MANNING DIVERSIFIED FOREST PRODUCTS LTD.

2012-2021 Forest Management Plan

Chapter 1 Corporate Overview and Forest Management Approach

June 30, 2013 (Draft)

October 1, 2013 (Approved)

EXECUTIVE SUMMARY

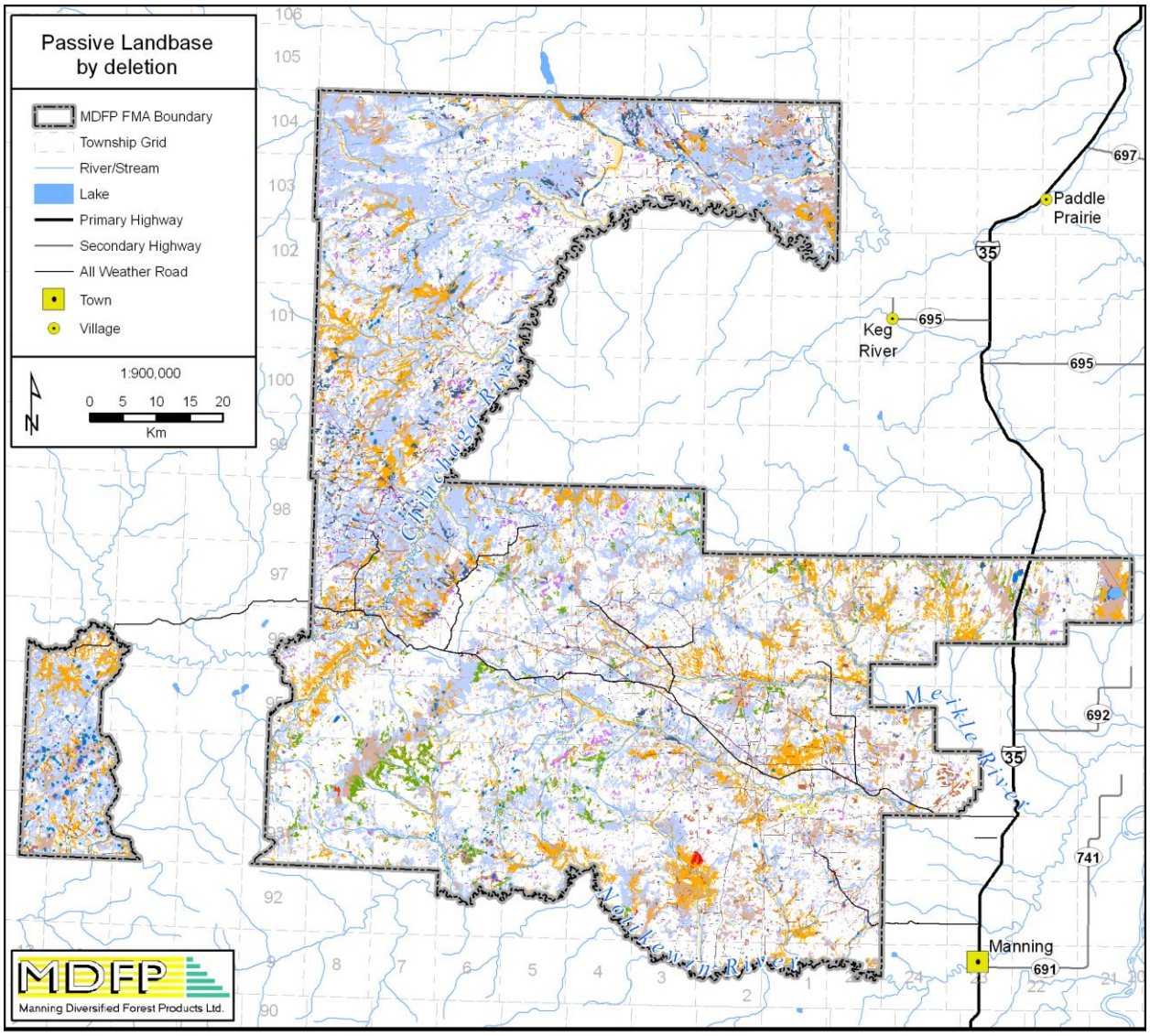
Following the expansion of Forest Management Agreement (FMA) #0200041 to include Forest Management Unit (FMU) P18 in 2009, Manning Diversified Forest Products Ltd., (MDFP) undertook the development of a new Forest Management Plan (FMP). The 2012-2021 FMP was completed five years early in order to provide a consistent planning approach across the expanded FMA area, designated Forest Management Unit (FMU) P20.

A Plan Development Team (PDT) with representation from MDFP, quota holders, government and consultants was formed to provide direction and resolve issues. External input into the FMP was obtained throughout FMP development through MDFP's ongoing Public Consultation Program and revised First Nation Consultation.

The 2012-2021 FMP was developed following Alberta's planning requirements for sustainable forest management. The plan covers the ten year period from May 1, 2012 to April 30, 2022, but considers the impacts of the preferred strategies over the long term by forecasting over a 200-year planning horizon.

Building upon MDPF's previous plan, the 2012-2021 FMP continues much of the same forest management objectives and strategies as the previous FMP but is updated to reflect the larger FMA area, new government policies and emerging forest management issues. The Mountain Pine Beetle (MPB) infestation which has killed thousands of trees in P20, woodland caribou and the management of deciduous stands with coniferous understory are key issues addressed by the 2012-2021 FMP. Values, Objectives, Indicators and Targets (VOITs) were reviewed and refined to reflect current conditions and to improve performance monitoring over the life of the plan.

The 2012-2021 FMP continued the extensive forest management approach of the previous FMP. This approach is well suited to the FMU composition where the passive landbase comprises 443,494 ha representing 48% of the gross FMU area. The active landbase, the area suitable for timber harvesting, comprises 486,606 ha representing 52% of the gross area. As demonstrated by the following map, almost half of the FMU will never be harvested.



Deletions

- SRD PSPs deleted
- Reservations/Notations deleted
- Pipeline features (AVI and dispositions)
- Road features (AVI and dispositions)
- Specific block planning deletions
- AVI polygons with no block information
- Hotchkiss Understory Protection Study blocks
- Dispositions now not forested
- Non forest
- Non vegetated
- Water (from AVI or Hydrologic data)
- AVI and post-AVI identified fires
- Steep slopes along rivers
- No harvest zone around trumpeter swan sites
- Buffers around water features
- Fair sites in pure Decid strata
- Unproductive sites (all strata)
- Wetlands
- A Density
- Larch as primary conifer
- Black spruce leading
- Isolated/trapped timber

Map of FMU P20 passive landbase classification

Based on experience obtained from the previous FMP, implementation strategies for the 2012-2021 FMP were refined, reviewed and accepted by the PDT. Chapter 7 contains all of the FMP commitments as well as the strategies to effectively implement the FMP over the next 10 years.

Key products of the 2012-2021 FMP are the Preferred Forest Management Scenario (PFMS) and the 20-year Spatial Harvest Sequence (SHS) which reflect sustainable forest management objectives and the balance between ecological and industrial objectives. These products were created with input from First Nations, government, quota holders and MDFP. Based on the PFMS and SHS, recommended Annual Allowable Cuts (AAC) and timber volume allocation to the coniferous and deciduous quota holders are presented in the following three tables.

Recommend AAC for FMU P20 effective May 1, 2012

Species	Utilization	Primary m3/yr	Secondary m3/yr	Total m3/yr
Coniferous	15+/11/30 cm	526,500	65,200	591,700
Deciduous	15+/10/30 cm	174,100	151,400	325,500
Total		700,600	216,600	917,200

All AAC numbers are reduced for cull: 3.7% for coniferous and 9% for deciduous.

Recommend Coniferous AAC Allocation for FMU P20 effective May 1, 2012

FMU	Company Name	Disposition Number	Primary Disposition Allocation %	Primary AAC 15+/11/30 cm m3/yr	Secondary Disposition Allocation %	Secondary AAC 15+/11/30 cm m3/yr	Total Approved AAC m3/yr
Coniferous							
P20	*Manning Diversified Forest Products Ltd*	*FMA0200041*		*506,172*		*58,953*	*565,125*
P20		*Local Use* [1]		*5,113*		*595*	*5,708*
P20	FMA AAC Subtotal	FMA0200041	97.1102%	511,285	91.3311%	59,548	570,833
P20	Gordon Buchannan Enterprises Ltd.	CTQP180002	2.8898%	15,215	8.6689%	5,652	20,867
P20	Total			526,500		65,200	591,700

1. Any unused coniferous local use volume (1% of FMA AAC) is available for MDFP to harvest.

All AAC numbers are reduced for cull, 3.7% for coniferous and 9% for deciduous.

Recommend Deciduous AAC Allocation for FMU P20 effective May 1, 2012

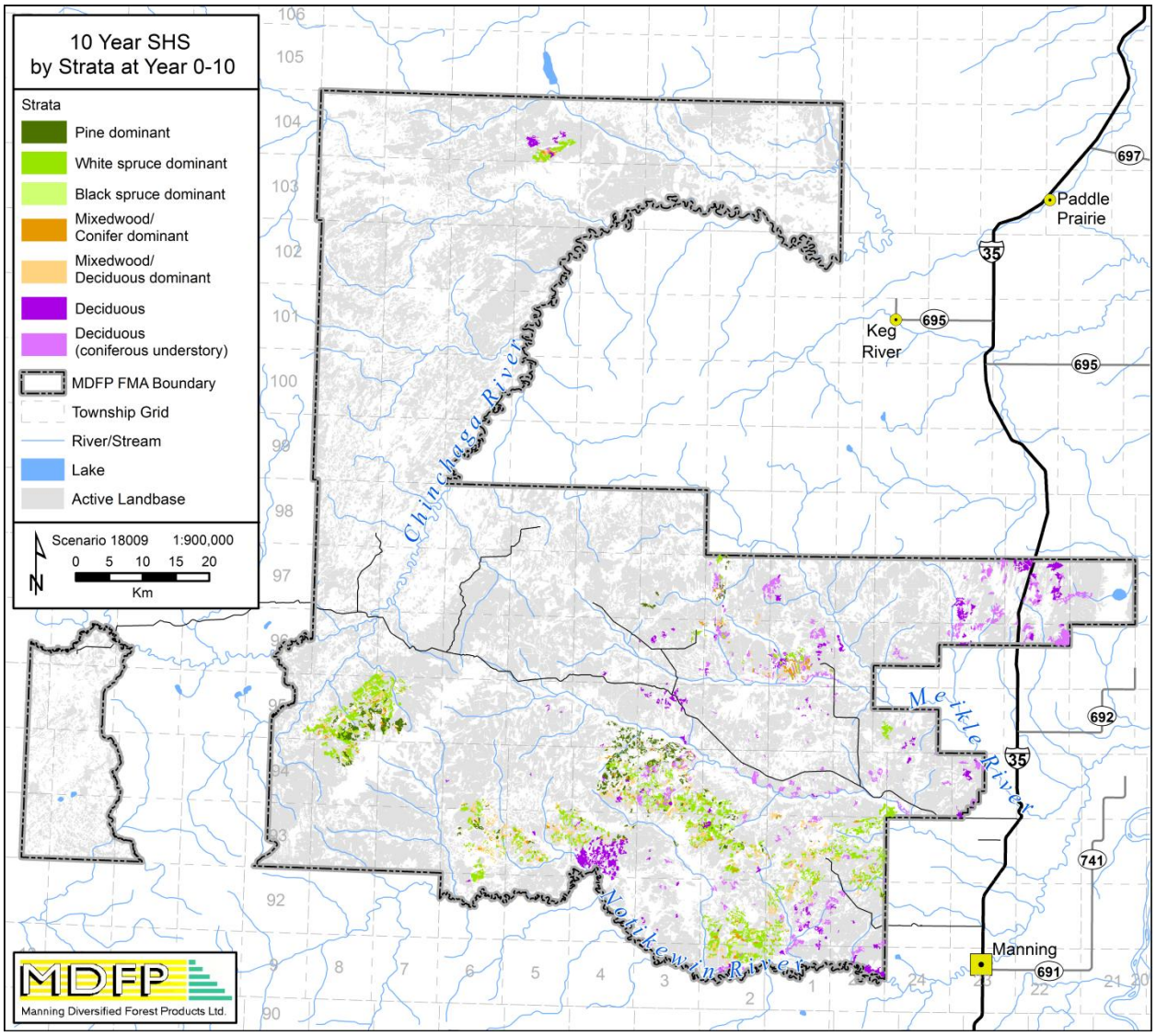
FMU	Company Name	Disposition Number	Primary Disposition Allocation %	Primary AAC 15+/10/30 cm m3/yr	Secondary Disposition Allocation %	Secondary AAC 15+/10/30 cm m3/yr	Total Approved AAC m3/yr
Deciduous							
P20	*Daishowa-Marubeni International Ltd.*	*DTAP200001*		*172,359*		*149,886*	*322,245*
P20		*Local Use* [2]		*1,741*		*1,514*	*3,255*
P20	DTAP20001 Total	DTAP200001		174,100		151,400	325,500

2. Any unused deciduous local use volume (1% of DTA) is available for DMI to harvest.

All AAC numbers are reduced for cull, 3.7% for coniferous and 9% for deciduous.

A map of the first 10 years (2012-2021) of the SHS is presented in the following figure. Stands allocated for harvesting in the next 10 years are concentrated in the southern portion of P20, with small allocations in the north. This is a reflection of the distribution of the mature timber types in the FMU. Areas which are not allocated in the short term are scheduled for future harvest and are required to support the current sustainable harvest levels needed to maintain MDFP's operations and a viable forest products industry in the Manning area.

Page revised October 1, 2013: corrections to "Recommend Coniferous AAC Allocation for FMU P20 effective May 1, 2012" Table



Stands allocated for harvest in the period 2012 to 2021

MDFP and DMI, with Direction from Alberta, negotiated a Memorandum of Understanding (MOU) to formalize, for the 10-year term of this plan, operational issues and a management approach for deciduous stands with an identified coniferous understorey. The MOU required a significant amount of time to finalize and developing an approach to manage deciduous stands with coniferous understory in the FMP was a major milestone involving considerable input. This has been an ongoing issue since the creation of the FMA, and while both companies expect improved management as a result of the MOU and this new FMP, both expire in ten years.

A MPB infestation has firmly entrenched MPB in the FMA area and has already killed much of the mature pine in the FMA area. To address this infestation, MDFP incorporated a MPB strategy into the 2012-2021 FMP. However, the MPB infestation continues to spread and MDFP expects the majority of the mature pine to be dead within the next few years. With approximately 75,000 ha of immature pine in the FMA which is vulnerable to future MPB infestations, the Company is concerned about its long term fibre supply.

Woodland caribou was a large management issue requiring considerable effort in the development of this and the previous FMP. Caribou range plans have not been developed for the FMA area. For the 2012-2021 FMP development, a caribou habitat strategy guided the development of the SHS and associated operational guidelines.

MDFP expects that Regional Plans for the Lower and Upper Peace Regions as well as caribou range plans will be developed and approved within the 10-year period of the 2012-2021 FMP. The impact of these plans on the FMA causes uncertainty and raises concerns about the long term fibre supply. As the FMA holder, MDFP would participate in the development of these plans.

The June 30, 2013 version of the FMP was submitted to ESRD for review. Incorporating feedback received from ESRD, this revised version dated October 1, 2013 was submitted as the approved version of the FMP. Pages with revisions are identified. Excluding the new date, revised pages are:

- Executive Summary: pages iii and v;
- Chapter 2: page 3;
- Chapter 5: pages 3, 8, 97;
- Chapter 6: page i;
- Chapter 7: page 18.

Page revised October 1, 2013

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List of Figures

Acknowledgements

As with any large undertaking many individuals contributed to the development of the 2012-2021 FMP. MDFP would like to acknowledge the following individuals for their contributions to this FMP.

Ted Gooding

Bob Christian

Brian Maier

Stuart Adkins

Keith Wells

Clarence Budal

Robert Stokes

Gord Whitmore

Brendan Hemens

Marty O'Byrne

Mark Crowley

Andrew Oliver

Dave Moyles

Steve Blanton, Woodlands Manager, MDFP

2012-2021 FMP Components

Binder	Type	ID	Name
ONE	Chapter	1	Corporate Overview and Forest Management Approach
	Chapter	2	FMP Development
	Chapter	3	Landscape Assessment
	Chapter	4	Summary of Previous FMP
	Chapter	5	Values, Objectives, Indicators and Targets
	Chapter	6	Preferred Forest Management Scenario
	Chapter	7	FMP Implementation
TWO	Annex	I	Forest Management Agreement (FMA)
	Annex	II	FMP Checklist
	Annex	III	PDT Meetings Notes
	Annex	IV	2007 - 2011 Stewardship Report
	Annex	V	Landbase Documentation
THREE	Annex	VI	Yield Curve Documentation
	Annex	VII	Forecasting
	Annex	VIII	Spatial Harvest Sequence (SHS) Map

1. Introduction

1.1 Background

On May 28, 2009, under Order in Council 250/2009, *Manning Diversified Forest Products Ltd.*[1] (MDFP) *Forest Management Agreement* (FMA), FMA0200041 was expanded to include *Forest Management Unit* (FMU) P18. Under the terms of the FMA, MDFP was not due to prepare and submit a *Forest Management Plan* (FMP) until May 1, 2017. However, the Company decided to prepare and submit the 2012-2021 FMP five years early in order to address the need for comprehensive and consistent planning across the expanded FMA area. This early submission provides strategic direction for sustainable forest management activities for the 10 year planning period May 1, 2012 to April 30, 2022.

1.2 About This Document

1.2.1 Document Structure

This FMP document is structured to fulfill the requirements of the Alberta Forest Management Standard, Version 4.1 (Alberta Sustainable Resource Development, 2006). The complete document consists of an executive summary, seven chapters and eight annexes. A synopsis of each of the chapters and annexes follows.

Chapter 1 – Corporate Overview and Forest Management Approach

- Defines the area to which the FMP is applicable

[1] Terms and initialisms that are defined in the Glossary (Appendix II) are shown in italics the first time they are presented in this document.

- Summarizes the companies with long-term timber rights in the FMA and their manufacturing facilities
- Outlines the forest management approach and the broad strategies to be employed to achieve the strategies
- Describes the layout and content of the FMP document

Chapter 2 – FMP Development

- Describes the process used to develop the FMP, important milestones, FMP products and the communication processes employed
- Summarizes and describes the *Plan Development Team* (PDT), its actions and decisions
- Summarizes Public Consultation and actions taken to address the concerns identified
- Summarizes First Nation Consultation and the actions to address the concerns identified

Chapter 3 – Landscape Assessment

- Describes the status of the FMA area in 2012, including:
- Administrative boundaries and landuse
- Geological, topological, soils, hydrology and climate conditions
- Forest Landscape patterns and structures
- Landscape disturbance and succession regimes and patterns

Chapter 4 – Summary of Previous FMP

- Status and performance of the 2007-2017 FMP
- Significant events affecting the FMA area since 2007-2017 FMP implementation

Chapter 5 – Values, Objectives, Indicators and Targets

- Describes the *Values, Objectives, Indicators and Targets* (VOITs) and the reporting required to demonstrate that FMP targets are achieved
- Predicts change in indicator status over time by following the activities planned in the PFMS

Chapter 6 – Preferred Forest Management Scenario

- Describes the assumptions, inputs and management objectives for the *Preferred Forest Management Scenario* (PFMS)
- Describes the rationale for selection of the PFMS by the PDT
- Demonstrates long-term sustainability of the PFMS by predicting the condition of the forest over the next 200 years using key indicators
- Predicts the flow of forest products over time from the PFMS
- Determines an *Annual Allowable Cut* (AAC) and the allocation for each timber quota

Chapter 7 – FMP Implementation

- Lists all of the commitments in the FMP
- Describes implementation strategies and actions to the undertaken by all operators in FMP P20 over the ten year life of the plan. Includes:
    - Access planning and development
    - AAC and direction on how timber volume is to be charged
    - Stands identified for each operator to harvest
    - Reforestation treatment and strategies
    - Forest Protection strategies
    - Strategies for the maintenance of *biodiversity*
    - Caribou and *Mountain Pine Beetle* (MPB) strategies
    - Monitoring and Reporting

Annex I – Forest Management Agreement

Annex II – FMP Checklist

Annex III – PDT Meeting Notes

Annex IV – 2007-2011 Stewardship Report

Annex V – Landbase Documentation

Annex VI – Yield Curve Documentation

Annex VII – Forecasting

Annex VIII – Spatial harvest Sequence (SHS) Map

1.2.2 Defined Terms

Definitions and terms as used in this FMP document are described in Appendix II. *Italic font* is used for the first use of defined terms in each chapter.

1.2.3 Timber Years

ESRD's timber year begins May 1st and ends April 30th and are normally written in the format XXXX/XX (*e.g.* 2012/13). For brevity, the title of the 2012-2021 FMP uses the year in which the timber year begins to represent timber years. The planned ten-year implementation period for the 2012-2021 FMP is May 1, 2012 to April 30, 2022.

1.3 Defined Forest Area

The 2012-2021 FMP is applicable to the *Defined Forest Area* (DFA) as identified in Figure 1. The DFA equals the area of FMA020041, which is identified as FMU P20. This document uses the terms 'FMU P20' or 'FMA area' to refer to the DFA.

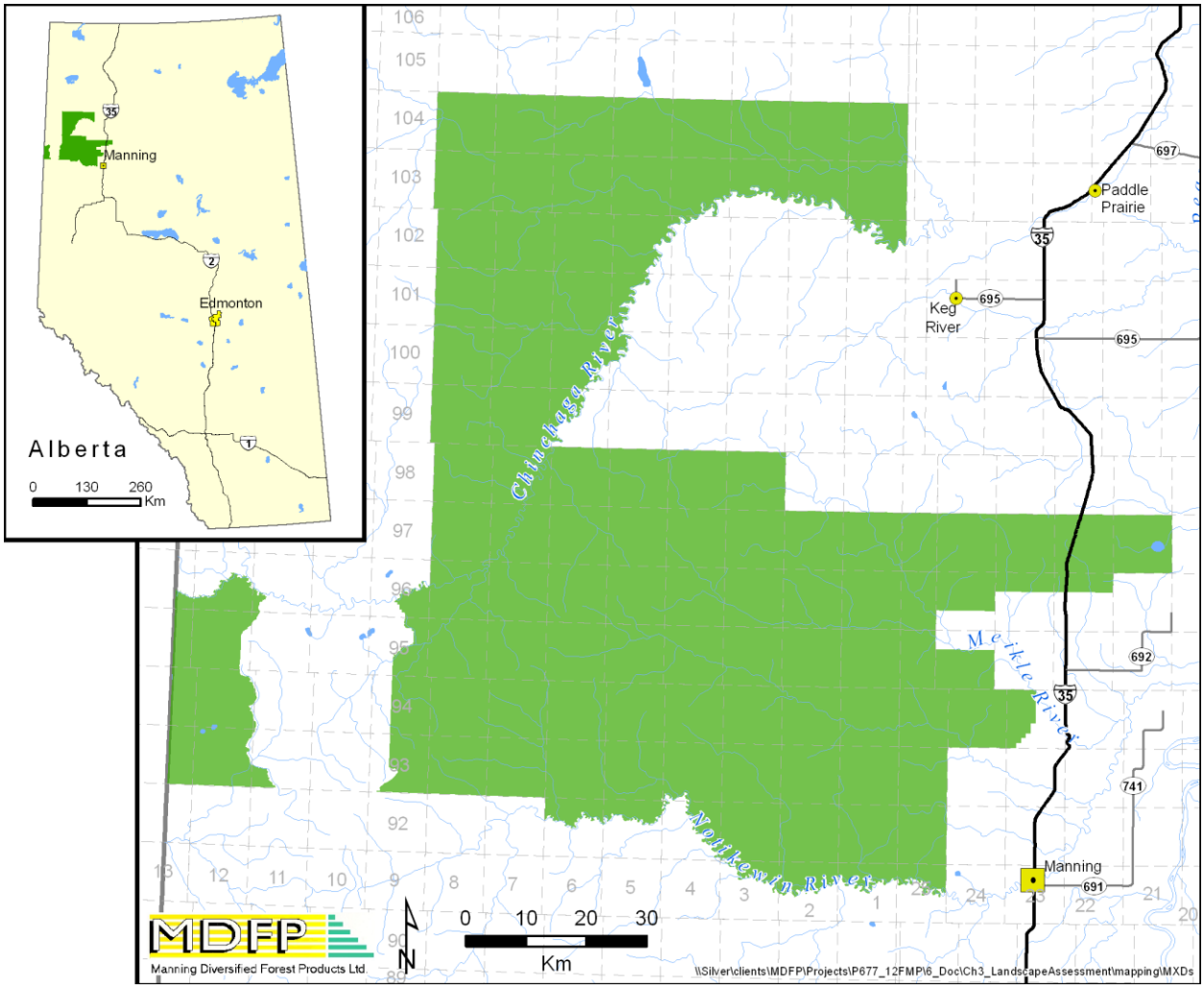

Figure 1. Defined Forest Area for the 2012-2021 FMP

2. Corporate Overview

MDFP, *Daishowa-Marubeni International* Ltd (DMI) and Buchanan Lumber have long term timber rights in the FMA area. An overview of each company is summarized below.

2.1 Manning Diversified Forest Products Ltd.

MDFP received its first coniferous timber quota from Alberta in November 1992. The Company was initially founded by nine partners, most of whom had strong ties to the Manning area. Their vision was to build a value-added wood processing facility near Manning to utilize all the available timber resources and provide maximum economic and social benefits to the Manning region. In keeping with this vision, the Company has further developed their facilities to include sawmill, planer mill and pellet mill, all located at a single site northwest of the town of Manning. MDFP's products are distributed to domestic, U. S. and Asian markets.

The Company's mission statement reads:

> *The goal of MDFP is to produce top quality, diversified forest products in a safe work environment for all, while maintaining high productivity. This will be done with care for the environment and wise use of the natural resources. By combining our talents and energy, we can achieve these goals.*

Entering into a Forest Management Agreement with Alberta and operating under an approved FMP are key components in fulfilling the Company's mission statement.

2.1.1 Facilities

Sawmill

Sawmill, the first facility to be constructed by MDFP, was completed by December 1993. The facility is located 24 km north of the town of Manning. The sawmill produces kiln-dried sawn wood, the majority of which is designated for further processing.

Currently, the sawmill produces roughly ninety million board feet per year using two primary breakdown lines. The facility runs two shifts per day, five days per week, with each shift generally responsible for a single line. The green lumber coming into sawmill is dried in one of three dry kilns, two of which are run on sawmill waste. The third kiln is run on natural gas.

Logs generally arrive at the sawmill facility in tree length form for processing. The mill itself contains a cut-off saw, a de-barker, two primary breakdown lines, a trimsaw/sorting system and a chipper. Chips produced as a by-product from the sawmilling process are designated for transfer to regional pulp mills. Two primary breakdown lines are size dependant, with larger logs going to one line and smaller logs going to the other. Maintaining two separate breakdown lines helps to ensure that MDFP uses full range of log sizes that grow within its FMA Area.

Planer Mill

The planer mill started operations in September of 1994. This is a single line mill which utilizes a planer to process the incoming rough lumber from sawmill. The volume is normally accommodated running one shift per day with occasional extra shifts. Additions to the planer mill since 1994 include expansion of the building and new automated grading and sorting equipment.

Planer Shavings Bagger

In 2003, a shavings bagger was installed at the Manning mill site. The bagger has a capacity of up to 2,000 bags of shavings per day. The shavings are used primarily as bedding material.

Pellet Mill

As part of the Company's commitment to value added local manufacturing and diversification, construction and start-up of a new pellet mill was completed in 2012. The mill utilizes planer shavings to produce approximate 7,500 tonnes per year of wood pellets in both bags and bulk form.

Biomass Energy

To promote self-sustainability and to reduce carbon footprint, the Company is constructing an innovative *Combined Heat and Power* (CHP) facility incorporating a waste wood biomass energy system and an *Organic Rankine Cycle* (ORC) Power Generating Turbine. Heat and power generated from renewable biomass may be used to generate offset credits in Alberta under the Specified Gas Emitters Regulation with use of approved Alberta protocols. The renewable heat and power generated will be sold through the provincial power grid. Biomass feedstock for the CHP facility will be produced on site from mill waste (≈40,000 tonnes) and possibly from harvest debris (slash ≈10,000 tonnes). The Company anticipates this facility to be operational in 2014.

As described in the April 2010 SRD Forest Industry Sustainability Information Bulletin (Alberta Sustainable Resource Development, 2010), FMA holders own all parts of a tree once it is severed from its stump, including offset credits earned. Generation of energy products from logging or mill residues is regulated in Alberta and is recognized under the current stumpage system. Tops, large branches and other recoverable harvest debris pieces (slash) that are used as biomass fuel, are owned by MDFP and are subject to dues as described in the Regulation. Biomass from slash will primarily consist of excess woody debris that must be disposed of within the block (burning) to reduce fire hazard and facilitate reforestation. Use of slash as biomass fuel will reduce the amount of pile burning and thus, have environmental benefits in addition to offsetting fossil fuel use. The amount of harvest debris taken as biomass fuel for the CHP facility will not jeopardize coarse woody debris retention required for habitat or soil conservation as directed by the regulating authority and described in this FMP.

2.1.2 Employment

MDFP employs approximately one hundred and ten full time employees on-site. This figure includes office staff, mill workers, and a woodlands staff of five. There are also approximately one hundred full and part-time contract positions which include year-round operations such as sales, shipping and trucking or in seasonal operations such as harvesting, log haul or reforestation (primarily site preparation and tree planting).

2.2 Daishowa-Marubeni International Ltd.

Prior to the expansion of the FMA, Daishowa-Marubeni International Ltd. (DMI), Peace River Pulp Division, held *Deciduous Timber Allocation* (DTA) certificates DTAP160001 in FMU P16 and DTAP180001 in P18. The certificates entitle DMI to 100% of the deciduous Annual Allowable Cut (AAC) in FMU P18 and P19. On February 22, 2011, ENVSRD approved the creation of FMU P20 and DMI has applied to merge the 2 DTAs into a single certificate. DMI is responsible for regeneration of areas it harvests under its authority.

DMI's processing facility is located 16 km north of the town of Peace River. The mill employs 350 people and produces 480,000 air-dried metric tonnes of kraft pulp. Typically, one quarter of the total production is softwood pulp and three quarter is hardwood pulp.

The pulp mill pioneered the production of hardwood pulp in north-western Alberta. It is designed to minimize the impact on the environment and utilizes previously uneconomical hardwood timber and residual softwood chips purchased from sawmills in the area.

DMI converted a majority of their harvesting operations from tree length to in-bush chipping. However, a portion of the mill's fiber continues to be delivered as tree length.

2.3 Buchanan Lumber Ltd.

Prior to the amalgamation of FMU P18 in the FMA, Buchanan Lumber held coniferous timber rights in FMU P18 in the form of a *Coniferous Timber Quota* (CTQ) equalling to 20.43% of the conifer AAC. Upon

the creation of FMU P20, a new CTQ which applies to the entire P20 was issued to Buchanan and the quota percent adjusted to account for the larger area. The revised P20 quota percent is 2.8898%. As part of the agreement to amalgamate two old FMUs into P20, fibre for Buchanan's quota will continue to be sourced from their traditional area, the old FMU P18 area (Appendix I).

Buchannan Lumber's Sawmill is located in High Prairie, Alberta and has an annual production capacity of over 100 million board feet of dimensional lumber per year. The Company's value added products include custom lumber sizes, finger-jointed lumber and wood-only densified firelogs.

3. Forest Management Approach

MDFP will employ an extensive forest management philosophy for the maintenance of landscape ecological function. This complements the relative remoteness of the FMA area, the timber values and other development patterns and infrastructure present in the FMA. To implement this approach, MDFP has developed the following general forest management approaches.

1 Forest management activities will be restricted to approximately 52% of the FMA area. This will limit the impact and scale of forest management activities to half of the *landbase*. The 48% of the *landbase* area which remains undisturbed from forest management activities will contribute to forest conservation values.

2 Emulation of natural disturbance patterns. Wildfires are the prime natural disturbance agent and largely responsible for shaping landscape patterns. Harvesting and reforestation activities will be designed to mimic these patterns to the extent possible, while taking into consideration the other values and limitations that must also be managed.

3 Extensive level of forest management which maintains and works with natural ecological processes across the FMA area. This will aid in the maintenance of the natural species composition and forest structures across the landscape.

To implement this forest management approach, MDFP has selected complementary forest management strategies which meet regulatory requirements and the company's needs.

3.1 Forest Management Strategies

MDFP will apply the *Canadian Standard Association* (2002) forest management framework that was developed from the Canadian Council of Forest Ministers' (CCFM) Criterion and Indicators (C&I) (Canadian Council of Forest Ministers, 1997). The CSA framework is based upon the establishment of Values, Objectives, Indicators and Targets (VOIT) which establishes specific management targets for broad criterion:

1. Conservation of *biological diversity*;
2. Maintenance and enhancement of forest ecosystem condition and productivity;
3. Conservation of soil and water resources;
4. Forest ecosystem contribution to global ecological cycles;
5. Multiple benefits to society; and
6. Accepting society's responsibility for sustainable development.

In addition to accepting the CCFM's C&I and a planning process based on VOITs, MDFP employs additional strategies in both the FMP process and at the operational level where the FMP is implemented. Examples are:

Adaptive management – MDFP plans and operates under long time horizons which are appropriate for the boreal forest. MDFP will adapt its planning and operations as the company and other operators continually increase their knowledge of forest management; and due to changing conditions such as the mountain pine beetle infestation.

Continual improvement – MDFP strives to continually improve its operations and forest management practices. Prompt reporting is a component of continual improvement; the plan, do, check cycle. MDFP undertakes annual reporting of activities to provide an early indication of the achievement of targets and provide time to adapt and improve.

Multi-level planning – MDFP conducts planning across the broad spatial and temporal scales required to effectively manage the boreal forest in the FMA Area. The Company recognizes the importance of creating strong linkages between planning hierarchies. MDFP invested a large amount of effort in ensuring that the *Spatial Harvest Sequence* (SHS), developed for 2012-2021 FMP as part of the company's long-term strategic planning, can be economically implemented each year over the next 10 years.

Communication and Consultation – MDFP conducts ongoing consultation and communication with First Nations, Métis, other public members and other forest users and stakeholders. This program is outlined in MDFP's Communication Plan (refer to Chapter II). The Company is an active member and supporter of The Town of Manning and the local communities.

Silviculture Intensity – MDFP applies *silviculture* prescriptions to regenerate commercial timber crops in order to sustain harvest levels. These prescriptions are designed to utilize the natural ecological growth processes.

Minimize access - utilizing winter only access roads and minimizing the construction of all weather road networks, reduces access and helps to preserve the remoteness of the FMA.

Cooperation between operators – where practical, MDFP cooperates with other forestry operators and other industrial users to minimize both the extent of disturbances and length of the period when activity is undertaken.

Third party certification – MDFP has obtained third party certification for its forest management activities and a chain of custody for the company's products. This provides independent verification of the company's products and practices.

Ongoing training – MDFP supports ongoing training for staff and contractors. This promotes safety and provides staff and contractors with the information required for changing needs in today's' dynamic working environment.

Corporate economic sustainability – by maintaining an economically viable operation the company will be able to continue to provide jobs to the local communities. MDFP's recent investment in a pellet mill and a biomass energy system are examples of investments to maintain economic sustainability.

Details on how these strategies were incorporated into the planning process used to develop the 2012-2021 FMP can be found in subsequent chapters and in the annexes. Descriptions on how these strategies will be applied over the 10-year life of the FMP are provided in Chapter 7 FMP Implementation.

4. References

Alberta Sustainable Resource Development. 2010. Forest Bio-fibre, Carbon, Carbon Sequestration Benefits. Forest Industry Sustainability. Information Bulletin. 3 pages. Available: http://srd.alberta.ca/LandsForests/ForestBusiness/BioproductsFromForestFibres/documents/ForestBiofibreCarbonSequestionBenefitsApr2010.pdf

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Appendix I FMU P20 Approval Letter

Government of Alberta
Sustainable Resource Development

Forest Management Branch
Forestry Division
8th Floor, Great West Life Building
9920 – 108 Street
Edmonton, Alberta T5K 2M4
Telephone: (780) 427-8474
www.alberta.ca

File: 06302 - 010

February 22, 2011

Mr. Steve Blanton
Woodlands Manager
Manning Diversified Forest Products Ltd.
Box 370
Manning, Alberta, Canada
T0H 2M0

Dear Mr. Blanton:

Subject: APPROVAL - CREATION OF FOREST MANAGEMENT UNIT P20

The department has approved the creation of Forest Management Unit (FMU) P20. This FMU results from the amalgamation of FMUs P16 and P18 (see Map 1) and aligns with Manning Diversified Forest Products Ltd. Forest Management Agreement 0200041.

The original FMU boundaries are dissolved creating P20 (see Map 2). The timber supplies of all operators within FMUs P16 and P18 have been confirmed within P20. The coniferous disposition holders will continue operations in their traditional areas (see attached letter from Buchanan Lumber). In the event of a major landscape disturbance, disposition holders may be required to relocate their operations. The effective date for these revisions is May 1, 2010.

The historical Annual Allowable Cuts (AACs) (Tables 1 and 2), revised AACs (Tables 3 and 4) and associated Periodic Allowable Cuts / Quadrant Authorized Allowable Cuts (Tables 5 and 6) are attached.

Please direct any questions to Mr. Frazer Butt at (780) 422-4815.

Yours truly,

Robert W. Stokes, RPF
Senior Manager
Forest Planning Section

cc: Shawn Barraclaugh, Forestry Program Manager, Peace Area
Mark Crowley, Senior Forester, Peace Area
Owen Cook, Area Forester, Peace Area
Keith Branting, Woodlands Manager, Gordon Buchanan Enterprise Ltd.
Tim Barker, Business Team Leader - Planning, Daishowa-Marubeni International Ltd.

Alberta
Freedom To Create. Spirit To Achieve.

August 3, 2010

MAY-03-2010 MON 03:09 PM MANNING DIVERSIFIED FAX NO. 780 836 3202 P. 02
MAY-03-2010 09:43 From:BUCHANAN LUMBER LTD 780 523 5422 To:780 836 3202 P.1/1

BUCHANAN LUMBER
MANUFACTURERS OF WESTERN SPRUCE

P.O. Box 38 • High Prairie • Alberta • T0G 1E0 • Bus (780) 523-4544 • Fax (780) 523-5422

May 1, 2010

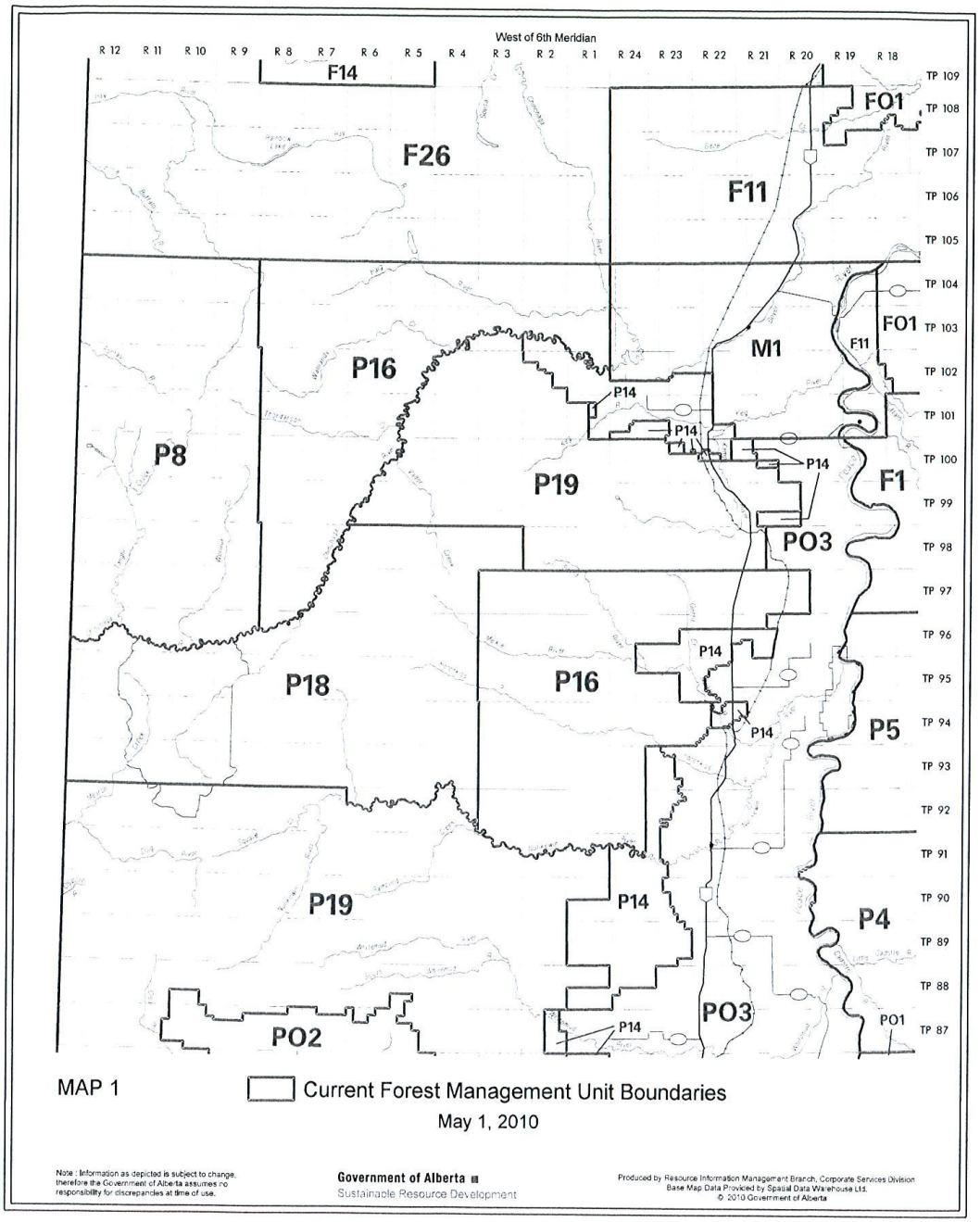
Manning Diversified Forest Products
Box 370
Manning, Alberta

Attention: Steve Blanton

It is our understanding that you wish to dissolve the boundaries between FMU P 16 (your FMA) and FMU P 18 and create one FMU/FMA. It is understood that this would then create one larger FMA for yourselves with Buchanan Lumber having quota within this area. It is also understood that Buchanan would have a Volume Supply Area within this new FMA which would be the old FMU P18 boundary. Buchanan Lumber agrees with this approach.

