, regeneration standards, and acceptable alternative harvest, renewal and stand tending treatments for a specific development type. SGRs guide prescriptions for operational treatments (i.e., harvest, renewal and stand tending) and actively managed areas which experience stand-replacing natural disturbance. They also provide linkages between stand development types, silviculture regimes and modelling assumptions.

Ten SGRs were developed for the Sakâw FMP. For easy reference, each SGR is organized with all pertinent components (i.e., reference code, transitions, treatment options, regeneration targets) described on a single page. These components are briefly described in the sections below.

Reference Code

The reference code is used to identify each SGR for reference in the FMP, operational plans and reports. The three-part code (separated by dashes) indicates the appropriate: SGR number (1 to 10), species type and development type.

Transitions

There are no transitions of forest types (H, HS, SH, H) planned at the landscape level however, stands or portions of stands may regenerate to different types. Overall, the amount of each type regenerated will be consistent with the harvest areas, but the block level flexibility will allow for the efficient application of silvicultural resources. For example, a small area of H in a larger SH block is likely to be planted and shift change types – but small HS areas within a larger H block may well be left for natural regeneration.

Existing Forest Condition

The existing forest condition describes how development types are organized into stand yield groups for modelling purposes. This section also provides the corresponding provincial forest type (PFT) and approximate area of the productive forest for each development type for context.

Future Forest Condition

The future forest condition lists the future stand yield group(s) used to project forest growth after harvest and provides expected species types and unit volumes predicted for a typical rotation age.

Treatment Options

The treatment options row describes the appropriate operational treatments (i.e., harvest, renewal and stand tending) for each SGR. Supplementary notes are provided to describe conditions when specific treatments would be considered.

Silviculture System

This section describes the silviculture system (e.g., clearcut, seed tree, shelterwood, coppice, patch cut, retention) and variant (e.g., with reserves, strip clear-cut, uniform shelterwood) appropriate for the SGR. Options may also be included with supplementary notes.

Logging Method and Slash Management

This section describes the logging method(s) (e.g., full tree, tree length or short wood), and slash management method(s) (e.g., pile and burn, scatter across site), appropriate for the SGR. Options or special restrictions on the equipment type, prescription or timing of logging may also be included as supplementary notes.

Renewal
Multiple renewal strategies may be appropriate for each SGR. A summary name and the expected application rate are provided. Special restrictions on the equipment type, prescription or timing of activities may also be included as supplementary notes.

Site Preparation
This section describes the appropriate treatments options for site preparation (e.g., mechanical, chemical, prescribed burn).

Regeneration
This section describes the appropriate treatments options for stand regeneration (e.g., natural, plant, seed).

Tending
This section describes the appropriate stand tending treatments options (e.g., cleaning, spacing) required to meet the regeneration standard and/or to advance the stand to rotation age once the free growing standards have been met.

Regeneration Targets
The regeneration targets row describes the criteria (survey window, preferred/acceptable species/species type, density) used to assess regeneration progress for developing stands. These regeneration standards can be used to evaluate the current status of the stand and evaluate the likelihood of the stand to achieve the future forest condition. Supplementary notes are provided to describe alternative development trends that may apply.

Survey Window
This section describes the number of years since harvest completion that a stand is predicted to reach establishment and free-to-grow (FTG) status.

Species and Heights
This section provides the minimum height that the preferred and acceptable tree species must attain at establishment and for FTG declaration. At a minimum, each of the qualifying stems must meet all other free-to-grow Provincial Regeneration standards (e.g., distance from competing vegetation).

Stocking
The use of empirical yield curves (natural stands) to model future stand growth projections suggests that some stands will not achieve full stocking. This section provides the minimum stocking level and stems per hectare (sph) of the preferred and acceptable species that must be present within the FTG window to consider the stand FTG. It also provides a target softwood proportion(s) expected to develop the desired species type (i.e., H, HS, SH, S) at rotation age (adapted from 'Development of a Regenerating Mixedwood Succession Matrix', Gelhorn, 2009).

For each SGR, an appropriate matrix that highlights the target stocking densities and stand types at FTG is provided for reference. This provides a reasonable indicator for assessing the species type trajectory within the establishment window so that any treatments necessary to achieve the appropriate S/H proportions can be scheduled and completed prior to FTG survey.

Silviculture Ground Rules

Reference Code: 1-H-HW

Transitions

Existing Forest Condition

Development Type	Area (ha)	Yield	FMZ	Site	Density
HW	89,264	01	1, 2, 3	All	B
	291,516	02	1, 2, 3	All	C, D

(PFT = TAB, AOH)

Future Forest Condition

%	Yield Group	Species Type	Vol/ha @	Rotation Age
100%	01-H-HW	H8S2	105 m³/ha	60 yrs
100%	02-H-HW	H8S2	150 m³/ha	60 yrs

Treatment Options

Silviculture System

Clearcut with retention

Logging Method and Slash Management

Full-Tree; process at roadside and spread, or
Tree-Length; process at roadside and spread, or
Cut-To-Length; process at stump or process at roadside (spread)

% Applied	Renewal Name	Site Preparation	Regeneration	Tending (Pre-/Post Free-to-Grow)
>95%	A. Leave	None	Leave For naturals	None anticipated
<5%	C. Plant	If required (mechanical)	Plant @ 800 sph	None anticipated

- Planting is only expected where small pockets of existing H stands are incidentally treated within blocks of S or SH or HS stands. Any resulting loss of H area is expected to be small and addressed at the landscape level through a lack of planting is small areas of HS or SH in larger H blocks.
- Maintain softwood presence by retaining overstory conifer as seed trees and/or protecting advance growth within the understory.

Regeneration Targets

Survey Window		Preferred Species/Height (m)	Acceptable Species/Height (m)
Establishment (4 to 7 years)	S:	wS/0.3, bS/0.1	jP/0.3, tL/0.1
	H:	tA/0.3	bP/0.1, wB/0.1
FTG (8 to 14 years)	S:	wS/1.5, bS/1.5	jP/2.0, tL/2.0
	H:	tA/2.0	bP/2.0, wB/2.0

Stocking

Minimum: ≥80% stocked and ≥800 sph
At <10,000 sph: S <7% of stems
At ≥10,000 sph, S <3% of stems

- The 80% stocking requirement typically requires >1200 sph of uniformly spaced (planted) trees or >3000 sph in less uniform areas. These densities are assumed to deliver forecasted yields in future.
- The target stocking percentages by species types at establishment and FTG are expected to develop the desired species type (H) at rotation age (adapted from 'Development of a Regenerating Mixedwood Succession Matrix', Gelhorn, 2009 – see densities from matrix to the right).
- Some planted stands that regenerate to HS will offset the reverse trend elsewhere.

Hardwood Densities (sph) — Spruce Mixed @ 80 yrs

Softwood (sph)	30000	20000	15000	10000	5000	4000	3000	2000	1500	1000	750	500	250
1500	SH	SH	SH	SH	SH	SH	SH	S	S	S	S	S	S
1250	SH	HS	HS	SH	SH	SH	SH	S	S	S	S	S	S
1000	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S
800	HS	HS	HS	HS	SH	SH	SH	SH	SH	S	S	S	S
600	HS	HS	HS	HS	HS	HS	HS	SH	SH	SH	S	S	S
500	HS	H	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	S
350	H	H	H	HS	HS	HS	HS	HS	SH	SH	SH	SH	S
200	H	H	H	H	H	H	H	HS	HS	HS	SH	SH	S
100	H	H	H	H	H	H	H	H	H	HS	HS	HS	SH

Silviculture Ground Rules — Reference Code: 2-HS-HjP

Transitions

Existing Forest Condition

Development Type	Area (ha)	Yield	FMZ	Site	Density
HjP	26,539	03	1, 2, 3	All	B
	25,598	04	1, 2, 3	All	C, D
(PFT = HPM)					

Future Forest Condition

%	Yield Group	Species Type	Vol/ha @	Rotation Age
100%	03-HS-HjP	H6S4	95 m³/ha	70 yrs
100%	04-HS-HjP	H6S4	188 m³/ha	80 yrs

Treatment Options

Silviculture System

Clearcut with retention

Logging Method and Slash Management

Full-Tree; process at roadside and spread, or
Tree-Length; process at roadside and burn / spread, or
Cut-To-Length; process at stump or process at roadside and spread

% Applied	Renewal Name	Site Preparation	Regeneration	Tending (Pre-/Post Free-to-Grow)
50%	B. Drag & Leave	Scarification	Leave For naturals	Only if required
45%	A. Leave	None	Leave For naturals	Only if required
5%	C. Plant	If required (mechanical)	Plant @ 800 sph	Only if required

- Leave for natural to occur where sufficient seed source and disturbance are present (scarification not warranted to achieve desired jP stocking).
- Assist with maintaining softwood presence by retaining overstory conifer as seed trees and/or protecting advance growth within the understory.
- Consider planting where insufficient seed source exists to achieve desired jP stocking (i.e. Mistletoe areas)
- Tending may occur to remove undesirable / competing vegetation or improve likelihood of achieving desired species association.

Regeneration Targets

Survey Window		Preferred Species/Height (m)	Acceptable Species/Height (m)	Stocking
Establishment (4 to 7 years)	S:	jP/0.3, wS/0.3	bS/0.1, tL/0.1	Minimum: ≥80% stocked and ≥800 sph
	H:	tA/0.3	bP/0.1, wB/0.1	At <10,000 sph: S ≥7% and <15% of stems
FTG (8 to 14 years)	S:	jP/2.0, wS/1.5	bS/1.5, tL/2.0	At ≥10,000 sph, S ≥3% and <10% of stems
	H:	tA/2.0	bP/2.0, wB/2.0	

- The 80% stocking requirement typically requires >1200 sph of uniformly spaced (planted) trees or >3000 sph in less uniform areas. These densities are assumed to deliver forecasted yields in future.
- The target stocking percentages by species types at establishment and FTG are expected to develop the desired species type (HS) at rotation age (adapted from 'Development of a Regenerating Mixedwood Succession Matrix', Gelhorn, 2009 – see densities from matrix to the right).
- Some scarified stands that regenerate to an SH species type and some LFN stands that regenerate to an H species type will offset the reverse trend elsewhere.
-

Pine Mixed @ 70 yrs

Softwood (sph) \ Hardwood Densities (sph)	20000	15000	10000	5000	4000	3000	2000	1500	1000	750	500	250
20000	S	S	S	S	S	S	S	S	S	S	S	S
15000	SH	S	S	S	S	S	S	S	S	S	S	S
10000	SH	S	S	S	S	S	S	S	S	S	S	S
5000	SH	SH	SH	S	S	S	S	S	S	S	S	S
4000	SH	SH	SH	S	S	S	S	S	S	S	S	S
3000	SH	SH	SH	SH	S	S	S	S	S	S	S	S
2000	SH	SH	SH	SH	SH	S	S	S	S	S	S	S
1500	HS	HS	SH	SH	SH	SH	S	S	S	S	S	S
1000	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S
750	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S
500	H	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	H
250	H	H	H	H	H	HS	HS	HS	H	H	H	H

Silviculture Ground Rules

Reference Code: 3-SH-jPH

Transitions

Existing Forest Condition

Development Type	Area (ha)	Yield	FMZ	Site	Density
jPH	21,737	05	1, 2, 3	All	B
	17,501	06	1, 2, 3	All	C, D

(PFT = PMW)

Future Forest Condition

%	Yield Group	Species Type	Vol/ha @	Rotation Age
100%	05-SH-jPH	S7H3	95 m³/ha	70 yrs
100%	06-SH-jPH	S7H3	188 m³/ha	80 yrs

Treatment Options

Silviculture System

Clearcut with retention

Logging Method and Slash Management

Full-Tree; process at roadside and spread, or
Tree-Length; process at roadside and burn / spread, or
Cut-To-Length; process at stump or process at roadside and spread

% Applied	Renewal Name	Site Preparation	Regeneration	Tending (Pre-/Post Free-to-Grow)
95%	B. Drag & Leave	Scarification	Leave For naturals	Only if required
5%	C. Plant	If required (mechanical)	Plant @ 1200 sph	Only if required

- Planting expected only where the LFN strategy is not expected to produce sufficient stocking (e.g. stands heavily impacted by dwarf mistletoe).
- Tending may occur to remove undesirable / competing vegetation or improve likelihood of achieving desired species association.

Regeneration Targets

Survey Window		Preferred Species/Height (m)	Acceptable Species/Height (m)
Establishment (4 to 7 years)	S:	jP/0.3, wS/0.3, bS/0.1	bF/0.1, tL/0.1
	H:	tA/0.3	bP/0.1, wB/0.10.1
FTG (8 to 14 years)	S:	jP/2.0, wS/1.5, bS/1.5	bF1.5, tL/2.0
	H:	tA/2.0	bP/2.0, wB/2.0P/2.0

Stocking

Minimum: ≥80% stocked and ≥800 sph
At <10,000 sph: S ≥15% and <38% of stems
At ≥10,000 sph, S ≥10% and <40% of stems

- The 80% stocking requirement typically requires >1200 sph of uniformly spaced (planted) trees or >3000 sph in less uniform areas. These densities are assumed to deliver forecasted yields in future.
- The target stocking percentages by species types at establishment and FTG are expected to develop the desired species type (SH) at rotation age (adapted from 'Development of a Regenerating Mixedwood Succession Matrix', Gelhorn, 2009 – see densities from matrix to the right).

Hardwood Densities (sph) — **Pine Mixed @ 70 yrs**

Softwood (sph)	20000	15000	10000	5000	4000	3000	2000	1500	1000	750	500	250
20000	S	S	S	S	S	S	S	S	S	S	S	S
15000	SH	S	S	S	S	S	S	S	S	S	S	S
10000	SH	S	S	S	S	S	S	S	S	S	S	S
5000	SH	SH	SH	S	S	S	S	S	S	S	S	S
4000	SH	SH	SH	S	S	S	S	S	S	S	S	S
3000	SH	SH	SH	SH	S	S	S	S	S	S	S	S
2000	SH	SH	SH	SH	SH	S	S	S	S	S	S	S
1500	HS	HS	SH	SH	SH	SH	S	S	S	S	S	S
1000	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S
750	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S
500	H	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	H
250	H	H	H	H	H	HS	HS	HS	H	H	H	H

Silviculture Ground Rules

Reference Code: 4-HS-HxS

Transitions

Existing Forest Condition

Development Type	Area (ha)	Yield	FMZ	Site	Density
HxS	25,197	07	1, 2, 3	All	B
(PFT = HSM)	72,268	08	1, 2, 3	All	C, D

Future Forest Condition

%	Yield Group	Species Type	Vol/ha @	Rotation Age
100%	07-HS-HxS	H6S4	140 m³/ha	90 yrs
100%	08-HS-HxS	H6S4	203 m³/ha	90 yrs

Treatment Options

Silviculture System

Clearcut with retention

Logging Method and Slash Management

Full-Tree; process at roadside and burn / spread, or
Tree-Length; process at roadside and burn / spread, or
Cut-To-Length; process at stump or process at roadside and burn / spread (note: generally burn in planted blocks)

% Applied	Renewal Name	Site Preparation	Regeneration	Tending (Pre-/Post Free-to-Grow)
95%	C. Plant	If required (mechanical or chemical)	Plant @ 800 sph	Only if required
5%	A. Leave	None	Leave for naturals	Only if required

- Consider measures to protect advanced softwood understory stand component and/or retain pockets of softwood overstory as seed trees.
- Leave for natural intended only for circumstances where there is sufficient advanced understory to result in an HS type, or where small pockets of HxS exist within a larger H block that is not being planted (to be offset by situations where H types are planted within HS/SH/S blocks).
- Site preparation may be required to improve planting access due to slash loading or excessive competition.
- Tending may occur to remove undesirable / competing vegetation or improve likelihood of achieving desired species association.

Regeneration Targets

Survey Window		Preferred Species/Height (m)	Acceptable Species/Height (m)
Establishment (4 to 7 years)	S:	wS/0.3, bF/0.3	jP/0.3, bS/0.1, tL/0.1
	H:	tA/0.3	bP/0.1, wB/0.1
FTG (8 to 14 years)	S:	wS/1.5, bF/1.5	jP/2.0, bS/1.5, tL/2.0
	H:	tA/2.0	bP/2.0, wB/2.0

Stocking

Minimum: ≥80% stocked and ≥800 sph
At <10,000 sph: S ≥5% and <12% of stems
At ≥10,000 sph, S ≥3% and <7% of stems

- The 80% stocking requirement typically requires >1200 sph of uniformly spaced (planted) trees or >3000 sph in less uniform areas. These densities are assumed to deliver forecasted yields in future.
- The target stocking percentages by species types at establishment and FTG are expected to develop the desired species type (HS) at rotation age (adapted from ‘Development of a Regenerating Mixedwood Succession Matrix’, Gelhorn, 2009 – see densities from matrix to the right).
- Some stands that regenerate to an H or SH type will offset the reverse trend elsewhere.

Hardwood Densities (sph) — Spruce Mixed @ 90 yrs

Softwood (sph)	30000	20000	15000	10000	5000	4000	3000	2000	1500	1000	750	500	250
1500	SH	SH	SH	SH	SH	S	S	S	S	S	S	S	S
1250	SH	SH	SH	SH	SH	SH	SH	S	S	S	S	S	S
1000	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S	S
800	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S
600	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S
500	HS	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S
350	H	H	H	HS	HS	HS	HS	SH	SH	SH	SH	S	S
200	H	H	H	H	H	HS	HS	HS	HS	SH	SH	SH	S
100	H	H	H	H	H	H	H	H	HS	HS	HS	HS	SH

Silviculture Ground Rules — Reference Code: 5-SH-xSH

Transitions

Existing Forest Condition

Development Type	Area (ha)	Yield	FMZ	Site	Density
xSH	13,658	09	1, 2, 3	All	B
(PFT = SMW)	36,237	10	1, 2, 3	All	C, D

Future Forest Condition

%	Yield Group	Species Type	Vol/ha @	Rotation Age
100%	09-SH-xSH	xS7H3	140 m³/ha	90 yrs
100%	10-SH-xSH	xS6H4	203 m³/ha	90 yrs

Treatment Options

Silviculture System

Clearcut with retention

Logging Method and Slash Management

Full-Tree; process at roadside and burn / spread, or
Tree-Length; process at roadside and burn / spread, or
Cut-To-Length; process at stump or process at roadside and burn / spread

% Applied	Renewal Name	Site Preparation	Regeneration	Tending (Pre-/Post Free-to-Grow)
95%	C. Plant	If required (mechanical or chemical)	Plant @ 1200 sph	Only if required
5%	A. Leave	None	Leave For naturals	Only if required

- Consider measures to protect softwood understory stand component or retain pockets of softwood overstory as seed trees.
- Leave for natural intended only for circumstances where there is sufficient advanced understory to result in an SH type, or where small pockets of xSH exist within a larger H block that is not being planted (to be offset by situations where H types are planted within HS/SH/S blocks).
- Site preparation may be required to improve planting access due to slash loading or excessive competition.
- Consider tending as a cleaning activity (manual or chemical) to remove undesirable or competing vegetation.

Regeneration Targets

Survey Window		Preferred Species/Height (m)	Acceptable Species/Height (m)
Establishment (4 to 7 years)	S:	wS/0.3, bF/0.3	jP/0.3, bS/0.1, tL/0.1
	H:	tA/0.3	bP/0.1, wB/0.1
FTG (8 to 14 years)	S:	wS/1.5, bF/1.5	jP/2.0, bS/1.5, tL/2.0
	H:	tA/2.0	bP/2.0, wB/2.0

Stocking

Minimum: ≥80% stocked and ≥800 sph
At <10,000 sph: S ≥12% and <31% of stems
At ≥10,000 sph, S ≥7% and <29% of stems

- The 80% stocking requirement typically requires >1200 sph of uniformly spaced (planted) trees or >3000 sph in less uniform areas. These densities are assumed to deliver forecasted yields in future.
- The target stocking percentages by species types at establishment and FTG are expected to develop the desired species type (SH) at rotation age (adapted from 'Development of a Regenerating Mixedwood Succession Matrix', Gelhorn, 2009 – see densities from matrix to the right).
- Some stands that regenerate to an HS type will the reverse trend elsewhere.

Hardwood Densities (sph) — Spruce Mixed @ 90 yrs

Softwood (sph)	30000	20000	15000	10000	5000	4000	3000	2000	1500	1000	750	500	250
1500	SH	SH	SH	SH	SH	S	S	S	S	S	S	S	S
1250	SH	SH	SH	SH	SH	SH	SH	S	S	S	S	S	S
1000	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S	S
800	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S
600	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S
500	HS	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S
350	H	H	H	HS	HS	HS	HS	SH	SH	SH	SH	S	S
200	H	H	H	H	H	HS	HS	HS	HS	SH	SH	SH	S
100	H	H	H	H	H	H	H	H	HS	HS	HS	HS	SH

Silviculture Ground Rules — Reference Code: 6-S-bS

Transitions

Existing Forest Condition

Development Type	Area (ha)	Yield	FMZ	Site	Density
bS	171,556	11	1, 2, 3	1	B, C, D
	83,483	12	1, 2, 3	2, 3	B, C, D

(PFT = BSL)

Future Forest Condition

%	Yield Group	Species Type	Vol/ha @	Rotation Age
100%	11-S-bS	S9H1	81 m³/ha	80 yrs
100%	12-S-bS	S9H1	112 m³/ha	80 yrs

Treatment Options

Silviculture System

Clearcut with retention

Logging Method and Slash Management

Full-Tree; process at roadside and burn / spread, or
Tree-Length; process at roadside and burn / spread, or
Cut-To-Length; process at stump or process at roadside and burn / spread

% Applied	Renewal Name	Site Preparation	Regeneration	Tending (Pre-/Post Free-to-Grow)
90%	C. Plant	If required (mechanical or chemical)	Plant @ 1200 sph	Only if required
9%	B. Drag & Leave	Scarification	Leave For naturals	Only if required
1%	A. Leave	None	Leave For naturals	Only if required

- Site preparation may be required to improve planting access due to slash loading or excessive competition (e.g., some sites harvested in winter).
- Consider tending as a cleaning activity (manual or chemical) to remove undesirable or competing vegetation.
- Leave for natural option appropriate only for small isolated areas where seed-in is expected from bS trees within or adjacent to area.

Regeneration Targets

Survey Window		Preferred Species/Height (m)	Acceptable Species/Height (m)
Establishment (4 to 7 years)	S:	bS/0.1, bF/0.1, wS/0.3	jP/0.3, tL/0.1
	H:	n/a	tA/0.3, bP/0.1, wB/0.1
FTG (8 to 14 years)	S:	bS/1.5, bF/1.5, wS/1.5	jP/2.0, tL/2.0
	H:	tA/2.0, bP/2.0, wB/2.0	n/a

Stocking

Minimum: ≥80% stocked and ≥800 sph
At <10,000 sph: S ≥31% of stems
At ≥10,000 sph, S ≥29% stems

- The 80% stocking requirement typically requires >1200 sph of uniformly spaced (planted) trees or >3000 sph in less uniform areas. These densities are assumed to deliver forecasted yields in future.
- The target stocking percentages by species types at establishment and FTG are expected to develop the desired species type (S) at rotation age (adapted from 'Development of a Regenerating Mixedwood Succession Matrix', Gelhorn, 2009 – see densities from matrix to the right).
- Some stands that regenerate to an SH species type will offset the reverse trend elsewhere.

Hardwood Densities (sph) — Spruce Mixed @ 90 yrs

Softwood (sph)	30000	20000	15000	10000	5000	4000	3000	2000	1500	1000	750	500	250
1500	SH	SH	SH	SH	SH	S	S	S	S	S	S	S	S
1250	SH	SH	SH	SH	SH	SH	SH	S	S	S	S	S	S
1000	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S	S
800	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S
600	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S
500	HS	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S
350	H	H	H	HS	HS	HS	HS	SH	SH	SH	SH	S	S
200	H	H	H	H	H	HS	HS	HS	HS	SH	SH	SH	S
100	H	H	H	H	H	H	H	H	HS	HS	HS	HS	SH

Silviculture Ground Rules — Reference Code: 7-S-jP

Transitions

Existing Forest Condition

Development Type	Area (ha)	Yield	FMZ	Site	Density
jP	33,760	13	1, 2, 3	1, 2	B, C, D
	254,553	14	1, 2, 3	3	B, C, D

(PFT = JLP)

Future Forest Condition

%	Yield Group	Species Type	Vol/ha @	Rotation Age
100%	13-S-jP	jP9H1	69 m³/ha	80 yrs
100%	14-S-jP	jP9H1	142 m³/ha	70 yrs

Treatment Options

Silviculture System

Clearcut with retention
Clearcut (mistletoe area)

Logging Method and Slash Management

Full-Tree; process at roadside and spread, or
Tree-Length; process at roadside and spread, or
Cut-To-Length; process at stump or process at roadside and spread

% Applied	Renewal Name	Site Preparation	Regeneration	Tending (Pre-/Post Free-to-Grow)
90%	B. Drag & Leave	Scarification	Leave For naturals	Only if required
5%	A. Leave	None	Leave For naturals	Only if required
5%	C. Plant	If required (mechanical)	Plant @ 1200 sph	Only if required

- Natural regeneration is appropriate where sufficient logging disturbance is present with a seed source. Consider planting where natural regeneration is unsuccessful or unlikely.
- For stands heavily impacted by dwarf mistletoe consider scarifying, removing infected trees and planting non-host species within a 20m buffer zone from potential seed sources. Alternatively, maintain a cleared buffer zone next to adjacent stands scheduled for harvest.
- Consider tending as a pre-commercial thinning activity (manual) to control over-stocking (e.g., ≥30,000 sph) and stem quality.

Regeneration Targets

Survey Window		Preferred Species/Height (m)	Acceptable Species/Height (m)	Stocking
Establishment (4 to 7 years)	S:	jP/0.3, wS/0.3	bF/0.1, bS/0.1, tL/0.1	Minimum: ≥80% stocked and ≥800 sph
	H:	n/a	tA/0.3, bP/0.1, wB/0.1	At <10,000 sph: S ≥38% of stems
FTG (8 to 14 years)	S:	jP/2.0, wS/1.5	bF1.5, bS/1.5, tL/2.0	At ≥10,000 sph, S ≥40% stems
	H:	n/a	tA/2.0, bP/2.0, wB/2.0	

- The 80% stocking requirement typically requires >1200 sph of uniformly spaced (planted) trees or >3000 sph in less uniform areas. These densities are assumed to deliver forecasted yields in future.
- The target stocking percentages by species types at establishment and FTG are expected to develop the desired species type (S) at rotation age (adapted from 'Development of a Regenerating Mixedwood Succession Matrix', Gelhorn, 2009 – see densities from matrix to the right).
- Some stands that regenerate to an SH species type will offset the reverse trend elsewhere.

Pine Mixed @ 80 yrs

Softwood (sph) \ Hardwood Densities (sph)	20000	15000	10000	5000	4000	3000	2000	1500	1000	750	500	250
20000	S	S	S	S	S	S	S	S	S	S	S	S
15000	S	S	S	S	S	S	S	S	S	S	S	S
10000	SH	S	S	S	S	S	S	S	S	S	S	S
5000	SH	SH	SH	S	S	S	S	S	S	S	S	S
4000	SH	SH	SH	S	S	S	S	S	S	S	S	S
3000	SH	SH	SH	SH	S	S	S	S	S	S	S	S
2000	SH	SH	SH	SH	SH	S	S	S	S	S	S	S
1500	SH	SH	SH	SH	SH	SH	S	S	S	S	S	S
1000	HS	HS	HS	SH	SH	SH	S	S	S	S	S	S
750	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S
500	HS	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	H
250	H	H	H	H	HS	HS	HS	HS	H	H	H	H

Silviculture Ground Rules

Reference Code: 8-S-jPbS

Transitions

Existing Forest Condition

Development Type	Area (ha)	Yield	FMZ	Site	Density
jPbS	27,234	15	1, 2, 3	1, 2	B, C, D
	159,268	16	1, 2, 3	3	B, C, D

(PFT = BSJ)

Future Forest Condition

%	Yield Group	Species Type	Vol/ha @	Rotation Age
100%	15-S-jPbS	jP10	66 m³/ha	90 yrs
100%	16-S-jPbS	jPbS9H1	107 m³/ha	70 yrs

Treatment Options

Silviculture System

Clearcut with retention
Clearcut (mistletoe area)

Logging Method and Slash Management

Full-Tree; process at roadside and burn / spread, or
Tree-Length; process at roadside and burn / spread, or
Cut-To-Length; process at stump or process at roadside and burn / spread

% Applied	Renewal Name	Site Preparation	Regeneration	Tending (Pre-/Post Free-to-Grow)
80%	B. Drag & Leave	Scarification	Leave For naturals	Only if required
15%	C. Plant	If required	Plant @ 1200 sph	Only if required
5%	A. Leave	None	Leave For naturals	Only if required

- Consider planting where insufficient seed source exists to achieve stocking using a leave for naturals approach (i.e. Mistletoe areas).
- For stands heavily impacted by dwarf mistletoe consider scarifying, removing infected trees and planting non-host species within a 20m buffer zone from potential seed sources. Alternatively, maintain a cleared buffer zone next to adjacent stands scheduled for harvest.
- Consider tending as a cleaning activity (manual or chemical) to remove undesirable or competing vegetation.

Regeneration Targets

Survey Window		Preferred Species/Height (m)	Acceptable Species/Height (m)
Establishment (4 to 7 years)	S:	jP/0.3, wS/0.3, bS/0.1	bF/0.1, tL/0.1
	H:	n/a	tA/0.3, bP/0.1, wB/0.1
FTG (8 to 14 years)	S:	jP/2.0, wS/1.5, bS/1.5	bF1.5, tL/2.0
	H:	n/a	tA/2.0, bP/2.0, wB/2.0

Stocking

Minimum: ≥80% stocked and ≥800 sph
At <10,000 sph: S ≥38% of stems
At ≥10,000 sph, S ≥40% stems

- The 80% stocking requirement typically requires >1200 sph of uniformly spaced (planted) trees or >3000 sph in less uniform areas. These densities are assumed to deliver forecasted yields in future.
- The target stocking percentages by species types at establishment and FTG are expected to develop the desired species type (S) at rotation age (adapted from 'Development of a Regenerating Mixedwood Succession Matrix', Gelhorn, 2009 – see densities from matrix to the right).
- Some stands that regenerate to an SH species type will offset the reverse trend elsewhere.

Pine Mixed @ 90 yrs

Softwood (sph) \ Hardwood Densities (sph)	20000	15000	10000	5000	4000	3000	2000	1500	1000	750	500	250
20000	S	S	S	S	S	S	S	S	S	S	S	S
15000	S	S	S	S	S	S	S	S	S	S	S	S
10000	SH	S	S	S	S	S	S	S	S	S	S	S
5000	SH	SH	SH	S	S	S	S	S	S	S	S	S
4000	SH	SH	SH	S	S	S	S	S	S	S	S	S
3000	SH	SH	SH	SH	S	S	S	S	S	S	S	S
2000	SH	SH	SH	SH	SH	S	S	S	S	S	S	S
1500	SH	SH	SH	SH	SH	SH	S	S	S	S	S	S
1000	HS	HS	HS	SH	SH	SH	S	S	S	S	S	S
750	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S
500	HS	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	H
250	H	H	H	H	HS	HS	HS	HS	H	H	H	H

Silviculture Ground Rules — Reference Code: 9-S-wSbF

Transitions

Existing Forest Condition → **Future Forest Condition**

Development Type	Area (ha)	Yield	FMZ	Site	Density	%	Yield Group	Species Type	Vol/ha @	Rotation Age
wSbF	18,133	17	1	All	B, C, D	100%	17-S-wSbF	wSbF8H2	178 m³/ha	80 yrs
(PFT = WSF)	32,700	18	2, 3	All	B, C, D	100%	18-S-wSbF	wSbF9H1	180 m³/ha	80 yrs

Treatment Options

Silviculture System

Clearcut with retention

Logging Method and Slash Management

Full-Tree; process at roadside and burn / spread, or
Tree-Length; process at roadside and burn / spread, or
Cut-To-Length; process at stump or process at roadside and burn / spread

% Applied	Renewal Name	Site Preparation	Regeneration	Tending (Pre-/Post Free-to-Grow)
95%	C. Plant	If required (mechanical or chemical)	Plant @ 1200 sph	Only if required
5%	A. Leave	None	Leave For naturals	Only if required

- Consider measures to protect softwood understory stand component or retain pockets of softwood overstory as seed trees
- Site preparation may be required to improve planting access due to slash loading or excessive competition.
- Consider tending as a cleaning activity (manual or chemical) to remove undesirable or competing vegetation.

Regeneration Targets

Survey Window		Preferred Species/Height (m)	Acceptable Species/Height (m)
Establishment (4 to 7 years)	S:	wS/0.3, bF/0.3	jP/0.3, bS/0.1, tL/0.1
	H:	n/a	tA/0.3, bP/0.1, wB/0.1
FTG (8 to 14 years)	S:	wS/1.5, bF/1.5	jP/2.0, bS/1.5, tL/2.0
	H:	n/a	tA/2.0, bP/2.0, wB/2.0

Stocking

Minimum: ≥80% stocked and ≥800 sph
At <10,000 sph: S ≥31% of stems
At ≥10,000 sph, S ≥29% stems

- The 80% stocking requirement typically requires >1200 sph of uniformly spaced (planted) trees or >3000 sph in less uniform areas. These densities are assumed to deliver forecasted yields in future.
- The target stocking percentages by species types at establishment and FTG are expected to develop the desired species type (S) at rotation age (adapted from 'Development of a Regenerating Mixedwood Succession Matrix', Gelhorn, 2009 – see densities from matrix to the right).
- Some stands that regenerate to an SH species type will offset the reverse trend elsewhere.

Spruce Mixed @ 80 yrs

Softwood (sph) \ Hardwood Densities (sph)	30000	20000	15000	10000	5000	4000	3000	2000	1500	1000	750	500	250
1500	SH	SH	SH	SH	SH	SH	SH	S	S	S	S	S	S
1250	SH	HS	HS	SH	SH	SH	SH	S	S	S	S	S	S
1000	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S
800	HS	HS	HS	HS	SH	SH	SH	SH	SH	S	S	S	S
600	HS	HS	HS	HS	HS	HS	HS	SH	SH	SH	S	S	S
500	HS	H	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	S
350	H	H	H	HS	HS	HS	HS	HS	SH	SH	SH	SH	S
200	H	H	H	H	H	H	H	HS	HS	HS	SH	SH	S
100	H	H	H	H	H	H	H	H	H	HS	HS	HS	SH

Silviculture Ground Rules

Reference Code: 10-S-xStL

Transitions

Existing Forest Condition

Development Type	Area (ha)	Yield	FMZ	Site	Density
xStL (PFT = mostly BSL or BSJ; tL 11-30% of stand)	36,623	19	1, 2, 3	All	B, C, D

Future Forest Condition

%	Yield Group	Species Type	Vol/ha @	Rotation Age
100%	19-S-StL	S10	78 m³/ha	80 yrs

Treatment Options

Silviculture System

Clearcut with retention

Logging Method and Slash Management

Full-Tree; process at roadside and burn / spread, or
Tree-Length; process at roadside and burn / spread, or
Cut-To-Length; process at stump or process at roadside and burn / spread

% Applied	Renewal Name	Site Preparation	Regeneration	Tending (Pre-/Post Free-to-Grow)
90%	C. Plant	If required (mechanical)	Plant @ 1200 sph	Only if required
10%	A. Leave	None	Leave For naturals	Only if required

- Where practical, maintain tL within retention (unharvested) while harvesting on other species (typically bS).
- Site preparation may be required to improve planting access due to slash loading or excessive competition.
- Consider tending as a cleaning activity (manual or chemical) to remove undesirable or competing vegetation.

Regeneration Targets

Survey Window		Preferred Species/Height (m)	Acceptable Species/Height (m)	Stocking
Establishment (4 to 7 years)	S:	tL/0.1, bS/0.1,	wS/0.3,jP/0.3	Minimum: ≥80% stocked and ≥800 sph
	H:	n/a	tA/0.3, bP/0.1	At <10,000 sph: S ≥31% of stems
FTG (8 to 14 years)	S:	tL/2.0, bS/1.5	wS/1.5, jP/2.0	At ≥10,000 sph, S ≥29% stems
	H:	n/a	tA/2.0, bP/2.0	

- The 80% stocking requirement typically requires >1200 sph of uniformly spaced (planted) trees or >3000 sph in less uniform areas. These densities are assumed to deliver forecasted yields in future.
- The target stocking percentages by species types at establishment and FTG are expected to develop the desired species type (S) at rotation age (adapted from 'Development of a Regenerating Mixedwood Succession Matrix', Gelhorn, 2009 – see densities from matrix to the right).
- Some stands that regenerate to an SH species type will offset the reverse trend elsewhere.

Hardwood Densities (sph) — Spruce Mixed @ 90 yrs

Softwood (sph)	30000	20000	15000	10000	5000	4000	3000	2000	1500	1000	750	500	250
1500	SH	SH	SH	SH	SH	S	S	S	S	S	S	S	S
1250	SH	SH	SH	SH	SH	SH	SH	S	S	S	S	S	S
1000	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S	S
800	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S	S
600	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S	S
500	HS	HS	HS	HS	HS	HS	SH	SH	SH	SH	S	S	S
350	H	H	H	HS	HS	HS	HS	SH	SH	SH	SH	S	S
200	H	H	H	H	H	HS	HS	HS	HS	SH	SH	SH	S
100	H	H	H	H	H	H	H	H	HS	HS	HS	HS	SH

Appendix C Forest Estate Modeling Report/Assumptions Document

Prince Albert FMA

Forest Estate Modelling Report

November 10, 2017

Project [1062-4]

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Executive Summary

This document contains the forest estate modelling methodology and results for the Prince Albert Forest Management Agreement (PA FMA) area as a part of the 2018-2038 Twenty Year Forest management Plan (FMP). The PA FMA area is approximately 3,349,533 hectares in size, with 44.5% considered non-forested. The net landbase, where commercial forestry is expected to occur, has been estimated at 1,396,528 hectares.

The inventory for the PA FMA was completed by Weyerhaeuser Saskatchewan during the period 1999 to 2005, and submitted to Saskatchewan Environment in 2006. It follows the Saskatchewan Forest Vegetation Inventory (SFVI) format and has been updated for this analysis to reflect changes (harvesting, fires, etc.) to 2017 and to address other issues such as data gaps where past landbase exclusions no longer apply.

The natural stand yield curves, compiled by Timberline in 2008, are based on development types (species1/species2) and occasionally split by stand density or site productivity (12 curves total). Yields were re-compiled in 2014 to reflect updates to utilization standards and assume a 10cm min top diameter. Tamarack volume was not included in any yield curves. All curves have a terminal age defined after which they decline at 1% per year until they reach zero volume. During modelling, stands were assumed to 'die' once they reached 25% of their peak volume and restart at ages between 20-50 years old to emulate succession patterns and recognizing advanced regeneration. These succession ages were typically between 170-190 years old for hardwoods, and between 180-200 years old for softwoods.

PATCHWORKS^{TM}, a spatially explicit, heuristic based, forest estate model was used to conduct the analysis. The model was run for a 200-year planning horizon split into forty 5-year planning periods. Several management scenarios and sensitivity analyses were explored prior to selecting a Preferred Management Scenario.

The Preferred Management Scenario considers Natural Forest Patterns [in-block retention, old seral retention, interior old seral, harvest event size distribution], 2017 Caribou Habitat Management Plan, cut-to-length utilization for softwood (tree length for hardwood), and minimum pulp production targets including dedicated stands. This scenario is able to support the current softwood sawlog HVS of 1,265,000m³/year and an increased hardwood HVS of 1,125,000m³/year for 35 years, with a forecasted pulp harvest of 600,000m³/year (200,000 m³/yr of this from dedicated pulp stands) (see Figure 1).

Long-term harvest rates are lower than short-term levels because the suppression of fires has allowed the FMA's age class distribution to become unnaturally old and thus contain higher volumes per hectare than future managed stands. It is the management intent of the FMP to bring age classes more in line with a historically natural landscape experiencing a natural fire disturbance regime. The long term harvest levels for softwood may increase as better information is obtained on volumes generated from managed stands (those regenerated after harvesting).

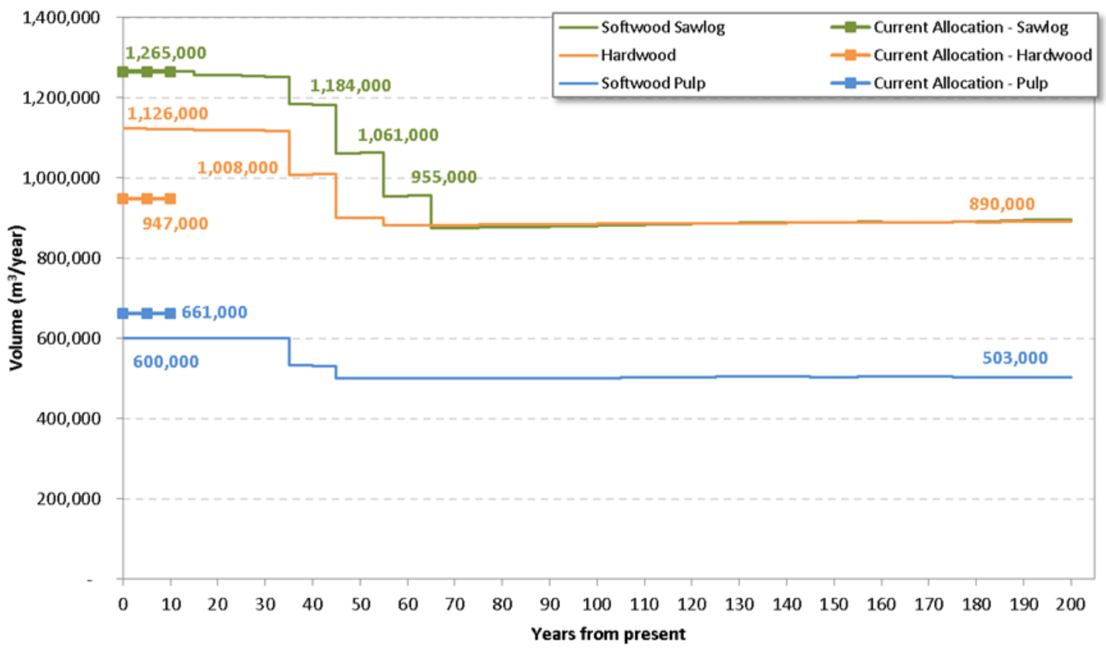

Figure 1 Preferred Scenario HVS for softwood sawlogs, hardwood, and softwood pulp.

Numerous sensitivity analyses were completed and indicate that there is sensitivity to extended rotation ages - having to wait an extra 10 years to harvest second growth stands would reduce the number of years the HVS can be maintained. Softwood harvest levels could be substantially improved or reduced if different utilization standards are adopted – both of which would increase the amount of pulp volume realized. Overall, only two sensitivities indicated that the current sawlog and hardwood HVS's could not be maintained for the term of the plan. These were increasing the disturbance age within the Caribou Management Zones to 40 years (current HVS can only be maintained 15 years), and changing top diameter utilization for sawlog to 12.5 cm (current HVS reduced by 9.5%) when compared to the Preferred Scenario.

The recommended HVS for the 2015-2035 FMP is as follows:

Table 1 Recommended harvest levels for the 2015-2035 FMP

2018-2038 FMP Timeframe	**Softwood Harvest (m^3/yr)**	**Hardwood Harvest (m^3/yr)**	**Softwood Pulp Harvest (m^3/yr)**
2018-2028	1,265,000	1,126,000	600,000
2028-2038	1,265,000	1,126,000	600,000

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List of Acronyms

AU	Analysis Unit
CSG	Cover Species Group
FMA	Forest Management Agreement
FMP	Forest Management Plan
FMPD	Forest Management Planning Document
FMZ	Forest Management Zone
GIS	Geographical Information System
HVS	Harvest Volume Schedule
HWD	Hardwoods
LRSY	Long Run Sustainable Yield
M	Million
NFP	Natural Forest Patterns
PA FMA	Prince Albert FMA
PFLB	Productive Forest Land Base
PFLB	Productive Forest Land Base
PFT	Provincial Forest Type
PFT	Provincial Forest Types
PA	Prince Albert
RAN	Representative Area Network
SFVI	Saskatchewan Forest Vegetation Inventory
SWD	Softwoods
THLB	Timber Harvesting Land Base
TSP	Temporary Sample Plots
WFVI	Weyerhaeuser Forest Vegetation Inventory

1 Introduction

This document describes the forest estate modelling conducted for the Prince Albert Forest Management Agreement (PA FMA) as part of the 2018-2038 Twenty Year Forest Management Plan (FMP). A full description of the study area, the work conducted to prepare the data, and the assumptions used in the model are detailed in two complementary documents: (1) Volume I Background Information for PA FMA Twenty-Year Forest Management Plan (August 2009) and (2) Forest Estate Modelling Assumptions (FEMA) prepared by Forsite and reproduced in Appendix IV.

Forest estate modelling is employed to assess timber supply and forecast forest related indicators over time. Determining a sustainable timber supply involves consideration of a wide range of physical, biological, social, and economic factors that can influence the acceptable rate of timber harvesting within a management unit. The factors encompass both the timber and non-timber values found in forests, and ensure that timber harvesting objectives are balanced with the non-timber objectives (concerns for wildlife, biodiversity, recreational opportunities, etc.).

The forest estate modelling documented here explores several management strategies (candidate scenarios) and associated sustainable rates of harvest over a 200-year planning horizon while considering both timber and non-timber objectives. An initial set of scenarios was created in 2015. The inventory was then updated in 2017 and another set of scenarios completed. This document includes both the 2015 and 2017 analyses.

Through consultations with the forest management planning team and the public advisory group, the management strategy that best fit the desired outcomes was selected as the preferred scenario for the 2018-2038 FMP. This scenario will be used to develop the 20-year tactical plan that guides development foresters in preparing their annual operating plans during the term of the plan, and will assure consistency with the modeled forecast. The detailed tactical plan is provided in a separate submission.

2 Study Area

2.1 Location

The Prince Albert Forest FMA area (PAFMA) is approximately 3.35 million hectares in north-central Saskatchewan's boreal forest, north of the city of Prince Albert (Figure 2).

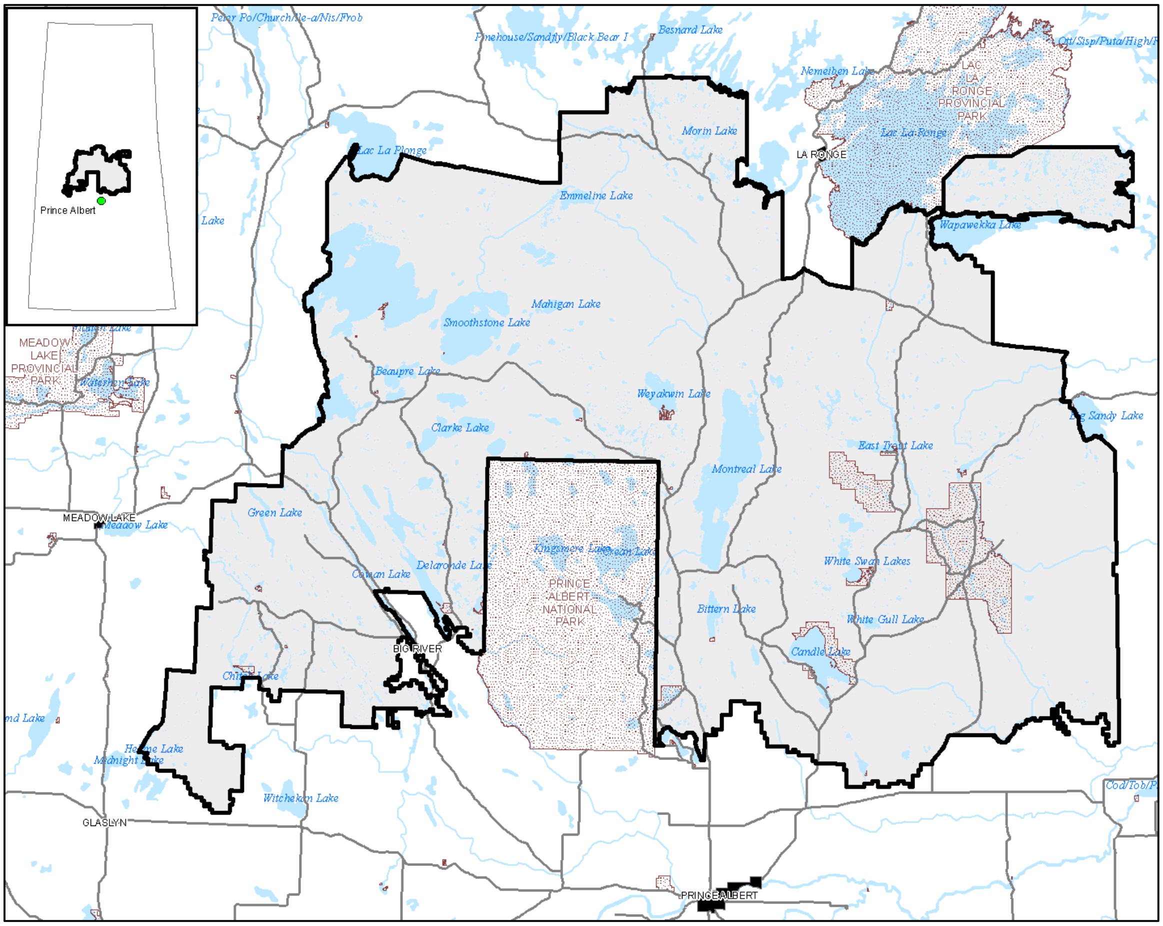

Figure 2 Location and extent of Prince Albert FMA area

2.2 Land Base Definition

This section describes the assumptions used to support land base definitions. Four key land base definitions are made:

1. **Total FMA Area**: the gross area within the legal FMA boundaries.
2. **Productive Forest Land Base (PFLB)**: the subset of the total area that is crown forested land. It is defined by removing all Permanent Exclusions from the gross FMA area.
3. **Managed Forest Land Base (MFLB)**: the subset of the PFLB that is allowed to contribute toward meeting both timber and non-timber values. It consists of all Partial Exclusion areas and the Net land base as defined in the FMPD Appendix 6, section 13.2.4.
4. **Net Area:** the subset of the MFLB where harvesting has or could occur in the future. The Net Area excludes areas that are inoperable, uneconomic, or are otherwise off-limits to timber harvesting.

The land base summary is shown in Table 2, Figure 3, and in Figure 4.

Table 2 Land Base Area Netdown Summary

Land Base element	Total Area (ha)	Effective Area (ha)*	% Total Area	% MFLB
Total Crown area (PA FMA)	**3,349,533**	**3,349,533**		
Less:				
Non FMA Lands (IR, VILNC, Patent Lands, Misc. leases)	49,569	49,569	1.5%	
Dispositions (Buffered and Non-Buffered)	16,116	14,279	0.4%	
Treaty Land Entitlements	3,588	3,579	0.1%	
Non Forest / Non Productive Forest	1,527,837	1,492,202	44.5%	
Roads, Rail, Utilities Corridors	1,626	1,207	0.0%	
Productive Forest Land Base (PFLB)		**1,788,697**	**53.4%**	
Less:				
Reserved Forest (RAN, Weyco Release, Rec Areas, Prov Parks)	131,223	84,790	2.5%	
Managed Forest land Base (MFLB)		**1,703,907**	**50.9%**	**100.0%**
Less:				
Subjective Leave Areas Around Developments	1,587	816	0.0%	0.0%
Steep Slopes	7,246	3,923	0.1%	0.2%
Non-Commercial - Low Density	49,734	46,692	1.4%	2.7%
Non-Commercial - Problem Types	18,413	8,711	0.3%	0.5%
Non-Commercial - "Larchy"	146,307	120,750	3.6%	7.1%
Non-Commercial - Low Site Productivity	96,035	48,988	1.5%	2.9%
Isolated Areas (Uneconomic)	6,121	6,121	0.2%	0.4%
Spatial Net Area		**1,467,907**	**43.8%**	**86.1%**
Less Non Spatial Netdowns:				
Riparian (lakes, rivers, streams)	53,643	12,663	0.4%	0.7%
Stand Level Retention (Insular – 9% gross , 4% net impact)		132,112	3.9%	7.8%
Effective Net Area		**1,323,142**	**39.5%**	**77.7%**
Less Future Non-Spatial Netdowns:				
Future permanent roads (0.62% of Net Area)	11,000	8,800	0.3%	0.5%
Effective Future Net Area		**1,314,342**	**39.2%**	**77.1%**

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

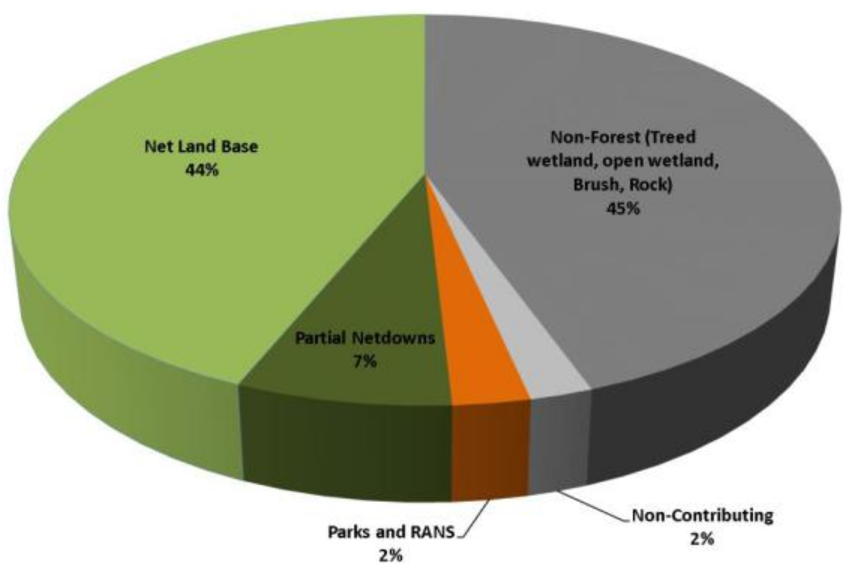

Figure 3 Prince Albert FMA land base Summary

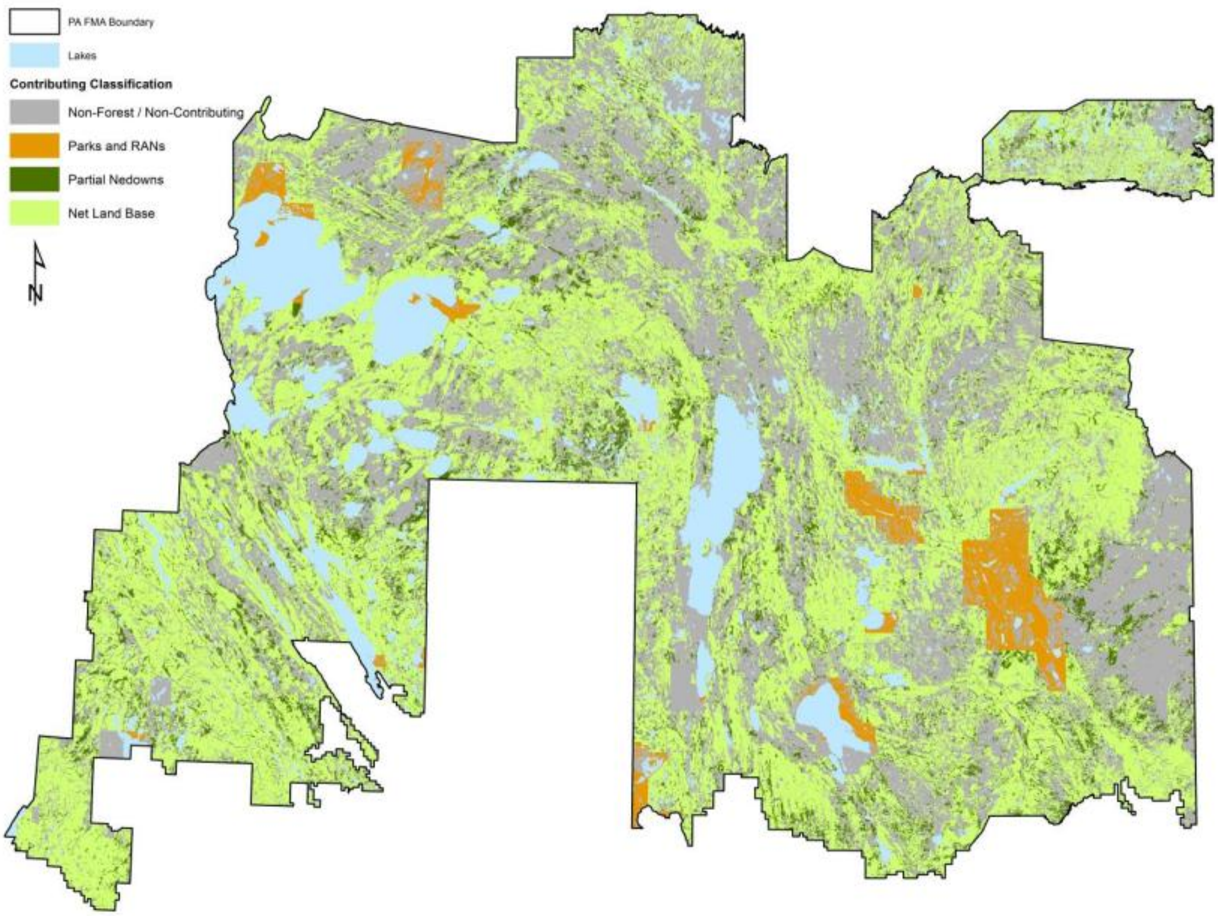

Figure 4 Prince Albert FMA Contributing Land Base Overview Map

2.3 Current Attributes of the FMA

Descriptive statistics for the FMA are presented in this section in order to understand the current state of the FMA and provide context to the forest estate modelling results. Approximately 53% of the total area of the PA FMA is productive forest (Table 2) while the other 47% of the land base is non-productive (e.g. water bodies, flooded lands, pastures, muskeg) or Non-FMA (e.g. First Nations Reserves, Private land, etc.). Approximately 82% of the MFLB, or 42% of the total FMA area, is available for timber harvesting.

Within the net area, 56% is occupied by softwood dominated stands (30%-BSJ&BSL, 23%-JLP, 4%-WSF), 27% by hardwood dominated stands, and 17% by mixedwood stands (Figure 5).

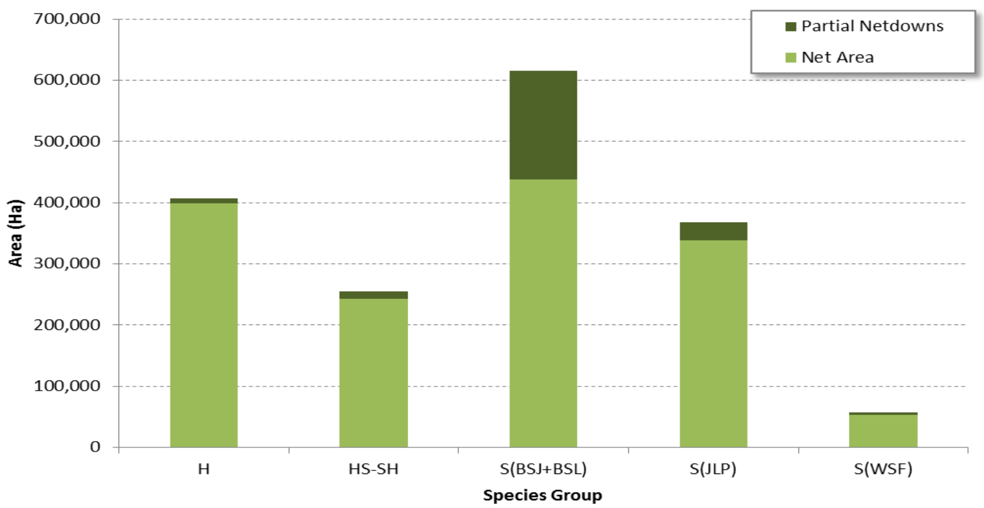

Figure 5 Species group in the MFLB by land base type

The majority of the land base is comprised of age classes younger than 50 years or between 80 and 140 years (Figure 6). The significant areas of older age classes suggests that natural disturbance patterns have been suppressed, leading to landscapes that are generally older than what they would be without fire suppression. Detailed statistics for management unit, species group, and seral area distribution are included in the Appendix of the Modeling Assumptions document (Appendix IV).

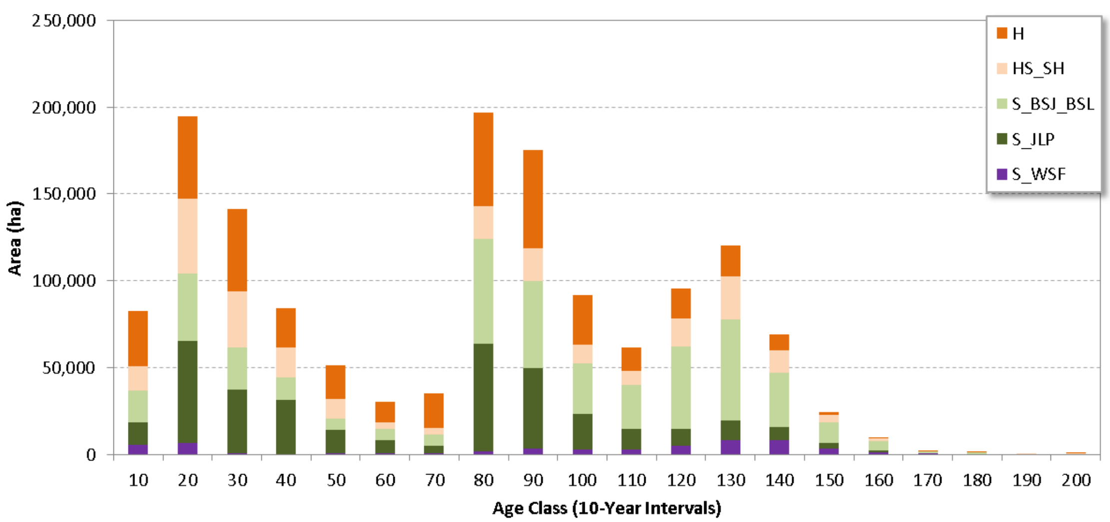

Figure 6 Current age class distribution of the MFLB by land base type

This site index distribution of the net landbase is shown in Figure 7. The weighted average site index is 14.2m. All stands with site index below 7 were excluded from the net land base.

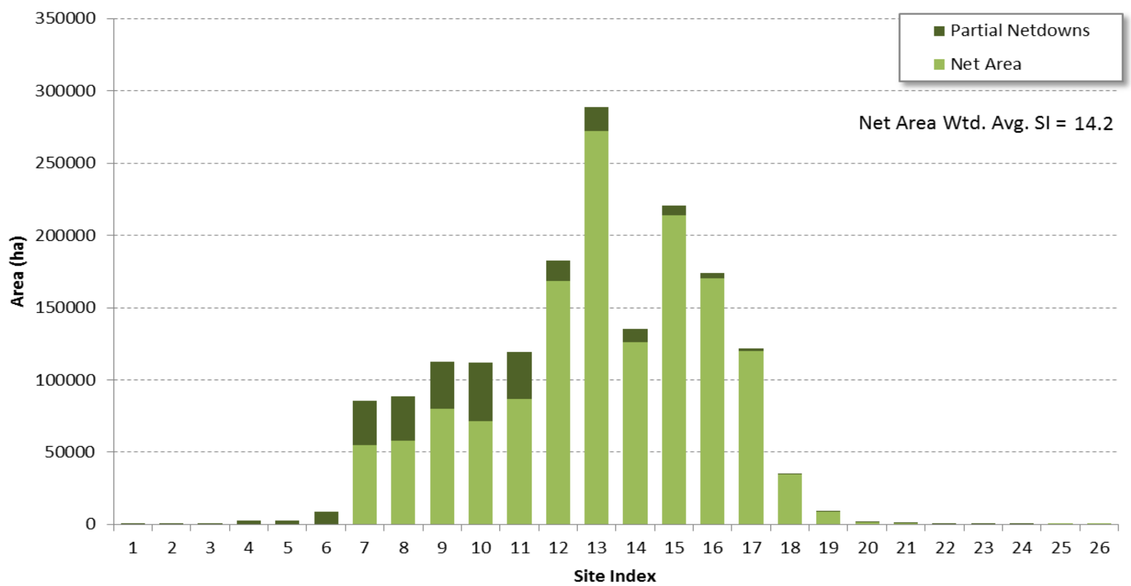

Figure 7 Site index distribution in the MFLB by land base type

3 Summary of Modelling Assumptions

This section provides a summary of the key modelling assumptions. Full details can be found in Appendix IV (Forest Estate Modelling Assumptions).