Yours truly,

Keith Brantingham
Woodlands Manager
Buchanan Lumber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MAP 1
Current Forest Management Unit Boundaries
May 1, 2010
Note : Information as depicted is subject to change, therefore the Government of Alberta assumes no responsibility for discrepancies at time of use.
Government of Alberta
Sustainable Resource Development
Produced by Resource Information Management Branch, Corporate Services Division
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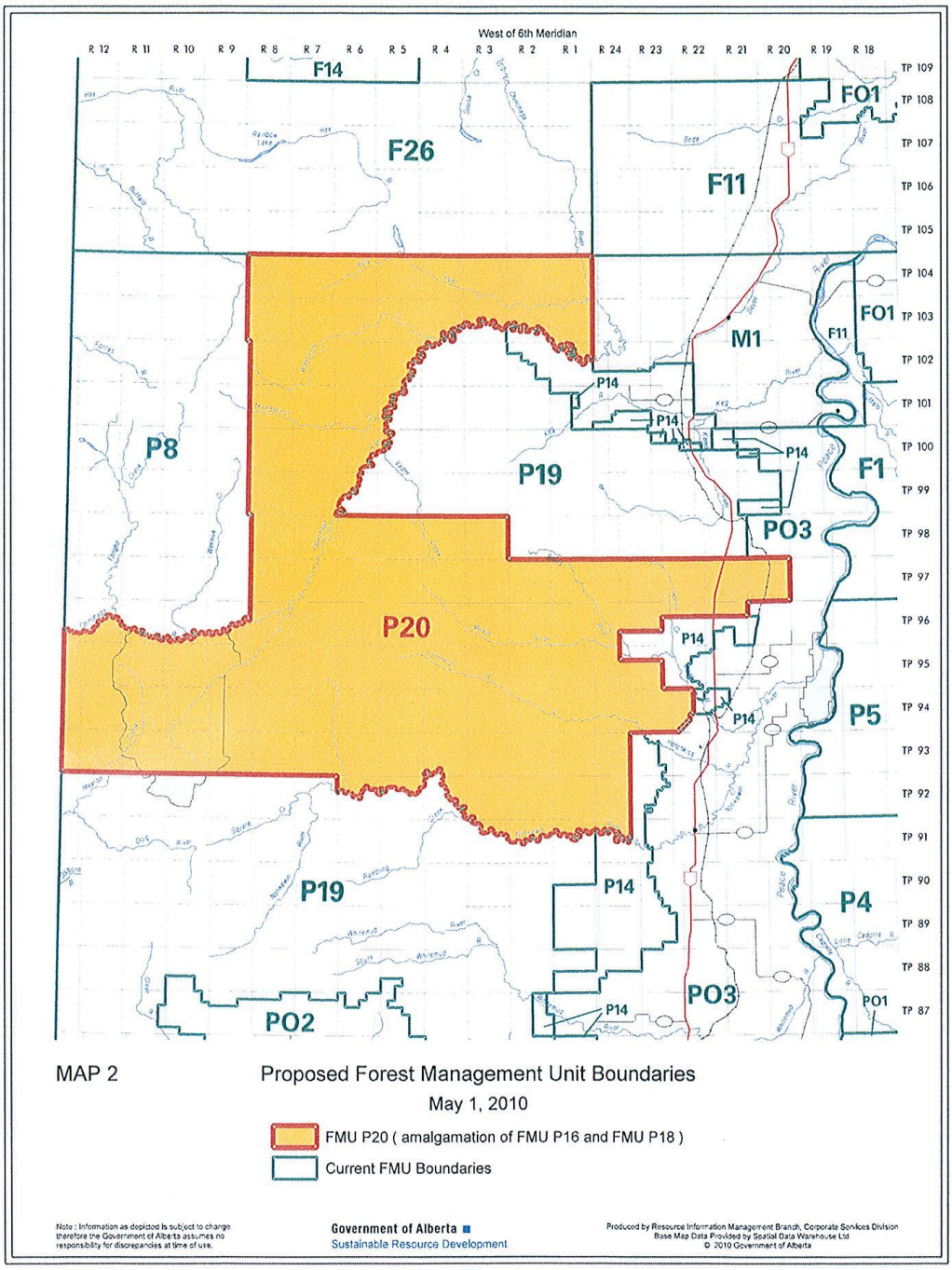
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MAP 2
Proposed Forest Management Unit Boundaries
May 1, 2010
FMU P20 (amalgamation of FMU P16 and FMU P18)
Current FMU Boundaries
Note : Information as depicted is subject to change therefore the Government of Alberta assumes no responsibility for discrepancies at time of use.
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Appendix II Glossary of Terms and Initialisms

Glossary Term		Definition
Above Mean Sea Level	AMSL	A measure of topographic elevation.
Active landbase		Areas that are available for forest management activities. That component of the physical landbase that is not deleted in the landbase netdown process. Consists of the combined coniferous and deciduous landbases. Also referred to as the timber harvesting landbase, net landbase, managed landbase or
Adaptive management		A process for continually improving of planning, implementing, and monitoring policies and practices by learning from the outcomes of previously employed policies and practices, and taking corrective actions where unplanned results occur.
Alberta Environment and Sustainable Resource Development	ESRD	Government of Alberta ministry responsible for regulating FMAs.
Alberta Regeneration Information System	ARIS	A Provincial database of silviculture treatments applied to harvested lands. Updated annually by permit and license holders. Considered to be the defacto record of treatment history and block status.
Alberta Biodiversity Monitoring Institute	ABMI	A province-wide monitoring program that collects information on about 2000 species through site visits, aerial photography and satellite imagery. ABMI provides information on the state of Alberta's biodiversity to facilitate management.
Annual Allowable Cut	AAC	The volume of timber permitted to be harvested in any one year, as stipulated in the pertinent approved FMP. In Alberta, the AAC is the quadrant cut divided by the number of years in that quadrant (usually five).
ARC Macro Language	AML	A third-generation (non-compiled) scripting language, propriety to ESRI. AML is a legacy language used commonly in early versions of ESRI software. While primarily a legacy product, it is still used for developing processes that need to run unattended.
Alberta Vegetation Inventory	AVI	The provincial standard for forest inventory information (classification and data storage).
AVI polygon		A polygon delineated based on aerial photography using AVI rules (AFLW 1991, Nesby 1997). For vegetated areas, areas must be sufficiently similar in terms of structure, moisture regime, crown closure, height, species composition and origin year to be considered a single unit or a polygon. Non-vegetated areas must have a similar nonvegetated classification.
Base natural yield curve		The "standard" set of yield curves developed for yield strata, representing the main stand types within the FMA area. Base yield curves may or may not be used to represent these stand types in the final timber supply analysis.
Biological diversity (biodiversity)		The variety, distribution, and abundance of different plants, animals, and microorganisms, the ecological functions and processes they perform, and the genetic diversity they contain at local, regional, or landscape levels of analysis.
Broad Cover Group	BCG	A classification of forest types based on coniferous and deciduous components of the AVI species composition. The broad cover groups are coniferous (C), coniferous-leading mixedwood (CD), deciduous-leading mixedwood (DC) and deciduous (D).
BCG: Pure Deciduous	D	Deciduous ≥ 80%
BCG: Deciduous-Coniferous	DC	Coniferous > 20% and Deciduous > 20%
BCG: Conifer-Deciduous	CD	Coniferous > 20% and Deciduous > 20%
BCG: Pure Coniferous	C	Coniferous ≥ 80%
Buffer		Used in several contexts: (1) In protecting critical habitat areas, the buffer is an area of forest land that reduces the impacts of adjacent activities on the critical area. (2) A strip of land between two areas under different management regimes. (3) An area maintained around a sample or experimental plot to ensure that the latter is not affected by any treatment applied to the area beyond the buffer. (4) In GIS work, a new polygon zone computed on distance from a point, line or existing polygon.
Canadian Standard Association	CSA	Not-for-profit standards organization that is is composed of representatives from industry, government, and consumer groups and which develops standards in 57 areas.
Caribou		Boreal woodland caribou can be found in forested areas across Canada. In Alberta there are two varieties of woodland caribou – the mountain caribou in foothills and mountains of west-central Alberta, and the boreal caribou in northern Alberta. Woodland caribou are listed as threatened under the Alberta Wildlife Act and federally under the Species at Risk Act (SARA).
Caribou, habitat contols		Rules/constrains applied in a hierarchical forest modeling process with considerations across various spatial and temporal scales to enhance the caribou habitat. The main controls were: (1) 30/20 rule – in the deciduous and mixedwood stratum, a maximum of 20% is allowed to be under 30 years old; (2) Patch target – a patch target that tended towards patches (under 30 years old) larger than 300 ha.
Caribou, provincial zone		Provincially-approved caribou land-use referral map layers that are inteded to alert planners when harvest plans fall in or near these special land management areas and aim to reduce the industrial footprint and impacts on caribou.

Glossary Term		Definition
Classified landbase		A spatial landbase and attribute classification generated as the second stage of the TSA process. Used to calculate the area and distribution of all features on the landscape, particularly to generate summaries of seismic detail and carry this into the modeling landbase.
Clearcutting		A regeneration system where all or most of the merchantable trees in a defined area are harvested in one cutting with reproduction obtained through artificial or natural means.
Committee on the Status of Endangered Wildlife in Canada	COSEWIC	Harvested in one cutting with reproduction obtained through artificial or natural means.
Compartment		A subsection of a Forest Management Agreement (FMA) for which operational plans are developed.
Compartment, working circles		A subsection of an FMA defined by the Manning Diversified Forest Products Ltd.
Combined Heat and Power	CHP	The simultaneous production of electricity and heat from a single fuel source
Composite yield curve		Area-weighted composite yield curves developed from empirically-fit natural stand yield curves; generally by BCG or groupings thereof.
Coniferous Timber Quota	CTQ	One of two types of volume-based long-term forest tenures (also deciduous timber allocation) for harvesting a set proportion of the coniferous AAC volume within a defined area, usually for a period of 20
Connectivity, landscape		A measure of how well different areas (patches or a landscape) are connected by linkages, such as habitat patches, single or multiple corridors, or "stepping stones" of vegetation. Landscape connectivity can be defined as the degree to which the landscape facilitates movement between resources patches.
Corrective actions		May include one or more of the following: - Address a nonconformity in a management system by identifying and eliminating the causes of a problem; - Carry-out an appropriate enforcement response; - Direct that the work to be corrected and re-submitted.
Corridor		A physical linkage connecting two areas of habitat and differing from the habitat on either side. Corridors are used by organisms to move around without having to leave the preferred habitat. A linear habitat patch through which a species must travel to reach habitat more suitable for reproduction and other life sustaining needs. Many corridors, linking several patches of habitat, form a network of habitats.
Cull deductions		Trees or portions thereof that are merchantable, but are removed because of defect.
Culmination age		The age at which the stand, for the stated diameter limit and utilization standard, achieves its maximum average rate of volume production (the Mean Annual Increment (MAI) is maximized).
Cutblock		A specified area that is either designated for harvest or has already been harvested.
Daily mean temperature		Derived on a daily basis from daily minimum and daily maximum temperatures. Daily minimums and maximums are recorded over 24 hour periods that begin and end in the morning. These values are then averaged for the entire month, over the reporting period (generally 30 years, from 1961- 1990).
Daishowa Marubeni International Ltd.	DMI	A neighbouring FMA holder and license holder inside the MDFP FMA area.
Defined Forest Area	DFA	Area of forest, including land and water (regardless of ownership or tenure), to which the requirements of the FMA apply.
Defining layer		Inventory layer used to assign strata. The defining layer may be the overstory or the understory.
Deletions		All areas excluded from the active landbase and assigned a code identifying the reason for deletion.
Digitally Integrated Disposition system	DIDs	A Provincial database and system of specific land use disposition types submitted for approval. The DIDs spatial data are managed and distributed by Alberta Public Lands.
Disturbance patch		Disturbance patches are used to describe the patch sizes of any part of the active landbase that is less than 20 years old, regardless of strata.
Deciduous Timber Allocation	DTA	One of two types of volume-based long-term forest tenures (also see coniferous timber quota) for harvesting a set proportion of the deciduous AAC volume within a defined area, usually for a period of 20
Environmental Systems Research Institute ™	ESRI	The developer of the suite of geographic information system software products commonly known as ArcInfo, ArcMap, ArcView, Spatial Analyst and others.
Environment and Sustainable Resource Development	ESRD	Alberta Environment and Sustainable Resource Development is a ministry of the Government of Alberta that brings together the former departments of Environment and Water and Sustainable Resource Development.
FireSmart		The philosophy that seeks to mitigate the likelihood of large, high intensity and severity fires.
FireSmart community zone		A standard ten kilometre radius around the community extending from the Wildland Urban Interface Zone. A unique data set will be gathered for this zone for community protection planning to provide a fundamental linkage between FireSmart Communities and FireSmart Landscapes.
FireSmart landscapes		FireSmart landscapes are designed to recognize the interaction between ecological, economic, and social impacts, thus, maximize the positive ecological impacts and minimize the negative economic and social impacts.
FireSmart landscape zone		The zone that extends beyond the FireSmart Community Zone overlapping multiple jurisdictions at a broad landscape level. This zone focuses on mitigating the likelihood of large, high intensity, high severity fires. Fire, Forest and Land Management planning are integrated and designed to reduce the negative ecological, economic, and social impacts of wildfire while maximizing the positive attributes of wildfire.
Forecasting		See Timber Supply Analysis.
Forest Management Agreement	FMA	Contract between the Province of Alberta and the FMA holder whereby the Province provides an area-based Crown timber supply. In return, the FMA holder commits to: managing the timber resource on a perpetual sustained yield basis, taking into consideration a broad range of forest values in determining forest management practices; and meeting defined economic objectives, including capital investments and job creation, and seeking out new business opportunities that provide measurable economic benefits for both the Province and the FMA holder. The FMA gives the FMA holder the right to access Crown fibre. In return, the FMA holder commits to forest management responsibilities, which may change from time to time (Alberta SRD 2006).

Glossary Term		Definition
Forest Management Plan	FMP	A document prepared by the FMA holder that describes the spatial and temporal harvest plan and forest harvest operations on Crown lands over a 10-year planning horizon (in Alberta). The document provides detailed methods, schedules, and responsibilities of the FMA holder in terms of accessing, harvesting, renewing and protecting the resource to enable site-specific operations to proceed. The document must be approved by the Government of Alberta, with input from stakeholders.
Forest Management Unit	FMU	An administrative unit of forest land designated by the Minister, as authorized under Section 14(1) of the Forests Act.
Forest patch		A stand of forest in the same seral stage that is not split by a linear feature greater than 8 m wide.
Forests Act, the		The legislative statute that authorizes the Minister to administer and manage the forested lands of Alberta.
Fully stocked		All potential growing space that is effectively occupied by merchantable tree species.
GEO	GEO	ESRI notation to for data stored in coordinates representing latitude and longitude.
Geographic Information System	GIS	A collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.
Green-up period		The time needed to re-establish vegetation after a disturbance. Specific green-up periods may be established to satisfy visual objectives or hydrological requirements, or as a means of ensuring re-establishment of vegetation (for silviculture, wildlife habitat or hydrological reasons) before adjacent
Gross volume		A term applied to tree-level, plot-level or stand-level volumes (*e.g.,* gross total tree volume, gross merchantable tree volume, gross total plot volume, gross merchantable plot volume, gross total stand volume, gross merchantable stand volume) that Indicates no defect/cull deduction has been applied.
Growing Degree Day	GDD	The sum of mean daily temperature above a baseline temperature (i.e. 5 degrees Celsius). Daily values are accumulated over the growing to determine annual values.
Growing stock		The sum (by number, basal area or volume) of trees in a forest or a specified part of it.
Harvest area		A specified land area with defined boundaries where timber harvesting is scheduled, or has occurred (commonly referred to as a cut block).
Industrial Sample Plot	ISP	A forest plot used to monitor the natural growth and yield of trees.
Influential point		An extreme data point that negatively influences model performance, resulting in failure to converge or an unacceptable curve shape.
Input datasets		Datasets received for the purpose of completing the landbase netdown. These frequently require processing to convert or add attributes, assign/add projection information, or combine with other inputs that represent the same features.
Landbase		A result of a classification process used to identify and determine areas available and suiatble for timber harvesting activities.
Landbase, active (also referred to as net, or managed, or contributing)		The landbase available for timber harvest and that comprises the net productive coniferous and net productive deciduous land bases. The active landbase is further classified into either conifer or deciduous landbase depending on species composition.
Landbase, passive (also referred to as		The landbase that is not part of the net productive coniferous or deciduous landbases
Landbase polygon		A polygon within the (classified, TSA, or modeling) landbase derived during spatial processing to incorporate various spatial layers and attributes of interest.
Managed landbase		That portion of the net landbase which is considered "managed" in the respect that the land received a harvest treatment and subsequent silviculture treatments. Note that AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any records of reforestation are not considered 'managed'.
Managed stand		Stand that is initiated by anthropogenic disturbance such as harvesting.
Managed stand yield curve		Yield curves generally created by applying regeneration lags to base natural yield curves with cull. Regeneration lags varied depending on whether cutblocks were harvested prior to or after 1993. Thus both Pre93 and Post93 managed managed stand yield curves developed.
Manning Diversified Forest Products Ltd.	MDFP	The forest products company in Alberta responsible for this FMP.
Mean Annual Increment	MAI	Average annual increase in volume of individual trees or stands up to the specified point in time. The MAI changes with different growth phases in the life of a tree, being highest in the middle years and then slowly decreasing with age. The point at which MAI peaks is commonly used to identify the biological maturity of the stand and its readiness for harvesting (Alberta SRD 2006).
Metadata		Data that describes the content, quality, conditions, use limitations and other characteristics of a dataset and which also documents bibliographic records including but not limited to information such as who collected the data, when and how it was collected, preprocessed and converted, its resolution and who presently holds the data. In summary, metadata is information about a thing, apart from the thing itself.
Merchantable volume, stand		Merchantable tree volume summed to represent volume on a per hectare basis.
Merchantable volume, tree		A tree-level term; the volume of those portions of a tree bole that meet utilization requirements (stump height, top and bottom diameter limits and log length).
Modeling landbase		A tabular and spatial landbase. Tabular data make the landbase suitable for both strategic and operational timber supply modeling. The spatial component is used for harvest scheduling.
Modeling tool, Patchworks©		A spatially-explicit wood supply planning and modeling tool developed by Spatial Planning Systems that was designed to provide the user with operational-scale decision-making capacity within a strategic analytical environment.
Modeling tool, Woodstock©		A non-spatial forest modeling tool developed by Remsoft used for harvest scheduling, wood supply analysis, wildlife management and simulation of forest ecosystems to test and compare different management assumptions.

Glossary Term		Definition
Mountain Pine Beetle	MPB	A defoliator insect species (*Dendroctonus ponderosae*) endemic to western North America that infects pine trees during its life cycle and results in tree mortality.
Natural stand		Stands developed under natural (non-anthropogenic) disturbance regimes. Stand initiation was due to natural disturbances, such as fire, pest or pathogen outbreak.
Natural stand empirical yield curve		Empirical yield curve fitted using data from all sampled natural stands within the active landbase.
Net volume		Timber volume that includes the main stem and excludes the stump, top and defective and decayed wood.
Non-linear regression		The practice of fitting a model where the dependent variable is a nonlinear function of one or more independent variables. One benefit of the nonlinear models is that they are often derived on the basis of physical and/or biological considerations.
North American Datum	NAD	A mathematical process of correcting geospatial locations relative to a fixed, known position.
Noxious weed		A plant designated under the Weed Regulation (AR 171/2001) of the Weed Control Act.
Observation		One plot measurement at a specific point in time. All TSPs have only one associated observation, whereas PSPs may have one or more observations (remeasured data) for a single plot.
Operating Ground Rules	OGR	Practices used in operational planning and for implementation of timber harvest operations.
Organic Rankine Cycle	ORC	Thermodynamic process where heat is transferred to a fluid at a constant pressure
Patch		A stand of forest in the same seral stage, and not split by a linear feature greater than 8m wide. Linear features in this definition include roads, pipelines, powerlines, and rivers, but do not include seismic lines.
Passive landbase		That part of the gross landbase that has a deletion and is excluded from the active landbase.
Permanent Sample Plot	PSP	A fixed or variable area plot established for (forest) sampling and measurement purposes, and designed for re-measurement.
Piece size		Number of trees required to obtain one cubic meter (m^3) of gross merchantable tree volume.
Plan Development Team	PDT	A group of individuals assembled for production of MDFP's Forest Management Plan that includes representatives from MDFP, DMI and Buchanan Lumber, Alberta Environment and Sustainable Resource Development, and FORCORP. The goal of the PDT is to provide a forum for facilitating efficient and productive communication and decision making.
Plot		Unit of area, within which variables of interest are assessed.
Plot volume		Gross merchantable tree volume within a plot on a per hectare basis (m^3/ha).
Polygon		A closed geometric entity used to spatially represent area features with associated attributes.
Post93 managed stand yield curve		A managed stand yield curve with a 2-year regeneration lag applied to the coniferous landbase and a 0-year regeneration lag applied to the deciduous landbase.
Pre93 managed stand yield curve		A managed stand yield curve with a 5-year regeneration lag applied to the coniferous landbase and a 2-year regeneration lag applied to the deciduous landbase.
Preferred Forest Management Scenario	PFMS	The forest management scenario that represents MDFP's preferred strategies and activities for managing the FMA area over a 200-year planning horizon.
Prescribed burn		The planned use of carefully controlled fire to accomplish various predetermined management goals: site preparation for planting; reduction of fire hazards or pest problems; improvement of the ease with which the site can be traversed; and creation of better quality browse for wildlife.
Regeneration		The renewal of a tree crop by natural or artificial means. It may also refer to the young crop itself.
Regeneration lag		The period of time between harvest and establishment of the regenerated stand.
Rotation		The period of years required to establish and grow even-aged timber crops to a specified condition of maturity.
Sensitive sites		Sites that have soil, water, slope, aesthetic, vegetation or wildlife characteristics that require special protection beyond the normal precautions described in the ground rules.
Seral stage (SS)		Stages in forest succession that are characterized by plant community conditions. The seral stage definition in this document are based on age and strata classifications
SS: Mature	Mature	Stands that are old enough for harvesting. Age: 61-100 for D and DU; Age: 71-110 for DC and CD; Age: 71-120 for PL; Age: 106-160 for SB, and 106-150 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Old	Old	Stands that are starting to break up or become stagnant. Age ≥ 101 for D and DU; Age ≥ 111 for DC and CD; Age ≥ 121 for PL; Age ≥ 161 for SB; Age ≥ 151 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Regeneration	Regeneration	Stands that are in early stages of development. Age: 0-15 for all strata classes. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Young	Young	Stands that are vigorously growing but are not yet fully grown. Age: 16-60 for D and DU; Age: 16-70 for DC, CD, and PL; Age: 16-105 for SB and SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
Silviculture		The theory and practice of controlling the establishment, composition, health, structure and growth of forests in order to achieve specified management objectives.
Sliver		Generally small polygons created in the spatial analysis due to overlapping features that do not have coincident boundaries. Typically these are artifacts of spatial processing and generally do not represent true differences in polygon differentiation with respect to landbase classification.
Soil productivity		The capacity of soil to support plant growth.
Spatial Harvest Sequence	SHS	A stand level map depicting forest stands scheduled for timber harvesting that are feasible to be operated by the organization.
Special Management Zone		An area of varying size adjacent to an area in which special management measures are necessary to protect natural resources.
Species at risk		Any species known to be "at risk" after formal detailed status assessment and designation as "Endangered" or "Threatened" in Alberta. The list of species is maintained by Alberta.

Glossary Term		Definition
Species group		A single species code used to represent one or more AVI species. For example, the AW species group consists of AVI species A and Aw; and the LT species group consists of La, Lt and Lw.
Species type		There are two species types: deciduous and coniferous. Deciduous species include aspen, birch and poplar. Coniferous species include fir, pine, larch and spruce.
Stand		A community of trees sufficiently uniform in species, age, arrangement or condition as to be distinguishable as a group in the forest or other growth in the area. A stand may also be that polygon as defined in the AVI or Phase III inventory (Alberta SRD 2006).
Stand Susceptibility Index	SSI	An indicator of the potential loss in stand basal area or volume that could occur if mountain pine beetle infested a particular stand. A susceptibility index based on four variables: relative abundance of susceptible pine basal area in a given stand, age of dominant and co-dominant live pine, the density of the stand, and the location (latitude, longitude and elevation) of the stand.
Stand volume		Gross merchantable volume within a stand on a per hectare basis (m^3/ha); also known as gross merchantable stand volume.
Strata/Stratification		A classification scheme for defining data for use in management or modeling.
Structured Query Language	SQL	A formal computer language for querying relational database system tables. The language follows an ANSI compliant format and the core set of commands are part of a common language used across many database software programs.
Submission datasets		Datasets submitted to ESRD for approval.
Temporary Sample Plot	TSP	A fixed or variable area plot established for forest sampling and measurement; usually assessed only once.
Thinning, commercial		A partial cut where trees of a merchantable size and value are removed to provide an interim harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees. Used to capture volume likely to succumb to competition pressures and be lost to disease, insects, or dieback.
Thinning, pre-commercial		A silvicultural treatment to reduce tree density in young stands, carried out before the stems reach merchantable size. The intent is to concentrate the site's growth potential on fewer trees thereby accelerating stand development and reducing the time to final harvest, retaining more live crown, creating opportunities for future commercial thinning activities and improving stand operability.
Timber Harvest Planning and Operating Ground Rules		Standards for operational planning and field practices that must be measurable and auditable and based on forest management plan objectives.
Timber Management Regulation	TMR	The legislative statute that describes the mechanism and regulations by which the forested lands of Alberta are managed. The Regulation is associated with the Forests Act.
Timber operations		Includes all activities related to timber harvesting including site assessments, planning, road construction, harvesting, reclamation and reforestation.
Timber Supply Analysis	TSA	Harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees.
TSA landbase		A spatial landbase that carries all the information of the classified landbase, with the exception of the seismic line work.
Total stand volume		Used to capture volume likely to succumb to competition pressures and be lost to disease
Tree improvement		Insect, or dieback.
Tree improvement yield curve		A modified yield curve for the PL and SW yield strata, whereby the managed stand is adjusted such that volume increase (a fixed percent) occurs at approximately the average harvest age, but the maximum total volume across all ages is unaffected.
Understorey		The trees and other woody species growing under the canopies of larger adjacent trees and other woody growth.
Ungulate		A mammal with hooves.
Universal Transverse Mercator	UTM	A method of projecting spherical shapes on a flat plane. Typically this projection is used when the features need to have good area representation and the extent of the dataset does not cover more than one predefined UTM zone (three degrees of longitude).
Unmanaged landbase		That portion of the net landbase which is considered to be on a "natural" yield projection. All unharvested areas are considered 'unmanged'. AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any record of reforestation are also considered 'unmanaged'.
Values, Objectives, Indicators and Targets	VOIT	A framework of criteria and indicators to help track progress in achieving sustainable forest planning and management under sound environmental, economic, and social objectives.
Watercourse		The bed, bank or shore of a river, stream, creek, lake or other natural body of water, whether it contains or conveys water continuously or intermittently.
Watershed		An area of land, which may or may not be under forest cover, that drains water, organic matter, dissolved nutrients and sediments into a lake or stream. The topographic boundary, usually a height of land, that marks the dividing line from which surface streams flow in two different directions.
Wildlife		Any species of amphibian, bird, fish, mammal and reptile found in the wild, living unrestrained or free roaming and not domesticated. Some definitions include plants, fungi, algae and bacteria.
Wildlife Management Unit	WMU	Areas within province of Alberta managed by ESRD and regulated by the Alberta Wildlife Act (2012).
Years Before Present	YBP	A unit of measure of historical time.
Yield curve		Graphical representation of a predictive yield equation. One yield curve in fact consists of three curves: a conifer volume-age curve, a deciduous volume-age curve and a total volume-age curve.
Yield strata (YS)		A system of stratification applied to the forested landscape based upon FMU, and defining layer and/or understory layer attributes (BCG, crown closure class, leading conifer species). Yield strata form the basis for the development of yield curves; each yield stratum has one or more associated yield curves.

Glossary Term		Definition
YS: Deciduous	D	Species grouping defined as Deciduous
YS: Deciduous w/ Conifer Understory	DU	Species grouping defined as Deciduous with Coniferous Understory
YS: Mixedwood - Deciduous	DC	Species grouping defined as Mixedwood with Deciduous leading
YS: Mixedwood - Coniferous	CD	Species grouping defined as Mixedwood with Coniferous leading
YS: Coniferous - Pine leading	PL	Species grouping defined as Coniferous with Pine leading
YS: Coniferous - Black Spruce leading	SB	Species grouping defined as Coniferous with Black Spruce leading
YS: Coniferous - White Spruce leading	SW	Species grouping defined as Coniferous with White Spruce leading
YS: No Strata (cutblocks)	XCC	No Yield Strata assignment (cutblocks)
YS: No Strata	X	No Yiel+D21d Strata assignment

FORCORP Project Number: P677
For additional information, please contact:
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MANNING DIVERSIFIED FOREST PRODUCTS LTD.

2012-2021 Forest Management Plan

Chapter 2 FMP Development

June 30, 2013 (Draft)

October 1, 2013 (Approved)

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2012-2021 FMP Components

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	Chapter	3	Landscape Assessment
	Chapter	4	Summary of Previous FMP
	Chapter	5	Values, Objectives, Indicators and Targets
	Chapter	6	Preferred Forest Management Scenario
	Chapter	7	FMP Implementation
TWO	Annex	I	Forest Management Agreement (FMA)
	Annex	II	FMP Checklist
	Annex	III	PDT Meetings Notes
	Annex	IV	2007 - 2011 Stewardship Report
	Annex	V	Landbase Documentation
THREE	Annex	VI	Yield Curve Documentation
	Annex	VII	Forecasting
	Annex	VIII	Spatial Harvest Sequence (SHS) Map

1. FMP Development

Manning Diversified Forest Products[1] (MDFP) began development of the 2012-2013 *Forest Management Plan* (FMP) with the first *Plan Development Team* (PDT) meeting on June 28, 2010. The 2012-2021 FMP was submitted to *Environment and Sustainable Resource Development* (ESRD) in June 2013. This first section presents an overview of the process used to develop the 2012-2021 FMP and important the milestones which were achieved.

To expand input and incorporate feedback, MDFP developed and implemented communication and consultation processes specifically tailored to meet the needs of the local situation and the 2012-2021 FMP. Section 2 documents the processes applied to manage internal and external FMP communication. Public consultation is summarized in Section 3 and First Nation Consultation is summarized in Section 4.

1.1 FMP Development Process

The 2012-2021 FMP development followed the process outlined in the 2012-2021 FMP Terms of Reference (The Forestry Corp., 2010). A PDT comprised of government, quota holders, MDFP and technical support was the primary mechanism to identify, investigate and resolve issues.

A few issues consumed a large portion of the FMP development effort and extended the time required to develop the FMP. These issues were:

- sequencing deciduous stands with coniferous *understory*;
- understory protection treatments;
- woodland *caribou*;

[1] Terms and initialisms that are defined in the Glossary (Appendix I) are shown in italics the first time they are presented in this document.

- *mountain pine beetle* (MPB);
- *Alberta Reforestation Information System* (ARIS) and *landbase* reconciliation; and
- in 2012, the largest wildfire since 1980 occurred in the *Forest Management Agreement* (FMA) area.

Resolution of these and the other management issues addressed are documented chapters 6 and 7.

MDFP initially intended that the 2012-2021 FMP would be an update to the 2007-2016 FMP applied to the expanded FMA area. However, as development progressed, new issues, such as the MPB infestation, arose. Other long standing issues such as clarification of the sequencing of deciduous stands with coniferous understory were addressed and new government policies were incorporated. These proved to be more complex than anticipated which expanded the scope of the work and the time required for FMP development. MDFP feels that the result was a superior plan with a wider range of issues addressed which will provide a solid plan to be implemented over the next 10 years.

1.2 FMP Milestones

Milestones for development of the 2012-2021 FMP are summarized below.

- June 2010 First PDT meeting
- August 2010 Submit Terms of Reference for the 2012-2021 FMP
- September 2010 Approval of Terms of Reference for the 2012-2021 FMP
- October 2010 First 2012-2021 FMP meeting with Duncan's First Nation
- October 2010 Initial contact with Dene Thá First Nation
- December 2010 Approval of public consultation plan
- February 2011 Approval of *Forest Management Unit* (FMU) P20 creation (P16 + P18 amalgamation)
- October 2011 PDT acceptance of *Values, Objectives, Indicators and Targets* (VOIT)
- November 2011 First FMP meeting with Dene Thá First Nation
- December 2011 PDT acceptance of caribou strategy for the 2012-2021 FMP
- January 2012 MDFP-DMI Memorandum of Understanding signed
- February 2012 First submission of net landbase and yield curves
- April 2012 Approval of ARIS reconciliation
- July 2012 PDT acceptance of timber drain methodology
- July 2012 Wildfire in Halverson ridge area
- August 2012 Agreement-in-Principle for net landbase and yield curves
- September 2012 PDT accepted revised First Nation Consultation Plan
- January 2013 PDT accepted MPB strategy
- January 2013 PDT acceptance of the *Preferred Forest Management Scenario* (PFMS)
- March 2013 PDT acceptance of the *Spatial Harvest Sequence* (SHS)
- March 2013 PDT received Fish &Wildlife comments on the SHS

- March 2013 Presentation of 2012-2021 FMP in Peace River
- June 2013 Submission of 2012-2013 FMP to ESRD
- October 2013 Submission of Approved version of 2012-2013 FMP to ESRD

1.3 FMP Products

Numerous products were produced during the development of the 2012-2021 FMP. Some of the products were specific to the FMP development process (*e.g.* PDT meeting notes), while others (*e.g*. SHS) are required for ongoing FMP implementation during the FMP period *i.e.* May 1, 2012 to April 30, 2021. Upon approval of the 2012-2021 FMP by ESRD, the important FMP products are those related to ongoing implementation. The primary 2012-2021 FMP implementation products and location in the 2012-2021 FMP document are:

- Public Communication Program – refer to Chapter 2, Section 3;
- First Nation Consultation Plan – refer to Chapter 2, Section 4;
- VOITS – refer to Chapter 5;
- PFMS, including the SHS and Annual Allowable Cut – refer to Chapter 6;
- Implementation strategies including monitoring and reporting – refer to Chapter 7.

This page revised October 1, 2013

2. FMP Communication

Communication and consultation activities related to the development of the 2012-2012 FMP include internal communication and external communication. To ensure and promote continuous effectiveness within the company, MDFP is committed to fostering effective and sustaining communication. Furthermore, in recognizing the importance of public engagement in the forest management planning process and operations, the company facilitates programs for public engagement. This section outlines and highlights both internal and external communications. MDFP's communication program and additional details on communication and consultation activities are described in this chapter.

2.1 Internal Communication

Internal communication refers to communications among the members of the MDFP 2012-2021 FMP PDT. The PDT for the 2012-2012 FMP was assembled in June of 2010 and will be disbanded upon FMP approval. It included representatives from MDFP, *Daishowa-Marubeni International Ltd* (DMI), Buchanan Lumber, ESRD and FORCORP. Team members, their affiliation and their role within the PDT are identified in Table 2-1.

Table 2-1. Plan Development Team (PDT) members, affiliation and role/responsibility

Name	Affiliation	Role/Responsibility
Aitkin, Darren	ESRD – Edmonton	ESRD Growth and Yield representative
Arndt, Brandi	SREM - Peace River	SREM representative
Barker, Tim	Daishowa-Marubeni International	DMI representative
Benson, Al	ESRD – Edmonton	ESRD Operations
Blanton, Steve	Manning Diversified Forest Products (MDFP)	Chair and MDFP representative
Bossé, Vicky	ESRD – Edmonton	ESRD FMP representative
Branting, Keith	Buchanan Lumber	Buchanan Lumber representative
Burr, Rod	ENV - Peace River	ENV representative
Butt, Fraser	ESRD – Edmonton	ESRD FMP representative
Christian, Bob	FORCORP	FORCORP TSA analysis
Cook, Owen	ESRD – Peace River	ESRD Operations
Crowley, Mark	ESRD – Peace River	ESRD Operations
Gooding, Ted	FORCORP	FORCORP Project Manager
Hemens, Brendan	ESRD – Edmonton	ESRD FMP representative
Kelm, Stuart	ESRD – Edmonton	ESRD Fire representative
Moyles, Dave	ESRD – Peace River	ESRD Wildlife representative
O'Byrne, Marty	ESRD – Peace River	ESRD Silviculture representative
Oliver, Andrew	ESRD – Peace River	ESRD Operations
Stokes, Robert	ESRD – Edmonton	ESRD FMP representative
Wells, Keith	Manning Diversified Forest Products (MDFP)	MDFP representative
Whitmore, Gord	Daishowa-Marubeni International (DMI)	DMI representative

The development of an FMP requires a well-defined and well-organized process for efficient information exchange among the PDT members. MDFP's internal communication mechanisms provided effective distribution, exchange, and storage of information and ideas. The main goals of the MDFP internal communications is to provide members of the PDT with access to appropriate levels of information required to identify, discuss, resolve issues, and to aid in decisions for the development and approval of the 2012-2021 FMP.

Most issues were resolved and accepted by the PDT by mutual agreement. For the few issues where mutual agreement was not possible, ESRD provided binding decisions.

A suite of tools was utilized to ensure that all those who are involved with the plan's development, approval and implementation have access to, and the ability to share appropriate levels of information. For instance, to facilitate seamless process of information exchange and to manage timelines, MDFP employed a web-based project management application to track the status of Action Items, documents and deliverables among the PDT members (Figure 2-1).

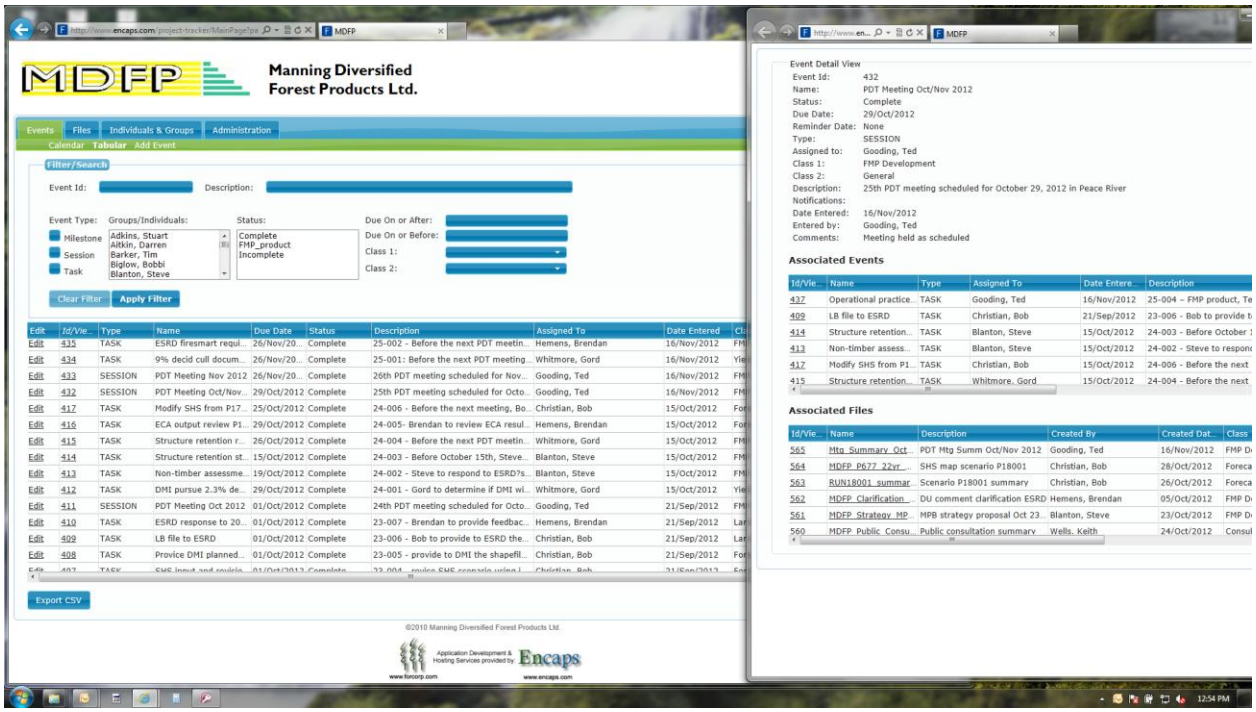

Figure 2-1. Screen capture of FMP project management application

Regular PDT meetings provided the forum for cooperative plan development and issue resolution. In total, there were 28 PDT meetings held from June 28, 2010 to February 27, 2013 (Table 2-2). There were 210 Action Items created and addressed by the PDT, with many of these Action Items requiring several meetings to resolve. In addition, 247 handouts and deliverables were tracked and distributed at PDT meetings and directly to PDT members. PDT meeting notes summarizing the issues discussed, decisions made and the acceptance of FMP components are included in Annex III.

For selected issues there is a direct link between Action Items identified in the PDT meeting notes and the 2012-2021 FMP document. Action Items are tracked in the PDT meeting notes and in the web application by using a combination PDT meeting number and Action Item number. For example, Action Item 22-022 requires wording to be included in the FMP document that ESRD to be notified if the MDFP and DMI Memorandum of Understanding (MOU) are cancelled. Refer to FMP Implementation (Chapter 7) under Section 3 for more information.

The PDT addressed a wide range of issues, including issues which were outside of the scope required for FMP development. These additional issues consisted of topics ranging from policy and its impacts on the forest products industry to operational procedures and considerations. In many cases, these discussions supported and enhanced FMP strategies. Issues and the location where they are addressed within the 2012-2021 FMP document are listed in Section 5 - Forest Management Issues.

Table 2-2. PDT meeting dates and locations

PDT Meeting #	Date and Time		Location
1st Meeting	June 28, 2010	09:00-13:00	Peace River Provincial Building
2nd Meeting	September 9, 2010	10:00-15:00	Peace River Provincial Building
3rd Meeting	October 13, 2010	10:00-15:00	Peace River Provincial Building
4th Meeting	November 9, 2010	9:45-15:00	Peace River Provincial Building
5th Meeting	December 7, 2010	10:00-15:30	Peace River Provincial Building
6th Meeting	January 11, 2011	10:00-15:30	Peace River Provincial Building
7th Meeting	February 8, 2011	10:00-15:30	Peace River Provincial Building
8th Meeting	March 16, 2011	11:00-15:30	Peace River Provincial Building
9th Meeting	April 5, 2011	10:00-13:00	Peace River Provincial Building
10th Meeting	May 11, 2011	10:00-15:00	Peace River Provincial Building
11th Meeting	June 08, 2011	10:00-15:00	Peace River Provincial Building
12th Meeting	July 20, 2011	10:00-15:00	Peace River Provincial Building
13th Meeting	August 24, 2011	10:00-12:30	Peace River Provincial Building
14th Meeting	September 28, 2011	10:00-13:00	Peace River Provincial Building
15th Meeting	October 31, 2011	10:00-12:30	Peace River Provincial Building
16th Meeting	December 11, 2011	10:00-15:30	Peace River Provincial Building
17th Meeting	January 16, 2012	10:00-13:30	Peace River Provincial Building
18th Meeting	February 15, 2012	10:00-13:30	Peace River Provincial Building
19th Meeting	March 21, 2012	10:00-15:30	Peace River Provincial Building
20th Meeting	May 9, 2012	10:00-15:30	Peace River Provincial Building
21st Meeting	June 11, 2012	10:00-12:00	Peace River Provincial Building
22nd Meeting	July 4, 2012	10:00-15:00	Peace River Provincial Building
23rd Meeting	September 5, 2012	10:00-15:00	Peace River Provincial Building
24th Meeting	October 1, 2012	10:30-15:00	Peace River Provincial Building
25th Meeting	October 29, 2012	10:30-15:00	Peace River Provincial Building
26th Meeting	November 26, 2012	11:00-15:00	Peace River Provincial Building
27th Meeting	January 9, 2013	10:30-15:30	Peace River Provincial Building
28th Meeting	February 27, 2014	09:00-10:00	Conference Call
29th Meeting	March 25, 2015	10:30-15:00	Peace River Provincial Building

2.2 External Communication

External communications are communications among and with those who are not immediate members of the PDT, but still desire to participate in the FMP development process. These may include, but are not limited to MDFP staff members that are not part of the PDT, First Nations, Métis, local governmental organizations, members of the public, and other industrial and non-industrial stakeholders. MDFP recognizes the importance of public and key stakeholder engagement and participation into the FMP process and operations. To enhance participation, in 2002 MDFP developed a *Public Consultation Program* (PCP) that helps to incorporate public's input into FMPs and ongoing operations. This program was reviewed and revised for the 2012-2021 FMP and approved by ESRD in December 2010 (refer to Section 3).

3. Public Consultation Program

This section describes MDFP's PCP and its application to the development and implementation of the 2012-2021 FMP.

3.1 Ongoing Public Consultation

MDFP has been undertaking public consultation since they received their *Coniferous Timber Quota* (CTQ) in 1993. Public consultations reflect the company's small town situation, local ownership and active involvement in the communities and the surrounding areas. Much of the mill and the woodlands workforce are local. The company believes that effective two-way communication has assisted in keeping issues to a minimum.

MDFP hosts open houses as a venue to obtain public input and despite the low turnout, continues to host a minimum of one per year. The company holds annual meetings with the local municipalities and trappers to provide updates on upcoming events, with additional sessions to address specific issues. MDFP's PCP aims to facilitate the participation process and incorporate input from public into FMPs and operations. The MDFP applied the PCP as described here which involved:

1. Informing the public and key stakeholders about how MDFP is working towards better planning and implementation processes; and

2. Soliciting inputs that can contribute to a better and improved outcome of these processes. MDFP PCP covers meetings with municipal councils/boards, and the trappers association.

As part of its consultation initiative, MDFP facilitated a series of meetings between the MDFP and the local community council members represented by the local public and stakeholder groups. There were six community/stakeholder groups that participated in these meeting between MDFP and public: Clear Hills County; County of Northern Lights; Manning Trapper's Association; Paddle Prairie Métis

Settlement; and Town of Manning. Three meetings over the period from 2011 to 2013 were held with each of the community/stakeholder groups (Table 3-1).

Table 3-1. Summary of public consultation meeting dates and locations

Meeting	MDFP attendees	Date	Location
Clear Hills County	Steve Blanton, Keith Wells	May 10, 2011	Clear Hills County Council Chambers; Worsley, AB
Town of Manning	Steve Blanton, Keith Wells	May 11, 2011	Town of Manning Council Chambers, Manning, AB
County of Northern Lights	Steve Blanton, Stuart Adkins	May 11, 2011	MD of Northern Lights #22 Council Chambers, Manning, AB
Paddle Prairie Métis Settlement	Steve Blanton, Stuart Adkins	May 17, 2011	Paddle Prairie Métis Settlement Council Chambers, Paddle Prairie, Alberta
Open Public	Steve Blanton, Keith Wells	May 17, 2011	Elks Hall, Manning, AB
Manning Board of Trade	Steve Blanton, Stuart Adkins	May 18, 2011	Town of Manning Council Chambers,
Manning Trapper's	Steve Blanton, Keith Wells	May 18, 2011	Manning Ranger Station, Manning, AB
Manning Trapper's	Clarence Budal	April 20, 2012	Remax Office, Manning, AB
Open Public	Steve Blanton, Keith Wells	May 15, 2012	Elks Hall, Manning, AB
County of Northern Lights	Steve Blanton, Keith Wells	October 9, 2012	County of Northern Lights Council Chambers, Manning, AB
Manning Board of Trade	Steve Blanton, Keith Wells	October 9, 2012	Town of Manning Council Chambers, Manning, AB
Paddle Prairie Métis Settlement	Steve Blanton, Keith Wells	October 15, 2012	Paddle Prairie Métis Settlement Council Chambers, Paddle Prairie, Alberta
Clear Hills County	Steve Blanton, Keith Wells	October 16, 2012	Clear Hills County Council Chambers; Worsley, AB
Town of Manning	Steve Blanton, Keith Wells	October 25, 2012	Town of Manning Council Chambers, Manning, AB
Manning Trapper's	Steve Blanton	April 19, 2013	PennWest office, Manning, AB
Open Public	Steve Blanton, Keith Wells	May 14, 2013	Elks Hall, Manning, AB
Clear Hills County	Steve Blanton, Keith Wells	May 28, 2013	Clear Hills County Council Chambers; Worsley, AB
Paddle Prairie Métis Settlement	Steve Blanton, Jason Taylor	June 10, 2013	Paddle Prairie Métis Settlement Council Chambers, Paddle Prairie, Alberta
County of Northern Lights	Steve Blanton, Jason Taylor	June 11, 2013	County of Northern Lights Council Chambers, Manning, AB
Town of Manning	Steve Blanton, Jason Taylor	June 12, 2013	Town of Manning Council Chambers,

The objectives of each meeting were to inform the participants, discuss the concerns identified by local communities, and explain the MDFP actions to address concerns. The outcomes of each meeting included summary reports of the main discussion points and concerns raised by the particular community, future MDFP actions for communications and outreach initiatives, and analysis of public/stakeholder input. Table 3-2 provides summary information on the key issues raised by community council members during the sessions.

Table 3-2. Issues raised during public consultation and MDFP responses

Issue	MDFP Response	Approximate Location in FMP
All weather Forestry road density	MDFP is a winter logging company. DMI does require all weather roads for some of their non-frozen conditions logging. MDFP may in the future require all weather roads but currently does not.	Objective 1.1.1.3
Swan Lakes	Swan lakes have a 200m buffer placed on them. This buffer is not part of the managed landbase.	Objective 1.2.1.1 (b); Annex V Landbase
Caribou range especially west of Chinchaga Wildland Park	MDFP is aware that most of WC8 (parcel west of park) is caribou zone.	Objective 1.2.1.1 (a); Chapter 6; Chapter 7
Harvest within Caribou zone	MDFP is following approved SHS and employing caribou habitat stategies.	Objective 1.2.1.1 (a); Chapter 6; Chapter 7
Access control	ESRD requires access control in certain areas. In some areas scarification is employed to take out block roads as well. Block roads are part of the block and need to be reforested.	Objective 2.1.1.1, Objective 2.1.1.2
Harvest frequency on traplines	SHS is being followed.	Objective 1.1.1.1, Objective 5.2.1.1,
Protection of rare species	Forest companies have to protect all identified rare species.	Objective 1.1.1.4, Objective 1.2.1.1
Mountain Pine Beetle Harvesting	MDFP has been trying to target pine over the last few years of the current SHS. Going forward there will be a MPB stategy in the 2012-2021 FMP.	MPB Strategy, SHS
Amount of logging in Clear Hills County	Do not have a final SHS yet. There will be a fair bit of logging in the Halverson ridge area. Volumes may depend on the MPB infestation.	TSA, SHS
Percentage of pure conifer reforestation	ESRD has a policy which basically says you must put back what you cut. If mixed-woods are cut the same approximate mixed-wood will be reforested.	Objective 1.1.1.1 ; Chapter 6; Chapter 7
First Nations Consultation	For the 2012-2021 P20 FMP MDFP was instructed by ESRD to consult with the Duncan's First Nation and the Dene Tha First Nation.	Objective 6.1.1.1; Chapter 2
Old Interior Forest	This value will move around the landbase. It is not a reserve but a percentage of total landbase. Can be cut as long as other stands "grow into" the value.	Objective 1.1.1.1, Objective 1.1.1.2; Chapter 6
Caribou Habitat Stategy	30/20 rule is only applied within the provincial caribou zone, the APMA and the P18 specified area.	Objective 1.2.1.1 (a); Chapter 7

3.2 Stakeholder Region

MDFP established the Town of Manning and surrounding area as the stakeholder region for consultation. Although stakeholders and interested parties from outside this region are free to provide input, it has been the company's experience that there is little interest beyond this region.

With an addition of P18 to the FMA, the stakeholder region has expanded but there are no new communities along the access routes into P18. Thus the communities within the stakeholder region are not being impacted by the addition of P18.

3.3 Stakeholders

MDFP's public consultation documentation lists stakeholders and describes the meetings that have taken place. The stakeholders with whom the company holds annual meetings are:

- Town of Manning;
- Paddle Prairie Métis Settlement;
- Clear Hills County;
- County of Northern Lights;
- Trappers Association.

Prior to the approval of the 2007-2017 FMP, MDFP held meetings with the Manning District Board of Trade, but it has been partially disbanded and these meetings have become sporadic. Annual meetings are reported in the Annual Stewardship Report. MDFP maintains communication with stakeholders as part of ongoing operations. Stakeholder lists and contacts are regularly updated.

3.4 Public Participation Group

Section 2, article 1.5.ii of the Planning Standard, requires the formation of a Public Participation Group (PPG). As explained in MDFP PCP, the company has not formed a PPG. During the development of the last FMP, stakeholders were asked but expressed no interest in forming such a group. Instead, MDFP has developed two-way communication with the stakeholders listed above as well as input received from being part of a small tightly knit community. The company finds this to be more effective and applicable to their local situation.

It is the company's belief that while many members of the local communities use the local forests for recreation and employment, there is not a high level of concern about forest management practices. This is reflected in the lack of attendance at open houses and the small number of issues related to forest management that have been raised at public meetings. Creating a PPG that provides little input that has not been already received or addressed through other means is not effective.

3.5 Issues Management

MDFP identified and documented a process for the management and tracking of consultation issues in their PCP and in the 2012-2021 FMP. A summary of the issue management process is:

- Update the issues list;
- Develop the appropriate response to address the issue; and
- Document the response and outcome.

4. First Nation Consultation

4.1 Overview

There are no First Nation communities within the FMA area, even with the addition of FMU P18 to the FMA. This puts MDFP into a unique position among FMA holders in the province. Alberta is responsible for defining the First Nations that must be consulted. Duncan's First Nation and Dene Tha' First Nation were the First Nations identified by Alberta for Consultation.

Alberta's Consultation requirements changed during development of the 2012-2021 FMP. This included the addition of Dene Tha' First Nation for Consultation and clarification of the questions to be asked at each session and the information to be recorded in the Consultation Log. MDFP's process adapted to these requirements as the company recognises that First Nation Consultation is an ongoing process. MDFP continues to consult with First Nations on a number of topics but only FMP relevant material is summarized here.

4.2 FMP Consultation Summary

MDFP has been completing First Nation Consultation sessions for the 2012 – 2021 FMP since August 2010. The First Nation Consultation has been consistent with the Government of Alberta First Nation Consultation Guidelines. During the development of the FMP, MDFP has attended and made presentations at eight meetings with First Nations Communities; five with Duncan's First Nation and three with Dene Tha' First Nation.

On November 26, 2012, MDFP submitted its interim Consultation Logs and supporting documentation to Alberta for a review of the adequacy of the company's First Nation Consultation efforts for the 2012-2021 FMP. Feedback from Alberta indicated that the undertaken Consultation activity was satisfactory, but there was some room for improvement in administrative management, formatting and reporting in the log (*e.g.* one entry for each contact attempt, do not combine multiple contact attempts into a single entry). In addition Consultation meeting notes were to be provided to ESRD for review. MDFP made

changes in their Consultation program to reflect these requirements. For more information refer to PDT Action Items 28-001, 27-001 and 26-003.

The Consultation for this FMP was divided into four components – VOITs, Caribou, Spatial Harvest Sequence and Final Draft FMP. MDFP's First Nation's Consultation Plan is an active and periodically updated document. To date, consultation has been completed on the first three components. The Consultation package of the Final Draft FMP to the First Nations will be completed at approximately the same time as submission of the FMP to ESRD.

MDFP developed an Issues List from the items that were raised and addressed during the First Nation Consultation sessions (refer to Table 4-1). The most frequent discussion items that pertain to the FMP were associated with Caribou, Forest Management and Traditional Uses. Frequent discussion was also held regarding Economic Development, but since this is not an FMP issue, it will not be included in this summary. During the First Nation Consultation meetings there were no specific issues raised regarding treaty rights and no culturally important areas or areas which require protection were identified.

- Caribou: Caribou was the most frequent discussion item during the First Nation Consultation. Discussion ranged from concern over lack of large undisturbed habitat and protection of existing habitat to predation as it relates to access and integration with other users. Most of the discussion pertained to provincial caribou management policy as it relates to landscape issues and other users.
    - Dene Tha' First Nation made recommendations regarding access that MDFP has incorporated into the Best Management Practices for Access. This has been shared with Dene Tha' First Nation.
    - Duncan's First Nation made recommendations regarding areas of caribou populations and caribou corridors that cross the Chinchaga Forestry Road. MDFP used this information in the development of the Woodland Caribou Habitat Strategy for this FMP and also altered the Spatial Harvest Sequence in order to leave the crossing corridors intact. This has been shared with Duncan's First Nation.
- Land Management: The First Nations often had a desire to discuss Land Management issues as they pertain to Provincial Policy. Issues such as forest health, use of herbicides, other wildlife (Trumpeter Swan and Grizzly Bear), climate change, weeds, wildfire, retention, spruce budworm and mountain pine beetle were discussed.
- Treaty Rights and Traditional Uses: Impacts on Treaty Rights and Traditional Use is one of the main requirements of First Nation Consultation. MDFP asked for information regarding traditional use areas at each of the meetings and in the letter accompanying Consultation packages. While both First Nations are concerned about MDFP's potential impact on their traditional use of the land, no traditional use areas have been identified. MDFP asked for information on potential impacts to Treaty rights to hunt, trap and fish at both meetings and in the letters accompanying Consultation packages. No specific concerns regarding Treaty Rights were expressed to MDFP. General concerns were raised regarding access. Some First Nation members preferred that the access be left open for use while others preferred the access be closed in order to limit the opportunity for access.

Table 4-1. First Nation Consultation issues and MDFP response

Issue	MDFP Response	Location in FMP
Caribou		
Noise and Disruption	MDFP is winter only operation and has no all season roads. SHS tries to focus on areas over many years to avoid large annual footprint.	VOIT - 1.2.1
Lack of remaining large undisturbed Area	MDFP does not operate in Chinchaga Wildland Park or FMU P8 and has no control over other users.	VOIT - 1.2.1
Preditation and Access Control	MDFP is taking into consideration suggestions from F/N and has developed BMP's for access considerations.	VOIT - 1.2.1
Loss of Habitat/Protection of Existing Habitat	MDFP has a Caribou Habitat Strategy in the FMP. MDFP has no control over other industrial users.	VOIT - 1.2.1
Loss of Travel Corridors	MDFP has altered SHS to remove blocks in known travel corridors and OGR riparian buffers leave corridors. Large amounts of unmanaged Landbase also contributes to travel corridors.	VOIT - 1.2.1
Integration with other users	MDFP tries to share access when possible but it is often hard to arrange.	VOIT - 1.2.1
Other Wildlife		
Grizzly Bear	FMA not in primary or secondary habitat.	VOIT - 1.2.1
Trumpeter Swan	Protection of known nesting lakes and forest surrounding known nesting lakes built into OGRs and SHS.	VOIT - 1.2.1
Studies for presence of sensitive species	MDFP has not conducted any studies, but if encountered, will protect.	VOIT - 1.1.2.2
Treaty Right to Hunt, Fish, and Trap		
Some members of First Nation's community would like to have more access left open for hunting, others would rather have access blocked to limit access	This was a comment, no action on MDFP's part.	VOIT - 6.1.1.1
Loss of traditional areas to hunt/gather - need to expand to new areas in FMA	This was a comment, no action on MDFP's part.	VOIT - 6.1.1.1
Traditional Uses		
Traditional Uses	MDFP interested to know where T/U areas are so MDFP can protect them. Will work with F/N if any areas are identified.	VOIT - 6.1.1.1
Forest Health		
Mountain Pine Beetle	MDFP has targeted MBP in recent years, has new strategy as part of new FMP.	VOIT - 2.1.2.2
Spruce Bud Worm	MDFP is monitoring populations. Has been problem in past.	VOIT - 2.1.2.2
Species Diversity (response to stress)	MDFP follows FGRMS.	VOIT - 1.3.1.1
Riparian/Retention (For genetics and wildlife)	Protected under SHS and OGRs.	VOIT - 1.3.1.1
Climate Change	MDFP follows FGRMS.	VOIT - 1.3.1.1
Weeds	Weed monitoring and control practiced. Equipment must be washed before coming to work.	VOIT - 2.1.3
Wildfire	MDFP helps when possible.	VOIT - 5.2.1.1
Is Forestry Sustainable?	MDFP believes the science is good and forestry as MDFP practices it is sustainable.	VOIT - 5.1.1.1
Herbicide Use		
Loss of opportunity for gathering	MDFP limits herbicide use to where needed for conifer survival and growth. Generally shrubs/flowers growing again within a couple of years.	OGR
Harmful effects on wildlife	MDFP does not spray over water. Herbicide used bonds with soils and does not leave site.	OGR
Trapping and Hunting		
Cutblock not easy to hunt in due to high density of trees	This was a comment, no action on MDFP's part.	N/A
How are Trappers Consulted with	MDFP sends all trappers affected by harvesting maps, also meets. No Known F/N members have trapelines in FMA.	VOIT - 6.2.1.1
Economic Development		
Consultation to help provide funds to off-set economic loss due to forestry operations	This was a comment, no action on MDFP's part. Outside scope of consultation.	N/A
Potential for FN contractors to work for MDFP	This was a comment, no action on MDFP's part. Outside scope of consultation.	N/A

4.3 Duncan's First Nation

Since the development of the 2007-2017 FMP, MDFP has maintained ongoing communication and Consultation with Duncan's First Nation. Discussions have been to a large part constructive and related to company or forest management issues. In addition to emails and phone calls, MDFP met in person with the Duncan's First Nation five times (Table 4-2).

Table 4-2. Duncan's First Nation FMP meetings with MDFP

Date	Purpose
October 15, 2010	First meeting, discuss consultation process
May 18, 2011	Discuss concerns, present VOITs
September 22, 2012	Present disturbance map, caribou
March 12, 2012	Review caribou and preliminary SHS
March 18, 2013	Present summary of consultation process

MDFP met with Duncan's First Nation on March 18, 2013 to present a summary of the consultation process. This meeting identified to MDFP that the current priorities and expectation of the current Lands Department do not necessarily reflect the priorities and expectations of the Lands Department from previous consultation meetings and communications.

Main products delivered to Duncan's First Nation as part of the Consultation process were:

- November 28, 2011 – woodland caribou maps with supporting disposition information sent;
- September 10, 2012 – VOIT Consultation package sent;
- September 13, 2012 – woodland caribou Consultation package sent;
- October 26, 2012 – SHS Consultation package sent; and
- FMP document – to be delivered early July 2013 when FMP is submitted.

To date, no responses have been received by MDFP to the three Consultation packages sent to Duncan's First Nation.

4.4 Dene Tha' First Nation

In October of 2010, the Government of Alberta informed MDFP that the Dene Tha' First Nation was added to the list of First Nations which must be consulted with by MDFP. Before that time MDFP did not consult with the Dene Tha' First Nation. MDFP met in person with the Dene Tha' First Nation three times during FMP development (Table 4-3).

Table 4-3. Dene Thá First Nation FMP meetings with MDFP

Date	Purpose
October 21, 2010	Initial contact (phone conversation)
November 17, 2011	First meeting; discussed VOITs and caribou
March 14, 2012	Present preliminary SHS and discuss concerns
October 23, 2012	Review and discuss SHS, best management practices and discuss concerns

Major FMP related products delivered to Dene Tha' First Nation as part of the Consultation process were:

- September 10, 2012 – VOIT Consultation package sent;
- September 13, 2012 – woodland caribou Consultation package sent;
- October 23, 2012 – copies of caribou best management practices and the SHS with a plain language Consultation package was hand delivered; and
- FMP document – to be delivered early July 2013 when FMP is submitted.

To date, no responses to the three Consultation packages have been received by MDFP from Dene Thá First Nation.

5. Forest Management Issues

Numerous issues were addressed and resolved during the development of the 2012-2021 FMP. Table 5-1 summarizes the major issues that were addressed and the location where each of the issues is documented in the 20012-2021 FMP. The issues which are reported here required a large amount of time to address, were new to MDFP, or reflect a large change from the previous FMP.

Table 5-1. Major forest management issues addressed

Issue	Comments	Document Location
FMU P20 timber rights	Alignment of timber quotas and timber quadrants to the new P20 FMU	Chapter 6 Forecasting; and Chapter 7 Implementation
Woodland caribou	Develop strategy and alter harvesting to meet caribou habitat objectives	Chapter 6 Forecasting; and Chapter 7 Implementation
Deciduous stands with coniferous understory	Develop a MOU and related strategies to sequence and manage these stands	Chapter 6 Forecasting; and Chapter 7 Implementation
Mountain pine beetle (MPB)	Strategy to address the infestation	Chapter 6 Forecasting; and Chapter 7 Implementation
ARIS reconciliation	Align forecasting landbase with ESRD's silviculture records	Annex V Landbase
Understory protection	Yield curve for understory protection treatment response	Annex VI Yield Curves
AAC drain methodology	Consistent procedures to charge all merchantable timber on the FMA area against the AAC	Chapter 7 Implementation
Structure retention	Modify structure retention strategies	Chapter 7 Implementation
Regenerated Standards of Alberta (RSA)	Modify ESRD's VOITs to address RSA reporting requirements	Chapter 5 VOITs
Reforestation treatments	Treatments to be applied by all timber operators to achieve reforestation objectives	Chapter 7 Implementation
Timber utilization standards	Develop alternative coniferous utilization standards	Chapter 6 Forecasting; Chapter 7 Implementation; and Annex VI Yield Curves
First Nation Consultation	Implement Alberta's new First Nation Consultation requirements through MDFP's First Nation Consultation Plan	Chapter 2 FMP Development
Public consultation	MDFP developed a Public Communication Plan tailored to meet ESRD's and MDFP's requirements that is tailored to reflect the local situation	Chapter 2 FMP Development
Permanent sample plot measurements	Suspend measurement of MDFP PSP program pending resolution of the provincial growth and yield initiative	Chapter 7 Implementation
Tree improvement program	MDFP is a partner in tree improvement but did not include any gains in timber volumes from improved stock of the 2012-2021 FMP	Chapter 6 Forecasting; and Chapter 7 Implementation
Buchanan Lumber harvest sequencing	Stands for Buchanan Lumber to harvest are located in the old P18 unit, but MDFP and Buchanan Lumber will cooperate on harvesting and reforestation	Chapter 6 Forecasting; and Chapter 7 Implementation
Spatial Harvest Sequence	The SHS was developed and reviewed by ESRD, MDFP, DMI and Buchanan Lumber. MDFP and quota holders have agreed to the SHS	Chapter 6 Forecasting; Chapter 7 Implementation; Annex VII Forecasting; Annex VIII SHS map

6. References

The Forestry Corp., 2010. 2012-2021 FMP Terms of Reference August 3, 2010. Manning Diversified Forest Products Ltd. 58 pages.

Appendix I Glossary of Terms and Initialisms

Glossary Term		Definition
Above Mean Sea Level	AMSL	A measure of topographic elevation.
Active landbase		Areas that are available for forest management activities. That component of the physical landbase that is not deleted in the landbase netdown process. Consists of the combined coniferous and deciduous landbases. Also referred to as the timber harvesting landbase, net landbase, managed landbase or
Adaptive management		A process for continually improving of planning, implementing, and monitoring policies and practices by learning from the outcomes of previously employed policies and practices, and taking corrective actions where unplanned results occur.
Alberta Environment and Sustainable Resource Development	ESRD	Government of Alberta ministry responsible for regulating FMAs.
Alberta Regeneration Information System	ARIS	A Provincial database of silviculture treatments applied to harvested lands. Updated annually by permit and license holders. Considered to be the defacto record of treatment history and block status.
Alberta Biodiversity Monitoring Institute	ABMI	A province-wide monitoring program that collects information on about 2000 species through site visits, aerial photography and satellite imagery. ABMI provides information on the state of Alberta's biodiversity to facilitate management.
Annual Allowable Cut	AAC	The volume of timber permitted to be harvested in any one year, as stipulated in the pertinent approved FMP. In Alberta, the AAC is the quadrant cut divided by the number of years in that quadrant (usually five).
ARC Macro Language	AML	A third-generation (non-compiled) scripting language, propriety to ESRI. AML is a legacy language used commonly in early versions of ESRI software. While primarily a legacy product, it is still used for developing processes that need to run unattended.
Alberta Vegetation Inventory	AVI	The provincial standard for forest inventory information (classification and data storage).
AVI polygon		A polygon delineated based on aerial photography using AVI rules (AFLW 1991, Nesby 1997). For vegetated areas, areas must be sufficiently similar in terms of structure, moisture regime, crown closure, height, species composition and origin year to be considered a single unit or a polygon. Non-vegetated areas must have a similar nonvegetated classification.
Base natural yield curve		The "standard" set of yield curves developed for yield strata, representing the main stand types within the FMA area. Base yield curves may or may not be used to represent these stand types in the final timber supply analysis.
Biological diversity (biodiversity)		The variety, distribution, and abundance of different plants, animals, and microorganisms, the ecological functions and processes they perform, and the genetic diversity they contain at local, regional, or landscape levels of analysis.
Broad Cover Group	BCG	A classification of forest types based on coniferous and deciduous components of the AVI species composition. The broad cover groups are coniferous (C), coniferous-leading mixedwood (CD), deciduous-leading mixedwood (DC) and deciduous (D).
BCG: Pure Deciduous	D	Deciduous ≥ 80%
BCG: Deciduous-Coniferous	DC	Coniferous > 20% and Deciduous > 20%
BCG: Conifer-Deciduous	CD	Coniferous > 20% and Deciduous > 20%
BCG: Pure Coniferous	C	Coniferous ≥ 80%
Buffer		Used in several contexts: (1) In protecting critical habitat areas, the buffer is an area of forest land that reduces the impacts of adjacent activities on the critical area. (2) A strip of land between two areas under different management regimes. (3) An area maintained around a sample or experimental plot to ensure that the latter is not affected by any treatment applied to the area beyond the buffer. (4) In GIS work, a new polygon zone computed on distance from a point, line or existing polygon.
Canadian Standard Association	CSA	Not-for-profit standards organization that is is composed of representatives from industry, government, and consumer groups and which develops standards in 57 areas.
Caribou		Boreal woodland caribou can be found in forested areas across Canada. In Alberta there are two varieties of woodland caribou – the mountain caribou in foothills and mountains of west-central Alberta, and the boreal caribou in northern Alberta. Woodland caribou are listed as threatened under the Alberta Wildlife Act and federally under the Species at Risk Act (SARA).
Caribou, habitat contols		Rules/constrains applied in a hierarchical forest modeling process with considerations across various spatial and temporal scales to enhance the caribou habitat. The main controls were: (1) 30/20 rule – in the deciduous and mixedwood stratum, a maximum of 20% is allowed to be under 30 years old; (2) Patch target – a patch target that tended towards patches (under 30 years old) larger than 300 ha.
Caribou, provincial zone		Provincially-approved caribou land-use referral map layers that are inteded to alert planners when harvest plans fall in or near these special land management areas and aim to reduce the industrial footprint and impacts on caribou.

Glossary Term		Definition
Classified landbase		A spatial landbase and attribute classification generated as the second stage of the TSA process. Used to calculate the area and distribution of all features on the landscape, particularly to generate summaries of seismic detail and carry this into the modeling landbase.
Clearcutting		A regeneration system where all or most of the merchantable trees in a defined area are harvested in one cutting with reproduction obtained through artificial or natural means.
Committee on the Status of Endangered Wildlife in Canada	COSEWIC	Harvested in one cutting with reproduction obtained through artificial or natural means.
Compartment		A subsection of a Forest Management Agreement (FMA) for which operational plans are developed.
Compartment, working circles		A subsection of an FMA defined by the Manning Diversified Forest Products Ltd.
Combined Heat and Power	CHP	The simultaneous production of electricity and heat from a single fuel source
Composite yield curve		Area-weighted composite yield curves developed from empirically-fit natural stand yield curves; generally by BCG or groupings thereof.
Coniferous Timber Quota	CTQ	One of two types of volume-based long-term forest tenures (also deciduous timber allocation) for harvesting a set proportion of the coniferous AAC volume within a defined area, usually for a period of 20
Connectivity, landscape		A measure of how well different areas (patches or a landscape) are connected by linkages, such as habitat patches, single or multiple corridors, or "stepping stones" of vegetation. Landscape connectivity can be defined as the degree to which the landscape facilitates movement between resources patches.
Corrective actions		May include one or more of the following: - Address a nonconformity in a management system by identifying and eliminating the causes of a problem; - Carry-out an appropriate enforcement response; - Direct that the work to be corrected and re-submitted.
Corridor		A physical linkage connecting two areas of habitat and differing from the habitat on either side. Corridors are used by organisms to move around without having to leave the preferred habitat. A linear habitat patch through which a species must travel to reach habitat more suitable for reproduction and other life sustaining needs. Many corridors, linking several patches of habitat, form a network of habitats.
Cull deductions, reduction		Trees or portions thereof that are merchantable, but are removed because of defect.
Culmination age		The age at which the stand, for the stated diameter limit and utilization standard, achieves its maximum average rate of volume production (the Mean Annual Increment (MAI) is maximized).
Cutblock		A specified area that is either designated for harvest or has already been harvested.
Daily mean temperature		Derived on a daily basis from daily minimum and daily maximum temperatures. Daily minimums and maximums are recorded over 24 hour periods that begin and end in the morning. These values are then averaged for the entire month, over the reporting period (generally 30 years, from 1961- 1990).
Daishowa Marubeni International Ltd.	DMI	A neighbouring FMA holder and license holder inside the MDFP FMA area.
Defined Forest Area	DFA	Area of forest, including land and water (regardless of ownership or tenure), to which the requirements of the FMA apply.
Defining layer		Inventory layer used to assign strata. The defining layer may be the overstory or the understory.
Deletions		All areas excluded from the active landbase and assigned a code identifying the reason for deletion.
Digitally Integrated Disposition system	DIDs	A Provincial database and system of specific land use disposition types submitted for approval. The DIDs spatial data are managed and distributed by Alberta Public Lands.
Disturbance patch		Disturbance patches are used to describe the patch sizes of any part of the active landbase that is less than 20 years old, regardless of strata.
Deciduous Timber Allocation	DTA	One of two types of volume-based long-term forest tenures (also see coniferous timber quota) for harvesting a set proportion of the deciduous AAC volume within a defined area, usually for a period of 20
Environmental Systems Research Institute ™	ESRI	The developer of the suite of geographic information system software products commonly known as ArcInfo, ArcMap, ArcView, Spatial Analyst and others.
Environment and Sustainable Resource Development	ESRD	Alberta Environment and Sustainable Resource Development is a ministry of the Government of Alberta that brings together the former departments of Environment and Water and Sustainable Resource Development.
FireSmart		The philosophy that seeks to mitigate the likelihood of large, high intensity and severity fires.
FireSmart community zone		A standard ten kilometre radius around the community extending from the Wildland Urban Interface Zone. A unique data set will be gathered for this zone for community protection planning to provide a fundamental linkage between FireSmart Communities and FireSmart Landscapes.
FireSmart landscapes		FireSmart landscapes are designed to recognize the interaction between ecological, economic, and social impacts, thus, maximize the positive ecological impacts and minimize the negative economic and social impacts.
FireSmart landscape zone		The zone that extends beyond the FireSmart Community Zone overlapping multiple jurisdictions at a broad landscape level. This zone focuses on mitigating the likelihood of large, high intensity, high severity fires. Fire, Forest and Land Management planning are integrated and designed to reduce the negative ecological, economic, and social impacts of wildfire while maximizing the positive attributes of wildfire.
Forecasting		See Timber Supply Analysis.
Forest Management Agreement	FMA	Contract between the Province of Alberta and the FMA holder whereby the Province provides an area-based Crown timber supply. In return, the FMA holder commits to: managing the timber resource on a perpetual sustained yield basis, taking into consideration a broad range of forest values in determining forest management practices; and meeting defined economic objectives, including capital investments and job creation, and seeking out new business opportunities that provide measurable economic benefits for both the Province and the FMA holder. The FMA gives the FMA holder the right to access Crown fibre. In return, the FMA holder commits to forest management responsibilities, which may change from time to time (Alberta SRD 2006).

Glossary Term		Definition
Forest Management Plan	FMP	A document prepared by the FMA holder that describes the spatial and temporal harvest plan and forest harvest operations on Crown lands over a 10-year planning horizon (in Alberta). The document provides detailed methods, schedules, and responsibilities of the FMA holder in terms of accessing, harvesting, renewing and protecting the resource to enable site-specific operations to proceed. The document must be approved by the Government of Alberta, with input from stakeholders.
Forest Management Unit	FMU	An administrative unit of forest land designated by the Minister, as authorized under Section 14(1) of the Forests Act.
Forest patch		A stand of forest in the same seral stage that is not split by a linear feature greater than 8 m wide.
Forests Act, the		The legislative statute that authorizes the Minister to administer and manage the forested lands of Alberta.
Fully stocked		All potential growing space that is effectively occupied by merchantable tree species.
GEO	GEO	ESRI notation to for data stored in coordinates representing latitude and longitude.
Geographic Information System	GIS	A collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.
Green-up period		The time needed to re-establish vegetation after a disturbance. Specific green-up periods may be established to satisfy visual objectives or hydrological requirements, or as a means of ensuring re-establishment of vegetation (for silviculture, wildlife habitat or hydrological reasons) before adjacent
Gross volume		A term applied to tree-level, plot-level or stand-level volumes (*e.g.,* gross total tree volume, gross merchantable tree volume, gross total plot volume, gross merchantable plot volume, gross total stand volume, gross merchantable stand volume) that Indicates no defect/cull deduction has been applied.
Growing Degree Day	GDD	The sum of mean daily temperature above a baseline temperature (i.e. 5 degrees Celsius). Daily values are accumulated over the growing to determine annual values.
Growing stock		The sum (by number, basal area or volume) of trees in a forest or a specified part of it.
Harvest area		A specified land area with defined boundaries where timber harvesting is scheduled, or has occurred (commonly referred to as a cut block).
Industrial Sample Plot	ISP	A forest plot used to monitor the natural growth and yield of trees.
Influential point		An extreme data point that negatively influences model performance, resulting in failure to converge or an unacceptable curve shape.
Input datasets		Datasets received for the purpose of completing the landbase netdown. These frequently require processing to convert or add attributes, assign/add projection information, or combine with other inputs that represent the same features.
Landbase		A result of a classification process used to identify and determine areas available and suiatble for timber harvesting activities.
Landbase, active (also referred to as net, or managed, or contributing)		The landbase available for timber harvest and that comprises the net productive coniferous and net productive deciduous land bases. The active landbase is further classified into either conifer or deciduous landbase depending on species composition.
Landbase, passive (also referred to as		The landbase that is not part of the net productive coniferous or deciduous landbases
Landbase polygon		A polygon within the (classified, TSA, or modeling) landbase derived during spatial processing to incorporate various spatial layers and attributes of interest.
Managed landbase		That portion of the net landbase which is considered "managed" in the respect that the land received a harvest treatment and subsequent silviculture treatments. Note that AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any records of reforestation are not considered 'managed'.
Managed stand		Stand that is initiated by anthropogenic disturbance such as harvesting.
Managed stand yield curve		Yield curves generally created by applying regeneration lags to base natural yield curves with cull. Regeneration lags varied depending on whether cutblocks were harvested prior to or after 1993. Thus both Pre93 and Post93 managed managed stand yield curves developed.
Manning Diversified Forest Products Ltd.	MDFP	The forest products company in Alberta responsible for this FMP.
Mean Annual Increment	MAI	Average annual increase in volume of individual trees or stands up to the specified point in time. The MAI changes with different growth phases in the life of a tree, being highest in the middle years and then slowly decreasing with age. The point at which MAI peaks is commonly used to identify the biological maturity of the stand and its readiness for harvesting (Alberta SRD 2006).
Metadata		Data that describes the content, quality, conditions, use limitations and other characteristics of a dataset and which also documents bibliographic records including but not limited to information such as who collected the data, when and how it was collected, preprocessed and converted, its resolution and who presently holds the data. In summary, metadata is information about a thing, apart from the thing itself.
Merchantable volume, stand		Merchantable tree volume summed to represent volume on a per hectare basis.
Merchantable volume, tree		A tree-level term; the volume of those portions of a tree bole that meet utilization requirements (stump height, top and bottom diameter limits and log length).
Modeling landbase		A tabular and spatial landbase. Tabular data make the landbase suitable for both strategic and operational timber supply modeling. The spatial component is used for harvest scheduling.
Modeling tool, Patchworks©		A spatially-explicit wood supply planning and modeling tool developed by Spatial Planning Systems that was designed to provide the user with operational-scale decision-making capacity within a strategic analytical environment.
Modeling tool, Woodstock©		A non-spatial forest modeling tool developed by Remsoft used for harvest scheduling, wood supply analysis, wildlife management and simulation of forest ecosystems to test and compare different management assumptions.

Glossary Term		Definition
Mountain Pine Beetle	MPB	A defoliator insect species (*Dendroctonus ponderosae*) endemic to western North America that infects pine trees during its life cycle and results in tree mortality.
Natural stand		Stands developed under natural (non-anthropogenic) disturbance regimes. Stand initiation was due to natural disturbances, such as fire, pest or pathogen outbreak.
Natural stand empirical yield curve		Empirical yield curve fitted using data from all sampled natural stands within the active landbase.
Net volume		Timber volume that includes the main stem and excludes the stump, top and defective and decayed wood.
Non-linear regression		The practice of fitting a model where the dependent variable is a nonlinear function of one or more independent variables. One benefit of the nonlinear models is that they are often derived on the basis of physical and/or biological considerations.
North American Datum	NAD	A mathematical process of correcting geospatial locations relative to a fixed, known position.
Noxious weed		A plant designated under the Weed Regulation (AR 171/2001) of the Weed Control Act.
Observation		One plot measurement at a specific point in time. All TSPs have only one associated observation, whereas PSPs may have one or more observations (remeasured data) for a single plot.
Operating Ground Rules	OGR	Practices used in operational planning and for implementation of timber harvest operations.
Organic Rankine Cycle	ORC	Thermodynamic process where heat is transferred to a fluid at a constant pressure
Patch		A stand of forest in the same seral stage, and not split by a linear feature greater than 8m wide. Linear features in this definition include roads, pipelines, powerlines, and rivers, but do not include seismic lines.
Passive landbase		That part of the gross landbase that has a deletion and is excluded from the active landbase.
Permanent Sample Plot	PSP	A fixed or variable area plot established for (forest) sampling and measurement purposes, and designed for re-measurement.
Piece size		Number of trees required to obtain one cubic meter (m^3) of gross merchantable tree volume.
Plan Development Team	PDT	A group of individuals assembled for production of MDFP's Forest Management Plan that includes representatives from MDFP, DMI and Buchanan Lumber, Alberta Environment and Sustainable Resource Development, and FORCORP. The goal of the PDT is to provide a forum for facilitating efficient and productive communication and decision making.
Plot		Unit of area, within which variables of interest are assessed.
Plot volume		Gross merchantable tree volume within a plot on a per hectare basis (m^3/ha).
Polygon		A closed geometric entity used to spatially represent area features with associated attributes.
Post93 managed stand yield curve		A managed stand yield curve with a 2-year regeneration lag applied to the coniferous landbase and a 0-year regeneration lag applied to the deciduous landbase.
Pre93 managed stand yield curve		A managed stand yield curve with a 5-year regeneration lag applied to the coniferous landbase and a 2-year regeneration lag applied to the deciduous landbase.
Preferred Forest Management Scenario	PFMS	The forest management scenario that represents MDFP's preferred strategies and activities for managing the FMA area over a 200-year planning horizon.
Prescribed burn		The planned use of carefully controlled fire to accomplish various predetermined management goals: site preparation for planting; reduction of fire hazards or pest problems; improvement of the ease with which the site can be traversed; and creation of better quality browse for wildlife.
Regeneration		The renewal of a tree crop by natural or artificial means. It may also refer to the young crop itself.
Regeneration lag		The period of time between harvest and establishment of the regenerated stand.
Rotation		The period of years required to establish and grow even-aged timber crops to a specified condition of maturity.
Sensitive sites		Sites that have soil, water, slope, aesthetic, vegetation or wildlife characteristics that require special protection beyond the normal precautions described in the ground rules.
Seral stage (SS)		Stages in forest succession that are characterized by plant community conditions. The seral stage definition in this document are based on age and strata classifications
SS: Mature	Mature	Stands that are old enough for harvesting. Age: 61-100 for D and DU; Age: 71-110 for DC and CD; Age: 71-120 for PL; Age: 106-160 for SB, and 106-150 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Old	Old	Stands that are starting to break up or become stagnant. Age ≥ 101 for D and DU; Age ≥ 111 for DC and CD; Age ≥ 121 for PL; Age ≥ 161 for SB; Age ≥ 151 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Regeneration	Regeneration	Stands that are in early stages of development. Age: 0-15 for all strata classes. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Young	Young	Stands that are vigorously growing but are not yet fully grown. Age: 16-60 for D and DU; Age: 16-70 for DC, CD, and PL; Age: 16-105 for SB and SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
Silviculture		The theory and practice of controlling the establishment, composition, health, structure and growth of forests in order to achieve specified management objectives.
Sliver		Generally small polygons created in the spatial analysis due to overlapping features that do not have coincident boundaries. Typically these are artifacts of spatial processing and generally do not represent true differences in polygon differentiation with respect to landbase classification.
Soil productivity		The capacity of soil to support plant growth.
Spatial Harvest Sequence	SHS	A stand level map depicting forest stands scheduled for timber harvesting that are feasible to be operated by the organization.
Special Management Zone		An area of varying size adjacent to an area in which special management measures are necessary to protect natural resources.
Species at risk		Any species known to be "at risk" after formal detailed status assessment and designation as "Endangered" or "Threatened" in Alberta. The list of species is maintained by Alberta.