The PATCHWORKS™ (www.spatial.ca) forest estate model was used in the analysis. It is a spatially explicit model that employs computational heuristics to find solutions. The model was run for a 200-year planning horizon split into forty 5-year planning periods. The approved planning inventory (GIS resultant file) for the FMA was used to create blocks, which are the base unit in Patchworks. Blocks contained common age stands (i.e. within 10 years of each other) of the same development type. Full details around development of the planning inventory file are found in the modeling assumptions document.

3.1 Forest Inventory, Growth and Yield, and Harvesting/Silviculture

Current Annual Operating Plan (AOP) blocks were prioritized for harvest in the first decade of the plan. This aligns current planning with the modeling outputs that will inform the tactical plan.

The inventory for the PA FMA was completed by Weyerhaeuser Saskatchewan from 1999 to 2005, and submitted to Saskatchewan Environment in 2006. It follows the new Saskatchewan Forest Vegetation Inventory (SFVI) format. The inventory has been updated for the purpose of the 2015-2035 FMP to reflect changes (harvesting, fires, etc.) and to address other issues such as data gaps where exclusions areas had changed.

Natural stand yield curves were compiled by Timberline in 2008 from ~6500 temporary sample plots stratified into 10 development types (species combinations) further split by either stand density or site productivity or geographic zone. Yields were re-compiled in 2014 using the same plot data to reflect different harvesting practices - and changes to the merchandizing assumptions occurred that altered the softwood pulp/sawlog distribution. The same 10 development types were used to produce 19 yield groups that reflected differences in density or site productivity or geographic zone (Table 3). Tamarack volume continued to not be included in any yield curves and all stands with >30% TL were fully excluded from the landbase.

All curves reach a terminal age and then all but pure black spruce stands decline at 1% per year until reaching zero volume. During modelling, stands were assumed to die after declining to 25% of their peak volume and restart at ages between 20-50 years old to emulate succession patterns and recognizing advanced regeneration (BS stands assumed to restart at 200 years old). For hardwoods, succession occurred between 170-190 years old, and for softwoods between 180-200 years old.

Silviculture treatments were predominantly clearcut with retention. Stands were regenerated back to the same natural stand yield curve (no shifting of stand types, no managed stand yield gains) but subsequent harvests did have a 0.62% yield reduction to reflect area lost to future permanent roads. A summary of the modeled Analysis Units (AUs), their operability windows, and regeneration delays can be found in Appendix IV – Detailed Modelling Assumptions Document. Additional AU numbering was used during modelling to differentiate existing natural, existing managed, and future stands for purposes of tracking/reporting.

Table 3 Treatment availability by analysis unit

Existing Stands							Future Stands	
AU	Description	Yield Group	Min. Harvest Age	Max. Harvest Age	Treatment+	% of Harvested Area	AU	Initial Age
101	1_H_HW_Density_B	1	45	145	CC-LFN	100	101	0
102	1_H_HW_Density_CD	2	50	145	CC-LFN	100	102	0
103	2_HS_HjP_Density_B	3	60	150	CC-LFN	100	103	0
104	2_HS_HjP_Density_CD	4	65	150	CC-LFN	100	104	0
105	3_SH_jPH_Density_B	5	60	150	CC-SCARIFY	100	105	-1
106	3_SH_jPH_Density_CD	6	65	150	CC-SCARIFY	100	106	-1
107	4_HS_HxS_Density_B	7	75	160	CC-LFN	100	107	0
108	4_HS_HxS_Density_CD	8	80	165	CC-LFN	100	108	0
109	5_SH_SxH_Density_B	9	75	185	CC-LFN	100	109	0
110	5_SH_SxH_Density_CD	10	80	190	CC-LFN	100	110	0
111	6_S_bS_SiteModPoor	11	65	200	CC-PLANT	100	111	-1
112	6_S_bS_SiteGood	12	65	200	CC-PLANT	100	112	-1
113	7_S_jP_SitePoor	13	70	120	CC-SCARIFY	100	113	-1
114	7_S_jP_SiteGoodMod	14	55	155	CC-SCARIFY	100	114	-1
115	8_S_jPbS_SitePoor	15	80	145	CC-SCARIFY	100	115	-1
116	8_S_jPbS_SiteGoodMod	16	60	180	CC-SCARIFY	100	116	-1
117	9_S_wSbF_FMZ1	17	65	190	CC-PLANT	100	117	-1
118	9_S_wSbF_FMZ23	18	65	185	CC-PLANT	100	118	-1
119	10_S_tL_11to30pct	19	60	100	CC-PLANT	100	119	-1

+ LFN = Leave For Naturals

Endemic losses from pest and disease are reflected in the yield curves. No recognition of catastrophic losses (wind throw, fire) is included in the analysis. Fire losses were not modeled in favour of using a disturbance threshold which would trigger a reassessment of timber supply.

3.2 Non-Timber Objectives

In-block retention of areas representative of those being harvested was modeled at 9% (4% net impact). This is implemented as an aspatial area netdown within each block. This allowed the retained areas to contribute toward old and very old seral requirements.

<u>Old seral and very old seral</u> stands were maintained on the land base within eleven geographic management units (MU's – see Figure 8) and within five stand types (H, HS/SH, bS, wS, Jp) for a total of 55 independent targets. A minimum of amount of the MFLB in each MU/stand type had to be old or very old seral, and a portion had to be very old seral (see assumptions document for details). A subset of the old/very old stands provided 'interior' conditions (i.e. away from stand edge influences). A surrogate for a minimum target of 20% <u>old interior habitat</u> was applied, during modeling, for the first 20 years, by targeting 45% of the old seral in patches > 500 hectares.

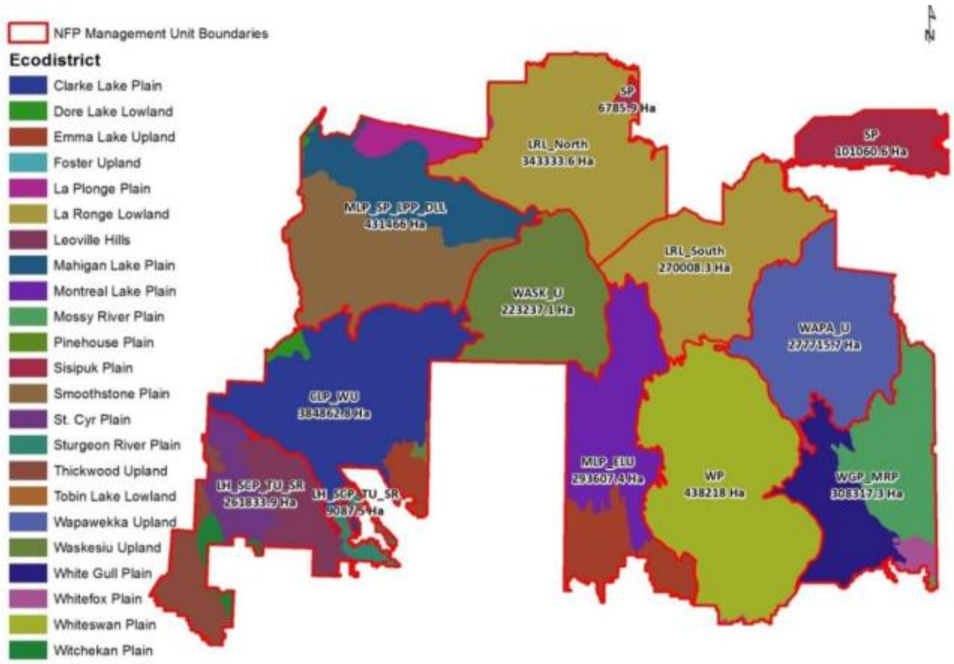

Figure 8 Management Units used for managing old forest

Table 4 Management Unit species group area summaries for the Managed Forest Land Base

Management Unit	Species Group	MFLB (Ha)
CLP_WU	H	80,939
	HS-SH	42,639
	S(JLP)	14,156
	S(BSJ+BSL)	64,617
	S(WSF)	13,012
	Sub-Total	**215,363**
LH_SCP_TU_SR	H	122,131
	HS-SH	26,207
	S(JLP)	18,084
	S(BSJ+BSL)	28,375
	S(WSF)	10,236
	Sub-Total	**205,033**
LRL_North	H	17,662
	HS-SH	20,533
	S(JLP)	39,808
	S(BSJ+BSL)	61,916
	S(WSF)	2,566
	Sub-Total	**142,484**
LRL_South	H	17,702
	HS-SH	16,844
	S(JLP)	47,672
	S(BSJ+BSL)	43,305
	S(WSF)	3,514
	Sub-Total	**129,037**

Management Unit	Species Group	MFLB (Ha)
MLP_ELU	H	31,716
	HS-SH	21,625
	S(JLP)	25,102
	S(BSJ+BSL)	47,016
	S(WSF)	3,861
	Sub-Total	**129,321**
MLP_SP_LPP_DLL	H	39,032
	HS-SH	35,974
	S(JLP)	20,665
	S(BSJ+BSL)	64,122
	S(WSF)	10,280
	Sub-Total	**170,073**
SP	H	3,310
	HS-SH	4,248
	S(JLP)	17,886
	S(BSJ+BSL)	29,003
	S(WSF)	789
	Sub-Total	**55,236**
WAPA_U	H	27,045
	HS-SH	26,829
	S(JLP)	44,223
	S(BSJ+BSL)	63,783
	S(WSF)	2,176
	Sub-Total	**164,056**

Management Unit	Species Group	MFLB (Ha)
WASK_U	H	17,578
	HS-SH	19,210
	S(JLP)	35,931
	S(BSJ+BSL)	68,006
	S(WSF)	3,332
	Sub-Total	**144,057**
WGP_MRP	H	24,214
	HS-SH	11,543
	S(JLP)	42,467
	S(BSJ+BSL)	45,564
	S(WSF)	3,198
	Sub-Total	**126,986**
WP	H	25,287
	HS-SH	29,879
	S(JLP)	62,328
	S(BSJ+BSL)	100,306
	S(WSF)	4,461
	Sub-Total	**222,261**
Grand Total		**1,703,907**

4 The LRSY Calculation

The long run sustained yield (LRSY) was calculated by determining, for each yield group (YG), the product of its Mean Annual Increment at culmination (CMAI) and its net area (Table 5). For hardwood stands (YG 1&2), the reference year was based on maximum hardwood CMAI, for mixed-wood stands, the reference year was based on the total increment (YG curves 3-10), and for softwood stands (YG curves 11-19) it was based on the softwood increment.

Table 5 LRSY Calculated with PA FMA Yield Curves and Utilization Standards.

Yield Group	Description	CMAI AGE	HWD MAI	SWD MAI	Area (ha)	Hwd VOL (m^3/yr)	Swd Pulp Vol (m^3/yr)	Swd Sawlog vol (m^3/yr)	Total VOL (m^3/yr)
1	1_H_HW_Density_B	50	1.373	0.358	84,293	115,702	10,328	19,861	145,891
2	1_H_HW_Density_CD	55	2.115	0.368	266,578	563,938	15,938	82,196	662,072
3	2_HS_HjP_Density_B	80	0.685	0.678	24,466	16,761	2,098	14,481	33,340
4	2_HS_HjP_Density_CD	85	1.120	1.242	24,122	27,014	7,562	22,392	56,968
5	3_SH_jPH_Density_B	80	0.477	0.886	20,475	9,770	3,805	14,326	27,902
6	3_SH_jPH_Density_CD	85	0.750	1.612	16,430	12,314	7,448	19,039	38,801
7	4_HS_HxS_Density_B	95	0.482	1.073	23,475	11,318	3,494	21,694	36,507
8	4_HS_HxS_Density_CD	100	1.300	0.976	66,960	87,066	7,965	57,420	152,451
9	5_SH_SxH_Density_B	95	0.553	1.003	12,829	7,088	1,680	11,183	19,951
10	5_SH_SxH_Density_CD	100	0.859	1.418	33,533	28,793	6,110	41,442	76,346
11	6_S_bS_SiteModPoor	85	0.081	0.938	153,132	12,427	36,561	107,072	156,060
12	6_S_bS_SiteGood	90	0.093	1.324	76,719	7,162	21,207	80,351	108,719
13	7_S_jP_SitePoor	55	0.053	0.869	79,374	4,229	23,520	45,300	73,050
14	7_S_jP_SiteGoodMod	65	0.114	1.915	190,174	21,602	111,142	253,126	385,871
15	8_S_jPbS_SitePoor	70	0.005	0.766	26,125	138	4,562	15,381	20,080
16	8_S_jPbS_SiteGoodMod	80	0.126	1.398	144,110	18,184	52,602	148,644	219,430
17	9_S_wSbF_FMZ1	70	0.279	1.907	17,076	4,767	6,777	24,802	36,347
18	9_S_wSbF_FMZ23	70	0.244	1.959	30,433	7,436	6,926	50,980	65,342
19	10_S_tL_11to30pct	50	0.325	0.937	32,838	10,677	5,593	24,898	41,167
				Total	**1,323,142**	**966,388**	**335,318**	**1,054,588**	**2,356,295**

Note: Total increment for mixed stands is the sum of the softwood and hardwood increments.

This LRSY calculation suggests that the theoretical maximum long term harvest level for this landbase would be 966,388 m^3/yr for hardwood, 1,054,588 m^3/yr for softwood sawlogs, and 335,318 m^3/yr for pulp. These harvest levels would only be achieved in the long-term if no constraints are applied in the model and stands could all be harvested at exactly the assumed age. Short-term harvest levels can vary substantially from these levels depending on the age of the forest being harvested.

5 Candidate Scenario Modelling Results (2015 Analysis)

Modelling results are presented for two candidate scenarios (Timber Focused and Natural Forest Patterns). Then, a number of sensitivity analyses are explored to understand alternative assumptions. Finally, a preferred scenario is identified and presented in detail.

5.1 Timber Focused Scenario (2015)

The Timber Focused scenario was designed to allow the model to focus almost solely on the production of timber over time. The landbase definition remained unchanged so consideration of non-timber values such as riparian and subjective leave areas are still in place – but in block retention was not implemented. The key variables in the Timber Focused scenarios are shown in Table 6. A description of the critical variables for each candidate scenario is available in Appendix I.

Table 6 Timber Focused Scenarios - Key Variable Descriptions.

Key Variable	Timber Focused - NDY	Timber Focused - Highest Initial
Harvest Flow Regime	Highest possible Non-Declining HVS	Highest possible Initial Harvest Rate. Max. 10% change per/period. Minimize impact to Long-term HVS.
Net Land base	1,467,907 (spatial), 1,455,143 (net)	1,467,907 (spatial), 1,455,143 (net)
Growth and Yield	As per development report	As per development report
Minimum Harvest Ages	As per modeling assumptions document (e.g. tA@45 or 50, jP@55 or 70, bS@65yrs, wS@65yrs)	As per modeling assumptions document (e.g. tA@45 or 50, jP@55 or 70, bS@65yrs, wS@65yrs)
Regeneration Delay	0 yrs. for H, HS, and SH-SxH, 1 yr. for all other S, and SH	0 yrs. for H, HS, and SH-SxH, 1 yr. for all other S, and SH
In-Block Retention	Not modelled	Not modelled
Annual Operating Plan	Not prioritized	Not prioritized
Seral Requirements	Not modelled	Not modelled
Interior Forest	Not modelled	Not modelled
Harvest Event Size	Not modelled	Not modelled
Caribou Habitat	Not modelled	Not modelled
Moose Habitat	Not modelled	Not modelled
Fisher Habitat	Not modelled	Not modelled
Visuals / Lakeshore	Not modelled	Not modelled
Hillside	Not modelled	Not modelled
Roads	Not modelled	Not modelled

Two different harvest flow regimes were explored:

1. High Initial Step-down (max 10% steps per period) - designed to quickly harvest old timber and convert the landbase to a managed condition as soon as possible while limiting inter-period variation.
2. Non-Declining Even Flow – designed to show a steady state harvest. Increases are allowed only if they can be sustained indefinitely, and decreases are not allowed.

Figure 9 provides the harvest flow forecasts for the hardwood, softwood sawlogs, and softwood pulp for both flow regimes. The harvest request for the non-declining Timber Focused scenario was set at the calculated LRSY (Table 5) for both the hardwood and softwood sawlog volumes. It is able to sustain this level for 200 years because it is able to use some of the older stand ages (high volumes) over much of the timeframe. When the two flows are compared, it can be seen that the higher initial harvest flow in the first few decades does not impact the long term sustainable harvest level. This occurs because harvest volume is captured from old stands before they would be lost to stand break up / succession (declining yield curves and/or mortality). If not harvested early in the planning horizon, the volume is lost anyway (see Figure 10). The High Initial Flow harvests 749,000 m^3/year more hardwood, 511,000 m^3/year more sawlog, and 147,000 m^3/year more pulp in the first decade relative to the non-declining flow.

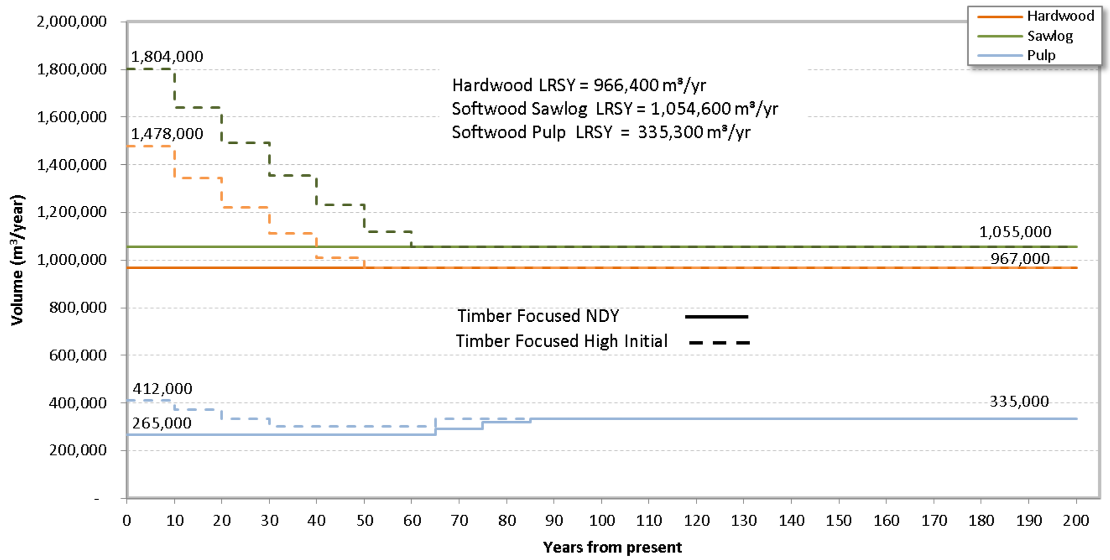

Figure 9 Harvest flow by product for Timber Focused non-declining (solid line), highest initial (dashed line) scenarios.

Figure 10 shows that the extra harvest in the 'high initial' scenario reduces the amount of area undergoing succession. In the 'high initial' scenario, there is ~3,200 ha/yr. less succession at the peak than in the NDY flow regime.

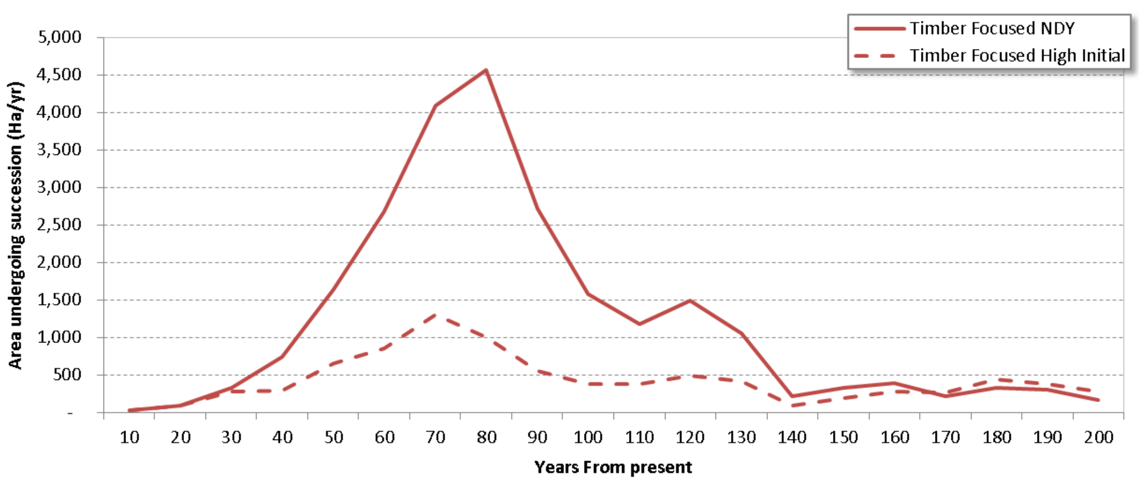

Figure 10 Succession on the THLB from Timber Focused NDY (solid), highest initial (dashed).

Figure 11 shows total volume on the landbase (growing stock) by product type throughout the 200 year planning horizon, for both the NDY and high initial Timber Focused scenarios. In these scenarios, a non-declining growing stock target was applied at the end of the planning horizon so that, in the long term, the rate of harvest is equal to the rate of forest growth. Due to the higher harvest rates in the 'High Initial' scenario, the growing stock is depleted at a much higher rate than the 'NDY' scenario. However, over time (100 to 120 years in the future) the growing stock values converge because the additional volume associated with older age classes is removed from the landbase either by harvesting and/or stand mortality (mortality just takes longer).

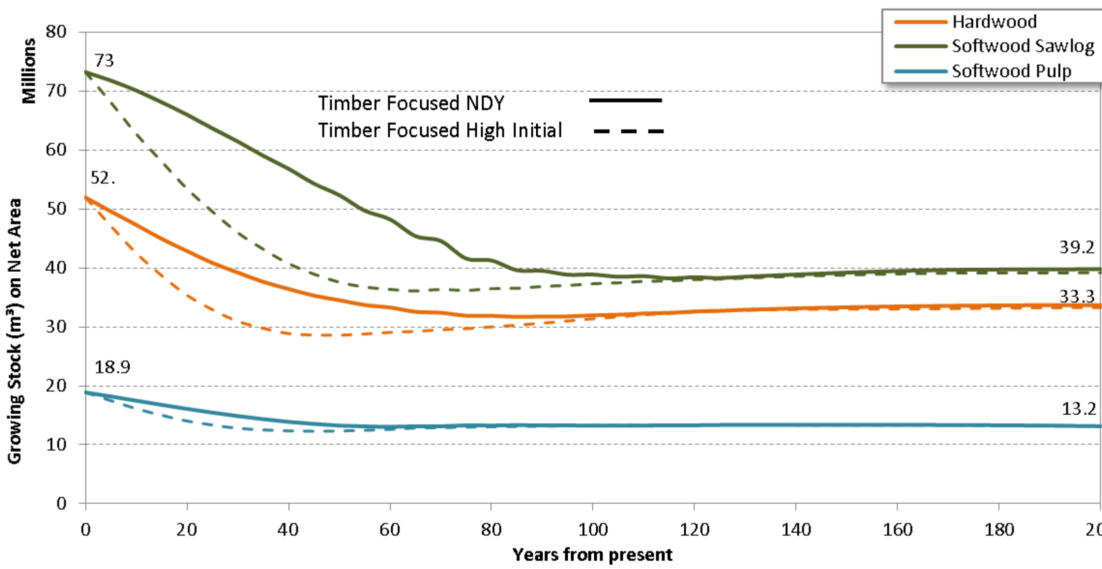

Figure 11 Total growing stock from timber focused NDY (solid) and high initial (dashed) harvest flow regimes.

The merchantable growing stock is the volume in stands that are within their respective operability windows (appropriate age for harvest). Again, due to the greater harvest rate in the High Initial flow regime, merchantable growing stock is depleted more rapidly than in the NDY scenario (Figure 12). This graph shows that the minimum timber availability occurs 50-60 years from now under the High Initial flow regime, and around 100 years from now under the NDY flow regime.

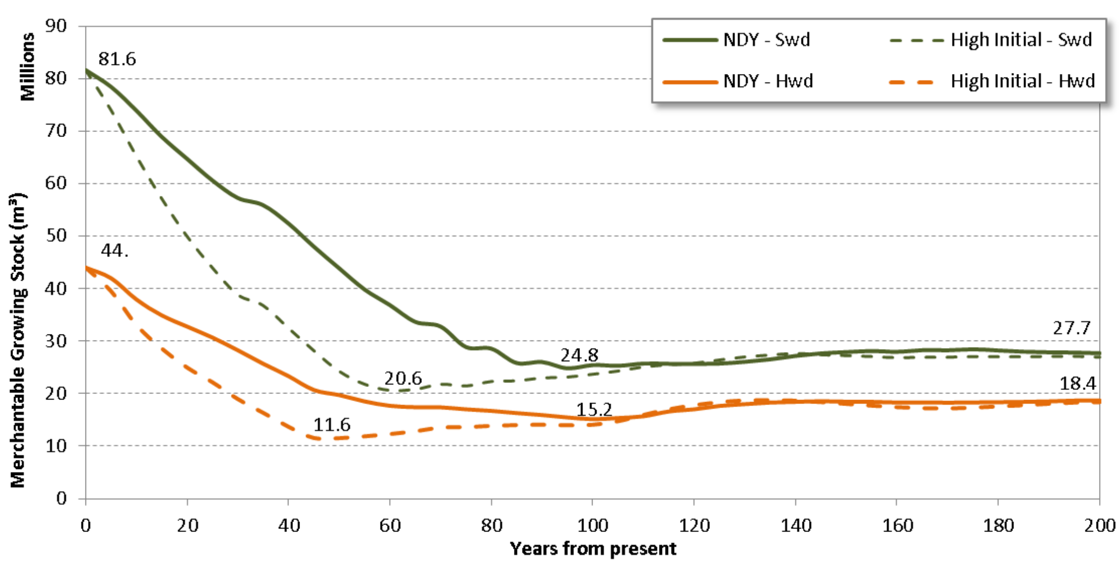

Figure 12 Merchantable growing stock from timber focused NDY (solid) and high initial (dashed) harvest flow regimes.

Figure 13 provides the average harvest age over time for both of the Timber Focused flow regimes, and Figure 14 provides the average harvest volume (m³/ha) over time. The High Initial flow can be seen to harvest older stands for a shorter period of time relative to the NDY flow regime (hardwood and softwood), and higher volumes/ha are associated with these older stands. In the long term, very little difference between the two flow regimes is present.

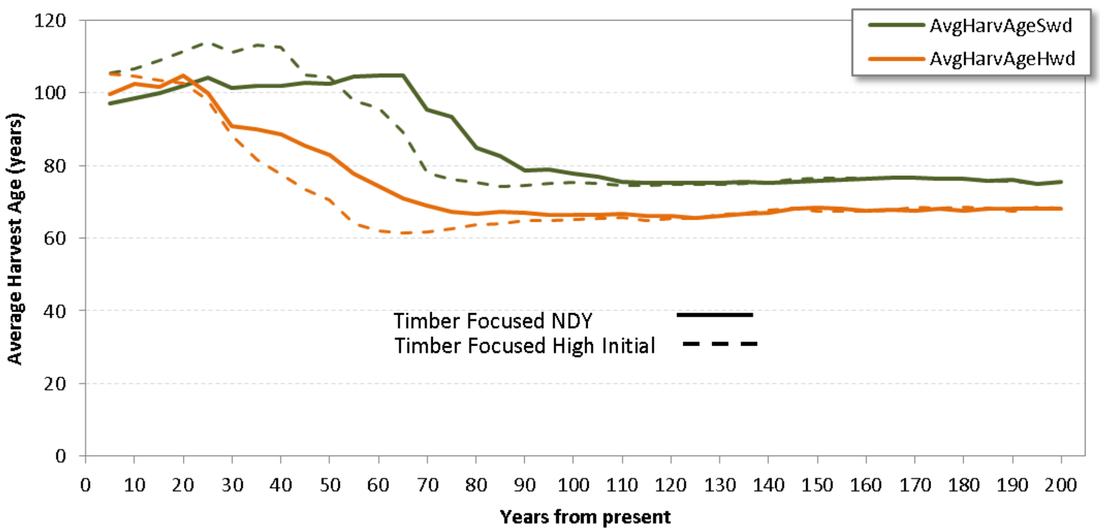

Figure 13 Average harvest age for timber focused NDY (Solid) and high initial (dashed) harvest flow regimes.

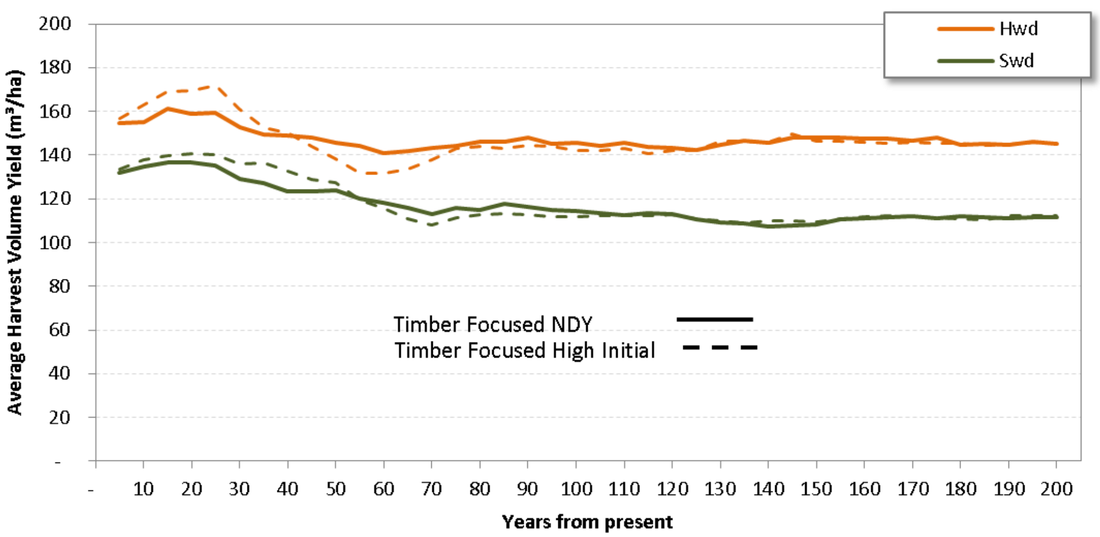

Figure 14 Average harvest volume for timber focused NDY (Solid) and high Initial (dashed) harvest flow regimes.

The age class distributions for the net landbase at 0, 50, 100, and 200 years in the future are shown in Figure 15. The initial condition is the same, and as seen previously, the long term is also quite similar. In the Year 50 graph below, the High Initial flow regime has harvested more of the old stands and thus shows more area in the younger age classes. Both flow regimes ultimately convert the forest into a 'regulated' state, with a similar area in each age class below the rotation ages (70-90 yrs). Note that the

0-10 year age class contains more area because it represents an 11 year age class width due to the regeneration delay (i.e. the class spans ages -1 to 10).

Figure 15 Age class distribution on the net landbase at 0, 50, 100, and 200 years for the timber focused scenario.

5.2 The Natural Forest Patterns Scenario (2015)

This scenario builds on the previous one but adds elements designed to help forest harvesting better mimic the forest patterns created by natural disturbances like fire – the most common means of forest renewal in the boreal forest. The Forest Service's November 2014 draft Natural Forest Pattern (NFP) document was used to guide the implementation of issues such as event/patch sizes, stand-level retention, old and very old seral requirements, and interior old forest requirements.

Additional considerations for visually sensitive areas and wildlife habitat were also included in this scenario. All of the key variables in the NFP scenario are shown in Table 7. Further details of how these elements were implemented in the model are in Appendix IV.

Table 7 Natural Forest Patterns Scenario - Key Variables Description

Key Variable	Description
Harvest Flow Regime	Hold current HVS as long as possible. Max 10% change/period. No compromise to long-term.
Net Land base	1,467,907 (spatial), 1,323,032 (net)
Growth and Yield	As per Development Report
Minimum Harvest Ages	As per modeling assumptions document (e.g. tA@45 or 50, jP@55 or 70, bS@65yrs, wS@65yrs)
Regeneration Delay	0 yrs. for H, HS, and SH-SxH, 1 yr for all other S, and SH
In-Block Retention	9% aspatial reserve (can count towards old seral if correct age)
Annual Operating Plan	Prioritized in first 10 years
Seral Requirements	15% old plus age, 5% very old plus age
Interior Forest	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.
Harvest Event Size	Harvest patch size distribution controlled but not allowed to impact HVS.
Caribou Habitat	Min harvest in area considered suitable and undisturbed 0-20 yrs. but no impact to HVS
Moose Habitat	Tracking only

Key Variable	Description
Fisher Habitat	Tracking only
Visuals -Lakeshore **Visuals -Hillsides**	Max 33% of MFLB to be <30 years at any time. Min 20% of MFLB to be >70/80 yrs (Hwd/ Swd). Maximum of 20% of MFLB can be <20 years.
Roads	No tracking / no controls

The timber focused scenarios presented two flow regime options. They showed how higher initial harvest rates captured volume prior to declines / succession losses, and did not impact the long term harvest level. For the remainder of the harvest scenarios presented in this report, a single harvest flow policy will be used that reflects a compromise between the two – it captures a portion of the volume losses before succession but also maintains a more stable flow of timber from the forest. The **harvest flow policy** is as follows:

To attempt to maintain the current harvest allocations (HVS), for each product type, for as long as possible without impacting sustainable long-term harvest levels.

This policy has been collectively agreed to by all Sakâw shareholders, and has been adopted for this scenario. A harvest flow above the current HVS was possible but it was decided that maintaining the current HVS was prudent while the province works on range plans for caribou.

The harvest forecast resulting from the adoption of this flow regime policy and the introduction of NFP and other non-timber value elements is shown in Figure 16. The current sawlog HVS can be maintained for 50 years before stepping down to a long term level of 920,000 m^3/yr. The current hardwood HVS can be maintained for 35 years before stepping down to a long term of 766,000 m^3/yr. Following the trend seen in the Timber Focused scenario, the softwood pulp harvest is less than half of its current HVS. This occurs because of the difference in softwood yield curves relative to the previous FMP.

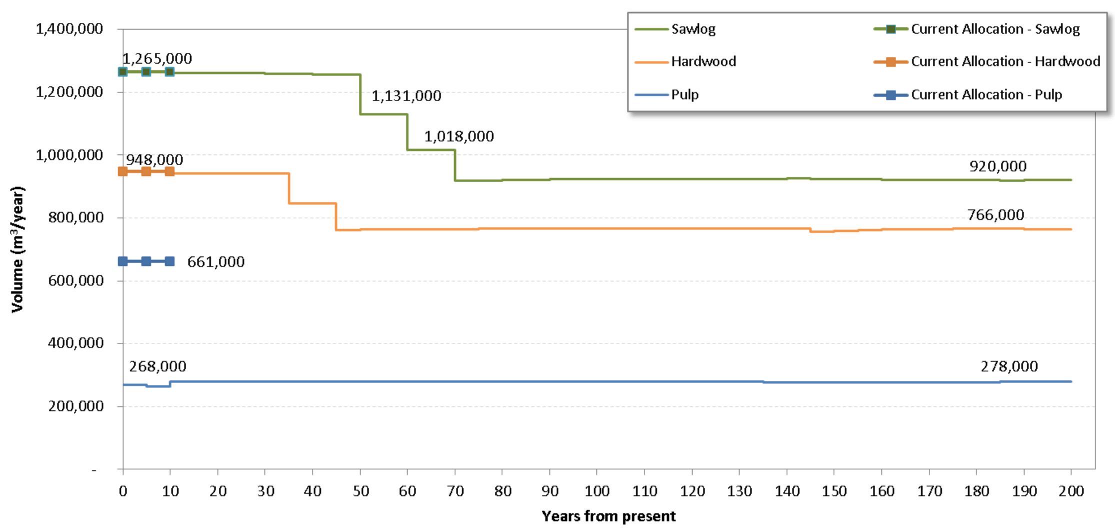

Figure 16 NFP Scenario - Harvest volume schedule by product.

Figure 17 shows the total growing stock over time for each product class, and Figure 18 shows the merchantable growing stock over time. The shifting of age classes toward younger forest and higher initial harvest causes the decline in growing stock over the first 50 years. Long term growing stock is stable at ~80 million m³ because age class distributions on the landbase have become relatively stable. The merchantable growing stock graph shows that the period of least available mature timber will occur 55-65 years in the future.

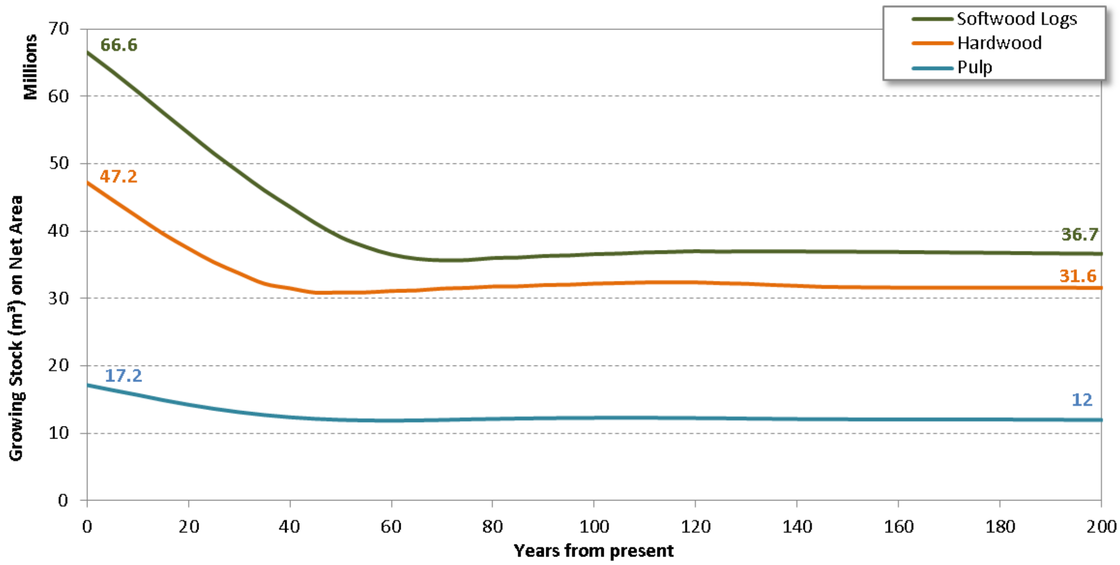

Figure 17 NFP Scenario - Growing stock by product on the net landbase

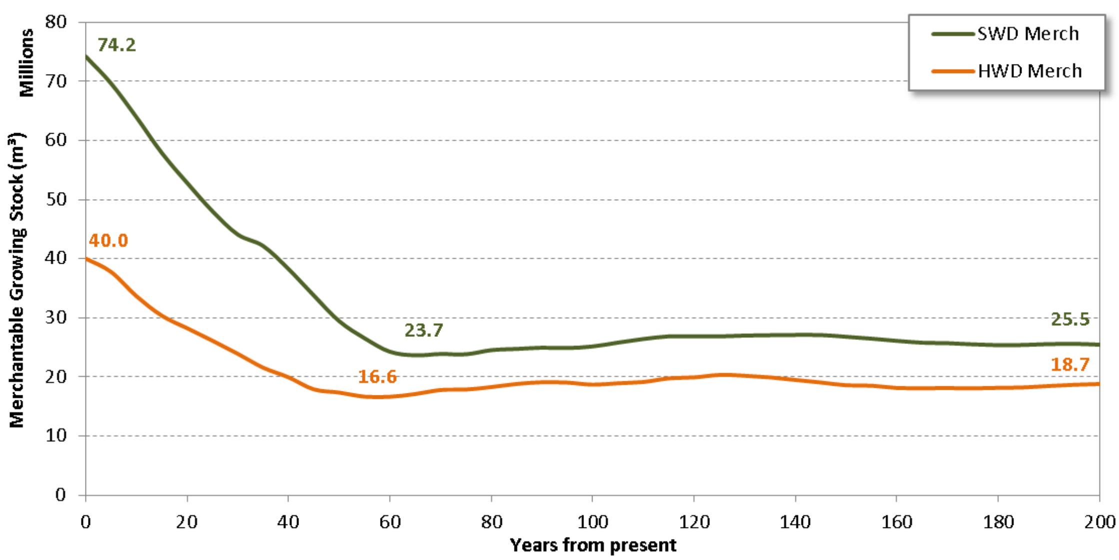

Figure 18 NFP Scenario - Merchantable growing stock by cover type on the net landbase.

Other metrics are very similar to the ones presented for the Timber Focused scenario and are not repeated here. Full details are provided for the Preferred Scenario in Section 7.

6 Sensitivity Analysis (2015)

The sensitivity analyses presented in this section use the NFP scenario presented in Section 5.2 as the baseline for comparison. The description of any of the sensitivity analysis scenarios includes only the key differences relative to the NFP scenario.

6.1 Provincial Full Utilization Scenario

This sensitivity investigates the impact on harvest flow from changing to the 2008 Provincial Utilization Standard curves. Yield Group stratification is slightly different for the 2008 vs 2013 yield curves; thus the landbase was re-stratified accordingly. The key differences in this scenario are a shift from an 8cm min top diameter to a 5cm min top diameter, and the inclusion of Tamarack (TL) volume. Two runs were made - including and not including the TL volume.

The definitions for the yield group assignments for this scenario are illustrated in Table 8.

Table 8 Sensitivity analysis for Provincial Full Utilization Scenario - key variables description

<table>
<tr><th>Key Variable</th><th>Description</th></tr>
<tr><td>Harvest Flow Regime</td><td>Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long-term.</td></tr>
<tr><td>Net Land base</td><td>1,467,907 (spatial), 1,323,032 (net)</td></tr>
<tr><td>Yield Stratification
(2008 Provincial Utilization Curves)</td><td>
<table>
<tr><th>Yield Group</th><th>Development Type</th><th>FMZ</th><th>Site</th><th>Crown Closure</th></tr>
<tr><td>1</td><td>HW</td><td>1,2,3</td><td>III</td><td>B,C,D</td></tr>
<tr><td>2</td><td>HW</td><td>1,2,3</td><td>I,II</td><td>B,C,D</td></tr>
<tr><td>3</td><td>HjP</td><td>1,2,3</td><td>I,II,III</td><td>B,C,D</td></tr>
<tr><td>4</td><td>jPH</td><td>1,2,3</td><td>I,II,III</td><td>B,C,D</td></tr>
<tr><td>5</td><td>HxS</td><td>2,3</td><td>I,II,III</td><td>B,C,D</td></tr>
<tr><td>6</td><td>HxS</td><td>1</td><td>I,II,III</td><td>B,C,D</td></tr>
<tr><td>7</td><td>xSH</td><td>2,3</td><td>I,II,III</td><td>B,C,D</td></tr>
<tr><td>8</td><td>xSH</td><td>1</td><td>I,II,III</td><td>B,C,D</td></tr>
<tr><td>9</td><td>bS</td><td>1,2,3</td><td>II,III</td><td>B,C,D</td></tr>
<tr><td>10</td><td>bS</td><td>1,2,3</td><td>I</td><td>B,C,D</td></tr>
<tr><td>11</td><td>jP</td><td>1,2,3</td><td>III</td><td>B,C,D</td></tr>
<tr><td>12</td><td>jP</td><td>1,2,3</td><td>I,II</td><td>B,C,D</td></tr>
<tr><td>13</td><td>jPbS</td><td>1,2,3</td><td>I,II,III</td><td>B</td></tr>
<tr><td>14</td><td>jPbS</td><td>1,2,3</td><td>I,II,III</td><td>C,D</td></tr>
<tr><td>15</td><td>wSbF</td><td>2,3</td><td>I,II,III</td><td>B,C,D</td></tr>
<tr><td>16</td><td>wSbF</td><td>1</td><td>I,II,III</td><td>B,C,D</td></tr>
<tr><td>17</td><td>tL11</td><td>1,2,3</td><td>I,II,III</td><td>B</td></tr>
<tr><td>18</td><td>tL11</td><td>1,2,3</td><td>I,II,III</td><td>C,D</td></tr>
</table>
</td></tr>
<tr><td>Utilization</td><td>
<table>
<tr><th>Variable</th><th>Base Case</th><th>Provincial Utilization</th></tr>
<tr><td>Stump Height</td><td>30cm</td><td>30cm</td></tr>
<tr><td>Top dib</td><td>8cm</td><td>5cm</td></tr>
<tr><td>Tamarack</td><td>Included</td><td>2 Scenarios, 1 with TL included 1 Without.</td></tr>
</table>
</td></tr>
</table>

Key Variable	Description			
	Yield Group	Description	Min Harvest Age	Max Harvest Age
Minimum Harvest Ages	1	1_H_HW_Density_B	40	140
	2	1_H_HW_Density_CD	40	140
	3	2_HS_HjP_Density_B	55	145
	4	2_HS_HjP_Density_CD	55	155
	5	3_SH_jPH_Density_B	60	145
	6	3_SH_jPH_Density_CD	50	145
	7	4_HS_HxS_Density_B	60	165
	8	4_HS_HxS_Density_CD	55	165
	9	5_SH_SxH_Density_B	55	200
	10	5_SH_SxH_Density_CD	55	200
	11	6_S_bS_SiteModPoor	60	155
	12	6_S_bS_SiteGood	45	150
	13	7_S_jP_SitePoor	50	175
	14	7_S_jP_SiteGoodMod	55	175
	15	8_S_jPbS_SitePoor	70	165
	16	8_S_jPbS_SiteGoodMod	60	165
	17	9_S_wSbF_FMZ1	55	145
	18	9_S_wSbF_FMZ23	50	140

The 2008 provincial utilization curves did not contain the same product breakdowns found in the yield curves used in this analysis (i.e. no product split between softwood sawlog and pulp) so the model was run with targets set only on the softwood and hardwood HVS.

Furthermore, when the current utilization curves were derived, the hardwood utilization was dramatically changed by shifting some hardwood stems into merchantable categories based on different interpretations of tree defect calls in the TSPs. Therefore, the hardwood curves are not directly comparable and thus are not presented here.[1]

Two provincial utilization scenarios were initially run, one including tamarack, and another with tamarack removed. These runs did not exhibit any significant difference in yield or growing stock because only a small subset of stands contained TL volume and these stands had <30% TL volume (following our net landbase definition). In the following comparisons, the provincial utilization curves contain tamarack.

Under the full utilization standard, the short-term softwood harvest level is 13.6% (+208,000 m³/yr) higher than the NFP scenario (Figure 19). This is followed by two 10% drops over two decades to a long-term flow of 1.41 million m³/yr which is 17.4% higher (208,000 m³/yr) than the NFP scenario. This increase is due to two key factors:

1. More of each tree is used (portion from 8cm to 5cm diameter)
2. Shorter trees that could not meet a merchantable length to a 8cm top were entirely excluded previously, but if they can meet the merchantable length requirement using a 5cm top, the entire tree is not included in the volume calculations. This makes the volume difference between the two utilization stand change over a stands age –with the biggest % difference seen when the stand is young and has a lot of shorter trees.

[1] Even with the shift to a higher utilization level (5cm top vs 8cm top), the hardwood harvest forecast with the 2008 Provincial Utilization curves was lower than the NFP scenario because of the compilation changes made in 2013. Thus it would have been misleading to present here and was left out.

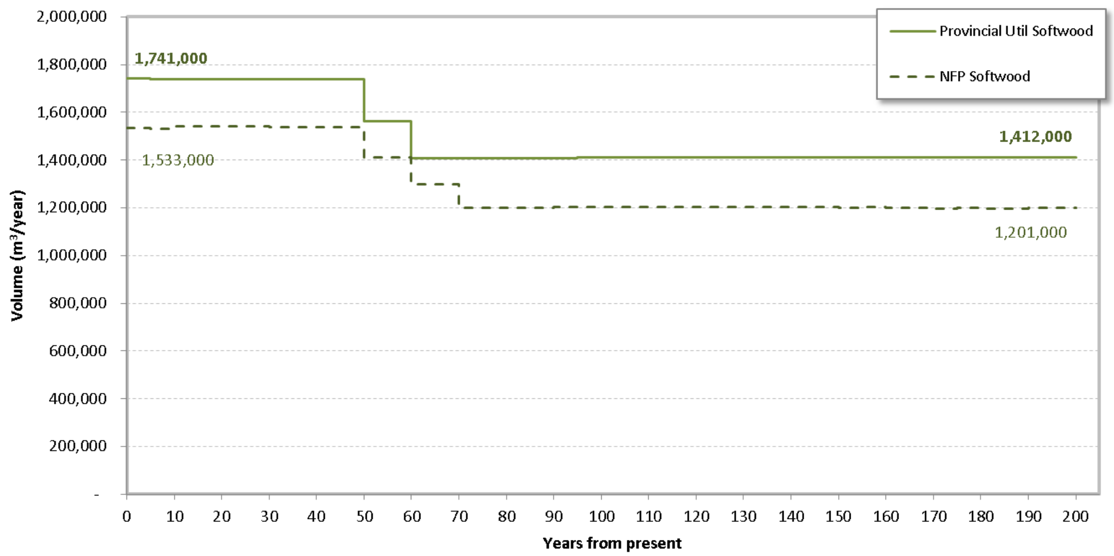

Figure 19 HVS comparison between NFP and 2008 Provincial Utilization.

The provincial utilization growing stock remains essentially parallel throughout the planning horizon. The growing stock is initially 19.8% greater, while the long-term growing stock is 18.4% greater than the NFP scenario (Figure 20).

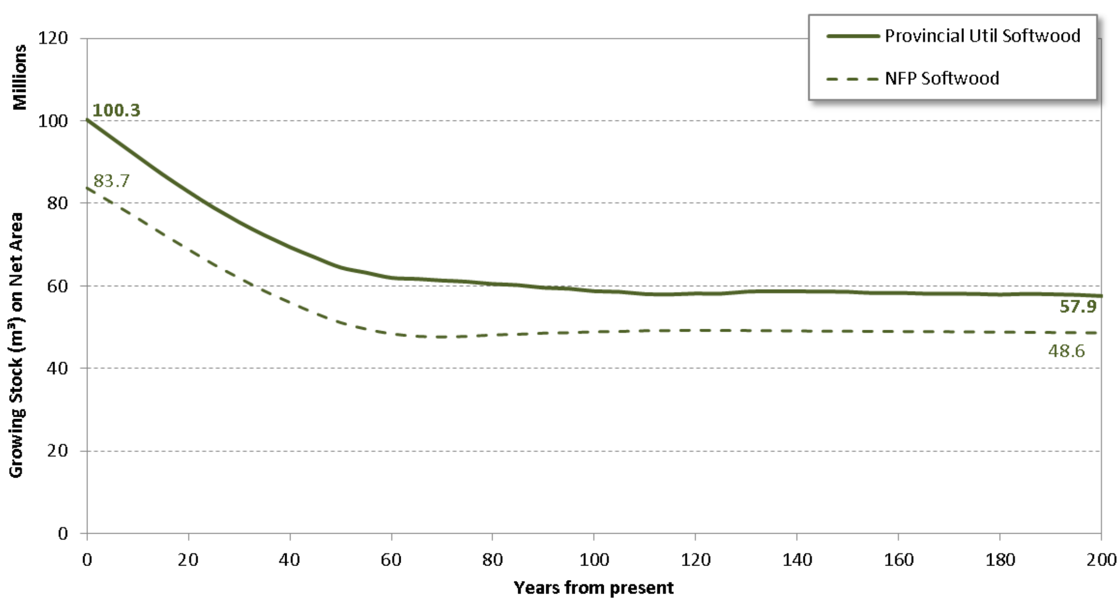

Figure 20 Total Growing stock comparison between NFP and 2008 Provincial Utilization.

6.2 Higher Pulp

Due to the pulp volume forecasts being significantly lower than the current pulp HVS, it was necessary to explore this issue. In general, the difference occurs because the previous (1999) analysis applied pulp downgrade factors to sawlog size material to predict pulp volumes, while the current (2013 yield curves) used only log size and tree defect calls found in the TSP's to predict pulp volume. At culmination ages, the 1999 FMP curves predicted that 35% of softwood volume would be pulp, while the 2014 curves suggest only 24% pulp.

In this sensitivity analyses, a percentage of the small saw log volume from each of the yield curves was transferred to pulp volume (Table 9). These percentages are loosely based[2] on the Weyerhaeuser 1999 FMP, Appendix 1.8 product distributions (Table 10).

Table 9 Percentage of small sawlog per yield group transferred to pulp for the higher pulp sensitivity

Yield Group	Description	Age	Current % Pulp @100yrs	Sawlog Downgrade Target	Adjusted Pulp %	Difference	% Difference
1	1_H_HW_B_Density	100	7%	15%	**15%**	8%	127%
2	1_H_HW_CD_Density	100	13%	15%	**15%**	2%	19%
3	2_HS_HjP_B_Density	100	11%	35%	**35%**	24%	208%
4	2_HS_HjP_CD_Density	100	25%	35%	**35%**	10%	41%
5	3_SH_jPH_B_Density	100	19%	35%	**35%**	16%	89%
6	3_SH_jPH_CD_Density	100	25%	35%	**35%**	10%	42%
7	4_HS_HxS_B_Density	100	14%	15%	**15%**	1%	11%
8	4_HS_HxS_CD_Density	100	12%	15%	**15%**	3%	23%
9	5_SH_SxH_B_Density	100	13%	15%	**15%**	2%	17%
10	5_SH_SxH_CD_Density	100	13%	15%	**15%**	2%	17%
11	6_S_bS_1_Site	100	24%	20%	**24%**	0%	0%
12	6_S_bS_23_Site	100	18%	20%	**20%**	2%	8%
13	7_S_jP_12_Site	100	22%	35%	**35%**	13%	59%
14	7_S_jP_3_Site	100	23%	35%	**35%**	12%	53%
15	8_S_jPbS_12_Site	100	17%	25%	**25%**	8%	44%
16	8_S_jPbS_3_Site	100	20%	25%	**25%**	5%	23%
17	9_S_wSbF_1_FMZ	100	18%	15%	**18%**	0%	0%
18	9_S_wSbF_23_FMZ	100	10%	15%	**15%**	5%	49%
19	10_S_tL_11_Comp	100	22%	25%	**25%**	3%	15%
	Area Wtd. Avg.		**17.5%**		**23.3%**		

Table 10 Weyerhaeuser 1999 softwood product distributions

	Tree Size Class	Species	Product Type			
			Large Logs	Small Logs	Pulp Logs	All Logs
	All trees to tdib = 8.01 cm	All Hardwoods	0%	0%	100%	100%
Small Trees	All trees to tdib = 8.01 cm when dib @ 5.5 m <10cm	All Softwoods	0%	0%	100%	100%
Medium Size Trees	All trees when dib @ 5.5 m >10cm & when dib @ 5.5 M < 14cm	white spruce	0.0%	85%	15%	100%
		balsam fir	0.0%	85%	15%	100%
		black spruce	0.0%	75%	25%	100%
		jack pine	0.0%	60%	40%	100%
Large Trees	All trees when dib @ 5.5 m >=14cm	white spruce	85%	12%	3%	100%
		balsam fir	85%	12%	3%	100%
		black spruce	75%	19%	6%	100%
		jack pine	60%	30%	10%	100%

Source: Weyerhaeuser 1999 FMP, Appendix 1.8 – Forman+1 (pg 17)

[2] Application to the current (2014) yield curves required that a single downgrade factor be used for a given species. So, for example, where the 1999 table suggests that 40% of medium size JP and 10% of large JP is pulp, this was generalized to a 35% pulp factor for all JP.

An example of the change in contribution, by product type, is shown in Figure 21. Yield group 13 has a 59% increase in pulp volume. Note that the total volume does not change.

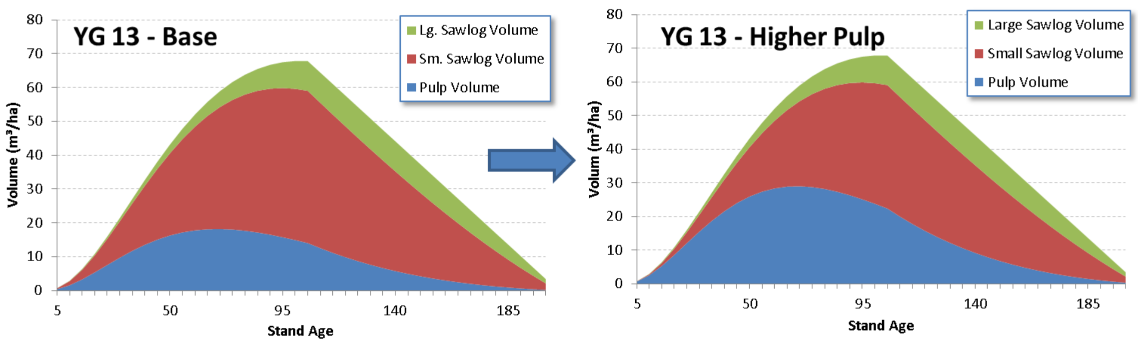

Figure 21 Change in contribution between the base case and sensitivity scenario for YG 13.

When the increased pulp proportions are implemented, the current Sawlog HVS can be maintained for only 35 years before dropping to a long-term level that is 10.6% lower (98,000 m³/yr) than the base NFP scenario (Figure 22). Pulp harvest is 42.9% higher initially and 38.1% higher (106,000 m³/yr) in the long-term.

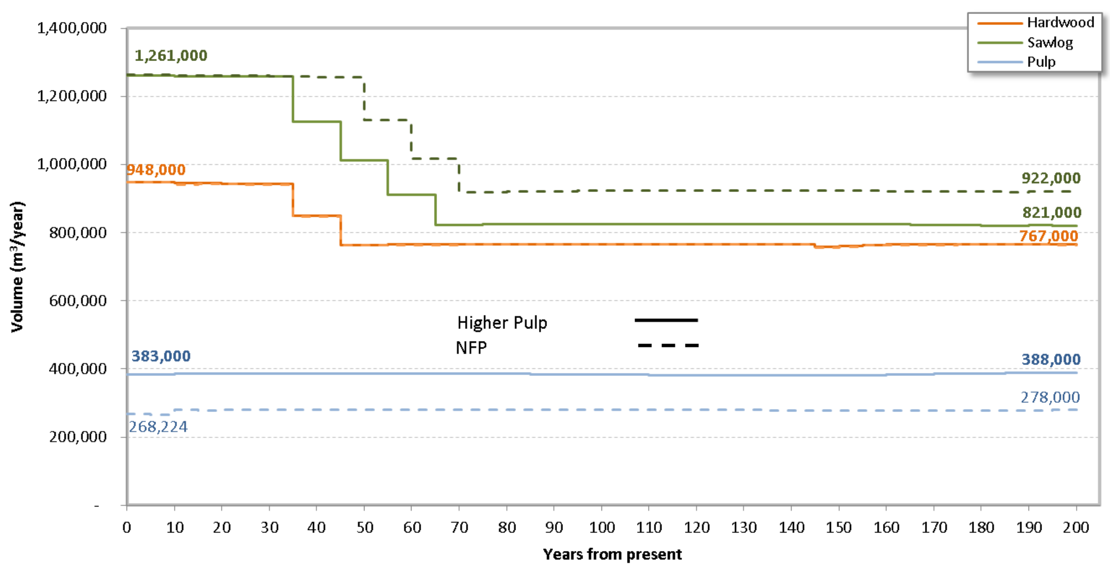

Figure 22 HVS comparison of NFP scenario and higher pulp scenario

The overall contribution of pulp to the total softwood harvest now comprises 31.8% of total softwood harvest in the long-term, while in the NFP base it was 23.1% of the softwood harvest, a difference of 8.6%. Even with increased pulp factors, the pulp forecast is still well under the current HVS level (even with the current HVS sawlog harvest and ~31% pulp) – suggesting that the historical calculation of the 661,000 was done in some other way.

6.3 Volume Estimates +/- 10%

Yield estimates are a crucial part of harvest forecasting. The current yields were derived from ~6500 temporary sample plots of different ages with the assumption that the volume differences between ages were a result of growth. This approach gives a good estimate of the volume currently on the landbase but to get future growth trajectories, direct measurement of growth on permanent sample plots is desired. So while the current yields are expected to be the best information currently available, they are subject to uncertainty. In addition, issues such as climate change may increase this uncertainty.

The objective of this sensitivity is to investigate the effect on harvest rates when the yield curves are increased / decreased by 10%.

Table 11 Sensitivity analysis for +/- 10% Volume scenario - key variables description

Key Variable	Description
Harvest Flow Regime	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long-term.
Net Land base	1,467,907 (spatial), 1,455,143 (net)
Growth and Yield	All volumes curves increased and decreased by 10% (no change to operability age windows)

When yields are increased by 10%, the current sawlog HVS can be extended by 25 years, and hardwood by 35 years (Figure 23). The long-term HVS is 10.2% higher than the NFP base case. It would also have been possible to immediately increase the HVS by 10%, but it was not modeled this way because the flow policy was to maintain the current HVS for as long as possible.

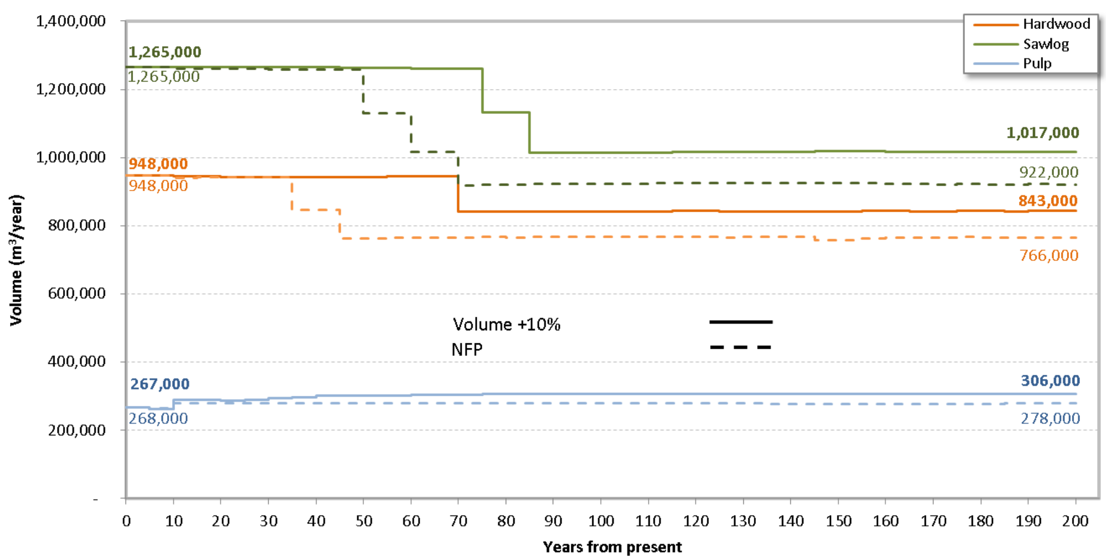

Figure 23 HVS comparison of NFP scenario and 10% increased yields scenario.

Growing stocks for all products are all 10% higher initially, and in the range of 10-10.9% at the end of the planning horizon (Figure 24).