Glossary Term		Definition
Species group		A single species code used to represent one or more AVI species. For example, the AW species group consists of AVI species A and Aw; and the LT species group consists of La, Lt and Lw.
Species type		There are two species types: deciduous and coniferous. Deciduous species include aspen, birch and poplar. Coniferous species include fir, pine, larch and spruce.
Stand		A community of trees sufficiently uniform in species, age, arrangement or condition as to be distinguishable as a group in the forest or other growth in the area. A stand may also be that polygon as defined in the AVI or Phase III inventory (Alberta SRD 2006).
Stand Susceptibility Index	SSI	An indicator of the potential loss in stand basal area or volume that could occur if mountain pine beetle infested a particular stand. A susceptibility index based on four variables: relative abundance of susceptible pine basal area in a given stand, age of dominant and co-dominant live pine, the density of the stand, and the location (latitude, longitude and elevation) of the stand.
Stand volume		Gross merchantable volume within a stand on a per hectare basis (m^3/ha); also known as gross merchantable stand volume.
Strata/Stratification		A classification scheme for defining data for use in management or modeling.
Structured Query Language	SQL	A formal computer language for querying relational database system tables. The language follows an ANSI compliant format and the core set of commands are part of a common language used across many database software programs.
Submission datasets		Datasets submitted to ESRD for approval.
Temporary Sample Plot	TSP	A fixed or variable area plot established for forest sampling and measurement; usually assessed only once.
Thinning, commercial		A partial cut where trees of a merchantable size and value are removed to provide an interim harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees. Used to capture volume likely to succumb to competition pressures and be lost to disease, insects, or dieback.
Thinning, pre-commercial		A silvicultural treatment to reduce tree density in young stands, carried out before the stems reach merchantable size. The intent is to concentrate the site's growth potential on fewer trees thereby accelerating stand development and reducing the time to final harvest, retaining more live crown, creating opportunities for future commercial thinning activities and improving stand operability.
Timber Harvest Planning and Operating Ground Rules		Standards for operational planning and field practices that must be measurable and auditable and based on forest management plan objectives.
Timber Management Regulation	TMR	The legislative statute that describes the mechanism and regulations by which the forested lands of Alberta are managed. The Regulation is associated with the Forests Act.
Timber operations		Includes all activities related to timber harvesting including site assessments, planning, road construction, harvesting, reclamation and reforestation.
Timber Supply Analysis	TSA	Harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees.
TSA landbase		A spatial landbase that carries all the information of the classified landbase, with the exception of the seismic line work.
Total stand volume		Used to capture volume likely to succumb to competition pressures and be lost to disease
Tree improvement		Insect, or dieback.
Tree improvement yield curve		A modified yield curve for the PL and SW yield strata, whereby the managed stand is adjusted such that volume increase (a fixed percent) occurs at approximately the average harvest age, but the maximum total volume across all ages is unaffected.
Understorey		The trees and other woody species growing under the canopies of larger adjacent trees and other woody growth.
Ungulate		A mammal with hooves.
Universal Transverse Mercator	UTM	A method of projecting spherical shapes on a flat plane. Typically this projection is used when the features need to have good area representation and the extent of the dataset does not cover more than one predefined UTM zone (three degrees of longitude).
Unmanaged landbase		That portion of the net landbase which is considered to be on a "natural" yield projection. All unharvested areas are considered 'unmanged'. AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any record of reforestation are also considered 'unmanaged'.
Values, Objectives, Indicators and Targets	VOIT	A framework of criteria and indicators to help track progress in achieving sustainable forest planning and management under sound environmental, economic, and social objectives.
Watercourse		The bed, bank or shore of a river, stream, creek, lake or other natural body of water, whether it contains or conveys water continuously or intermittently.
Watershed		An area of land, which may or may not be under forest cover, that drains water, organic matter, dissolved nutrients and sediments into a lake or stream. The topographic boundary, usually a height of land, that marks the dividing line from which surface streams flow in two different directions.
Wildlife		Any species of amphibian, bird, fish, mammal and reptile found in the wild, living unrestrained or free roaming and not domesticated. Some definitions include plants, fungi, algae and bacteria.
Wildlife Management Unit	WMU	Areas within province of Alberta managed by ESRD and regulated by the Alberta Wildlife Act (2012).
Years Before Present	YBP	A unit of measure of historical time.
Yield curve		Graphical representation of a predictive yield equation. One yield curve in fact consists of three curves: a conifer volume-age curve, a deciduous volume-age curve and a total volume-age curve.
Yield strata (YS)		A system of stratification applied to the forested landscape based upon FMU, and defining layer and/or understory layer attributes (BCG, crown closure class, leading conifer species). Yield strata form the basis for the development of yield curves; each yield stratum has one or more associated yield curves.

Glossary Term		Definition
YS: Deciduous	D	Species grouping defined as Deciduous
YS: Deciduous w/ Conifer Understory	DU	Species grouping defined as Deciduous with Coniferous Understory
YS: Mixedwood - Deciduous	DC	Species grouping defined as Mixedwood with Deciduous leading
YS: Mixedwood - Coniferous	CD	Species grouping defined as Mixedwood with Coniferous leading
YS: Coniferous - Pine leading	PL	Species grouping defined as Coniferous with Pine leading
YS: Coniferous - Black Spruce leading	SB	Species grouping defined as Coniferous with Black Spruce leading
YS: Coniferous - White Spruce leading	SW	Species grouping defined as Coniferous with White Spruce leading
YS: No Strata (cutblocks)	XCC	No Yield Strata assignment (cutblocks)
YS: No Strata	X	No Yiel+D21d Strata assignment

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MANNING DIVERSIFIED FOREST PRODUCTS LTD.

2012-2021 Forest Management Plan

Chapter 3 Landscape Assessment

June 30, 2013

ABOUT THIS CHAPTER

The Landscape Assessment chapter presents a snapshot of the Manning Diversified Forest Products Ltd. Defined Forest Area at the time of the 2012-2021 Forest Management Plan development. Unless otherwise specified, the current condition is presented as of May 2010. This chapter outlines administrative boundaries, physical conditions, forest landscape pattern and structure, forest landscape disturbance and succession, and landscape fire assessment. Land use activities across the Forest Management Agreement area are also described.

The intent of this chapter is to present a snapshot of the current condition and to identify potential management targets to be used in the development of the 2012-2021 Forest Management Plan. To enable this, many of the same indicators used to describe the forest in this chapter are used throughout the document. However, due to updates in data and refinements to assumptions during the development of the plan, there may be slight differences in values between this chapter and subsequent chapters.

Information in this chapter was used to develop the 2012-2021 Forest Management Plan and is not intended for plan implementation. There are no commitments in this chapter. Decision-making parameters are included in Chapter 5 Values, Objectives, Indicators and Targets and in Chapter 6 Preferred Forest Management Scenario. All the 2012-2021 Forest Management Plan commitments are contained in Chapter 7 Implementation.

This chapter is intended to meet the requirements of the Planning Standard, Appendix A – Landscape Assessment Standards. Headings from the Planning Standard are used here. Appendix I contains a Glossary of Terms and Initialisms used throughout the 2012-2021 Forest Management Plan, while Appendix II contains a description of the data sources used in this chapter.

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	Chapter	4	Summary of Previous FMP
	Chapter	5	Values, Objectives, Indicators and Targets
	Chapter	6	Preferred Forest Management Scenario
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TWO	Annex	I	Forest Management Agreement (FMA)
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1. Administrative Boundaries

1.1 Forest Management Agreement and Defined Forest Areas

The *Manning Diversified Forest Products Ltd.*[1] (MDFP) *Forest Management Agreement* (FMA) area is located in northwestern Alberta, northwest of the town of Manning (area in green in Figure 1-1). In total, the gross FMA area is approximately 930,100 ha in size. The *Defined Forest Area* (DFA) is equal to the FMA area. The FMA area does not include the Chinchaga Wildland Park, which creates an isolated portion of the FMA area west of the park border, along the BC border (Figure 1-1). The southern boundary is formed by the Notikewin River and township line 92; it lies at roughly the same latitude as the town of Manning.

[1] Terms and initialisms that are defined in the Glossary (Appendix II) are shown in italics the first time they are presented in this document.

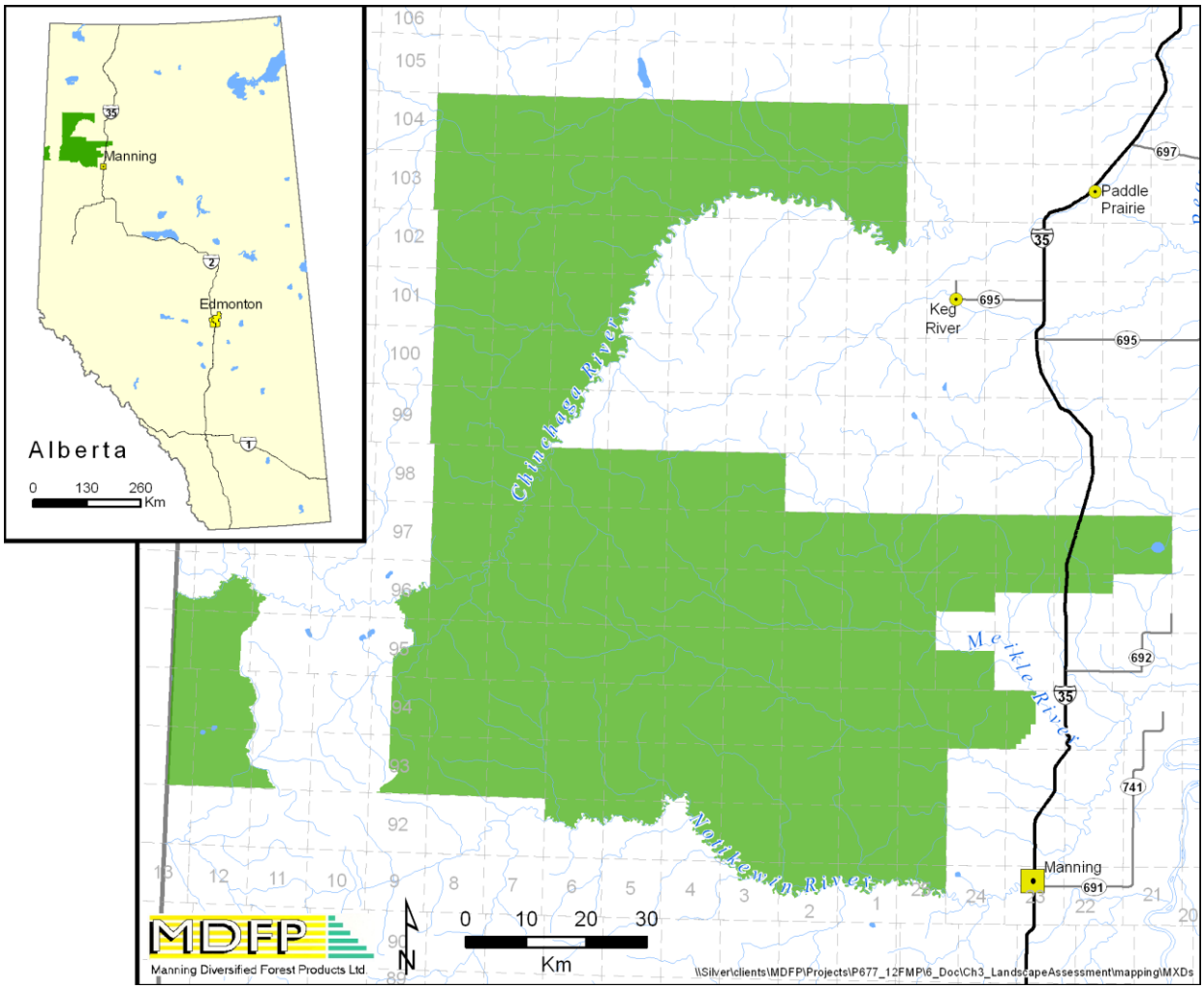


Figure 1-1. Defined forest area for the MDFP FMA area

1.2 Forest Management Units

The MDFP FMA area comprises a single *Forest Management Unit* (FMU), designated as P20, represented by the entire area in white (excluding Chinchaga Wildland) in Figure 1-2. Following the expansion of the MDFP FMA in May 2009, FMU P20 was formally created from the amalgamation of P18 and P16 in February 22, 2011. The *Daishowa Marubeni International Ltd.* (DMI) FMU P19 borders the southern edge and the northeast boundary south of the Chinchaga River (Figure 1-2). FMU F26 (Tolko Industries Ltd. and Footner Forest Products Ltd.) borders the northern edge of the FMA area along township line 105. Agricultural land, PO3 (White Zone) and P14 are located to the east of the FMA area. Highway 35 (also known as the MacKenzie Highway) crosses through the eastern edge of the FMA area. The Paddle Prairie Métis Settlement (FMU M1) lies to the northeast of P20. The western edge of the FMA area is bordered by FMU P8 in the north and the BC border in the southern portion.

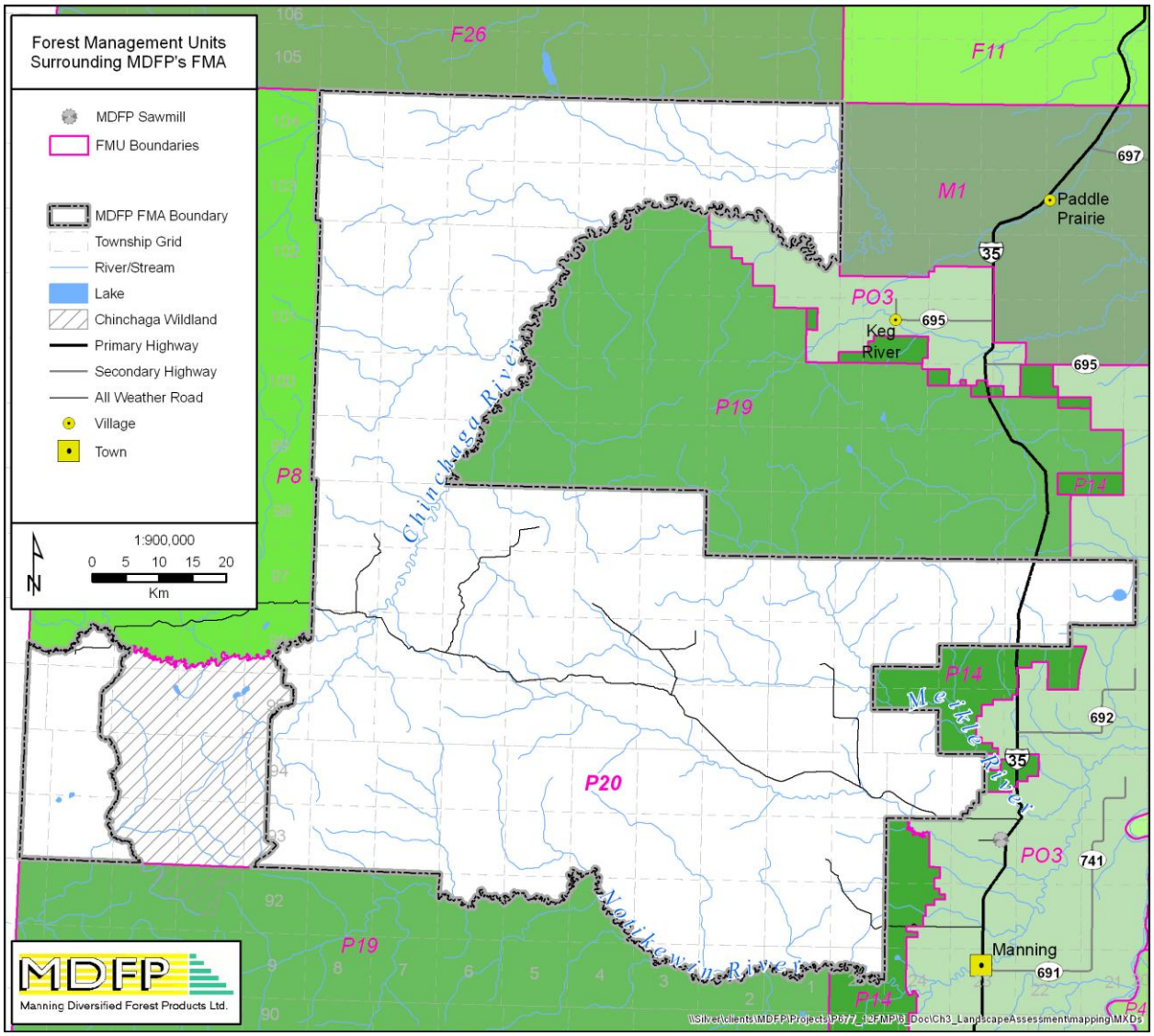


Figure 1-2. The MDFP FMU and surrounding area

1.3 Working Circles

MDFP divided the FMA into 8 Operating *Compartments* or *Working Circles* (Figure 1-3) to accommodate strategic and operational forest planning and management.

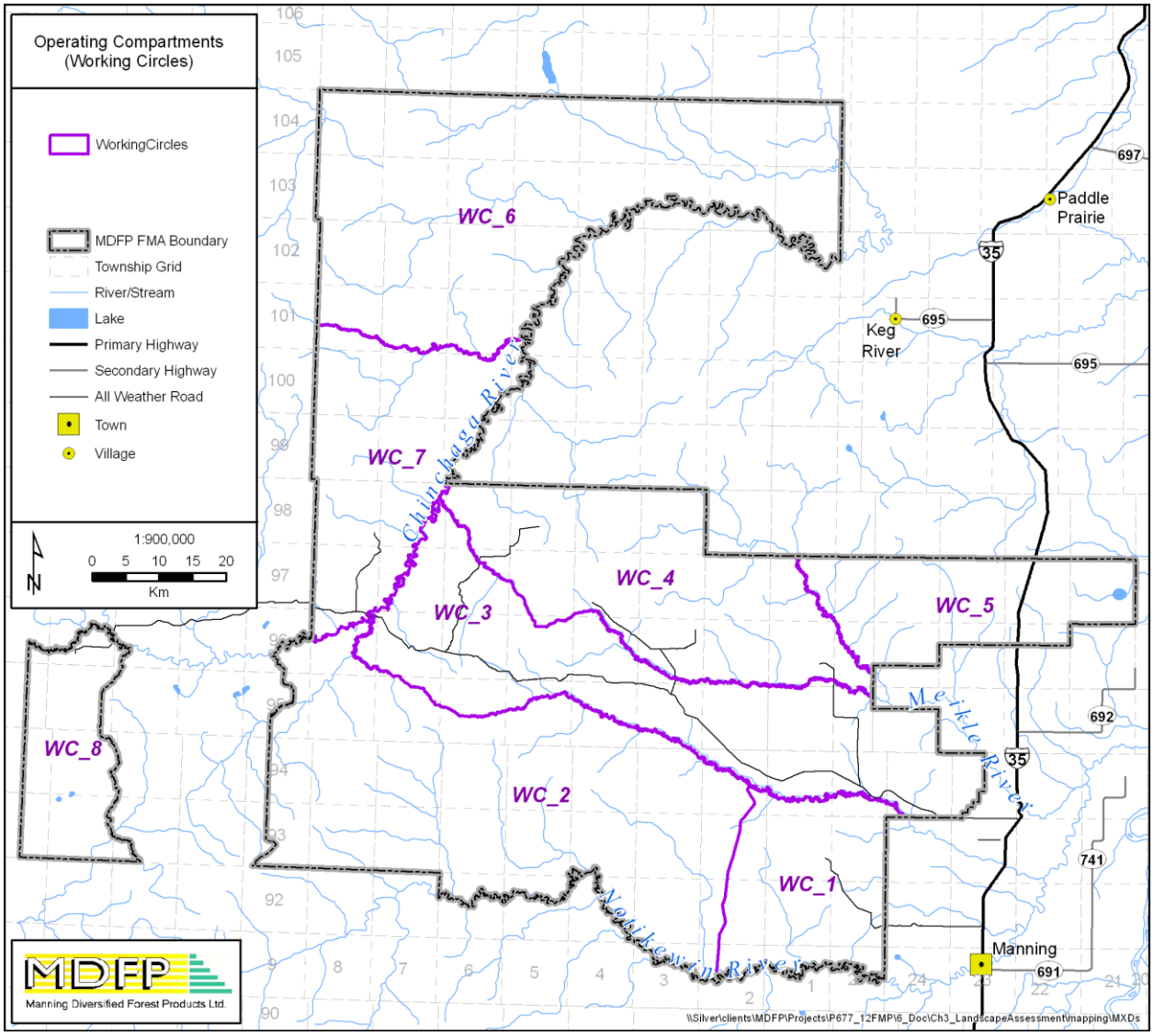


Figure 1-3. Working circles in the MDFP FMA

1.4 Natural Subregions

The Natural Regions and Subregions of Alberta (2006) landscape classification system is widely used for land management programs (*e.g.,* parks and protected areas network, ecologically-based forest management tools, *etc.*). The system was originally developed in 1994 (AEP 1994). A review to refine and update the classification was initiated in the autumn 2000 to take advantage of *Geographic Information System* (GIS) technology and an increased knowledge of the ecology of the province. The following description is based on the 2006 Version of the Natural Regions and Subregions of Alberta (Figure 1-4).

Natural Regions contain similar landforms, hydrology, geology, soils, climate, plants and wildlife. They are further divided into Subregions on the basis of similar landscape patterns. The MDFP FMA area falls within four Natural Subregions. The Lower Boreal Highlands Subregion occurs throughout the majority of the FMA area and accounts for 79% of the FMA area (Table 1-1. Summary of Natural SubregionsTable 1-1; Figure 1-4. Natural subregions). The Central Mixedwood and Upper Boreal Highlands Subregions, located in the northeast corner and southern portions of the FMA area, respectively, each account for 9% of the FMA area. The remaining 3% of the FMA area lies within the Dry Mixedwood Subregion, found along the eastern edges of the FMA area.

Table 1-1. Summary of Natural Subregions

Natural Subregions	Area (ha)	%
Lower Boreal Highlands	734,533	78.97
Upper Boreal Highlands	95,642	10.28
Central Mixedwood	77,248	8.31
Dry Mixedwood	22,677	2.44
Total	930,100	100.00

The following descriptions are taken from the Natural Regions Committee (2006).

1.4.1 Lower Boreal Highlands Natural Subregion

The Lower Boreal Highlands Natural Subregion, which accounts for 79% of the FMA area, is characterized by diverse mixedwood forests along lower northern slopes and extensive wetlands. The Subregion occurs along the lower slopes of the highlands of northern Alberta (*e.g.,* Buffalo Head Hills, Birch Mountains). Mean annual temperature is -1.0° C and mean annual precipitation is 495 mm. The average frost free period is 97 days and the average *Growing Degree Days* (GDD) is 1097.

Parent material is predominantly glacial till. Soils are mainly Orthic Gray Luvisols, which are often gleyed. Wetlands are associated with Mesisols and occasionally Gleysols.

Mixedwood forest cover is dominant in the Lower Boreal Highlands, with combinations of aspen, poplar, white spruce, black spruce and paper birch. These often succeed to predominant white spruce, with a balsam fir component. Lodgepole-jack pine hybrids are associated with this Subregion, as well as white birch stands at higher elevations. Understory shrubs such as red-osier dogwood, bracted honeysuckle, and prickly rose occur on richer sites, with nutrient poor sites supporting Labrador tea and *Vaccinium* species.

1.4.2 Central Mixedwood Natural Subregion

The Central Mixedwood Natural Subregion is represented by undulating plains with some hummocky uplands. The climate is continental, with warm summers and cold winters. Mean annual temperature is 0.2° C and mean annual precipitation is 478 mm. The average frost free period is 97 days and the average GDD is 1240.

Parent materials in the Subregion are a combination of glacial till, lacustrine and fluvial materials. Orthic Gray Luvisolic soils are predominant, with Brunisols occurring on sands. Wetlands are generally associated with Mesisols, although Fibrisols and Gleysols also occur.

Mixedwood forest cover is dominant in the Central Mixedwood Subregion, with aspen predominant early in the life cycle, succeeding to white spruce at later stages. Shrub understories with low bush cranberry, rose, green alder, beaked hazel and buffalo berry are common. Jack pine forests are common on sandy sites. Peatlands supporting black spruce and/or tamarack are fairly extensive.

1.4.3 Upper Boreal Highlands Natural Subregion

The Upper Boreal Highlands Natural Subregion occurs along the upper slopes and undulating plateau surfaces of the highlands of northern Alberta. Mean annual temperature is -1.5° C and the mean annual precipitation is 535 mm. The average frost free period is 97 days and the GDD is 990.

Parent material is predominantly glacial till. Soils are generally Orthic and Brunisolic Gray Luvisols. Both may be Gleyed. Mesisols and Organic soils and Gleysols are associated with wetland areas.

Conifer forest cover dominates the Upper Boreal Highlands Subregion. Lodgepole and lodgepole/jack pine hybrids form extensive stands, often mixed with black spruce. White spruce stands are not common. Understory shrubs include Labrador tea and bog cranberry. Wetter sites are characterized by open-grown black spruce forest types.

1.4.4 Dry Mixedwood Natural Subregion

The Dry Mixedwood Natural Subregion is characterized by undulating plains, aspen-dominated forests and fens. The climate is drier than other Subregions. Mean annual temperature is -1.0° C and mean annual precipitation is 459 mm. The average frost free period is 98 days and the average GDD is 1299.

Parent materials in the Subregion are mainly glacial till, along with some lacustrine and fluvial materials. Associated soils are predominantly Gray and Dark Gray Luvisols in upland areas with wetlands consisting of Gleysols and Organics.

Aspen forests with shrub understories (rose, beaked hazel, low-bush cranberry) are common in the Subregion. In the northern portion of the Dry Mixedwood Subregion near Manning, buffaloberry becomes a prominent understory shrub. White spruce is also common, often occurring in mixtures with aspen. Jack pine forests are common on sandy sites.

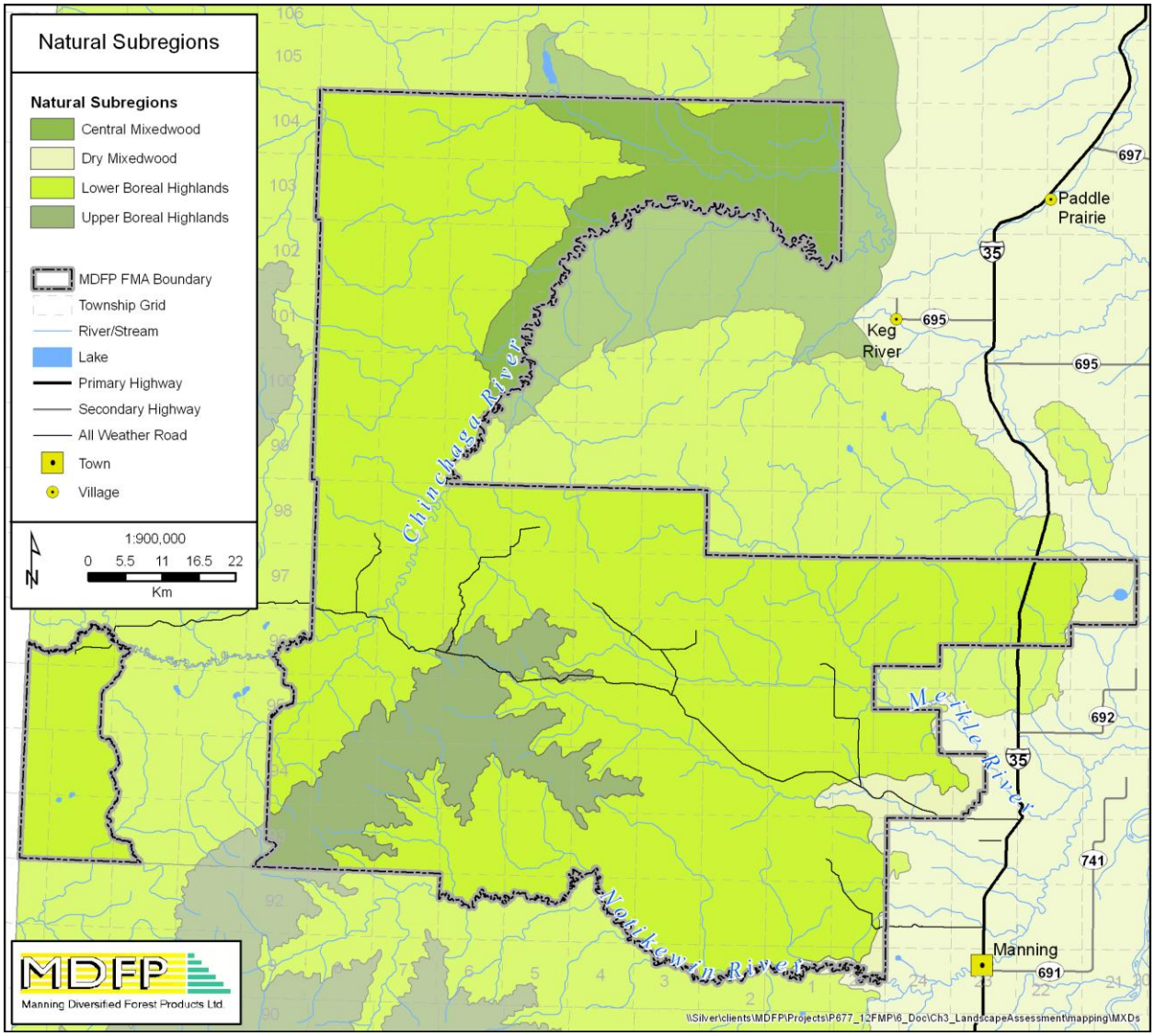


Figure 1-4. Natural subregions in the MDFP FMA and surrounding area

1.5 Municipal Districts

The MDFP FMA area is occupied by two counties (Figure 1-5), Northern Lights and Clear Hills. The town of Manning is located within the County of Northern Lights. MacKenzie County borders the northern edge of the FMA area.

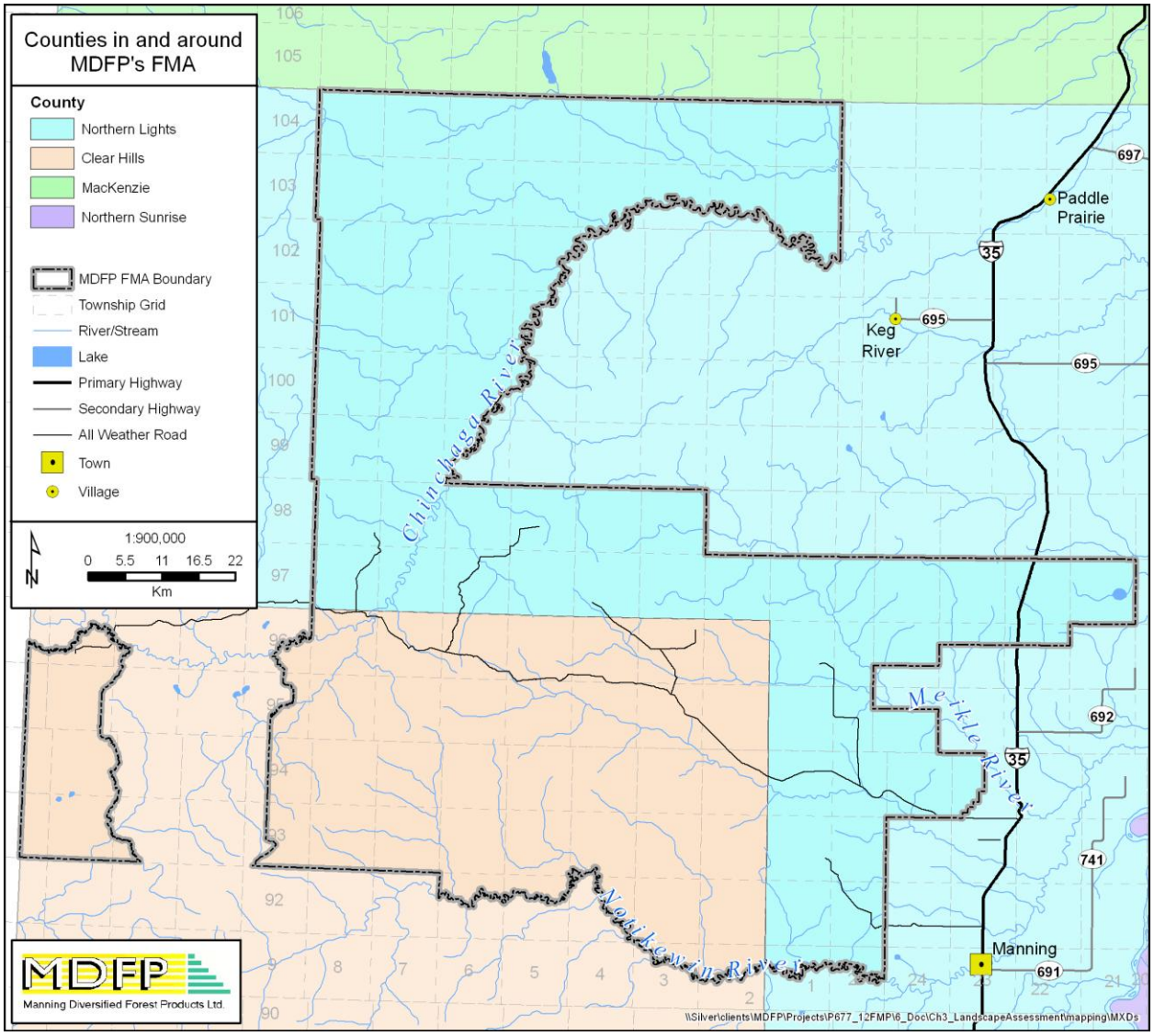


Figure 1-5. Counties in and around the MDFP FMA area

1.6 Federal Government Lands

No federal government lands occur within the FMA area boundaries.

1.7 Indian Reservations

No Indian reservations occur within the FMA area.

1.8 Protected Areas and Parks

Figure 1-6 shows the provincial protected areas and parks in and around the FMA area. The only provincial protected area contained within the MDFP FMA area is the Twin Lakes Recreation Area (5 ha), indicated on the east side of the FMA area along Highway 35. Chinchaga Wildland Park is not part of FMU P20. See Figure 6-2 for a close up of the Twin Lakes Recreation Area.

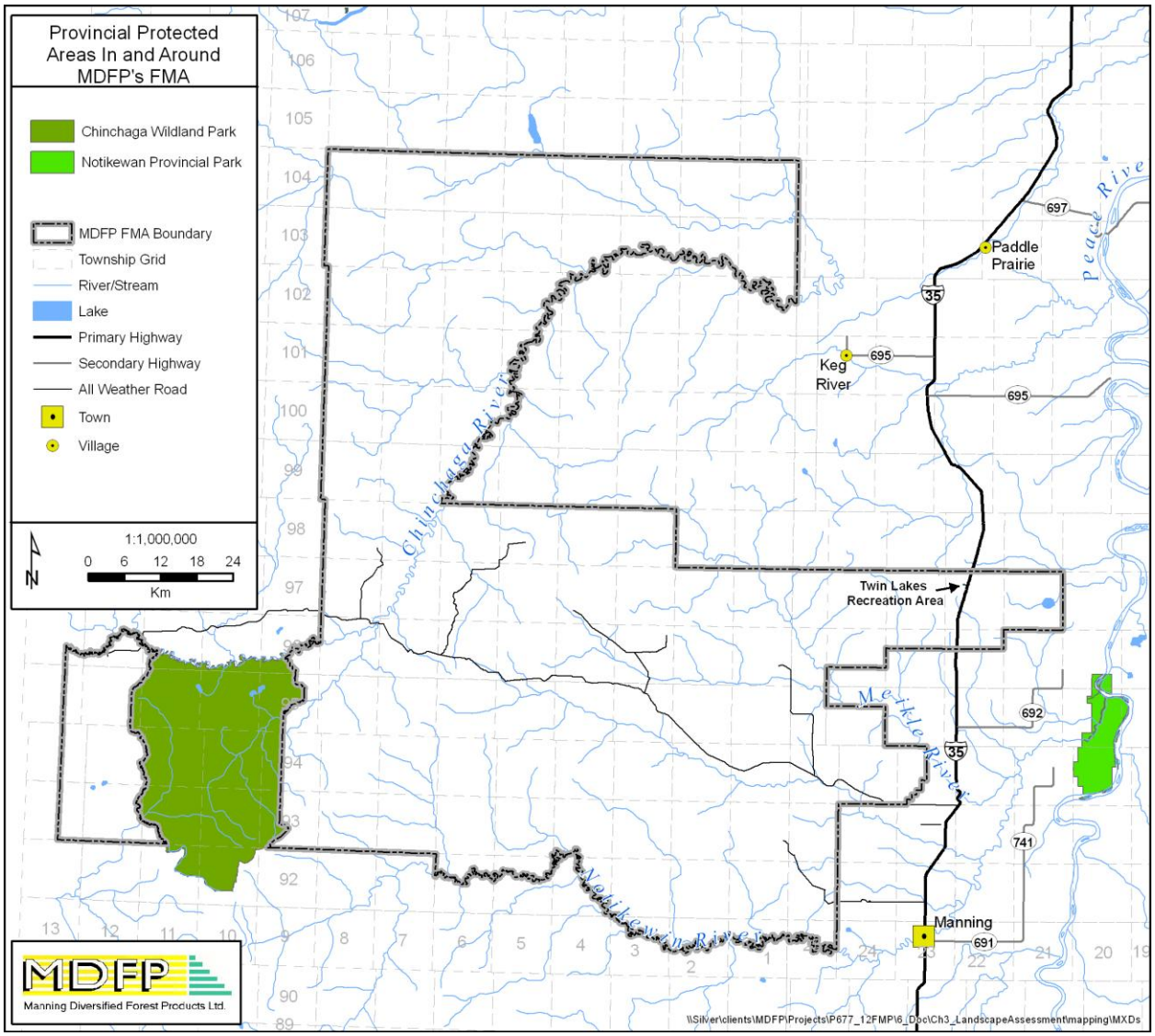


Figure 1-6. Provincial protected areas in and around the MDFP FMA area

1.9 Wildfire Management Areas

The MDFP FMA area is part of the Peace Wildfire Management Area (fire control zones 32 and 33). No other management zones (such as FireSmart landscape zones) have been designated within the FMA area.

2. Physical Conditions

2.1 Topography

The topography of northern Alberta was shaped by glacial advance and retreat flattening the landscape. The gentle topography in this area consists of flat or slightly rolling terrain with moderate river valleys (Figure 2-1). Elevation within the FMA area ranges from 398 m above mean sea level along the Chinchaga River in the northeast to 1059 m along the Naylor Hills in the southwest (Figure 2-2).