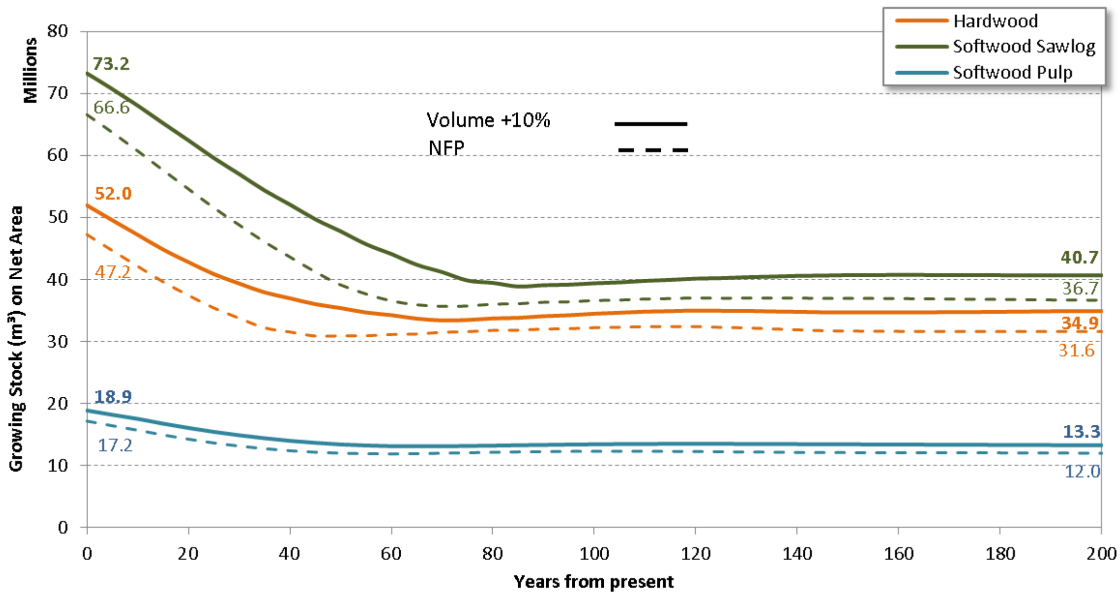

Figure 24 Total growing stock comparison between NFP scenario and 10% increased yields scenario.

When yields are decreased by 10%, the current sawlog HVS can only be maintained for 25 years (25 yrs less), and the current hardwood HVS can only be maintained for 20 years (15 years less). The long-term HVS for each of the three products is between 10 and 12 percent lower (Figure 25).

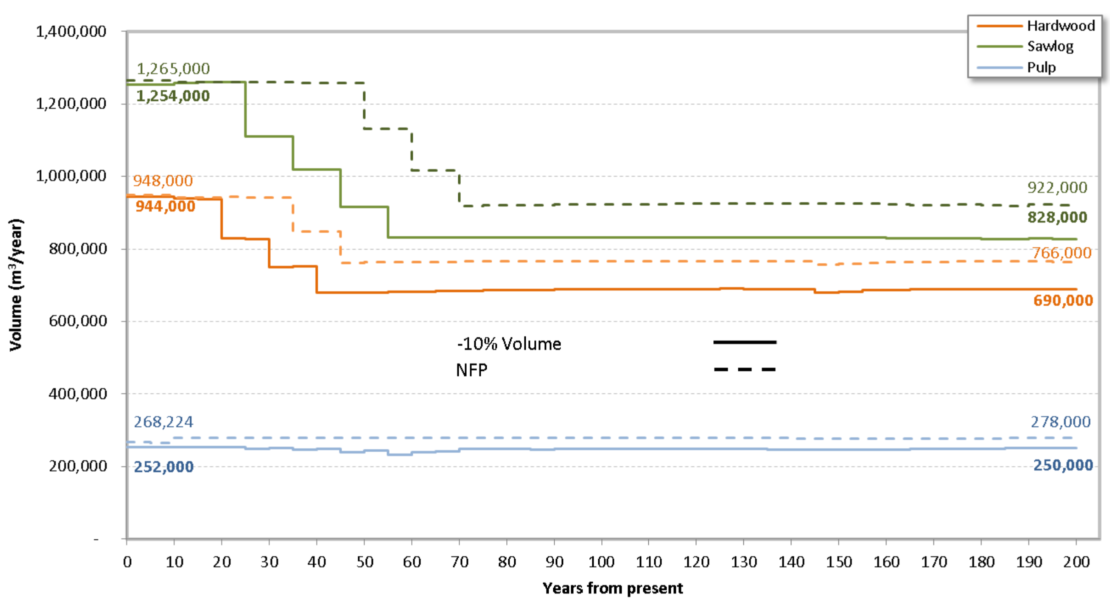

Figure 25 HVS comparison between NFP scenario and 10% decreased yields.

As expected, the initial growing stocks are initially 10% smaller (Figure 26). By the end of the planning horizon, the growing stocks are between 8.4% and 9.3% smaller.

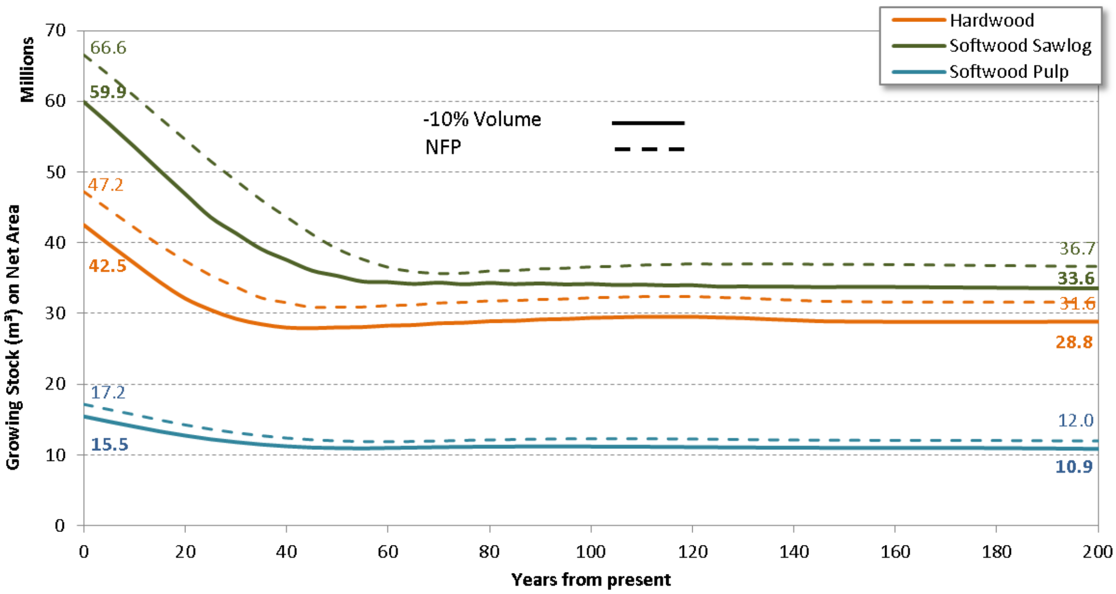

Figure 26 Growing stock comparison between NFP scenario and scenario with 10% decreased yields.

6.4 10 Year Increase in Minimum Harvest Age

The minimum harvest ages (MHA) are important because they define how quickly regenerating stands can be accessed, and thus determine how long existing natural stand growing stock must be metered out. Typically, the MHA for a yield curve corresponds to the age at which the yield curve reaches the maximum mean annual incremental value, also called the culmination value. However, other constraints (e.g., operability) can shift the MHA to older or younger ages. For this sensitivity analysis, all MHA's were increased by 10 years to explore the implications of having to wait longer for regenerating stands to become merchantable.

Table 12 Sensitivity analysis for Increase in minimum harvest age scenario - key variables description

Key Variable	Description
Harvest Flow Regime	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long-term.
Net Land base	1,467,907 (spatial), 1,323,032 (net)
Minimum Harvest Ages	(see table below)

Yield Group	Description	Base MHA	Sens. MHA
1	1_H_HW_Density_B	45	55
2	1_H_HW_Density_CD	50	60
3	2_HS_HjP_Density_B	60	70
4	2_HS_HjP_Density_CD	65	75
5	3_SH_jPH_Density_B	60	70
6	3_SH_jPH_Density_CD	65	75
7	4_HS_HxS_Density_B	75	85
8	4_HS_HxS_Density_CD	80	90
9	5_SH_SxH_Density_B	75	85
10	5_SH_SxH_Density_CD	80	90
11	6_S_bS_SiteModPoor	65	75
12	6_S_bS_SiteGood	65	75
13	7_S_jP_SitePoor	70	80
14	7_S_jP_SiteGoodMod	55	65
15	8_S_jPbS_SitePoor	80	90
16	8_S_jPbS_SiteGoodMod	60	70
17	9_S_wSbF_FMZ1	65	75
18	9_S_wSbF_FMZ23	65	75
19	10_S_tL_11to30pct	50	60

Short-term harvest levels are quite sensitive to an increase in MHAs. When MHAs were increased by 10 years, the current sawlog HVS can only be maintained for 25 years versus 50 years in the base NFP scenario, and the hardwood harvest can only be maintained for 15 years versus 35 years. In the long term, the sawlog harvest level is 4.2% higher because older stands are providing less pulp (more sawlog). There is essentially no change in the long term for hardwood.

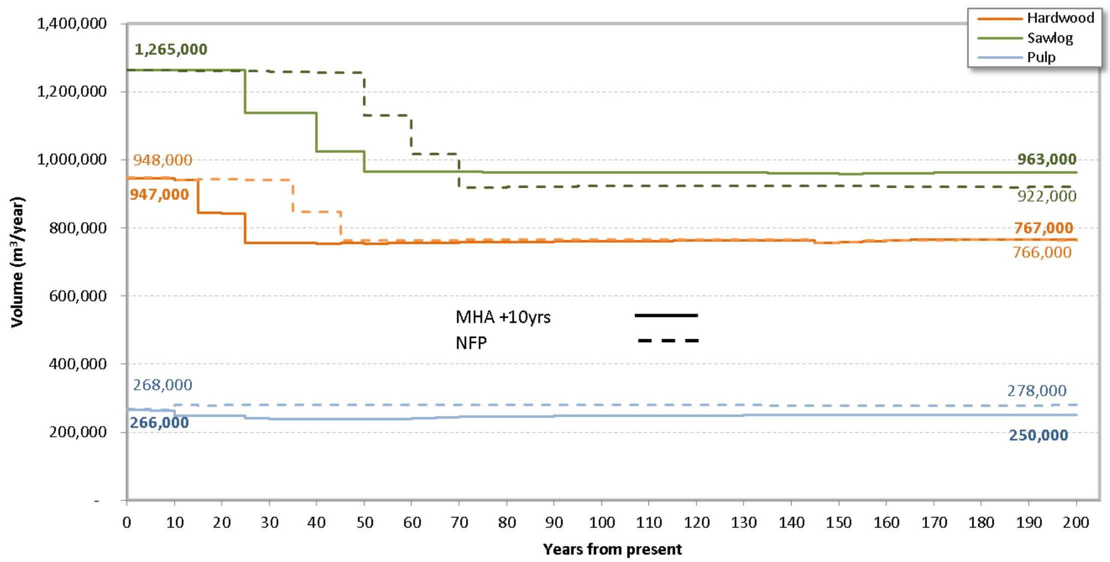

Figure 27 HVS comparison between NFP scenario and MHA +10 years.

The increase in MHA of 10 years results in a 15 year increase in softwood average harvest age, and a 12 year increase in hardwood average harvest age, calculated over the last 100 years (Figure 28).

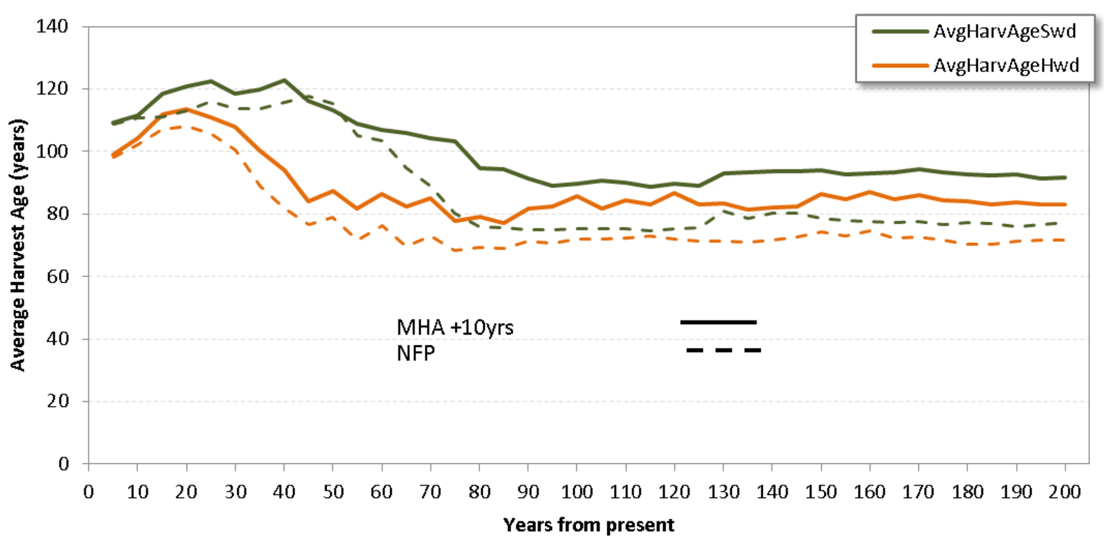

Figure 28 Average harvest age comparison between NFP and MHA +10 years.

6.5 Decrease and Increase in Regeneration Delays

Regeneration delays occur when stands are not regenerated promptly following harvest and these delays can have negative impacts on harvest rates. The objective of this sensitivity analysis is to investigate the impact on harvest rates if the regeneration delays are changed to those in Table 13, summarized as follows:

(a) Longer Delay: increased by 1 year for hardwoods and 2 years for softwoods and

(b) Shorter Delay: decreased by 2 years for softwoods. This later sensitivity would represent an advanced age of 1 year for softwood - potentially achieved by planting 1 year old stock in the same year as harvesting occurs.

Table 13 Regeneration age change by yield group for the decrease and increase in regeneration delay sensitivity

Yield group	Description	NFP Baseline (age reset)	Longer Delay (age reset)	Shorter Delay (age reset)
1	1_H_HW_Density_B	0	-1	0
2	1_H_HW_Density_CD	0	-1	0
3	2_HS_HjP_Density_B	0	-1	0
4	2_HS_HjP_Density_CD	0	-1	0
5	3_SH_jPH_Density_B	-1	-3	1
6	3_SH_jPH_Density_CD	-1	-3	1
7	4_HS_HxS_Density_B	0	-1	0
8	4_HS_HxS_Density_CD	0	-1	0
9	5_SH_SxH_Density_B	0	-2	2
10	5_SH_SxH_Density_CD	0	-2	2
11	6_S_bS_SiteModPoor	-1	-3	1
12	6_S_bS_SiteGood	-1	-3	1
13	7_S_jP_SitePoor	-1	-3	1
14	7_S_jP_SiteGoodMod	-1	-3	1
15	8_S_jPbS_SitePoor	-1	-3	1
16	8_S_jPbS_SiteGoodMod	-1	-3	1
17	9_S_wSbF_FMZ1	-1	-3	1
18	9_S_wSbF_FMZ23	-1	-3	1
19	10_S_tL_11to30pct	-1	-3	1

HVS was virtually unaffected by the increase in regeneration delay (Figure 29). However, there was a slight decrease in growing stock level over time relative to the NFP scenario (Figure 30).

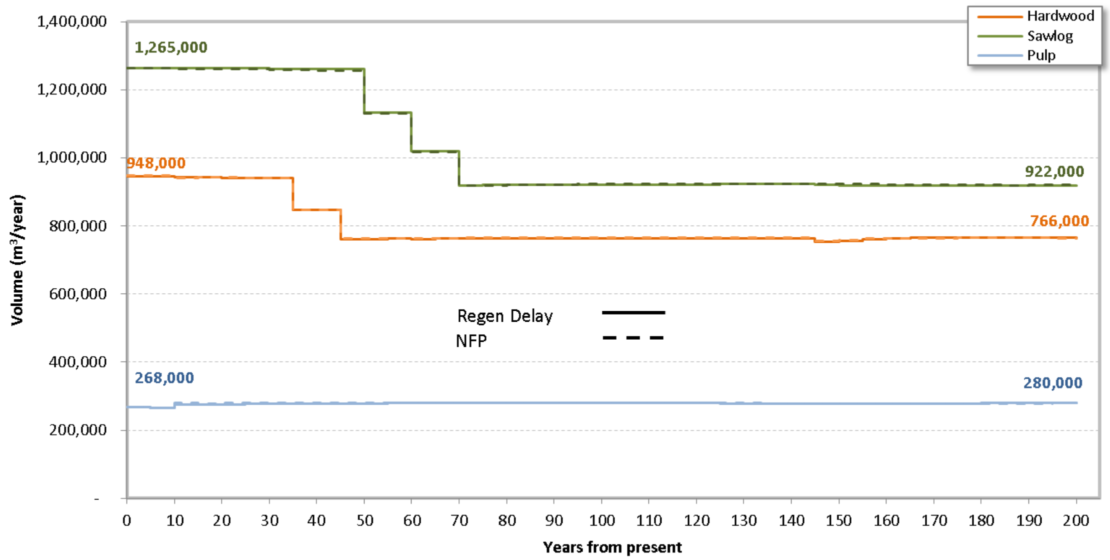

Figure 29 HVS comparison between NFP scenario and increase in regen delay.

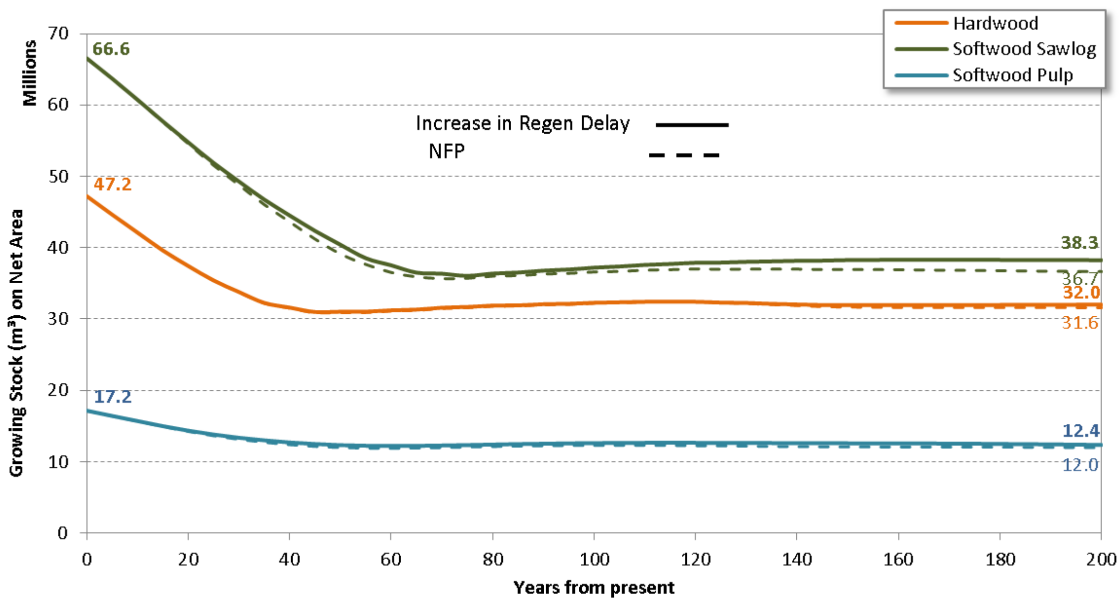

Figure 30 Growing stock comparison between NFP scenario and increase in regen delay.

When the regeneration delay was decreased relative to the base NFP scenario, the current sawlog HVS was extended by 5 years (one period) relative to the base NFP scenario. The long-term sawlog harvest level increased slightly by 1.2% (11,000 m^3/year). The long-term growing stock levels were also slightly higher (3.0% overall; Figure 32).

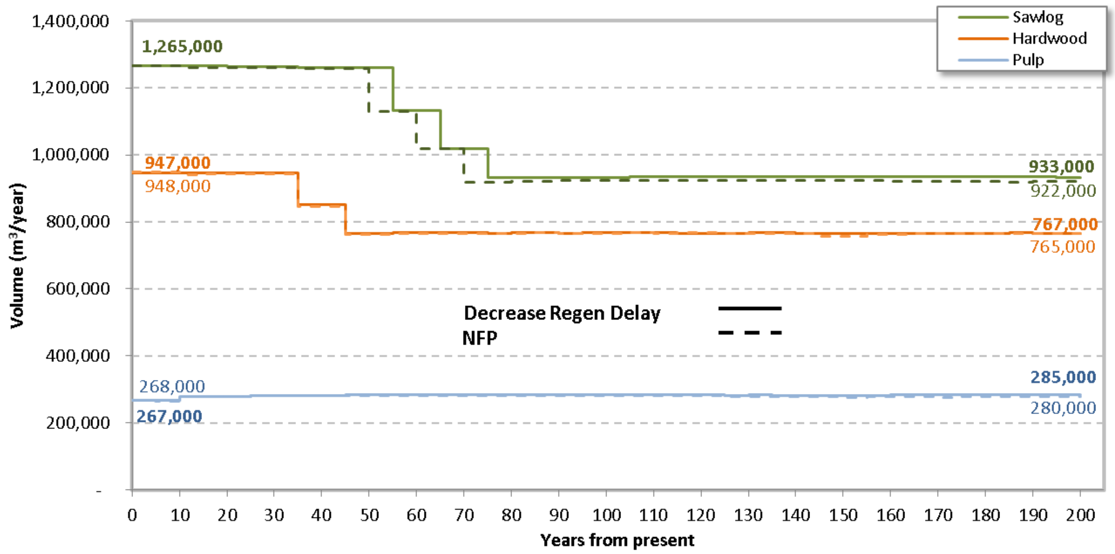

Figure 31 HVS comparison between NFP scenario and decrease in regeneration delay.

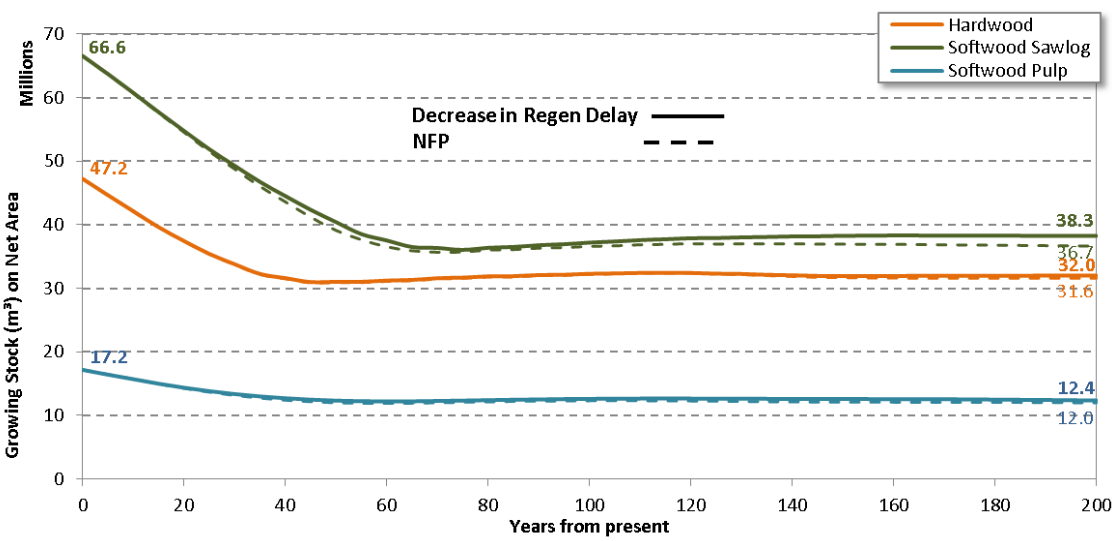

Figure 32 Growing stock comparison between NFP scenario and decreased regeneration delay.

6.6 Exclusion of High Pulp Stands

This scenario investigates the impact to sawlog harvest levels from no longer having access to stands with high pulp proportions for economic reasons. As a surrogate for this analysis, high pulp content stands were defined as those meeting the following criteria: stands in JLP, BSJ, BSL provincial forest types, with a site class of 3 or 4, and a density of C or D (low site, high density). Approximately 127,900 ha of these stands were identified and removed from harvest eligibility, resulting in a 10% effective impact to the net area.

When these stands are excluded from harvest, the sawlog harvest HVS is maintained for only 40 years instead of 50 years. In the long term, the sawlog and pulp harvest levels are both 2.9% lower (27,000 and

8,000, respectively) than the base NFP scenario. Hardwood HVS was virtually unaffected due to the relatively small amount of deciduous present in the types of stands that were excluded in this scenario.

The stands removed in this scenario have a relatively low yield per hectare a smaller % sawlog than the rest of the landbase, so the 10% area reduction translated into a disproportionately smaller harvest level impact. The impact of these stands is further lessened since they can contribute to non-timber objectives and thus can help to reduce the impact of old seral NFP requirements on the remaining landbase.

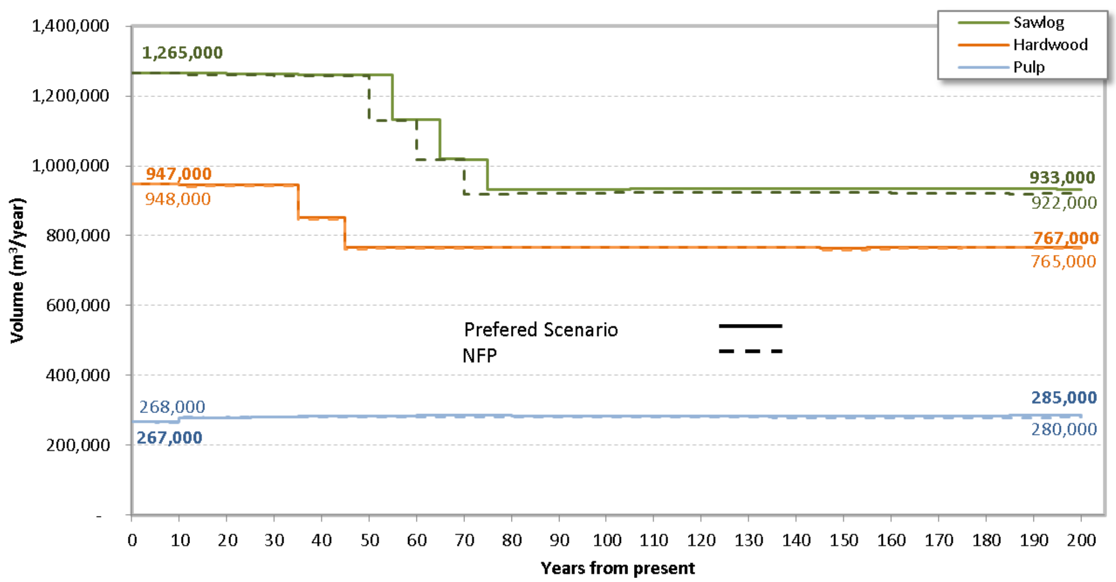

Figure 33 HVS comparison between NFP scenario and scenario with exclusion of high pulp stands.

This scenario was developed using built-in model functionality (timing constraints) to disallow scheduling of treatments on predetermined high pulp stands. This did not remove the area from the net landbase; therefore, the growing stock comparison presented here shows the excluded high pulp stands, resulting in higher growing stock compared to the NFP (Figure 34). The comparison is included as it shows that the biggest difference in sawlog harvest rates between the two scenarios (40-70 years) correlates with the biggest difference in growing stock between the two scenarios.

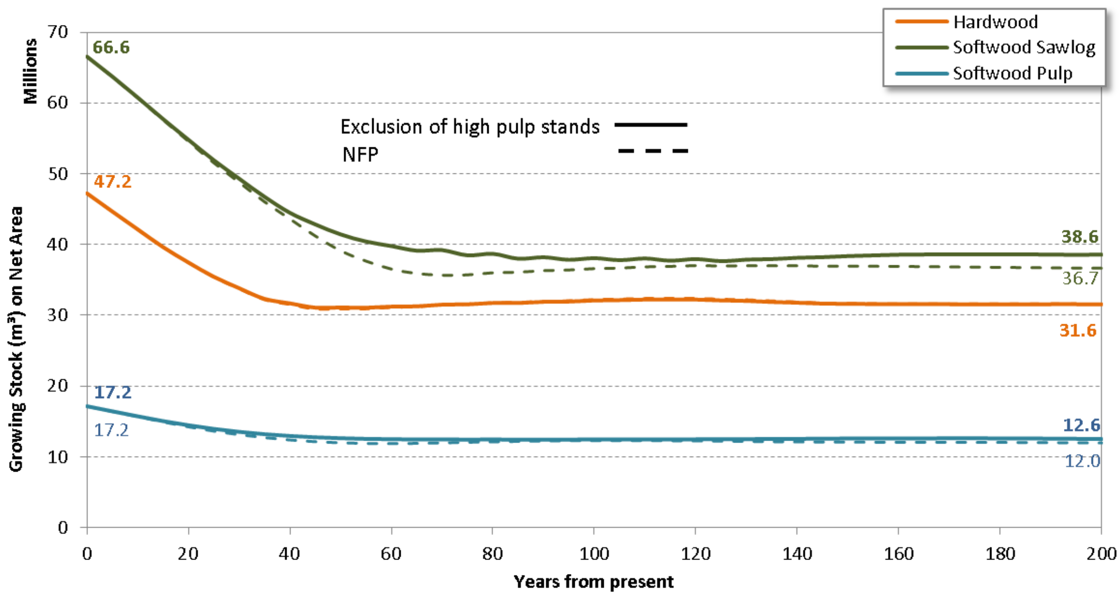

Figure 34 Growing stock comparison between NFP and exclusion of high pulp stands scenarios.

6.7 Lower In-Block Retention

The percentage in-block retention (i.e., the forested area within a harvested block that is left standing for ecological purposes) is set at 9% for the NFP scenario. In this scenario, in-block retention was reduced from 9% to 4.5% to reflect the possibility that the net impact of leaving 9% at time of harvest may be less than the full 9% because of overlaps with other netdowns. The result is 66,055 ha of in-block retention removed from the landbase (instead of 132,112 ha).

Figure 35 shows that the 4.5% in-block retention scenario allows for an extra 5 years of HVS harvest for softwood and a long-term increase of 4.0%. Hardwood harvest shows no difference in the short term and a 3.7% increase in the long term. The 4.5% increase in harvest volume at the block level does not translate into the same increase in harvest flow because the in-block retention contributes to old growth requirements, and when reduced, these requirements must now be filled elsewhere on the net landbase.

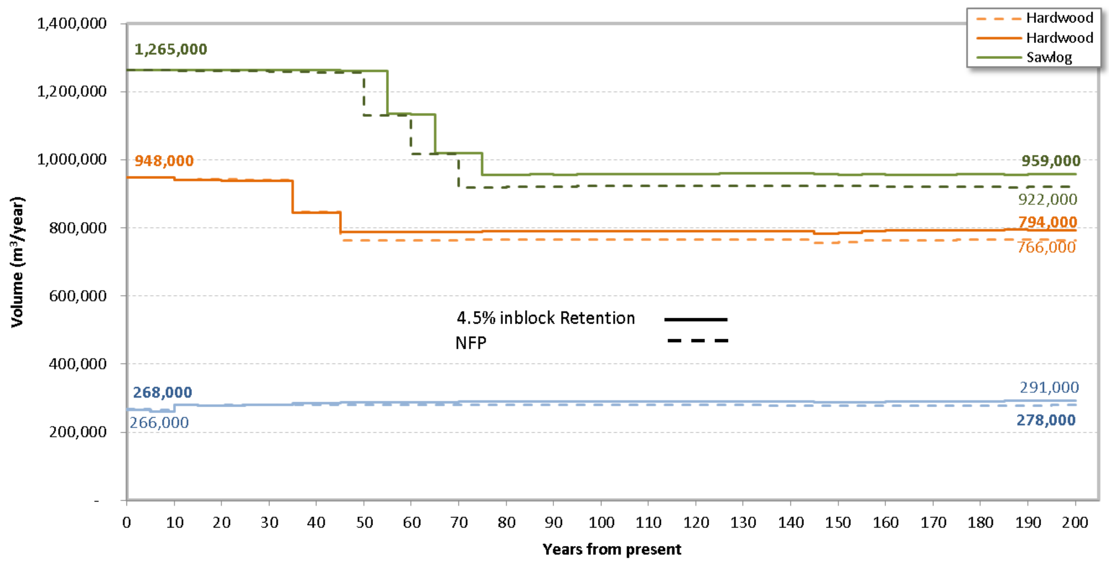

Figure 35 HVS comparison between NFP scenario and 4.5% in block retention.

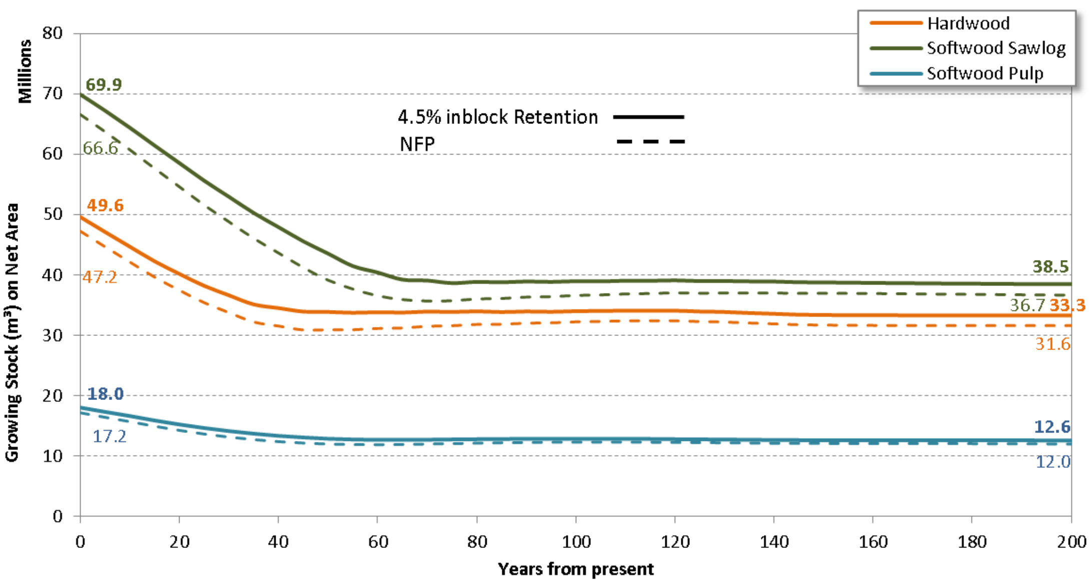

Figure 36 Growing stock comparison between NFP and 4.5% in-block retention scenario.

6.8 Softwood Reduction

Softwood establishment in regenerating hardwood-leading and hardwood-mixed stands can be problematic due to extensive hardwood suckering. This scenario explores what may happen if a passive approach is taken to softwood establishment in these types. In this scenario, softwood volumes were reduced by 50% within regenerated hardwood stands, and 25% in regenerating hardwood mixed stands. Figure 37 shows the difference between the NFP scenario and this sensitivity for future managed Yield Group 1 (Hardwood yield group - 50% reduction of softwood, overall stand volume reduced). Overall stand volumes are assumed to be lower because the presence of softwood in the stand often does not come at the expense of hardwood volume (and a reduction in softwood would not allow for more hardwood).

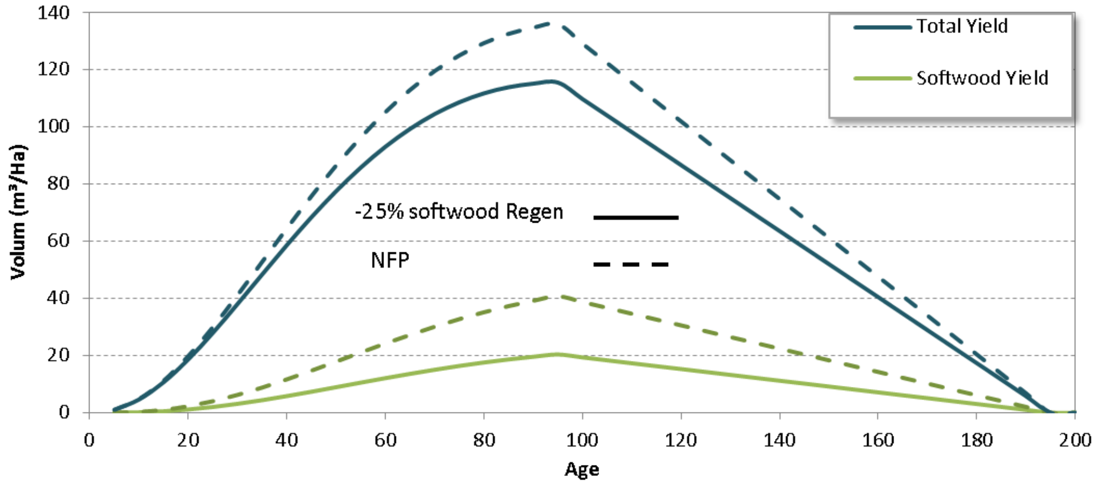

Figure 37 Softwood contribution to yield volumes for NFP and 'less softwood' scenarios using YG1.

Table 14 shows that 28% of the net landbase has a 50% reduction in softwood (but little softwood present already), and 12% has a 25% softwood reduction, while 60% of the landbase remains unchanged.

Table 14 Area contribution of different yield group reductions on the net landbase.

	Total	Area 50%	Area 25%	Area 0%
Area (Ha)	1,467,906	412,907	175,494	879,504
Percent	100%	28%	12%	60%

The result was no difference in the short-term HVS for any of the products because the initial yield curves remain the same. Later, as the existing stands transfer to managed stands with reduced softwood yields, there is a 8% decrease for sawlog harvest, and a 5% decrease in pulp harvest (Figure 38).

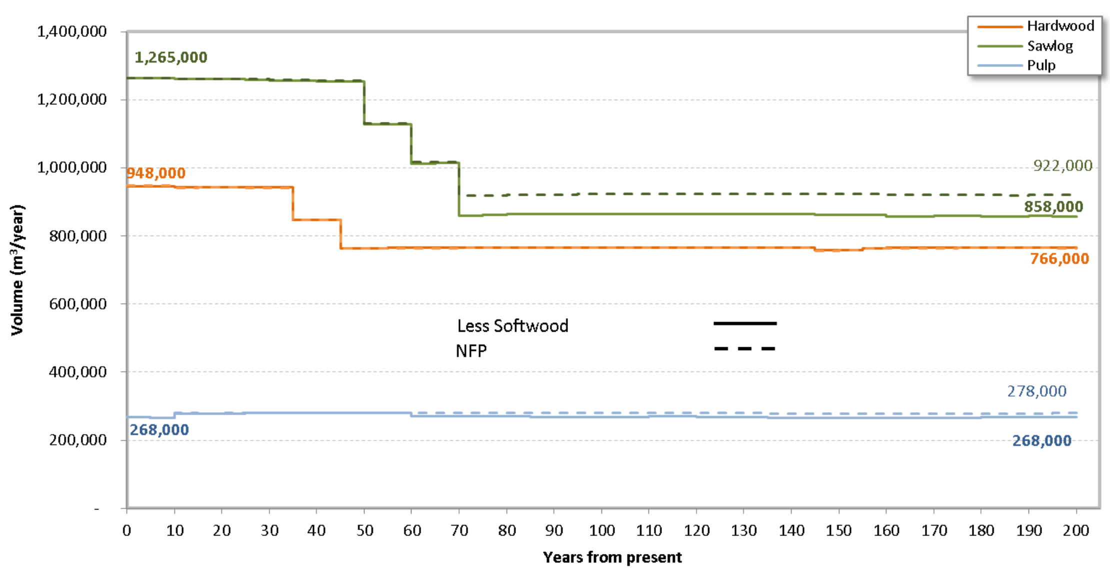

Figure 38 HVS comparison between NFP and softwood reduction scenario.

The growing stock also begins at the same level for all three products, and the hardwood growing stock remains unchanged across the entire planning horizon. The sawlog growing stock decreases by 8.2% (2,900,000m³), and pulp by 5% (600,000m³) as the stands shift to managed yield curves.

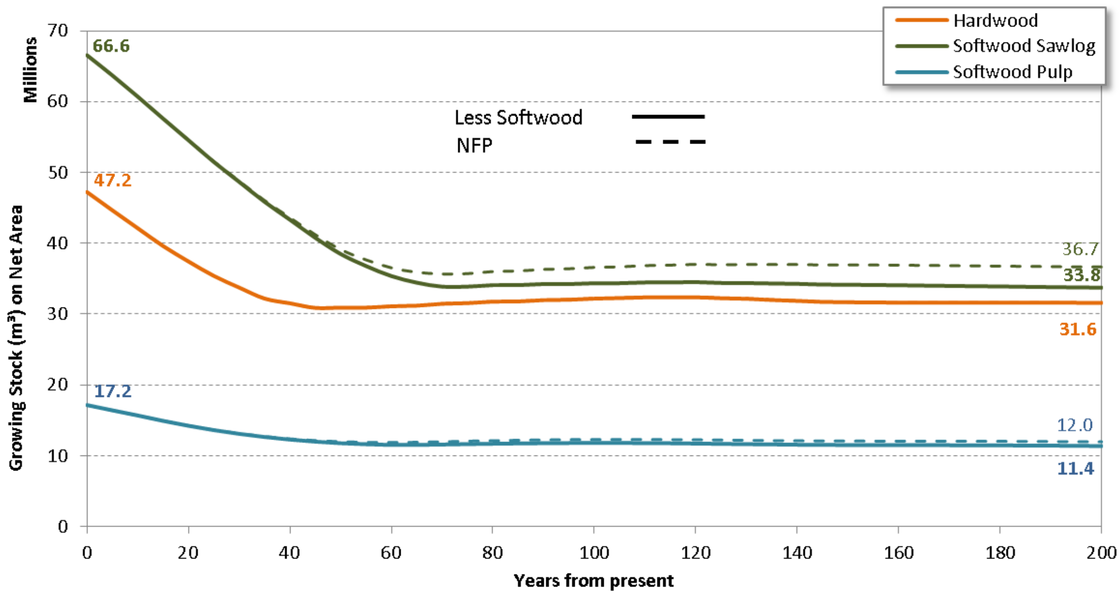

Figure 39 Growing stock comparison between NFP and softwood reduction scenario.

6.9 Mixed Stands Regenerate with Less Hardwood Volume

This scenario assumes that an active silviculture program occurs to allow current mixed stand types (HS/ SH) to regenerate with 25% more softwood volume than they had preharvest. The volume increase is shifted from the hardwood stand component to the softwood component, with no change in total volume under the assumption that hardwood would need to be removed to achieve the goal.

Table 15 Summary of yield adjustment for the mixed stands regenerate with less hardwood volume sensitivity

Std Type	Yield Group	MHA	Swd Netvol (m³/ha)	Hwd netvol (m³/ha)	Total netvol (m³/ha)	% Swd	% Hwd	% Shift	% Swd new	% Hwd new
HS	3	60	40	38	78	51%	49%	**25%**	77%	22%
HS	4	65	79	67	146	54%	46%	**25%**	68%	32%
SH	5	60	51	28	78	65%	35%	**25%**	89%	19%
SH	6	65	99	47	146	68%	32%	**25%**	85%	15%
HS	7	75	79	34	113	70%	30%	**25%**	87%	13%
HS	8	80	82	94	176	47%	53%	**25%**	58%	42%
SH	9	75	75	37	113	67%	33%	**25%**	84%	16%
SH	10	80	114	62	176	65%	35%	**25%**	80%	20%

As seen in Figure 40, the forecasted harvest volumes remained unchanged in the short term, and shifted from the hardwood to the softwood in the long term. The softwood volume (sawlog + pulp volumes) increased by 55,000 m³/yr (3.7%), and the hardwood volume decreased by 45,000 m³/yr. These results are expected because the initial stands remained the same, and only the mixed stands slowly transitioned over the planning horizon to those with a higher proportion of softwood volume.

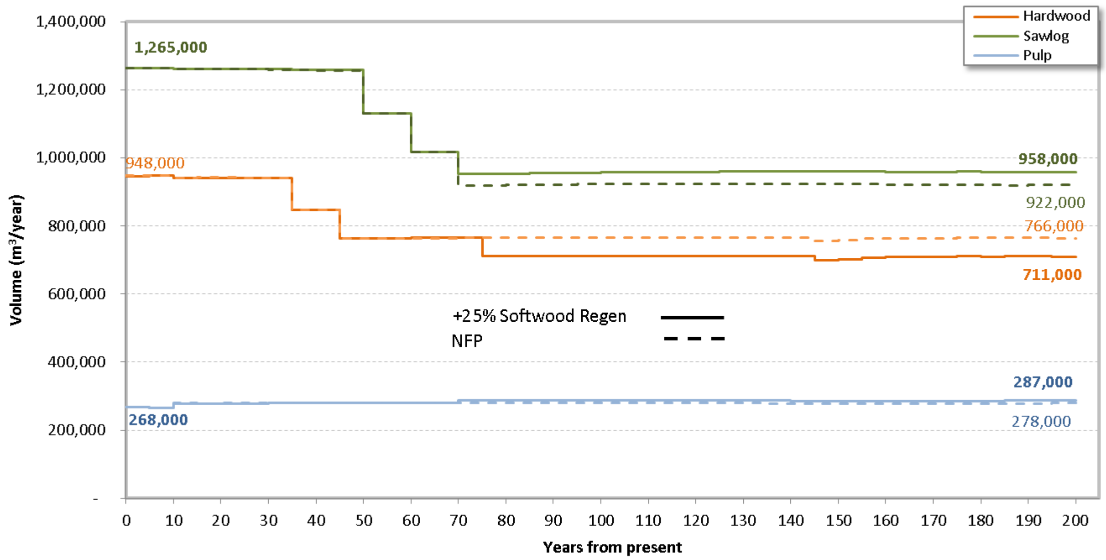

Figure 40 HVS comparison between NFP and increased softwood scenarios.

These same trends are seen in the comparison between the growing stocks (Figure 41). Initially all of the growing stock values are the same. Over time, stands shift to those containing more softwood, and this scenario deviates from the NFP scenario. The softwood growing stock increases by 5.1% (2,500,000 m³), and the hardwood decreases by 6.8% (2 million m³).

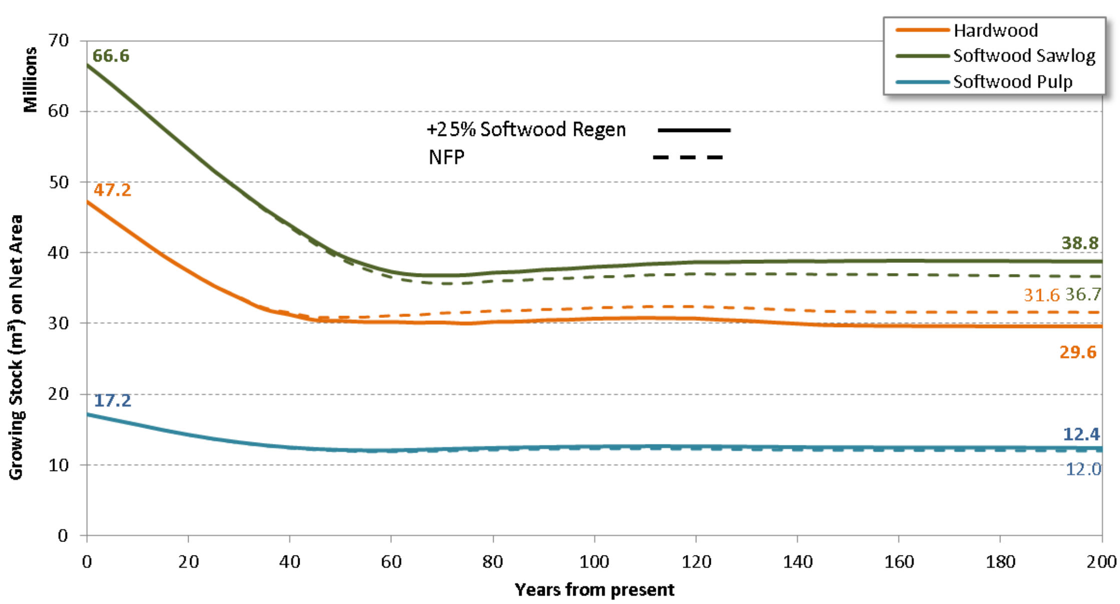

Figure 41 Growing stock comparison between NFP and increased softwood scenarios.

6.10 Cut-to-Length Utilization (Softwood)

This scenario examines changing from tree length (TL) utilization to cut-to-length (CTL) utilization for softwood.

CTL involves bucking a tree using specific log length criteria and can result in the top portion of a tree being unutilized because it is too short to make a specific log length (Figure 42). The more flexible the log length criteria are, the less waste occurs.

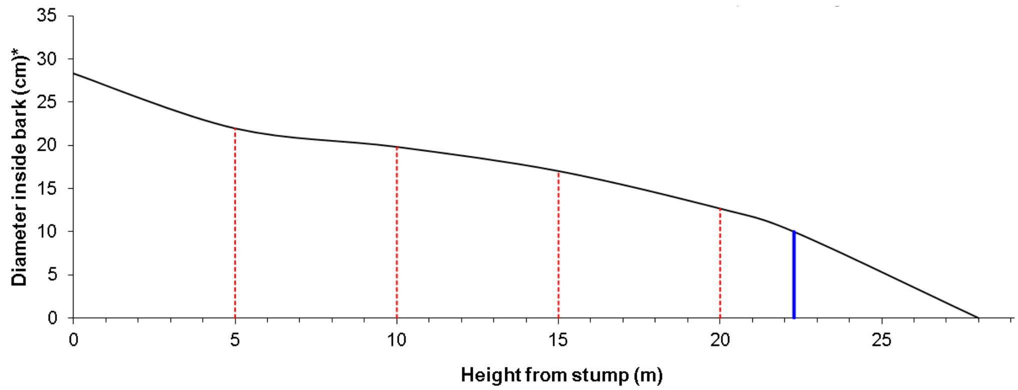

Figure 42 Example bucking based on rigid 5m log lengths to a 10cm top.

Previous analysis work on this issue summarized in Penney 2010 (Sakâw Commitments on the PA FMA Report) indicates a 4.5% HVS impact when switching from treelength to CTL (minimum top dib of 10 cm and 2.6 m log lengths were assumed). This was calculated using the Forest Service's stand/stock tables for the PA FMA which have net volumes determined for different utilization standards for each FCT inventory code (species, age, density). The analysis was conducted on all merchantable stands (height class 15m [>12.5m]) by linking the area of each FCT code to the volume/ha provided by the stand/stock tables.

This approach is expected to overestimate the impact of using CTL relative to how it is proposed on this FMA because of its rigid adherence to a single log length.

Alberta conversion factors (Stadt et al., 2014) were also examined as another approach to impact assessment (AESRDProvincialUtilizationConversions2014). When a minimum 10cm top dib is used with a 2.44m rigid log length rule, a ~3% volume reduction factor is indicated for both hardwood and softwood stands in the Boreal Natural Region. [Assumes a 30cm stump height with a 12cm minimum stump diameter].

It should be noted that introducing flexibility in log sizes (i.e. 8', 10', 12', 16' length options), combined with optimal bucking process, has been shown to greatly reduce the impact of shifting to CTL. A recent unpublished study in Alberta determined a ~1% impact in this circumstance.

For the purpose of this sensitivity analysis, the high end impact estimate of 4.5% was assumed. This volume was moved to the pulp component for all of the yield groups as the short log was assumed to be appended to the pulp log. The total volume of the stand did not change.

The change in projected sawlog harvest volume was 15 fewer years of current HVS harvest and a long term that is 4.4% (41,000 m^3/yr) lower than the NFP scenario. This volume loss is balanced by an increase in the pulp harvest volume of 72,000m^3/yr in the short term and 37,000 m^3/yr in the long term. The hardwood volume remains unchanged as the hardwood yield curves are the same as the NFP scenario.

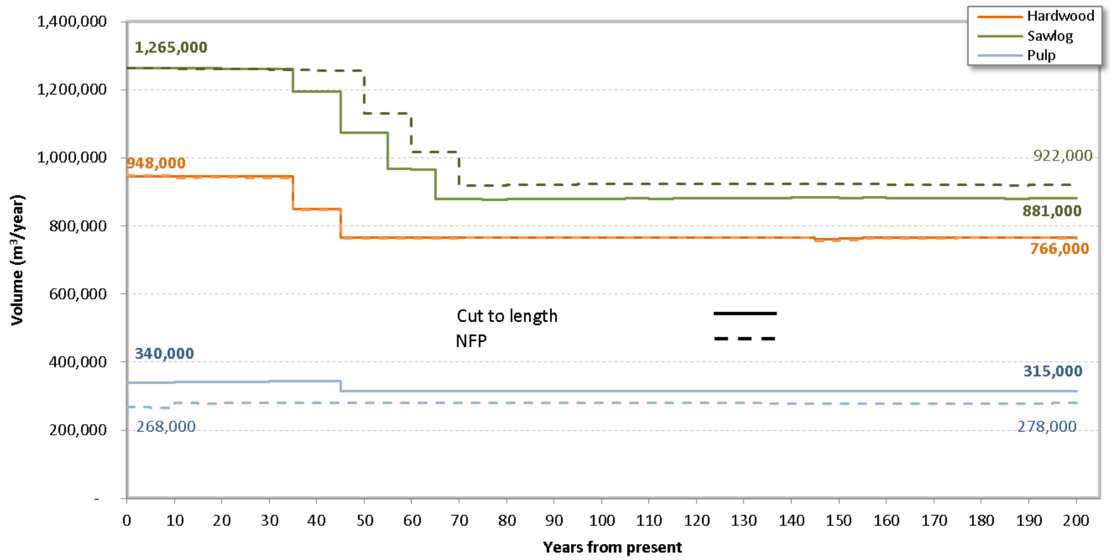

Figure 43 HVS comparison between NFP and cut to length scenarios.

As expected, the initial growing stock of sawlogs is 4.5% (3 million m³) lower, and the pulp growing stock is 3 million m³ higher. The growing stocks for both softwood products eventually converge toward the NFP levels in the long term (Figure 44).

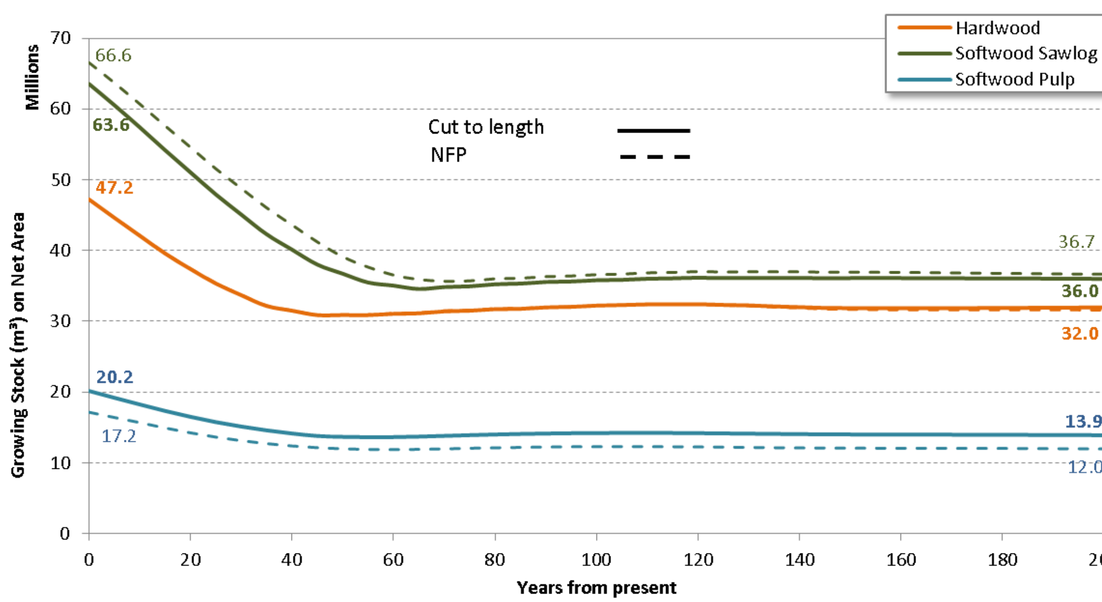

Figure 44 Growing stock comparison between HVS and cut-to-length scenarios.

6.11 Short-term Caribou Exclusions (2015 Plan)

The Saskatchewan government is still developing management direction for woodland caribou habitat in the province, including the Prince Albert FMA landbase. Draft maps of high suitability caribou habitat, and areas of known caribou presence, have been roughly identified. Based on the draft maps, the Sakaw shareholders have identified Caribou Habitat Maintenance Zones (Figure 45 and Table 16) around concentrations of high caribou habitat suitability and relatively low timber values. These zones are proposed as short-term harvest exclusion areas, with the intent of minimizing habitat fragmentation during the term of the FMP, while minimizing the impact on timber supply.

Table 16 Net Area covered by proposed caribou maintenance areas

Caribou Area	Gross Area (Ha)	% of Gross PA FMA Area	Net Area (Ha)	Net % of Gross Area
1	82,747	2.5%	26,211	32%
2	9,596	0.3%	94	1%
3	52,270	1.6%	7,643	15%
4	114,328	3.4%	17,856	16%
5	20,026	0.6%	1,458	7%
6	113,885	3.4%	9,507	8%
7	99,433	3.0%	44,874	45%
8	55,591	1.7%	9,670	17%
Total	**547,877**	**16.4%**	**117,313**	**21.4%**

In this scenario, temporary caribou exclusions were imposed for 50 years (management intent is only for 20 years or until Range Plans direct otherwise), while current AOP blocks within the exclusion zones were permitted to be harvested. The result is that there is essentially no deviation from the NFP scenario for harvest levels or the growing stock (Figure 46).

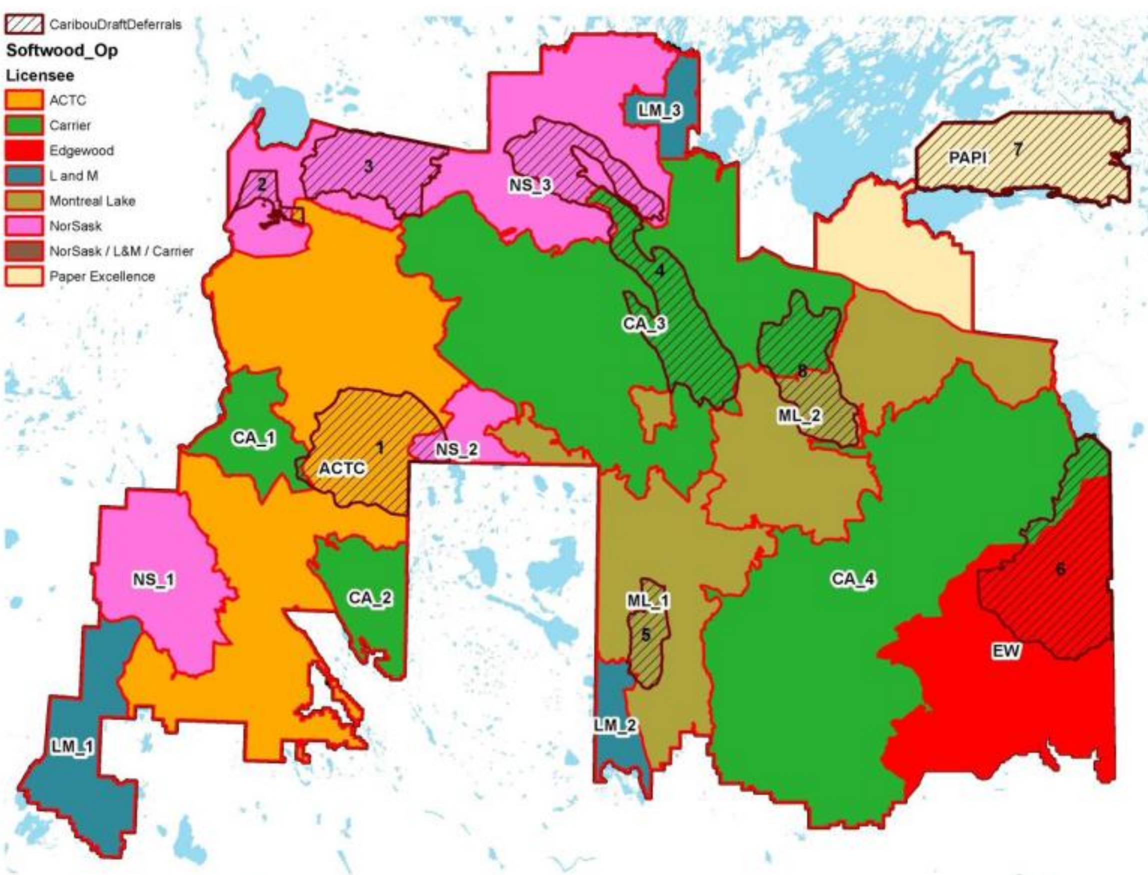

Figure 45 Caribou Maintenance Zones

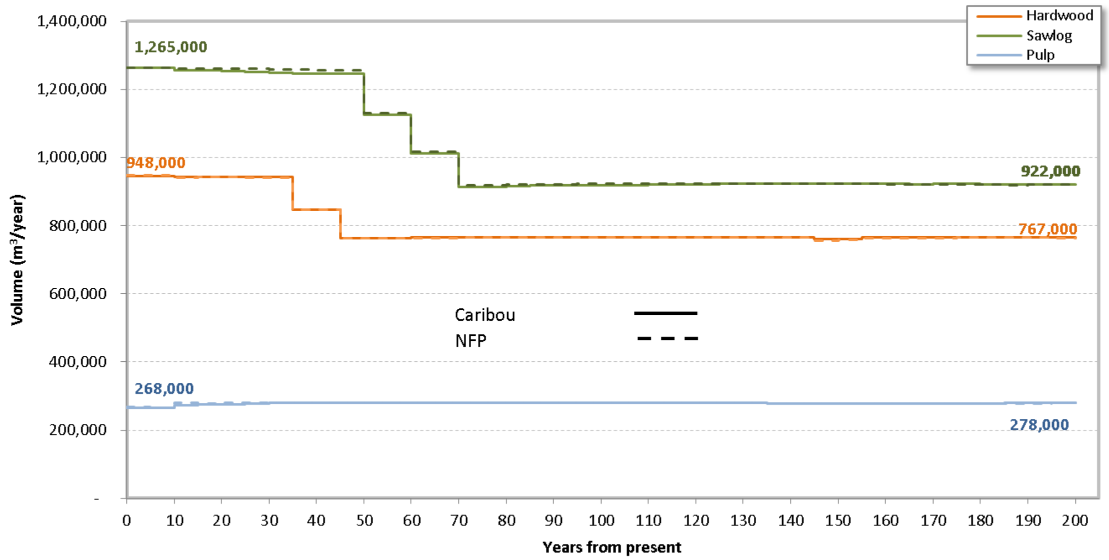

Figure 46 HVS comparison between NFP and caribou exclusion scenarios.

6.12 Managed Stand Yield Gain

Managed stands (post-harvest, regenerated stands) are often more productive in terms of volume because there is purposeful management of stocking and spatial regeneration patterns designed to meet government regeneration requirements. In this scenario, a 10% softwood volume increase was applied to all the future managed stands containing softwood (Yield Groups > 2).

The resulting short-term sawlog and hardwood harvest flows are unaffected, but there is a gain in the long term for both softwood products (Figure 47). This occurs because the short-term yield curves are the same and all hardwood curves are the same as in the NFP scenario. The softwood harvest increased proportionally with the increased yield curves; sawlogs see an increase of 9.5% (88,000m³/yr), and pulp an increase of 10.4% (29,000m³/yr).

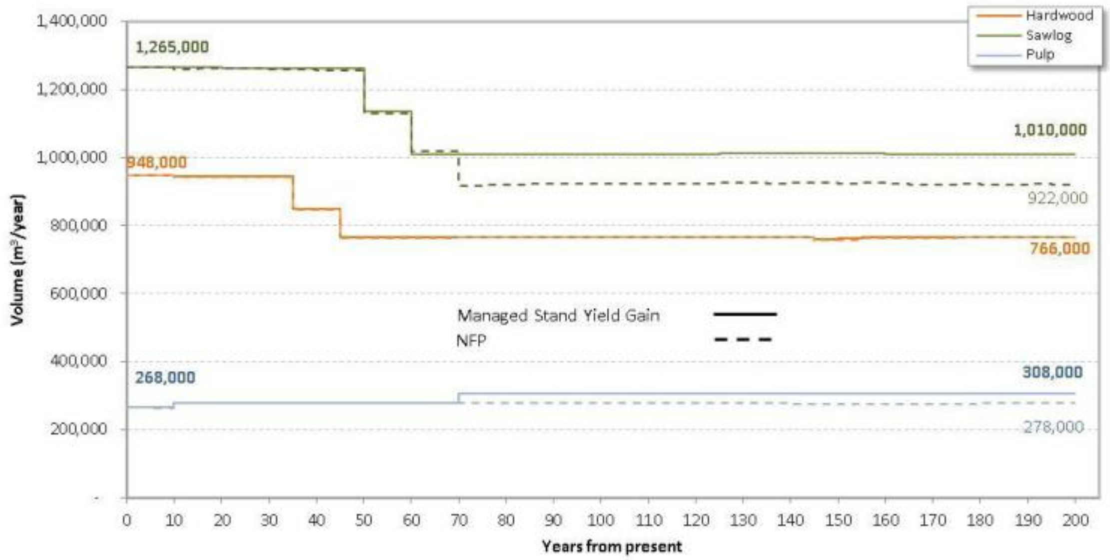

Figure 47 HVS comparison between managed stand yield gain and NFP.

6.13 Summary of Sensitivities

Table 17 summarizes the impact on HVS, for each of the sensitivities, relative to the NFP base case.

Table 17 Synopsis of sensitivities.

Scenario	HVS - Initial Deviation from NFP			HVS-Long Term Deviation from NFP		
	Pulp	Saw	Hwd	Pulp	Saw	Hwd
Provincial Util	+13.6% (208,000m³/yr)			+17.4% (208,000m³)/yr		
Higher Pulp	+115,000m³/yr	-15years	No change	+106,000m³/yr	-98,000 m³/yr	No change
Volume + 10%	+1,000m³/yr	+25 years	+35 years	+28,000m³/yr	+95,000m³/yr	+77,000m³/yr
Volume - 10%	-16,000m³/yr	-25 years	-15 years	-28,000m³/yr	+76,000³/yr	+94,00m³/yr
MHA + 10	-8,000m³/yr	-25 years	-20years	-28,000 m³/yr	44,000m³/yr	no change
Increase Regen Delays	no change	no change	no change	no change	no change	no change
Decrease Regen Delays	+1,000m³/yr	+5 years	No change	+5,000m³/yr	+11,000m³/yr	no change
Exclusion of High Pulp Stands	+5,000m³/yr	+10 years	No change	-8,000m³/yr	23,000m³/yr	-8,000m³/yr
4.5% In-Block Retention	+2,000m³/yr	+5 years	No change	+13,000 m³/yr	+37,000m³/yr	+28,000m³/yr
Softwood Reduction	no change	no change	no change	-10,000m³/yr	no change	-64,000m³/yr
Less Hardwood Regen	no change	no change	no change	+9,000m³/yr	+37,000m³/yr	-45,000m³/yr
Cut-To-Length Util	+72,000m³	-15 years	no change	+37,000m³/yr	-41,000m³/yr	no change
Caribou Exclusions	no change	no change	no change	no change	no change	no change
Managed Stand Yield Gain	no change	no change	no change	+30,000m³/yr	+88,000m³/yr	no change

No sensitivities indicated that the current HVS could not be maintained for the term of this plan.

7 Composite Scenario (2015) Results

This composite management scenario reflects the planning team's 2015 vision of desired management of the FMA for the term of this FMP. It includes managing for NFP, cut-to-length utilization for softwood, and management for caribou habitat maintenance zones as an interim measure until range plans are completed.

Table 18 The Composite Scenario - Key Variables Description

Key Variable	Description
Harvest Flow Regime	Hold current allocation as long as possible. Max 10% change/period. No compromise to long-term.
Net Landbase	1,467,907 (spatial), 1,323,032 (net)
Growth and Yield	**Cut-to-Length for Softwood (4.5% sawlog shifted to Pulp, no change in overall softwood volume)**
Minimum Harvest Ages	As per modeling assumptions document (e.g. tA@45 or 50, jP@55 or 70, bS@65yrs, wS@65yrs)
Regeneration Delay	0 yrs. for H, HS, and SH-SxH, 1 yr. for all other S, and SH
In-Block Retention	9% aspatial reserve (can count towards old seral if correct age)
Annual Operating Plan	Prioritized in first 10 years
Seral Requirements	15% old plus age, 5% very old plus age
Interior Forest	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.
Harvest Event Size	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.
Caribou Habitat	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS. **No harvest within caribou maintenance zones for the first 50 years except current Year 1 AOP blocks.**
Moose Habitat	Tracking only
Fisher Habitat	Tracking only
Visuals / Lakeshore Management	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).
Hillside Visual Management	Maximum of 20% of MFLB can be <20 years.
Roads	No tracking / no controls

The harvest forecasts by product for the composite scenario are shown in Figure 48.

- The current **hardwood** HVS (947,000 m³/yr) can be maintained for 35 years, and the long-term harvest is 767,000 m³/yr.
- The current **sawlog** HVS (1,265,000 m³/yr) can be maintained for 35 years, and the long-term harvest is 881,000 m³/yr.
- The **pulp** harvest level is 339,000 m³/yr in the short term and 315,000 in the long term. This is well below the current HVS of 661,000 m³/yr.

Differences from the NFP scenario are primarily due to the adoption of the softwood cut-to-length utilization, as the short-term caribou deferral sensitivity had no impact on HVS (see Section 6.11).

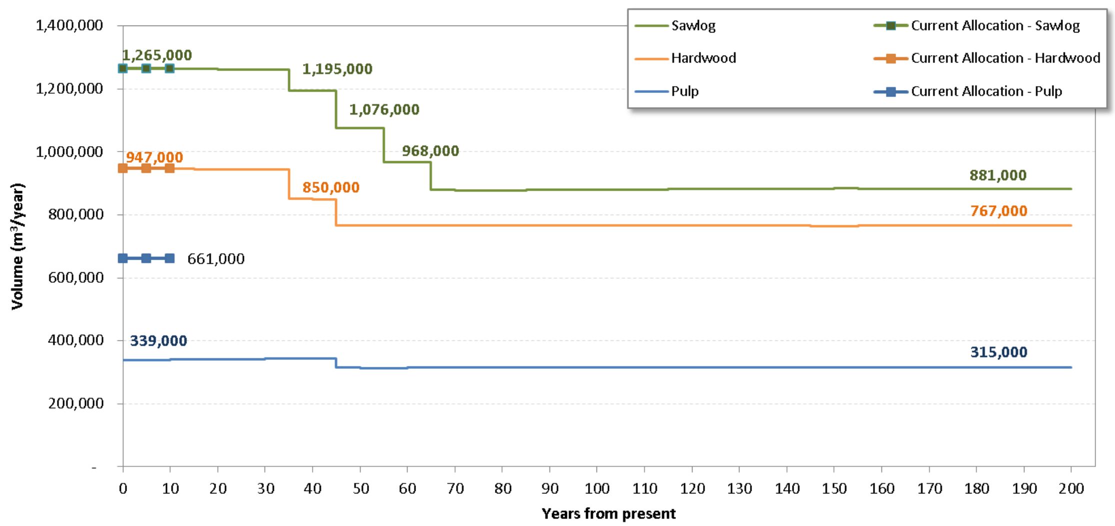

Figure 48 Composite Scenario – Harvest volume schedule by product.

Figure 49 shows the contribution of incidental volumes to the total harvest by product. Incidental volume is softwood volume realized from harvesting hardwood-leading stands and vice versa. On average, 8.9% of hardwood volume comes from softwood-leading stands, 10.5% of softwood sawlog, and 7.5% of softwood pulp come from harvesting hardwood-leading stands.

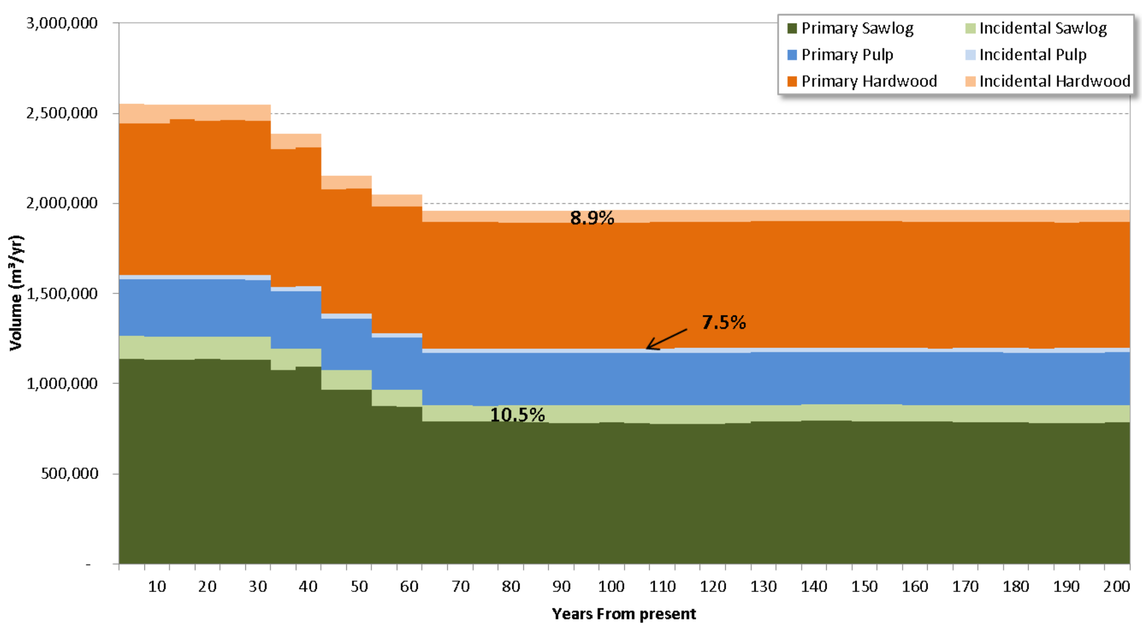

Figure 49 Composite Scenario - Annual Incidental Harvest Volume by product.

Total growing stock on the net landbase declines for the first 60 years and recovers slightly before reaching a steady-state condition around 100 years from now (Figure 50). This reflects the shifting of the landbase to a younger age class distribution, and then a balanced state where harvest equals growth.

Merchantable growing stock (Figure 50 and Figure 51) declines rapidly for the first 60 years to reach a low of 16.7 M m^3 for HWD and 23.3M m^3 for softwood (sawlogs + pulp). This indicates that 50-60 years from now will be the most challenging time to find merchantable wood and thus, this time period is a key driver for timber supply results (i.e. a pinch point). Beyond this, relatively stable levels of merchantable growing stock are seen, which is consistent with the objective of shifting the landscape to a younger age class distribution. As stands become older than minimum harvest age, they are typically harvested unless they are needed to meet a non-timber objective such as old seral retention.

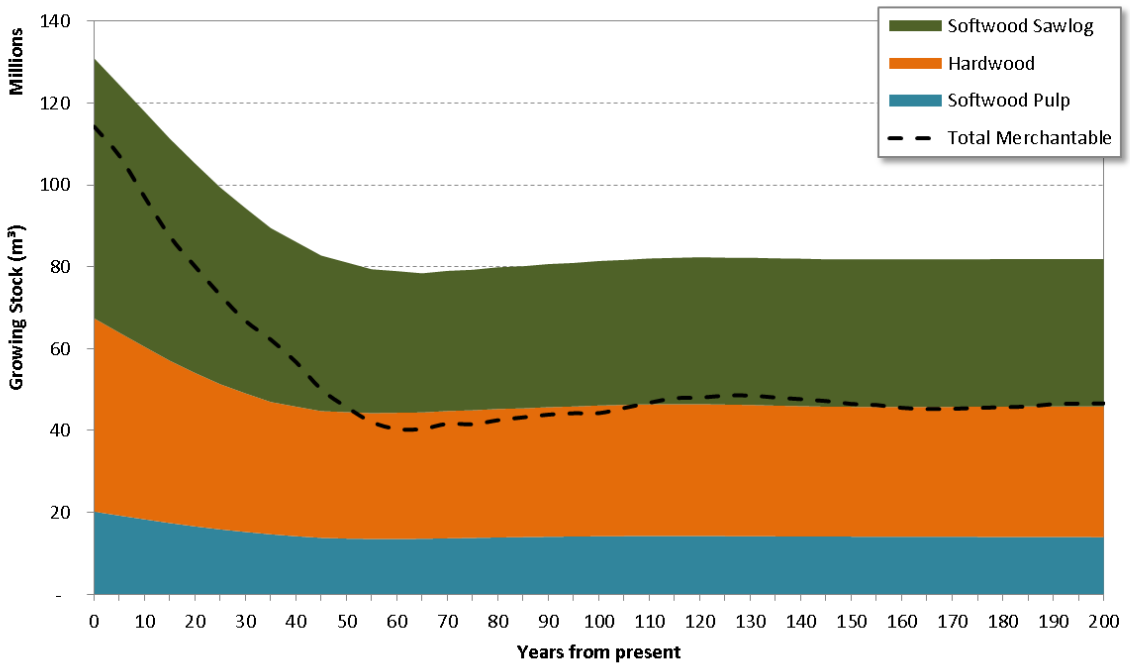

Figure 50 Composite Scenario – Growing stock by product on the net landbase.

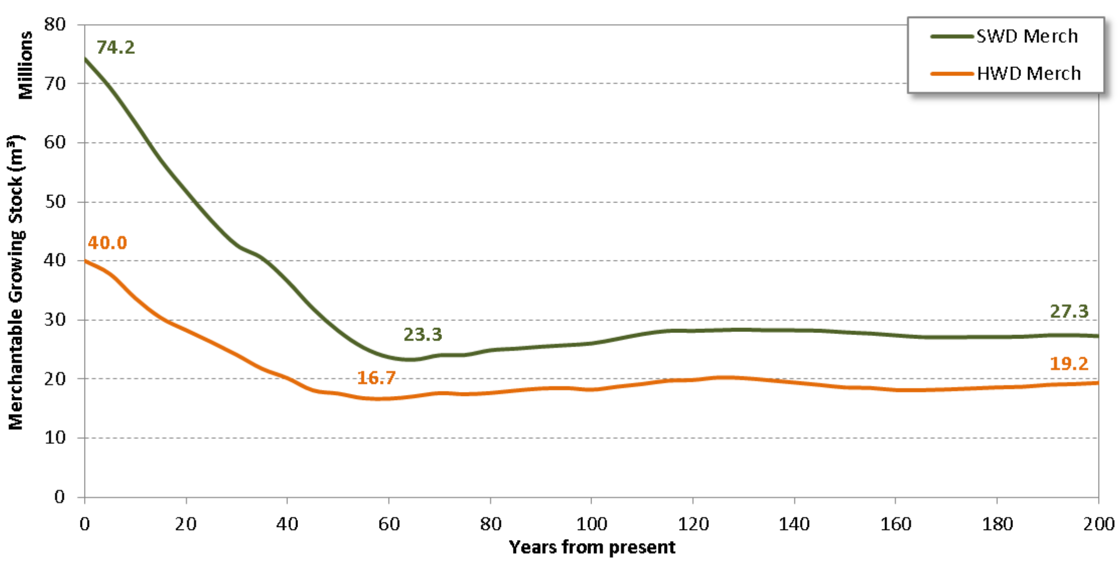

Figure 51 Composite Scenario -merchantable growing stock on the net landbase.

Annual harvest area (Figure 52) averages around 16,600 ha/year over the first 70 years, and then in the last 100 years averages around 15,300 ha/year. Most of the harvest area consist of softwood stands (56% average for 200-year planning horizon) followed by hardwood stands (29%) and mixed-wood stands (10% HS, 6% SH).

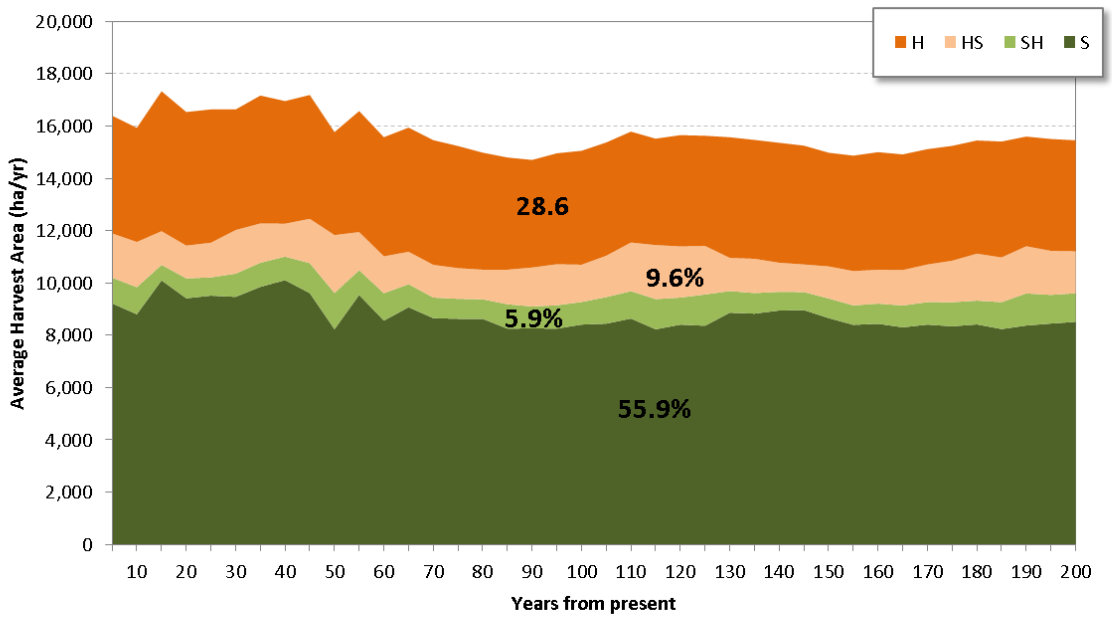

Figure 52 Composite Scenario - Annual harvest area by stand types (200-year average percentages)

The average harvest age in the first 70-80 years is much higher than in the long term as a large portion of the landbase is comprised of older stands at the beginning of the planning horizon (Figure 53). After 80 years the harvest ages stabilize around 79 years for softwood, and 73 years for hardwood. Figure 54 provides a breakdown of the area harvested within each harvest age class and shows that for the first 40 years, there is almost no younger second growth being harvested.

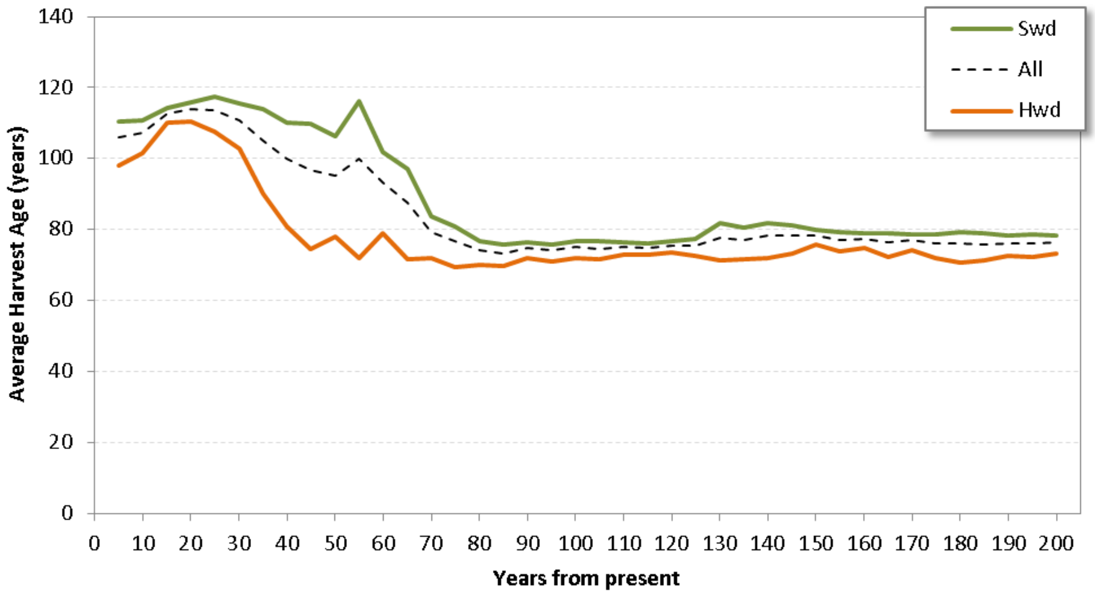

Figure 53 Composite Scenario - Average harvest age by stand types

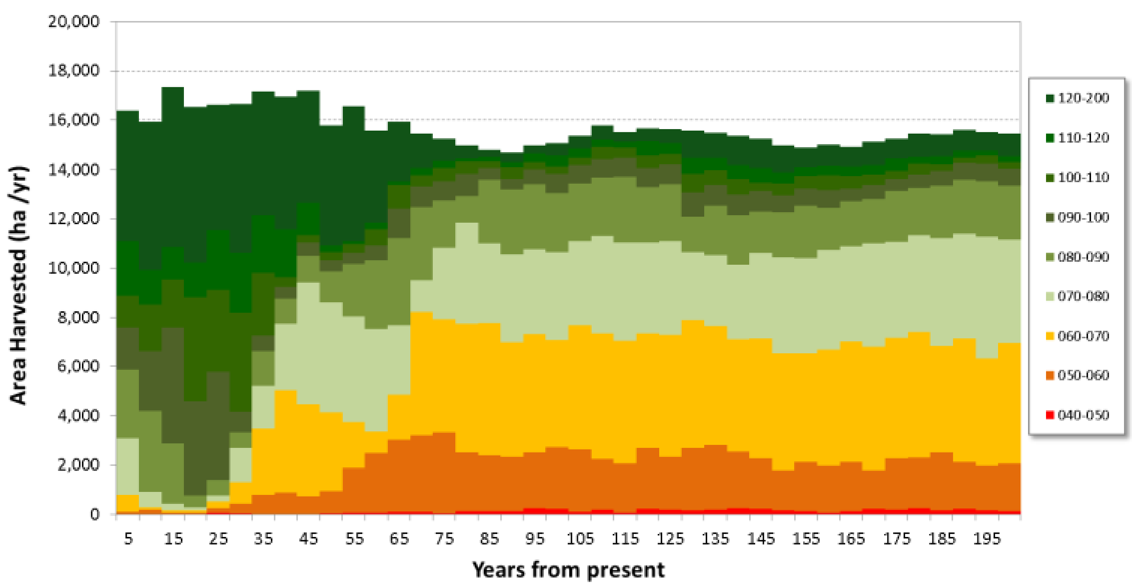

Figure 54 Composite Scenario - Area harvested by age class

Average harvest volume is slightly higher near the beginning of the planning horizon and then fluctuates between 140-160 m^3/ha in the case of hardwood, and 110-120 m^3/ha in the case of softwood (Figure 55). The difference in volume/ha between the short and long term is moderated (despite different harvest ages) by the declining yield produced from older stands. These yield declines are largely avoided in the long term as stands are harvested at or near their peak volumes.

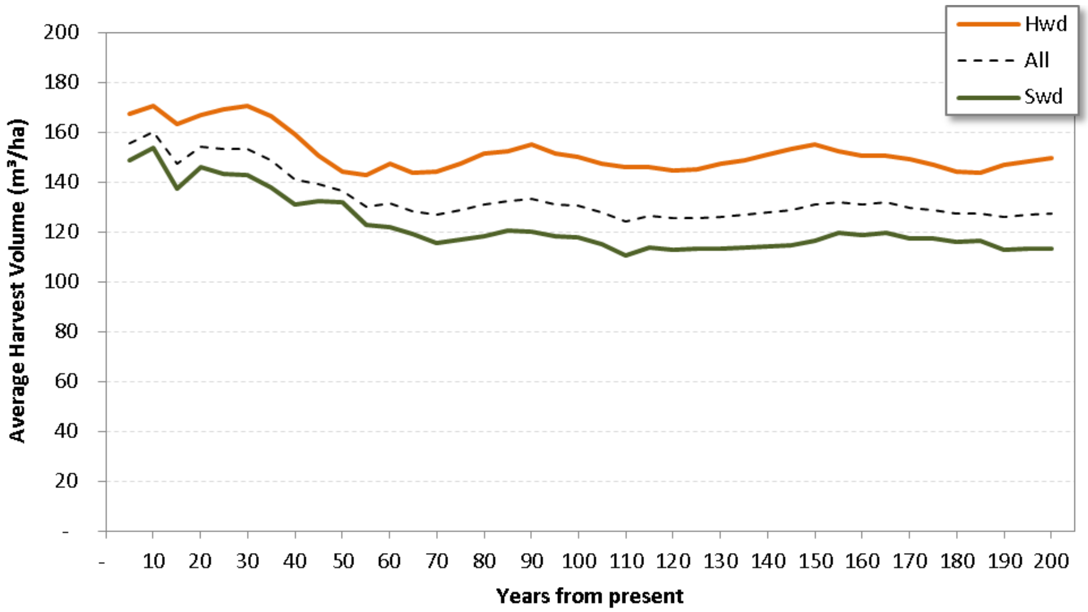

Figure 55 Composite Scenario - Average harvest volume by stand types

Figure 56 indicates that the harvested piece size will remain consistent for several decades as harvesting occurs in the older existing stand types, but then it will decline significantly for hardwoods and slightly for softwood as younger stands are harvested.

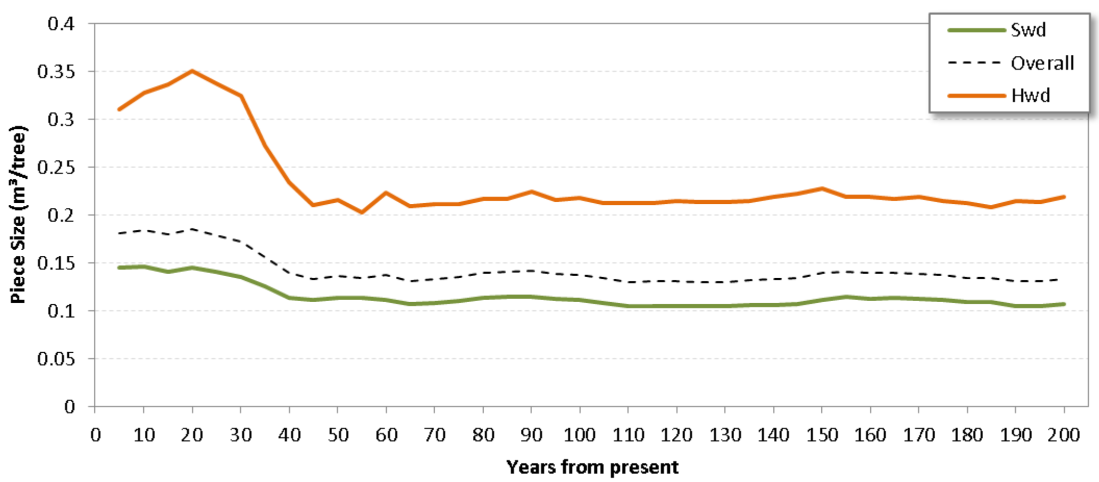

Figure 56 Composite Scenario – Piece Size by stand type

The area undergoing succession over time by species type is shown in Figure 57. The succession rate peaks 70 years from now, which indicates that the harvest flow policy of maintaining the current allocation (harvest) for as long as possible is not high enough to capture all of the eligible older stands before they undergo succession.

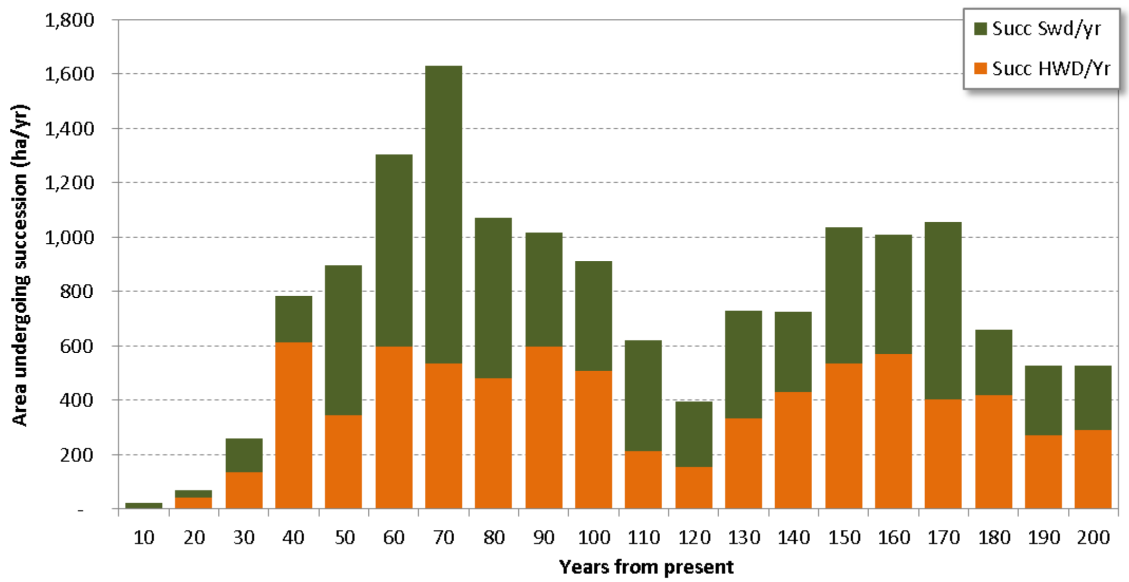

Figure 57 Composite Scenario - Area undergoing succession over time by stand type.

Figure 58 shows the age class distribution at years 0, 50, 100 and 200 of the planning horizon. The goal of shifting the age class structure toward a younger, more natural distribution is evident in the Year 100 and Year 200 charts. Compared to the Timber Focused scenario (Figure 15), there is more net area in older age classes at the end of the 200-year forecast because of the old seral requirements in this scenario.

Figure 58 Composite Scenario - Age class distribution by land base type at year 0, 50, 100, and 200.

8 Updated Analysis (2017)

The 2015 analysis was updated in 2017 to reflect inventory updates for fire, harvesting and growth. The composite scenario was then re-run as the new baseline, and three sensitivity analyses were completed. A 2017 Composite scenario was then created and two additional sensitivity analyses generated.

8.1 Inventory Updates

There were a number of large fires totalling approximately 100,000 hectares that occurred within the FMA boundaries between 2014 and 2016. Fire boundaries were approximated using existing line work within the planning file, and ages were reset to zero at the year of the fire for stands greater than 20 years old. Figure 59 shows the locations of these fires.

The inventory was also updated to reflect harvesting from 2013 to 2016. Approximately 48,000 hectares were updated, with the age of the stands reset to zero at the time the stand was harvested. Figure 60 shows the locations of the harvest updates. The age of the inventory was also updated to reflect growth to 2017.

These changes to the inventory result in a 10.5 percent reduction in initial softwood sawlog volume, 5.9 percent reduction in initial hardwood volume, and 9.4 percent reduction I initial softwood pulp volume, as shown in Figure 62, Section 8.2.

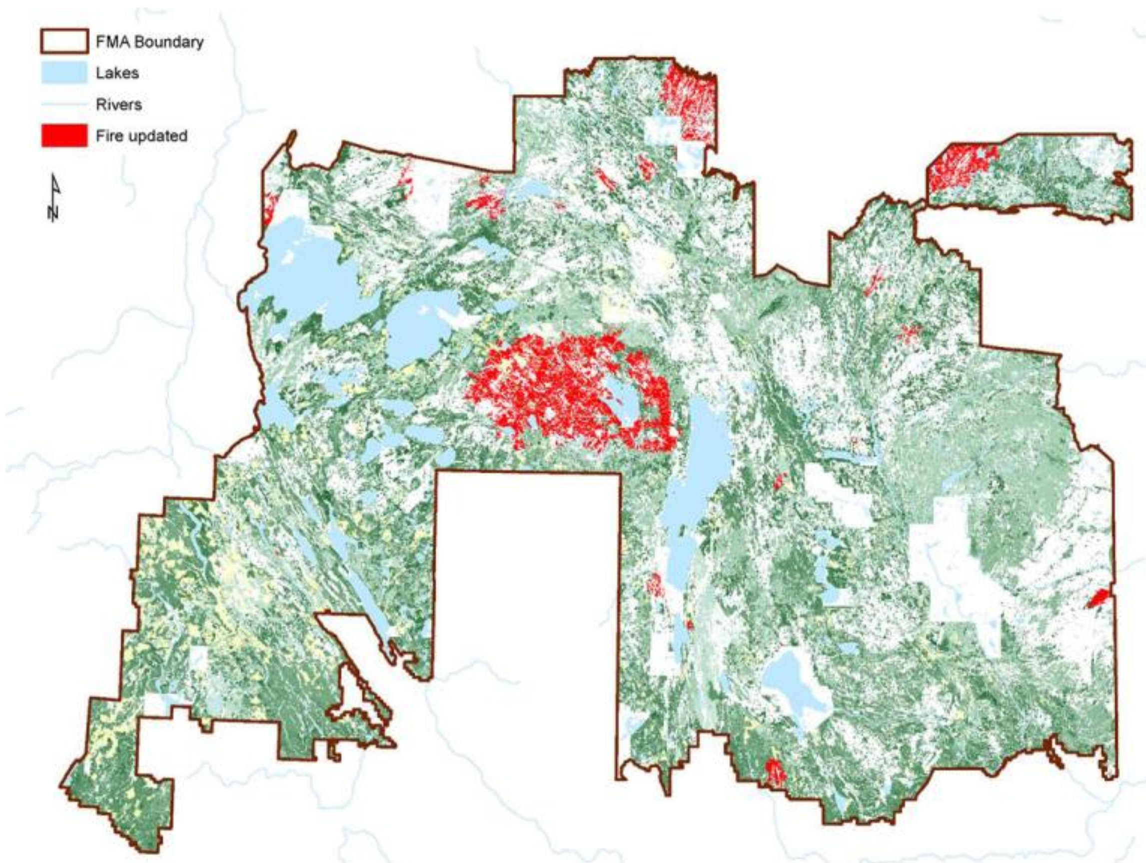

Figure 59 Fire update areas 2014 to 2016

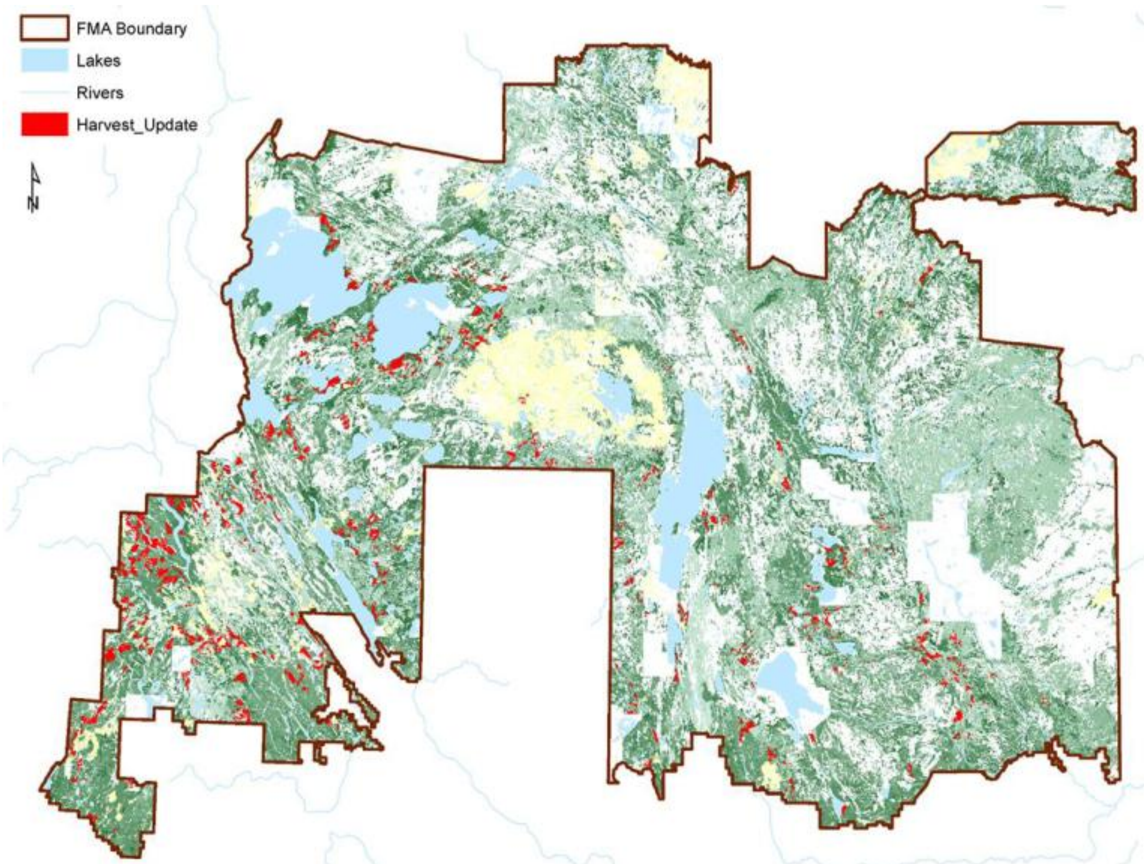

Figure 60 Harvest update areas 2013 to 2016

8.2 2015 Composite Scenario (Updated Inventory)

This scenario uses the updated inventory with the same model parameters as the 2015 Composite scenario. Figure 61 shows the HVS for this scenario compared to the original 2015 Composite scenario. The changes to the inventory result in the duration of the initial softwood sawlog HVS being reduced by 10 years, and the durations of the initial hardwood HVS and softwood HVS being reduced by 5 years. Hardwood is impacted less because the fires had a larger impact on softwood stands.

As expected, the initial growing stock is reduced due to the fire and harvest updates when the updated inventory is modeled (Figure 62). However, long-term growing stock levels are higher. This is most likely due to the overall reduced levels of succession for the updated scenario (Figure 63), which results in fewer stands being recycled and a corresponding higher volume on the net landbase.

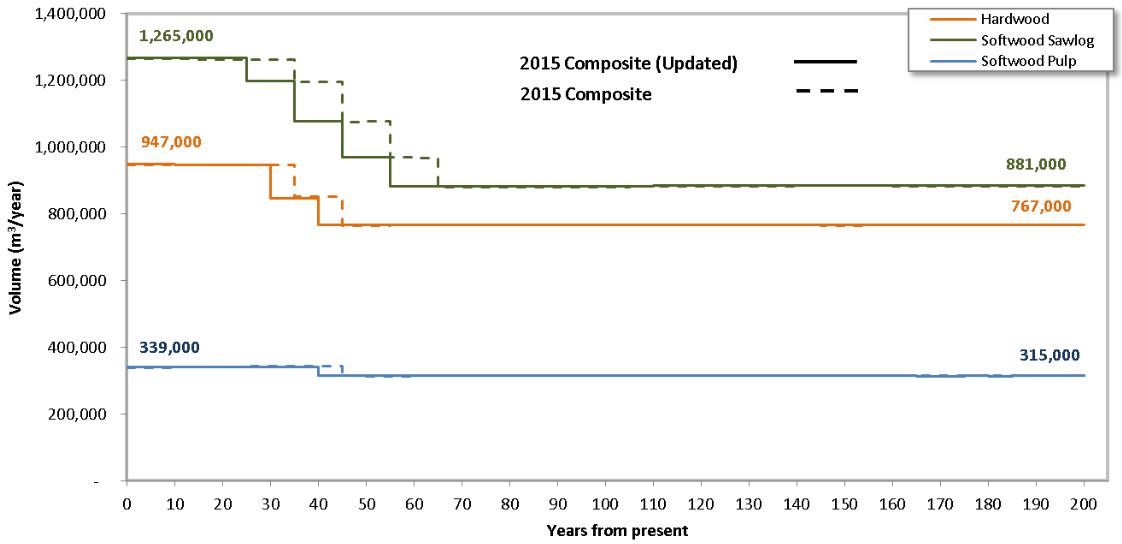

Figure 61 HVS comparison between 2015 Composite and 2015 Composite (Updated Inventory) scenarios

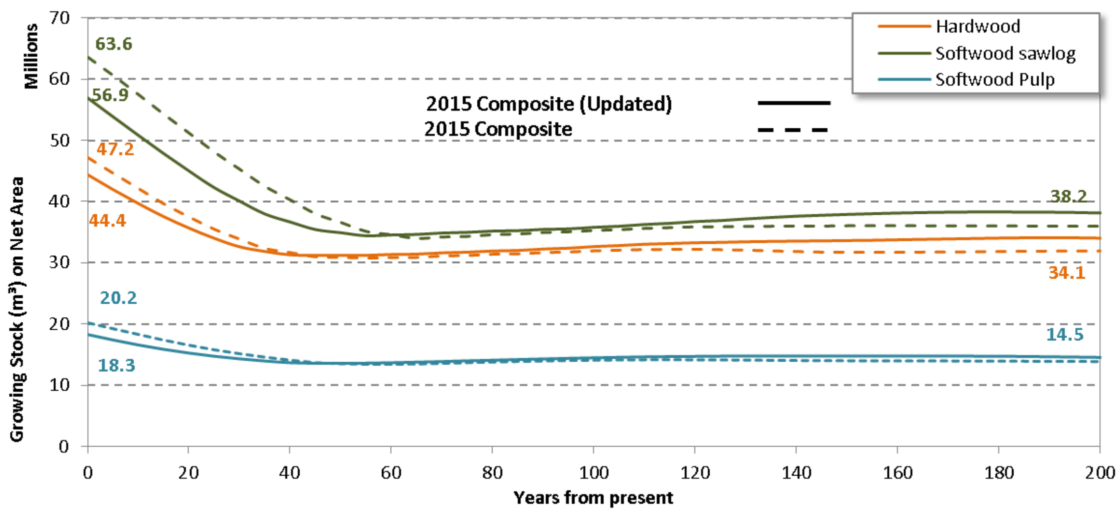

Figure 62 Growing stock comparison between 2015 Composite and 2015 Composite (Updated) scenarios

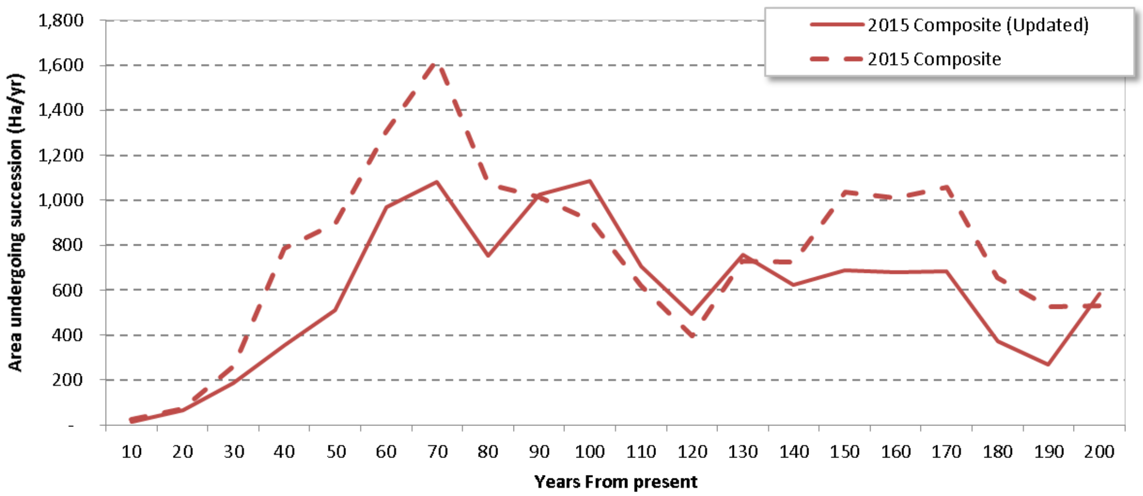

Figure 63 Succession areas comparison between 2015 Composite and 2015 Composite (Updated) scenarios

8.3 Sensitivity Analyses for the Updated 2015 Composite Scenario

Four sensitivity analyses were completed using the Updated Composite Scenario presented in Section 8.2 as the baseline for comparison. The description of any of the sensitivity analysis scenarios includes only the key difference relative to the Updated Composite Scenario.

8.3.1 Alternate NFP Retention

This sensitivity implements alternate seral stage targets and in-block retention levels. The full rationale for these revised targets may be found in the Appendix of the Modeling Assumptions document (Appendix IV).

In-block retention was modeled at 4%. While a full 9% retention is planned, 5% of this is assumed to overlap with other landbase netdowns (riparian, steep slopes, non-commercia types, cabin buffers, etc).

The modeled seral stage targets are outlined in Table 19, and Figure 64 shows the initial condition for seral stage by management unit/species group relative to the alternate NFP targets and the FMP Standard targets (i.e. 15% old plus very old, of which 5% is very old).

Table 19 Species groups and seral stage requirements based on a 55 year fire cycle

Group Species Label	Description	PFTs included	% Old + Very OLd	% Very Old
H	Hardwood stands	AOH, TAB	10%	5%
HS-SH	Mixedwood stands	HPM, HSM, SMW, PMW	8%	4%
S(BSJ_L)	Black Spruce leading softwood stands	BSJ, BSL	6%	3%
S(JLP)	Jack Pine leading softwood stands	JLP	6%	3%
S(WSF)	White Spruce/Balsam Fir leading softwood stands	WSF	7%	3%

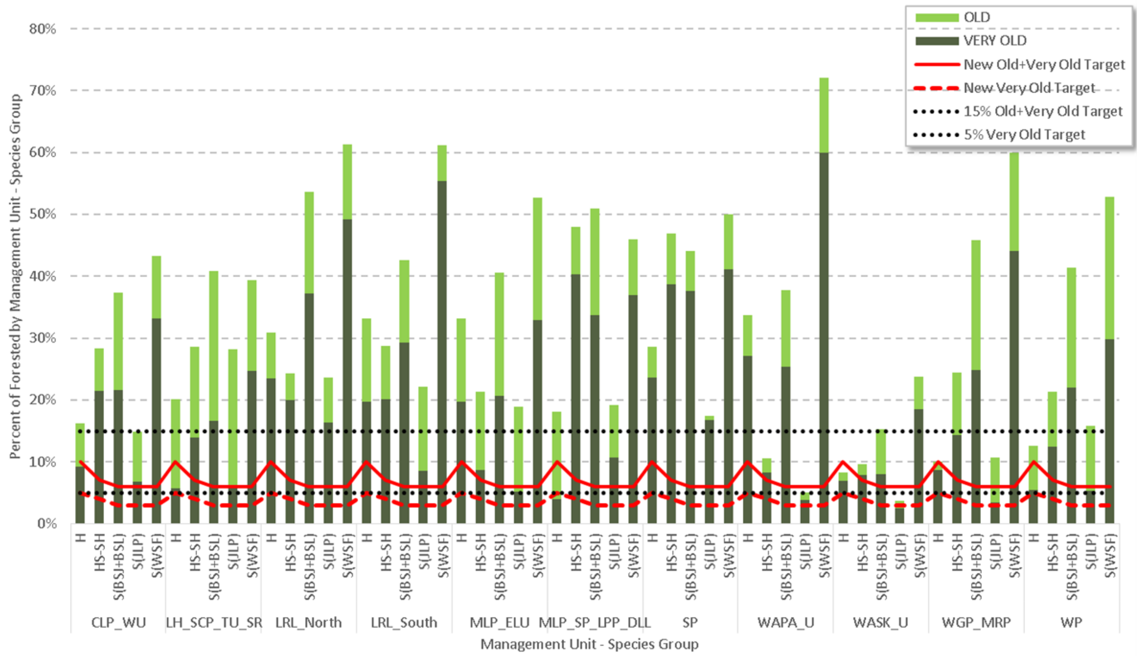

Figure 64 Initial seral stage vs alternate NFP targets and FMP Standard targets

Results show that the initial sawlog HVS can be extended for an additional 20 years, and there is an increase of 16.8% in the long-term level to 1,028,000 m^3/year (Figure 65). The initial hardwood HVS can be extended for an additional 40 years, and there is a 17.3% increase in the long-term level to 900,000 m^3/year. The initial pulp HVS increases by 9.4% to 371,000 m^3/year and is essentially maintained for the duration of the planning horizon, with a long-term level that is 17.5% higher than the baseline.

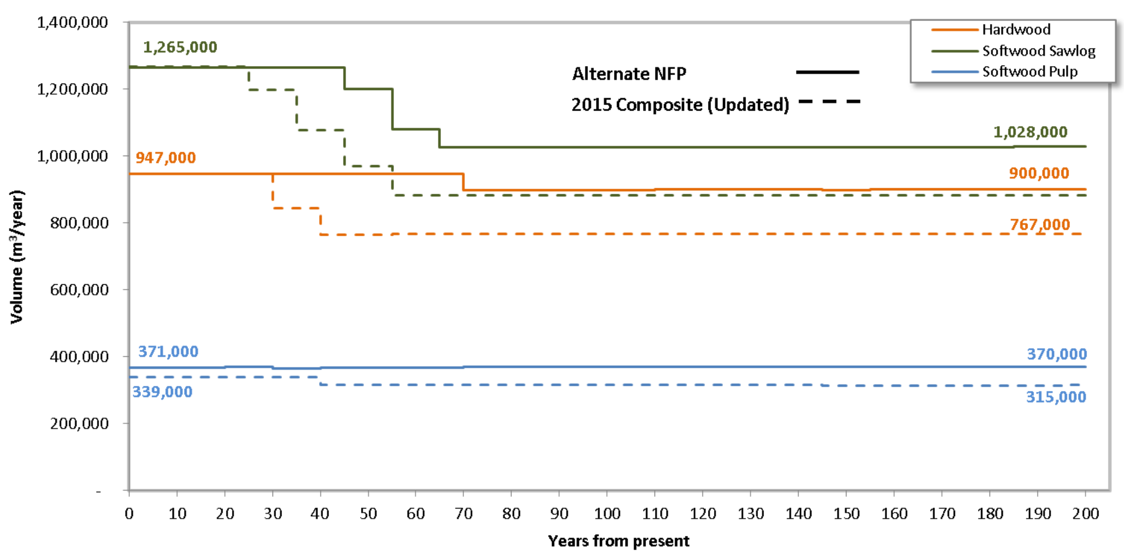

Figure 65 HVS comparison between Alternate NFP and 2015 Composite (Updated) scenarios

8.3.2 Caribou Habitat Management Plan

The 2015 Composite Scenario modelled caribou requirements by deferring harvest for 20 years in seven areas of high value habitat and including NFP management to create larger events in order to reduce fragmentation. Since then, a more detailed Caribou Habitat Management Plan has been developed for the FMP. The intent of this sensitivity analysis is to illustrate the timber supply implications of implementing this new plan.

The 2017 plan includes three caribou management zones (Figure 66) that require different modeling approaches.

Current High Value Habitat Zone:

- Modelled by deferring harvest for 20 years

Near Term/Future Habitat Zone:

- Modelled by encouraging harvest for 10 years to finish off areas, then deferring harvest for the following 20 years

Caribou Range in FMA:

- Includes the FMA's portion of the SK2 Central zone (gross area of 2,690,342 ha)
- Overlaps and includes the first two zones above
- Limit disturbance to 35% within this zone. This was modelled as follows:
    - Total maximum allowed disturbance = 941,620 ha (35% of gross area)
    - Existing permanent disturbance = 174,439 ha, comprised of linear features and buffers
    - Maximum allowed disturbance on remaining area = 767,181 ha
    - Disturbed area (under 30 years old) plus buffers calculated for harvest areas, using expansion factors to approximate the impact of buffers
        - 0 to 10 yrs – expansion factor of 200% (500 m buffer)
        - 11 to 20 yrs – expansion factor of 150% (250 m buffer)
        - 21 to 30 yrs – expansion factor of 100% (no buffer, only harvest blocks)
    - Limit total disturbed area, including expansion factors, to a maximum of 767,181 hectares

The results from this sensitivity analysis showed that there is no impact on the HVS when the 2017 Caribou Habitat Management Plan is modelled (Figure 67). An additional run was also completed that expanded the definition of disturbed areas to include ages up to 40 years. There was no additional impact when this change was implemented.

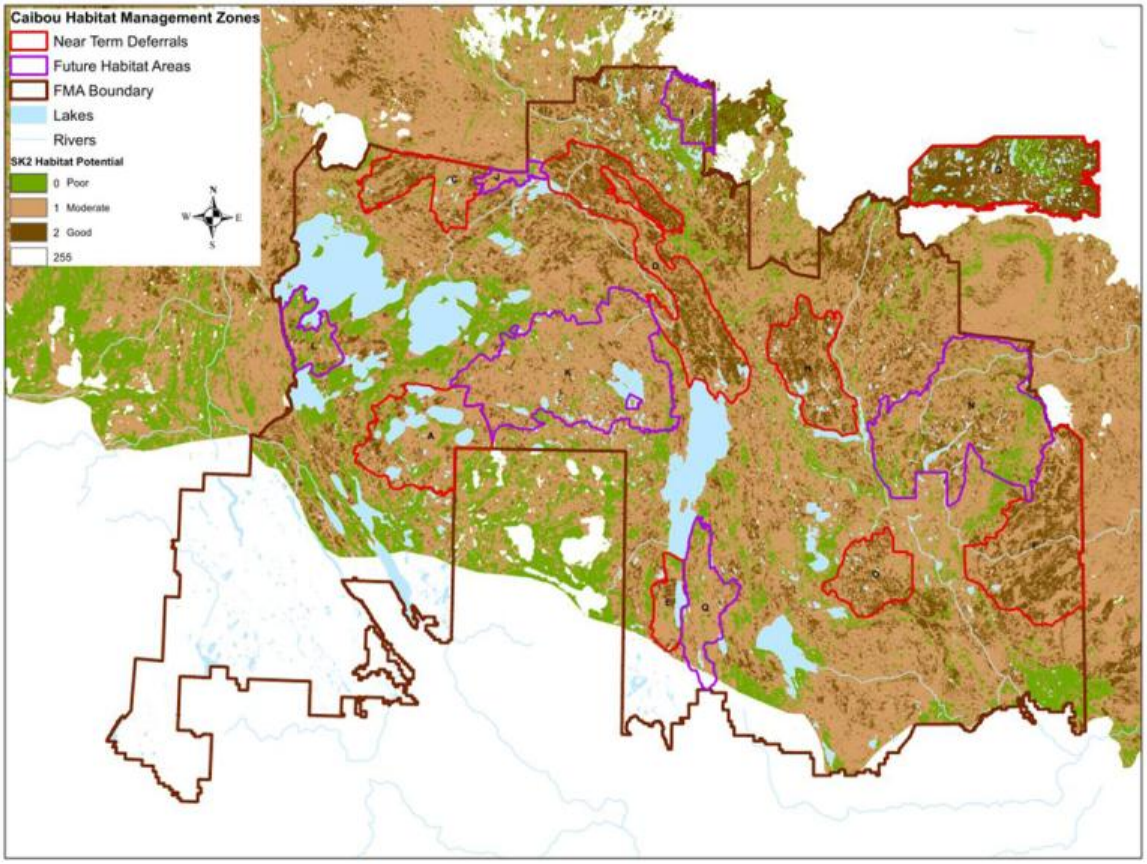

Figure 66 Caribou Management Zones mapped on top of habitat potential theme

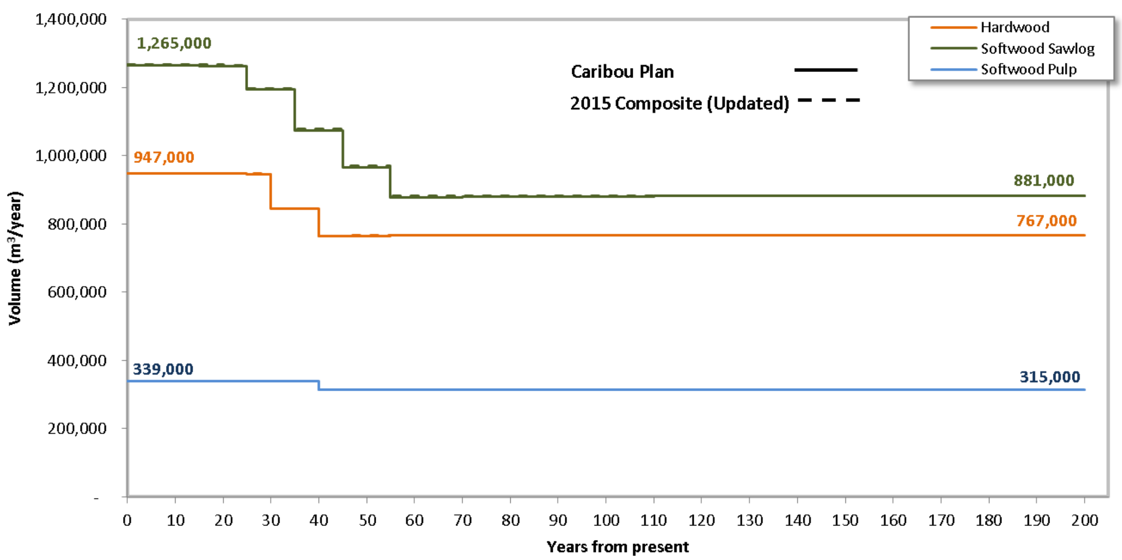

Figure 67 HVS comparison between 2017 Caribou Habitat Management and Updated 2015 Composite scenarios

8.3.3 Increased Pulp Harvest

This sensitivity analysis explores a scenario where the FMA must provide 600,000 m^3/yr of pulp, with 200,000 m^3/yr of this being sourced from dedicated stands. For purposes of modelling, stands with high small-log black spruce or jack pine content were targeted for the pulp harvest partition using an iterative process with Patchworks to determine the area required. Within the model, all softwood sawlog volume from these stands was reported as pulp volume when harvested. The total area identified was approximately 200,000 hectares.

Figure 68 shows the resulting harvest flows for this sensitivity. The duration of the initial softwood sawlog HVS is reduced by 10 years, and the long-term softwood sawlog HVS declines by 8.4%. The initial pulp HVS increases by 76.1% to 597,000 m^3/yr, and can be maintained for 20 years before stepping down to a long-term level of 442,000 m^3/yr (40.3% above the baseline). There are also small changes in the hardwood HVS, with the duration of the initial level increasing by 5 years, and the long-term level higher by 1.6%. Hardwood harvest increases because more mixed stands are harvested in the short term to support the sawlog HVS once 200,000 /yr of pure softwood stands are dedicated to pulp.

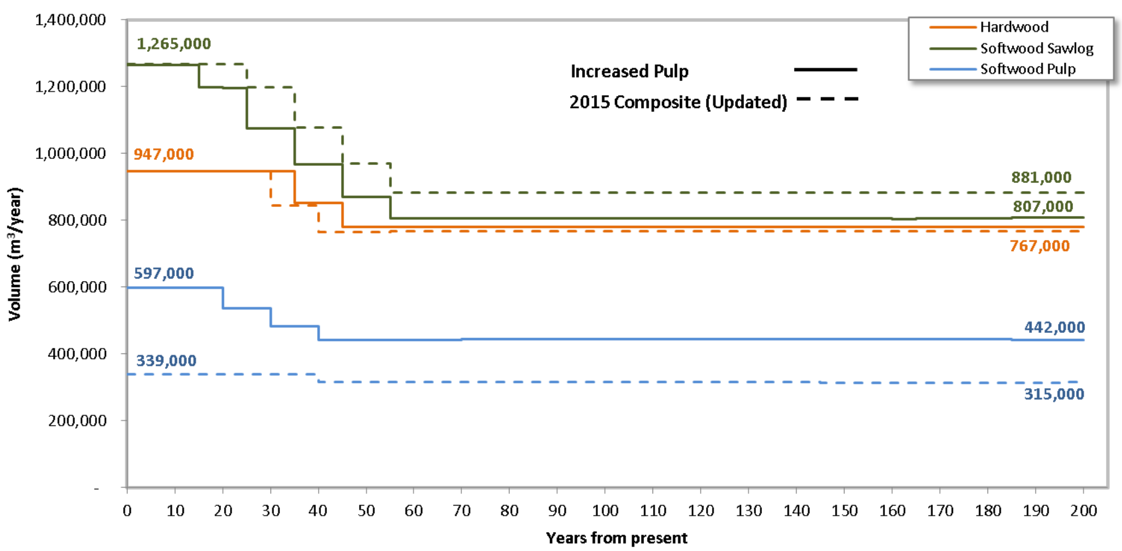

Figure 68 HVS comparison between Increased Pulp and 2015 Composite (Updated) scenarios

8.4 2017 Composite Scenario

This scenario combines the previous sensitivities into a 2017 composite run (generated using the following inputs and parameters):

- Updated inventory (Section 8.1)
- Alternate NFP Retention (Section 8.3.1)
- 2017 Caribou Habitat Management Plan, with stands under 30 years old considered to be disturbed (Section 8.3.2)
- Increased Pulp Harvest – 600,000 m^3/yr of pulp, with 200,000 m^3/yr being sourced from dedicated stands (Section 8.3.3)

Figure 69 illustrates the harvest flows for this scenario in relation to the Updated 2015 Composite scenario. The initial softwood sawlog HVS can be maintained for an additional 10 years and the long-term is slightly higher (1.0%) at 890,000 m^3/yr. The initial pulp HVS is 600,000 m^3/yr and the long-term is 503,000 m^3/yr. The initial hardwood HVS has been increased to 1,126,000 m^3/yr (+179,000 or 18.9% higher) and can be maintained for 35 years (5 years longer). The long-term hardwood HVS increases by 16.0% to 890,000 m^3/yr.

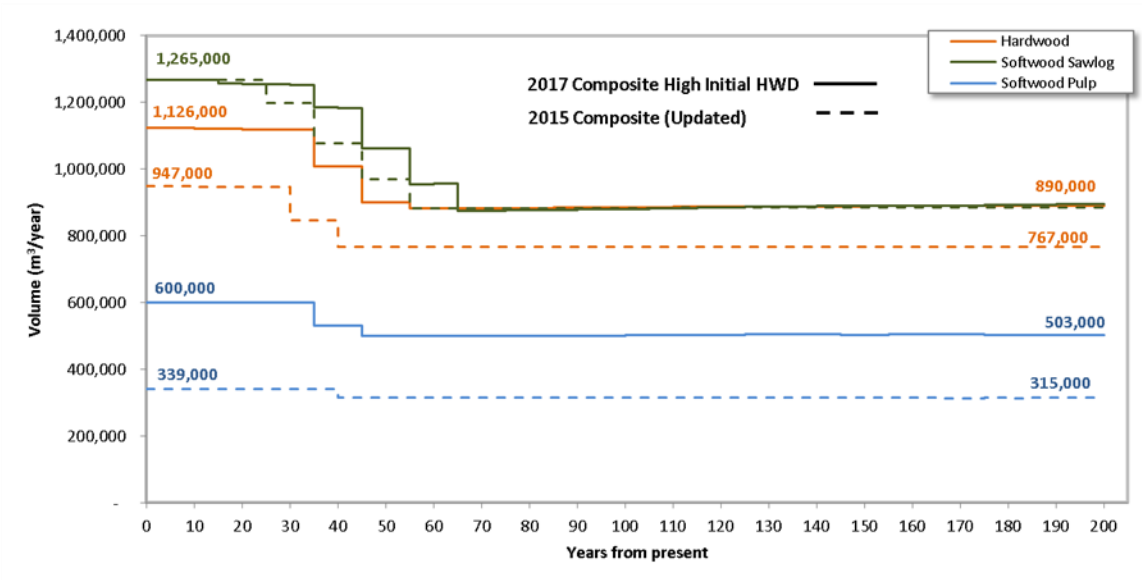

Figure 69 HVS comparison between the 2017 Composite and 2015 Composite (Updated) scenarios

Softwood sawlogs sees only a moderate improvement in timber supply because of the gains associated with the reduced NFP retention targets are offset by the shifting of landbase/volume to the pulp harvest profile. Hardwood does not have this offset (it in fact benefits from this shift) and thus has significantly improved timber supply. This allowed for the increase in hardwood harvest relative to the current HVS.