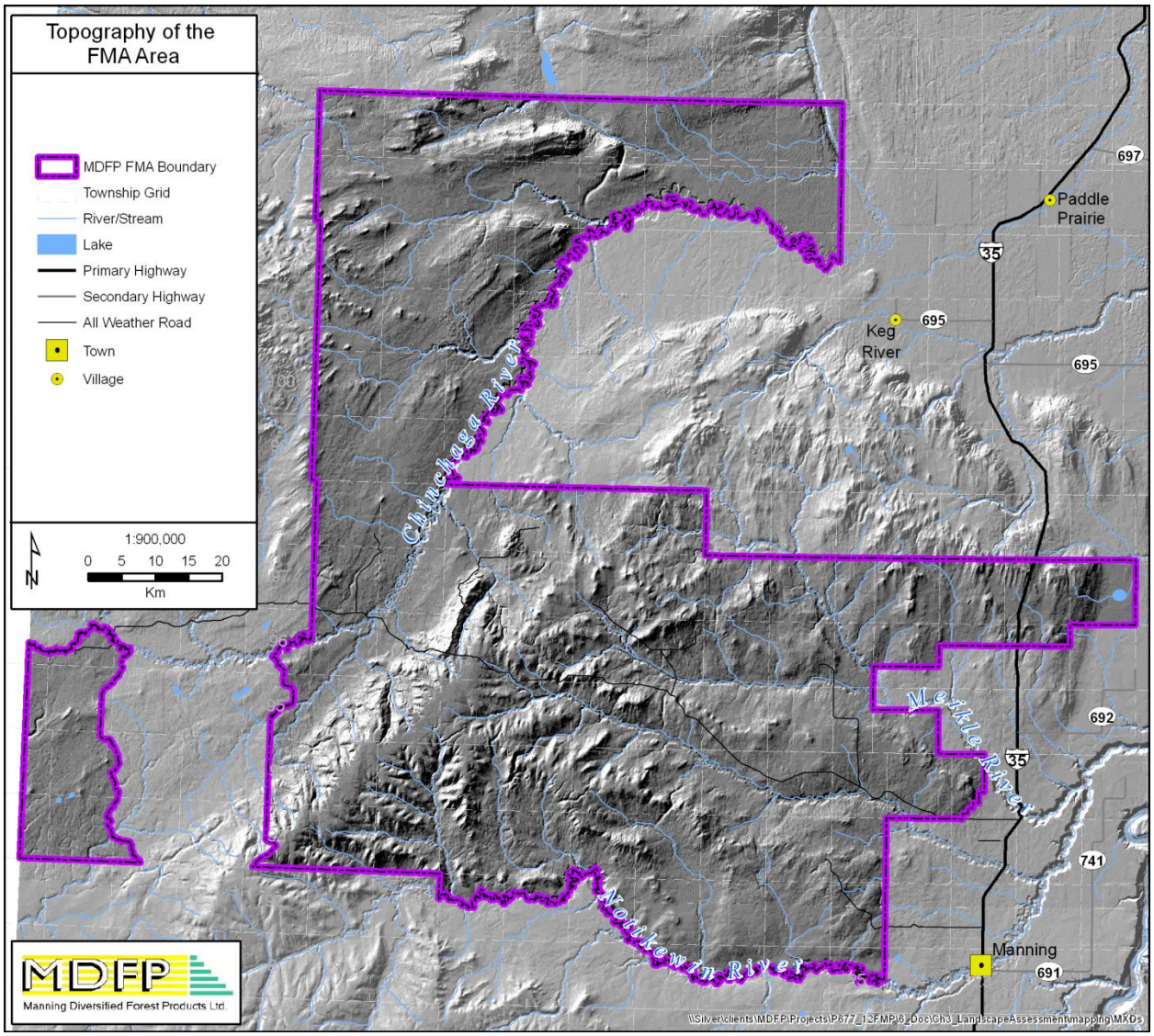


Figure 2-1. Hillshade showing topography in the FMA and surrounding area

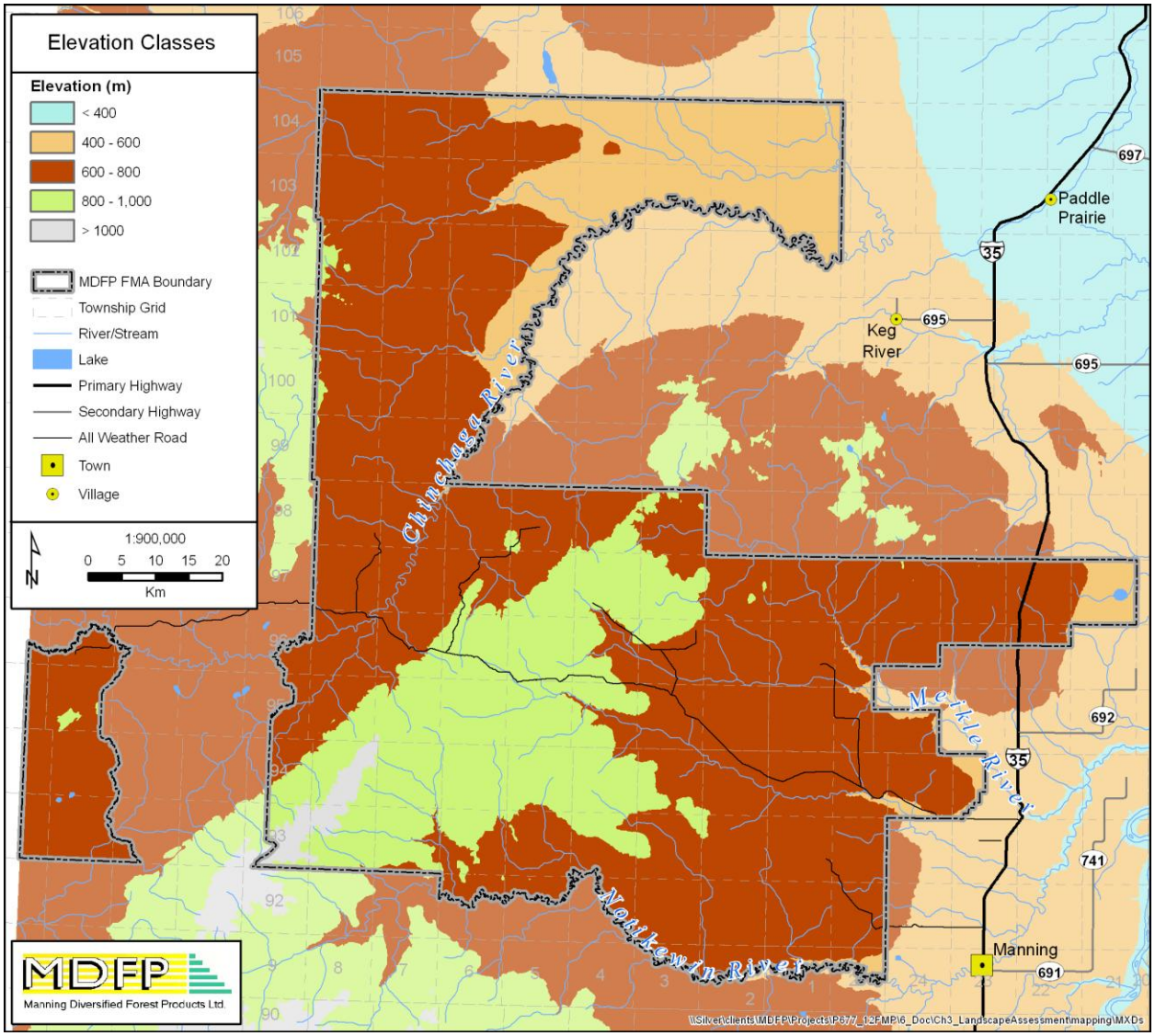


Figure 2-2. Elevation classes in and around the MDFP FMA area

2.2 Soils and Landforms

2.2.1 Geological Formations

The physical environment of northwestern Alberta strongly reflects geologic events associated with the Quaternary Period, which comprises the Pleistocene Epoch and the more recent Holocene Epoch.

The Pleistocene Epoch, commonly referred to as the Great Ice Age, spans from 1.8 million to approximately 10,000 years ago. The Pleistocene was characterized by four major ice advances, each separated by deglaciation during interglacial periods (which is the present condition).

During the last glacial advance, the Wisconsinian glaciation, the FMA area was covered by the Laurentide (or Continental) ice sheet, which spread from its centre in the Hudson Bay region. This ice sheet reached its maximum extent approximately 20,000 years ago and did not retreat from northwestern Alberta until approximately 12,000-13,500 years ago (Dyke and Prest 1987, Bobrowsky et. al. 1993, Stelfox and Wynnes 1999).

The advance of the Laurentide ice sheet through northern Alberta was primarily from the northeast to the southwest, while the subsequent retreat was generally in the reverse direction. As the ice sheet advanced, surface material over which the ice sheets passed (mixture of bedrock, older till, soil and plant material) was incorporated into the glacial ice. As the glacier retreated, this material was re-deposited as an unsorted mixture called ground moraine or till. Ground moraine deposits generally reflect the content of local materials that originated from the direction of ice advance (*i.e.,* transport of most material is not over long distances and follows the direction of ice advance).

The retreat of the Laurentide ice sheet produced large volumes of meltwater that were trapped between the retreating ice and higher elevation lands in western Alberta. Because the trapped water was in contact with the retreating edge of the ice sheet, soil particles were continuously entering the lake as the sheet continued melting. Deposition of the soil particles continued over time, with fine textured materials taking longer to deposit than coarse textured materials.

Because of the region's glacial history, the FMA area is characterized predominantly by relatively flat land with fine textured morainal soils that formed by deposits associated with Glacial Lake Peace. Organic soils are scattered throughout the FMA area, while fluvial deposits are generally restricted to existing or historic river channels.

Major geologic formations found within the FMA area include the Dunvegan, Puskwaskau and Shaftesbury, which date mainly to the Cretaceous Period. Figure 2-3 and Figure 2-4 show the periods and formations within and surrounding the FMA area.

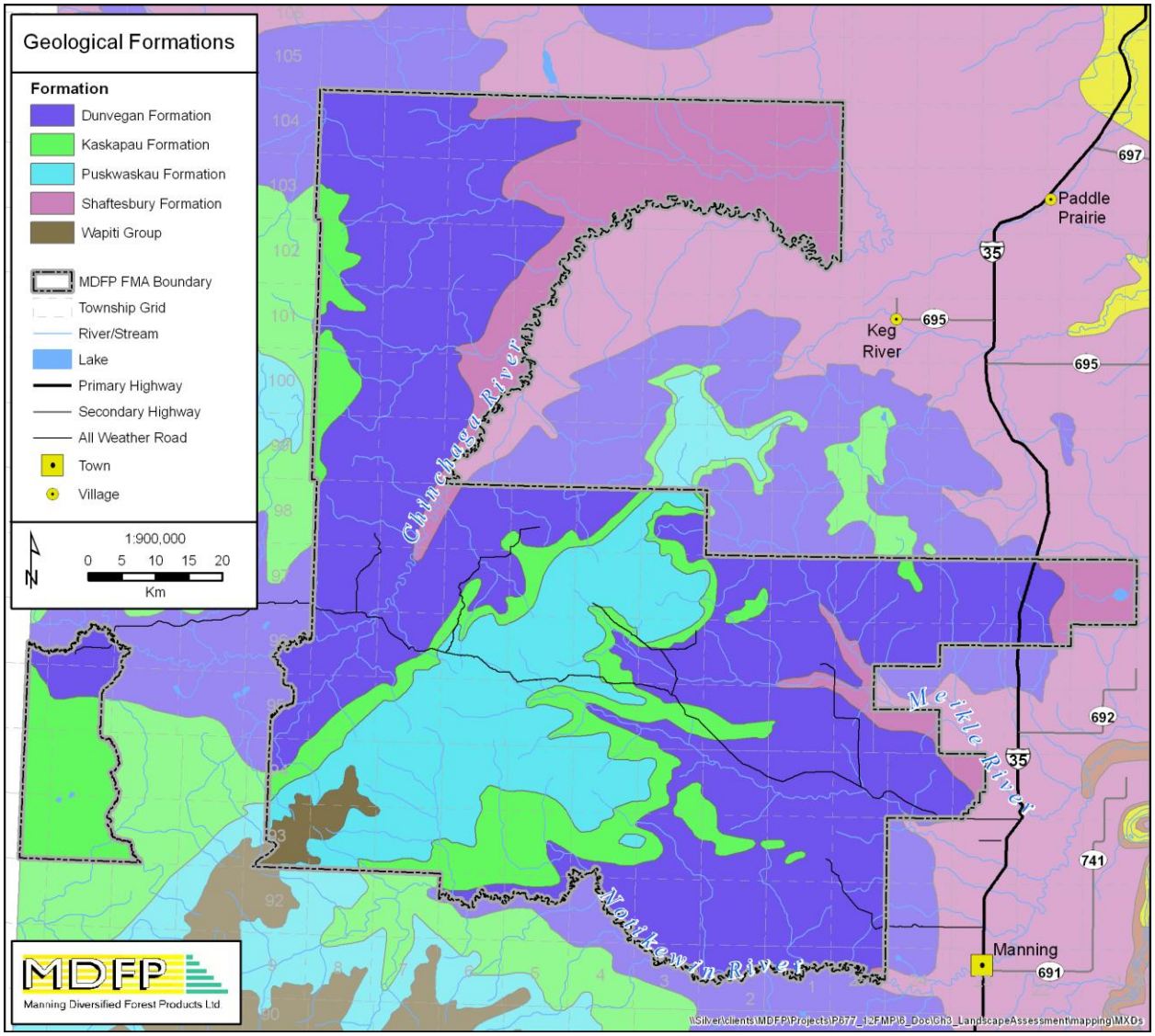


Figure 2-3. Geological formations in the MDFP FMA and surrounding area

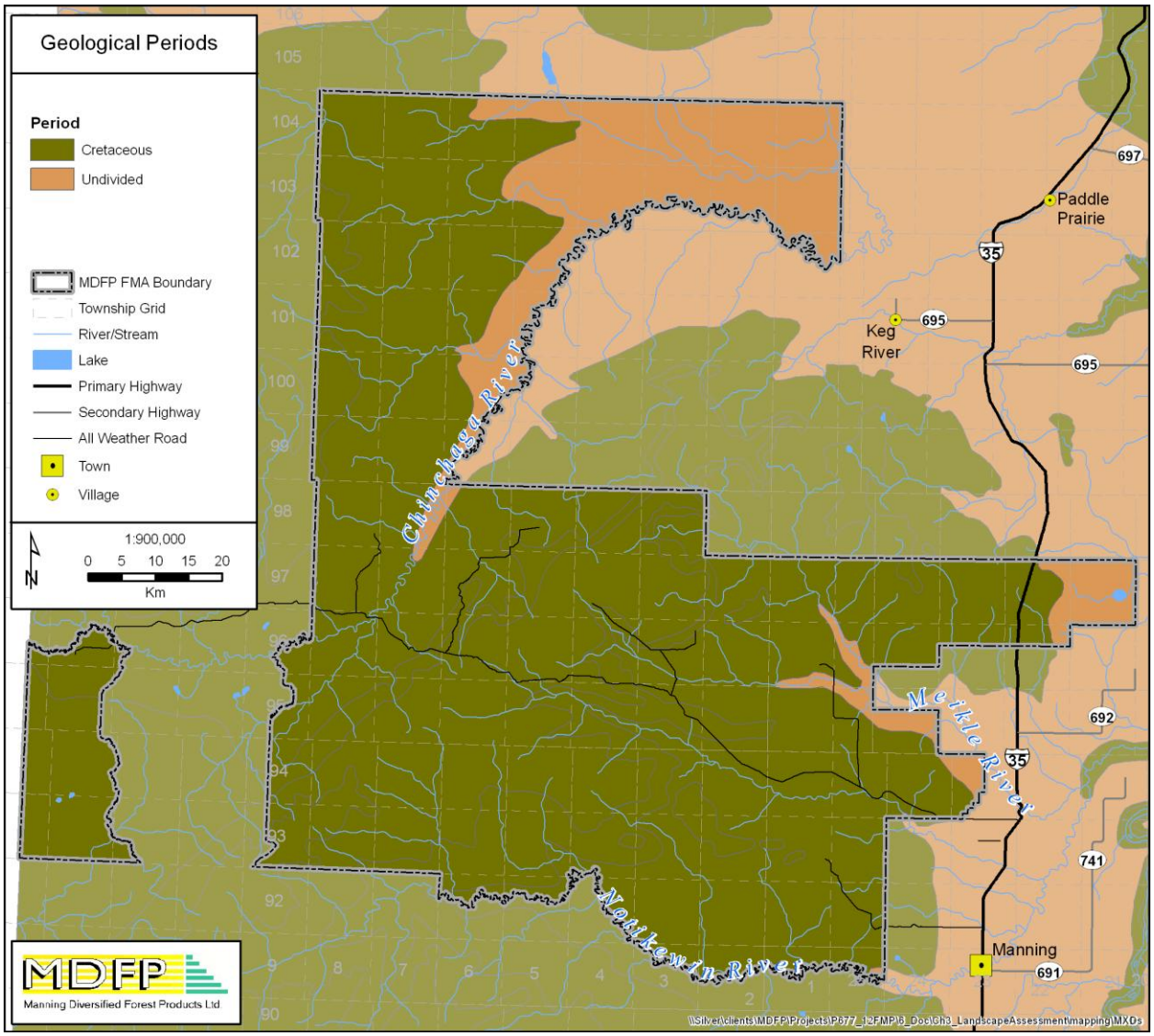


Figure 2-4. Geological periods

2.2.2 Soils

Gray luvisolic soils dominate the FMA area area (Figure 2-5), with a north-south band of Mesisolic soils in the northwest and Dark Gray Chernozemic soils along the Chinchaga River flood plain.

Most of the soil was deposited as morainal till, with fluvial deposition along the Chinchaga River and eolian (wind) deposition along the higher elevation ridge. The majority of the area comprises well-drained or moderately well-drained mineral soil making up Orthic Gray Luvisols. The band of Mesisols running north-south along the western edge of the FMA area comprises very poorly drained organic soil deposited through peat fens and glacial lakes.

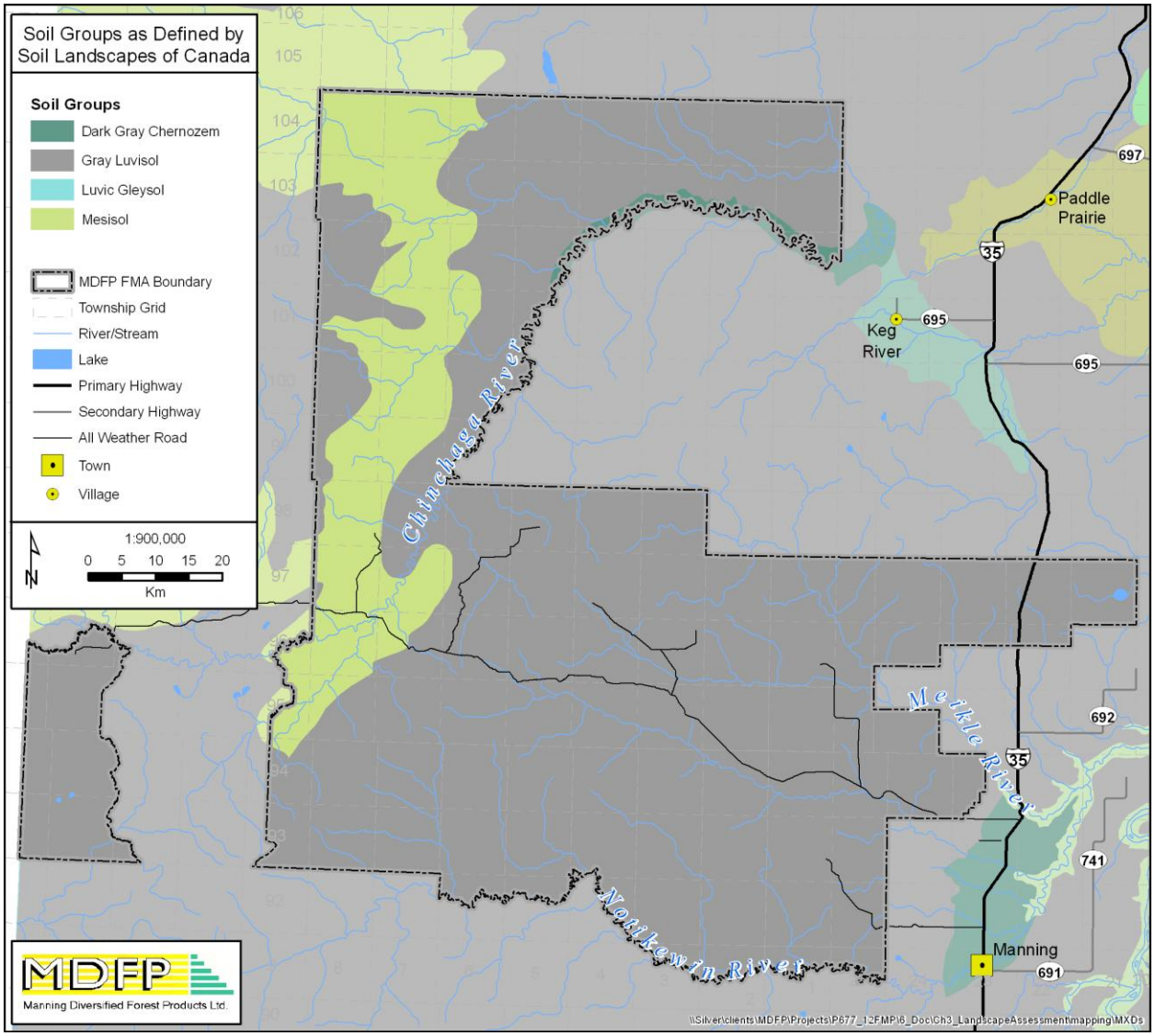


Figure 2-5. Soils in and around the MDFP FMA area (Soil Landscapes of Canada Working Group, 2010)

2.3 Hydrography

The MDFP FMA area is split between the Peace River and Hay River drainage basins. The Hay River drainage basin in the northwest portion of the FMA area is made up of the Chinchaga River and Haig River, as well as Sloat Creek, Thordarson Creek and Waniandy Creek. The Peace River drainage basin making up the Southeast portion of the FMA area includes the Meikle River, Botha River, Hotchkiss River and Notikewin River (forming the southern border of the FMA area). Some of the creeks in this southern drainage area include Alleman Creek, Stowe Creek and Lovet Creek. The Alberta government has identified approximately 145 unique 3rd order watersheds in the FMA area (Figure 2-6). Drainage basins are not shown on Figure 2-6 as they came from a different source (Agriculture and Agri-Food Canada) and do not line up with the Alberta government watersheds.

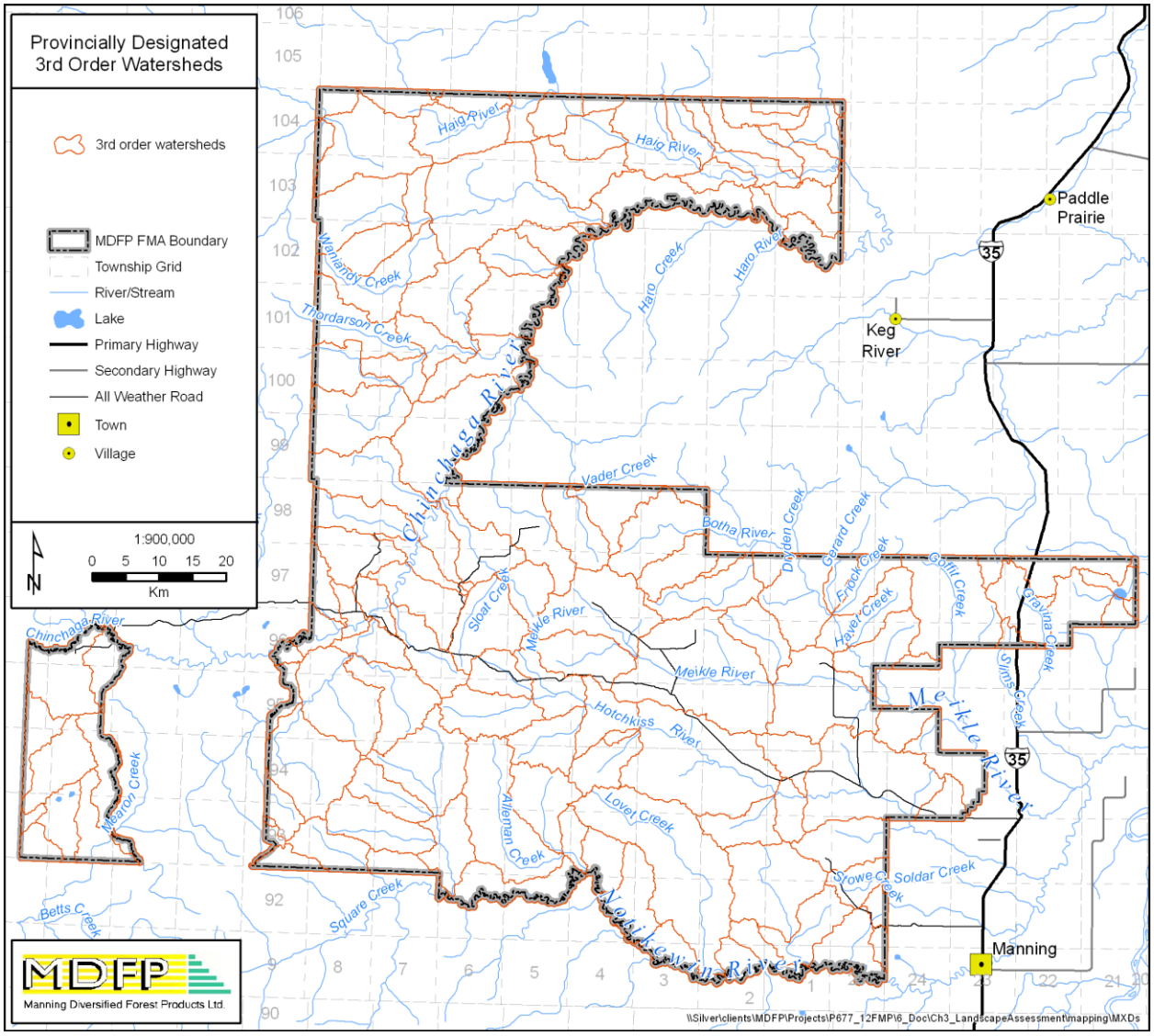


Figure 2-6. Provincially designated 3rd order watersheds within the MDFP FMA area

2.4 Climate

According to the Koppen-Geiger climate classification, the MDFP FMA area is divided into boreal and hemi-boreal zones. The hemi-boreal zone in the southern half of the FMA area is defined as having cold winters and warm summers (with long days), whereas the boreal zone in the northern half of the FMA area is defined by short summers and long, cold winters.

Approximately 79% of the FMA area lies within the Lower Boreal Highlands Subregion. The climate of this Subregion is influenced by its proximity to the Rocky Mountains to the west. Summer temperatures are typically cooler than in the adjacent Mixedwood Natural Regions, which are at a lower elevation. Mean annual temperature within this Subregion is -1.0°C and mean annual precipitation is 495 mm. The average frost free period is 97 days and the average GDD is 1097 (Natural Regions Committee, 2006).

Central and Dry Mixedwood Subregions make up 12% of the FMA area. The climate of these Subregions is slightly warmer than the adjacent Lower Boreal Highlands Subregion. The mean annual temperatures are between 0.1°C and 1.1°C while mean annual precipitation ranges between 461 and 478 mm. The average frost free period is 97/98 days and the average GDD is 1240 to 1301 (Natural Regions Committee, 2006).

The final 9% of the FMA area is composed of the Upper Boreal Highlands Natural Subregion. It is the coldest and wettest subregion within the FMA area with mean annual temperature of -1.5°C and mean annual precipitation at 535 mm. The average frost-free period is 97 days and the average GDD are 990.

Summers are short with moderate temperatures (July temp 12.5 - 17.5°C) and winters are cold (mean January temperatures range from -17.5 to -22.5°C). Mean annual temperatures are near 0°C. From 65% to 75% of the mean annual precipitation falls during April to August, during the growing season. According to Alberta Agriculture and Rural Development, the mean length of the growing season for the years 1971 to 2000 (when mean temperatures are higher than 5°C) for the MDFP FMA area is 160-170 days.

To better characterize the climate within the MDFP FMA area, nine Environment Canada climate stations were identified within the vicinity. The names and locations of these weather stations are identified in Table 2-1 and Figure 2-7 along with the information that was available for each station.

The following detailed climate information was compiled using Environment Canada climate normals. Descriptions of the data elements summarized were also obtained from Environment Canada.

2.4.1 Climate Normals

The climate data used represents climate 'normals', a term commonly used to describe climate data elements that have been averaged over a fixed, standard period of years. The period currently in use is from 1961 to 1990. However, for some stations climate normals are not available for the 1961-1990 period. In these cases, any currently available data was used (data collection periods are identified in Table 2-1 for each weather station).

2.4.2 Climate Elements

Environment Canada compiles and reports on a large number of climate elements, of which only a small subset was selected. All selected elements are reported on a monthly basis. Rainfall, snowfall and precipitation are also accumulated over each month and then averaged over the reporting period. Precipitation is measured using a rain gauge. Snowfall is measured at several points in the immediate vicinity of the station using a snow ruler. Precipitation represents the rainfall and the water equivalent of the snowfall, computed by dividing the snowfall depth by 10 (in some stations it can be measured more directly by sampling/melting the snowfall). Environment Canada warns climate data users that precipitation figures reported are not always equal to the sum of the rainfall plus one tenth of the snowfall because of missing observations and other data problems.

Table 2-1. Names, data collection years and locations of Environment Canada weather stations in the vicinity of the MDFP FMA area

Weather Station (data collection years)	Location (latitude, longitude)	Elevation (m)	Climate Data Available?			Notes
			Precipitation	Temperature	GDD	
Battle River Lookout Tower (1955-1993)	57°-29N 117°-39W	732	Y	Y	Y	Summer only
Berwyn (1975-1993)	56°-09N 117°-41W	626	Y	Y	N	Year-round
Hawk Hills Lookout Tower (1962-1993)	57°-39N 117°-25W	610	Y	Y	Y	Summer only
Keg River Ranger Station (1965-1993)	57°-45N 117°-37W	405	Y	Y	Some	Summer only
Manning (1985-1993)	56°-57N 117°-39W	491	Y	Y	N	Year-round
Nina Lake (1980-1993)	57°-19N 117°-12W	453	Y	N	N	Year-round
Notikewin East (1962 – 1993)	57°-01N 117°-34W	465	Y	Y	N	Year-round
Notikewin Lookout Tower (1957-1993)	56°-52N 118°-35W	762	Y	Y	Y	Summer only
Peace River Airport (1944-1990)	56°-13N 117°-26W	571	Y	Y	Y	Year-round

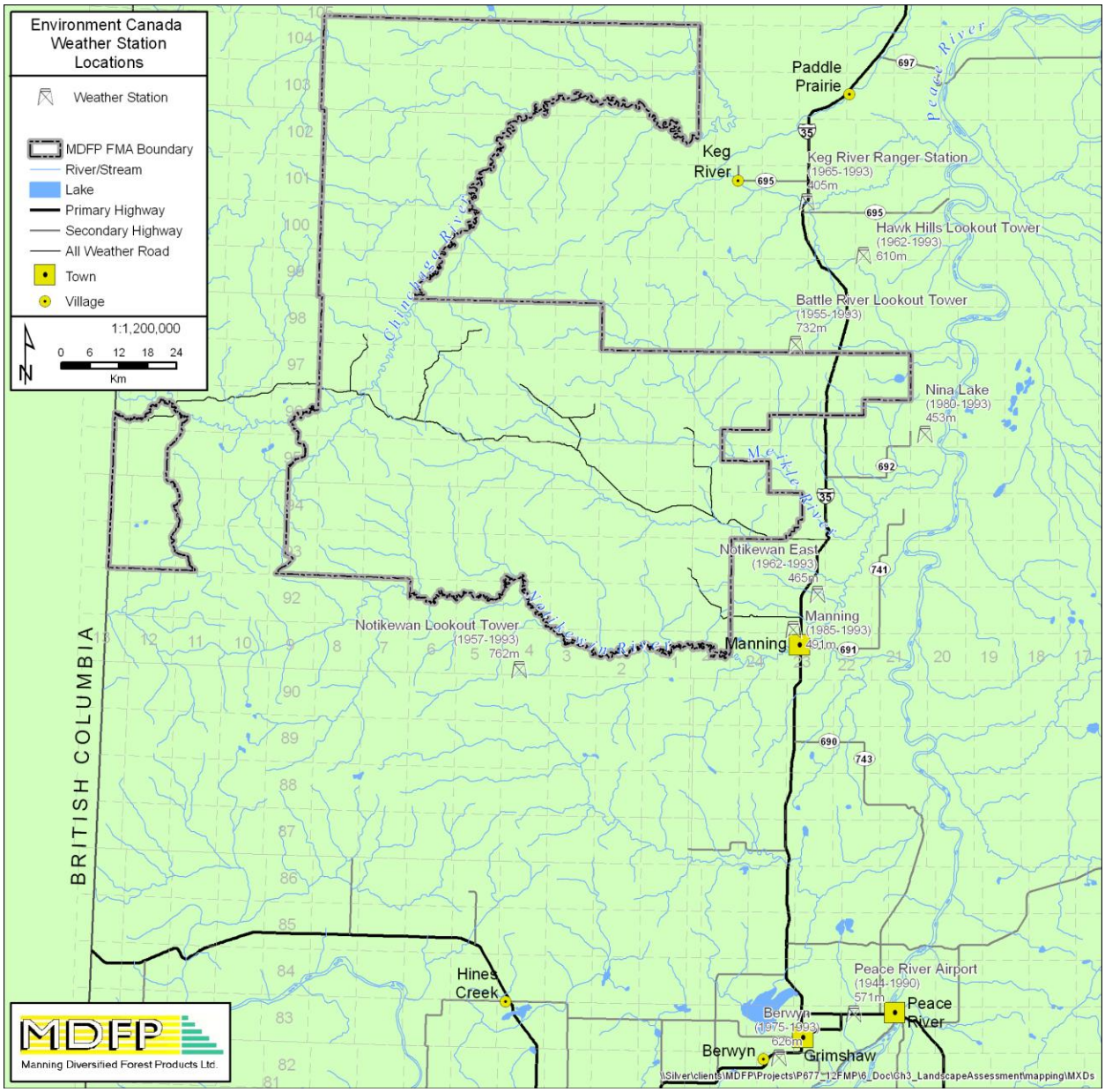


Figure 2-7. Locations of Environment Canada's weather stations in the vicinity of the MDFP FMA area

2.4.3 Climate within the FMA area

Temperature

The average daily minimum, mean and maximum temperature by month for all weather stations sampled is shown in Figure 2-8. Daily minimum, mean, and maximum temperatures showed the same trends, with July being the warmest month and January the coldest. Daily minimum temperatures for May to September averaged above freezing. Daily mean temperatures were highest for July (15.5°C) and lowest in January (-16.8°C). April to October had average daily means above freezing, while the remaining five months average below freezing. Daily maximum temperatures showed the same trends as mean temperature in terms of warmest and coldest months and months averaging above freezing.

July's daily maximum temperature was 21.6°C while January's was –11.1°C. The maximum temperature was, on average, below freezing for five months, with the March value only slightly below freezing at -0.7°C.

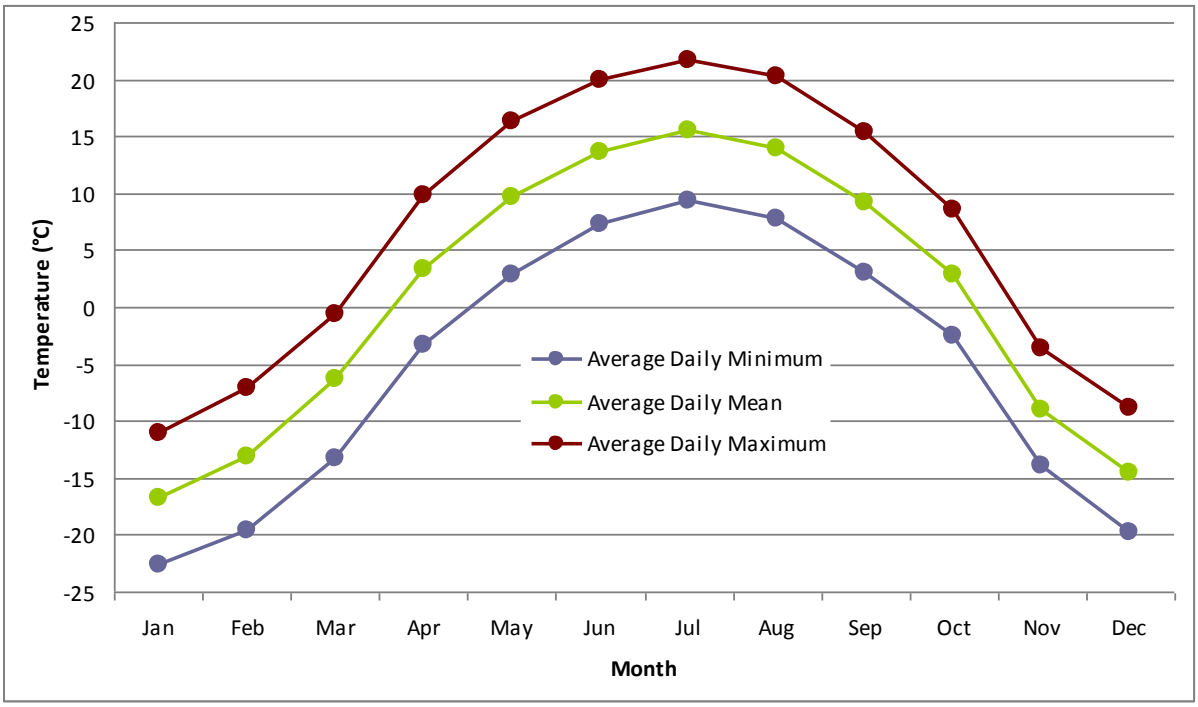


Figure 2-8. Daily minimum, mean and maximum temperatures for select weather stations in the vicinity of the FMA area (based on between 4 and 8 weather stations, depending on month)

Precipitation

Based on the Environment Canada climate station data used, the average annual precipitation in the vicinity of Manning's FMA area is 427 mm (Figure 2-9). Approximately 70% of the precipitation falls as rain (298 mm), and 30% falls as snow (129 mm). Precipitation from November to March is almost exclusively snowfall. Snowfalls in June and August are rare, and no snowfall was recorded at any of the weather stations in July.

Precipitation is highest in the summer months of June, July and August. Almost 70% of the rainfall occurs within these 3 months. Highest monthly precipitation rates occur in July, corresponding to the warmest air temperatures.

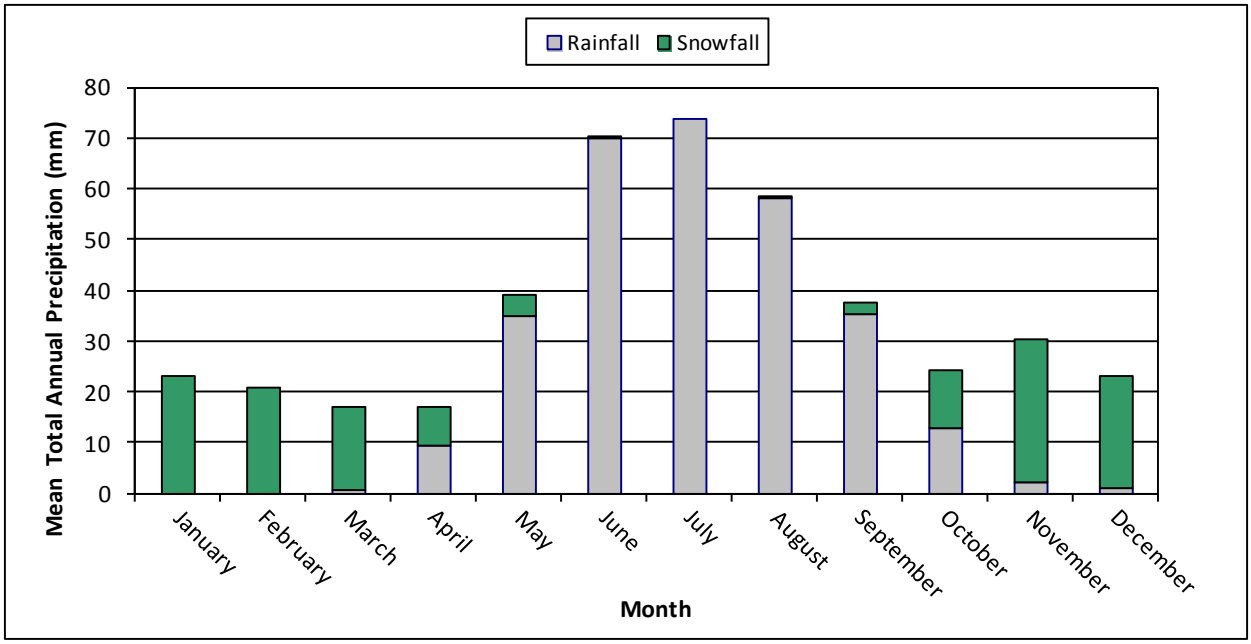


Figure 2-9. Average total precipitation, snowfall and rainfall, for select weather stations in the vicinity of the FMA area (based on 4-8 weather stations, depending on month)

Growing Degree Days

GDD data were only available for a limited number of weather stations, especially for non-summer months (September to April, see Table 2-1). Figure 2-10 shows the distribution of GDD through the year. One quarter of the GDD are accumulated in July, with an additional 44% accumulated in June and August. Total GDD averaged 1206, although this number should be considered a rough guide, since only the Peace River Airport station reported GDD between September and April.

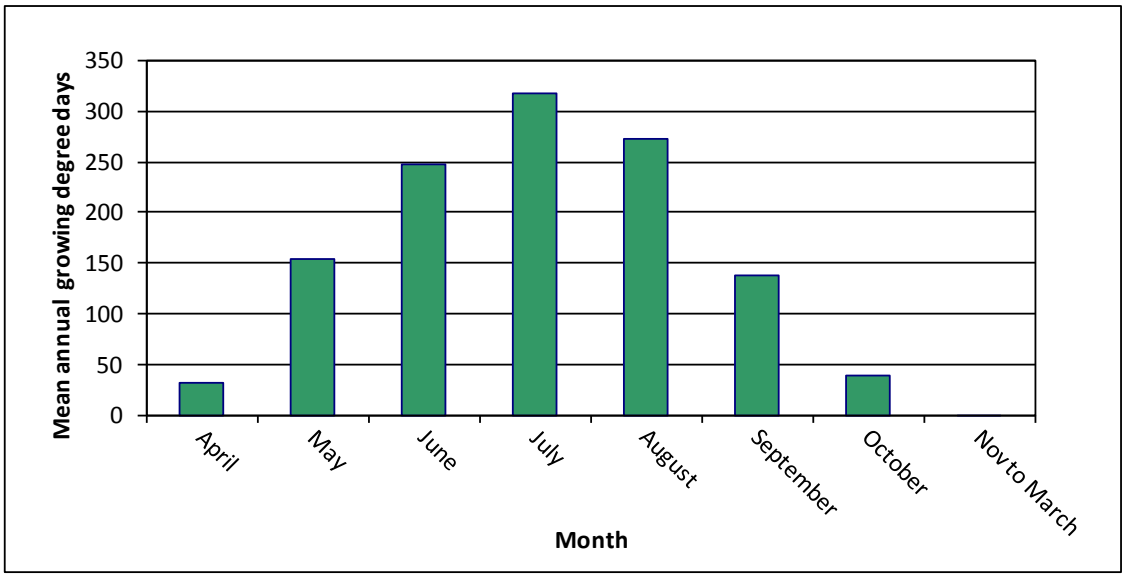


Figure 2-10. Growing degree days for select weather stations in the vicinity of the MDFP FMA area (only one weather station reporting from September to April)

3. Forest Landscape Pattern and Structure

3.1 Forest Species

Table 3-1 shows the area by leading overstory species, based on the Alberta Vegetation Inventory (AVI). Trembling aspen is the dominant overstory species across the landscape, followed by black spruce (SB in Table 3-2). Lodgepole pine and white spruce, the principle coniferous harvest species, together account for 27% of the overstory cover. Figure 3-1 provides a graphical representation of the overstory species distribution while Figure 3-2 shows the geographical distribution.

Table 3-1. FMA area classified by leading overstory species

Species	Area (ha)	%
Trembling Aspen	313,795	33.74
White Birch/Balsam Poplar	22,738	2.44
Black Spruce	219,774	23.63
Lodgepole Pine	141,429	15.21
White Spruce	114,372	12.30
Tamarack	3,937	0.42
Balsam Fir	62	0.01
Unforested or Recent Harvest	113,995	12.26
Total	930,100	100.00

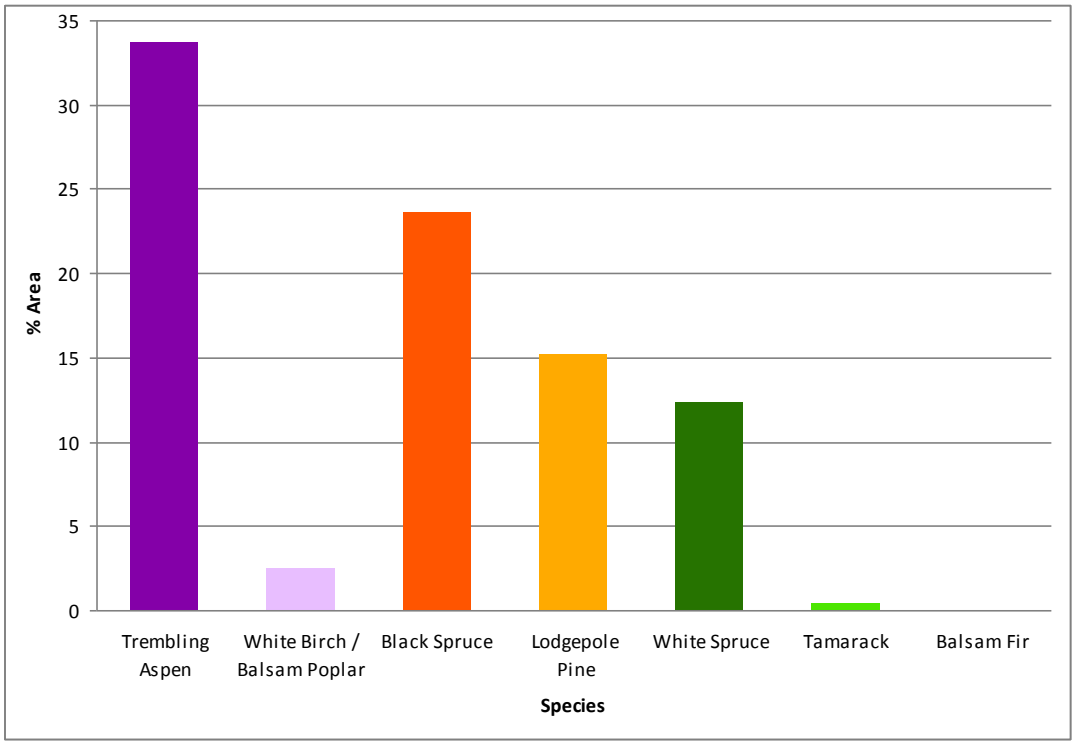


Figure 3-1. Percentage of FMA area by leading overstory species

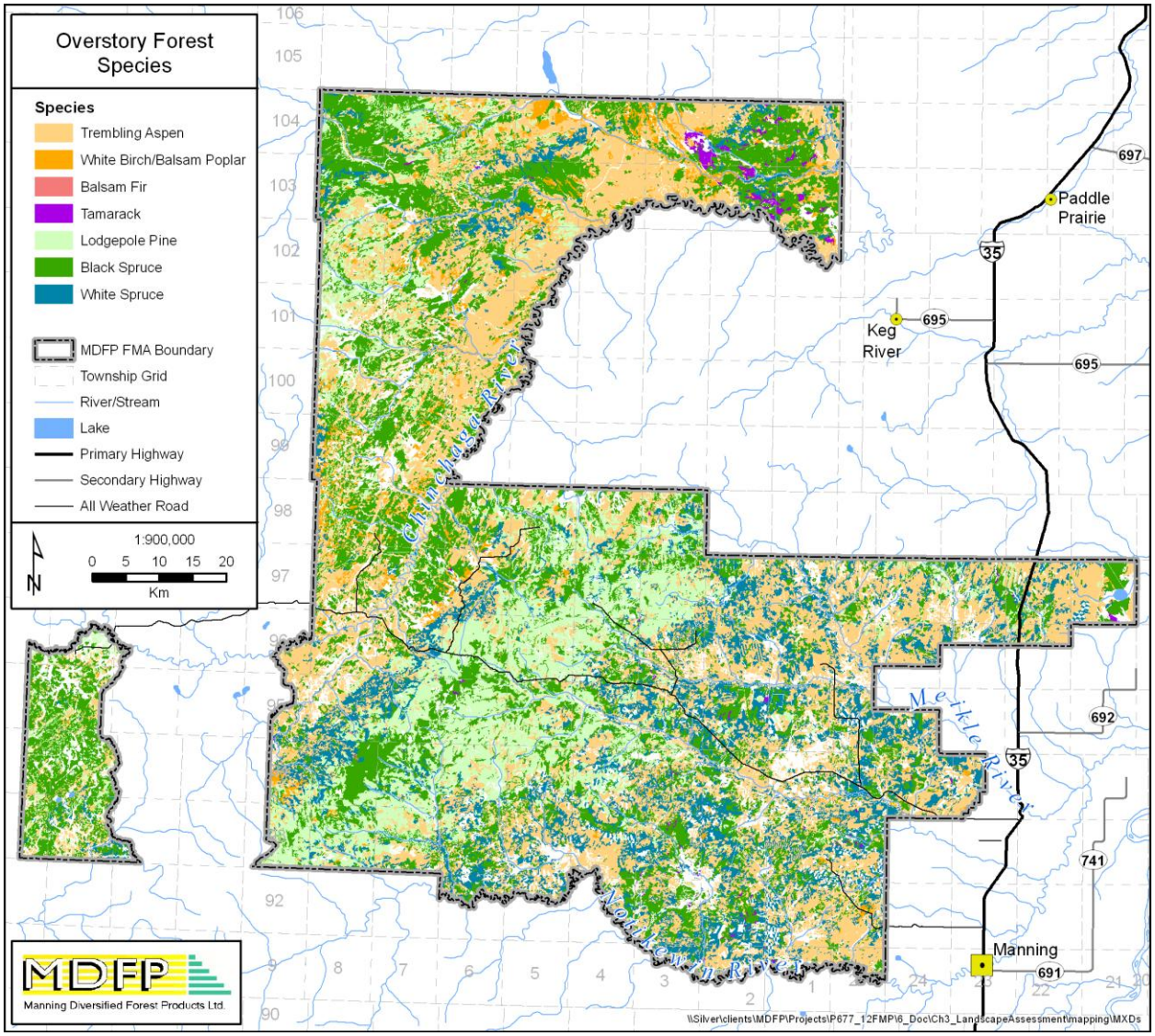


Figure 3-2. Leading overstory forest species cover in MDFP FMA area

3.2 Forest Cover types

Cover type-based strata based on forest tree species composition are defined for the 2012-2021 FMP in Chapter 6 PFMS and in Annex VI Forecasting.

The current distribution of the forested cover types (as of the *landbase* effective date of May 2010) across the FMA area is summarized in

Table 3-2, Figure 3-3 and Figure 3-4. Approximately 30% of the landbase is composed of Deciduous (D and DU) cover types, especially in the northwest portion, which generally has younger forests. Also of interest is the large amount of the black spruce (SB) cover type on the landbase, particularly in the northwest.

Table 3-2. Forested area by cover type in the MDFP FMA area

Strata	Cover Type	Area (ha)	%
D	Deciduous	161,767	17.39
DU	Deciduous with coniferous understory	114,682	12.33
DC	Mixedwood/deciduous dominant	45,405	4.88
CD	Mixedwood/conifer dominant	40,400	4.34
SB	Conifer/Black Spruce dominant	251,253	27.01
PL	Conifer/Pine dominant	112,013	12.04
SW	Conifer/White Spruce dominant	103,770	11.16
No Strata	No Yield strata assignment	100,810	10.84
Total		930,100	100.00

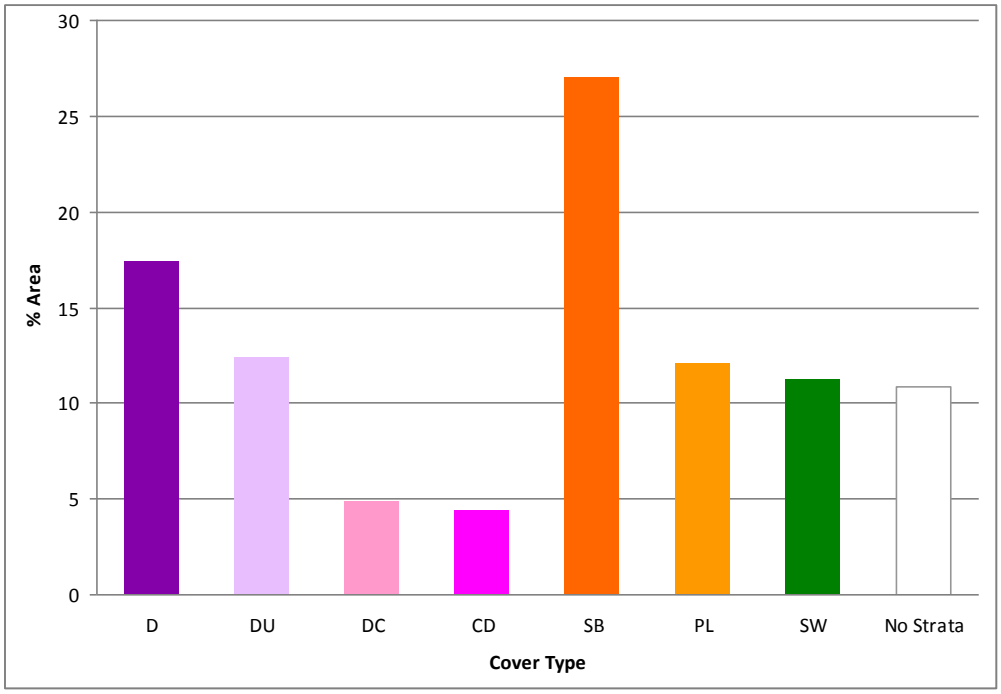


Figure 3-3. Percentage of total FMA area by forest cover type

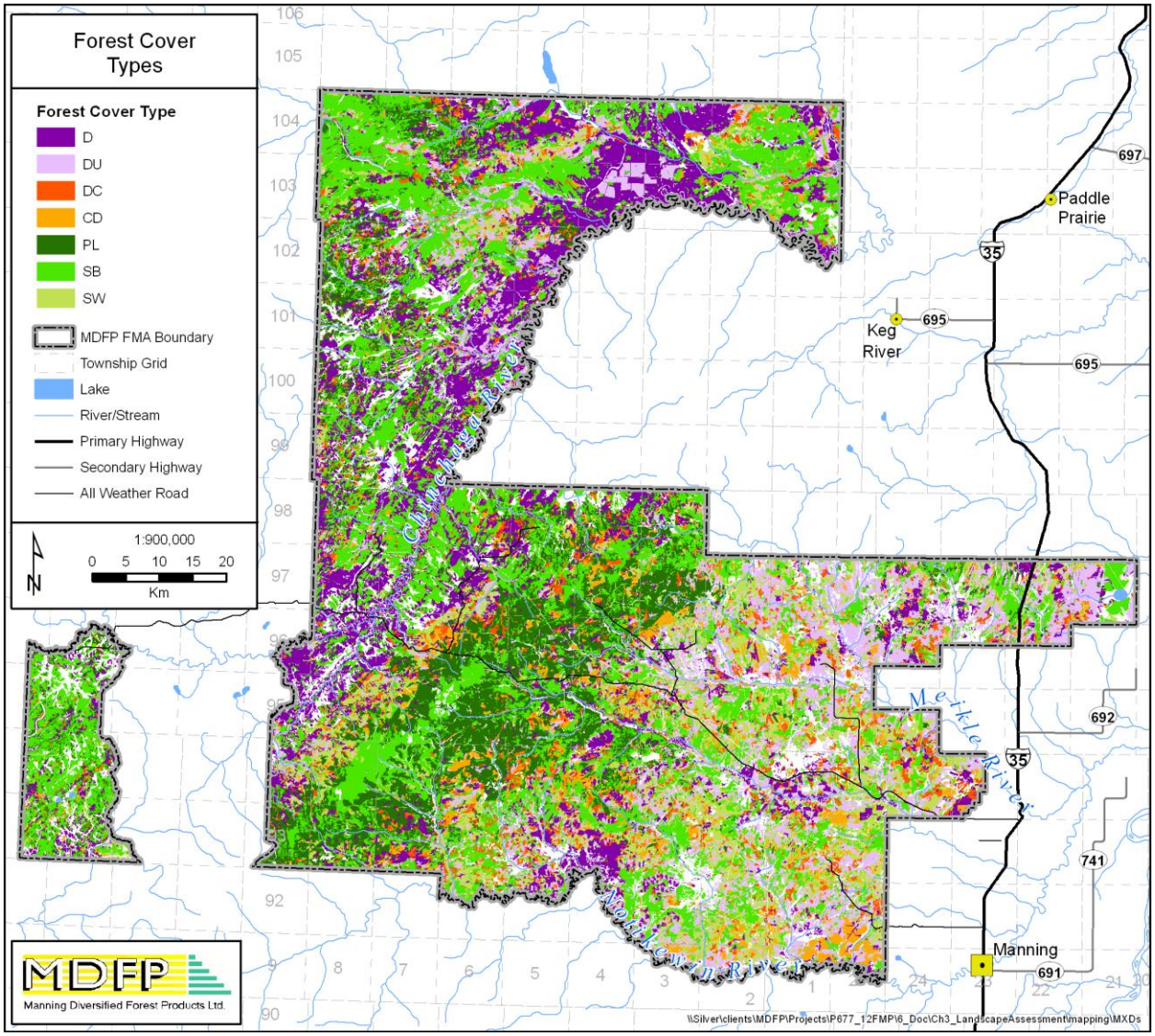


Figure 3-4. Forest cover types across the MDFP FMA area

3.3 Forest Age-Classes

The age class structure of the FMA area varies considerably from east to west (see Figure 3-5) as a result of fire history. The western and northwestern portion of the FMA area ranges from 41-60 years old, with a portion in the middle of the FMA area being younger (21-40 years). The eastern and southern portions of the FMA area contain the most harvestable trees between the ages of 81-120 years old. A few very old stands (121-180 years) can be found in the south central part of the FMA area. Table 3-3 outlines the area distribution of age classes across the forested portion of the FMA area.

Table 3-3. Forested area by age class

Age Class	Area (ha)	%
< 20	37,022	3.98
21 - 40	101,939	10.96
41 - 60	251,362	27.03
61 - 80	174,947	18.81
81 - 100	113,796	12.23
101 - 120	101,365	10.90
121 - 140	27,478	2.95
141 - 160	14,903	1.60
161 - 180	5,641	0.61
181 - 200	658	0.07
201 - 220	179	0.02
Total Forested	829,290	89.16
No Strata	100,810	10.84
Total FMA	**930,100**	**100.00**

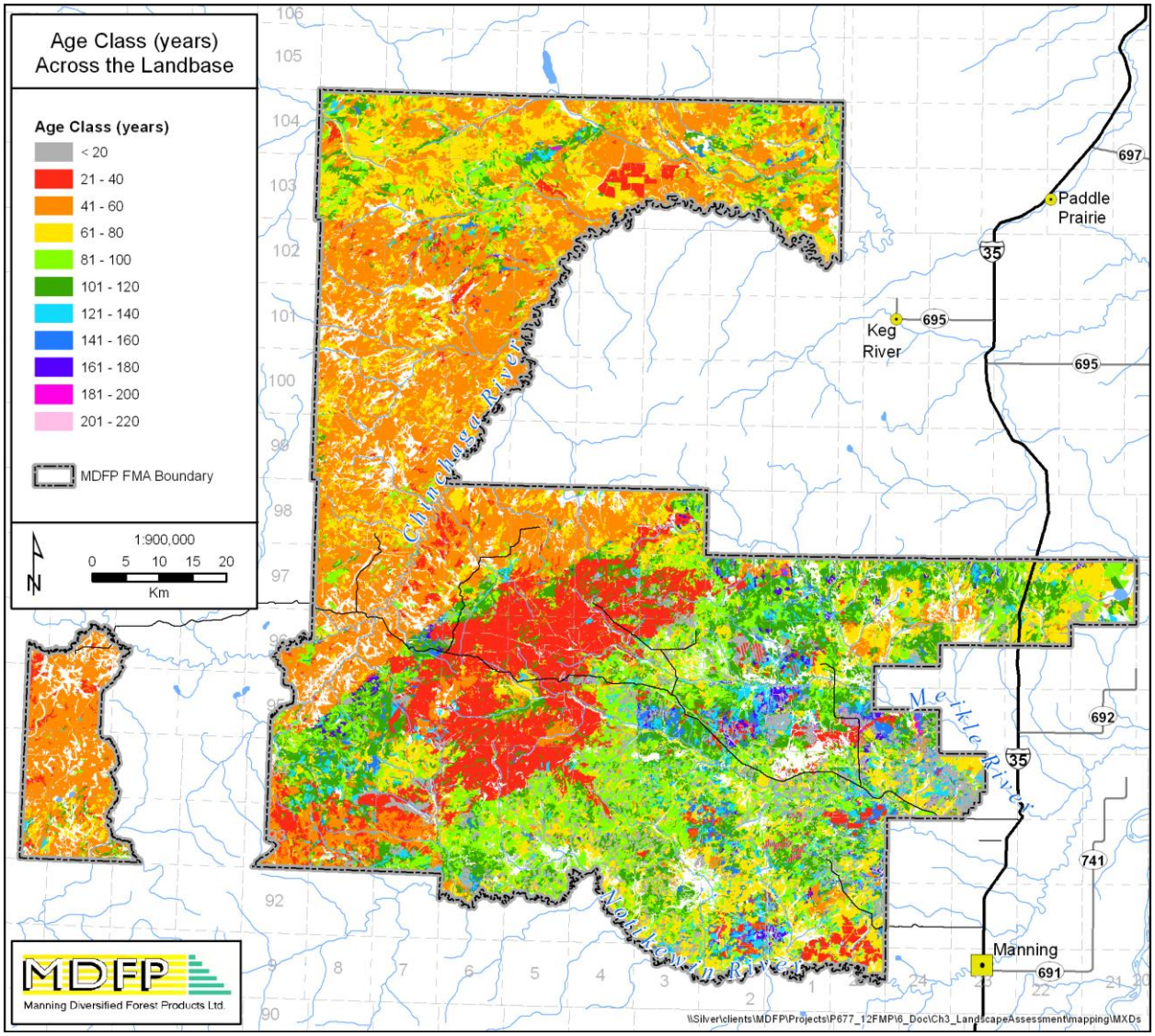


Figure 3-5. Forest age classes across the MDFP FMA area

3.4 Seral Stages

Although *seral stages* are related to stand age, they vary with the stand's growth characteristics. For example, white spruce stands tend to be relatively long-lived, while deciduous stands in the boreal region tend to reach maturity and senescence relatively quickly. These differences are incorporated into the age criteria used to define the seral stages. Seral stage definitions for the FMA area by strata are provided in Table 3-4.

Because seral stages were defined on the basis of age and predominant species, the distribution of seral stages is similar to the distribution of age classes within the FMA area (see Figure 3-5 and Figure 3-6). The active landbase in FMU P20 is predominantly in the Young seral stage (Table 3-5). Table 3-6 shows the distribution of species within each seral stage.

Table 3-4. Seral stage definition

		Minimum Age for each Seral Stage			
		Regen	Young	Mature	Old
Strata	Strata Label	(years)	(years)	(years)	(years)
D	Deciduous	0	16	61	101
DU	Deciduous with coniferous understory	0	16	61	101
DC	Mixedwood/deciduous dominant	0	16	71	111
CD	Mixedwood/conifer dominant	0	16	71	111
PL	Conifer/pine dominant	0	16	71	121
SB	Conifer/black spruce dominant	0	16	106	161
SW	Conifer/white spruce dominant	0	16	106	151

Table 3-5. Baseline (year zero) seral stage distribution across the MDFP FMA area

	Active Landbase	Passive Landbase	Gross Landbase
Seral Stage	(ha)	(ha)	(ha)
Regen	29,529	849	30,378
Young	254,967	254,437	509,404
Mature	166,957	76,616	243,573
Old	40,118	5,818	45,935
Total Forested	491,571	337,720	829,290
Unforested	0	100,810	100,810
Grand Total	491,571	438,530	930,100

Table 3-6. Seral stage landbase cover by species strata

Species Strata	Regen		Young		Mature		Old		Total	
	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
D	8,075	0.87	98,725	10.61	47,103	5.06	7,864	0.85	161,767	17.39
DU	127	0.01	27,193	2.92	67,830	7.29	19,533	2.10	114,682	12.33
DC	4,409	0.47	18,317	1.97	19,583	2.11	3,096	0.33	45,405	4.88
CD	4,321	0.46	23,360	2.51	7,145	0.77	5,574	0.60	40,400	4.34
PL	1,725	0.19	93,336	10.04	15,820	1.70	1,131	0.12	112,013	12.04
SB	212	0.02	204,938	22.03	45,514	4.89	588	0.06	251,253	27.01
SW	11,509	1.24	43,534	4.68	40,577	4.36	8,150	0.88	103,770	11.16
Total Forested	30,378	3.27	509,404	54.77	243,572	26.19	45,935	4.94	829,290	89.16
Unforested	-	-	-	-	-	-	-	-	100,810	10.84
Grand Total	30,378	-	509,404	-	243,572	-	45,935	-	930,100	100.00

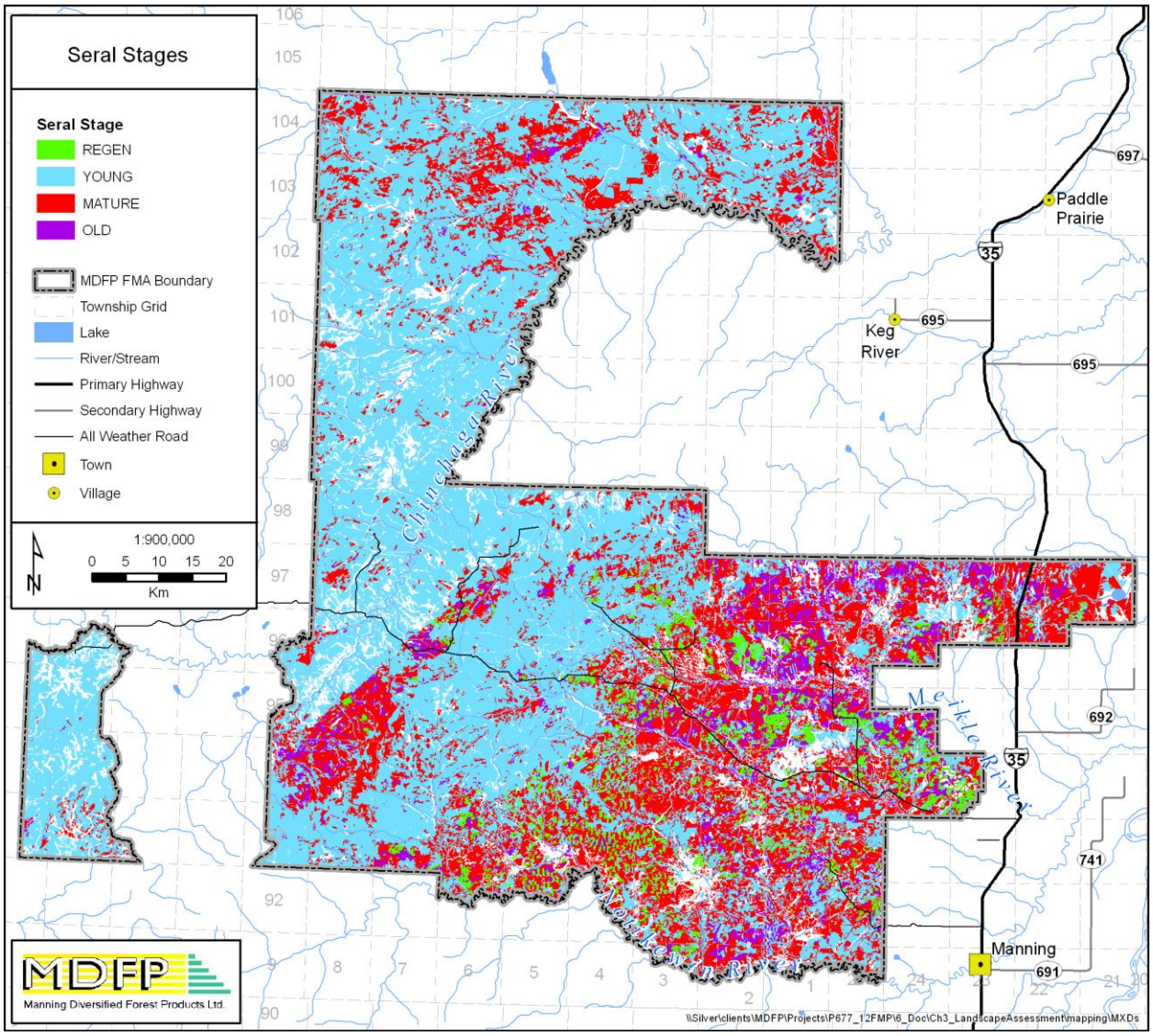


Figure 3-6. Seral stages distribution across the MDFP FMA area

3.5 Forest Patches

A *forest patch* is defined as a stand of forest in the same seral stage that is not split by a linear feature greater than 8 m wide. For forest patches, linear features include roads, pipelines, power lines, and rivers, but do not include seismic lines. Analysis of forest patch sizes was performed on the classified landbase after removing industrial related dispositions and cutblocks (Table 3-7 and Figure 3-7).

Table 3-7. Distribution of forest patch sizes by seral stage

Patch	Mature		Old		Regen		Young		Total	
Size (ha)	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
0-7.0	12,578	1.35	4,846	0.52	2,541	0.27	11,675	1.26	31,639	3.40
7.1-60.0	56,290	6.05	19,968	2.15	18,749	2.02	52,328	5.63	147,335	15.84
60.1-200	48,572	5.22	11,571	1.24	6,503	0.70	59,117	6.36	125,764	13.52
200 +	124,218	13.36	9,138	0.98	2,409	0.26	381,514	41.02	517,280	55.62
Total Forested	241,658	25.98	45,523	4.89	30,202	3.25	504,635	54.26	822,018	88.38
Unforested	-	-	-	-	-	-	-	-	95,812	10.30
Industrial DIDs Removed*		-	-	-	-	-	-	-	12,270	1.32
Grand Total	-	-	-	-	-	-	-	-	930,100	100.00

*DIDs: *Digitally Integrated Disposition System*

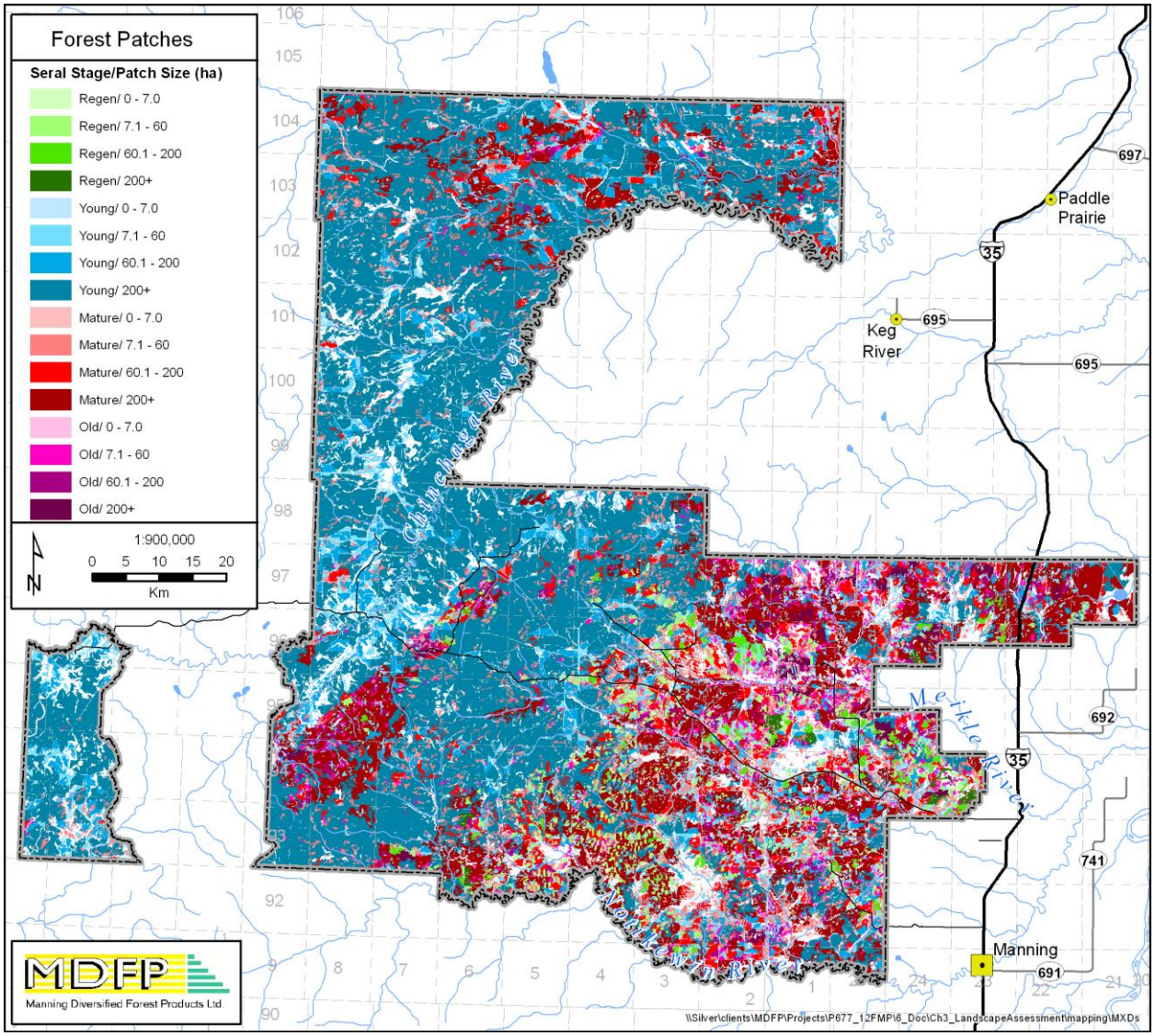


Figure 3-7. Forest patches by seral stage across the MDFP FMA area

3.6 Spatial and Temporal Variability of Cover Types and Seral Stages

The TSA was designed to determine *Annual Allowable Cut* (AAC), and the assumptions used maintain cover types over time with the exception of DU, which transitions to other strata. This is an artifact of modeling and in reality, DU will continue to exist on the landbase, and the distribution of cover types will vary, but the TSA was not designed to reflect this dynamic.

3.6.1 Cover type

Based on outputs from a Patchworks scenario, over time, conifer area remains constant while deciduous composition in the landbase appears to be steadily decreasing (Table 3-8, Figure 3-8, and Figure 3-9). This is the artifact of modeling mentioned above. In this case, DU is included with D and the model transitions DU to mixedwood. As a result, both mixedwood types (conifer dominated and deciduous dominated) increase over time, filling in the void left by the deciduous decline. This transition towards mixedwood types likely represents the ecological trajectories in the absence of fire. Refer to Chapter 6 Preferred Forest Management Scenario for the transitions from the desired forest management strategies.

Table 3-8. Gross landbase by cover type at 10, 50, 100 and 200 years.

Cover Type	Year 10 Area (ha)	Year 50 Area (ha)	Year 100 Area (ha)	Year 200 Area (ha)
Conifer	462,733	462,733	462,733	462,733
Deciduous	251,786	230,308	186,918	164,791
Mixedwood (conifer dominated)	40,294	50,896	68,452	75,106
Mixedwood (deciduous dominated)	40,431	51,307	77,141	92,615
Total Forested	795,244	795,244	795,244	795,244
Unforested	134,856	134,856	134,856	134,856
Grand Total	930,100	930,100	930,100	930,100

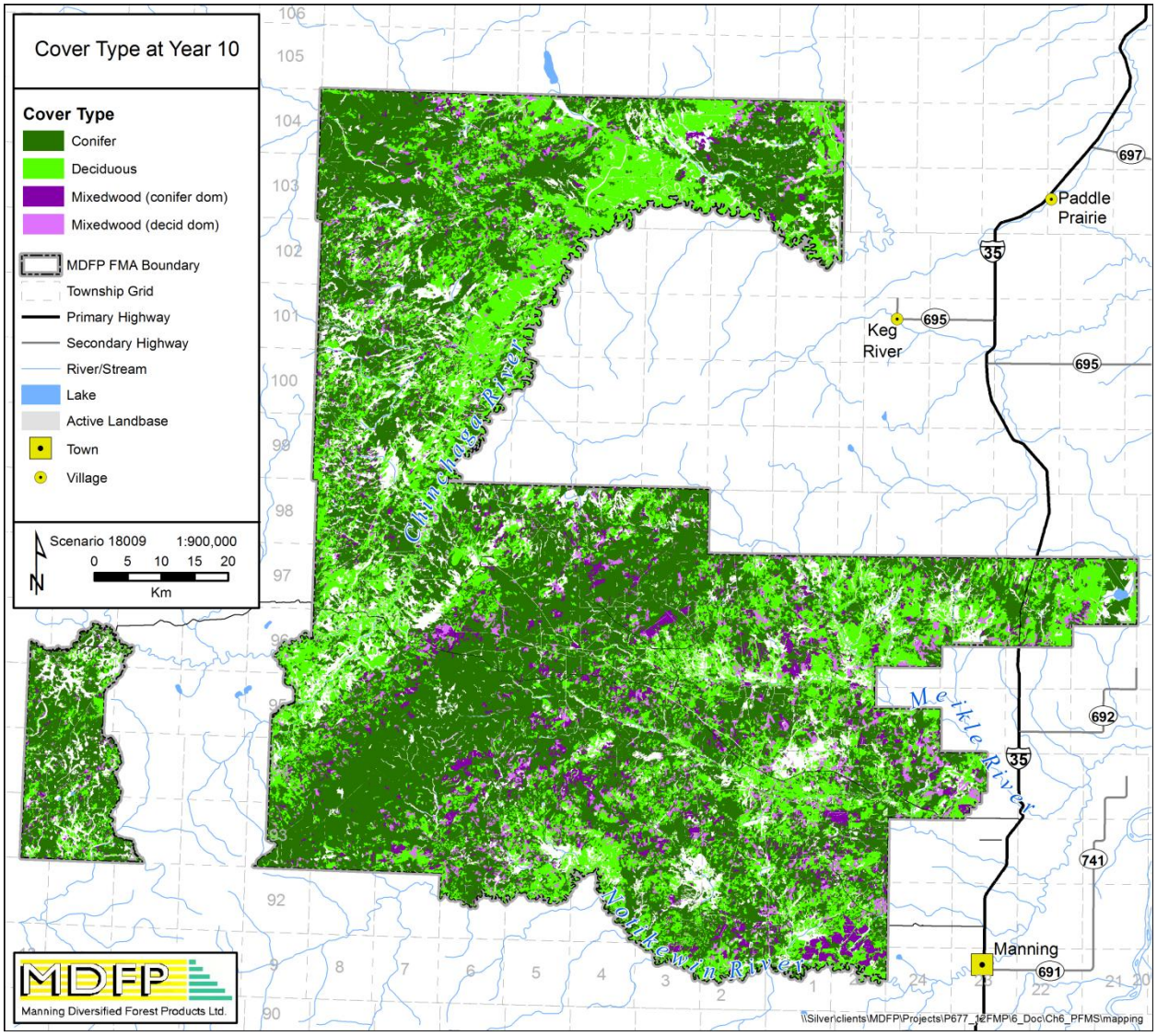


Figure 3-8. Cover type at year 10.

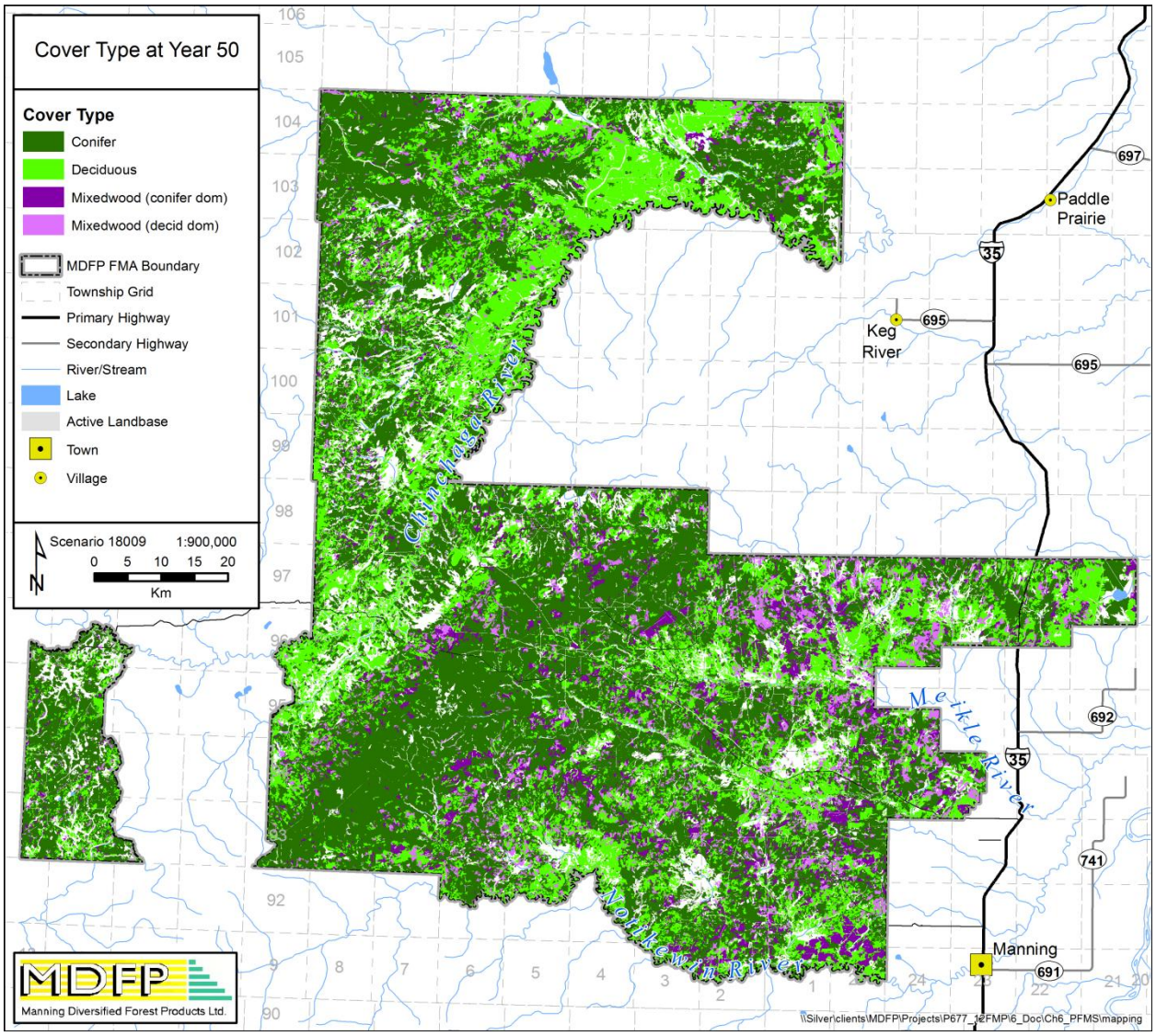


Figure 3-9. Cover type at year 50.

3.6.2 Seral stage

Regen and old increase while mature decreases. Young decreases from 10 to 50 years and then increases again.

Table 3-9. Gross landbase by seral stage at 10, 50, 100 and 200 years.

Seral Stage	Year 10 Area (ha)	Year 50 Area (ha)	Year 100 Area (ha)	Year 200 Area (ha)
Regen	44,102	63,081	60,381	126,697
Young	343,108	209,017	255,341	274,430
Mature	330,909	278,431	129,064	93,510
Old	103,236	270,827	376,569	326,718
Total Forested	821,355	821,355	821,355	821,355
Unforested	108,745	108,745	108,745	108,745
Grand Total	930,100	930,100	930,100	930,100

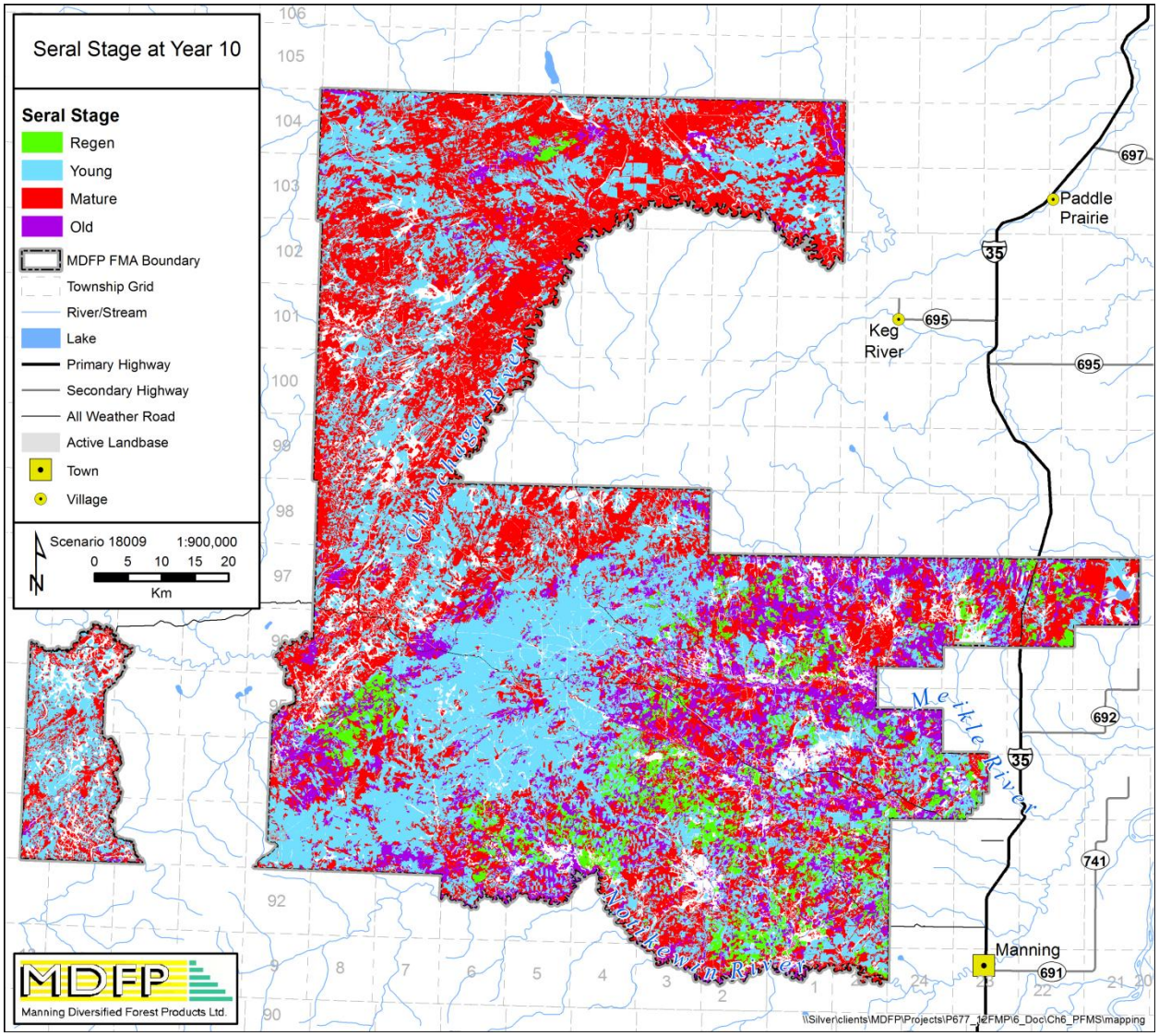


Figure 3-10. Seral stage at year 10.