8.5 Sensitivity Analyses for the 2017 Composite Scenario

Two sensitivity analyses were completed for the 2017 Composite Scenario presented in Section 8.4. The description of the sensitivity analysis scenarios includes only the key difference relative to the 2017 Composite Scenario.

8.5.1 Increased Age for Caribou Disturbance

This sensitivity analysis explores the impact of including all stands under 40 years of age as disturbed, as follows (see section 8.3.2 for more modeling details):

- 0 to 10 yrs – expansion factor of 200% (500 m buffer)
- 11 to 20 yrs – expansion factor of 150% (250 m buffer)
- 21to 40 yrs – expansion factor of 100% (no buffer, only harvest blocks)

Figure 70 shows the resulting harvest flows relative to the 2017 Composite Scenario. Unlike the sensitivity analysis completed for the Updated 2015 Composite scenario (Section 8.3.2), there is a significant impact on both softwood sawlog and pulp harvest levels when the disturbance age is increased to 40 years. The initial softwood sawlog HVS can only be maintained for 15 years (i.e.

reduction of 20 years), and the initial pulp HVS can only be maintained for 10 years (i.e. reduction of 30 years).

It should be noted that there is no difference in harvest in the first decade when either the 30 or 40 yr definition is used – differences only occur in future decades. Thus, for the functional term of this FMP, there appears to be little risk associated with this assumptions.

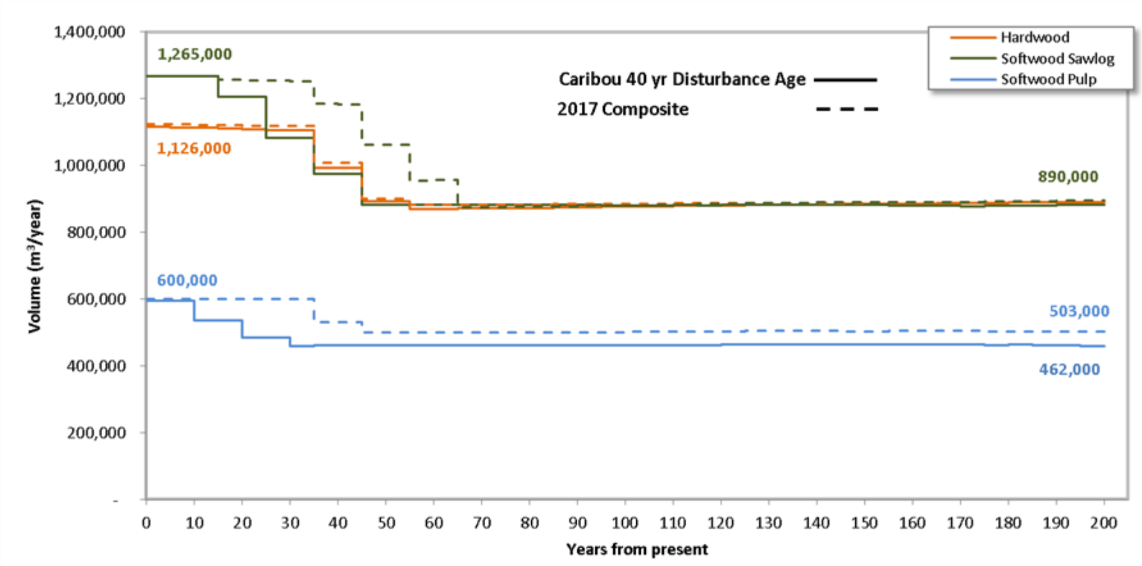

Figure 70 HVS comparison between Increased Age for Caribou Disturbance and 2017 Composite scenarios

8.5.2 12.5 cm Utilization

This sensitivity analysis considers the effect of changing softwood sawlog utilization from a 10.0 cm minimum top diameter to 12.5 cm min top diameter. Using a recompilation of PA FMA sample plot data, sawlog yield tables were reduced to correspond to a 12.5 cm top size, and pulp yield tables were increased by a corresponding amount. Impacts to current sawlog volume on the landbase are shown for each yield group below. Application in the model reflected both yield group and stand age when determining the difference in sawlog volume.

Table 20 Yield group volume changes associated with shifting from 10cm top to 12.5cm top diameter.

Yield Group	Area (ha)	Volume Bucked with 10.01 cm Log (m³)	Volume Bucked with 12.51 cm Log(m³)	Volume Switched to Pulp(m³)	AreaWt Average Age (yrs)	%Diff (Wtd Avg on Vol)
1 H_HW_B_Density	36,042	1,084,765	1,045,517	39,248	93	4%
2 H_HW_CD_Density	154,772	4,830,157	4,417,924	412,233	93	9%
3 HS_HjP_B_Density	2,755	126,928	117,337	9,591	96	8%
4 HS_HjP_CD_Density	9,174	678,834	623,521	55,313	90	8%
5 SH_jPH_B_Density	2,603	148,565	132,075	16,490	103	11%
6 SH_jPH_CD_Density	6,694	648,325	489,545	158,780	94	24%
7 HS_HxS_B_Density	11,833	948,058	878,920	69,138	104	7%
8 HS_HxS_CD_Density	45,854	3,462,005	3,195,781	266,224	107	8%
9 SH_SxH_B_Density	7,156	637,606	590,897	46,709	115	7%
10 SH_SxH_CD_Density	23,873	2,999,847	2,785,737	214,110	111	7%
11 S_bS_1_Site	119,507	8,997,948	6,292,842	2,705,106	114	30%
12 S_bS_23_Site	50,149	5,279,776	4,310,342	969,434	105	18%
13 S_jP_12_Site	13,190	604,002	325,784	278,218	94	46%
14 S_jP_3_Site	111,520	11,842,205	9,464,501	2,377,703	91	20%
15 S_jPbS_12_Site	18,461	1,344,761	962,591	382,171	95	28%
16 S_jPbS_3_Site	97,834	9,201,221	6,942,118	2,259,103	96	25%
17 S_wSbF_1_FMZ	12,287	1,738,936	1,615,084	123,851	127	7%
18 S_wSbF_23_FMZ	19,842	3,006,849	2,862,402	144,447	117	5%
19 S_tL_11_Comp	25,120	1,193,088	798,625	394,464	107	33%
Total	768,666	58,773,876	47,851,544	10,922,332	**101**	**19%**

Two variations of this sensitivity were considered.

- 200,000 m^3/yr of pulp is sourced from dedicated stands (status quo from Composite)
- No stands are dedicated to pulp production (deviation from Composite)

Figure 71 shows the harvest flows for the 12.5 cm utilization (Dedicated Pulp) scenario relative to the 2017 Composite base. The initial softwood sawlog HVS is reduced to 1,080,000 m^3/yr (14.6% reduction) while the long-term is reduced to 699,000 m^3/yr (21.5% reduction). The softwood pulp HVS increases 37.7% to 826,000 m^3/yr and is maintained for 25 years before stepping down to a long-term level of 709,000 m^3/yr (41.0% increase). There is no change to the hardwood HVS.

This scenario show that short term impact to sawlog harvest (14.6%) is lower than the long term impact (21.5%) because of current stand ages/sizes. It also shows that the combination of dedicated pulp stands + higher pulp volumes in all sawlog stands leads to a large overachievement of the targeted pulp harvest (600,000 m^3/yr). To understand the degree to which the dedicated pulp stands were contribution to this situation, another scenario was run with them removed.

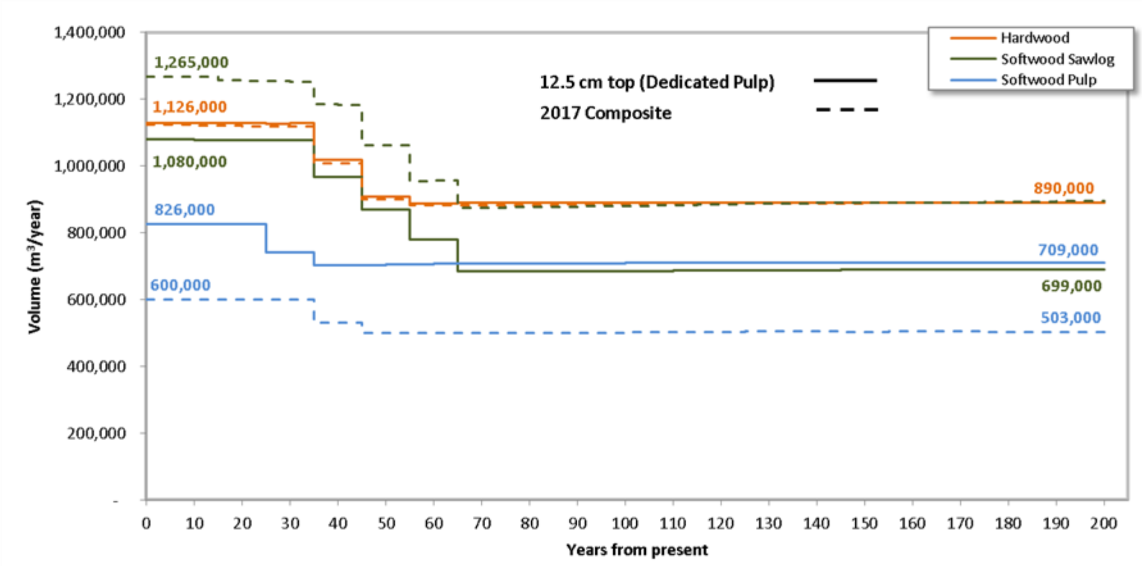

Figure 71 HVS comparison between 12.5 cm top (Dedicated Pulp) and 2017 Composite scenarios

Figure 72 shows the harvest flows for the 12.5 cm utilization (Without Dedicated Pulp) scenario relative to the 2017 Composite base. It can be seen that it is still possible to exceed the requirement for 600,000 m^3/yr of pulp by 9.7% even without the dedicated pulp stands. The initial softwood sawlog HVS drops to 1,145,000 m^3/yr (9.5% reduction relative to the baseline), and can be maintained for 35 years. Both the magnitude and duration of the initial softwood sawlog HVS is improved relative to 12.5 cm utilization with dedicated pulp stands because the dedicated pulp landbase has been restored to its original stats (sawlogs + pulp).

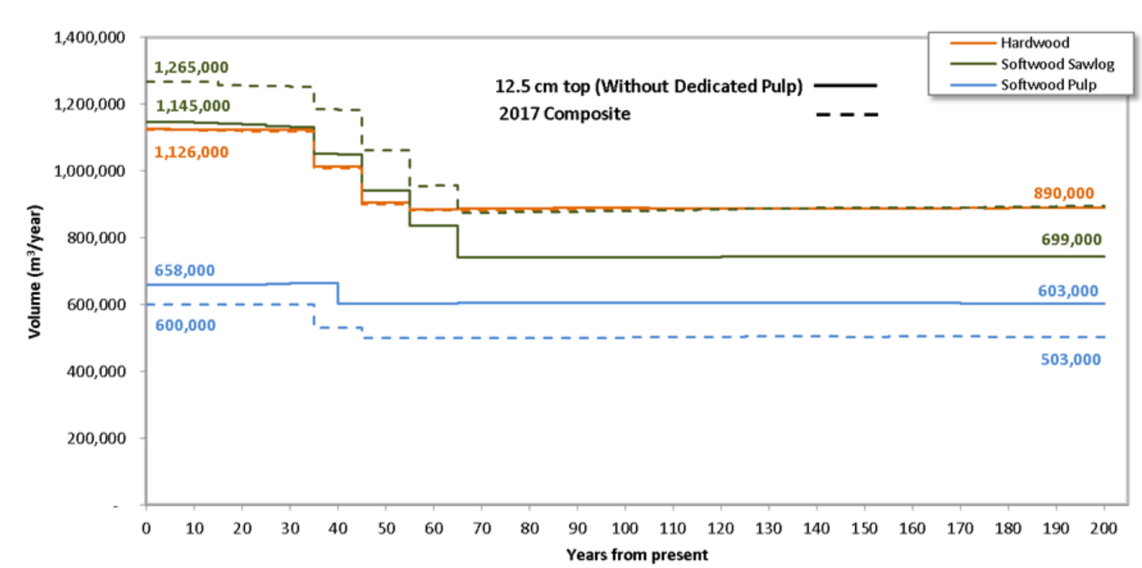

Figure 72 HVS comparison between 12.5 cm top (Without Dedicated Pulp) and 2017 Composite scenarios

9 Preferred Scenario Results

The preferred management scenario reflects the planning team's vision of desired management of the FMA for the term of this FMP. It is the same as the 2017 Composite Scenario and includes the updated inventory, alternate NFP retention, 2017 Caribou Habitat Management Plan, increased pulp harvest, dedicated pulp stands, and an elevated hardwood harvest. Table 31 provides an overview of the key variables for this scenario.

Table 21 The Preferred Scenario – Key Variables Description

Key Variable	Description
Harvest Flow Regime	Maintain sawlog HVS, increase pulp HVS to 600,000 m^3/yr, increase hardwood HVS. Max 10% change/period. No compromise to long-term.
Inventory	Updated to reflect fires, harvesting, and growth to 2016.
Pulp Commitment	200,000 m^3/yr of pulp to be sourced from dedicated stands, with all sawlog volume in these stands treated as pulp
Net Landbase	1,467,907 (spatial), 1,396,528 (net)
Growth and Yield	Cut-to-Length for Softwood (4.5% sawlog shifted to Pulp, no change in overall softwood volume)
Minimum Harvest Ages	As per modeling assumptions document (e.g. tA@45 or 50, jP@55 or 70, bS@65yrs, wS@65yrs)
Regeneration Delay	0 yrs. for H, HS, and SH-SxH, 1 yr. for all other S, and SH
In-Block Retention	4% aspatial reserve (can count towards old seral if correct age)
Annual Operating Plan	Prioritized in first 10 years
Seral Requirements	Alternate NFP targets (3-5% very old, 6 to 10% old plus very old depending on species group)
Interior Forest	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.
Harvest Event Size	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.
Caribou Habitat	Defer harvest for 10 years in current high value habitat zone. Encourage harvest for 10 years to finish areas in near term/future habitat zone, followed by 20 year harvest deferral. Maximum 35% disturbance in caribou range. Disturbance considered to be stands < 30 years old
Moose Habitat	Tracking only
Fisher Habitat	Tracking only
Visuals / Lakeshore Management	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).
Hillside Visual Management	Maximum of 20% of MFLB can be <20 years.
Roads	Not modelled

The harvest forecasts by product for the preferred scenario are shown in Figure 73.

- The initial hardwood harvest level (1,126,000 m^3/yr) is significantly higher than the current HVS and can be maintained for 35 years and then steps down to a long-term level of 890,000 m^3/yr.
- The current sawlog HVS (1,265,000 m^3/yr) can be maintained for 35 years before stepping down to a long-term harvest level of 890,000 m^3/yr.
- The pulp harvest level is 600,000 m^3/yr in the short-term and 503,000 m^3/yr in the long-term. This is below the current HVS of 661,000 m^3/yr.

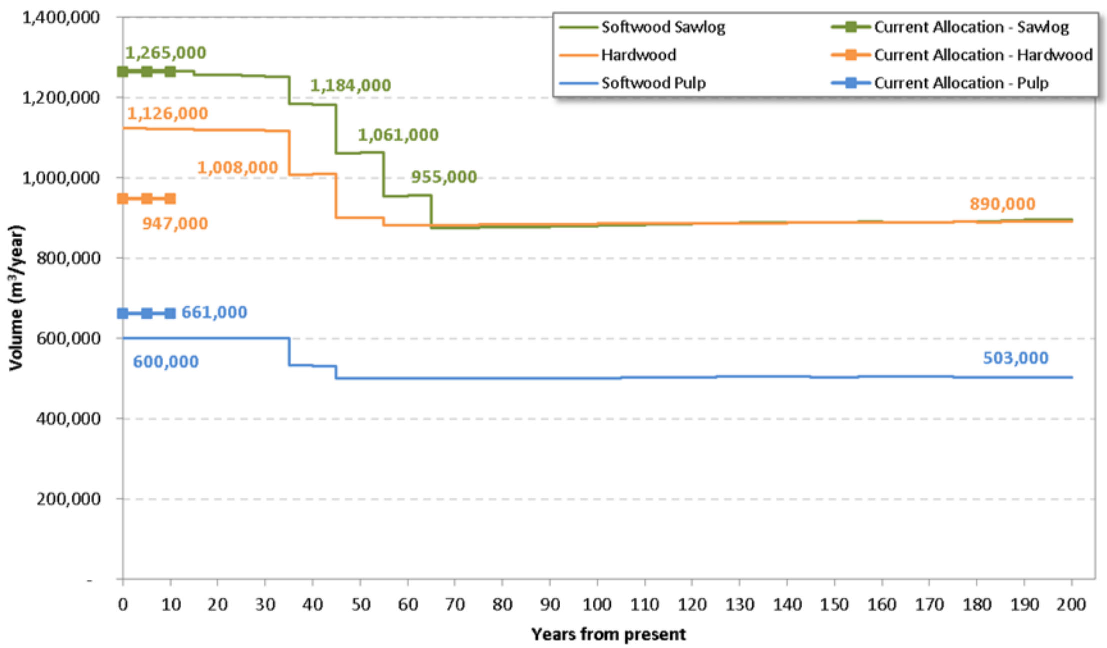

Figure 73 Preferred Scenario – Harvest volume schedule by product

Figure 74 shows the contribution of incidental volumes to the total harvest by product. Incidental volume is softwood volume realized from harvesting hardwood-leading stands and vice versa. On average, 17.5% of hardwood volume comes from softwood-leading stands, 24.0% of softwood sawlog, and 10.9% of softwood pulp come from harvesting hardwood-leading stands.

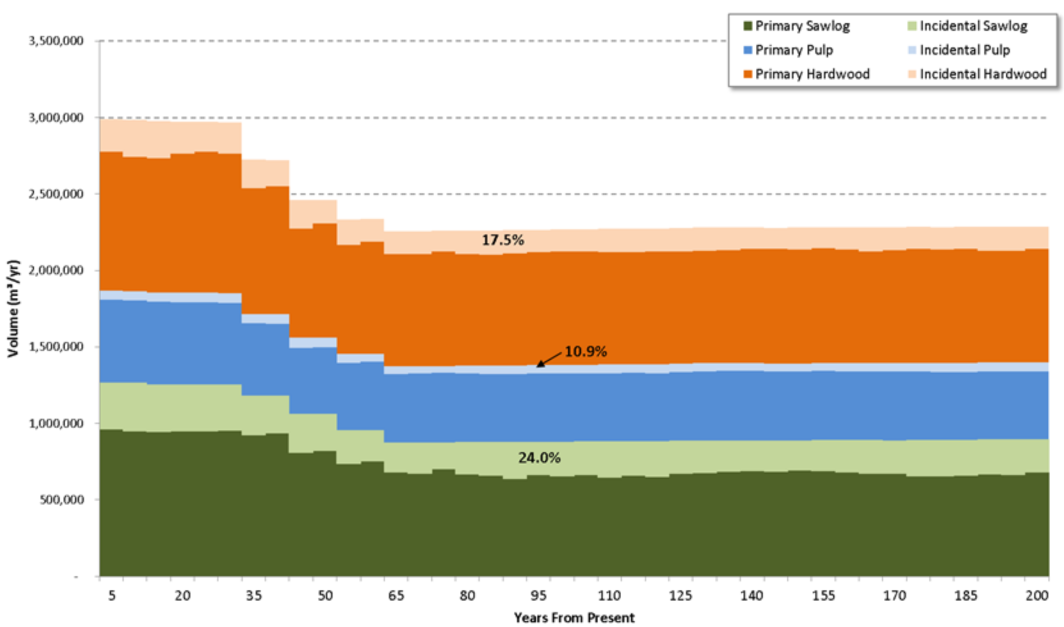

Figure 74 Preferred Scenario – Annual Incidental Harvest Volume by product

Total growing stock on the net landbase declines for the first 60 years and recovers slightly before reaching a steady-state condition around 100 years from now (Figure 75). This reflects the shifting of the landbase to a younger age class distribution, and then a balanced state where harvest equals growth.

Merchantable growing stock (Figure 76) declines rapidly for the first 60 years to reach a low of 13.4 million m^3 for HWD and 15.5 million m^3 for total softwood. This indicates that 50-60 years from now will be the most challenging time to find merchantable wood and thus, this time period is a key driver for timber supply results (i.e. a pinch point). Beyond this, relatively stable levels of merchantable growing stock are seen, which is consistent with the objective of shifting the landscape to a younger age class distribution. As stands become older than minimum harvest age, they are typically harvested unless they are needed to meet a non-timber objective such as old seral retention.

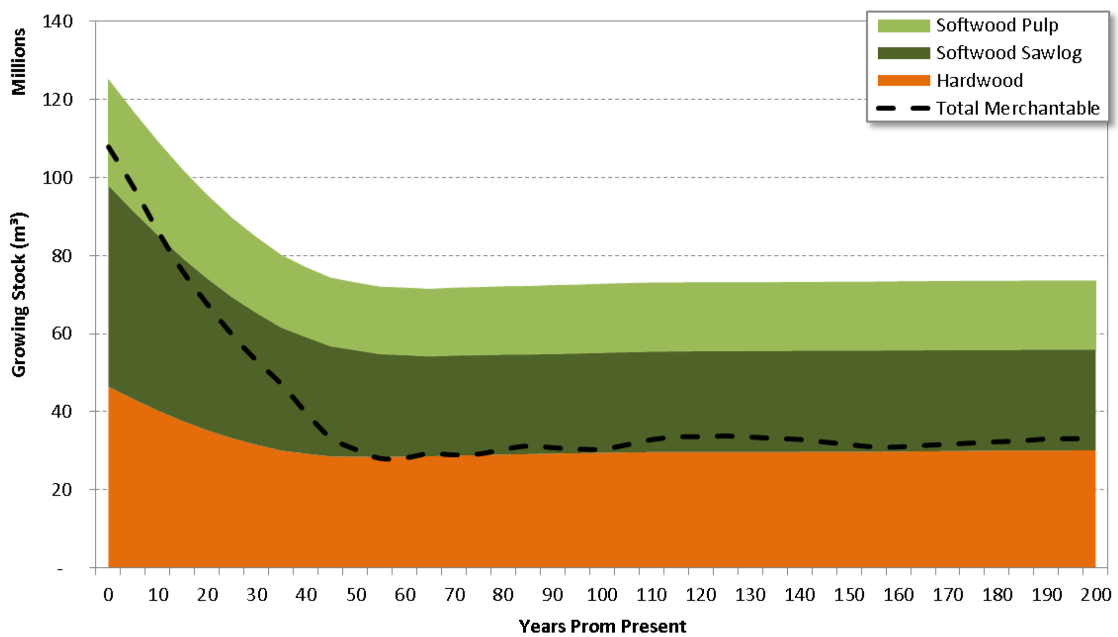

Figure 75 Preferred Scenario – Growing stock by product on the net landbase

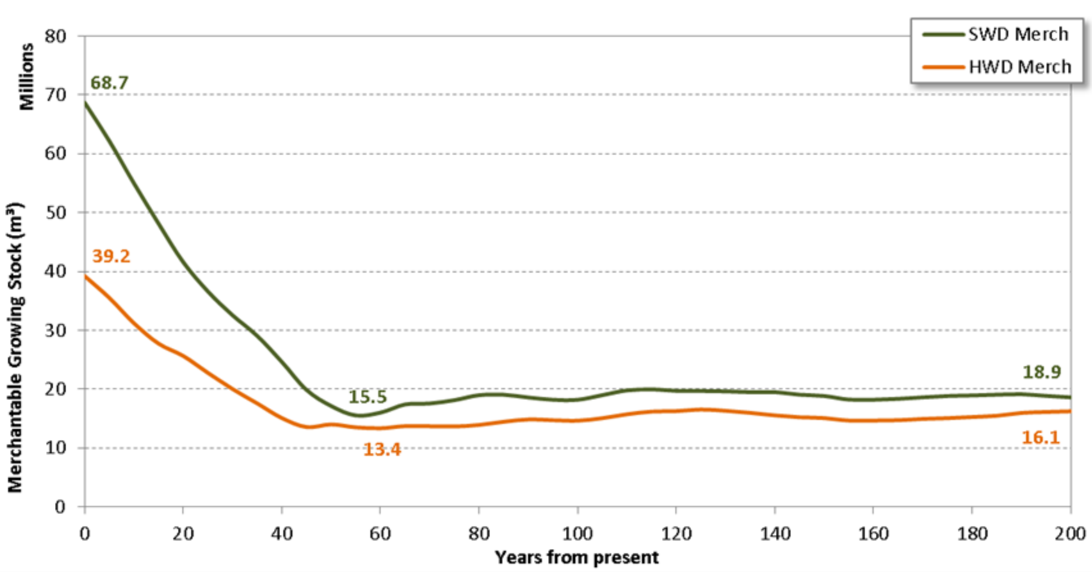

Figure 76 Preferred Scenario – Merchantable growing stock by product on the net landbase

Annual harvest area fluctuates between 19,000 and 21,600 ha/year over the first 70 years, then stabilizes at around 19,150 ha/year over the last 100 years (Figure 77). The majority of the harvest area consists of softwood stands (56.4% average for the 200-year planning horizon) followed by hardwood stands (28.6%) and mixed-wood stands (9.3% HS, 5.7% SH).

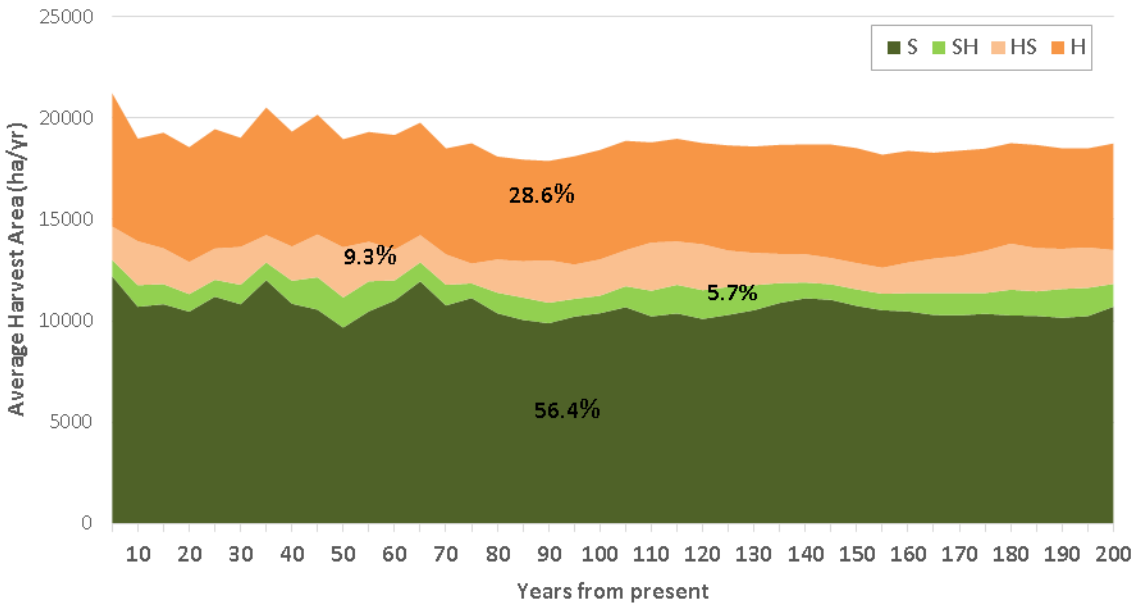

Figure 77 Preferred Scenario – Annual harvest area by stand types (200-year average percentages)

The average harvest age in the first 50-60 years is much higher than in the long term as a large portion of the landbase is comprised of older stands at the beginning of the planning horizon (Figure 78). After 60 years the harvest ages stabilize around 72 years for softwood, and 68 years for hardwood. Figure 79 provides a breakdown of the area harvested within each harvest age class and shows that for the first 40 years, there is almost no younger second growth being harvested.

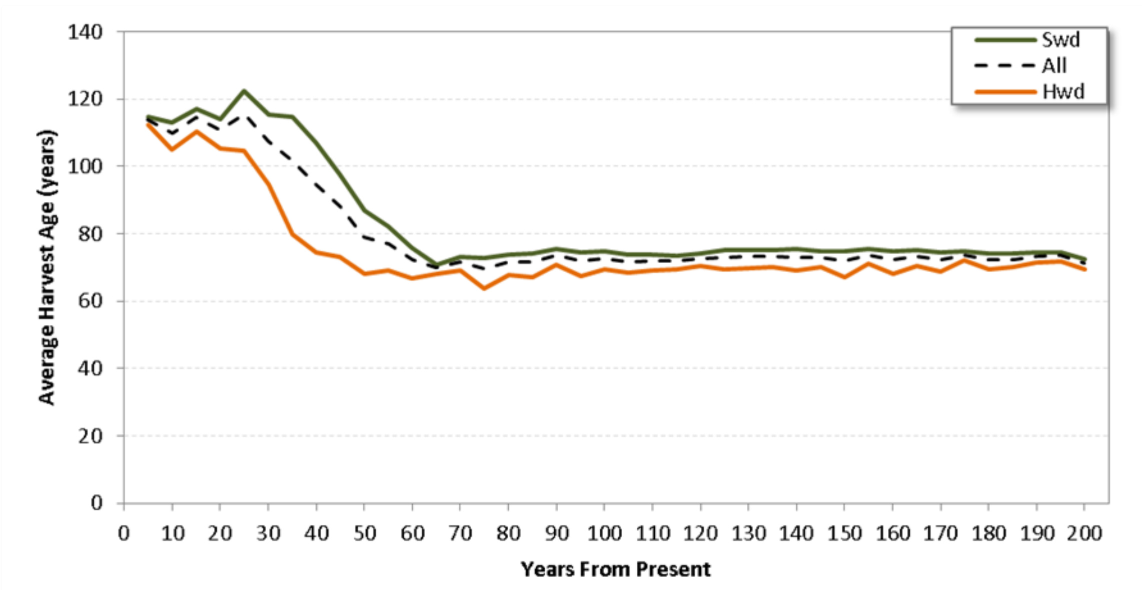

Figure 78 Preferred Scenario – Average harvest age by stand types

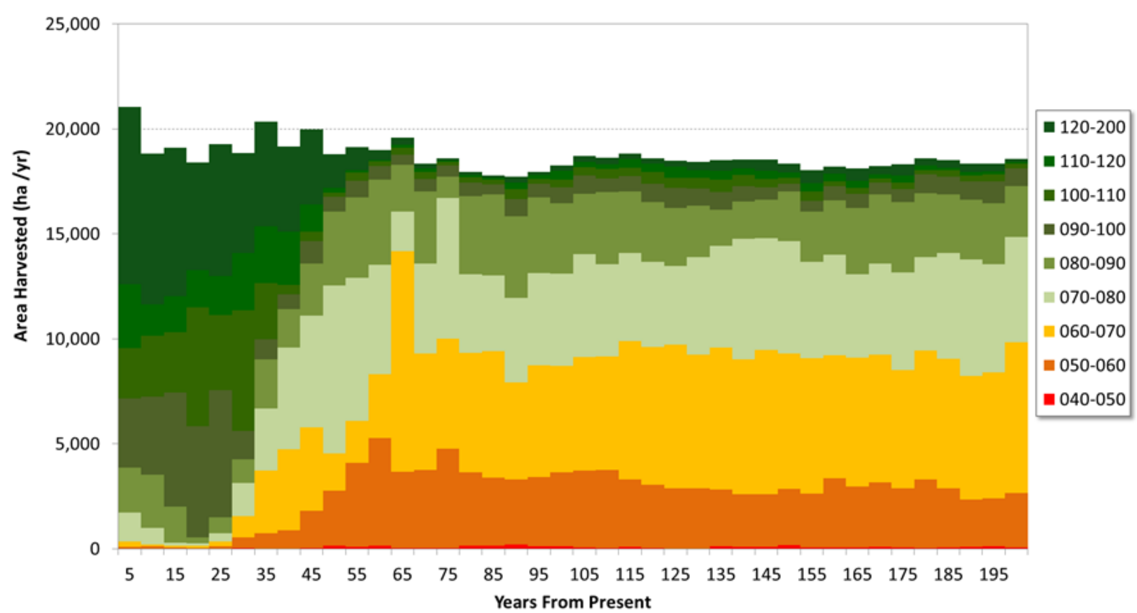

Figure 79 Preferred Scenario – Area harvested by age class

Average harvest volume increases for the first 20 years then decrease until 50-60 years from now. It then fluctuates between 140-150 m^3/ha for hardwood, and 105-110 m^3/ha for softwood.

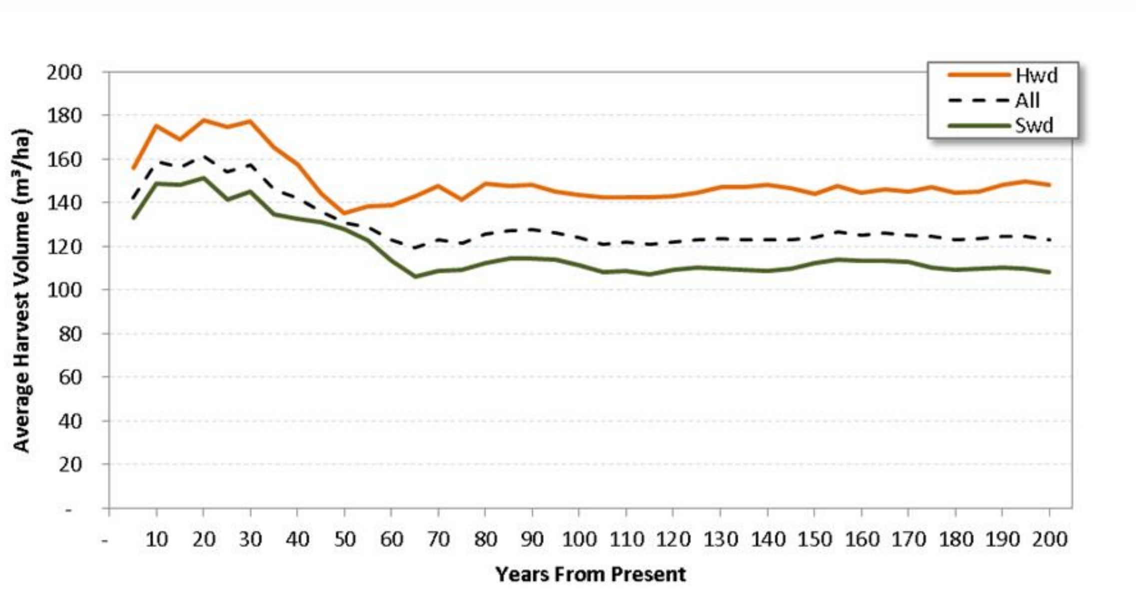

Figure 80 Preferred Scenario – Average harvest volume by stand types

The area undergoing succession over time by species type is shown in Figure 81. The succession rate peaks 70 years from now, which indicates that the harvest flows chosen are not high enough to capture all of the eligible older stands before they undergo succession. Increasing initial harvest flows would reduce the amount of succession, but the duration that they could be maintained would be reduced.

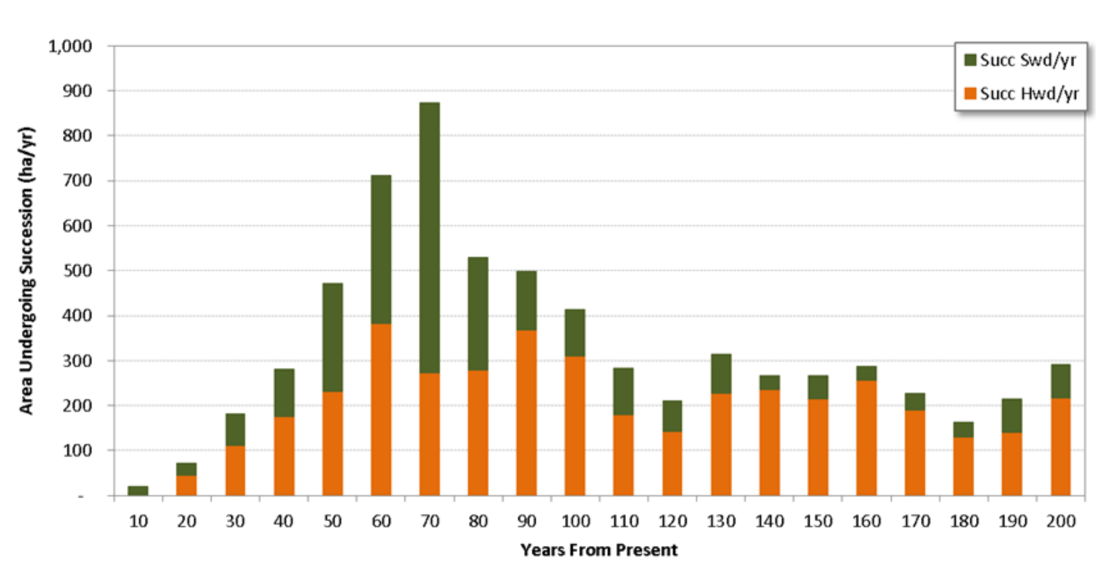

Figure 81 Preferred Scenario – Area undergoing succession over time by stand type

Figure 82 shows the age class distribution from time 0 to 200 years in the future. The goal of shifting the age class structure toward a younger, more natural distribution is evident in the Year 100 and Year 200 charts.

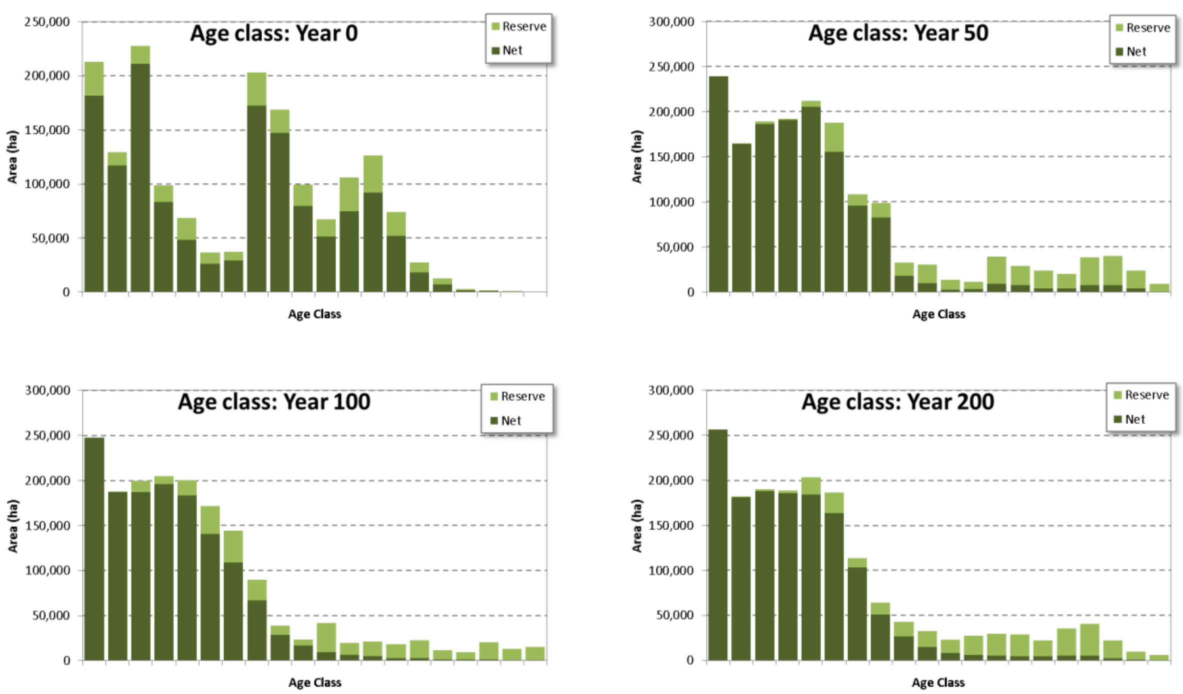

Figure 82 Preferred Scenario – Age class distribution by land base type at year 0, 50, 100, and 200

Additional timber supply analysis metrics for old/very old seral, interior old habitat, caribou disturbance, fisher habitat and moose habitat are included in Appendix II.

10 Conclusions

After exploring numerous management scenarios and sensitivity analyses, a Preferred Management Scenario was selected that considered Natural Forest Patterns [9% in-block retention (4% net impact), old seral ranging between 6% and 10% depending on species group, interior old seral, harvest event size distribution], 2017 Caribou Habitat Management Plan, cut-to-length utilization for softwood (tree length for hardwood), increased hardwood harvest and dedicated pulp stands. This scenario is able to support the current softwood sawlog HVS of 1,265,000m³/year and increase the current hardwood HVS to 1,126,000 m³/year for 35 years, with a forecasted pulp harvest of 600,000m³/year.

Long-term harvest rates are lower than short-term levels because the suppression of fires has allowed the FMA's age class distribution to become unnaturally old and thus contain higher volumes per hectare than future managed stands. It is the management intent of the FMP to bring age classes more in line with a historically natural landscape experiencing a fire disturbance regime.

Sensitivity analysis indicated that there is sensitivity to extended rotation ages – having to wait an extra 10 years to harvest second growth stands would reduce the number of years the HVS can be maintained dramatically. Softwood harvest levels could be substantially improved if higher utilization standards are adopted – but much of the additional volume realized would be pulp. Overall, only two sensitivities indicated that the current sawlog and hardwood HVS's could not be maintained for the full 20 year term of the plan. These were increasing the age defining disturbance within the Caribou Management Zones to 40 years (current HVS can only be maintained 15 years), and changing top diameter utilization for sawlog to 12.5 cm (current HVS reduced by 9.5%) when compared to the Preferred Scenario.

The recommended HVS for the 2018-2038 FMP is summarized in Table 22. These levels can be maintained for another 15 years before stepping down to the long-term levels. For reference, the modeled harvest levels for the remainder of the planning horizon are provided in Table 23:

Table 22 Recommended harvest levels for the 2015-2035 FMP.

2018-2038 FMP Timeframe	Softwood Harvest (m^3/yr)	Hardwood Harvest (m^3/yr)	Softwood Pulp Harvest (m^3/yr)
2018-2028	1,265,000	1,126,000	600,000
2028-2038	1,265,000	1,126,000	600,000

Table 23 HVS beyond the term of the FMP

Timeframe	Softwood Sawlog (m^3/yr)	Hardwood (m^3/yr)	Softwood Pulp (m^3/yr)
2038-2052	1,265,000	1,126,000	600,000
2053-2062	1,184,000	1,008,000	532,000
2063-2072	1,061,000	901,000	503,000
2073-2082	955,000	890,000	503,000
2083-2217	890,000	890,000	503,000

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Appendix I – Summary Comparison of Modelled Scenario Assumptions

Key Variable	Section Reference / Scenario Description		
	5.1	5.2	7
	Timber Focused - NDY	Full NFP - Current Allocation	The 2015 Composite Scenario
Harvest Flow Regime	a) Highest possible Non-Declining HVS b) Highest possible Initial Harvest Rate. Max. 10% change per/period. Minimize impact to Long-term HVS.	**Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.**	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long-term.
Net Land base	1,467,907 (spatial), 1,455,143 (net)	1,467,907 (spatial), 1,323,032 (net)	1,467,907 (spatial), 1,323,032 (net)
Growth and Yield	As per development report	As per Development Report	**Cut-to-Length Approximation (4.5% sawlog to Pulp)**
Minimum Harvest Ages	As per modeling assumptions document (eg. tA@45, jP@70, bS@80yrs, wS@65yrs)	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)
Regeneration Delay	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH	2 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH
In-Block Retention	Not Modelled	**9% aspatial reserve (can count towards old seral if correct age)**	9% aspatial reserve (can count towards old seral if correct age)
Annual Operating Plan	Not prioritized	Prioritized in first 10 years	Prioritized in first 10 years
Seral Requirements	Not Modelled	**15% old plus age, 5% very old plus age**	15% old plus age, 5% very old plus age
Interior Forest	Not Modelled	**Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.**	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.
Harvest Event Size	Not Modelled	**Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.**	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.
Caribou Habitat	Not Modelled	**Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS**	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS. **No harvest within Caribou maintenance zones.**
Moose Habitat	Not Modelled	Tracking only	
Fisher Habitat	Not Modelled	Tracking only	Tracking only
Visuals / Lakeshore Management	Not Modelled	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).	Tracking only
Hillside Visual Management	Not Modelled	Maximum of 20% of MFLB can be <20 years.	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).
Roads	Not Modelled	No tracking / no controls	Maximum of 20% of MFLB can be <20 years.

Key Variable	Section Reference / Scenario Description		
	6.1.1 Provincial Full Utilization	**6.1.2 Higher Pulp**	**6.1.3 Volume +/- 10%**
Harvest Flow Regime	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.
Net Land base	1,467,907 (spatial), 1,323,032 (net)	1,467,907 (spatial), 1,323,032 (net)	1,467,907 (spatial), 1,323,032 (net)
Growth and Yield	Use provincial Full Utilization Curves (5cm top but no TL vol)	A variable percentage of small sawlog transferred to pulp.	All volumes curves increased and decreased by 10%
Minimum Harvest Ages	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)
Regeneration Delay	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH
In-Block Retention	4% aspatial reserve (can count towards old seral if correct age)	4% aspatial reserve (can count towards old seral if correct age)	4% aspatial reserve (can count towards old seral if correct age)
Annual Operating Plan	Prioritized in first 10 years	Prioritized in first 10 years	Prioritized in first 10 years
Seral Requirements	15% old plus age, 5% very old plus age	15% old plus age, 5% very old plus age	15% old plus age, 5% very old plus age
Interior Forest	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.
Harvest Event Size	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.
Caribou Habitat	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS
Moose Habitat	Tracking only	Tracking only	Tracking only
Fisher Habitat	Tracking only	Tracking only	Tracking only
Visuals / Lakeshore Management	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).
Hillside Visual Management	Maximum of 20% of MFLB can be <20 years.	Maximum of 20% of MFLB can be <20 years.	Maximum of 20% of MFLB can be <20 years.
Roads	No tracking / no controls	No tracking / no controls	No tracking / no controls

Key Variable	Section Reference / Scenario Description		
	6.1.4	**6.1.5**	**6.1.6**
	10 Year Increase in Minimum Harvest Age	**Decrease and Increase in Regeneration Delay**	**Exclusion of High Pulp Stands**
Harvest Flow Regime	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.
Net Land base	1,467,907 (spatial), 1,323,032 (net)	1,467,907 (spatial), 1,323,032 (net)	1,340,007 (spatial), 1,207,856 (net)
Growth and Yield	As per Development Report	As per Development Report	As per Development Report
Minimum Harvest Ages	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)
Regeneration Delay	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH	a)increase by 1 year for hardwoods and 2 years for softwoods. B) Decreased by 1 years for softwoods.	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH
In-Block Retention	4% aspatial reserve (can count towards old seral if correct age)	4% aspatial reserve (can count towards old seral if correct age)	4% aspatial reserve (can count towards old seral if correct age)
Annual Operating Plan	Prioritized in first 10 years	Prioritized in first 10 years	Prioritized in first 10 years
Seral Requirements	15% old plus age, 5% very old plus age	15% old plus age, 5% very old plus age	15% old plus age, 5% very old plus age
Interior Forest	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.
Harvest Event Size	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.
Caribou Habitat	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS
Moose Habitat	Tracking only	Tracking only	Tracking only
Fisher Habitat	Tracking only	Tracking only	Tracking only
Visuals / Lakeshore Management	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).
Hillside Visual Management	Maximum of 20% of MFLB can be <20 years.	Maximum of 20% of MFLB can be <20 years.	Maximum of 20% of MFLB can be <20 years.
Roads	No tracking / no controls	No tracking / no controls	No tracking / no controls

Key Variable	Section Reference / Scenario Description		
	6.1.7	6.1.8	6.1.9
	Lower In-Block Retention	**Softwood Reduction**	**Lower Hardwood Regeneration**
Harvest Flow Regime	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.
Net Land base	1,467,907 (spatial), 1,323,032 (net)	1,467,907 (spatial), 1,323,032 (net)	1,467,907 (spatial), 1,323,032 (net)
Growth and Yield	As per Development Report	In H stands, softwood volumes reduced by 50 % for regenerated stands and in HS, softwood volumes reduced by 25%.	25% higher softwood in HS and SH types. Swd gains subtracted from Hwd volumes for no change in total volume.
Minimum Harvest Ages	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)
Regeneration Delay	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH
In-Block Retention	4.5% aspatial reserve (can count towards old seral if correct age)	4% aspatial reserve (can count towards old seral if correct age)	4% aspatial reserve (can count towards old seral if correct age)
Annual Operating Plan	Prioritized in first 10 years	Prioritized in first 10 years	Prioritized in first 10 years
Seral Requirements	15% old plus age, 5% very old plus age	15% old plus age, 5% very old plus age	15% old plus age, 5% very old plus age
Interior Forest	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.
Harvest Event Size	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.
Caribou Habitat	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS
Moose Habitat	Tracking only	Tracking only	Tracking only
Fisher Habitat	Tracking only	Tracking only	Tracking only
Visuals / Lakeshore Management	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).
Hillside Visual Management	Maximum of 20% of MFLB can be <20 years.	Maximum of 20% of MFLB can be <20 years.	Maximum of 20% of MFLB can be <20 years.
Roads	No tracking / no controls	No tracking / no controls	No tracking / no controls

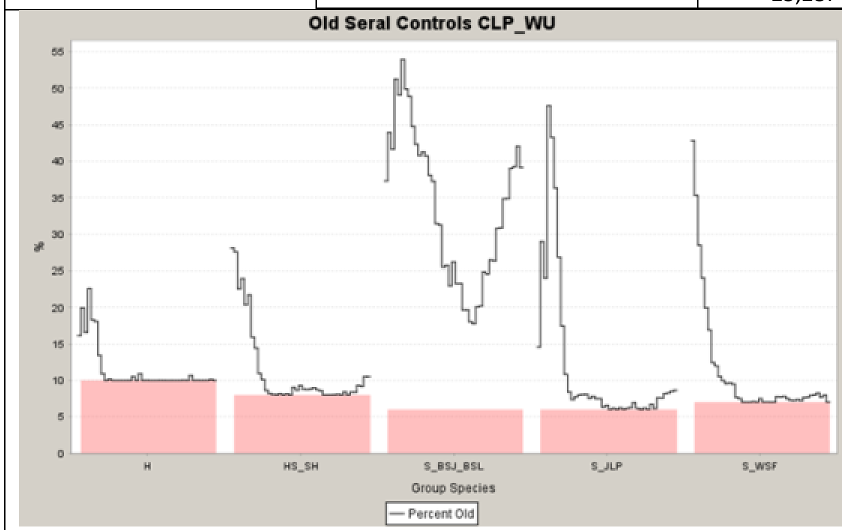
Key Variable	Section Reference / Scenario Description		
	6.1.10	**6.1.11**	**6.1.12**
	Cut-to-length Utilization	**Short-Term Caribou Exclusions**	**Managed Stand Yield Gains**
Harvest Flow Regime	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.	Hold Current Allocation as long as possible. Max 10% change/period. No compromise to long term.
Net Land base	1,467,907 (spatial), 1,323,032 (net)	1,467,907 (spatial), 1,323,032 (net)	1,467,907 (spatial), 1,323,032 (net)
Growth and Yield	A 4.5% shift of volume taken from sawlog curves and included in the pulp curves for all of the yield groups. No change in overall volume.	As per Development Report	10% gain on future managed Softwood stands.
Minimum Harvest Ages	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)	As per modeling assumptions document (e.g. tA@45, jP @ 70, bS @80yrs, wS @ 65 yrs)
Regeneration Delay	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH	0 yrs for H, HS, and SH-SxH, 1 yr for all other S, and SH
In-Block Retention	4% aspatial reserve (can count towards old seral if correct age)	9% aspatial reserve (can count towards old seral if correct age)	4% aspatial reserve (can count towards old seral if correct age)
Annual Operating Plan	Prioritized in first 10 years	Prioritized in first 10 years	Prioritized in first 10 years
Seral Requirements	15% old plus age, 5% very old plus age	15% old plus age, 5% very old plus age	15% old plus age, 5% very old plus age
Interior Forest	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.	Maximize 100 and 500 ha patches of old/very old forest – but not allowed to impact HVS.
Harvest Event Size	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.	Harvest patch size distribution controlled (10 yr patch defn) but not allowed to impact HVS.
Caribou Habitat	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS. Avoid harvest in proposed caribou maintenance areas for first 50 years but allow AOP harvest.	Min harvest in area considered suitable and undisturbed 0-20 yrs but no impact to HVS
Moose Habitat	Tracking only	Tracking only	Tracking only
Fisher Habitat	Tracking only	Tracking only	Tracking only
Visuals / Lakeshore Management	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).	Max. 33% of the MFLB can be <30 years at any time. A Min of 20% of the MFLB must be >70/80 years (HWD/ SWD).
Hillside Visual Management	Maximum of 20% of MFLB can be <20 years.	Maximum of 20% of MFLB can be <20 years.	Maximum of 20% of MFLB can be <20 years.
Roads	No tracking / no controls	No tracking / no controls	No tracking / no controls

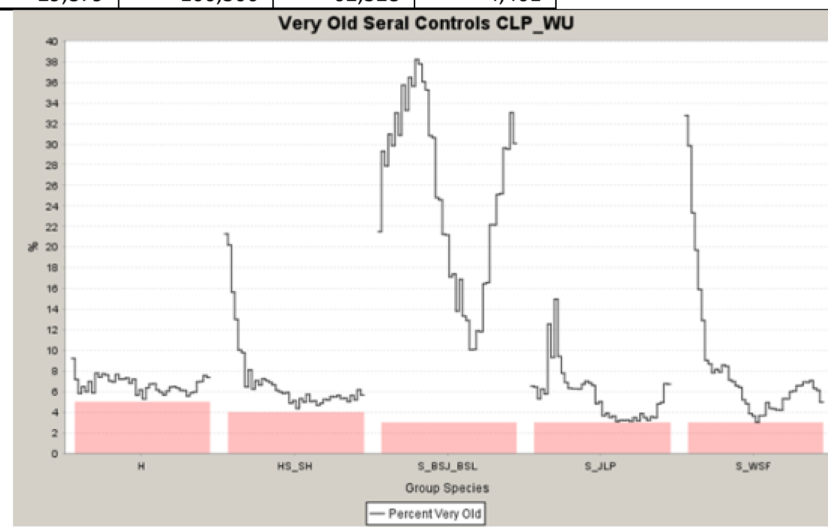
Appendix II Preferred Scenario Detailed Metrics

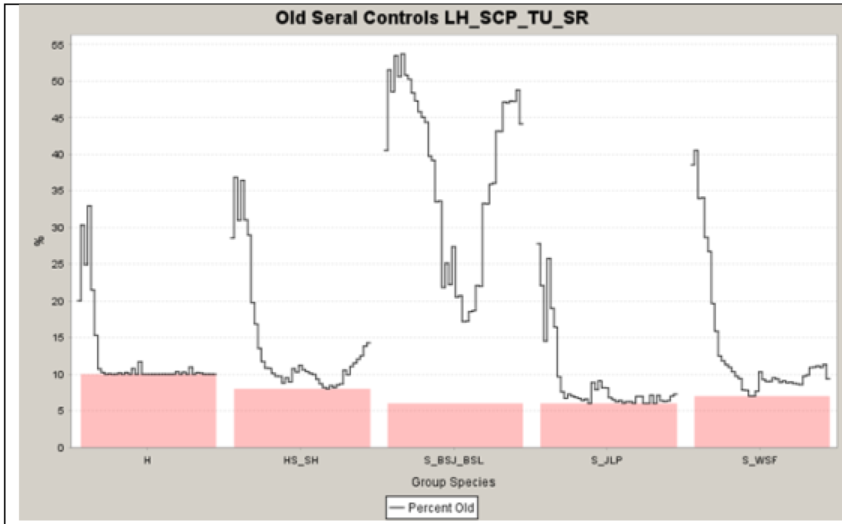
Table 24 Key estate modeling metrics for the preferred scenario - Old Seral target controls by Management Unit and species group.