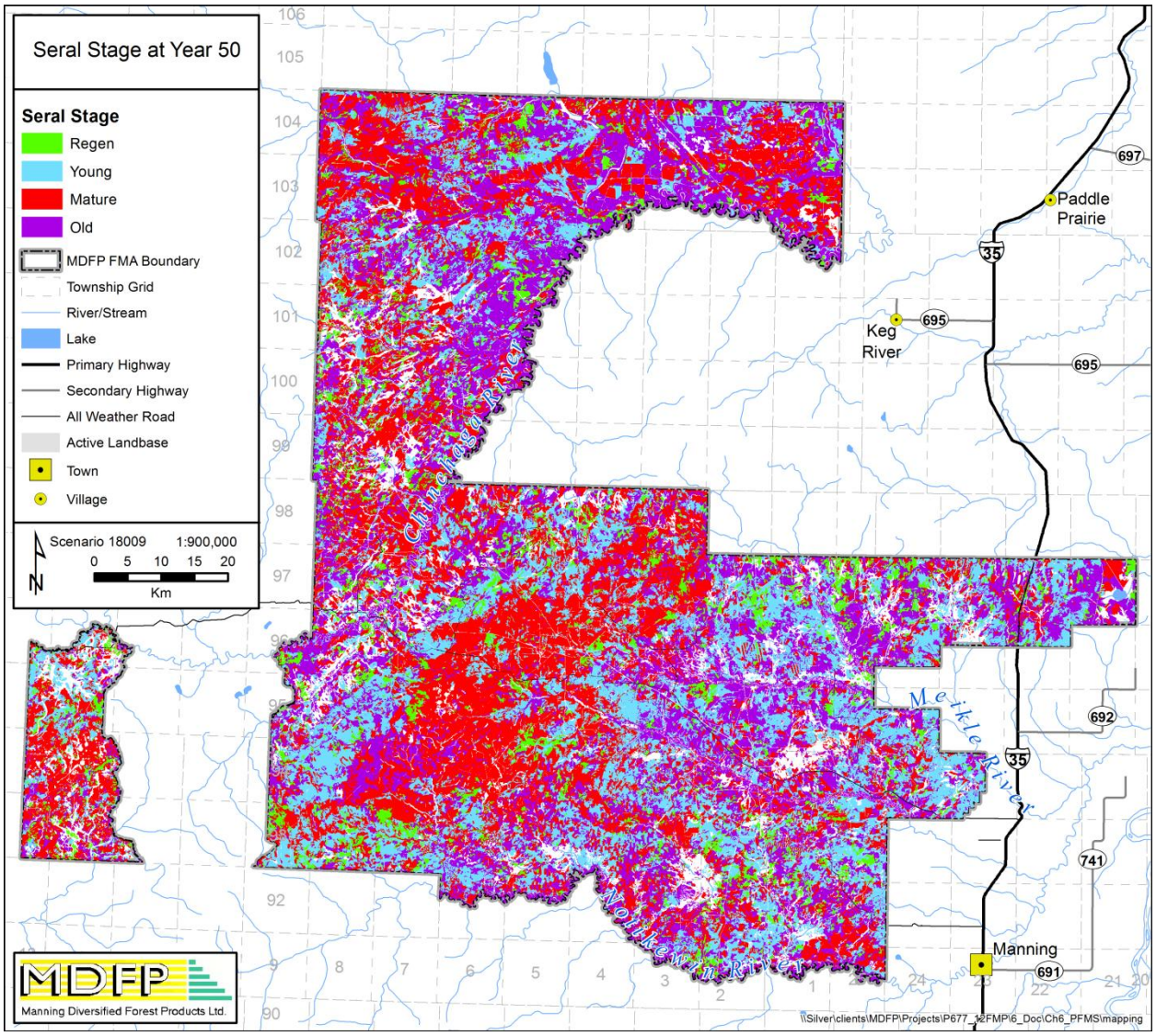


Figure 3-11. Seral stage at year 50.

4. Forest Landscape Disturbance and Succession

4.1 Inherent Disturbance Regime

The disturbance regime in northwestern Alberta has been dominated by wildfires and anthropogenic disturbance. In recent years, the *Mountain Pine Beetle* (MPB) infestation and the recent (2012) fire have affected the MDFP FMA area. No other major disturbances have occurred recently in this area.

4.2 Insects and Diseases

The current MPB infestation is trumping all other recent disturbances. Spruce budworm and spruce bark beetle have had outbreaks in the past, but not recently.

4.2.1 Mountain Pine Beetle

The MPB can be an extremely destructive pest of mature lodgepole pine forests. It is a bark beetle that feeds on the phloem of host trees. The beetle introduces a blue-stain fungus and, between the fungus and the larval feeding, host trees can be killed within one year of attack. Mortality is the result of disruption of the flow of water and nutrients in the phloem (Natural Resources Canada 2012a).

The MPB generally completes its life cycle within one year. Eggs deposited in vertical galleries between the bark and sapwood in mid-summer, hatch in late summer. The larvae are white, grub-like and marked with brown heads. Larvae develop within the sapwood throughout the autumn, feeding on the phloem and creating new horizontal galleries. After overwintering in the sapwood, the larvae resume feeding in spring until pupation is completed by early summer, when the small (4.0-7.5 mm in length) adult beetles emerge to attack new host trees (Natural Resources Canada 2012a).

MPB damage is characterized by:

- Cream coloured pitch and pitch tubes on the tree trunk (as the tree tries to repel the beetles);
- Sawdust in bark crevices and around base of the tree (from boring by beetles);

- J- shaped vertical egg galleries under the bark, beginning above the entry holes;
- Greyish blue sapwood (caused by the blue-stain fungi); and
- Yellowish-green needles over the full crown of the tree, becoming reddish the year after initial attack.

The Province of Alberta has initiated an aggressive strategy to limit the spread of MPB within the province. This strategy involves detection and control efforts, as well as salvage and risk reduction. To date, only detection efforts have been completed in the MDFP FMA area.

Detection and control efforts include:

- Annual aerial surveys to spot infestations (generally from the previous year);
- Ground surveys to detect current-year infestations; and
- Use of pheromone-bait traps to monitor beetle populations.

MPB were first detected in the MDFP FMA area in 2007 (Table 4-1). Since then the infestation has grown to a point where it now threatens the pine resource. Table 4-2 shows forecasted numbers from the northwest region MPB model. Alberta *Environment and Sustainable Resource Development* (ESRD) has increased MPB monitoring within the northwest region. Regional forest companies, in cooperation with ESRD, led a process to quantify MPB risk in the northwest region and to develop regional strategies to mitigate the impacts of the MPB infestation on forest communities and the forest industry.

Table 4-1. Number of trees infected by MPB over the past 6 years (summarized from red attack tree counts during aerial surveys)

Year	Number Infected Trees
2006	no survey
2007	no survey
2008	1,260
2009	390
2010	no survey
2011	1,217,427

Table 4-2. Area of green attack and pine stands in the FMA

% Pine	Area (ha)	
Content	Green attack Pine	Total Pine
< 10	15,620	73,448
10-40	23	32
40-70	1,188	1,704
70-100	9,559	30,964
Total	26,390	106,149

The infestation started in the southwest portion of the FMA area in 2007 and has been spreading north and east in subsequent years. Infected areas in 2011 are shown in Figure 4-1.

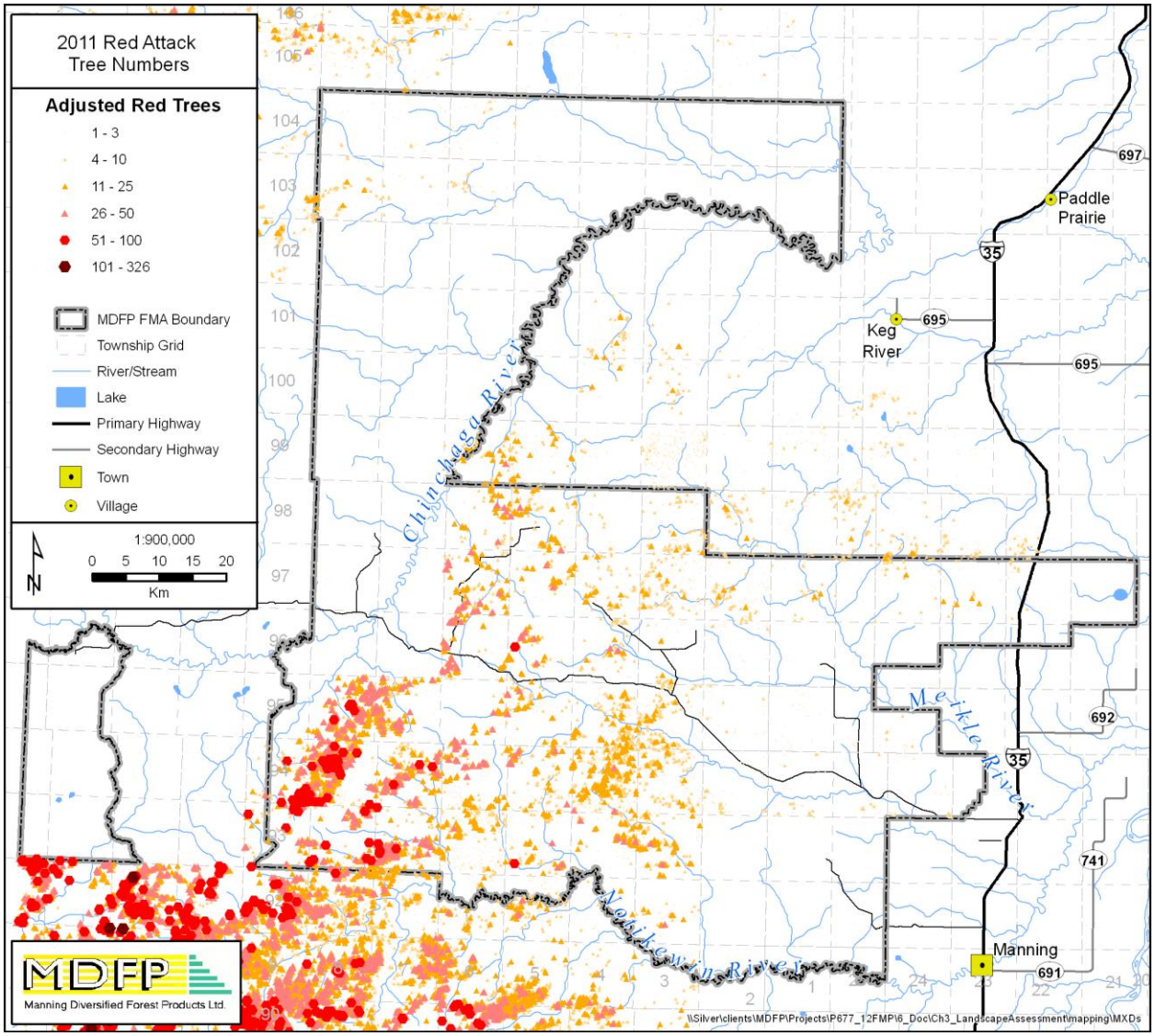


Figure 4-1. Aerial survey locations showing MPB infestation (by red attack tree counts) in 2011

4.2.2 Spruce Budworm

The spruce budworm is one of the most prevalent defoliators in the boreal forest in terms of its potential economic impact on the forest industry. It feeds predominantly on the current year's buds and needles but may occasionally consume mature needles (Natural Resources Canada 2012b). The spruce budworm is indigenous, with a widespread distribution across Canada and Alberta.

The spruce budworm completes its life cycle within a single year. Eggs hatch in the late summer, producing the first larval stage. The second larval stage moves by wind to new sites under bark scales, where it overwinters in cocoons, emerging in the spring to develop into the third larval stage. These either bore into buds or needles or spin webbing around new shoots and feed on the encased needles. Larval stages continue until mid-June and are responsible for most of the defoliation. At this time, the spruce budworm is 18-24 mm in length with a black head and two rows of paired whitish spots down the back. After the final larval stage, the budworm stops feeding, pupates and emerges as a mottled brownish moth. Moths mate, producing eggs that will hatch and develop into larvae prior to winter.

Although white spruce is the preferred host, spruce budworm will also feed on balsam fir and tamarack. Pure white spruce stands may be most susceptible, but mixed conifer and mixed conifer-deciduous stands are also susceptible. Outbreaks usually are initiated in overmature stands, but quickly spread to younger stands. Outbreaks recur every 20-40 years and can last 7-28 years. Outbreaks can lead to reduced tree growth and vigour. Dead tree tops can result after 4-5 years of defoliation and mortality can occur after an additional 1-2 years of damage.

Spruce budworm can be detected by:

- Defoliation of the current year's growth;
- New greenish egg masses found in the fall on the underside of needles; old whitish egg masses on older needles;
- Silken webbing seen in May/June around needles and shoots; and
- Rusty brown tree crowns in July, caused by the dead brown needles and pupal cases becoming entangled in silken webbing.

The Province of Alberta developed an Integrated Spruce Budworm Management Strategy (Alberta SRD 2002) to help address the need for widespread, coordinated efforts in controlling spruce budworm populations. The management program consists of:

- Detect and monitor spruce budworm populations;
- Assess the consequences of epidemic budworm populations on land management objectives;
- Implement an action plan to mitigate the impact of epidemic budworm populations on land management objectives;
- Increase budworm tolerance of host stands; and
- Reduce population levels through the use of biological control agents.

In 2008, 2009 and 2010, Provincial surveys detected areas of moderate to severe defoliation caused by spruce budworm restricted to the extreme northeast of the MDFP FMA area. For the past 15 years, MDFP has set and monitored pheromone lures in 12 locations (2 traps per location) in the FMA area. No significant outbreaks have been noted.

4.2.3 Spruce Beetle

The spruce beetle belongs to a group of insects commonly referred to as bark beetles. It is in the same genus as the MPB. The spruce beetle occurs at endemic levels throughout Alberta, with outbreaks related to incidents of blowdown, accumulations of debris (*e.g.,* through logging) and damaged standing timber, including fire damaged stems.

Within Alberta, the spruce beetle life cycle is completed over a 2-year period. Mature beetles overwinter in the base of trees. In spring, adults emerge to attack new hosts in May and June. Female beetles tunnel along the wood grain, creating galleries in which they lay their white eggs in mid-summer. Larvae emerge 2-4 weeks later, tunneling under the bark away from the egg gallery. Larvae are white grubs, 3-7 mm in length, with brown heads. The larvae overwinter and then pupate to become adult beetles in the second summer.

Spruce beetle outbreaks can last 2-5 years, damaging large-diameter spruce. Larval feeding within the bark can increase incidence of blue stain and associated fungi, loosen bark and stop sap flow. Damage caused by spruce beetles and subsequent control measures are similar to MPB (Section 4.2.1).

4.2.4 Aspen Defoliators

Aspen defoliators include both large aspen tortrix and forest tent caterpillars.

The large aspen tortrix occurs across Canada and is one of the most serious pests of trembling aspen. The insect 'rolls' leaves using silk threads to form a feeding shelter. Yellow-green larvae emerge from under bark scales and in bark crevices in the spring and begin feeding on foliage. Mature larvae are 1.5-2.1 cm in length, dark green in colour with two rows of black dots and have a black head. By mid-June the larvae form pupae, which are normally located within rolled leaves. Adult brownish-grey moths having a 2.5-3.5 cm wingspan emerge in late June through July and mate. Females lay large clusters of eggs on the top surfaces of leaves in July. Larvae hatch about 10 days later to feed on foliage until early autumn and then form silk overwintering shelters in bark crevices.

Aspen is the preferred host but tortrix will also feed on willow, balsam poplar, white birch and choke cherry. Outbreaks of the insect may last 3-4 years. Damage is predominantly caused by the later larval stages, which may also feed on buds. Massive defoliation can reduce growth increment but rarely results in tree mortality.

Signs of aspen tortrix infestation include:

- Defoliation of aspen and other deciduous species in early summer (April to June);
- Dark green larvae feeding from within rolled leaves;
- Black pupal cases within rolled leaves;
- Light green egg clusters on leaf surfaces in July; and
- In severe infestations, large amounts of spun silk on trees.

Control measures are not normally taken, since the infestations generally do not last more than 3-4 years and tree mortality is not widespread.

The forest tent caterpillar is generally considered the most serious defoliator of hardwoods in Canada. Larvae emerge in the spring, as the leaves are emerging. Mature larvae can reach 4.5-5.5 cm in length. They are hairy and have very distinctive markings: blue bands, a row of keyhole-shaped white markings and broken orange-brown lines. Larvae continue to feed until mid-June, when they form pupae, which are silken cocoons generally formed between two leaves. Light brown adult moths with a 3.5-4.5 cm wingspan emerge in late June through July. Females lay large clusters of eggs in bands around twigs. Young larvae develop inside the eggs before winter but do not hatch until the following spring.

Aspen is the preferred target of tent caterpillar; however the insect will attack almost any hardwood species during outbreaks. Outbreaks generally last up to 4 years and may reoccur every 10 years. Infestations cause branch dieback and reduced growth increment. Several years of severe defoliation may cause mortality, particularly where trees have additional stress factors.

Signs of forest tent caterpillar infestation include:

- Defoliation of aspen from April to June;
- Egg bands in late summer through early spring;
- Hairy, distinctively marked larvae, feeding in large groups (April to June); and
- Silken cocoons formed between leaves from late June to early July.

When forest tent caterpillar management outbreaks occur, the following management options exist:

- Aerial surveys of susceptible areas, flown late spring to early summer.
- Egg band surveys (fall to spring).
- Application of the pathogenic bacterium *Bacillus thuringiensis* var. *kurstake* to control infestations.

From 2008-2010 there were no significant aspen defoliators in northwestern Alberta.

4.3 Invasive Exotic Species

No exotic species have been identified for management in the MDFP FMA area. MDFP has a noxious weed control program in place.

4.4 Forest Succession Trajectories

Forest succession is the composition of vegetation communities, on a site, over time. The process of succession results in different structural components (e.g.: density by species, understory composition, snags or other dead materials) at various time periods. Many of these structural components undergo a somewhat predictable pattern of change as stands age. The discussion of successional factors and patterns presented here are a compilation of information from Boreal Centre (2002), Song (2002), Daishowa-Marubeni (2008). The report compiled by the Boreal Centre includes a considerable list of papers devoted to the subject of succession in the boreal mixedwood.

Moisture regime has the greatest influence on forest succession (Boreal Centre 2002). In the boreal mixedwood of Alberta, moist sites are characterized by stands of black spruce and larch, medium sites by aspen and white spruce and dry sites by pine (Boreal Centre 2002, Daishowa-Marubeni 2008).

Succession on moist and dry sites indicates that the original black spruce (moist sites) and pine (dry sites) tend to be generally replaced with the same stand type after fire, though often with some component of aspen. In cases where black spruce occurs as an understory to pine, the trajectory may result in a continued mixed-coniferous stand and not a pure pine stand, particularly in the absence of a fire event.

Following fire, aspen regenerates aggressively on medium sites through root suckering and is virtually always present in regenerating stands (Boreal Centre 2002). The introduction of white spruce on medium sites is more variable for a number of reasons (e.g.: variable seed production on neighbouring seed trees, distance from seed sources). Because of this variability in white spruce regeneration, several stand development pathways are possible on medium sites. Where ever white spruce seed is available along with a suitable seed bed, an even-aged mixed stand of white spruce and aspen can be expected. Because aspen is shade intolerant, it will typically not regenerate under a closed canopy. This leads to the conversion of these mixed stands to pure white spruce in approximately 100 years.

When white spruce seed is available, but the seedbed may not be suitable for quick germination, the stand will initially generate to aspen and spruce will incrementally enter the site. This condition leads to an uneven-aged mixed wood stand which will also eventually become a pure white spruce stand, but over a considerably longer time than under the even-age scenario.

The transition of stands to the mature stage is triggered by closure of the canopy. Self-thinning of the trees begins at this stage, but stand gaps are not yet prominent features. Mature stands tend to have the lowest level of structural diversity (Boreal Centre 2002)

The transition from mature to old stands is gradual. Key changes include canopy breakup and release of understory vegetation, emergence of secondary canopy species and accumulation of snags and downed logs (Stelfox 1995). Overall, structural diversity is highest in old stands and is reflected in high species richness of both plants and animals (Stelfox 1995).

4.5 Timber Harvesting

Timber harvesting in the FMA area has steadily increased from the first mapped areas in the 1960's to present day. Table 4-3 and Figure 4-2 summarize the area harvested for each decade, as well as the average harvest per year (Table only).

Table 4-3. Timber harvest by area from 1965-2012 in the MDFP FMA area

Decade	Area (ha)	%	Area/Year (ha)	# Years
1965-1969	958	0.10	192	5
1970-1979	2,264	0.24	323	7
1980-1989	9,359	1.01	1,170	8
1990-1999	13,388	1.44	1,339	10
2000-2009	19,435	2.09	1,943	10
2010-2012*	5,095	0.55	1,698	3
Total Harvested	50,500	5.43	-	-
Not Harvested	879,600	-	-	-
Grand Total	930,100	-	-	-

*Note: Only 3 years

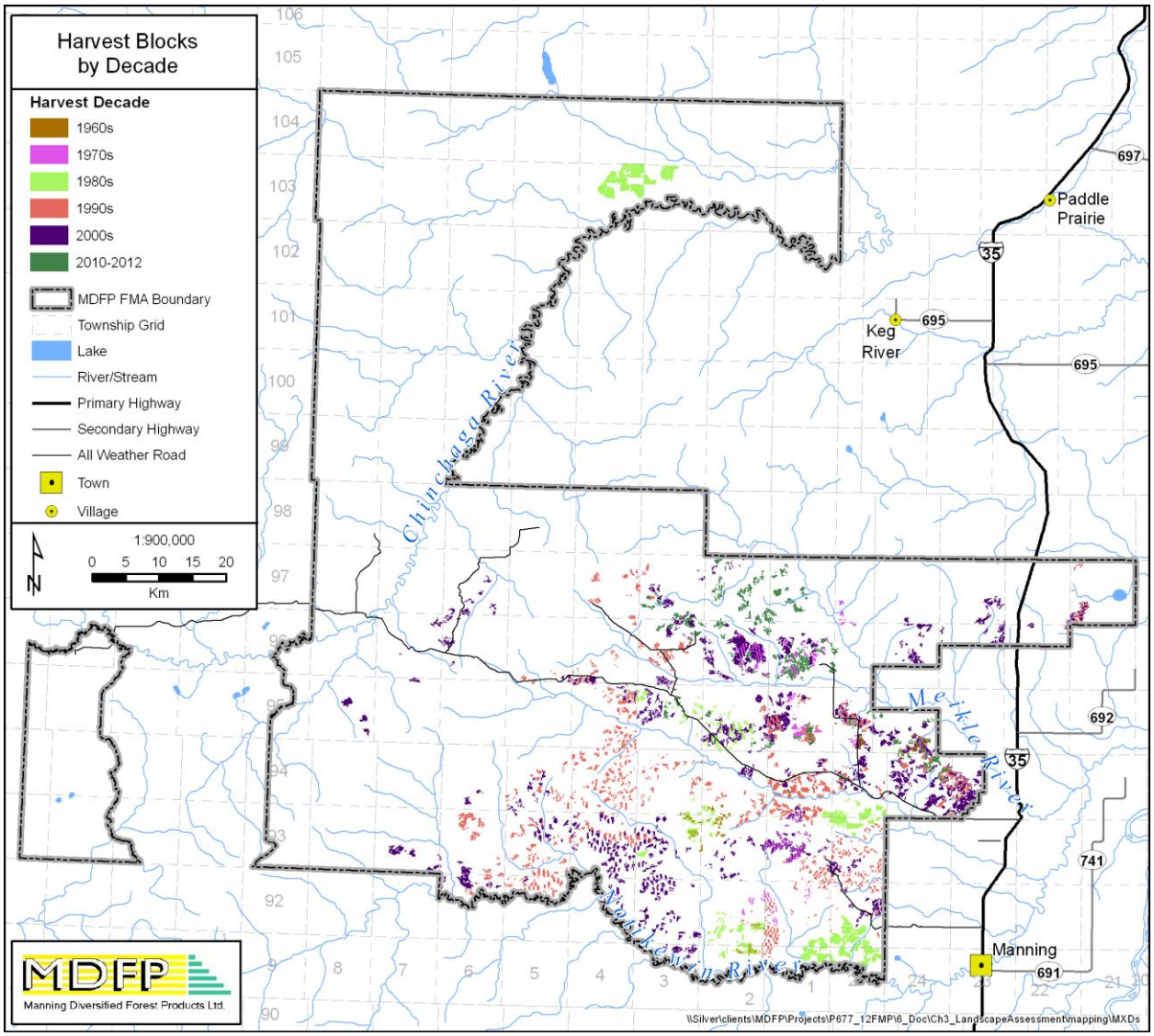


Figure 4-2. Harvest blocks within the MDFP FMA area by decade

4.6 Forest Industry Access

Figure 4-3 outlines the primary corridors used by the timber industry for access to harvest areas and during log haul operations.

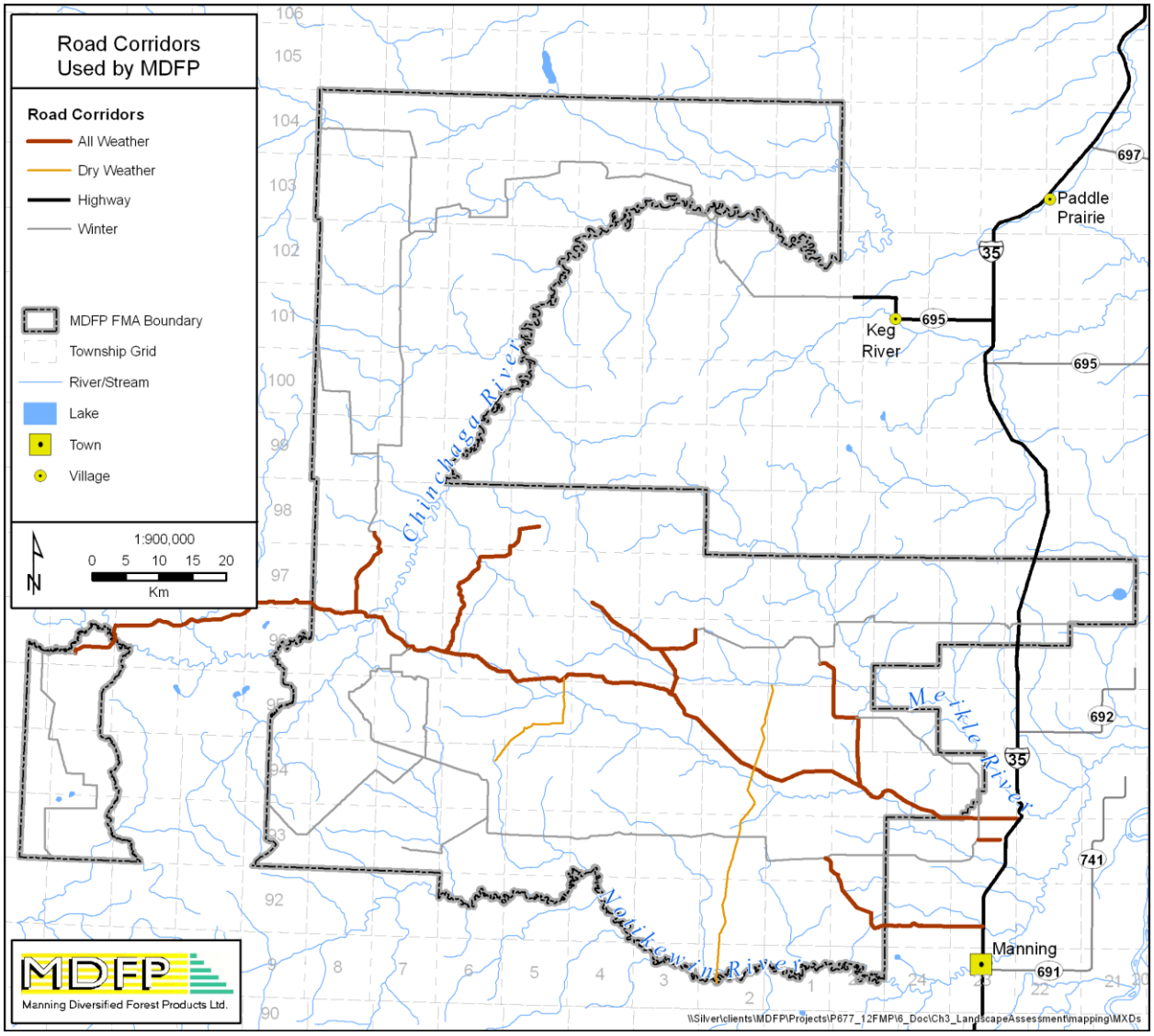


Figure 4-3. Road corridors used by the timber industry in the MDFP FMA area

4.7 Industrial Development

The oil and gas industry has been responsible for developing much of the road access in the FMA area. The majority of the seismic and wellsite activity occurs over the winter months, and this is reflected in the types of access that are developed. There is heavy reliance on winter-only roads. Additional all-weather access has also been developed. Table 4-4 outlines the Industrial Dispositions across the FMA area and Figure 4-4 shows the geographical distribution of those dispositions. Figure 4-5 shows the seismic line activity throughout the FMA area.

Table 4-4. Summary of industrial dispositions and seismic lines across the MDFP FMA area

Disposition Type	Area (ha)	%
Forestry Road	166	0.02
License of Occupation	4,070	0.44
Miscellaneous Lease	90	0.01
Miscellaneous Pipeline Lease	6	0.00
Mineral Surface Lease	2,027	0.22
Pipeline Installation Lease	72	0.01
Pipeline Agreement	4,431	0.48
Provincial Roadway	115	0.01
Non-Provincial Road Right of Way	292	0.03
Surface Materials Lease	61	0.01
Total Industrial Dispositions	11,331	1.22
Seismic Lines	10,058	1.08
Non-industrial Dispositions	18,594	2.00
No Disposition	890,117	95.70
Grand Total	930,100	100.00

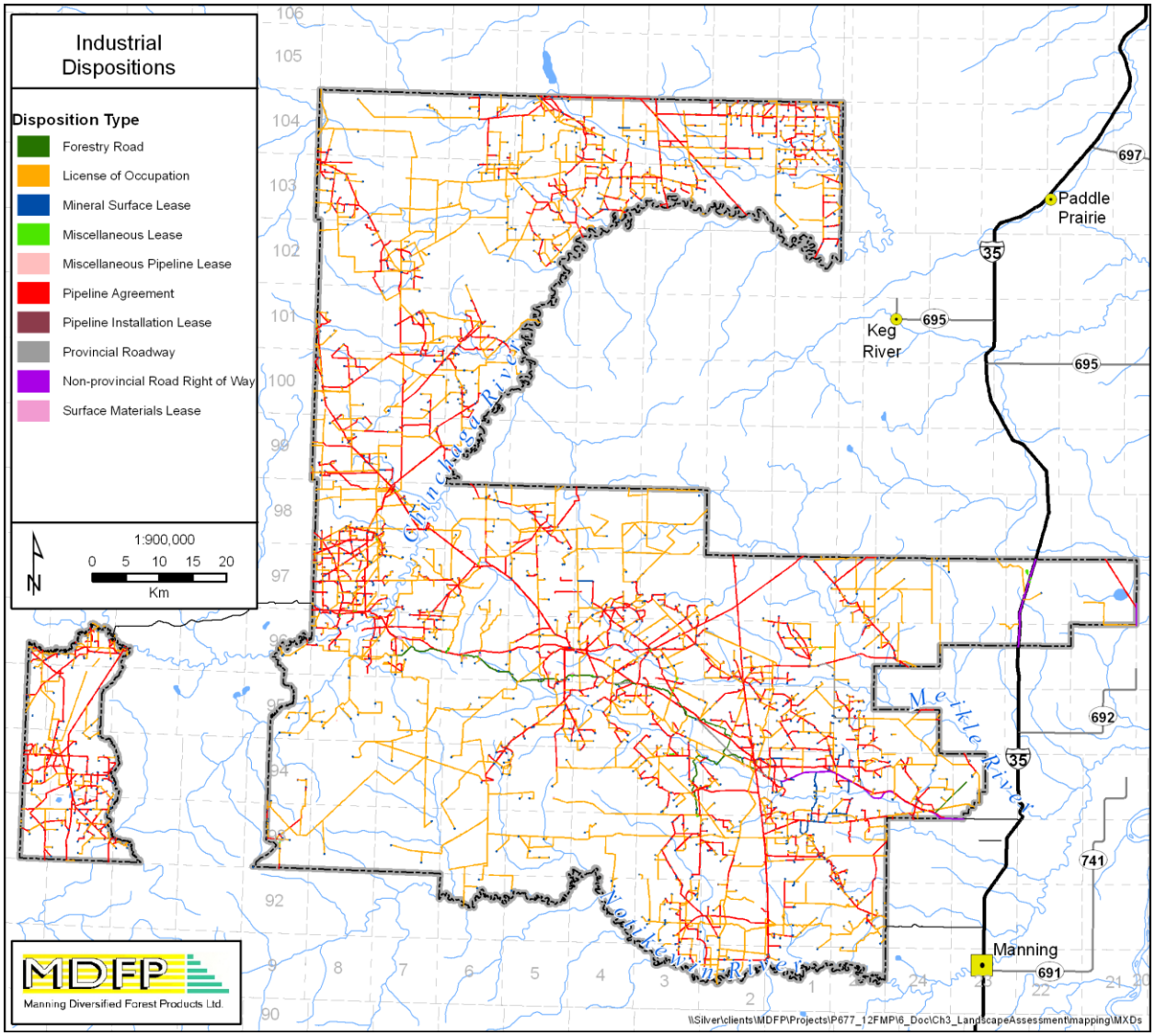


Figure 4-4. Industrial development in the MDFP FMA area by disposition type

Note that dispositions are shown with a 100 m buffer for improved visualization.

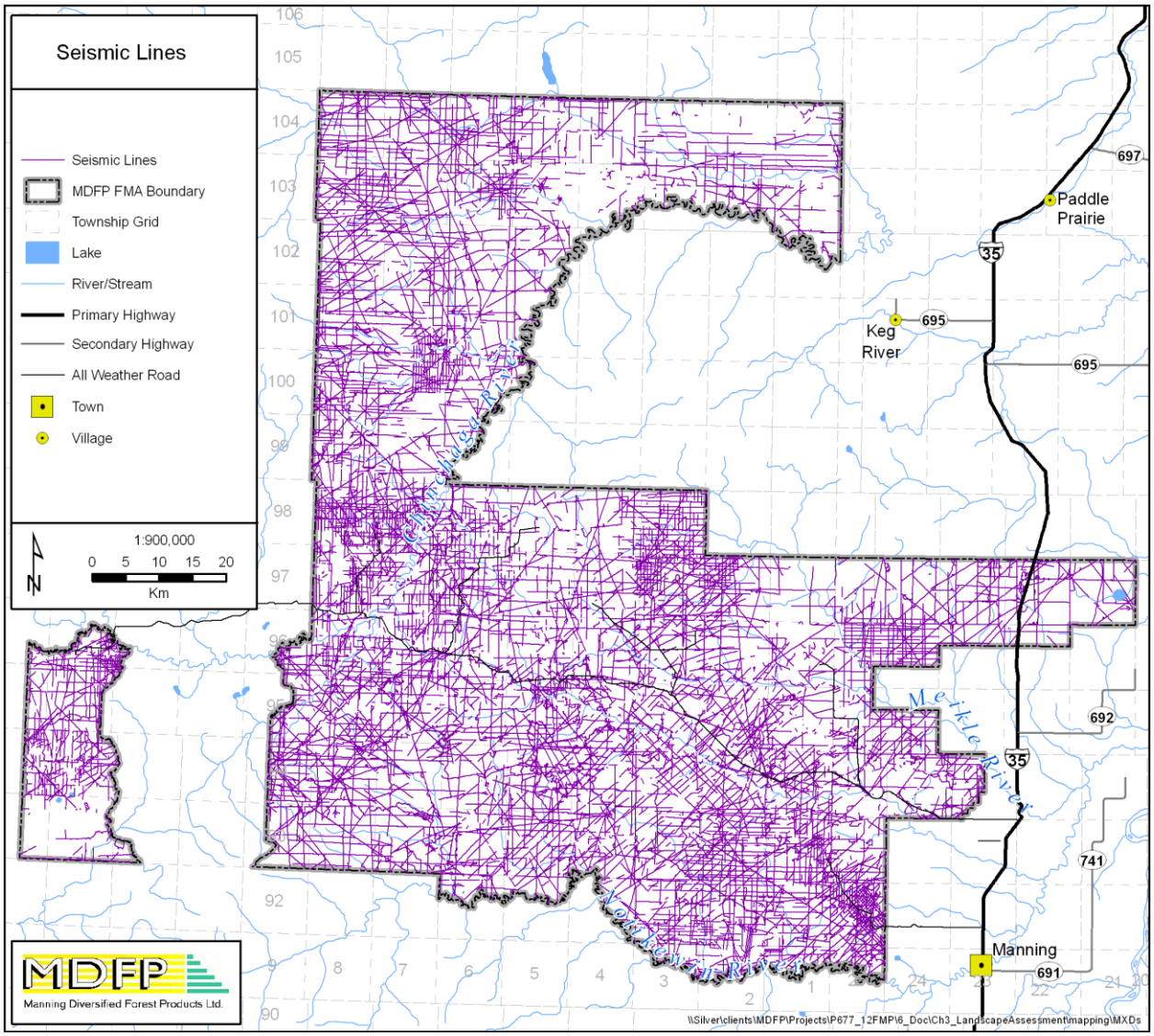


Figure 4-5. Seismic lines in the MDFP FMA area

4.8 Monitoring Sites

ESRD monitors 21 *Permanent Sample Plots* (PSPs) and MDFP monitors 154 *Industrial Sample Plots* (ISPs) across the FMA area (Figure 4-6).

Alberta Biodiversity Monitoring Institute (ABMI) has divided the province into 1,656 monitoring sites (24 of which fall within the MDFP FMA area), with a goal of repeating measures at each site every 5 years. Exact plot locations are not publicly accessible (map points are within 5.5 km of the actual survey location) to maintain an unbiased measure of biodiversity and the human footprint across Alberta.

Natural Resources Canada manages 11 blocks for the Hotchkiss River Mixedwood Timber Harvesting Study looking at harvest methods for understory protection of white spruce.

As part of the MDFP tree improvement program, one of the progeny test blocks is located within the FMA area.

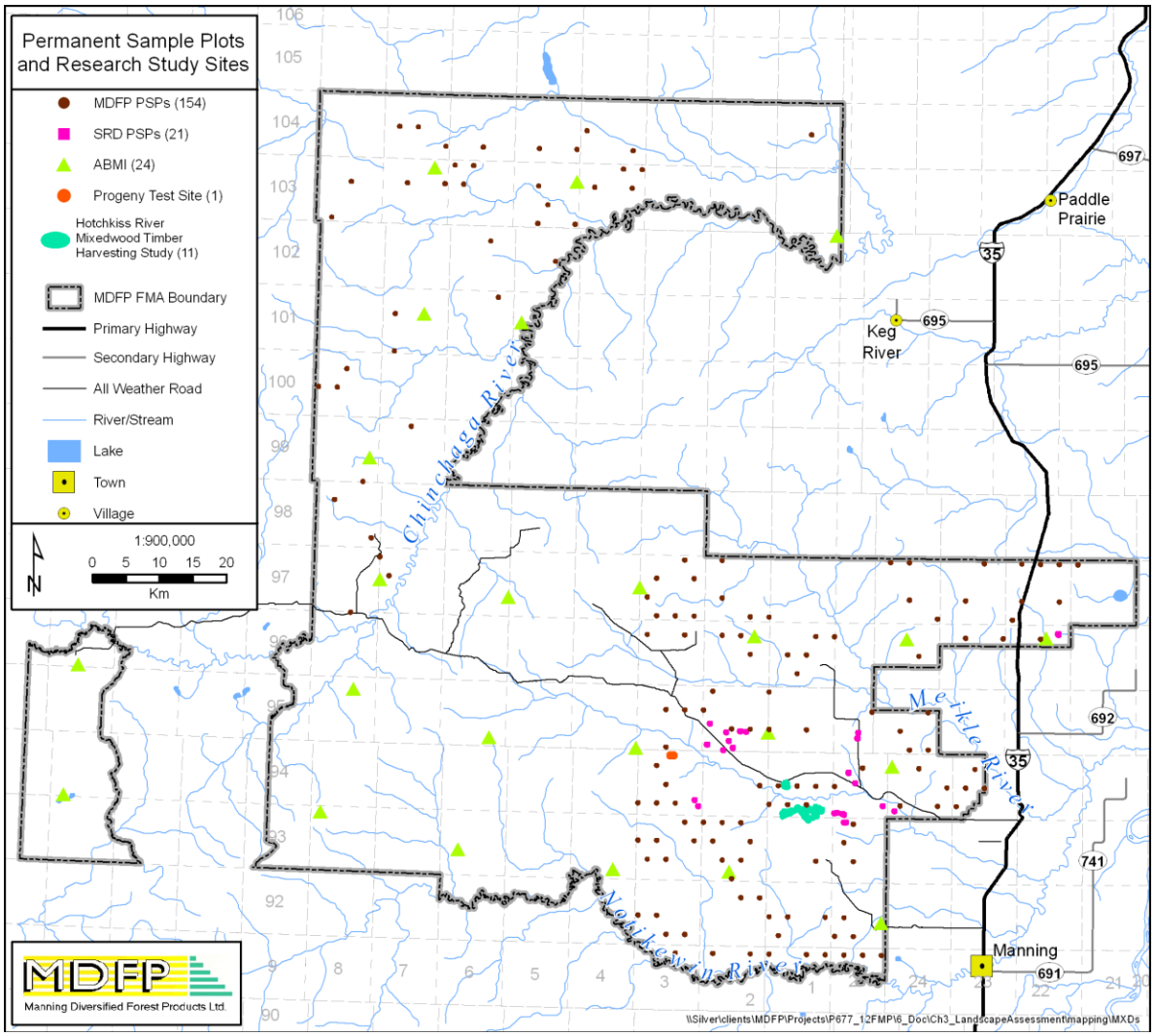


Figure 4-6. Permanent sample plots and research study sites in the MDFP FMA area

5. Landscape Fire Assessment

5.1 FireSmart Management and Wildfire Threat Assessment

Completed by Alberta Environment and Sustainable Resource Development, Forestry and Emergency Response Division, Wildfire Management Branch, January 2013.