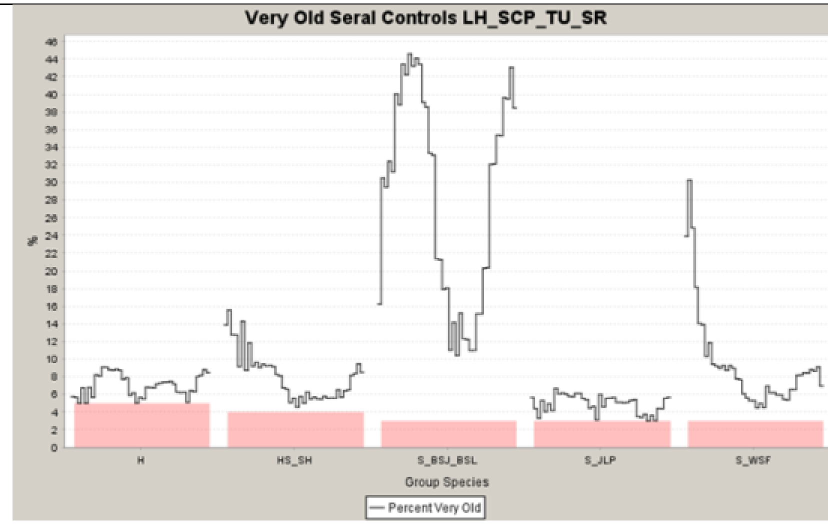
Area by Species Group and Management Unit

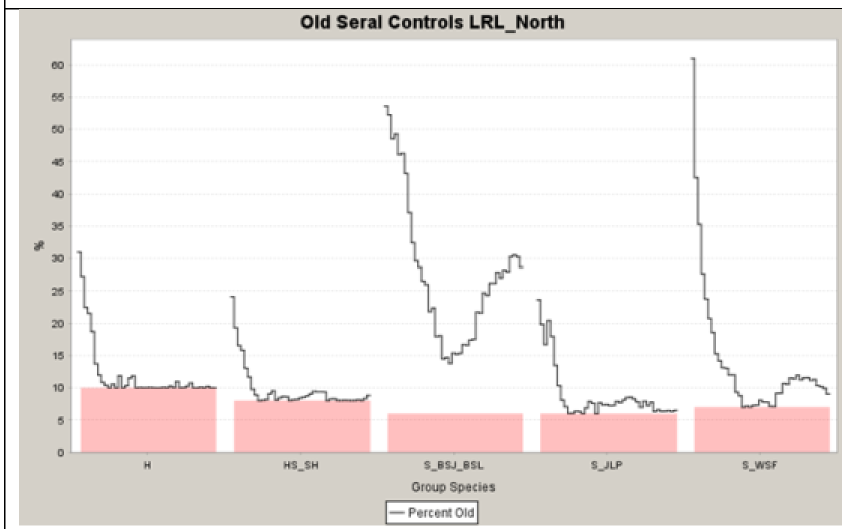
NFP NAME/Group Species	H	HS_SH	S_BSJ_BSL	S_JLP	S_WSF
CLP_WU	80,939	42,639	64,617	14,156	13,012
LH_SCP_TU_SR	122,131	26,207	28,375	18,084	10,236
LRL_North	17,662	20,533	61,916	39,808	2,566
LRL_South	17,702	16,844	43,305	47,672	3,514
MLP_ELU	31,716	21,625	47,016	25,102	3,861
MLP_SP_LPP_DLL	39,032	35,974	64,122	20,665	10,280
SP	3,310	4,248	29,003	17,886	789
WAPA_U	27,045	26,829	63,783	44,223	2,176
WASK_U	17,578	19,210	68,006	35,931	3,332
WGP_MRP	24,214	11,543	45,564	42,467	3,198
WP	25,287	29,879	100,306	62,328	4,461

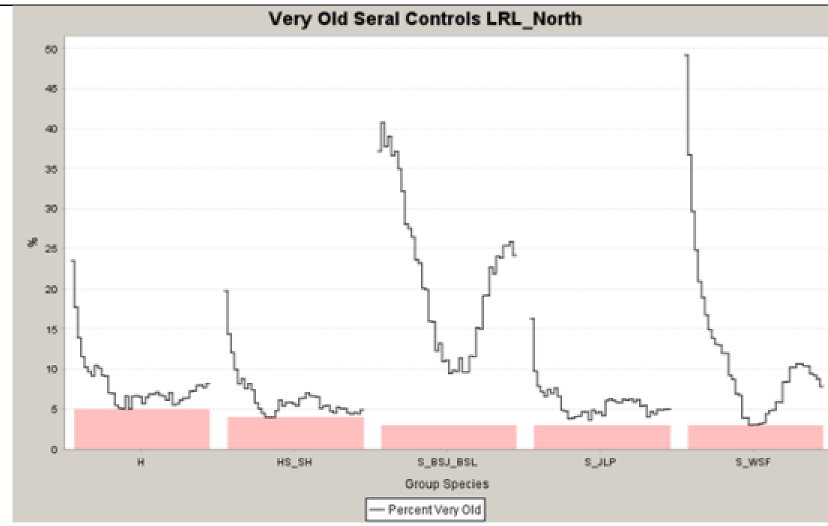


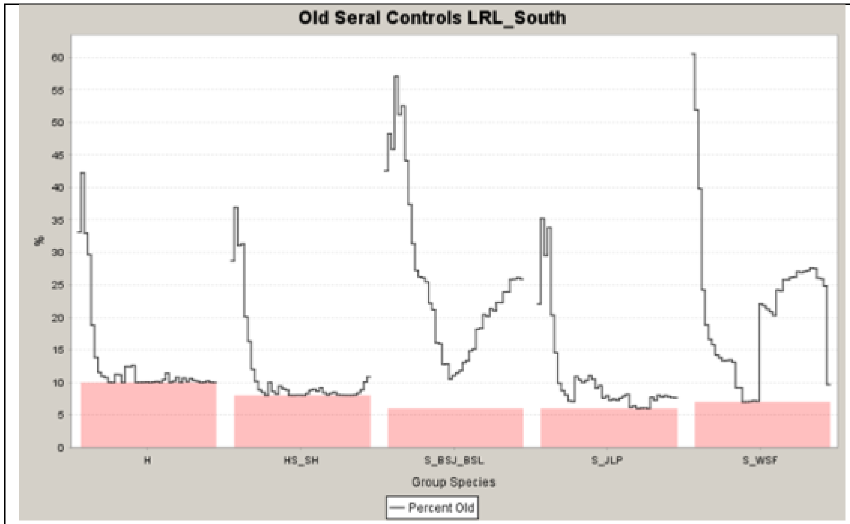


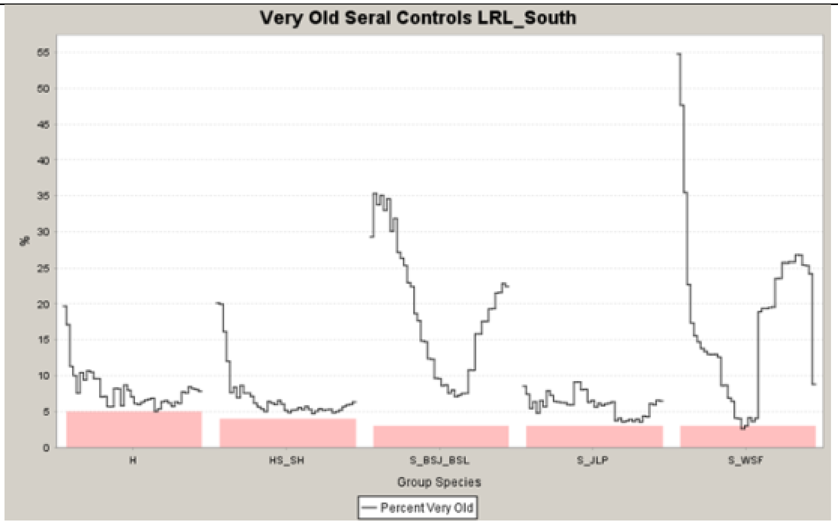

Old Seral Controls LH_SCP_TU_SR
%
Group Species
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Percent Old

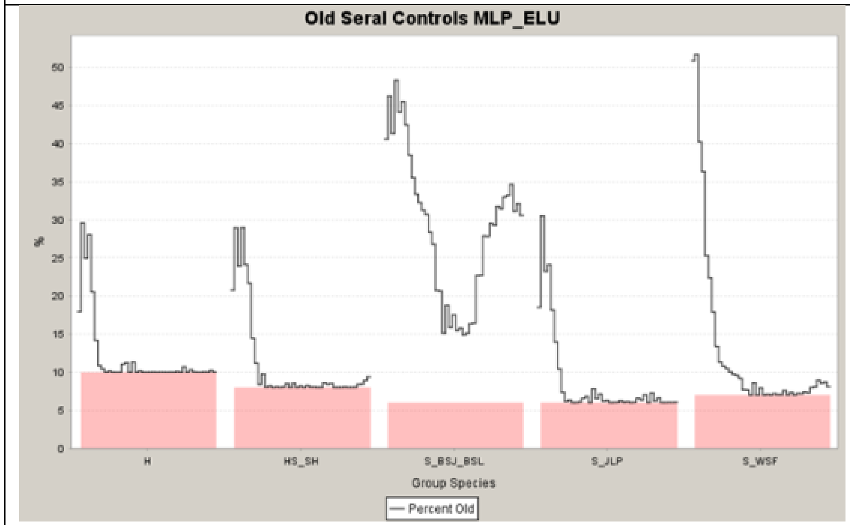

Very Old Seral Controls LH_SCP_TU_SR
%
Group Species
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Percent Very Old

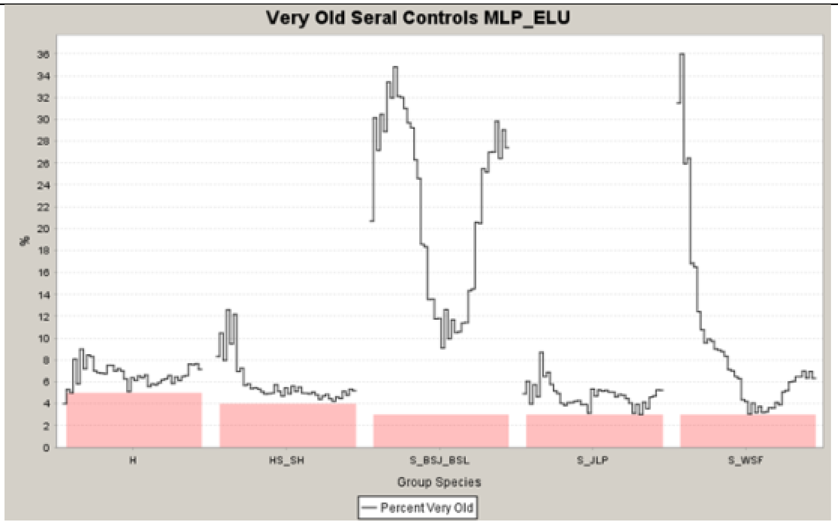

Old Seral Controls LRL_North
%
Group Species
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Percent Old

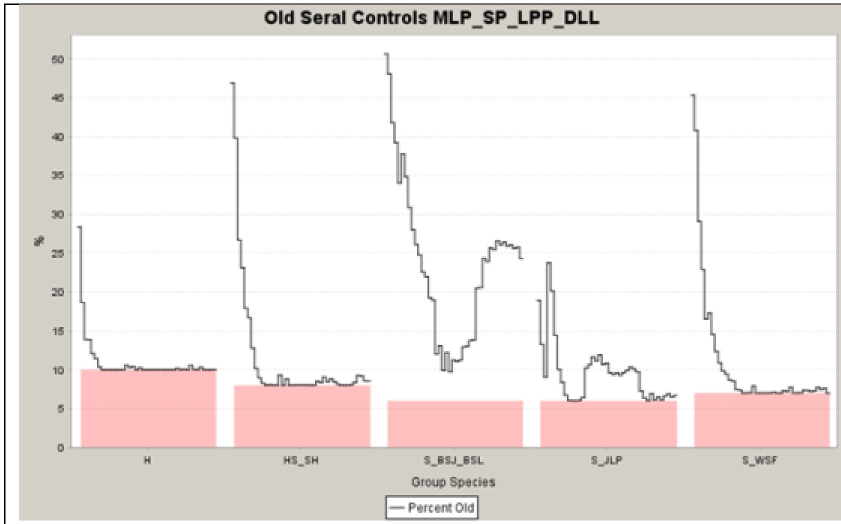

Very Old Seral Controls LRL_North
%
Group Species
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Percent Very Old

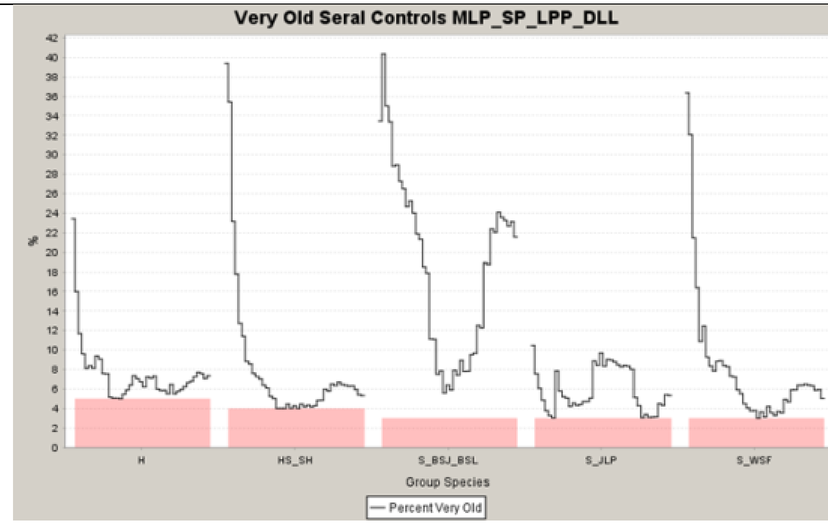

Old Seral Controls LRL_South
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Old

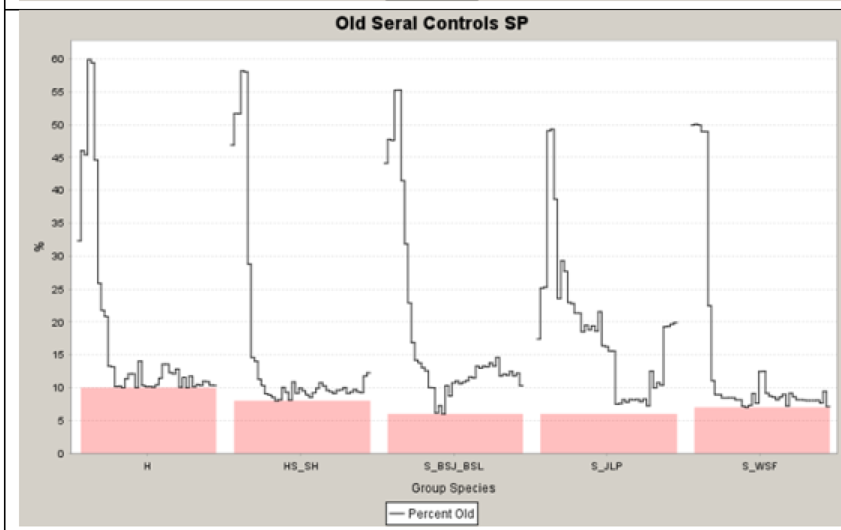

Very Old Seral Controls LRL_South
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Very Old

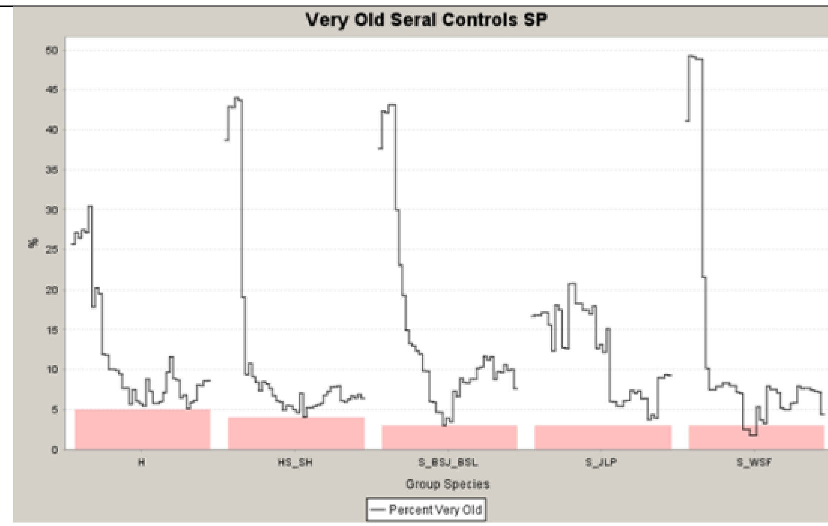

Old Seral Controls MLP_ELU
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Old

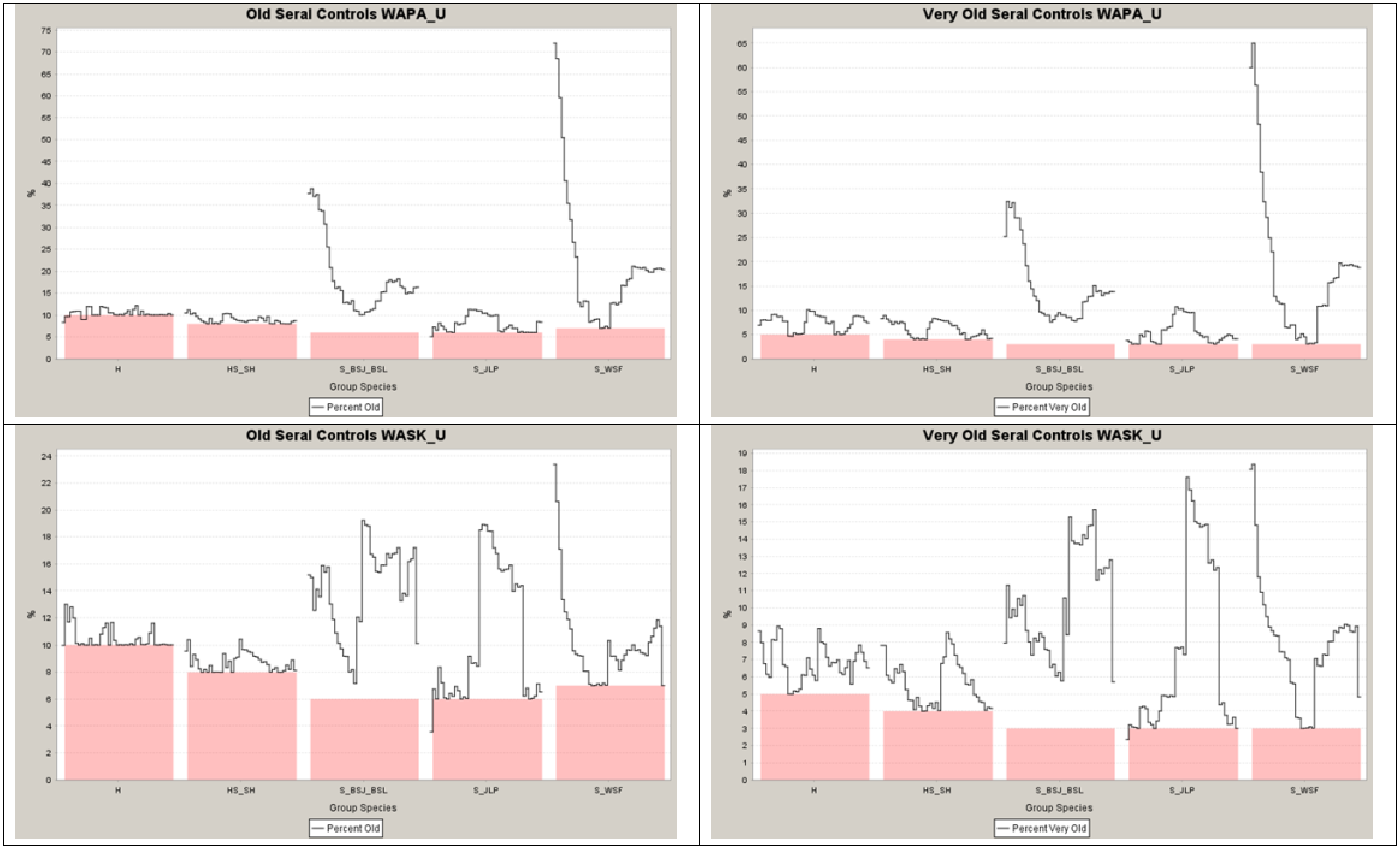

Very Old Seral Controls MLP_ELU
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Very Old


Old Seral Controls MLP_SP_LPP_DLL
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Old

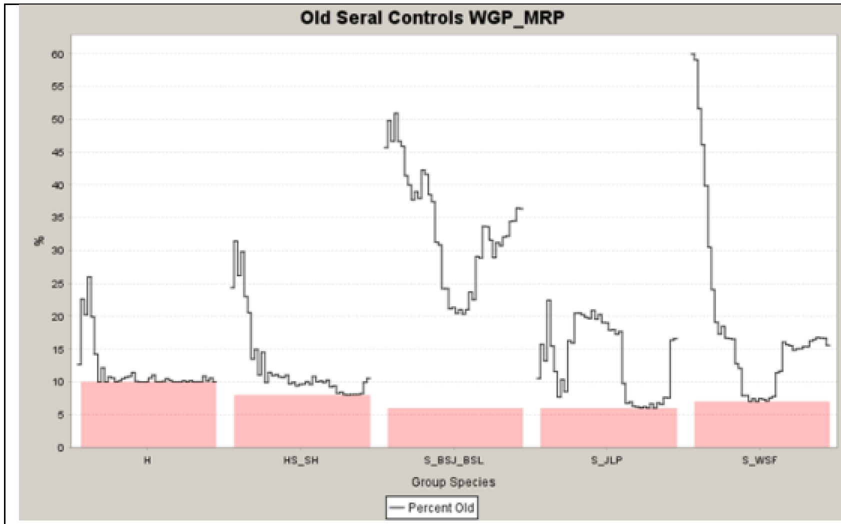

Very Old Seral Controls MLP_SP_LPP_DLL
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Very Old

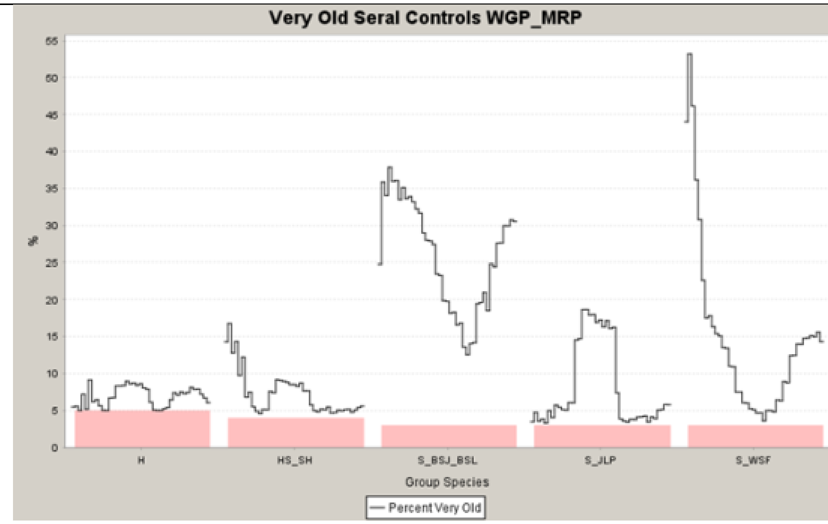

Old Seral Controls SP
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Old

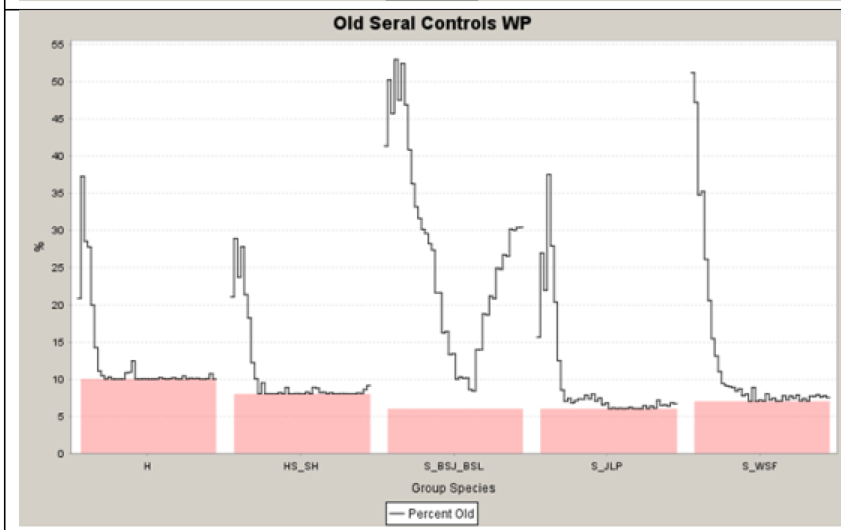

Very Old Seral Controls SP
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Very Old



Old Seral Controls WAPA_U
Very Old Seral Controls WAPA_U
Old Seral Controls WASK_U
Very Old Seral Controls WASK_U
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Old
Percent Very Old


Old Seral Controls WGP_MRP
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Old


Very Old Seral Controls WGP_MRP
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Very Old


Old Seral Controls WP
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Old

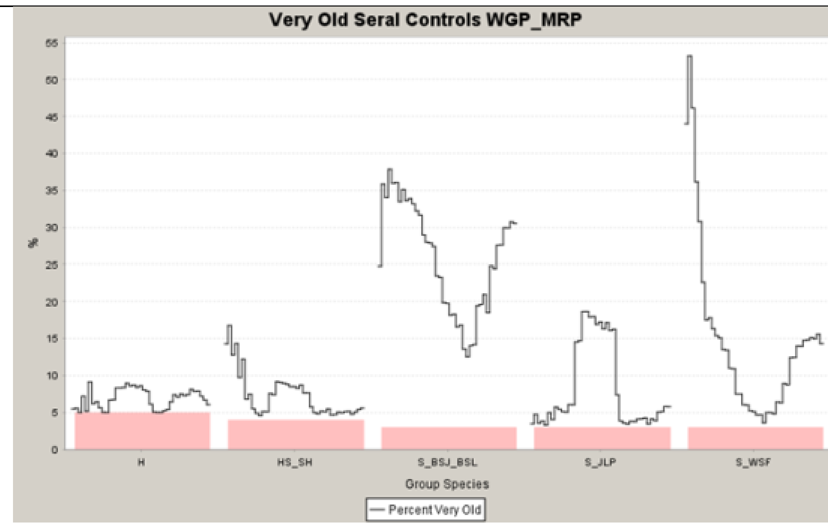
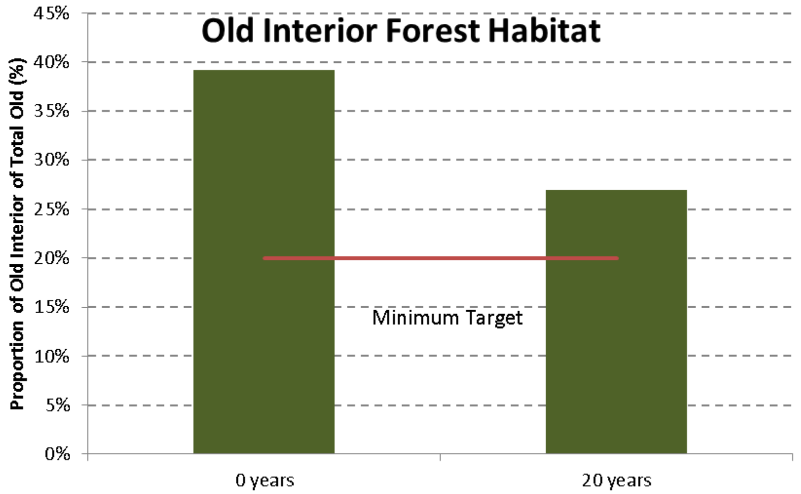

Very Old Seral Controls WGP_MRP
%
H
HS_SH
S_BSJ_BSL
S_JLP
S_WSF
Group Species
Percent Very Old

Table 25 Key estate modeling metrics for the preferred scenario - Interior Old Forest Habitat



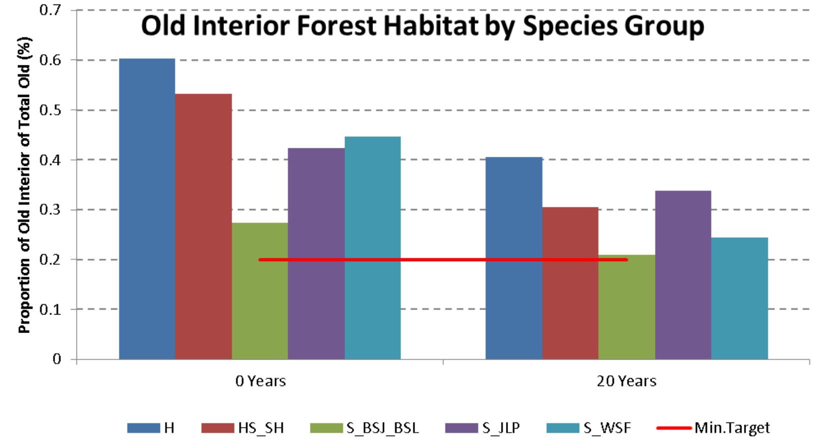
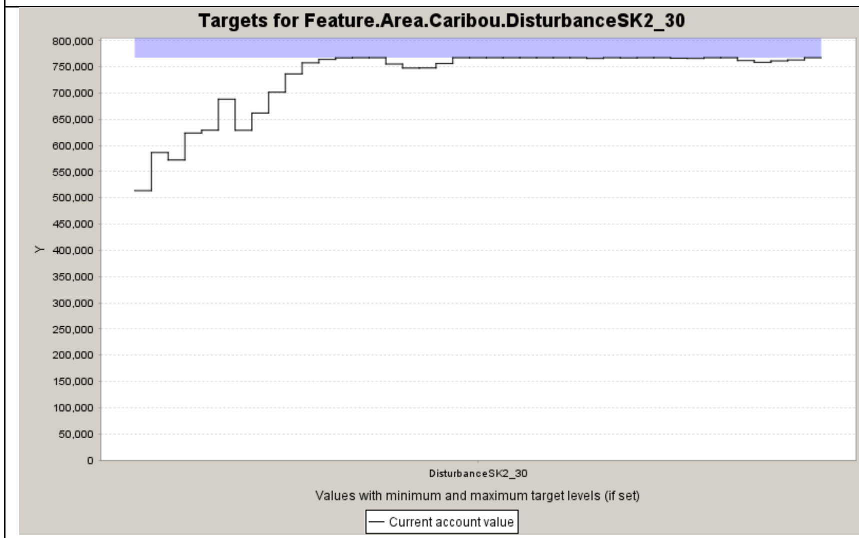


Table 26 Key estate modeling metrics for the preferred scenario – Caribou Disturbance Area

<table>
<tr><th>Caribou Disturbance (disturbance defined as age < 30 yrs + expansion factors to address buffering)</th><th>Caribou Disturbance (disturbance defined as < age 40 years + expansion factors to address buffering))</th></tr>
<tr><td>



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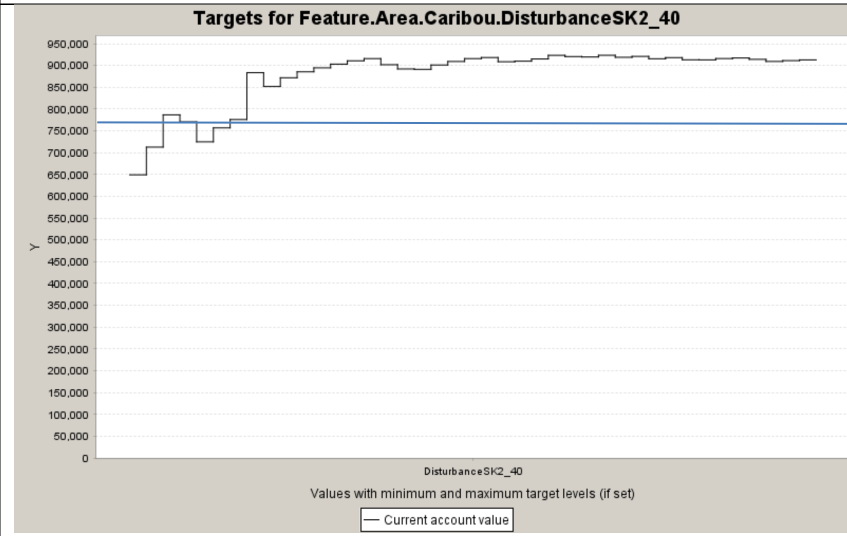
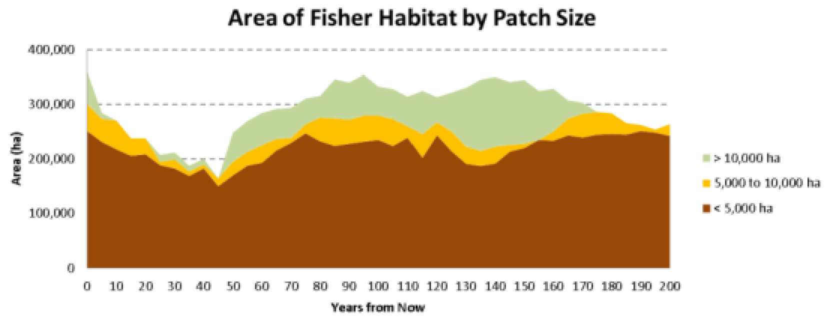
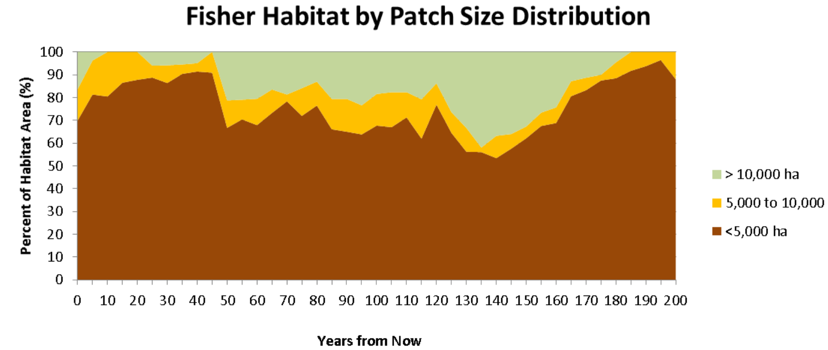


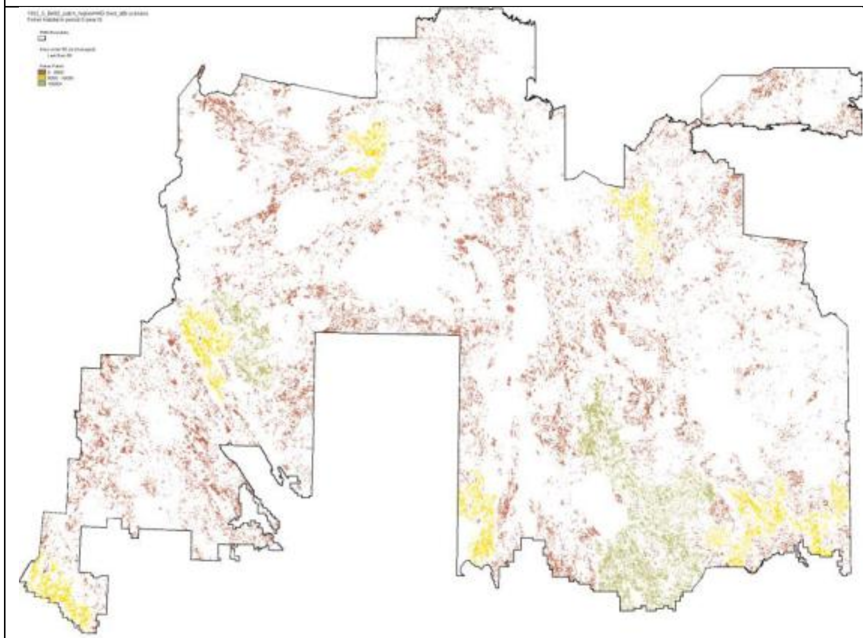
</td></tr>
<tr><td>Disturbance level proxy is kept below 35% (767,000ha + 174,000ha of permanent roads = 941,000 ha of disturbance out of caribou gross area (2.69 million ha).</td><td>Disturbance level proxy reaches 40% after ~50 years.</td></tr>
</table>

Table 27 Key estate modeling metrics for the preferred scenario – Fisher Habitat

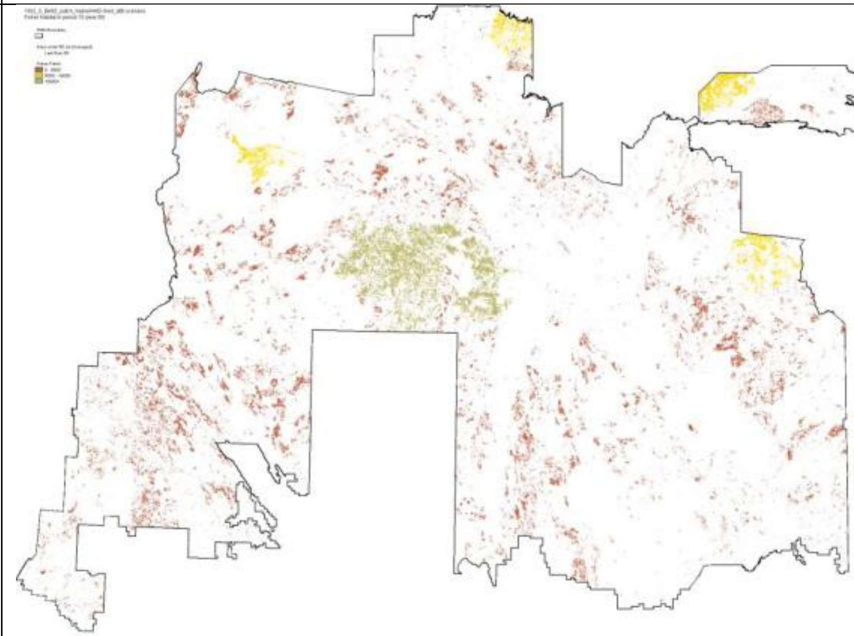




Fisher Habitat Year 0



Fisher Habitat Year 50



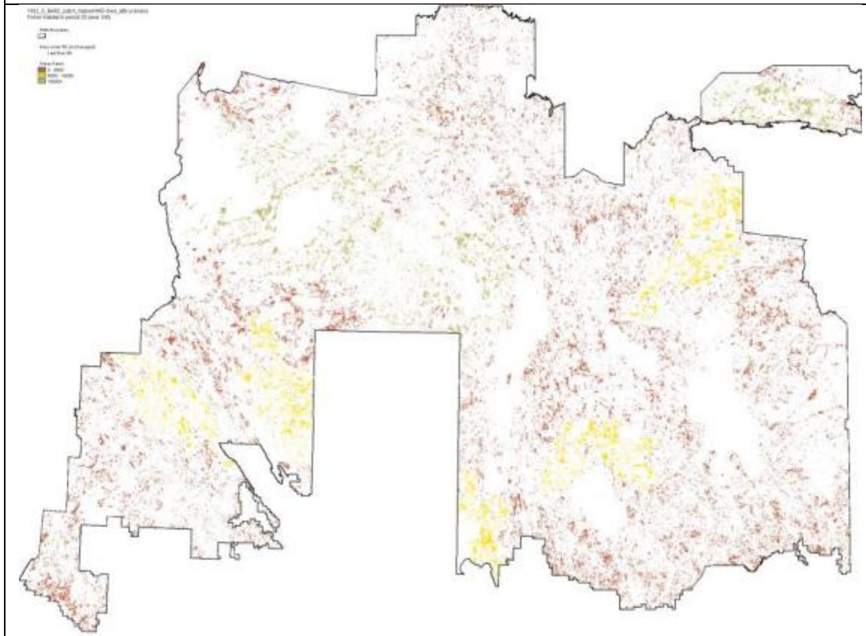
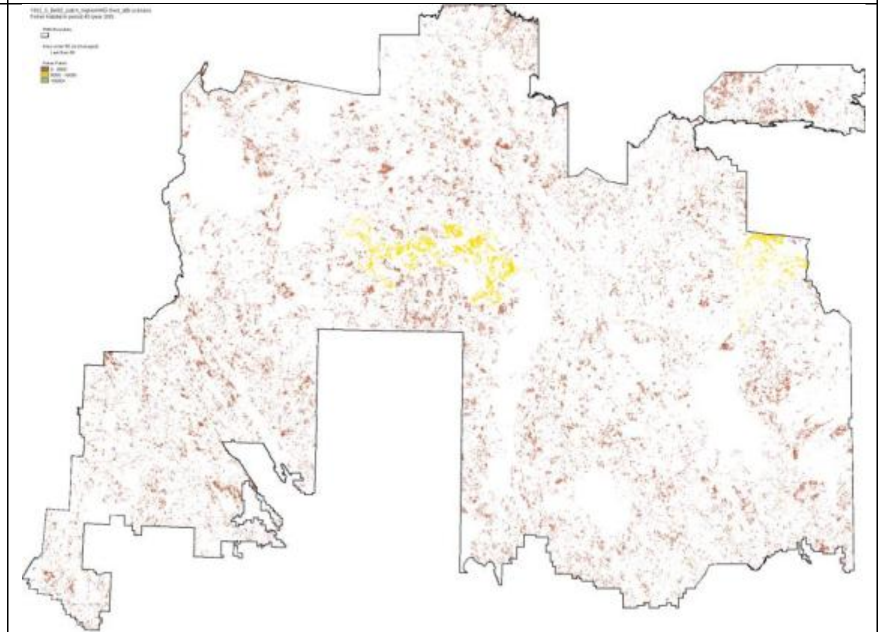
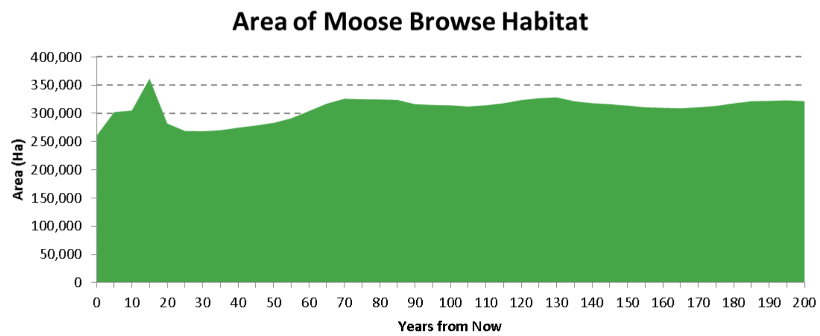
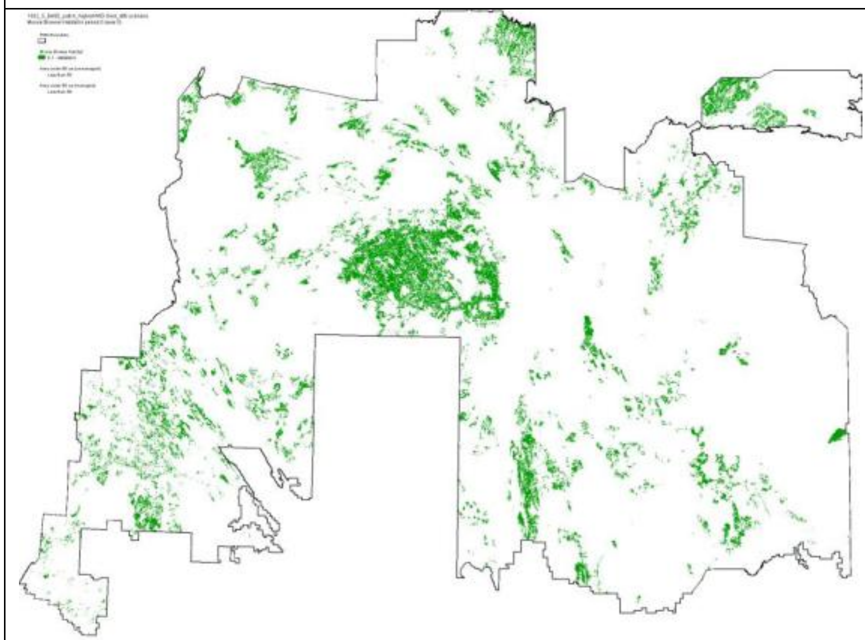
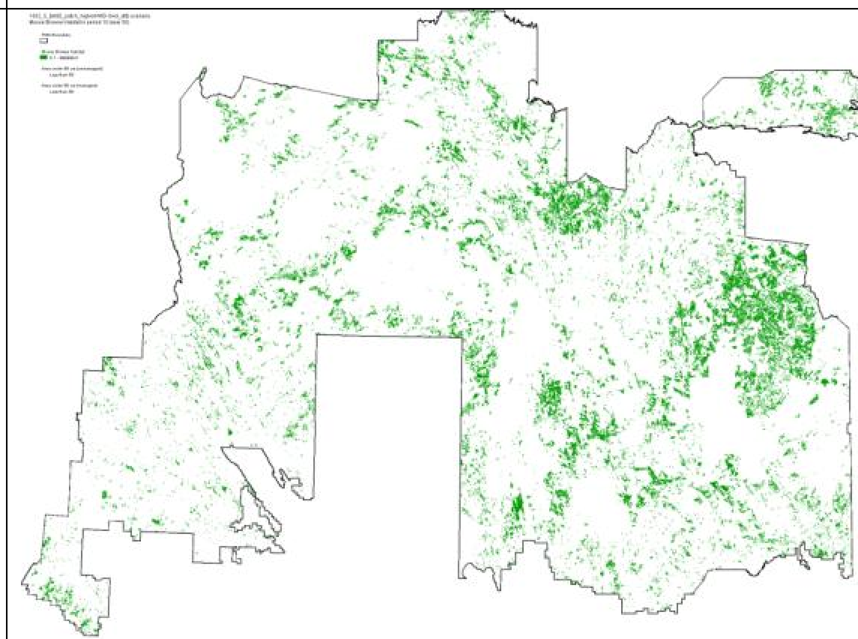
Fisher Habitat Year 100	Fisher Habitat Year 200
	

Table 28 Key estate modeling metrics for the preferred scenario – Moose Browse Habitat



Moose Browse Habitat Year 0	Moose Browse Habitat Year 50
	

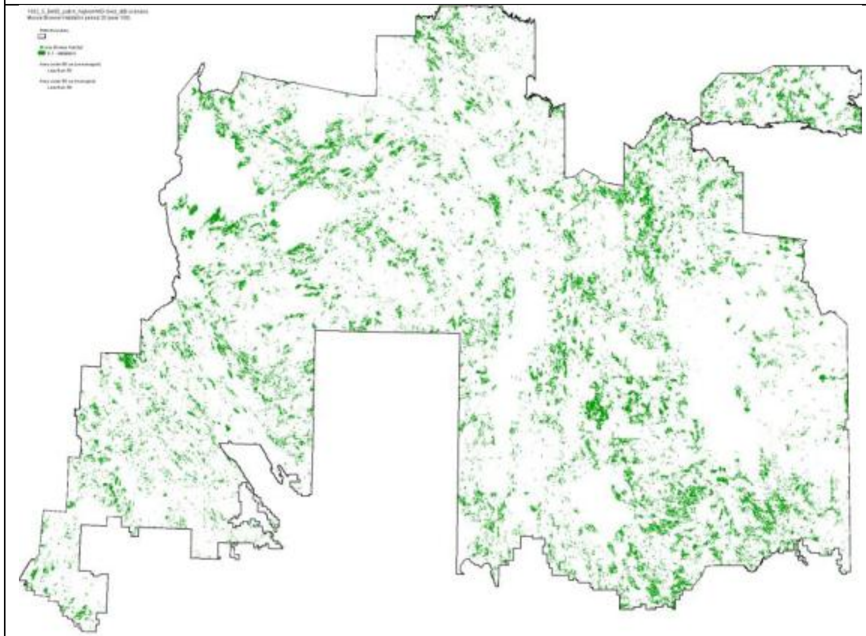
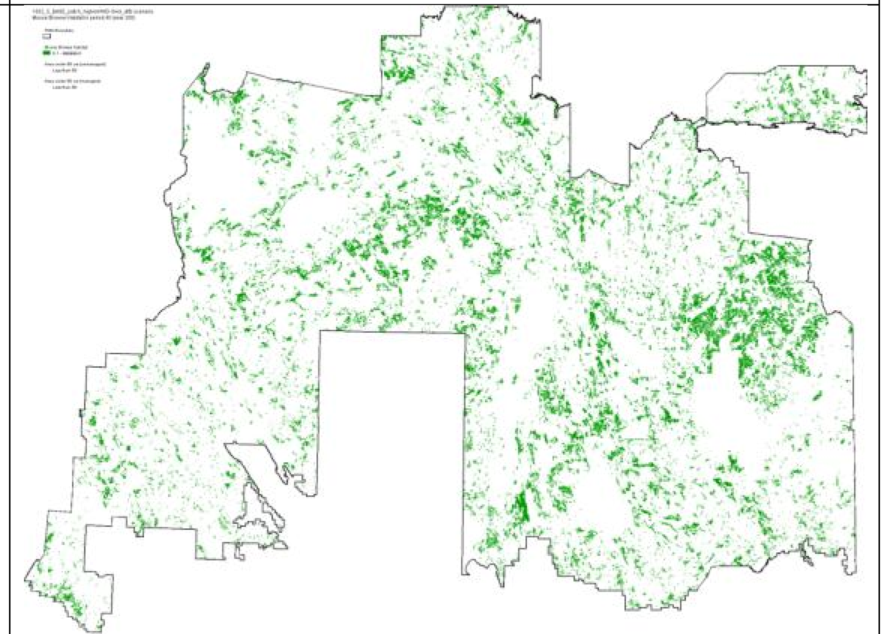
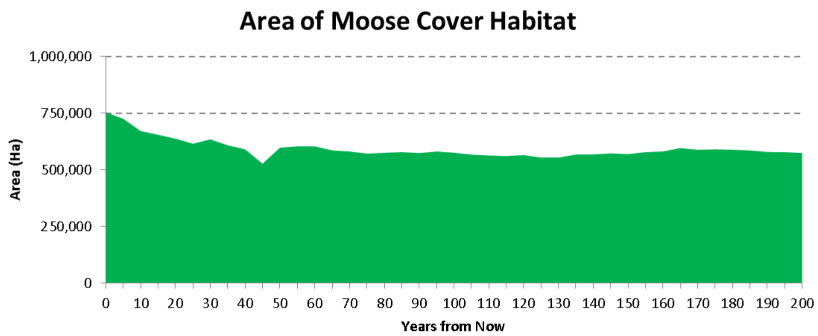
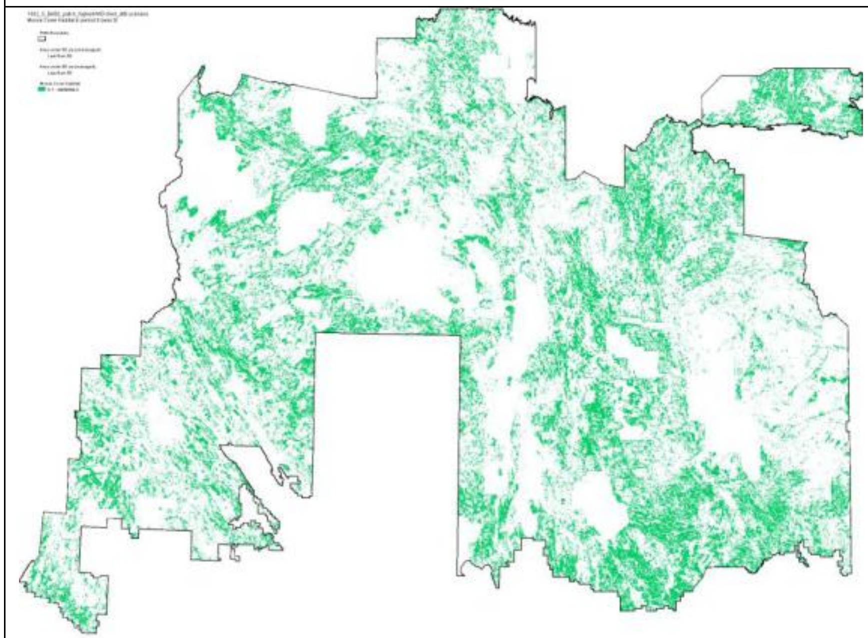
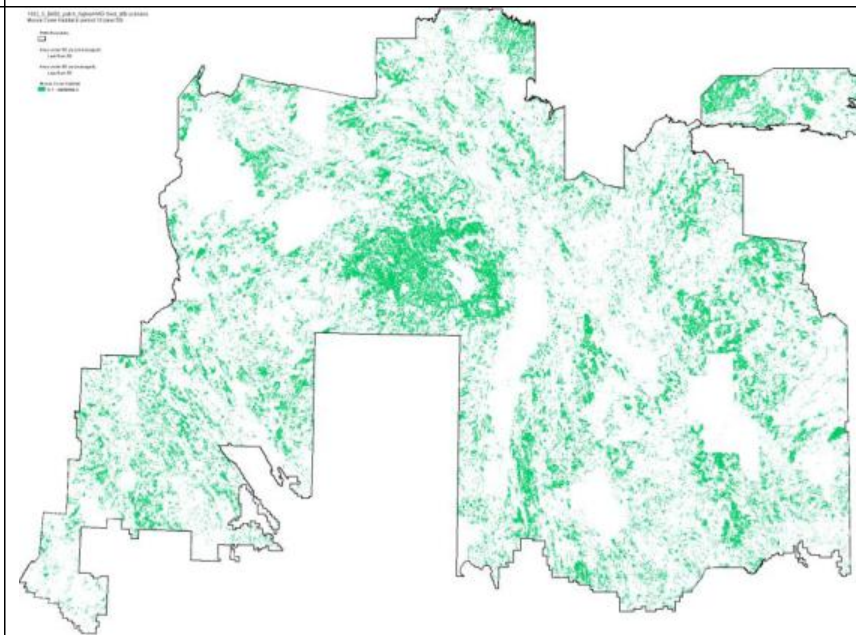
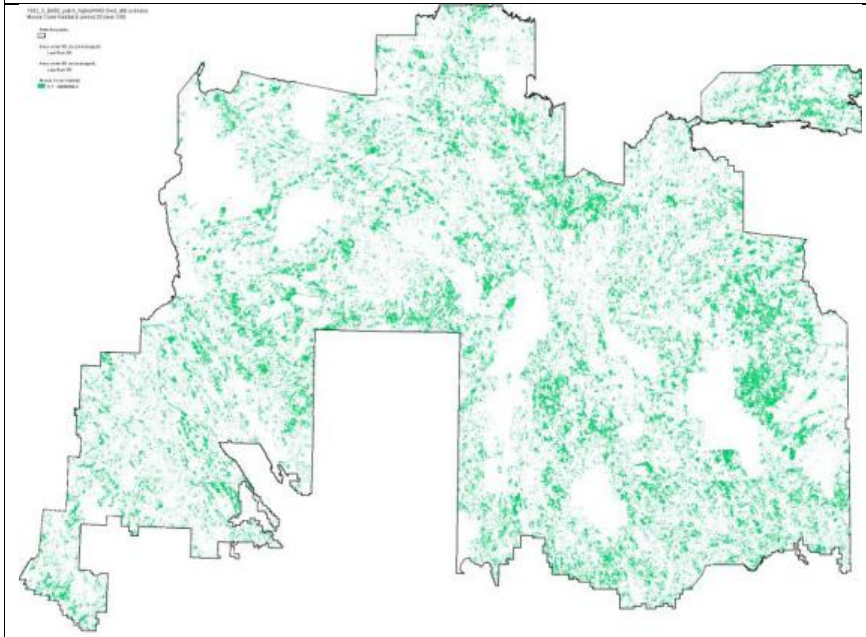
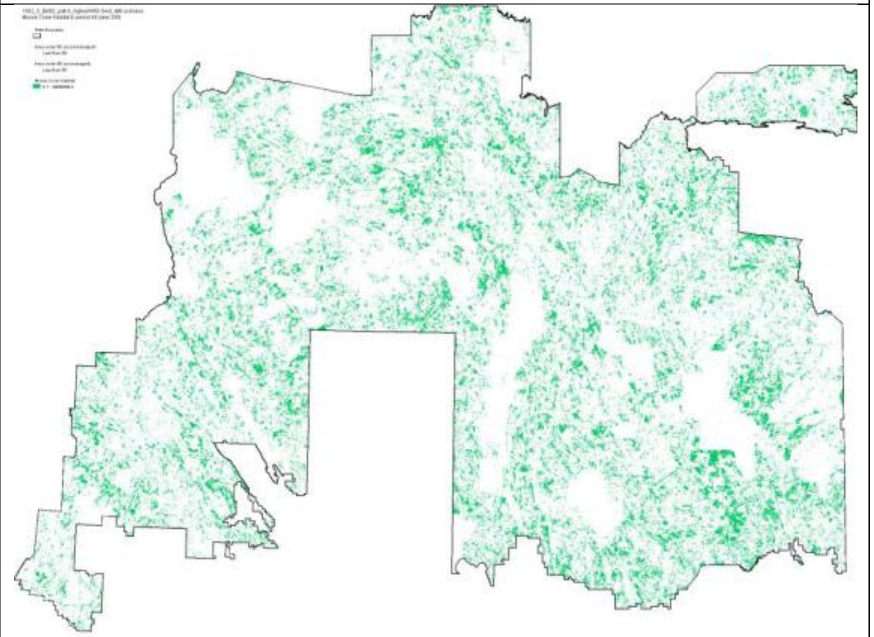
Moose Browse Habitat Year 100	Moose Browse Habitat Year 200
	

Table 29 Key estate modeling metrics for the preferred scenario – Moose Cover Habitat



Moose Cover Habitat Year 0	Moose Cover Habitat Year 50
	

Moose Cover Habitat Year 100	Moose Cover Habitat Year 200
	

Appendix III- Comparisons to Previous Analyses

This section compares and contrasts the information and assumptions used in this analysis with those used in the 1999 PA FMP produced by Weyerhaeuser.

12.1 Inventory

This analysis uses a consolidated inventory predominately composed of the Weyerhaeuser Inventory converted to SFVI standards in 2006 based on imagery captured between 1998 and 2004. Interpretation was completed in 2004. Previous UTM inventory was added where no information was available. This inventory has been updated to make it current to 2014 by incorporating harvesting, infrastructure, fire, and wind disturbances that has occurred since imagery capture. The previous FMP used an inventory current to April 1, 1996 that was originally assembled by SERM based on air photos taken between 1980 and 1987.

12.2 Land Base

The gross area of the PA FMA is 5.9% larger than the gross area reported in the 1999 FMP (Figure 83). An accurate comparison of the land base between the 2014 analysis and 1999 FMP is difficult because: (1) the 1999 FMP did not include provincial parks in the land base description, (2) the hierarchy for the land base removals in the 2014 analysis was different, and (3) different base inventories were used.

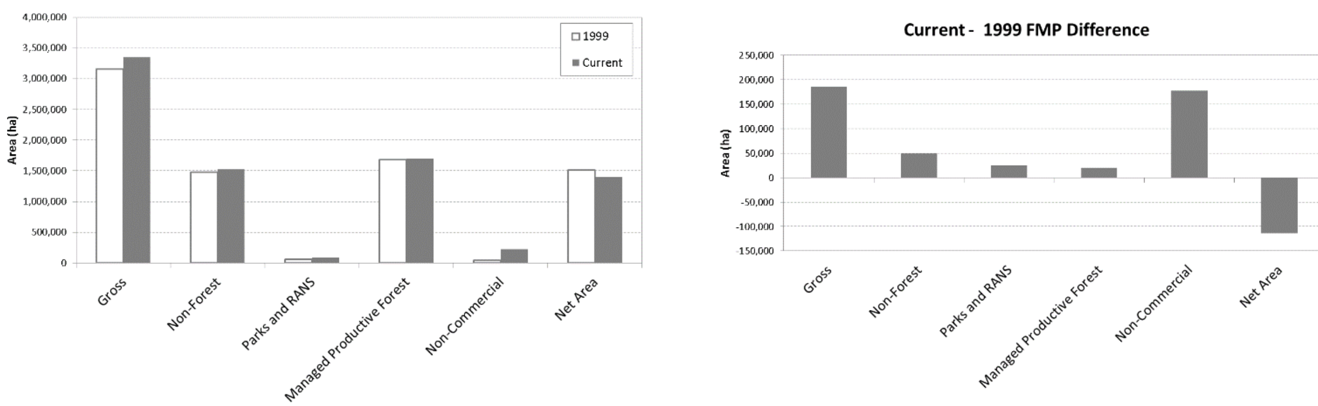


Figure 83 PA FMA – Area comparison for key land base components between 1999 FMP and 2014.

The non-forest area occupies 1.528 M ha (1.492 M ha of effective reductions) in the 2014 analysis, approximately 3% higher than the 1999 FMP (by 49,000 ha). This difference is mainly caused by the inclusion of the newly constructed roads since the 1999 FMP in the non-forest category.

Parks and RAN area is 6% higher in the 2014 analysis but this is partly because a different netdown hierarchy was employed relative to the 1999 FMP. From a practical point of view, the area of Parks/RANs did increase relative to 1999 because of the addition of the Great Blue Heron park (8,364 ha gross area).

The managed productive forest area is 1.2% higher in the 2014 analysis. This is the landbase that is allowed to contribute toward non-timber objectives such as old seral requirements. It does not include parks and RANs in either the 2014 analysis or 1999 FMP. The 2014 area is higher despite the increase in non-forest and Parks/RANs because it was offset by less disposition area (e.g. rescinded jail site) and less area in Treaty Land Entitlements.

The non-commercial area is significantly larger in the 2014 analysis due to non-commercial definitions inherited from the G&Y work done in 2008 (larchy stands, low site and low crown closure definitions). The low site and low crown closure definition were taken from the Forest Management Planning Document (pg. 228 FMPD – min 25% CC and 15m height class to be merchantable[3]). The condition described on this page is not used to define low density/low crown closure stands, but rather to define a merchantable stand whose PFT is classified differently in terms of converting attributes of three tree layers to one tree layer. The concept of low crown closure was first used by Lane Gelhorn, when he developed the growth and yield curves for the PA FMA in 2008 by excluding 'A' density stands from the productive landbase. The 2014 netdown removed ~223,000 ha while only 45,000 ha were removed in the 1999 FMP. The 223,000 ha in the 2014 was comprised of >30% tL stands (121,600 ha), low site productivity stands (49,900 ha), and low density stands (47,000 ha).

The final Net Land Base area in 2014 is 7.5% smaller (~114,000 fewer ha) than in 1999 due to the differences, discussed above, with the inventories, net down exclusions, and non-commercial area.

There are a number of other factors that changed the net land base in the 2014 analysis:

- Steep and unstable slopes account for ~7,200 ha in the 2014 analysis. Reductions for this category in the 1999 FMP were included in the 4% volume reduction applied for riparian, visual, and environmentally sensitive areas.
- Subjective leave areas account for ~1,600 ha in the 2014 analysis. These were applied in the 1999 FMP as dispositions but have now expired.
- Treaty land entitlements account for ~3,500 ha in the 2014 analysis. A preliminary area of ~11,800 ha was applied in the 1999 FMP but treaty land entitlements have since been established.
- Isolated Stands, consisting of merchantable stands that are less than 4 ha in size and are more than 100 m away from other net land base areas, account for ~6,120 ha in the 2014 analysis. Isolated stands were not considered in the 1999 FMP.
- Riparian area reserves account for ~0.4% of the productive land base and ~1.7% of the total land base in the 2014 analysis. This was derived from creating spatial buffers around mapped lakes, rivers, and streams as guided by the PA FMA standards. For more information on reserve and management width see Section 3.4.4 in the assumptions document. The 1999 FMP applied a 4% volume reduction to account for riparian zones, visually and environmentally sensitive areas, and steep slopes.
- In-block retention of 4% (area reduction) is applied to all harvested stands in the 2014 analysis. The 1999 FMP applied an average of 3% area reduction (1% for coniferous stands, 4% for deciduous stands).
- Future permanent roads are accounted in the 2014 analysis by applying a reduction of 1.5% net (3% gross) to the spatial net landbase area. It is not clear if the 1999 FMP included reductions for this category. The permanent road accounting for 1.5% reduction of the net area only in the first rotation for the 1999 FMP (see Table 4.4.10 on page 4-62 of the 1999 FMP document).
- Future SERM Withdrawals were accounted for in the 1999 FMP by applying a net area reduction of 4.14% respectively, but it is unclear how they relate to the current netdown.

[3] Growth and yield work (pg 16) assumed that if a tree could not reach 12.5m tall in 120 yrs it was site class 4 and was excluded from the landbase.

12.3 Growth and Yield

A detailed assessment of the 1999 vs 2015 yield curves has been submitted in a separate Forsite memo dated Oct 28, 2015. It shows that the 1999 yield curves produce higher yields at younger harvest ages and lower yields at older harvest ages. When assessed using LRSY calculations at CMAI ages, the hardwood harvest would increase by 20% with the 1999 yield curves, while the softwood sawlog harvest would increase by 14%, and the pulp harvest would increase by 88%. Refer to the Pulp Proportion memo in this series (Forsite Oct 2015) for more detail on why more pulp is present in the 1999 curves (small trees, tops of sawlogs, downgraded sawlogs).

Modeling with the 1999 yield curves in the 2015 NFP model showed HVS differences of:

- Short term: +12% hardwood, -5% softwood sawlog, +89% pulp
- Long term: +17% hardwood, +17% softwood sawlog, +89% pulp

Shifting to the 2015 yield curves clearly has a negative impact on HVS, particularly on pulp.

In addition to these base yield curve differences, the 1999 FMP included yields gains from silviculture that typically added 10% to hardwood stands and 15-20% to softwood stands (described further below). There were no silviculture gains assumed for managed stands in the 2015 analysis.

12.4 Management Assumptions

Differences in operability windows and breakup ages between the 2015 analysis and 1999 FMP are shown in Table 30.

Table 30 PA FMA - Comparing operability windows and breakup ages between the 1999 FMP and 2015.

	1999 FMP				2015 analysis				
Stand Group Description	**Ave. MHA**	**Ave. Break up**	**Yield #'s**	**Species Associations**	**Ave. MHA**	**Ave. Break up**	**Yield #'s**	**Dev. Type**	**PFT**
Hardwoods	39	130	38-44	TA, BP	48	145	1-2	HW	TAB, AOH
Hardwood with pine mixedwood	50	140	32-37	JPTA, TAJP	63	150	3-4	HjP	HPM
Pine dominated mixedwood	50	140	32-37	JPTA, TAJP	63	150	5-6	jPH	MPW
Hardwood with spruce mixedwood	42	140	100-105	TAWS	78	163	7-8	HsS	HSM
Spruce dominated mixedwood	61	150	26-31	WSTA, TAWS	78	188	9-10	SxH	SMW
Black spruce or tamarack/larch dominated softwood	55	171	7-12	BS	68	200	11-12	bS	BSL
Jack or lodgepole pine dominated softwood	54	146	13-18	JP	63	138	13-14	jP	JPL
Black spruce and Jack pine dominated mixed softwood	63	153	20-15	BSJP, BPBS	70	163	15-16	jPbS	BSJ
White spruce or balsam fir dominated softwood	39	166	1-6	WS	65	188	17-18	wSbF	WSF
Area Wt. Ave.	**55**	**150**			**61**	**163**			

In the 1999 FMP, stands were stratified into 44 yield groups compared to 18 (not including tamarack dominated stands) in the 2015 analysis. To produce a valuable comparison between the two FMPs, similar stand types in the 1999 FMP were grouped to closely match the stand types in the 2015 analysis. **The minimum harvest age (MHA) and break-up age of most groups are younger in the 1999 FMP compared to the 2015 analysis.** In the 1999 FMP, the average MHA was 55 years and the break-up age was 150 years (area weighted averages). In the 2015 analysis, the average MHA was 61 years and the break-up age was 163 years (area-weighted averages).

The average harvest age in the 1999 analysis declined to a low of 65 years in year 70 of the planning horizon (Figure 4.5.6 in the 1999 FMP Twenty-year plan). Younger MHAs can help to avoid pinch points because harvesting can occur in younger managed stands once older stands are liquidated. The youngest average harvest age in the 2015 analysis work to date was around 76 years.

At the request of the Forest Service, Forsite assessed the HVS impacts due to the operability windows and break-up age differences between the 1999 FMP and 2015 analysis (submitted in a separate memo). The results indicated the HVS was reduced by 7% (17% hardwoods, 5% softwoods sawlogs, and 5% softwood pulp) when the younger MHAs and break-up ages (from the 1999 FMP) were used. This is because younger break-up ages allowed more stands to undergo succession in the short term and encouraged the model in the long term to recruit more stands in the net area to meet the old and very old seral requirements.

<u>Natural vs. Managed</u> – The 2015 analysis uses natural stand yield curves for all natural and managed stands (i.e. no volume gains from active management were assumed). In the 1999 FMP, managed stands included gains associated with various silviculture treatment regimes (weighted average gain was 11.6% across all managed stands):

1. Natural regeneration of hardwoods – 0% gain
2. Natural regeneration of conifer with density control (ND) – 10% gain,
3. Natural regeneration of conifer with scarification (SS) – 10% gain,
4. Natural regeneration of conifer with density control and scarification (SD) – 15% gain, and
5. Plantations with density control (PD) – 20% gain.

<u>Seral targets</u> in the 1999 FMP were modeled by implementing a minimum of 5% retention of late seral and 1% very late seral stage (10%/2% for wS stands) for each of the 10 Forest Management Units. The 2015 analysis has a minimum seral stage retention level of 15% old and 5% very old for each ecosystem management unit and species group combination. The 2015 requirements are more constraining than those in the 1999 FMP. In the NFP model developed for the 2015 analysis, implementation of seral stage requirements alone suggests an approximate 10% HVS reduction.

<u>Interior forest habitat</u> requirements are still being developed for the 2015 analysis. Interior habitat is currently defined as the old forest free of edge effects (i.e., 60 m away from permanent anthropogenic disturbances and 30 m away from stands less than 40 years old). The interior forest habitat requirement was not considered in 1999. This requirement has the potential to impact HVS but has not yet been implemented.

<u>Fires</u> were previously considered by applying a 13.76% reduction to the harvest forecast. This factor was developed through an iterative process which determined the no-fire standing volume and the probability of realizing this volume. Multiplying the no-fire estimated volume with the probability that it will still be standing at time of harvest resulted in the standing volume considering fire. This factor was applied outside of the model in the 1999 FMP. The 2015 analysis does not make any reductions for fires but uses a 10% re-planning threshold on the net area basis (i.e. when the naturally disturbed area is accumulated to 10% of the net area, it will trigger the process of recalculating the HVS during the FMP term). This should have a strong upward pressure on timber supply in the recent analysis.

12.5 LRSY Comparisons

One way to approximate the HVS impacts using different yield curves is to estimate the long run sustainable yield (LRSY) that can be achieved on the same land base definition. Using the 2015 analysis land base definition, the LRSY was estimated for both sets of yield curves (1999 FMP and 2015 analysis) (Table 31). LRSY was calculated for each yield at the age of culmination mean annual increment (CMAI) for the hardwood volume (for hardwood leading stands) or for the softwood volume (for the softwood leading stands). The results indicate that using the 2015 FMP yield curves, the total volume decreased by approximately 27% from the 1999 FMP. When split by product components, 20% lower volume for hardwoods, 14% lower volume for softwood sawlogs, and 87% lower volume for softwood pulp is achieved compared to the 1999 yield curves.

Table 31 LRSY calculation using the two sets of yield curves (1999 FMP vs. 2015 analysis).

Product	1999 FMP Yields @ CMAI (m^3/yr)	2015 analysis Yields @ CMAI (m^3/yr)	Difference (1999-2015) (m^3/yr)	Difference (1999-2015) (%)	Current Allocation
Hardwood	1,228,494	1,019,993	208,501	-20%	947,000
Softwood Pulp	661,822	353,919	307,903	-87%	661,000
Softwood Sawlog	1,268,044	1,113,086	154,958	-14%	1,265,000
Total Volume	3,158,360	2,486,998	671,361	-27%	2,873,000

12.6 Comparison Summary

Table 32 summarizes the relative influence on HVS expected for each aspect of the analysis.

Table 32 Summary of the relative influence each analysis aspect has on the 2015 HVS

Analysis Aspect	Relative Influence on the 2015 HVS	%	Comments
Land Base Definition			
• Gross area	×	N/A	Larger total area
• Non-forest areas	↓	1	Slightly more area
• Parks and RAN area	↑	0.35	Higher
• Managed productive forest areas	↑	<1	1.2% higher; contributing to non-timber values
• Non-commercial area	↓	2.7	Revised definitions
• Steep and unstable slopes	×	N/A	Included in Riparian Reserves
• Land base deletions	×	N/A	Different inventory and net down hierarchies
• Disposition area	↓	1	Not applied in 1999
• Treaty land entitlements	↑	<1	Less area accounted
• Isolated Stands	×	N/A	Included in Riparian Reserves
• Riparian area reserve	↑	<1	Spatial buffers in 2015, in 4% factor in 1999
• Future permanent roads	↑	0.9	0.62% yield (2015), 1.5% area (1999)
• SERM withdrawals	↑	4.14	Not applied in 2015/ 4.14% very conservative
• Net land base area	↓	7.5	7.5% smaller in 2015
Management assumptions			
• Operability windows and break-up ages	↑	7	Detailed analysis conducted
• Natural vs. Managed yields	↓	27	Detailed analysis conducted
• Seral targets	↓	<10	Higher targets applied over more spatial units
• In block retention	↓	1	Higher net impact assumed (9% gross required)
• Interior forest habitat	Potential ↓	>10	Not yet having an impact in the 2015 analysis
• Fires	↑	13.76	Re-analysis threshold used vs 13.76% reduction
• Merchantable growing stock constraint	×	N/A	14.4xHVS (1999) – not clear if HVS impacted, 10xHVS (2015)-not constraining

Relative Influences: ↑ = increase of <10%; ↓ = decrease of <10%; × = little /no change; Green/Red indicate major items.

Compared to the 1999 FMP, there are several significant downward pressures on the 2015 modeled HVS (smaller net landbase, reduced yield expectations, and higher non-timber constraints) and only one clear upward pressure (removal of the fire reduction factor).

Appendix IV – Detailed Modelling Assumptions Document

Appendix D Natural Forest Patterns

Proposal for Alternative Stand and Landscape Retention Levels

[Prince Albert FMA FMP]

July 17, 2017

Project [1064-4]

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Overview

Based on a significant literature review, a 55 year fire cycle is proposed as representing a 'natural' disturbance regime in the Boreal Plains Upland ecoregion. While a wide range of fire cycles were found in the literature, the most recent and statistically thorough study (Andison 2007) was used to support this finding. It was felt to provide a reasonable approximation of the Prince Albert FMA landbase because of similarity or more extreme conditions for fire ignition probabilities, forest/fuel types, and fire behavior predictors (e.g. head fire index).

Old seral retention targets are proposed as the median old seral values derived in Andison's 2007 stochastic fire modeling output. Higher retention is required for stands with hardwood presence because they are less likely to burn and thus are more likely to be present at old ages.

Species Group Label	Description	% Old + Very Old	% Very Old
H	Hardwood stands	10%	5%
HS-SH	Mixedwood stands	8%	4%
S(BSJ+BSL)	Black Spruce and Jack Pine/Tamarak leading softwood stands	6%	3%
S(JLP)	Jack Pine leading softwood stands	6%	3%
S(WSF)	White Spruce/Balsam Fir leading softwood stands	7%	3%

Block level retention targets are proposed as:

For events with at least 20ha of harvested area (i.e. no retention if <20 ha):

- Total Event Retention is at least 9% of the harvested event area and made up of insular or proximal retention.
    - Insular Retention to be at least 4%
        - This retention must be trees in islands or clumps or singles with no connection to the block boundary.
        - This retention must be representative, merchantable timber (i.e. similar stand types to what was harvested).
    - Proximal Retention to make up the remainder (maximum 5%)
        - This retention must be forest within/adjacent to the harvest area and connected to the block boundary.
        - Retained stands must be merchantable (>= 60 m^3/ha) or if not merchantable, be approved by the Forest Service to meet the functional requirements of structural retention. Ideally, this forest captures riparian areas, wetland edges, springs, snags, species refuges, connectivity, or other forest left for non-timber values.
- Targets to be met on each event at the completion of harvesting, (e.g. variation can occur at the block level but not at the event level).

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List of Acronyms

FMA	Forest Management Area
FMP	Forest Management Plan
HVS	Harvest Volume Schedule
HWD	Hardwood
NFP	Natural Forest Patterns
NRV	Natural Range of Variation
PA FMA	Prince Albert Forest Management Area
SWD	Softwood
VOIT	Values, Objectives, Indicators, Targets

1 Introduction

Sakâw Askiy Management Inc. (Sakâw) is in the process of preparing a Forest Management Plan (FMP) for the Prince Albert FMA. This report proposes alternatives to some of the NFP requirements contained in the March 28, 2017 FMP Standard with the goal of better reflecting the natural range of variation (NRV) of these attributes in the PA FMA. Considering NRV while attempting to mimic the historical (pre-industrial) disturbance regimes on the landscape with forest management will increase the potential for managing and sustaining all the other biological values on the landscape (Andison, 2007; Weir et al., 2000; Swanson et al., 1994).

Sakâw is looking to apply alternatives to the following FMP Standards:

- Old Seral Retention Targets (35-1, 6)

  "*The targets for amount of old and very old forest shall consist of a combined total of old and very old forest area that meets or exceeds 15% of the forested landscape, with a minimum of 5% comprised of very old forests*;"

- Event Level Retention Targets (35-1, 15a)

  "*The retention area of live representative tree residuals for each harvest event shall be a minimum of 9% of the total harvested area. Retention area is calculated over the harvest event duration*."

These standards were included in Sakâw's 2015 timber supply modeling work and VOIT framework but are now being proposed for change due to a more rigorous examination of NRV literature. If accepted, this will lead to updated versions of VOIT 2 and 4 in the FMP document, and updated timber supply modeling. This report provides the proposed targets and outlines the rationale behind the deviation from the Standard.

2 Fire Cycles

In order to understand appropriate retention levels for old seral forest, it is necessary to estimate the natural disturbance regime that was present prior to industrial use of the landbase.

Although there are many influences on the landscape, fire is considered to be the main force behind the shape and characteristics of forests on the Boreal Plain landscape (Leverkus et al., 2017). For this reason the fire regime is the best agent to model NFP and the NRV (Andison et al., 2016; Johnson et al., 1998; Hunter, 1993). Fire regimes are determined by the following disturbance components: frequency (return interval or fire cycle), size, and intensity (Bergeron et al., 2002 and Stockdale, 2014; Parisien et al., 2004). Fire cycle is the main driver of seral stage distributions on the boreal landscape (Stockdale, 2014; Schulz, 2008) and is a measure of how many years (on average) it takes to burn an area equivalent to the total landscape in question.

2.1 Natural Disturbance Regime for the Boreal Plains

Fire regime studies on the Boreal Plains are numerous and are in agreement that the fire regime is characterized by frequent occurrence, large sizes, and of high severity (Stockdale, 2014). Another consensus is that fire cycles vary over time and space (Leverkus et al, 2017; Bergeron et al., 2002). Studies have also shown that the fire cycle in the boreal forest was very different pre-1900 (Leverkus et al, 2017; Bergeron et al., 2002; Weir et al., 2000; Johnson et al., 1998; Van Wagner, 1978). The major change at this time was industrialization and the introduction of fire suppression (Cumming, 2005; Bonar et al., 2003; Johnson et al., 1998; Van Wagner, 1978). Since fire suppression and forest fragmentation due to industrialization began, the fire cycles in the boreal forest have lengthened dramatically (Weir et al., 2000; Van Wagner, 1978). Thus, 'natural' landscape conditions cannot readily be assessed by looking at the landscape today.

The studies below estimate the pre-industrial fire regime for the Boreal Plains ecozone.

1. Alberta-Pacific Forest Industries Inc. (ALPAC) sought expert opinion on fire cycles for their northern Alberta FMA and received answers ranging from 40 to 250 years (Smith and D'Eon, 2006). To narrow it down ALPAC compared several studies.
    a. Cummings (2001 and 2005), used annual burn rates from 1961 to 1996 fire records to predict the fire cycle for the ALPAC FMA. Even accounting for fire suppression within this timeframe, Cumming's resulting fire cycle was 482 years.
    b. Tymstra et al. (2005), calculated fire cycles of 124 and 226 years for two ecoregions present is the FMA.
    c. Stockdale (2014) determined that fire cycles cannot be obtained by observing the forest in its present state and the use of fire records often results in values that are too large. A snap shot in time or several decades of human recording is not enough data to justify management strategies at a landscape scale; especially, when the goal is a pre-industrial state (Baker, 1989).
    d. Andison (2003) investigated burn rates within the FMA using age-class distribution roll-back and found the fire cycle to be 48 years (Andison, 2003). Based on this work and the study of the Mistik FMA, the fire cycle for the ALPAC FMA was estimated to range from 40-60 years.

    By incorporating historical fires before 1960, Andison's study was considered to be a closer representation of NRV; in contrast, Cummings and Tymstra et al. calculated a variation of the current fire cycle.
2. Bonar et al., 2003; Johnson et al., 1998 found that the probability of a stand living until natural old growth and break up is very small on the Boreal Plains - confirming that old and very old seral stages have never been a large component of the landscape.
3. Prince Albert National Park completed a study to determine its fire cycle and natural age class distribution (Weir et al., 2000) and found the regime could be divided into 3 periods: pre- 1890s, 1890-1945, and post-1945. The 1890-1945 timeframe is assumed to represent the NRV for our current climate and had fire cycles of 15-40 years in the south and 45-150 years in the north. The study noted that fire cycles are not precise estimates due to very large confidence intervals and the study area is too small to be statistically accurate. The study also found that <5% of the study area was older than 125 years – suggesting fire cycles shorter than 70 years (Andison et al., 2016; Andison and McCleary, 2014; Bergeron et al., 2002; Weir et al., 2000).
4. Mistik Management Ltd's (Mistik) FMP work originally estimated the natural fire cycle to be 35-70 years (Andison, 1999) using a 1970 inventory 'rollback' process that eliminiated industrial activity. Another assessment was completed in 2007 and arrived at a fire cycle of 33-65 years (Andison, 2007). It should be noted that a very detailed 'time-since-fire' assessment on the FMA was also completed (Shulz, in prep, Andison, 2005) that yielded a very precise estimate (43 years) but it only reflected 100,000 ha of the FMA. To support management guidance, the Andison study suggested the use of a 55 year fire cycle and completed detailed modeling of this scenario (plus 75 and 100 yr fire cycles for context).

2.2 Proposed Fire Cycle for the PA FMA

Although nationally reported boreal forest fire cycles have varied greatly (Smyth and D'Eon, 2006), Sakâw is confident that the use of a 55 year fire cycle for the PA FMA is consistent with historical (pre industrial) natural disturbance patterns. The previous FMP for the PA FMA also estimated pre-1900s fire cycle as 30-50 years (Weyerhaeuser, 1999).

Sakâw is proposing to use a fire cycle of 55 years because it is well within the NRV for the Boreal Plains.

2.3 Extrapolating Fire Cycles from the Mistik FMA to the PA FMA

The proposed 55 year fire cycle is largely based on Andison's 2007 work in the Mistik FMA. Extrapolation of these results to the PA FMA requires consideration of whether similar natural disturbance patterns can be expected on the PA FMA landbase. In order to do this, several factors can be evaluated: Geographic proximity, forest types and spatial distribution, lightning strike frequency, lightning strike fire ignition frequency, and Head Fire Index ratings (expected fire behavior probability).

Geographic Proximity: The Mistik FMA is adjacent to the PA FMA and within the same ecoregion (Mid Boreal Upland) of the Boreal Plain ecozone (Figure 1).

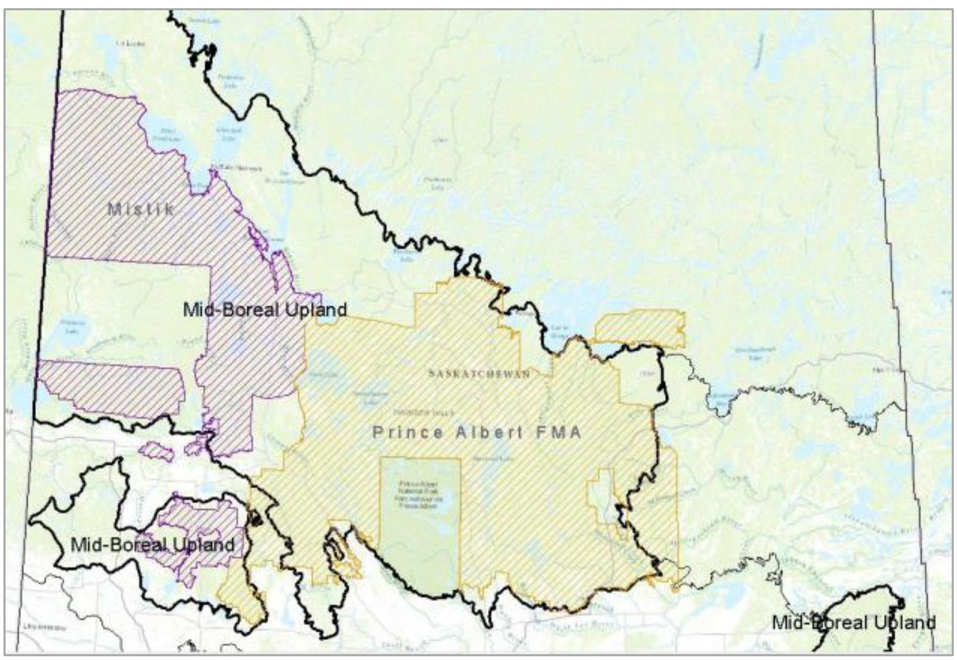


Figure 1. Mistik and PA FMA locations within the Mid Boreal Upland ecoregion

The Canadian Forest Service's 'Saskatchewan Fire Regime Analysis (Parisien et al, 2004)' indicates that the Mid Boreal Upland has significantly higher rates of fire disturbance from other portions of the Boreal Plain in Saskatchewan. This ecoregion is more prone to fires than other Boreal Plain ecoregions because of higher proportions of area containing flammable fuel types and greater fuel continuity (Parisien et al, 2004). It should be noted that this study included human caused fires and fire suppression activities so its estimated fire cycles are not helpful in understanding pre-industrial disturbance levels. However, it does provide a range of data from which to assess the similarities and difference of the Mistik and PA FMA landbases.

Forest Types and Spatial Distribution: Both Andison (2007) and Parisien et al (2004) indicate that the presence of contiguous areas of mature softwood stands will increase burn rates on a given landbase, while the presence of hardwoods and mixed stands tend to reduce burn rates. Figure 2 illustrates the presence and distribution of stands types (grouped into similar fire behavior classes) across the commercial forest zones of Saskatchewan (figure taken from Parisien et al, 2004). The approximate areas of the Mistik and PA FMA have been added to the figure to allow for comparison. It is clear that Mistik landbase has a larger proportion of Aspen stands and less area in contiguous conifer. The PA FMA has higher proportions of mixed wood and jack pine, with generally higher proportions of contiguous conifer.

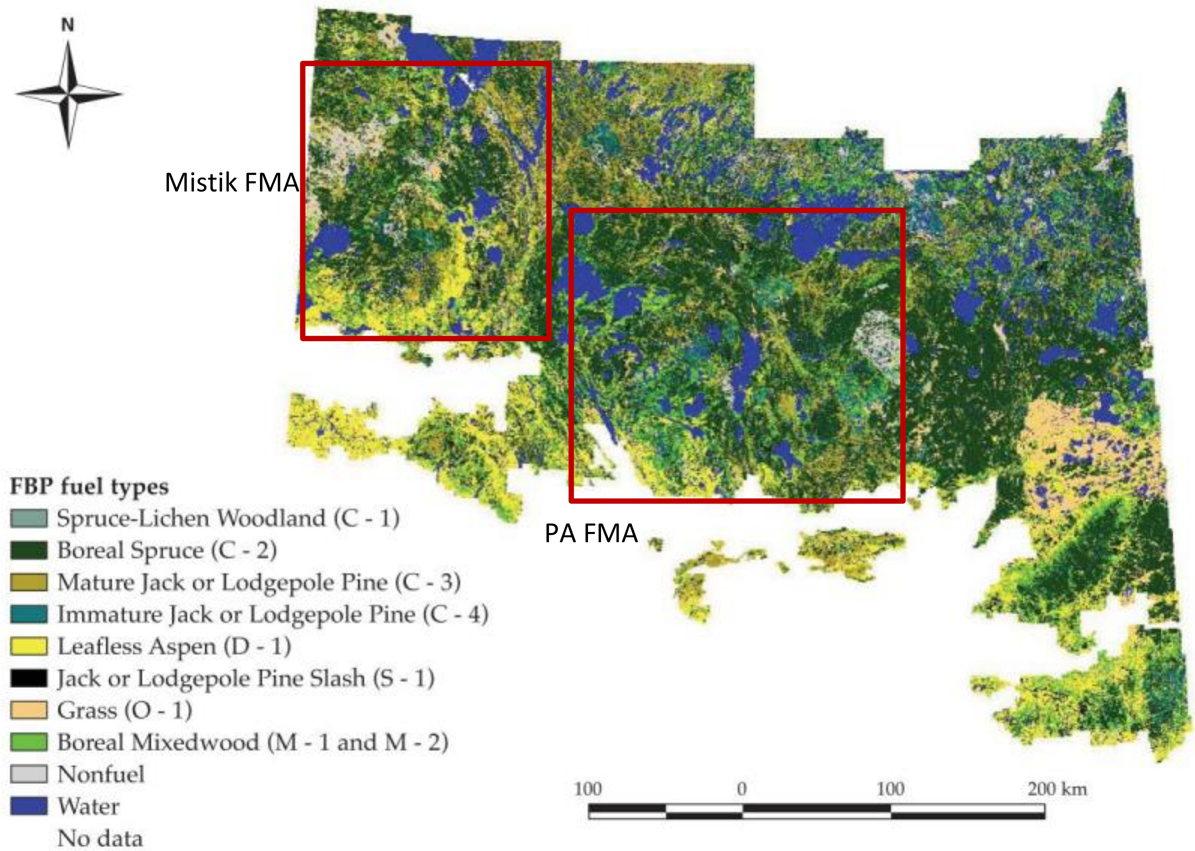


Figure 2. Canadian Forest Fire Behavior Prediction (FBP) System fuel types for the commercial forest of Saskatchewan and Prince Albert National Park (Parisien et al. 2004)

Using FMP reporting data, the Mistik FMA is 49% softwood, 18% mixedwood, and 33% hardwood. By comparison, the PA FMA is 59% Softwood, 17% mixedwood, and 24% hardwood. The higher levels of hardwood on the Mistik landbase (and reduced contiguous conifer) can be expected to result in higher fire cycles values (less area burned per year) than in the PA FMA (i.e. PA fire cycle would <= 55 years).

Lightning Frequency / Fire Start Frequency: The frequency/probability of natural fire starts (i.e. lightning) is also an important consideration when looking to apply the Mistik results to the Prince Albert landbase. Parisien et al (2004) provides information on the frequency of lightning strikes and lightning caused fires (see Figure 3) but note that it should be interpreted with caution due to data quality.

Based on a review of Figure 3, it appears that the PA FMA area has at least as high an instance of lightning strikes and lightning caused fires as seen in the Mistik FMA. In addition, the report states that "lightning-caused fires rarely, if ever, ignite in aspen stands, where much lightning activity occurs. In the Mid Boreal Upland, there were proportionally more lightning strikes than lightning-caused fires in the Leafless Aspen (D1) fuel type". This logic combined with the increased presence of aspen on the Mistik landbase correlate well with the images and reinforce the ideas that expected fire cycles in the PA FMA will be similar or shorter than the Mistik FMA.

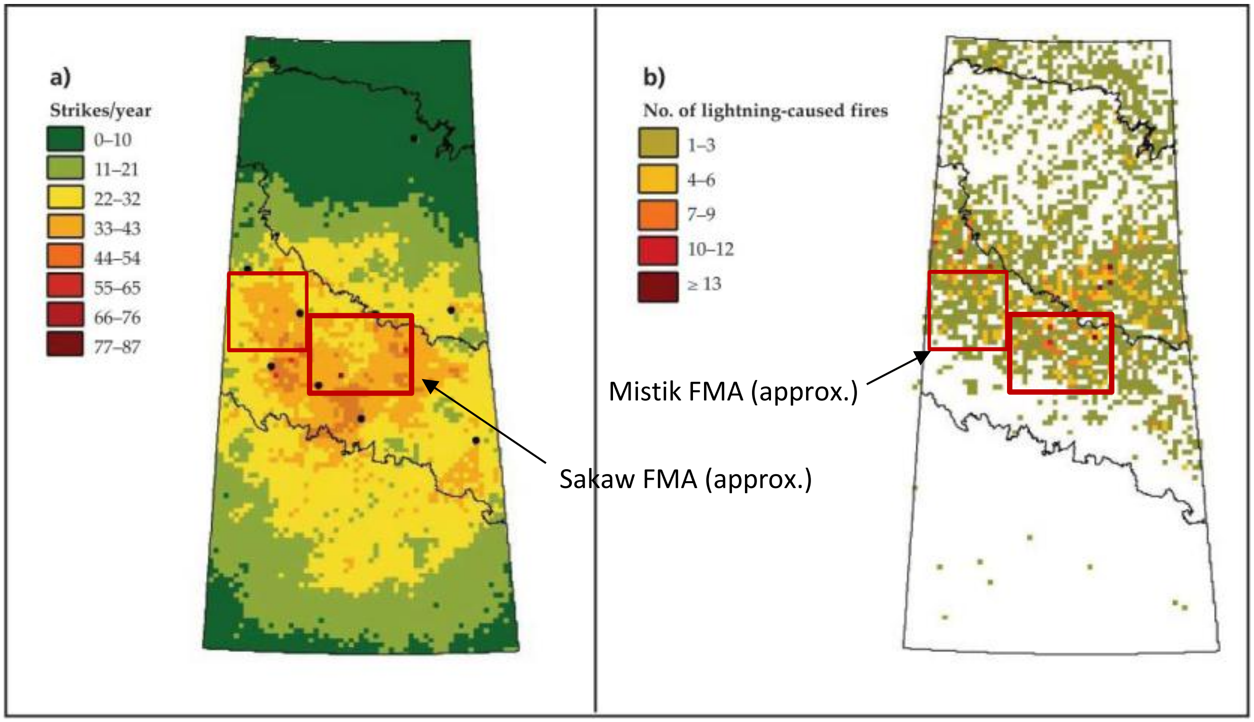


Figure 3. Density grids (100-km 2 cells) of (a) average lightning strikes per year from 1985 to 1999 and (b) reported lightning-caused fires, from 1981 to 2000 (both data types excluding 1988 and 1990). The black dots in Figure 9a represent provincial lightning detectors. (Parisien et al. 2004)

<u>Head Fire Intensity (HFI) Ratings</u>: HFI ratings are produced to assess the potential fire behaviour that would occur if a fire was to be initiated in a given area, and require weather/climate, fuels, and topography data. HFI maps produced in a previous study (Climate change in the prairie provinces: Assessing landscape fire behavior potential and evaluating fuel treatment as an adaptive strategy, Kafka, et al, 2001 CFS Unpublished Report) were referenced in the Parisien et al. study and are used again here.

This integration of weather, fuels, and topography data in the form of HFI maps (based on the 80th and 95th percentile weather conditions in 1990's) allows for the depiction of potential fire behavior on the commercial forests of Saskatchewan. The most extreme areas of fire behavior potential tend to correspond with the large expanses of mature coniferous fuels. It can be seen that the areas within the PA FMA are ranked similarly or worse than the areas within the Mistik FMA – particularly in the summer when deciduous trees have leafed out and serve to limit fire behaviour. The increased fire behavior expectations in the PA FMA are another factor indicating that the fire cycle in the the PA FMA is expected to be similar or shorter than what was found in the Mistik FMA.

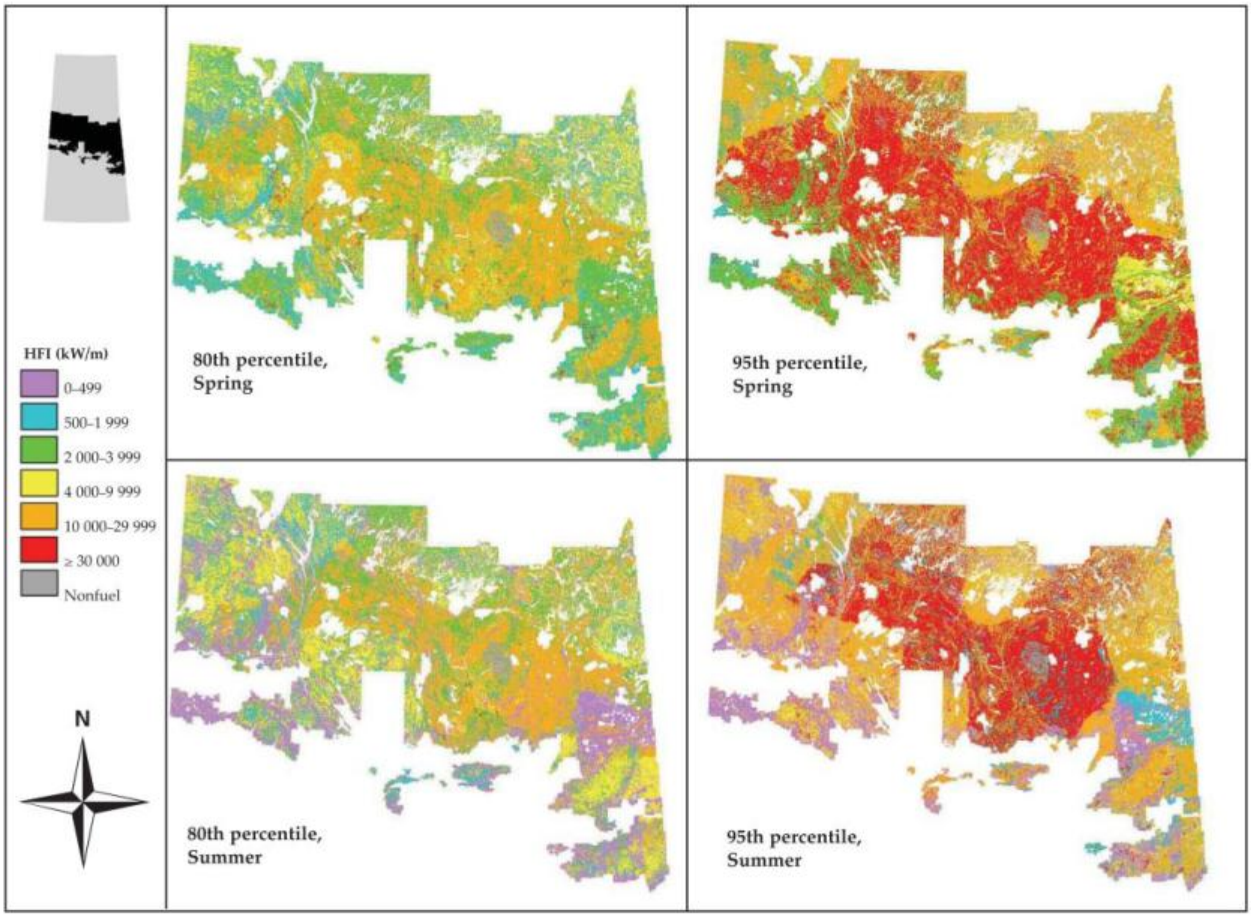


Figure 4. Head fire intensity (HFI) for the 80th and 95th percentile values (wind, temp) for spring and summer, from 1990 to 1999 (Kafka et al., CFS North. For. Cent., AB. Unpubl. Rep).

In summary, the PA FMA is expected to have a similar or lower fire cycle than the Mistik FMA because of their close proximity, a common ecoregion, a lower proportion of deciduous stands / higher proportion of contiguous conifer stands, similar or higher frequency of fire starts from lightning, and similar or higher Head Fire Index ratings.

3 Old and Very Old Seral Retention Targets (Landscape Level)

Two methods were examined for determining an age class distribution for the chosen fire cycle, a detailed modeling approach (Figure 1, Andison, 2007), and the simple negative exponential curve approach (Figure 2, Johnson and Van Wagner, 1984).

3.1 Stochastic Modeling Approach

Detailed modeling work was completed for Mistik in 2007 (Andison, 2007) and employed a landscape model with fire ignition probabilities, spatially random ignition sites, and fire sizes based on historical fire event spatial footprints, tree ages, fire scars, and release dates. This stochastic fire modeling was completed 100 times for three different fire cycles (55, 75, and 100 years) on the Mistik

FMA (55% SWD, 10% Mixedwood, 22% HWD) yielding a range of possible outcomes for each fire cycle. The range of landscape 'snapshots' associated with the 55 year fire cycle were summarized into quartiles and are shown in Figure 1 below. The middle quartiles (either side of median values) are considered to represent the natural range of variation, as the more extreme high/low quartiles are far less likely to occur.

Results show that a 55 year fire cycle produces median old seral values between 2 and 9% depending on stand types (Andison, 2007). Pure softwoods tended to have the smallest proportion of old stands (2-3%) while pure hardwoods tended to have the highest proportion of old stands (9%), and mixedwoods were in between (6%). This occurred because softwoods were more likely to burn on the landscape than hardwoods - which are more likely to escape burns.

Table 8. Natural Range Landscape Summaries for the Mistik FMA Area Using a 55-Year Average Fire Cycle (with 2005 Old forest levels in brackets)

Vegetation Class	Seral Stage	Percent Area of Each Vegetation Class					
		Below NRV	Quartile 1 of NRV	Quartile 2 of NRV	Quartile 3 of NRV	Quartile 4 of NRV	Above NRV
Pine 325,000 ha	Young	0 – 1.2	1.2 – 38	38 – 61	61 – 71	71 – 91	91 - 100
	Immature	0 – 8	8 – 21	21 – 32	32 – 46	46 – 77	77 - 100
	Mature	-	0 – 1.0	1.0 – 2.7	2.7 – 6	6 – 26	26 - 100
	Old (2.1%)	0 – 0.5	0.5 – 1.5	1.5 – 2.6	2.6 – 4.6	4.6 – 19	19 - 100
Black Spruce 631,000 ha	Young	0 – 1.1	1.1 – 37	37 – 58	58 – 69	69 – 91	91 - 100
	Immature	0 – 8	8 – 24	24 – 33	33 – 48	48 – 84	84 - 100
	Mature	-	0 – 0.8	0.8 – 2.6	2.6 – 6	6 – 26	26 - 100
	Old (2.5%)	0 – 0.4	0.4 – 1.2	1.2 – 2.0	2.0 – 3.8	3.8 – 17	17 - 100
White Spruce 30,000 ha	Young	0 – 0.6	0.6 – 33	33 – 53	53 – 66	66 – 91	96 - 100
	Immature	0 – 6	6 – 23	23 – 34	34 – 46	46 – 79	79 - 100
	Mature	-	0 – 0.9	0.9 – 2.8	2.8 – 7	7 – 26	26 - 100
	Old (13%)	0 – 0.5	0.5 – 1.6	1.6 – 2.6	2.6 – 3.8	3.8 – 14	14 - 100
Deciduous 403,000 ha	Young	0 – 6	6 – 29	29 – 43	43 – 55	55 – 86	86 - 100
	Immature	0 – 9	9 – 24	24 – 34	34 – 45	45 – 69	69 - 100
	Mature	0 – 0.2	0.2 – 2.0	2.0 – 6	6 – 11	11 – 27	27 - 100
	Old (3.3%)	0 – 2.4	2.4 – 7	7 – 9	9 – 14	14 – 33	33 - 100
Mixedwood 178,000 ha	Young	0 – 2.6	2.6 – 32	32 – 53	53 – 67	67 – 86	86 - 100
	Immature	0 – 7	7 – 23	23 – 33	33 – 45	45 – 72	72 - 100
	Mature	0 – 0.1	0.1 – 2.0	2.0 – 4.6	4.6 – 8	8 – 28	28 - 100
	Old (4.5%)	0 – 1.2	1.2 – 3.6	3.6 – 6	6 – 9	9 – 26	26 - 100

Figure 5. NRV of Age Classes by Stand Type for the Mistik FMA in a 55 Year Fire Cycle

3.2 Negative Exponential Distribution Approach

The use of the negative exponential distribution approach has also been documented as a means to approximate boreal landscape age class distributions for a given fire cycle (Van Wagner 1978, Johnson and Van Wagner, 1984). For a 50 year fire cycle, the equation is shown below along with a graph depicting % area older than a given age.

% area older than age X = exp (-[stand age / disturbance interval])

% area older than 100 years = exp(-(100/50)) = 13.5%

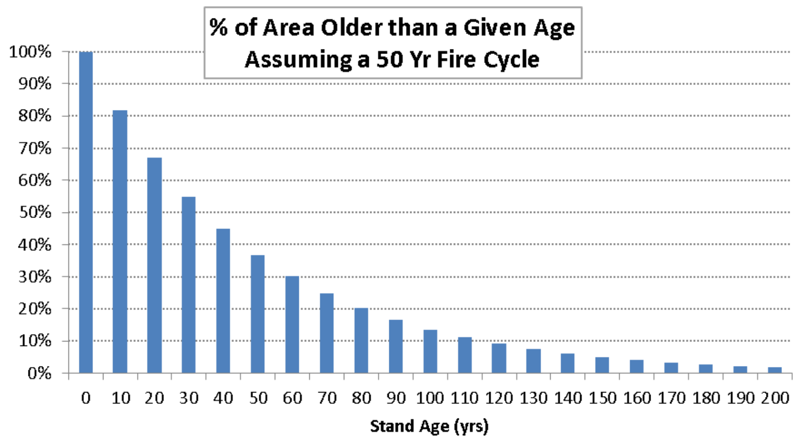


Figure 6. Graph of the % area older than a given age assuming a 50 year fire cycle (Negative Exp Approach)

This approach does not differentiate between different landscape patterns or extent of forest types/non forest and thus provides only a simple rule of thumb about age class distributions.

Proposed Seral Stage Targets

The current seral stage distribution of the PA FMA is shown in Figure 3 and reflects the fact that post-industrialization fire cycles have lengthened dramatically as there is now significant area in older age classes. As demonstrated above, long fire cycles and large proportions of old and very old stands are not within the NRV for the Boreal Plains.

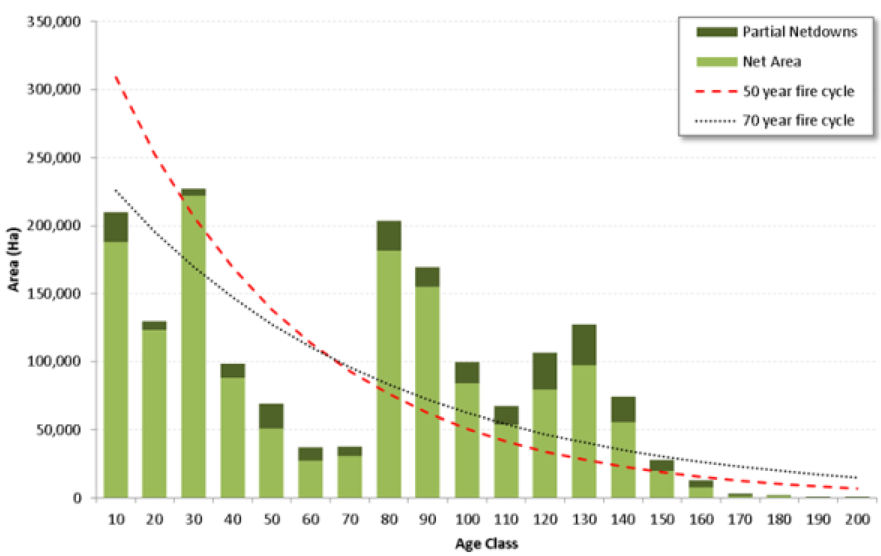


Figure 7. Current Seral Stages of the PA FMA shown against generic 50 and 70 year fire cycle age class profiles

3.3 Summary and Recommended Old Seral Targets

The results for the above mentioned methods indicate the following % old seral percent's:

- Stochastic Modeling Approach
  - Pine and Spruce = 3% Old and Very Old
  - Mixedwood = 6% Old and Very Old
  - Deciduous = 9% Old and Very Old
- Negative Exponential Curve Approach
  - Age Class 90+ (Deciduous/Jack Pine) = 16.5%
  - Age Class 100+ (Coniferous) = 13.5%

The statistical modeling approach is considered significantly more rigorous and specific to the landbase in question, while the negative exponential curve is very general and is not species specific. Sakâw has based their proposed old and very old seral stage distributions primarily on the modeling approach.

Sakâw proposes to vary from the current FMP Standard targets and use the targets outlined in Table 1.

Table 1. Seral Stage Distribution Targets for the PA FMA

Species Group Label	Description	% Old + Very Old	% Very Old
H	Hardwood stands	10%	5%
HS-SH	Mixedwood stands	8%	4%
S(BSJ+BSL)	Black Spruce and Jack Pine/Tamarak leading softwood stands	6%	3%
S(JLP)	Jack Pine leading softwood stands	6%	3%
S(WSF)	White Spruce/Balsam Fir leading softwood stands	7%	3%

For reference, the seral stage definitions used in the Standard are:

Cover Species Group	Young	Immature	Mature	Old	Very Old
H and HS (Hardwoods)	0 – 20	21 – 70	71 – 90	91 – 110	> 110
jP leading stands	0 – 20	21 – 70	71 – 90	91 – 110	> 110
S and SH (Softwoods not jP)	0 – 20	21 – 80	81 – 100	101 – 120	> 120

The proposed old and very old seral stage targets are slightly above the predicted median NRV values to address risk of losses from natural disturbances in addition to harvesting. In addition, white spruce has an additional buffer to acknowledge a regional sensitivity for old white spruce stands on the landscape, and recognize its relatively minor extent on the landbase.

Very old seral targets were set at half of the old + very old targets. Where insufficient very old stands exist on the landbase, old seral stands will age to become very old within <20 years. This target is expected to be met or achieved simply by meeting the larger old+very old target over time.

4 Stand Level Retention Targets (Block Level)

Structural complexity in managed forest stands promotes biodiversity and mimics natural disturbance patterns such as fire skips, and areas of partial mortality. Retention in harvested events is a means to ensure structure is retained in managed forests and helps deliver the required complexity for biodiversity in a managed landscape (Moussaoui et al., 2016). Fire, as the main natural disturbance force in the boreal forest, is looked to as the benchmark to determine retention types and extents. Typically this means intact tree patches or islands that the fire does not burn – often called post-fire residual patches (Moussaoui et al., 2016).

4.1 Post-Fire Residual Patches

Many studies have been conducted on post-fire residual patches, and they all indicate that fire residuals increase in number and size as the size of the fire event increases (Moussaoui et al., 2016; Araya et al., 2015; Dragotescu and Kneeshaw, 2012; Andison, 2007; Smyth et al., 2005). Most boreal studies of post-fire residual patches look at the percent of unburnt area left in a fire event, but there is no consensus on how much area is left after a disturbance event:

- A study conducted on 69 fires in northern Alberta found that fires 20-40ha had 0% residual patches, fires 40-200ha had 1% residual patches, and fires 200-400ha had 4% residual patches (Eberhart and Woodard, 1987).
- The proportion of post-fire residuals in Quebec forest fires (136-7976 ha) compared to the disturbance size was 7.3-19.1% (Dragotescu and Kneeshaw, 2012).
- In Ontario, fires <5ha had a 3% residual area and large fires had residuals patches that made up 15% of the fire disturbance area (Araya et al., 2015).
- In northern Quebec, post-fire residuals could be as little as 2% of the fire disturbance area (Madoui et al., 2010).
- A study conducted in northern British Columbia found the range of post-fire residuals in the disturbance area is 5-20% (Coates and Steventon, 1994).
- And a study that averaged numerous studies found fires <1000ha had 6% residual patches and fires >1000ha had 26% residual patches.
- Despite the range in post-fire residuals reported after fire disturbance, generally, small disturbances have lower percentages of unburnt area.

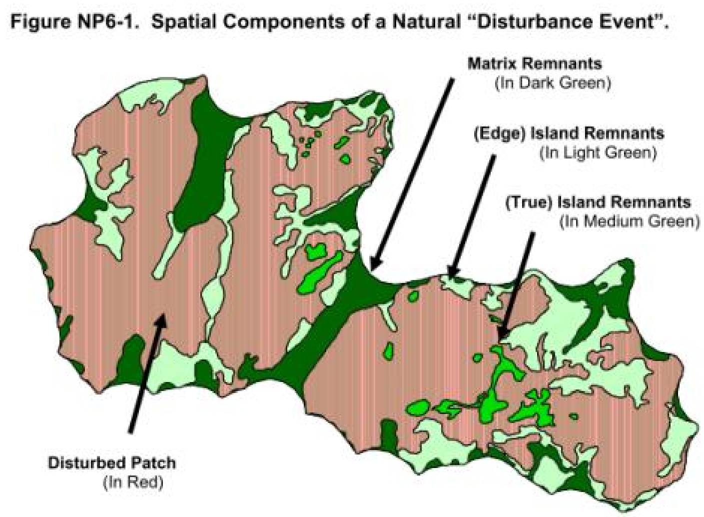
In terms of the number of residual patch areas left behind (vs area left), studies found:

- Residual patches tend to be made up of many small (<1ha) patches, clumps and individual trees, but most of the residual patch area comes from less frequent but larger patches (>1ha) (Andison, 2003).
- In the ALPAC FMA the most frequent residual size for historic fire events ranged between 0.1 and 1 ha (Andison, 2003).
- In Northern Alberta, fires <200ha had 1% of residual patches >1ha and fires >400ha had 4% of residual patches >1ha (Erbhart & Woodard, 1987).
- In Ontario 75% of residuals were <1ha (Araya et al., 2015).
- In British Columbia, residuals for fires <1000ha resulted in 49% at <2ha, 32% at 2-5ha, and 17% at 5-10ha (DeLong & Tanner, 1995).

Another consensus regarding post-fire residuals is that fires disturb and leave post-fire residuals of merchantable, non-merchantable, and non-forested areas alike (Andison, 2007). Post-fire residuals tend to be irregular shapes, and most often tend to be deciduous, treed wetlands, and areas of sparse coniferous trees (Araya et al., 2015).

Studies also recommended forest managers prioritize retention of rare features such as wetland edges, less common tree species, existing snags, riparian ecosystems, and areas influenced by water (Coates and Steventon, 1994). Retaining representative trees is important, but so is retaining important ecological features for biodiversity.

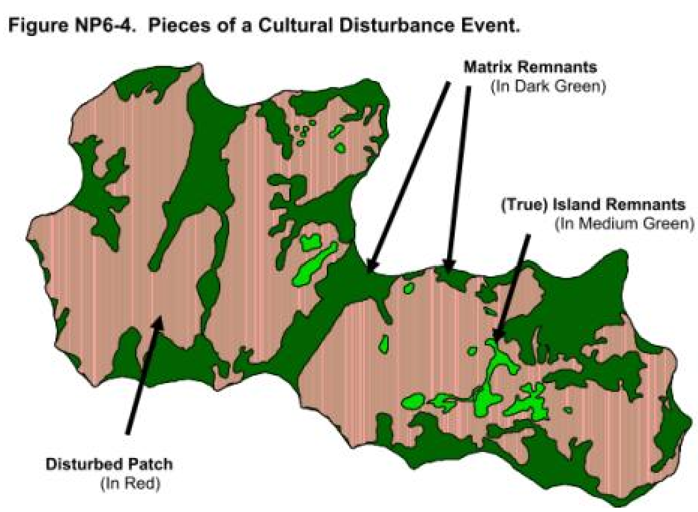
The most comprehensive and locally relevant study of post fire residuals was done in the Mistik FMA (Andison, 2007). The study found that in a typically large fire event, the total residual area averaged 35% of the event size, but only 5% could be considered true island (insular) residuals, and only 4% was considered representative merchantable timber. Figure 4 and 5, taken from the study, break down the Mistik FMA's residual patches further (Andison, 2007).



35% Total Residual Retention

- 11% Matrix Retention
- 24% Island Retention
  - 19% Partially Disturbed Edge Islands
  - 5% True Islands
    - 3% Partially Disturbed
    - 2% Undisturbed

Figure 8. Residual Components of a Natural Disturbance Event



In a harvested event, the Edge Islands become Matrix because they are partially disturbed and that does not occur in a managed disturbance event.

30% Matrix Retention

5% True Island Retention

The Island Retention is merchantable and non-merchantable timber.

Figure 9. Residual Components of a Managed (Timber Harvested) Disturbance Event

At the conclusion of this study, Andison made recommendations based on NRV findings for post-fire residuals.

Total Retention: Leave between 14 and 52% of the managed event area as retention including forested and non-forested areas

Island Retention: Leave between 3 and 7% of managed event areas as island retention (insular) including merchantable and non-merchantable timber. This is achieved as a 10 year average of harvested events, with any one event ranging from 0-20%.

Merch Retention: Leave at least 4% of the retention as representative/merchantable timber. Achieved as a 10 year average of harvested events, with any one event ranging from 0-20%.

4.2 Sakaw's Proposed Structural Retention Targets

Based on the studies above, Sakâw proposes the following alternative targets for retention at the event level.

For events with at least 20ha of harvested area (i.e. no retention if <20 ha):

- Total Event Retention is at least 9% of the harvested event area and made up of insular or proximal retention.
    - Insular Retention to be at least 4%
        - This retention must be trees in islands or clumps or singles with no connection to the block boundary.
        - This retention must be representative, merchantable timber (i.e. similar stand types to what was harvested).
    - Proximal Retention to make up the remainder (maximum 5%)
        - This retention must be forest within/adjacent to the harvest area and connected to the block boundary.
        - Retained stands must be merchantable (>= 60 m^3/ha) or if not merchantable, be approved by the Forest Service to meet the functional requirements of structural retention. Ideally, this forest captures riparian areas, wetland edges, springs, snags, species refuges, connectivity, or other forest left for non-timber values.
- Targets to be met on each event at the completion of harvesting, (e.g. variation can occur at the block level but not at the event level).

Figure 10, taken from the Draft FMP Standard, demonstrates the different retention types.

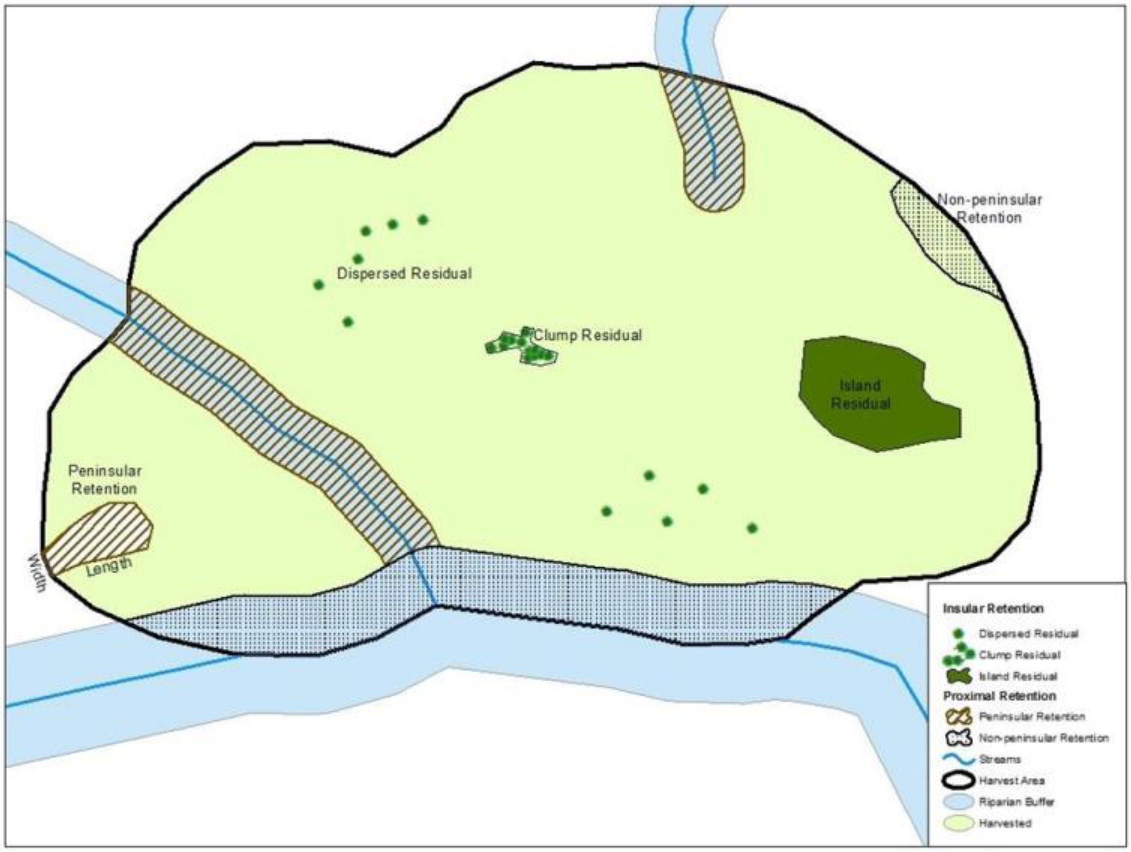


Figure 10. Example of Retention Types (from Draft FMP Standard, March 31, 2017)

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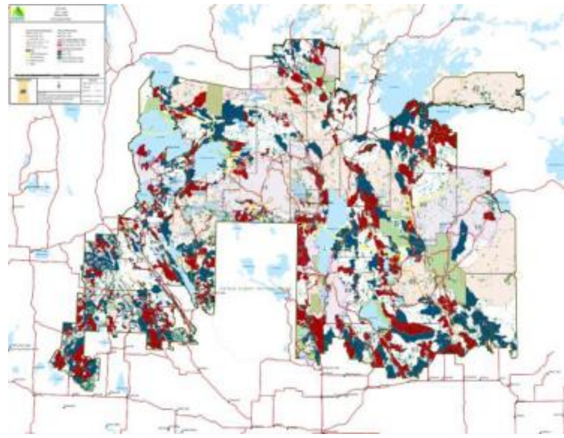
Appendix E Tactical Plan Maps

Overview Map (1:300,000 scale)

TacticalPlan_2018_2038_300K_E_L.pdf



Forestry Maps (31 maps covering the FMA at 1:50,000)

Unit01_TacticalPlan_2018_50K_E_P_Final.pdf
Unit02_TacticalPlan_2018_50K_E_P_Final.pdf
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Unit04_1of2_TacticalPlan_2018_50K_E_P_Final.pdf
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Unit05_1of2_TacticalPlan_2018_50K_E_P_Final.pdf
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Unit26_TacticalPlan_2018_50K_E_P_Final.pdf
Unit27_TacticalPlan_2018_50K_E_P_Final.pdf
Unit28_1of2_TacticalPlan_2018_50K_E_P_Final.pdf
Unit42_TacticalPlan_2018_50K_E_L_Final.pdf

Appendix F Public Engagement Report

Public Engagement Report

Volume II - Draft Forest Management Plan (2018-2038)

for the

Prince Albert Forest Management Agreement Area

January 2018

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ASKIY MANAGEMENT INC.

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Introduction

Sakâw Askiy Management Inc. is the corporation that holds the Forest Management Agreement for the Prince Albert Forest Management Agreement (PA FMA) area. It is a consortium of several shareholders with broad geographic, industrial and cultural representation, and 44% aboriginal ownership.

This document describes the processes used to share information and gather feedback about the strategies in Volume II of a long-term Forest Management Plan 2018-2038 (FMP) being developed for the PA FMA area. Volume II of the FMP provides a detailed plan of how forest management activities will be undertaken, along with a Tactical Plan that identifies general locations where forest harvesting is expected to occur during the term of the plan. It provides high level guidance for the preparation of operating plans, and measurable indicators to assess consistency with strategic objectives.

The requirements guiding the public engagement process used when developing the FMP are found in the Forest Management Planning Standard[1] and in the Public Consultation Plan for the 2018-2038 FMP.[2]

Activities carried out to ensure communities, stakeholders and Aboriginal people were aware of and engaged in the development of Volume II of the FMP included:

- A Public Advisory Group (PAG) meeting
- Thirteen public and Aboriginal information sessions held across the FMA area, and
- An information session for independent Third Party Operators who also harvest wood in the PA FMA area.

Public Advisory Group (PAG) Meeting

A Public Advisory Group (PAG) was formed in 2013 near the beginning of the FMP development process. The PAG met 3-4 times a year until mid-2015, when development of the FMP went into a hiatus while forest management issues and a new FMP standard were being worked on.

The group reconvened on May 31, 2017 for an update and to review proposed strategies for FMP Volume II. The topics covered at that meeting were:

- Update on the process to complete the FMP and associated timelines
- Input on progress to date on developing Values, Objectives, Indicators, and Targets (VOITs) to be measured
- Input on the caribou habitat management strategy
- Update on the old and very old retention strategy
- Update on last two years of harvesting and silviculture activities

The meeting invitation, attendance list, and presentation used at the meeting are found in Appendix 1.

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[1] Forest Management Planning Standard. September 5, 2017. http://publications.gov.sk.ca/documents/66/86843-Forest%20Management%20Planning%20Standard.pdf

[2] Public Consultation Plan. August 2017 revision.

A lot of information was covered during the meeting, and there were questions and discussion. There were no concerns identified that resulted in a change to any of the FMP strategies presented. A commitment was made to go on a field trip with the PAG members to look at aspects of forest management covered by the FMP strategies, such as riparian area and retention practices.

That field tour took place on September 20, 2017. Unfortunately, only 2 PAG members attended. Vehicles left from Prince Albert and travelled north up Highway 2 to the following stops:

Island Lake IBR
- 1998 harvest area and regeneration
- 1984 planting and 1990 cleaning
- 2016 harvest area

MacLennan River Harvest Area
- 2017 harvest area
- riparian management area (a drone was used to provide an overhead view along the stream)
- visual quality objectives

Elk Ridge FireSmart Fuel Break

Information Sessions

Thirteen public and Aboriginal information sessions at which FMP Volume II was discussed were held across the FMA area in the fall of 2017. An information session was also hosted for independent Third Party Operators who carry out forest harvesting on the PA FMA area, and Third Party Operators also attended some of the public sessions. The schedule for these information sessions is shown in Table 1.

Table 1. Schedule of information sessions

Date	Community	Time	Location
Mon., Oct. 16, 2017	Dore / Sled Lake	1 pm - 3 pm	Dore Lake Town Hall
	Big River	6 pm - 9 pm	Big River Community Center
Tues., Oct. 17, 2017	Emma, Anglin, Christopher Lk(s)	10 am - 12 pm	Christopher Lake, RM Office
	Little Red River, La Ronge Band	2 pm - 4 pm	Little Red River, Band Office
	Prince Albert	6 pm - 8 pm	Prince Albert, Travelodge,
Wed., Oct. 18, 2017	Duty to Consult Meeting	9 am – 11 am	Travelodge, Prince Albert
	Candle & Whiteswan Lake(s)	1 pm - 3 pm	Candle Lake, Community Hall
	Third Party Operators	6 pm - 8 pm	Prince Albert, Forest Center
Thurs., Oct. 19, 2017	Weyakwin	9 am - 11 am	Weyakwin, Mochikum Hall
	Montreal Lake	1 pm - 3 pm	Montreal Lake, Arena
Fri., Oct. 20, 2017	Chitek Lake	1 pm - 3 pm	Chitek Lake, Community Hall

Wed., Oct. 25, 2017	Hall Lake, Lac La Ronge Band	1 pm - 3 pm	Hall Lake, Band Office
Mon., Oct. 30, 2017	Candle Lake	10 am - 12 pm	Candle Lake, Town Office
Thurs., Nov 9, 2017	Lac La Ronge Indian Band Lands & Resources Management Board	11 am - 12 pm	La Ronge, Band Office

Both FMP Volume II (2018-2038) and the draft 2018-2023 Operating Plan were discussed at these events. A presentation on the forest management strategies in Volume II was the focus of the FMP portion of these sessions, except for the meeting at Hall Lake, and an overview Tactical Plan map was displayed at all of them.

The information sessions were advertised in newspapers that reached communities within and adjacent to the PA FMA area, on local radio stations, and on internet news (PA Now). Posters and personalized letters of invitation were also sent by regular or registered mail to 375 First Nations and Métis communities and contacts, outfitters, trappers, cabin owners, forest industry operators, municipalities, politicians, business owners, and interested public.

Copies of the poster and letter sent, information about the advertising done, contacts for the PA FMA area that the letters were mailed to, participants who signed the registration sheet at each session, and the FMP presentation given are provided in Appendix 2.

Sign in sheets and comment forms were available near the door at each meeting. There were several people at the larger meetings that did not see or sign the registration sheet. No one took advantage of the opportunity to leave written comments.

The Sakâw Askiy website (www.Sakâw .ca) continues to be an important way to make current information about Sakâw and the planning and operational activities on the Prince Albert FMA area available to the public and local people. A schedule of the public information meetings was posted on the Sakâw website (home page, "What's New" section), and the FMP presentation given at the public sessions was also posted there after the meetings. The website also has a public repository that contains a summary of the current FMP (2000 – 2020) and all working documents for the draft new FMP (2018 – 2038).

Summary of FMP Input and Sakâw's Response

Most discussion and input at the information sessions focused on the near-term operational activities that would fall under the new FMP, rather than the FMP strategies themselves. While people were interested in the FMP and appreciated hearing about the longer-term plan for the area, their main reason for attending an information session was to discuss the immediate operating plans that might affect them. Therefore the FMP presentation was moved to the end of each session, after people's immediate interests had been addressed.

People seemed to understand and agree with the reasons for clustering harvest in events instead of "being everywhere all the time". The caribou zones were of interest, and several people took the opportunity to compare the zones to where they had sighted caribou in the past.

When the Draft Range Plan for Woodland Caribou in Saskatchewan was released on October 30, 2017 there was a question about how the caribou habitat management plan in FMP Volume II was aligned with it. Sakaw considered the current habitat condition and critical areas in developing caribou habitat management strategies included in Volume II. Draft tactical plan and general development areas were provided earlier in the caribou range planning process to help guide Fish, Wildlife and Lands Branch in the establishment of caribou habitat management areas.

Other issues discussed are handled through mechanisms that are operational in nature. For example, the hydrological impacts of harvesting are dealt with in operating plans. If planned disturbance levels in a watershed will exceed science-based threshold disturbance levels, mitigation measures such as the re-design of roads or harvest areas are identified. Similarly, impacts from loss of wildlife habitat that is important for trapping or damage to traps are mitigated by reviewing draft operating plans with trappers and other land users *before* they occur, so that potential land use conflicts can be resolved.

No existing FMP strategies were changed, and no new strategies were added to FMP Volume II as a result of discussions that occurred at the PAG meeting or the information sessions. Similarly, no changes were made to the tactical areas as a result of the feedback obtained during those meetings.

Conclusions

It was possible to delve more deeply into the details of Volume II strategies with PAG members, because the PAG is an ongoing committee that has worked with Sakâw since the start of the FMP development process.

Covering both the operating plan and the FMP strategies at public information sessions worked well. Attendance was good in most of the communities visited. The right people were there to discuss details about both types of plans (short-term and long-term), and the most efficient use of everyone's time was made. Most participants attended to find out if there were any immediate harvesting plans in their area, and many details in draft operating plans were modified as a result of the discussions that occurred. Once the more immediate plans had been discussed, many people were also interested in knowing about the longer-term plan for the FMA area.

Alignment of Third Party Operator activities with the forest management strategies in the FMP will need to occur at the operating plan level.

Appendix 1: Public Advisory Group Meeting - May 31, 2017

Meeting Invitation

FORSITE
Forest Management Specialists

May 5, 2017

RE: Public Advisory Group for Prince Albert FMA

Dear Public Advisory Group Member,

Sakâw Askiy Management Inc. (Sakâw) is restarting the Forest Management Planning process and will be holding a Public Advisory Group (PAG) meeting on **May 31, 2017** at the **Prince Albert Travelodge** starting at **2:00 pm**.

This meeting is designed to update the PAG and seek input on progress to date on components such as the Values, Objectives, Indicators, and Targets (VOITs); and the Caribou strategy. Other topics for discussion will be:

- Update on the Old and Very Old retention strategy
- Update the process to complete the plan and associated timelines
- Update on last two years of harvesting and silviculture activities
- Provide a "state of the industry" overview and softwood lumber update
- Discuss a potential field tour in September

Sakâw anticipates presenting the draft plan to the PAG this fall.

Please refer to www.sakâw.ca for more information.

Public and stakeholder consultation is vital to this planning process. Please confirm your willingness to remain on the PAG by registering for this meeting by contacting me at (306) 961-8933 or dsande@forsite.ca.

Please feel free to contact me at dsande@forsite.ca or Cam Brown cbrown@forsite.ca with any further questions. Thank you for your consideration.

Yours truly,

Darryl Sande, RPF
Saskatchewan Operations Manager

Meeting Attendance

Dave Knight	Wapski
Ron Cherkewich	Candle Lake
Sarah Schmid	Prince Albert Model Forest / CPAWS
John Teer	RM of Big River
Doug Panter	RM of Big River
Wayne Cowan	City of Prince Albert
Don Cody	City of Prince Albert
John Stauffer	District of Lakeland 52
Hailey Leonardis	Saskatchewan Forestry Association
Gord Vaadeland	CPAWS
Ken Cantin	Sask. Wildlife Association
Robert Follett	Mistik Management
Ed Kwiatkowski	Carrier Forest Products
Nadine Penney	Forest Service Branch
Darryl Sande	Kaskew / Forsite
Cam Brown	Forsite

Presentation on FMP Volume II

Prince Albert FMA
Forest Management Plan

Management Strategies Meeting May 31, 2017

Prince Albert Forest Management Area (PA FMA)
Sakâw Askiy Management Inc.

Outline

- Sakaw Management Update
- FMP Timeline and Updated Draft FMP Standard
- Natural Forest Patterns
  - Old and Very Old Forest
  - Forest Retention
- Caribou Management Plan
- Pulp Supply
- Operations Update

Sakaw Management Update

- Previous GM was released in April 2017
- New Interim GM was appointed while search occurs
  Diane Roddy (Acting GM)
  GM@sakaw.ca
  (306) 953-2021
- Cam Brown (Forsite) tasked with getting FMP finished

FMP Timeline

- Last PAG meeting was June 2015 (almost 2 years ago)
- Long delay occurred when previous GM chose to slow down work on FMP while new FMP Standard was being developed.
  - Oct 2015 – Forest Service asked for more Pulp volume
  - FMP Standard revisions/discussion occur through 2016.
  - Nov 2016 - Forsite completes Economic Assessment of draft FMP Standard
  - Dec 2016 - Sakâw submits a new Workplan (FMP done Aug 2017)
  - Jan-Feb 2017 - Timber Supply work on meeting pulp target
- Significant work restarts in March 2017
- New workplan developed (FMP done by Feb 2018)

FMP – Current Status

- Finalizing strategies:
  - Old seral retention
  - Stand level retention
  - Caribou
  - Pulp
- Then:
  - Finalize Volume 2 document
  - Public and FN Review/Comment

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FMP Guiding Principles

1. Ecosystem Based Management
   - An approach to managing human activities that seeks to ensure the coexistence of healthy, functioning ecosystems and human communities
   - The intent is to maintain spatial and temporal characteristics of ecosystems such that species and ecological processes can be sustained, and human wellbeing supported and improved
2. Adaptive Management / Continual Improvement
3. Sustainable Forest Management
4. Public Involvement / Transparency
5. Accountability to government and stakeholders

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FMP Key Considerations

- Natural Forest Patterns (NFP)
- Wildlife (Caribou, Moose, Fisher, etc)
- Visual Management
- Water / Fish / Riparian Management
- Trapper / Outfitter
- Species at Risk
- Climate Change
- Losses to Fire / Pest / Disease / Wind

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NATURAL FOREST PATTERN MANAGEMENT

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Natural Forest Patterns

- Mimicking natural processes will help create conditions to maintain biodiversity
- Fire is the natural disturbance agent of the boreal forest
- Aiming to manage the forest to maintain similar landscape conditions that existed histroically (pre-industrial)

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OLD AND VERY OLD FOREST

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Current FMP Standard

- **Target: Maintain 15% old and very old forest**
- **Target: Maintain 5% very old forest**

- Based on a 70 yr fire cycle
- Does not differentiate based on species of geography

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Historical Fire Cycle

- Fire cycles are the length of time it takes for an area-equivalent of a region to burn once
- Fire cycles influence the age of the forests on the landscape
  - Trees do not get as old with shorter fire cycles
  - Current fire cycles are much longer than pre-industrial fire cycles because of fire suppression activities
- Our goal is to ensure forest management maintains landscapes consistent with pre-industrial conditions by mimicking the disturbance of historic fire cycles

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Historical Fire Cycle

- Scientific studies done on the boreal forest surrounding the PA FMA have the following historical fire cycle results:
  - Immediately west of the PA FMA in SASK = 33-65 years
  - Northwest of the PA FMA in AB = 40-60 years
  - PA National Park = 45-150 years
  - 1999 PA FMA = 30-50 years
- **Sakâw is proposing to use a historical fire cycle of 50 years**
  - Helps to set the amount of old and very old forest maintained on the landscape

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Andison 2007 – 55 Year Fire Cycle

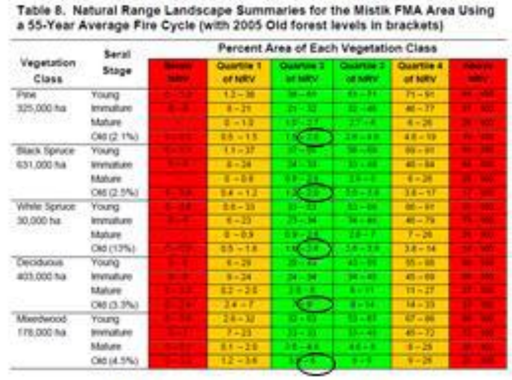

Table 8. Natural Range Landscape Summaries for the Mistik FMA Area Using a 55-Year Average Fire Cycle (with 2005 Old forest levels in brackets)

Vegetation Class	Seral Stage	Percent Area of Each Vegetation Class					
		[illegible]	Quartile 1 of NRV	Quartile 2 of NRV	Quartile 3 of NRV	Quartile 4 of NRV	[illegible]
Pine 325,000 ha	Young	[illegible]	12 – 38	[illegible]	[illegible]	71 – 91	[illegible]
	Immature	[illegible]	8 – 21	21 – 32	[illegible]	[illegible]	[illegible]
	Mature	[illegible]	0 – 1.5	[illegible]	[illegible]	6 – 26	[illegible]
	Old (2.1%)	[illegible]	0.5 – 1.5	[illegible]	[illegible]	[illegible]	[illegible]
Black Spruce 631,000 ha	Young	[illegible]	11 – 37	[illegible]	[illegible]	[illegible]	[illegible]
	Immature	[illegible]	8 – 28	[illegible]	[illegible]	[illegible]	[illegible]
	Mature	[illegible]	0 – 0.8	[illegible]	[illegible]	6 – 28	[illegible]
	Old (2.5%)	[illegible]	0.4 – 1.2	[illegible]	[illegible]	[illegible]	[illegible]
White Spruce 30,000 ha	Young	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Immature	[illegible]	6 – 23	[illegible]	[illegible]	46 – 79	[illegible]
	Mature	[illegible]	0 – 0.9	[illegible]	[illegible]	7 – 26	[illegible]
	Old (13%)	[illegible]	0.5 – 1.8	[illegible]	[illegible]	3.8 – 14	[illegible]
Deciduous 403,000 ha	Young	[illegible]	6 – 29	[illegible]	[illegible]	[illegible]	[illegible]
	Immature	[illegible]	9 – 24	24 – 34	[illegible]	[illegible]	[illegible]
	Mature	[illegible]	[illegible]	[illegible]	[illegible]	11 – 27	[illegible]
	Old (3.3%)	[illegible]	2.4 – 7	[illegible]	[illegible]	14 – 33	[illegible]
Mixedwood 178,000 ha	Young	[illegible]	2.4 – 32	[illegible]	[illegible]	[illegible]	[illegible]
	Immature	[illegible]	7 – 23	[illegible]	[illegible]	[illegible]	[illegible]
	Mature	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Old (4.5%)	[illegible]	1.2 – 3.6	[illegible]	[illegible]	[illegible]	[illegible]

Table taken from Andison, 2007

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Old Associated with a 50 Year Fire Cycle

- Andison Quartile Approach (top end of 2nd Quartile or median)
  - Pine/Spruce: **3%** Old + Very Old
  - Mixedwood: **6%** Old + Very Old
  - Deciduous: **9%** Old + Very Old
- Negative Exponential Curve Approach (Generic)
  - 16.5% O+VO (Mixed/Decid), 14% O+VO (Pine/Spruce)

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Proposed Seral Targets

- **Considering both approaches, with Andison's being more rigorous and more species specific, proposed values are:**

Species Group Label	Description	% Old + Very Old	% Very Old
H	Hardwood stands	**10%**	5%
HS SH	Hardwood leading mixedwood stands	**8%**	4%
S(BSJ+BSL)	Black Spruce and Jack Pine/Tamarack leading softwood stands	**6%**	3%
S(JLP)	Jack or Lodgepole Pine leading softwood stands	**6%**	3%
S(WSF)	White Spruce/Balsam Fir leading softwood stands	**7%**	3%

- Values are increased slightly from Andison findings to address risk of losses from natural disturbances in addition to harvesting.
- wS increased more than others due to lower absolute areas.

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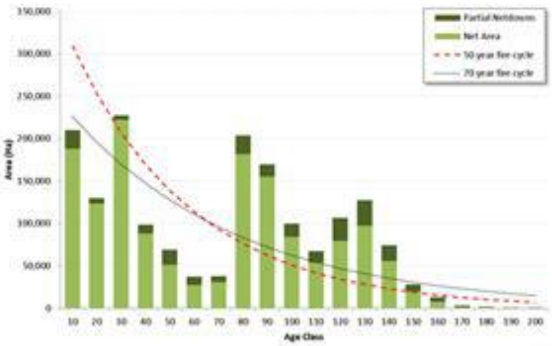
Proposed Forest Ages



Current Forest Ages of the PA FMA

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FOREST RETENTION

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Current VOIT Target

- Criterion 1.0: Biological Diversity
  - Element 1.1: Ecosystem Diversity
    - Value 1.1.1: Natural Range of Variation
      - Objective 1.1.1.1: Conservation of the biological diversity of SASK's forests
        - Indicator 4: Tree retention after harvest (includes salvage operations)
- **Target: The retention area of live representative tree residuals for each harvest event shall be ≥9% of the total harvested area. Up to 3% can be proximal retention.**

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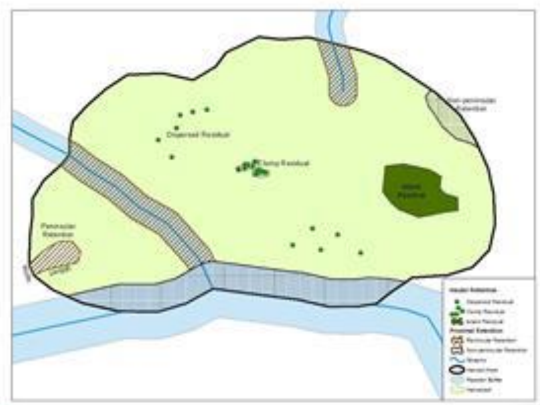
Insular vs Proximal Retention



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Post-Fire Residual Patches

- Managed stands need to provide structural complexity to maintain biodiversity
  - Structural complexity can be achieved through retention
- Fire regimes are the natural disturbance agents that drive NFPs for the boreal forest
- Fires leave behind residual unburnt patches that provide structural complexity

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Post-Fire Residual Patches

- Forest managers can model retention after fire residuals and subsequently maintain the NRV and biodiversity

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Post-Fire Residual Patches

- A number of studies have been conducted to analyze post-fire residual patches:

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Post-Fire Residual Patch Studies

- **Number of small islands (≥1ha) is high but area is small**
  - In Northern Alberta fires (Erbhart 1987):
    - <200ha – 1% of residual patches >1ha
    - >200ha – 4% of residual patches >1ha
  - In Ontario fires (Araya et al., 2015)
    - 75% of residuals were <1ha
  - In British Columbia fires (DeLong & Tanner, 1995)
    - <1000ha – 49% <2ha, 32% 2-5ha, and 17% 5-10ha
  - ALPAC FMA fires were analyzed (Andison, 2003)
    - The most residual patches were <1ha (clumps and individual trees)
  - Mistik's FMA fires were analyzed (Andison, 2007)
    - Average 35% of event is residual patches (forest and non forest)
    - Only 5% considered true island remnants

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Post-Fire Residual Patch Studies

- **Fires do not just leave merchantable timber behind**
  - In the Mistik FMA study done in 2007
    - 35% = the average total retention for fire events
      - 10% – non contributing landbase, 2% – non forested landbase
      - Remaining 23% is contributing landbase composed of both merchantable and non merchantable timber
    - **At least 4% retention of the harvest event area is recommended to be representative merchantable timber**

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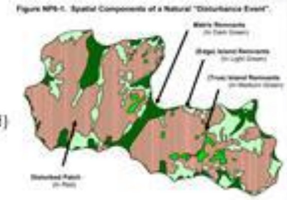
Andison 2007 - Mistik NFP Study

- 35% Retn in Avg Fire Event
  - 11% Matrix (undisturbed)
  - 24% Island
    - 19% edge islands (partially disturbed)
    - 5% true island
      - 3% partially disturbed
      - **2% undisturbed**
- Equivalent Avg Harvest Event
  - Disturbed edge islands → Matrix
  - 30% Matrix (forest/non forest)
  - 5% True Island Remnants (merch/non)



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Andison 2007 - Mistik NFP Study

- His proposed approach (pg 124-125):
- Between 14-52% of total event areas to be retention/residuals
  - Includes all forest and nonforest
- Between 3-7% (5%) of event area to be in islands/insular patches
  - Includes merch and nonmerch stands
  - Met as 10 year average, any one event can be 0-20%
- 4% representative merch timber
  - 10 year average, any one event 0-20%

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Post-Fire Residual Patch Conclusions

- Variation in size, shape, and location of residuals is important
- Retaining representative trees is important but so is retaining important ecological features for biodiversity
- Fires leave a range of age classes behind - not just mature merchantable timber.
- Small fire areas (<40 ha) tend not to have residual patches, above this, residual patch area increases with fire size
- Residuals tend to be many smaller patches but the bulk of the area comes from fewer larger patches.

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Managed Forest Retention

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Managed Forest Retention

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Proposed Targets for Structural Retention

1. For events >40 ha: 9% of event retained as:
   a. Insular Retention (6%)
      - Forest that is interior to the harvest opening (true islands)
      - **4% must be representative , merchantable timber**
      - 2% can be non representative, non merchantable timber that provides for habitat/biodiversity values or future/rotational structure (>30 yrs old)
   b. Proximal Retention (3%)
      - Forest within/adjacent to harvest area and connected to boundary
      - Will be a combination of contributing and non-contributing forest such as riparian areas, wetland edges, springs, snags, species refuges, connectivity, and/or future structure (>30 yrs old)

- Timber Supply Impact Estimate = 4%
  - Remainder in non-merch or overlaps with other netdowns

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CARIBOU HABITAT MANAGEMENT

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Caribou Strategy Developed in 2015

- Interim strategy meant to preserve options for range plan
  - 7 areas of high value habitat – harvest deferred for 20 years
  - NFP management (larger events to avoid fragmentation)

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PA FMP Meeting: May 31, 2017

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Federal Recovery Strategy

- Caribou need 65% undisturbed habitat to ensure 60% survival
- Disturbed is:
  - Young forests (<40 years) created by natural or human disturbance
  - 500m buffer on harvest blocks
  - 500m buffer on linear features: roads, seismic lines, well sites, etc.
- PA FMA affects the Boreal Plain Range (SK2) caribou population
  - Classified as over disturbed (>35%) with a population that is not self-sustaining because there is no population size or growth data

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Federal Recovery Strategy

- Shortcomings of federal methodology:
  - Analysis at coarse national scale results in broad assumptions
  - Assumptions are cautious and lead to highest level of protection
  - Area-specific management plans are needed to refine assumptions
    - Buffers should change as the area becomes less risky to caribou
    - The PA FMA has a proposed pre-industrial fire cycle of 50 years
      - The resulting forest ages from a 50 year cycle – 45% older than 40 years
      - Keeping 65% of the habitat >40 years and undisturbed is outside the NRV that caribou experienced on a pre-industrial landscape
    - The definition of disturbance or proportion of the landscape that is undisturbed requires adjustment for SASK's boreal forest

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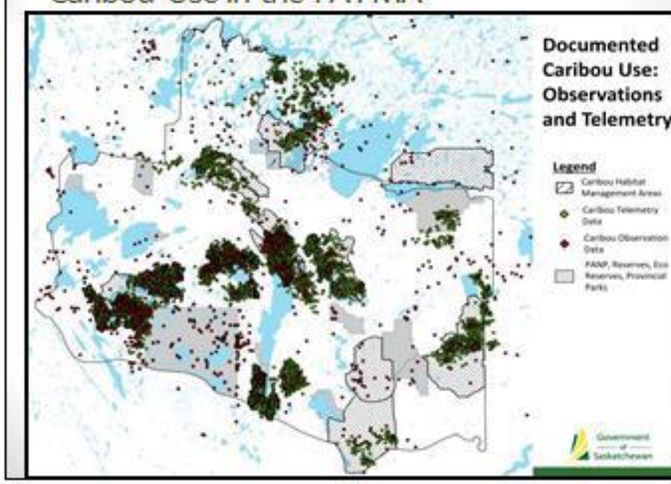
Caribou Use in the PA FMA



Management Strategies Meeting May 31, 2017

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Proposed Caribou Plan

- Building on the Pasquia-Porcupine FMA approved caribou plan
- The proposed plan addresses three caribou management zones:
  1. Current High Value Habitat
     - Harvest deferred for 20 years
     - Restoration of existing prioritized linear features (MOE ID and funds)
  2. Near Term/Future Habitat
     - Harvest encouraged for 10 years to finish areas, then deferred for 20
     - Any new linear features to be restored within 2 years post-harvest
     - Restoration of existing prioritized linear features (MOE ID and funds)
  3. FMA Range (entire caribou range in FMA, including zones 1 and 2)
     - Limit disturbed area to <35% of the gross area
     - Disturbance defined as <30 years old
     - Disturbance buffers defined based on risk of impacting caribou habitat

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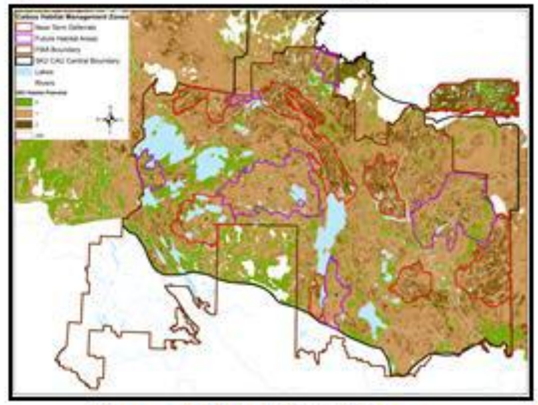
Proposed Caribou Plan: Polygons



Proposed Caribou Habitat Maintenance

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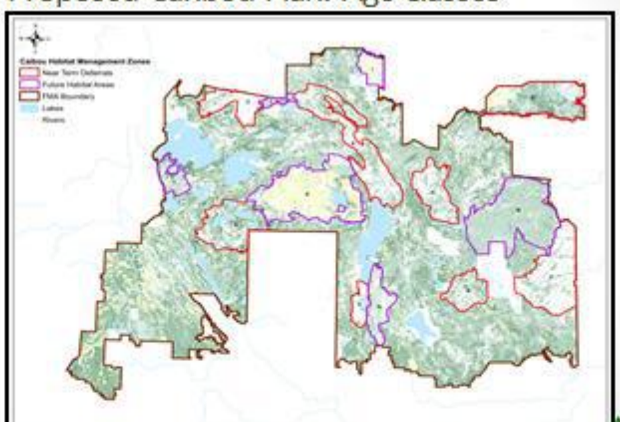
Proposed Caribou Plan: Age Classes



Proposed Caribou Management Zones

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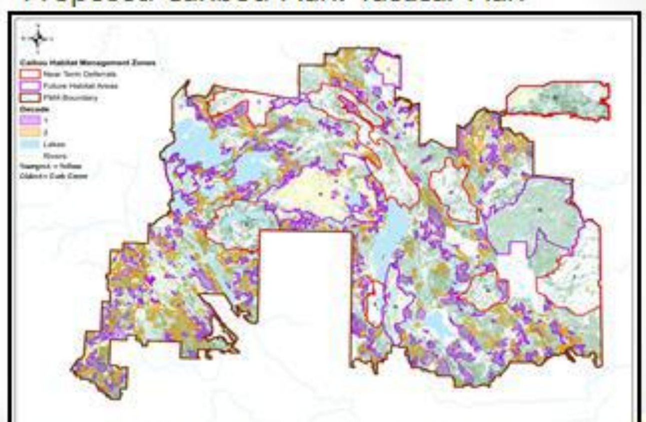
Proposed Caribou Plan: Tactical Plan



Proposed Tactical Plan with Age Classes

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Proposed Caribou Plan: Disturbance

- Disturbance based on <30 year old stands
  - Equivalent to natural disturbance regime that will give ~65% undisturbed

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Proposed Caribou Plan: Disturbance Buffer

- Buffers based on Pasquia-Porcupine FMA Caribou Plan
  - 500m on highways, rail lines, utility lines with brushing (<7 yrs)
  - 500m on permanent logging camps, mine sites, communities, etc.
  - 250m on groomed snowmobile trails, all season roads, other utility lines
  - 100m on secondary/tertiary haul roads (Class 2, 3)
  - 0m all trails/in-block roads
  - 500m on cutblocks <7 years old
  - 250m on spruce leading blocks 7-20 yrs
  - 250m on other species leading 7-14 yrs
  - 0m on older regenerated blocks

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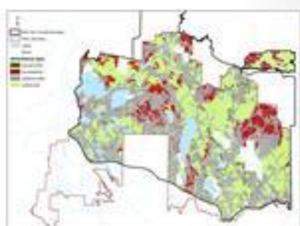
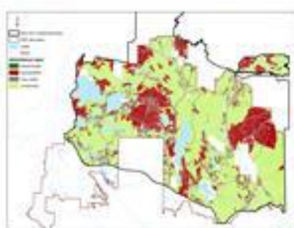
May 31, 2017

2017 Disturbance

- 500m Buffers on all trails, roads, and blocks, < 40 yrs old is distrubed
  - 43% disturbed (FMA SK2)



- Risk Based Buffers on roads/blocks, <30 yrs old is disturbed
  - 30% disturbed (FMA SK2)



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PA FMP Meeting May 31, 2017

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Proposed Caribou Plan: BMPs

- FMA Range Best Management Practices
  - Use winter roads to limit linear feature creation
  - Reclaim roads ASAP after harvest
  - Reclaim roads adjacent/nearby to any roads currently being reclaimed where funding and approvals are provided by MOE
  - Avoid fire salvage adjacent to treed peatland/peatland complexes
  - Log large patches instead of multiple small to lower disturbance
  - Prioritize harvesting in areas already disturbed
  - In Zone 2 (Future Habitat) use planting prescriptions that promote rapid re-establishment of caribou habitat
  - Manage access of hunters and poachers on roads using regulated earthen berms

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PA FMA OPERATIONS

Management Strategies Meeting May 31, 2017

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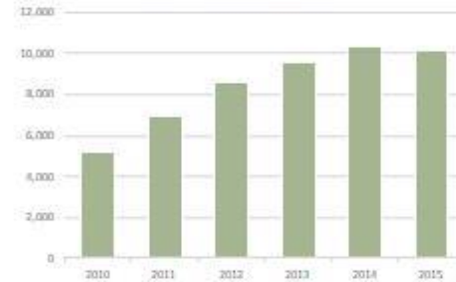
Harvested Area (ha) by Year

Harvest Year	Harvested Area (ha)
2010	5,226
2011	6,938
2012	8,622
2013	9,525
2014	10,290
2015	10,104
Grand Total	50,705



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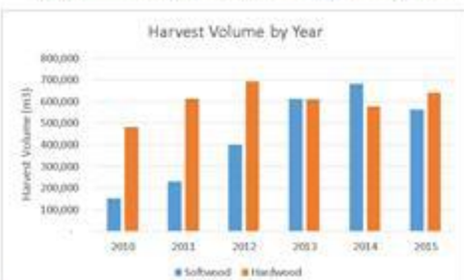
Harvested Volumes (m^3) by Year

Row Labels	Small Sawlog	Large Sawlog	Softwood Pulp	Hardwood
2010	69,608	58,678	25,253	480,768
2011	102,501	90,882	36,412	612,209
2012	168,488	174,680	58,198	693,400
2013	292,060	247,721	71,133	609,129
2014	288,594	303,35	88,701	578,177
2015	230,587	251,267	79,891	640,396
Grand Total	1,151,838	1,126,583	359,588	3,614,080



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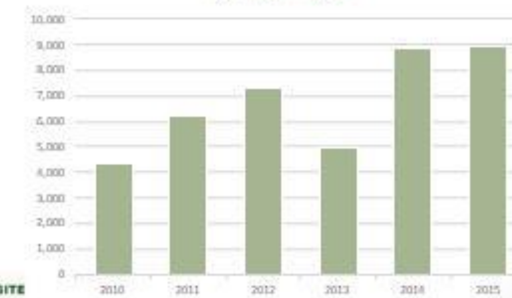
Area (ha) Reforested by Year

Treatment Year	Area (ha)
2010	4,342
2011	6,197
2012	7,321
2013	4,928
2014	8,831
2015	8,921
Grand Total	40,541



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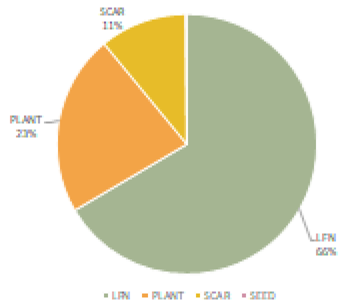
Type of Reforestation (2010-2016)

Reforestation Type	Area (ha)
Leave For Natural	26,964
Plant	9,128
Scarification	4,393
Seeded	55
Grand Total	40,541



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QUESTIONS?

www.sakaw.ca

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Appendix 2: Public Information Sessions

Poster Advertising Public Information Sessions

SAKÂW
ASKIY MANAGEMENT INC.

134 - 1061 Central Ave.
Prince Albert SK S6V 4V4
Phone: (306) 953-2021

Public Information Sessions

Draft Forest Management Plan
and 2018 – 2023 Operating Plan
Sakaw Askiy Management Inc.

Sakâw Askiy Management Inc. holds the forest management license for the Prince Albert forest area. The license gives our shareholders access to harvest wood for forest products mills and requires that good forestry practices, including forest renewal, be followed. Our shareholders are Agency Chiefs (AC) Forestry, Carrier Forest Products, Edgewood Forest Products, L&M Wood Products, Meadow Lake Mechanical Pulp, Montreal Lake Business Ventures, NorSask Forest Products, and Tolko Meadow Lake OSB Division.

As part of our commitment to engage with stakeholders and local communities Sakâw Askiy is holding the following public information sessions to seek your comments on a draft long-term Forest Management Plan for the whole forest area, and a draft Operating Plan for the 2018-2023 period. These sessions will start with a presentation on the draft Forest Management Plan, and the draft Operating Plan and maps will be available to discuss with staff in an open house format.

Community	Time	Location
Monday October 16, 2017		
Dore/Sled Lake	1 pm – 3 pm	Dore Lake Hall
Big River	6 pm – 8 pm	Big River Community Centre
Tuesday October 17, 2017		
Emma, Anglin & Christopher Lake(s)	10 am – 12 pm	Lakeland RM Office, Christopher Lake
Little Red River, La Ronge Band	2 pm – 4 pm	Little Red River Band Office
Prince Albert	6 pm – 8 pm	Travelodge, Prince Albert
Wednesday October 18, 2017		
Candle & White Swan Lake(s)	1 pm - 3 pm	Candle Lake Hall
Thursday October 19, 2017		
Weyakwin	9 am– 11 am	Mochikum Hall, Weyakwin
Montreal Lake	1 pm - 3 pm	Montreal Lake Band Office
Friday, October 20, 2017		
Chitek Lake	1 pm - 3 pm	Chitek Lake Community Hall
Hall Lake	1 pm - 3 pm	Hall Lake Band Office

Sakâw Askiy Management Inc. – Building on 50 years of sustainable forest management.
For more information visit www.sakaw.ca

www.sakaw.ca

Some meeting dates varied from those shown on the poster above, due to schedule changes.

Additional meetings were also held at Candle Lake (October 25, 2017) and with the Lac La Ronge Indian Band Resource Management Committee (November 7, 2017).

Letter Outlining Opportunities to Review Draft Forestry Plans

SAKÂW ASKIY MANAGEMENT INC.

134 - 1061 Central Ave.
Prince Albert SK S6V 4V4
Phone: (306) 953-2021

«Date»

«AddressBlock»

«GreetingLine»

RE: Opportunity to Review Draft Forestry Plans

Sakâw Askiy Management Inc. holds the forest management license for the Prince Albert forest area. The license gives our shareholders access to harvest wood for forest products mills and requires that good forestry practices, including forest renewal, be followed. Our shareholders are Agency Chiefs (AC) Forestry, Carrier Forest Products, Edgewood Forest Products, L&M Wood Products, Meadow Lake Mechanical Pulp, Montreal Lake Business Ventures, NorSask Forest Products, and Tolko Meadow Lake OSB Division.

We are in the process of finalizing a long-term Forest Management Plan for the Prince Albert forest area, and a draft Operating Plan for the period from 2018 to 2023. These plans reflect a continuous and comprehensive process of Stakeholder engagement, as well as operational and market considerations. The Operating Plan will be submitted to the Forest Service for review, Aboriginal consultation and approval on December 1, 2017. The Forest Management Plan will be submitted for approval shortly after that as well.

The Operating Plan outlines areas planned for harvest and renewal between April 2018 and March 2019 in detail. Once approved those harvest areas will not require subsequent stakeholder engagement unless there is a substantial change to the harvest design. Notification is provided to the Forest Service before any forestry operations begin. There are several ways to provide input into these plans.

The Operating Plan maps and other information about Sakâw Askiy and our shareholders will be available for viewing on our website at www.sakaw.ca and at the offices of all Sakâw shareholders, by approximately **November 18, 2017**. Information about the Forest Management Plan will also be available on the website and at shareholder offices.

If after reviewing the plans and maps you have additional questions, concerns, proposed improvements, or require further information please contact me or the appropriate Area Planner, as follows:

Shareholder Operations	Area Planners	
Agency Chiefs (AC) Forestry L&M Wood Products Meadow Lake Mechanical Pulp Tolko - Meadow Lake OSB Division NorSask Forest Products	Rod Pshebnicki	- rod.pshebnicki@tolko.co - Phone: (306) 922-0319
	Chad Wilkinson	- chad.wilkinson@tolko.com - Phone: (306) 922-0013
Carrier Forest Products Montreal Lake Business Ventures	Ed Kwiatkowski	- ekwiatkowski@carrierforestproducts.ca - Phone: (306) 922-6700
Edgewood Forest Products	Doug Braybrook	- dbraybrook@edgewoodfp.com - Phone: (306) 930-7393

You can also attend any of the public information sessions listed below. These sessions will start with a presentation on the Forest Management Plan, and the Operating Plan and maps will be available to discuss with staff in an open house format.

Community	Time	Location
Monday October 16, 2017		
Dore/Sled Lake	1 pm – 3 pm	Dore Lake Hall
Big River	6 pm – 8 pm	Big River Community Centre
Tuesday October 17, 2017		
Emma, Anglin & Christopher Lake(s)	10 am – 12 pm	Lakeland RM Office, Christopher Lake
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Thursday October 19, 2017		
Weyakwin	9 am– 11 am	Mochikum Hall, Weyakwin
Montreal Lake	1 pm - 3 pm	Montreal Lake Band Office
Friday October 20, 2017		
Chitek Lake	1 pm - 3 pm	Chitek Lake Community Hall
Hall Lake	1 pm - 3 pm	Hall Lake Band Office

We look forward to your comments on these forestry plans, and thank you for your time and interest.

Sincerely,
Diane Roddy, Acting General Manager
Sakâw Askiy Management Inc.

Actual dates varied, due to schedule changes.

Advertising for Information Sessions

Newspapers

The information sessions were advertised in newspapers that reach communities within and adjacent to the PA FMA area. Ads ran two weeks before the meeting week, as well as during the meeting week, in the following papers:

- Shellbrook Chronicle
- Spiritwood Chronicle
- Rural Roots

Ads also ran two weeks before the meeting week in the Big River Gateway paper.

Online Newspaper

Meeting notices ran on PA Now, a local online newspaper, two weeks before the main meeting week, as well as during the meeting week.

Radio

Ads ran on 900 CKBI Radio the week before meeting week. Meeting specific ads also ran the day of each meeting.

Sakâw Website

A schedule of meetings was posted on the Sakâw website (home page, “What’s New” section).
The FMP presentation given at the public sessions was also posted on the Sakâw website.

Stakeholder and Aboriginal Contacts for PA FMA Area

The following list includes people that Sakâw shareholders engage with on a regular basis about operating plans, as well as those included in the FMP Volume II engagement effort. They include First Nations and Métis communities and contacts, outfitters, trappers, cabin owners, forest industry operators, municipalities, politicians, business owners, and interested public.

Prince Albert FMA area stakeholder list.

Category	First Name	Last Name	Company	City / Location
Outfitters	Randy	Barks	Deer Tracking	White Fox
Cabin Owners	Muriel	Isbister		Air Ronge
Cabin Owners	Len	Soiseth		Saskatoon
Cabin Owners	Allen	Young		Prince Albert
Cabin Owners	Ken	Steinhauer		Saskatoon
Cabin Owners	Stella	Brown	Weyakwin Hamlet	Weyakwin
Cabin Owners	Laura	Reynish		Prince Albert
Cabin Owners	Rob	Bilinski		Regina
Cabin Owners	Peter	Dyck		Saskatoon
Cabin Owners	Gordon	Sukut		Saskatoon
Cabin Owners	Ron	Miller		Big River

Category	First Name	Last Name	Company	City / Location
Cabin Owners	Eric	Dueck	Michel Pt Cottage Owners	Hague
Cabin Owners	Ron	Luciuk		Saskatoon
Cabin Owners	Graham	Toporowski		Prince Albert
Cabin Owners	Kenneth	Rideout		Edmonton
Cabin Owners	Len	Zinovich	Tower Beach Cottage Owners	Big River
Cabin Owners	Robert	Nelson		Weyakwin
Cabin Owners	Dale	Hounsell		Green Lake
Cabin Owners	Virginia	Halkett		La Ronge
Cabin Owners	Jane	Halkett		La Ronge
Cabin Owners	Karl	Schulz		Candle Lk/ Meadow Lk
Cabin Owners	First	Last	Company	Prince Albert
Cabin Owners	Carol	Rowan	Weyakwin Cottage Owners	Weyakwin
Cabin Owners	Marian	Uytterhagen	Weyakwin Cottage Owners	Weyakwin
Cabin Owners	Eugene	Boyer		Prince Albert
Cabin Owners	Don	Radcliff	Whelan Bay Cottage Owners	Meath Park
Cabin Owners	Richard	Wuorinen		Grand Cache
Cabin Owners	Don	Boyenko	Anglin Lake Cottage Owners	Saskatoon
Cabin Owners	Dennis/Arlice	Adderley		Big River
Cabin Owners	Bernie	Kilden		Debden
First Nation/ Métis	Raymond	Dumais	Pelican Lake First Nation	Leoville
First Nation/ Métis	Peter	Bill	Pelican Lake First Nation	Leoville
First Nation/ Métis	Lee	Benson	Pelican Lake First Nation	Leoville
First Nation/ Métis		Chief/Council	Witchekan Lake First Nation	Spiritwood
First Nation/ Métis	Edward	Henderson	Montreal Lake First Nation	Montreal Lake
First Nation/ Métis	Sampson	Ratt	Lac La Ronge Indian Band	Lac La Ronge
First Nation/ Métis	Tammy	Cook-Searson	Lac La Ronge Indian Band	Lac La Ronge
First Nation/ Métis	Kelvin	Roy	Keyano Métis Local #5	Green Lake
First Nation/ Métis	Charlene	Cybenko		Montreal Lake
First Nation/ Métis	Grace	Cook		Stanley Mission
First Nation/ Métis	Bryan	Lee	Christopher Lake #108	Northside
First Nation/ Métis		Chief/Council	Big River First Nation	Debden
First Nation/ Métis	Christian	Nelson		Montreal Lake
First Nation/ Métis	Steven	Jim	Witchekan Lake First Nation	Spiritwood
General Interest		Exec Ctte	Big River Stakeholders Group	Big River
General Interest	Greg	Christiansen		Big River
General Interest	Denny	Laventure	Leoville Snow Drifters	Leoville
General Interest	Kevin	Bendrig		Big River
General Interest	Bob	Tallis		Meath Park
General Interest	Brad	Muir	Sundog Sled Excursions	Waskesui Lake
General Interest	Paul/Eileen	Doucette		Big River
General Interest	Debra	Daley		Big River
General Interest	Steffan/Tanya	DeMarie	Akela's Den Sled Dog Kennel	Christopher Lake
General Interest	Dean	Christiansen		Big River
General Interest	Archie	Latimer		Medstead
General Interest	Garry	McLean	Clearwater Nursery	Big River
General Interest	Barry	Nontell	Timber Trails Sno Riders	Big River
General Interest	Carla	Painchaud	Candle Lake Sno-drifters	Candle Lake
General Interest	Rob	Buckingham		Big River

Category	First Name	Last Name	Company	City / Location
General Interest	Richard	Braidek		Big River
General Interest	Carla	Braidek		Big River
General Interest	Ernie	Letendre		Meath Park
General Interest	Fred	Billinger		Big River
General Interest	Gale	Colan		Kelowna
General Interest	Shirley	Feszyk		Big River
General Interest	Dale	Daniels	Chitek Lake Bush Buddies	Chitek Lake
General Interest	Kelly	Palidwar	Twin Lakes Trail Blazers	Nipawin
General Interest	Jeremy	Hetu		Big River
General Interest	Bob	Moore	Whiteswan Snow Hawks	Meath Park
General Interest	Dennis	Johnson		Big River
General Interest	Wes	Funk		Sled Lake
General Interest	Jeff	Weir	Parks Canada, PANP	Waskesiu Lake
General Interest	Jesse	Klassen		Big River
General Interest	Rob	Warriner		Big River
General Interest	Erin	Thomson	Government of Canada	Saskatoon
General Interest	Johnny	Johnson		Big River
General Interest	Robert	Fincati	Montreal Lk Business Ventures	Prince Albert
General Interest	Kevin	Olson		Big River
General Interest	Ted	Ratzlaff		Sled Lake
General Interest	Jonathon	Fonos		Big River
General Interest	Lance	Fehr	Lakeland Tree Dodgers	Christopher Lake
General Interest	Howard	Fonos		Big River
General Interest	Seth	Cherry	PAGE, PA National Park	Waskesiu Lake
General Interest	Don	Banks		Big River
General Interest	Robert	Newton	Esker Bear Trails	Smeaton
General Interest	Peter	Kirychuck	Ramsay Bay Snowmobile Club	Weyakwin
Land Disposition	Charles	Ballantyne		Pelican Narrows
Land Disposition	Darlene	Newton		Meath Park
Land Disposition	Julius	Henderson		Montreal Lake
Land Disposition	Brian	Bird		Montreal Lake
Land Disposition	Paul	Rabbitskin		Debden
Land Disposition	Clayton	Gear		Big River
Land Disposition	Louie	Regan		Green Lake
Land Disposition	Rita	Loiselle		Chitek Lake
Land Disposition	Alfred	Prosofsky		Big River
Land Disposition	Stanley	Burgess		Choiceland
Land Disposition	Andrew	Crossland		Chitek Lake
Land Disposition	Larry	Siklenka		Meadow Lake
Land Disposition	Ben	Egland		Medstead
Land Disposition	Garth	Taylor		Melfort
Land Disposition	Lester	Kilbreath		Big River
Land Disposition	Harvey	Surprenant		Chitek Lake
Land Disposition	Dennis	Chamberlain		Candle Lake
Land Disposition	Victor	Laliberte		Green Lake
Land Disposition	Brad	Burkhart		Saskatoon
Land Disposition	Ronald	Colborn		Delisle
Land Disposition	Keith	Boyer		Chitek Lake

Category	First Name	Last Name	Company	City / Location
Land Disposition	Edward	Kiehn		Love
Land Disposition	Ryan	Hansen		Beauval
Land Disposition	Richard	Lafleur		Big River
Land Disposition	Gordon	Moffat		Green Lake
Land Disposition	Andy	Blomquist		Smeaton
Land Disposition	Jean	Stewart		Cumberland House
Land Disposition	Rema	Ballantyne		Montreal Lake
Land Disposition	Lenny	Bird		Montreal Lake
Land Disposition	Philip	Bird		Montreal Lake
Land Disposition	Thomas	Ratt		Air Ronge
Land Disposition	Jacob	Lavallee		Timber Bay
Land Disposition	Earl	Bell		Weyakwin
Land Disposition	Ernest	Henderson		Montreal Lake
Land Disposition	Georgina	Schloegel		Big River
Land Disposition	Audrey	Charles		La Ronge
Land Disposition	John	Ross		La Ronge
Land Disposition	James	Ross		La Ronge
Land Disposition	Dennis	Baun		Canwood
Land Disposition	William	Ross		La Ronge
Land Disposition	Gilbert	Halkett		Christopher Lake
Land Disposition	George	Durocher		Maidstone
Land Disposition	Gilbert	Bird		Montreal Lake
Land Disposition	Della	Lavallee		Prince Albert
Land Disposition	Norman	Ross		Montreal Lake
Land Disposition	Frank	Roberts		Montreal Lake
Land Disposition	Roberta E.E.	Ross		La Ronge
Land Disposition	Sally	Ross		La Ronge
Land Disposition	Charlie	Ross		La Ronge
Land Disposition	Simpson	Naytowhow		Montreal Lake
Land Disposition	Abel	Ross		Prince Albert
Land Disposition	George	Ross		Weyakwin
Land Disposition	James	Bird		Montreal Lake
Land Disposition	Cole	Dunn		Big River
Land Disposition	Victor	Lariviere		Pinehouse
Land Disposition	Darlene	Godwin		Montreal Lake
Land Disposition	Robert	Halkett		La Ronge
Land Disposition	Arnold	Lueken		Big River
Land Disposition	Mervin	Henderson		Montreal Lake
Land Disposition	Robert	Labrash		Meadow Lake
Land Disposition	Edwin	Beeds		Chitek Lake
Land Disposition			650117_53556 LDIS Recreational	Saskatoon
Land Disposition			650143_52614 LDIS Institutional	Candle Lake
Land Disposition	Barry	Ross		La Ronge
Land Disposition	Trevor	Leach		Big River
Land Disposition	Alison	Carlson		Air Ronge
Land Disposition			650233_52628 LDIS Institutional	Choiceland
Land Disposition	Dan	Schulz		Regina
Land Disposition	Robert	Buffin		Beauval

Category	First Name	Last Name	Company	City / Location
Land Disposition	Frank	Morin		Debden
Land Disposition	Victor	Durocher		Big River
Land Disposition	Harvey	Whitefish		Debden
Land Disposition			650208_52480 LDIS Institutional	Big River
Land Disposition	Fanny	Naytowhow		Montreal Lake
Land Disposition			655006_07068 LDIS Institutional	Christopher Lake
Land Disposition	John	Charles		Montreal Lake
Land Disposition	Randy	Bird		Montreal Lake
Land Disposition	Arthur	Beatty		La Ronge
Land Disposition	Gordon	Bird		Montreal Lake
Land Disposition			603175_07288 LDIS Commercial	Wakefield
Land Disposition	Harry	Halkett		Montreal Lake
Land Disposition	Jack	Nelson		Weyakwin
Land Disposition	Douglas	Ross		Weyakwin
Land Disposition			602731_06630 LDIS Institutional	Weyakwin
Land Disposition	Clint	Dunn		Big River
Land Disposition	Brian	Mirasty		Air Ronge
Land Disposition			602870_07222 LDIS Institutional	Smeaton
Land Disposition	Calvin	Naytowhow		Montreal Lake
Land Disposition	Bud	Bird		Montreal Lake
Land Disposition			350220_53014 LDIS Institutional	Regina
Land Disposition	Wilfred Moses	Bird		Montreal Lake
Land Disposition			350623_54222 LDIS Institutional	Saskatoon
Land Disposition	Ken	Pederson		Shellbrook
Land Disposition	Neil	Mc Mahon		Big River
Land Disposition	Richard	Sivertson		Smeaton
Land Disposition	Harold	Munro		Nipawin
Land Disposition	Walter	Lafaver		Sturgeon Lake
Land Disposition			350280_53086 LDIS ShootingRange	Smeaton
Land Disposition			Scouts Canada	Calgary
Land Disposition	Merv	Gunville		Prince Albert
Land Disposition	Terrence	Kwasnica		Shellbrook
Land Disposition	Robert F.	Nelson		Weyakwin
Land Disposition	Flora	Roberts		La Ronge
Land Disposition	Evelyn	Ross		La Ronge
Land Disposition	Susan	Ross		La Ronge
Land Disposition	Myron	Swityk		Saskatoon
Land Disposition	Larry	Laliberte		Green Lake
Land Disposition	Ron	Miller		Big River
Land Disposition	Kyle	Gardiner		Green Lake
Land Disposition	Lawrence	Melis		Saskatoon
Land Disposition	Neil	Hadland		Meadow Lake
Land Disposition	Tim	Peekeekoot		Canwood
Land Disposition	Morris	Cook		Air Ronge
Land Disposition	Ronald	Henderson		Montreal Lake
Miscellaneous	Larry	Potts	Big River Trail Riders	Big River
Miscellaneous	Cindy	Paul		Beauval
Miscellaneous			Chitek Lake Golf Course	Chitek Lake

Category	First Name	Last Name	Company	City / Location
Miscellaneous	Kenneth	Weibe		Whitecourt
Miscellaneous	Lyle	Shephard		Meadow Lake
Miscellaneous	David	Buettner		Prince Albert
Miscellaneous	Shelley	Lawrence	Rainbow Lodge	
Miscellaneous	Lloyd	Laliberte		Green Lake
Miscellaneous	Eva	Laliberte		Green Lake
Miscellaneous	Chad	Laliberte		Green Lake
Miscellaneous	Louie Martin	Regan		Green Lake
Miscellaneous	Bud William	Bird		Montreal Lake
Miscellaneous	Ron	Johnson	Big River Gun Club	Big River
Miscellaneous	Della	Aubichon	Green Lake Co-Management Bd	Green Lake
Miscellaneous	Robert John	Johnson		Battleford
Miscellaneous	Chris	James		Meath Park
MLA	Doyle	Vermette	MLA, Cumberland	La Ronge
MLA	Larry	Doke	MLA, Cut Knife - Turtleford	Maidstone
MLA	Jeremy	Harrison	MLA, Meadow Lake	Meadow Lake
MLA	Nicole	Rancourt	MLA, Prince Albert Northcote	Prince Albert
MLA	Nadine	Wilson	MLA, Saskatchewan Rivers	Prince Albert
MLA	Scott	Moe	MLA, Rosthern Shellbrook	Shellbrook
MLA	Fred	Bradshaw	MLA, Carrot River Valley	Carrot River
MLA	Delbert	Kirsch	MLA, Batoche	Cudworth
MLA	Buckley	Belanger	MLA, Athabasca	Ile-a-la-Crosse
MLA	Joe	Hargrave	MLA, Prince Albert Carlton	Prince Albert
Outfitters			Pure Passion Outfitting	North Battleford
Outfitters			Trails End Outfitters Ltd	Nipawin
Outfitters	Blaine	Tringer		Leoville
Outfitters	Vern	Hyllestad	Sask-Can Outfitters	Big River
Outfitters			Safari River Outdoors	Meadow Lake
Outfitters	Michael	Tullis		Lucky Lake
Outfitters			V&V Holdings	Martensville
Outfitters	Claude	Juteau	Western Trophy/GreatGrey Outfitters	St Phillippe
Outfitters	Jason	Vandereyk	Sask Adrenaline Outfitters	Domremy
Outfitters	Stan	Schneider		Scott
Outfitters	Gordon	Nash	White Tail Outfitting	Glaslyn
Outfitters	Devin	Beebe	Timberlost Outfitting	Leoville
Outfitters	Don	Doryk	Proudfoot Creek Outfitters	Leoville
Outfitters	Donald	Anderson	Prairieland Outfitters	Rosetown
Outfitters	Victor	Dorval	Poplar Point Resort	Big River
Outfitters	Wayne	Tallmadge	Wilderness Outfitting	Meadow Lake
Outfitters	Bill	Tomasik	White Gull River Outfitters	Choiceland
Outfitters	Roy	Stanoffsky	Smile Agencies Ltd	Christopher Lake
Outfitters	Tim	Lapierre	South Bay Outfitters	Big River
Outfitters	Alain	Madore	Steepbank Outfitters CDA Inc	Montreal
Outfitters	David	James	Outer Limit Outfitting	Saskatoon
Outfitters	Derek	Graham	Northway Outfitters	Cando
Outfitters			Stimson Enterprises Ltd	Eatonia
Outfitters	Kevin	McKay	Suggi Lake Outfitters	Cumberland House
Outfitters	Jason	Peterson	Track n Trail Adventures	Hepburn

Category	First Name	Last Name	Company	City / Location
Outfitters	Lyndon	Gliege	Smoothstone Lake Lodge	Big River
Outfitters	Daniel	Stevens	Stevens Bucks & Bears Outfitting	Thorhild
Outfitters	George	Henderson	Thunder Hills Outfitter	Saskatoon
Outfitters	Laurie	Thorsen	Thunder Mountain Outfitters	Christopher Lake
Outfitters	Waldemar	Knorr	Siberian Outfitters	Muenster
Outfitters	Jim	Shockey		Duncan
Outfitters	Allan	Turgeon	Spiritwood Outfitters Ltd	Spirtwood
Outfitters			Torch River Outfitters Ltd	White Fox
Outfitters	Marcel	Tetreault		Spiritwood
Outfitters	Fred	Gopher	Double Arrow Outfitters	North Battleford
Outfitters			Boulder Ridge Outfitters Inc	Prince Albert
Outfitters	Wade	Babcock	Adams Creek Outfitting	Codette
Outfitters	Corey	Solanik	Brush Creek Outfitters	Biggar
Outfitters	Kris	Cheater	Bear Down Outfitters	Stoughton
Outfitters	Fred	Lackie	Candle Lake Outfitters	Warman
Outfitters	Mark	Schumlick	Caribou Trail Outfitters	Langdon
Outfitters	Karl	Hintz	Minowukaw Lodge/Joe's Cabins	Candle Lake
Outfitters	Ed	Crossland	Chitek River Outfitters	Leoville
Outfitters	Richard	Farago	Clarke Lake Lodge	Big River
Outfitters	Keith	Graham	Alcott Bear Camp	Meadow Lake
Outfitters			D&M Investments, Canada Inc	Minot
Outfitters	Richard	Archer	DNA Guiding & Consulting	Waskesiu
Outfitters	Arnold	Kjerstad	Norseman Outfitters	Shell Lake
Outfitters			Dore Mountain Outfitting	Melfort
Outfitters			Outer Limits Bucks&Bears Outfitting	Meadow Lake
Outfitters	Ryan	Marsh	Marshland Outfitters Ltd	Prince Albert
Outfitters			Manley Outdoor Adventures Inc	Love
Outfitters	Harvey	McDonald	Elusive Sask Whitetail Outfitter	Richard
Outfitters	Kim	Tringer	Larson Lake Outfitters	Spiritwood
Outfitters			Lancaster Whitetails Ltd	Saskatoon
Outfitters	Maurice	Heisler	Garden River Outfitters	Martensville
Outfitters	Brad	Fry	Fry's Canadian Outback Outfitters	Prince Albert
Outfitters	Jeff	Smith	Kutawagan Outfitters	Choiceland
Outfitters	John	Koop		Glaslyn
Outfitters	Richard	Poulin	JR Outfitting	Nipawin
Outfitters	Ralph	Michayluk	Head Hunters Outfitters	Big River
Outfitters	Gerritt	Preston	Jared Trophy Book Adventures	Sangudo
Outfitters	Val	Popov		Martensville
Outfitters	Duane	Schron	Dore Lake Lodge	Grandora
Outfitters	Daniel	Mailand	Angler's Trail Resort	Beauval
Outfitters	Glen	Willsie	Camp Whitetail Ltd	Caroline
Outfitters	Brian	Johnson	Bear Foot Outfitters	Shell Lake
Outfitters	Trevor	Vause	Green Lake Outfitting	Cranbrook
Outfitters	Ron	Lavoie	Otter Creek Outfitters	Spiritwood
Outfitters	Brian	Hoffart	Bait Masters Bear Hunting Camps	Green Lake
Outfitters	Alan	Carswell	A.R.M. Outfitters	Shellbrook
Outfitters	Bryce	Liddell	Iskwatikan Lake Lodge	La Ronge
Outfitters	Arthur M	Laliberte		Green Lake

Category	First Name	Last Name	Company	City / Location
Outfitters	Ron	Schumlick	Northern Whitetail Outfitters Inc.	North Battleford
Outfitters	Keith	Graham	Alcott Bear Camp	Glaslyn
Outfitters	Reg	Quaale	Big Bend Guiding and Outfitting	Birch Hills
Outfitters			302780_06807 LDIS Institutional	Green Lake
Outfitters			Sure Shot Outfitting Ltd.	North Battleford
Outfitters	Linda	Archer		Waskesiu
Outfitters	Keith	Heisler	Northern Sask Wilderness Hunts	Saskatoon
Outfitters			Big Sandy Lk Outdoor Adventures	Shaunavon
RM/Town Council	Hilda	McKay		Big River
RM/Town Council		Mayor/Council	Village of Leoville	Leoville
RM/Town Council		Mayor/Council	Village of Chitek Lake	Chitek Lake
RM/Town Council		Mayor/Council	Timber Bay Hamlet/Peggy Hennie	Timber Bay
RM/Town Council		Mayor/Council	Resort Village of Candle Lake	Candle Lake
RM/Town Council		Mayor/Council	Northern Hamlet of Dore Lake	Big River
RM/Town Council		Mayor/Council	R.M. of Big River #555	Big River
RM/Town Council		Mayor/Council	R.M. of Lakeland #521	Lakeland
RM/Town Council		Mayor/Council	R.M. of Meadow Lake #588	Meadow Lake
RM/Town Council		Mayor/Council	R.M. of Medstead #497	Medstead
RM/Town Council		Mayor/Council	R.M. of Meeting Lake #466	Mayfair
RM/Town Council		Mayor/Council	R.M. of Paddockwood #520	Paddockwood
RM/Town Council	Pat	Porter	Clearwater Community	Big River
RM/Town Council		Mayor/Council	R.M. of Spiritwood #496	Spiritwood
RM/Town Council		Mayor/Council	Northern Village of Green Lake	Green Lake
RM/Town Council		Mayor/Council	Northern Settlement of Sled Lk	Big River
RM/Town Council	Pat	Panter	Big River Economic Development	Big River
RM/Town Council		Mayor/Council	Town of Big River	Big River
Trapping	Bill	Tyndall		Chitek Lake
Trapping	Marty	Ferguson		Prince Albert
Trapping	Lawrence	Melis		Saskatoon
Trapping	Mark	Melis		Saskatoon
Trapping	Gordon	Moffat		Green Lake
Trapping	Jarret	Nelson		Montreal Lake
Trapping	Jeffry	Okemow		Montreal Lake
Trapping	Amos	Ratt		Air Ronge
Trapping	Myles	Ratt		La Ronge
Trapping	Nelson	Reddekopp		Warman
Trapping	Susan	Schigol		Meath Park
Trapping	Wayne	Schigol		Meath Park
Trapping	Henry	Giroux		Christopher Lake
Trapping	Richard	Slykhuis		Meadow Lake
Trapping	Kyle	Kwasnica		Calgary
Trapping	Dave	Elliott		Prince Albert
Trapping	Hilda	Bird		Christopher Lake
Trapping	Stanley	Bird		Montreal Lake
Trapping	Ed	Kowal		Prince Albert
Trapping	Tracey	Dunn		Big River
Trapping	Wendel	Roberts		Air Ronge
Trapping	Noland	Henderson		Montreal Lake

Category	First Name	Last Name	Company	City / Location
Trapping	Ken	Armstrong		Chitek Lake
Trapping	Trevor	Athmer		Watson
Trapping	Milton	Brown		Choiceland
Trapping	Kerry	Sereda		Candle Lake
Trapping	David	Crouch		Meadow Lake
Trapping	Tom	Bear		Debden
Trapping	John	Beatty		Deschambeault Lake
Trapping	Shirley	Bell-Morin		Beauval
Trapping	Lionel	Bird		Montreal Lake
Trapping	Robert	Boyer		Lloydminister
Trapping	Wayne	Boyer		Chitek Lake
Trapping	Pat	Bradford		Clavet
Trapping	Franklin C.	Carriere		La Ronge
Trapping	Henry	McKenzie		La Ronge
Trapping	Lloyd	Corbett		Shellbrook
Trapping	Jeff	McKay		Green Lake
Trapping	Garry	Dyck		Meadow Lake
Trapping	Clint	Egeland		Medstead
Trapping	McIvor	Eninew		Air Ronge
Trapping	Richard	Farago		Big River
Trapping	Shawn	Fesyk		Big River
Trapping	Don	Gordon		Nipawin
Trapping	Eli	Roberts		Montreal Lake
Trapping	Caroline	Halkett		Montreal Lake
Trapping	Irwin	Hennie		La Ronge
Trapping	Jason	Klassen		Big River
Trapping	Terry	Barlow		Christopher Lake
Trapping	Adam	Charles		Stanley Mission

Participants at Information Sessions

Participants who signed the registration sheet at information sessions where FMP Volume II was presented and discussed, are listed below.

Name	Affiliation / Location
October 16, 2017	**Dore / Sled Lake (Dore Lake Town Hall)**
Dennis McKague	
Crazc Tondevold	
Ken McNarland	
Garry Smith	
Denis Adderley	
Arlice Adderley	
Shirley Feszyk	
Ken Stenaeuser	
Richard Fargo	
Jonathon Fonos (?)	
Quenton Fonos	
Victor Durocher	
Howard Fonos	Third Party Operator
Wes Funk	
Darcy McNarland	
October 16, 2017	**Big River (Big River Community Center)**
John Teer	RM 555
Eileen Doucette	
Russell Beegee	
Joy Lavoie	
Ashley Lavoie	
Jeanette Leach	
Buster Reimer	
Gary McLean	
Carla	
Maisie Krienki	
Wendy Wilson	
Wally Wilson	
Henry Meyer	
Pat Forbes	
Nancy Forbes	
Rob Buckingham	Third Party Operator
Wayne Cowan	
Greg Buckingham	Third Party Operator
Dean Christensen	Third Party Operator
October 17, 2017	**Emma, Anglin and Christopher Lakes (RM of Lakeland Office)**
Tanja Tabel	

Andrea Nelson	
Brad Muir	Sundog Dog Sledding
Henri D. Giroux	Trapper
John Stauffer	RM Lakeland
Alan Casswell	
October 17, 2017 Little Red River, La Ronge Band (Little Red River Band Office)	
Angus Mirasty	
Darwin Roy	
Gilbert Halkett	
Percy Ballantyne	
October 17, 2017 Prince Albert (Travelodge)	
Dave Elliott	
Terry Komarnicki	
Stan Burgess	
Laura Reymish	
Searl Reymish	
Mark Doyle	
Cindy Pederson	
Ken Pederson	
October 18, 2017 Candle & Whiteswan Lakes (Candle Lake Community Hall)	
Lionel Godwin	
Wes Godwin	
Floyd Toppings	
Rob Carruthers	
Allan Larson	
Dawn Doering	
Rob Moore	
Ron Cherkewich	
Shan Lidster	
Dave Hanson	
Bob Moore	
Bill Neufeld	
Many more came and went, not all signed in	
October 18, 2017 Prince Albert (Forest Center)	
Dale Romanchuk	Third Party Operator, Northern Post & Rail
October 19, 2017 Weyakwin (Mochikum Hall)	
Carol Rowan	
Marian Uytterhagen	
Walter Kroeker	

October 19, 2017 Montreal Lake (Montreal Lake Arena)	
Ervin Henderson	
Leonard Bird	
Jeff Okemow	
Byron King___	
Lori-ann Sewap	
Florence Ross	
Theresa Halkett	
Buddy Bird	
Ron Henderson	
Dixie Bird	
Many people came and went, not all signed the sheet	
October 20, 2017 Chitek Lake (Chitek Lake Community Hall)	
Ken Armgstrong	
Sheldon Sterling	
Myron Suityk	
Robert Matzner	
Wayne Boyer	
Bill Tyndall	Trapper
Clint Boyer	Trapper
Keith Boyer	
Darren Boyer	
Warren Boyer	
October 25, 2017 Hall Lake (Hall Lake Band Office)	
Trapping meeting. Good attendance, but no one signed in	
October 30, 2017 Candle Lake (Candle Lake Town Office)	
Ron Cherkewich	
Dan Tyson	
Susan Rieseberg	
Brian Brassard	
November 9, 2017 La Ronge (La Ronge Band Office)	
Presentation to Lac La Ronge Indian Band Resource Management Cttee	
Sam Roberts	Chair
Darwin Roy	Facilitator
Angus Mirasty	Little Red River
Tom Mackenzie	La Ronge Councilor
Ashley Charles	
Grace Cook	Stanley Mission
Gerald ___	Grandmother's Bay
Larry Charles	
Joe Roberts	
Julie Ross	

Presentation on FMP Volume II

Draft Forest Management Plan
Prince Albert FMA Area
2018-2038

Public / Community Feedback Sessions
October 2017

Sakâw Askiy Management Inc.

1 00:06

New Forest Management Plan (FMP)

- Big Picture plan for the long-term management of the whole forest area

2

Who Harvests Here ?

Sakaw Askiy Management Inc Shareholders:

A.C Forestry (Agency Chiefs Tribal Council)
Carrier Forest Products
Edgewood Forest Products
L&M Forest Products
Meadow Lake Mechanical Pulp
Meadow Lake OSB (Tolko)
Montreal Lake Business Ventures
NorSask Forest Products

16 Independent Operators

3

Protect Biological Diversity

- Take our cue from nature – **Natural Forest Patterns**
- Natural landscapes similar to those created historically by fire

Leave Green Trees Behind (average of 9%)
- Harvest areas can contain trees, islands, peninsulas of green trees

Landscape Patterns (harvest events)
- Size distribution of most harvest events between 100-1500 ha
- Some will be smaller, some larger (large is 'natural')

4

Protect Biological Diversity

- Maintain all forest cover types
- Maintain old forests, and interior old forests free from edge effects green trees behind

Age of the Productive Forest

5

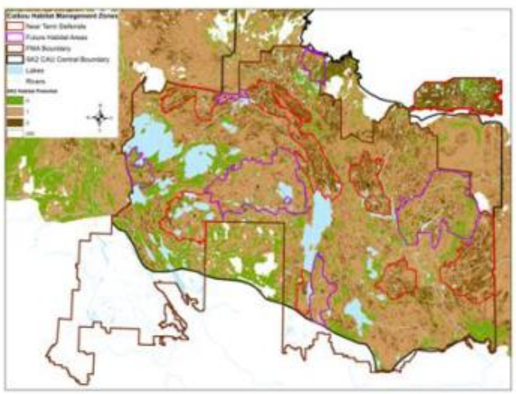
Where More is Needed …

Species at Risk

- Work with governments and local people to protect the species and their habitat.
- Northern Leopard Frog, Whooping Crane, Piping Clover, Woodland Caribou.

6

Caribou Habitat Management Zones



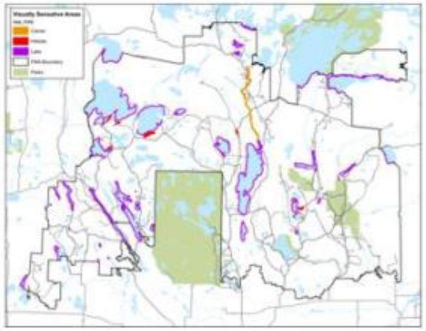
7

Trapping and Outfitting

- Work together during the development of Operating Plans
- Trapping: Accommodation measures may include retention of high value trapping habitat within harvesting events, and the maintenance of traditional access.
- Outfitting: Accommodation measures may include adjusting harvest areas, leaving retention in specific locations, and measures to manage access.

8

Views along Lakes and Rivers, Recreation



9

Water and Shorelines

Protect water quality, water quantity:

Where roads cross streams

- design crossings to allow predicted storm water flows, and avoid getting soil and sediments in the stream

Next to water - restricted or no harvesting

- Large (>5 ha) Lakes, Rivers, Streams: 40 m restricted zone

Large (>5 ha) Lakes, Rivers, Streams: 40m zone

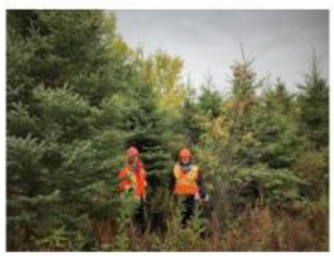
10

Timber Harvesting

- Hardwood harvest increasing to capture older stands before they deteriorate (has no impact on long term sustainability)
- Cap the amount of a particular type of forest cover that can be harvested in the West, Central, and East areas

Forest Renewal

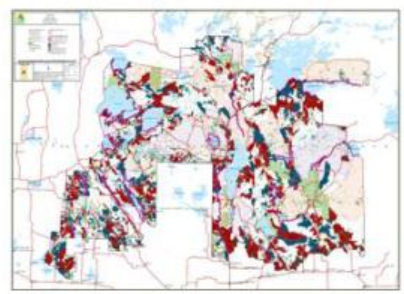
- Ground rules for renewing and tending specific forest types
- The new forest is surveyed twice to check reforestation success, growth rates



11

Draft Tactical Plan

- Indicates General Areas where harvesting is expected to occur over 20 years, and where harvesting will not occur (e.g. reserves of old forests, caribou deferral areas).
- Operating Plans, developed annually, is where harvesting decisions are made



12

Monitoring and Reporting

- Will report annually on 38 measures of sustainable forest management, related to;
  - 1) Biological Diversity;
  - 2) Ecosystem Condition and Productivity;
  - 3) Soil and Water;
  - 4) Role in Global Ecological Cycles;
  - 5) Economic and Social Benefits; and
  - 6) Society's Responsibility.
- Management Implementation Team will assess results, address issues
- Ongoing input from Public, First Nations, and Metis to continue during Operating Plan reviews

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13

Next Steps

- Your comments or concerns on the FMP will be gathered and considered during the preparation of the final plan document.
  - GM@sakaw.ca
  - (306) 953-2021
- The draft FMP (Volume II) will be available by October 31, 2017 at: http://sakaw.ca/fmp_working_documents.html
- Aiming for submission of final plan by Dec 31, 2017
- Government approval by Feb 28, 2017
- Implement April 1, 2018 (the new Operating Plan)

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Questions?

For more information:

Diane Roddy, RPF gm@sakaw.ca
www.sakaw.ca

Cam Brown, MF, RPF cbrown@forsite.ca

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