5.1.1 Introduction

The aim of wildfire management is to balance the ecological role of fire while protecting human life, communities, watersheds and sensitive soils, natural resources and infrastructure. The intention of the Alberta FireSmart program is to integrate fire, forest, and land management planning through a broad risk and resource management approach.

The goal of FireSmart forest management planning is to create a landscape in which catastrophic fire is minimized. This is accomplished through a combination of:

- Reducing the fire behaviour potential
- Reducing the fire occurrence risk
- Reducing the exposure of values at risk to fire
- Increasing the wildfire suppression capabilities

FireSmart landscapes are managed with the recognition of the interaction between the ecological, economic, and social impacts of fire while identifying opportunities for the use timber harvest and other disturbance strategies to meet landscape management objectives.

In order to meet FireSmart objectives, forest management activities in the Manning Diversified Forest Products (MDFP) FMA will:

- Comply with provincial forest protection legislation, policy, and directives.

- Apply feasible FireSmart strategies throughout the FMA.
- Reduce the likelihood of large high-intensity, high-severity fires through the use of timber harvest targeting older age classes adjacent to values at risk.
- Ensure consultation with the public and stakeholders has occurred.

5.1.2 Forest Fuel Types

The predominant Canadian Forest Fire Behaviour Prediction (FBP) fuel types occurring in the MDFP FMA (Figure 5-1) are C2 (boreal spruce, 244,245 hectares), M1/M2 (mixedwood with 40 to 60 percent conifer, 151,097 hectares), D1/D2 (aspen/poplar, 138,374 hectares) and O1 (grass, 101,272 hectares).

There are no established FireSmart Community Zones occurring in the FMA. The Chinchaga Wildland Provincial Park splits the Southwest portion of the FMA.

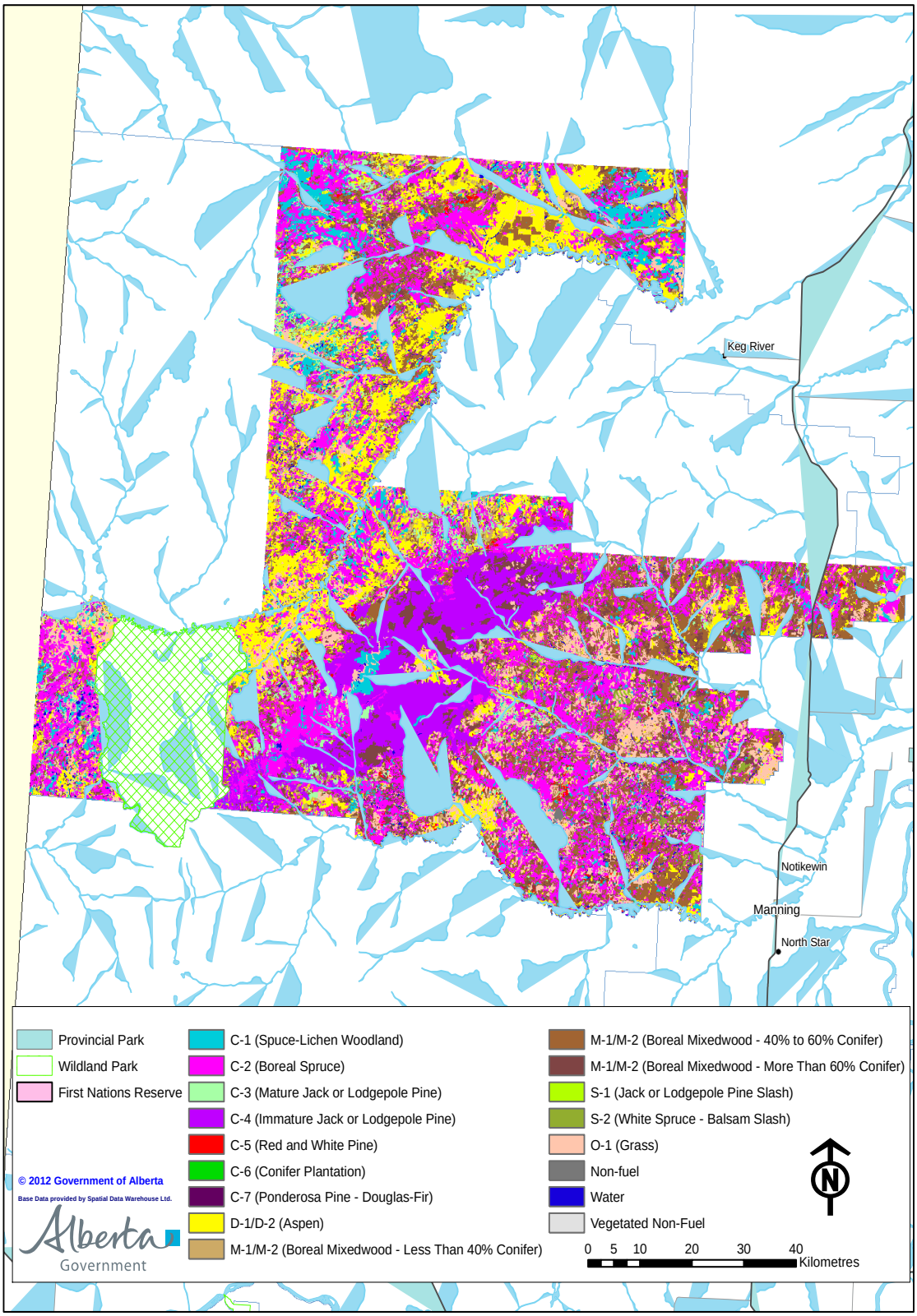


Figure 5-1. Canadian Forest Fire Behaviour Prediction (FBP) forest fuel types found in the MDFP FMA

5.1.3 Wildfire Threat Assessment

The Wildfire Threat Assessment Model (WTA Model) provides an analysis of what influence the preferred forest management strategy will have in achieving wildland fire management objectives on both the current and future forest states in the FMA.

The WTA Model is a spatial model which is used to rate the susceptibility of an area to the negative impact of wildfires. The WTA Model is an ArcGIS application which combines several data layers into one layer representing the final wildfire threat rating. Each of the underlying layers is weighted according to pre-determined parameters (Figure 5-2).

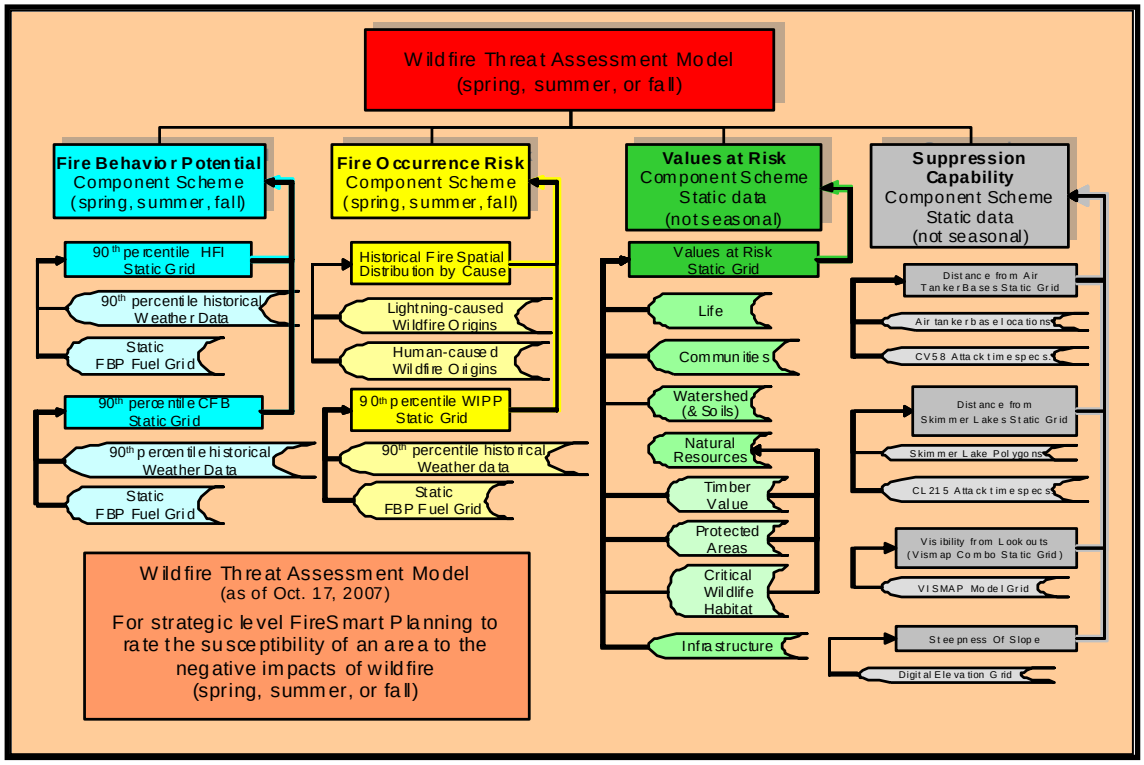


Figure 5-2. Wildfire threat model schematics.

The FireSmart objective for the preferred forest management strategy is to reduce the overall wildfire threat potential in the MDFP FMA through:

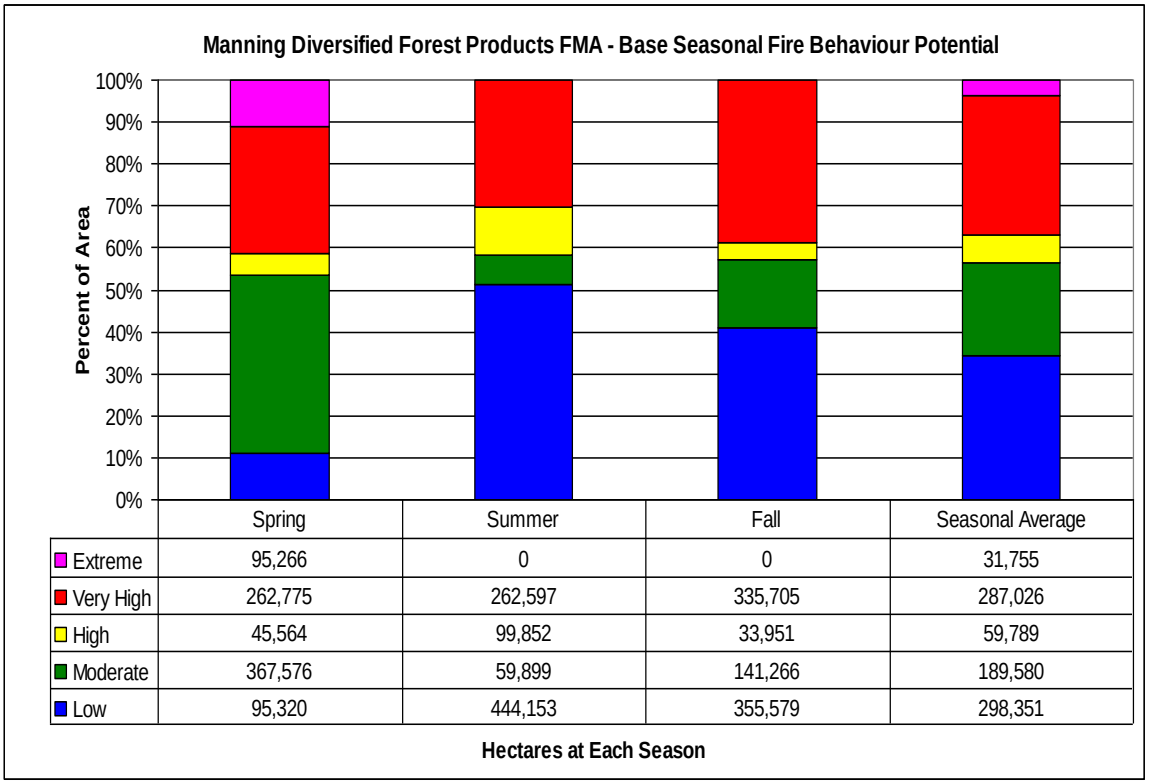
- Reducing the fire behaviour potential
- Reducing the fire occurrence risk
- Reducing fire exposure to values at risk
- Enhancing wildfire suppression capability

Wildfire Threat Analysis – Fire Behaviour Potential

The wildfire threat analysis for the FMA focused on the spring season as it is the season in which the greatest current fire behaviour potential occurred (Figure 5-3).

The current four-step process described in Annex 3 of the Alberta Forest Management Planning Standard was used to forecast the relationship between harvest sequence and fire behaviour potential.

The Wildfire Threat Assessment – Fire Behaviour Potential was completed for the MDFP FMA using the WTA Model. This output used forest fuel types, head fire intensity at the 90th percentile and crown fraction burn predictions as inputs. Fire behaviour potential was run for the current forest state. The model was then run incorporating a close to final version of the spatial harvest sequence to forecast fire behaviour potential at years 10, 20 and 50 (Figure 5-4, Table 5-1).

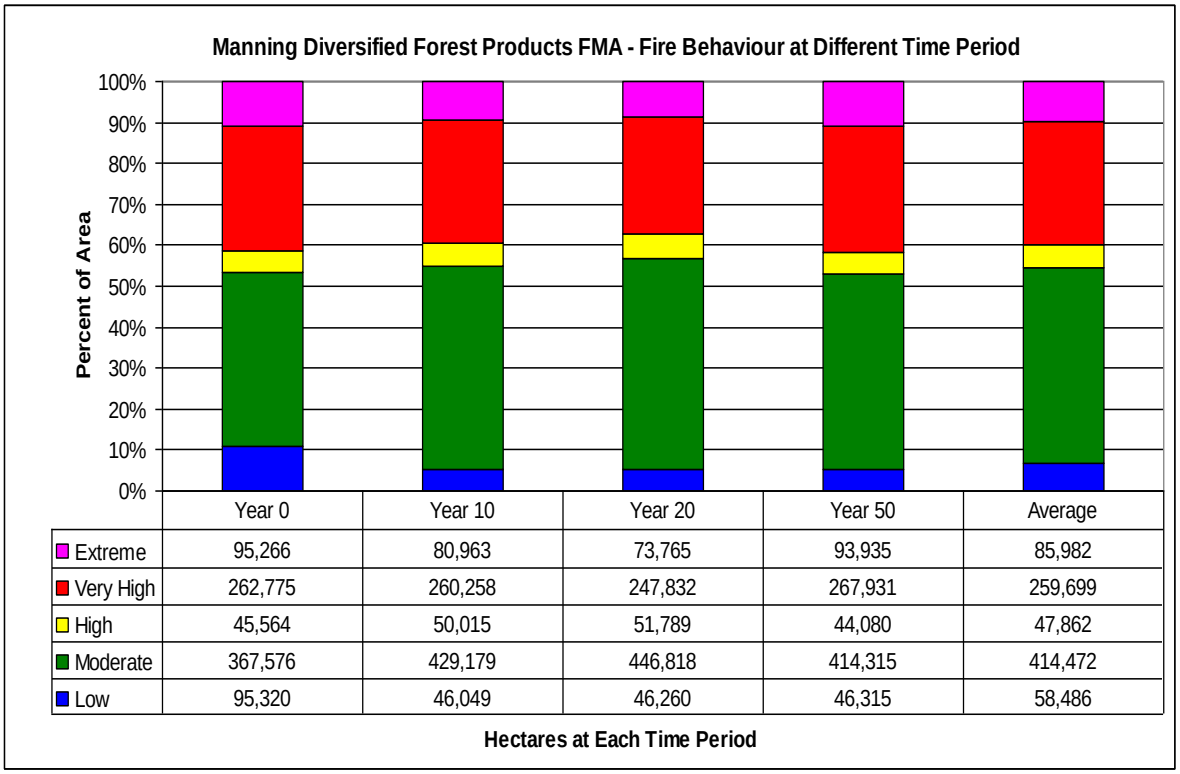


	Spring	Summer	Fall	Seasonal Average
Extreme	95,266	0	0	31,755
Very High	262,775	262,597	335,705	287,026
High	45,564	99,852	33,951	59,789
Moderate	367,576	59,899	141,266	189,580
Low	95,320	444,153	355,579	298,351

Figure 5-3. Seasonal fire behaviour potential for the MDFP FMA at the current forest state.

Spring was the season with the greatest (high to extreme) fire behaviour potential for the MDFP FMA. It was the season used to model the fire behaviour potential at years 10, 20, and 50.

The spring season is generally influenced by cured grass fuel types which are common in disturbed areas and leafless deciduous stands. The fire behaviour potential is significantly reduced when cured fuels green-up in the summer.



	Year 0	Year 10	Year 20	Year 50	Average
Extreme	95,266	80,963	73,765	93,935	85,982
Very High	262,775	260,258	247,832	267,931	259,699
High	45,564	50,015	51,789	44,080	47,862
Moderate	367,576	429,179	446,818	414,315	414,472
Low	95,320	46,049	46,260	46,315	58,486

Figure 5-4. MDFP FMA fire behaviour potential at the different time slices.

In the MDFP FMA, the combined high, very high and extreme fire behaviour was initially 403,605 hectares. This value was reduced by 12,369 hectares at year 10 and a further reduction of 17,850 hectares at year 20totalling a reduction of 30,219 hectares over the 20 year period of the SHS. At year 50, approximately 405,946 hectares of the FMA would fall in the high, very high, and extreme fire behaviour categories. This was a slight increase of 2,341 hectares from the current forest (year 0) to year 50.

Table 5-1. MDFP FMA percent fire behaviour potential at the different time slices.

Fire Behaviour Potential	Year 0 Percent	Year 10 Percent	Year 20 Percent	Year 50 Percent	Average
Low	10%	5%	5%	5%	6%
Moderate	40%	46%	48%	45%	45%
High	5%	5%	6%	5%	5%
Very High	28%	28%	27%	29%	28%
Extreme	10%	9%	8%	10%	9%
Non-fuel	7%	7%	7%	7%	7%
Total	100%	100%	100%	100%	100%

The percent change in the extreme fire behaviour potential in the MDFP FMA portion of the FMA decreased by 1% at year 10. This value decreased by an additional 1% at year 20. As harvested coniferous areas matured, the extreme fire behaviour increased by 2% from year 20 to year 50.

When examining fire behaviour potential, it is important to look at where harvest disturbances are placed throughout the landscape. Disturbances should be located in strategic locations to reduce problematic forest fuels, protect communities, increase the likelihood of fire containment and align with FireSmart and other landscape objectives.

Historical Fire Occurrence

The spring historical fire occurrence (Figure 5-5) is low to moderate for the MDFP FMA. This is due to the general lack of lightning during the spring, successful fire suppression, and few large (200 hectare plus) human-caused fires historically occurring in the FMA.

Values at Risk

There are numerous values at risk occurring in and adjacent to the MDFP FMA (Figure 5-6). As human life and communities are the top values, much of the very high to extreme ratings occur around populated locations including oil and gas facilities, known recreation areas and along major transportation routes.

Suppression Capability

The suppression capability for the MDFP FMA is generally low to moderate (Figure 5-7). The suppression capability value can be enhanced during higher wildfire hazard as there is an air tanker base located in Manning and numerous fire bases located throughout the area. Recent all-weather road development

also enhances suppression capability through increased access for ground based fire suppression resources.

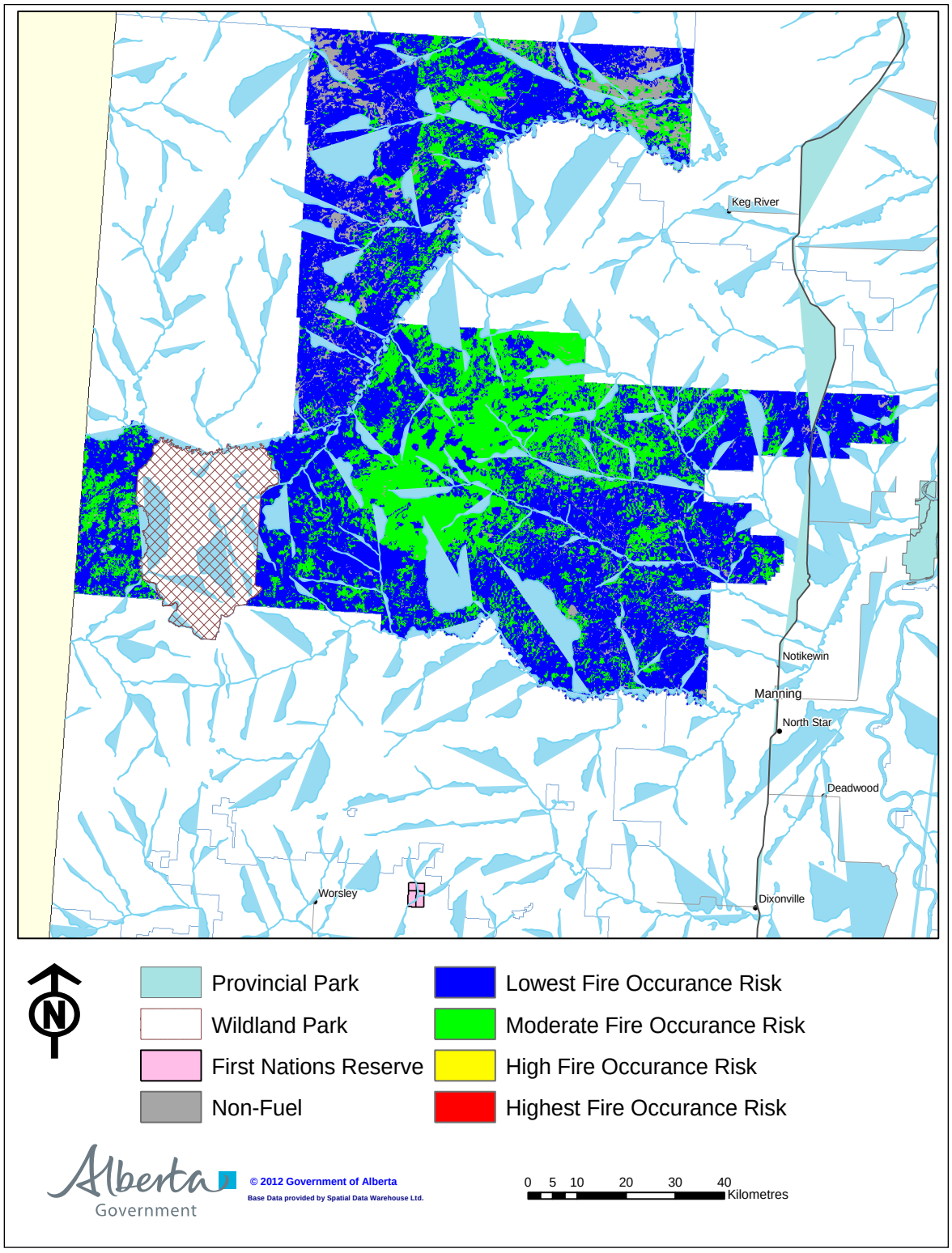


Figure 5-5. Historical fire occurrence risk for the spring season.

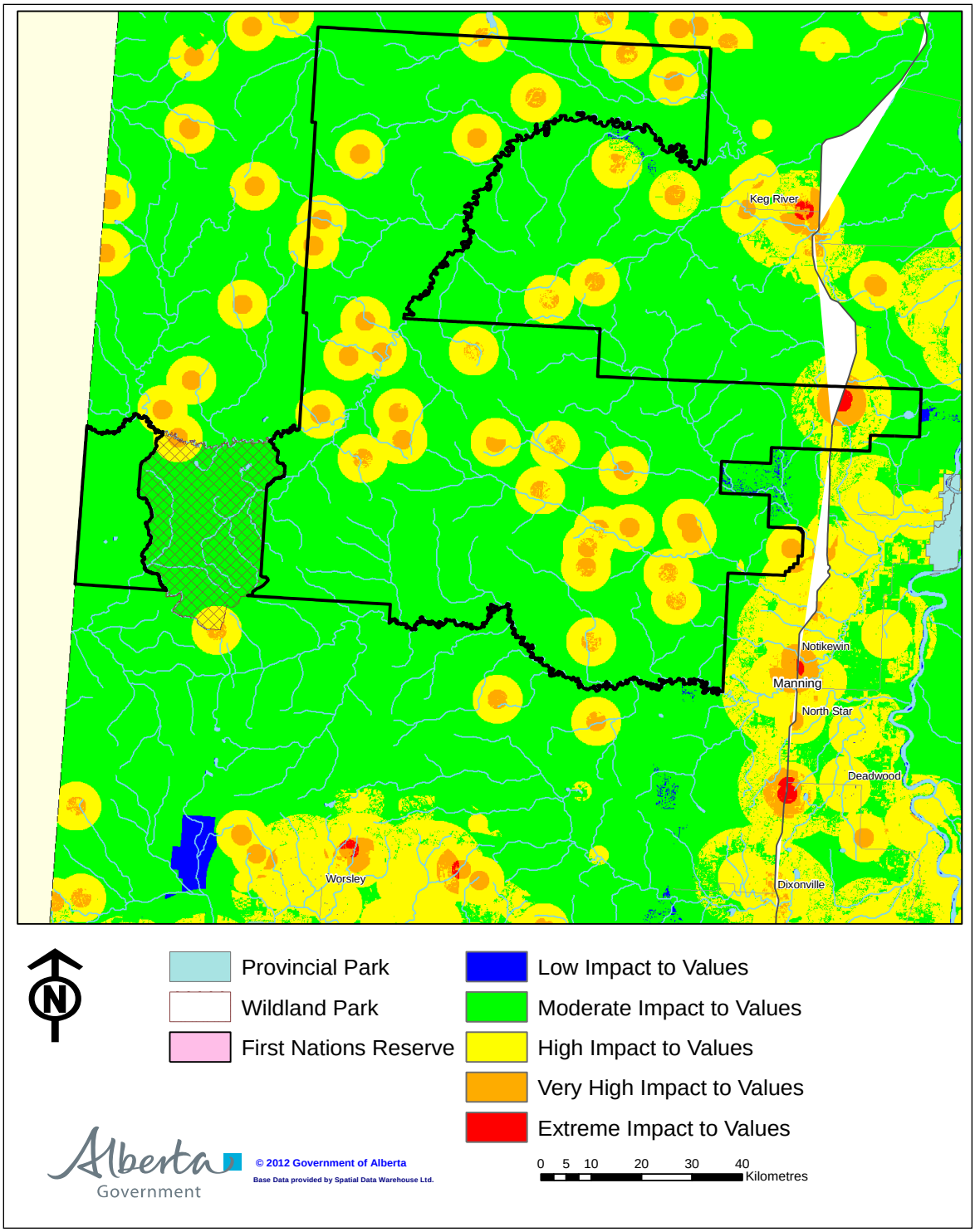


Figure 5-6. Values at Risk for the MDFP FMA.

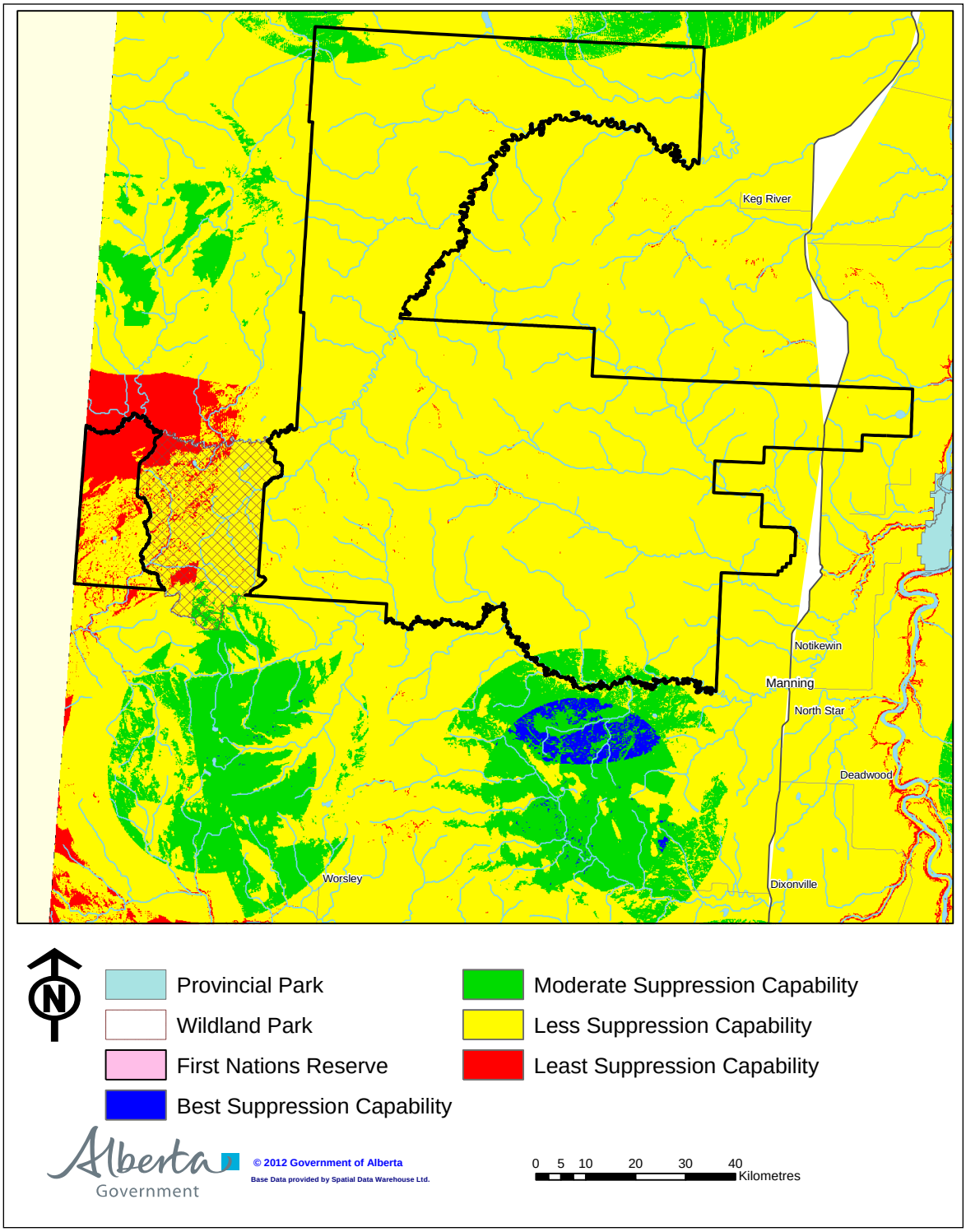


Figure 5-7. Suppression capability for the spring season.

6. Land Use

6.1 Timber

MDFP has had an FMA with the Province of Alberta since 2002 and prior to that a *Coniferous Timber Quota* (CTQ) from 1992. Under the FMA, MDFP has rights to harvest 100% of the coniferous AAC in P20, less the amounts for Buchanan, local timber users and unrecovered volumes from non-timber disposition holders.

Buchanan Lumber has a CTQ for 2.8898% of the primary coniferous AAC in P20 and 8.6689% of the secondary coniferous AAC in P20, which is to be sequenced from the old P18 area.

DMI has two *Deciduous Timber Allocation* (DTA) Certificates for the 100% of the deciduous AAC in P20.

Local timber users are permitted to harvest 1.00% of the coniferous and 1.00% deciduous AAC in P20. When these rights are exercised, volumes are to be drained against either MDFP's or DMI's AAC.

Timber rights and harvest levels are detailed in Chapter 6.

6.2 Registered Trappers

The FMA area encompasses 44 registered fur management areas (or traplines) (Figure 6-1). The average individual license within the FMA area is 20,668 ha in size. However, only a portion of many of the trapline licenses falls within the FMA area, so the average trapline area is somewhat larger. Common fur-bearing species trapped in this area include beaver, fisher, lynx, marten, mink, muskrat, coyote, red fox, red squirrel, river otter, weasel, wolf and wolverine.

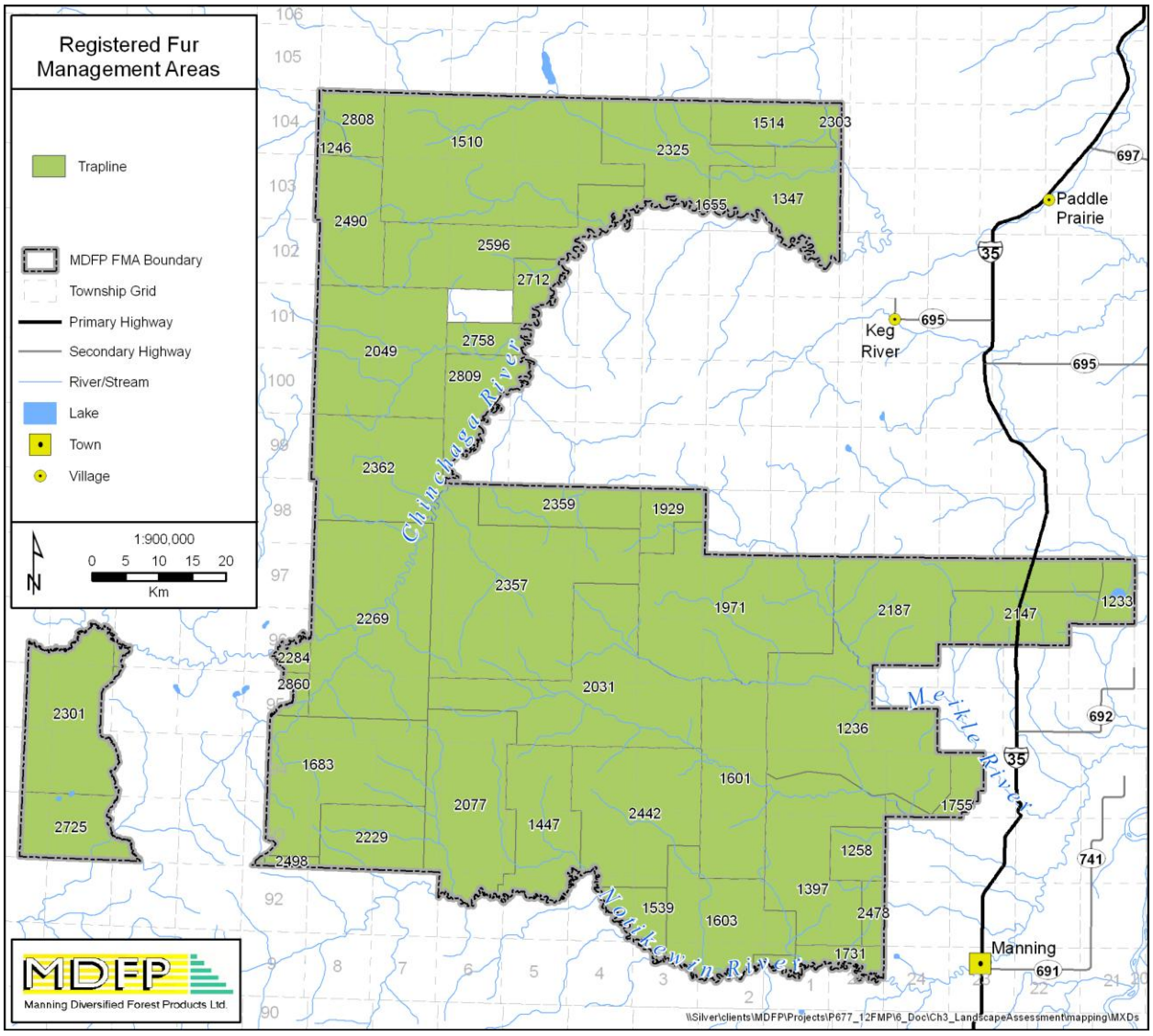


Figure 6-1. Registered fur management areas (traplines) within the MDFP FMA area

6.3 Grazing

There are no grazing dispositions within the boundaries of the FMA area.

6.4 Recreation and Tourism

Tourism facilities in the FMA area are generally restricted to the Twin Lakes Recreation Area, and the Twin Lakes Paradise Motel and Restaurant (Lodge), both located close to Highway 35 (Figure 6-2).

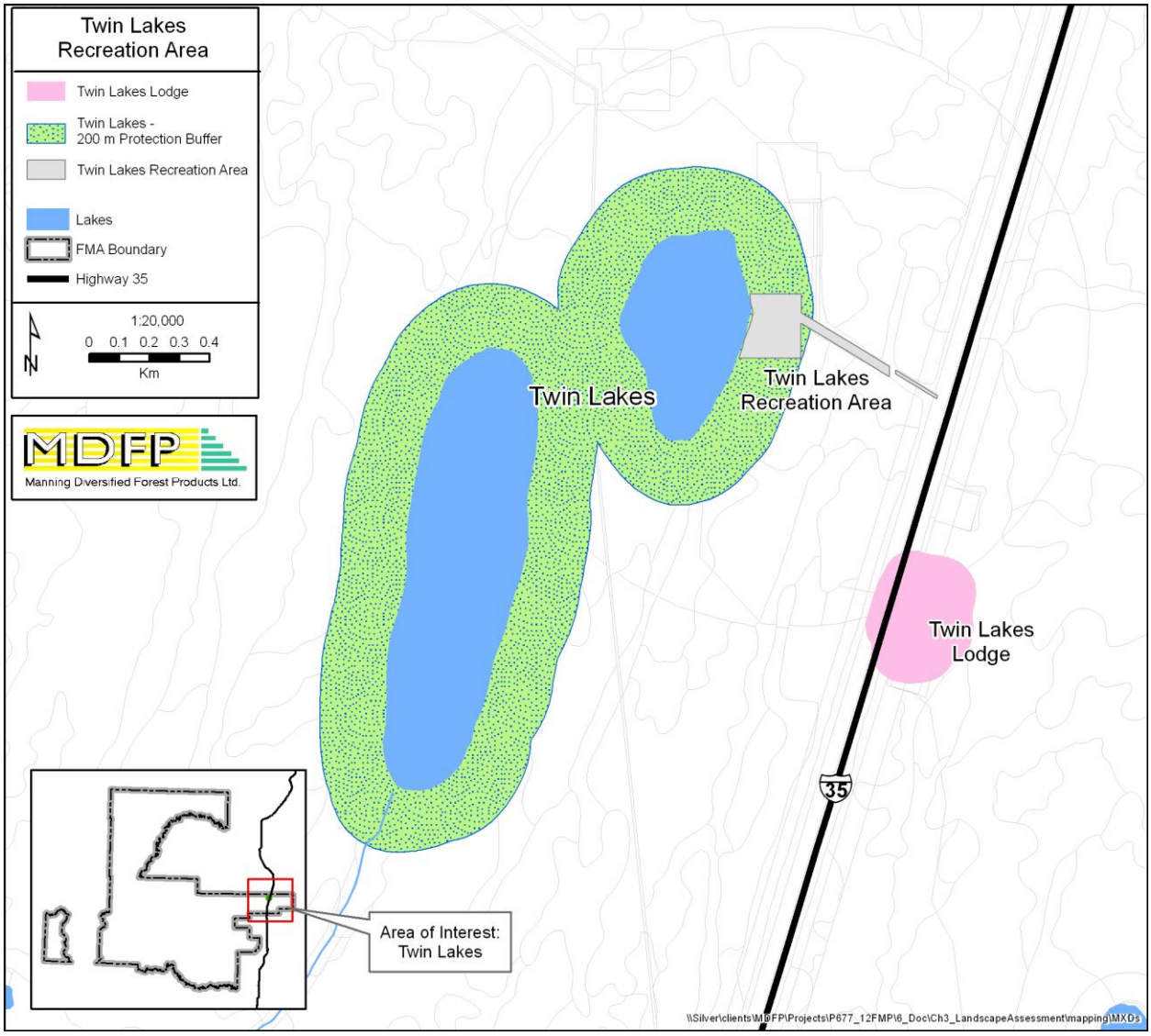


Figure 6-2. Location of Twin Lakes Recreation Area and Twin Lakes Paradise Motel and Restaurant.

Twin Lakes Recreation Area is a Provincial Recreation Area that offers camping and boating facilities. The Recreation Area is stocked with rainbow trout and is popular with fishermen. A 3-km looped nature trail allows access to the second of the Twin Lakes.

Twin Lakes Paradise Motel and Restaurant (Lodge) is a motel/restaurant complex that caters to tourists in the summer and resource sector workers during the winter. The site includes a motel with restaurant, several RV sites, camp-style accommodations and a helipad site.

6.5 Guiding and Outfitting

Commercial guiding and outfitting enterprises within Alberta are allocated and managed on the basis of *Wildlife Management Units* (WMU). Table 6-1 outlines the allocations for each WMU, as well as the number of guides/outfitters working in the WMUs found in the FMA area. The FMA area is located within three separate WMUs: WMU 524, 527 and 537 (Figure 6-3).

Table 6-1. Summary of guides and outfitters working in the vicinity of the MDFP FMA area

WMU Number/Name	# Guides/ Outfitters	Allocations					
		Mule Deer	Whitetail	Moose	Black Bear	Bird Game	Elk
524/Chinchaga River	14	17	6	68	71	-	-
527/Whitemud-Hotchkiss Rivers	15	30	38	23	44	4	8
537/Naylor Hills-Hawk Hills	8	8	7	27	39	4	-

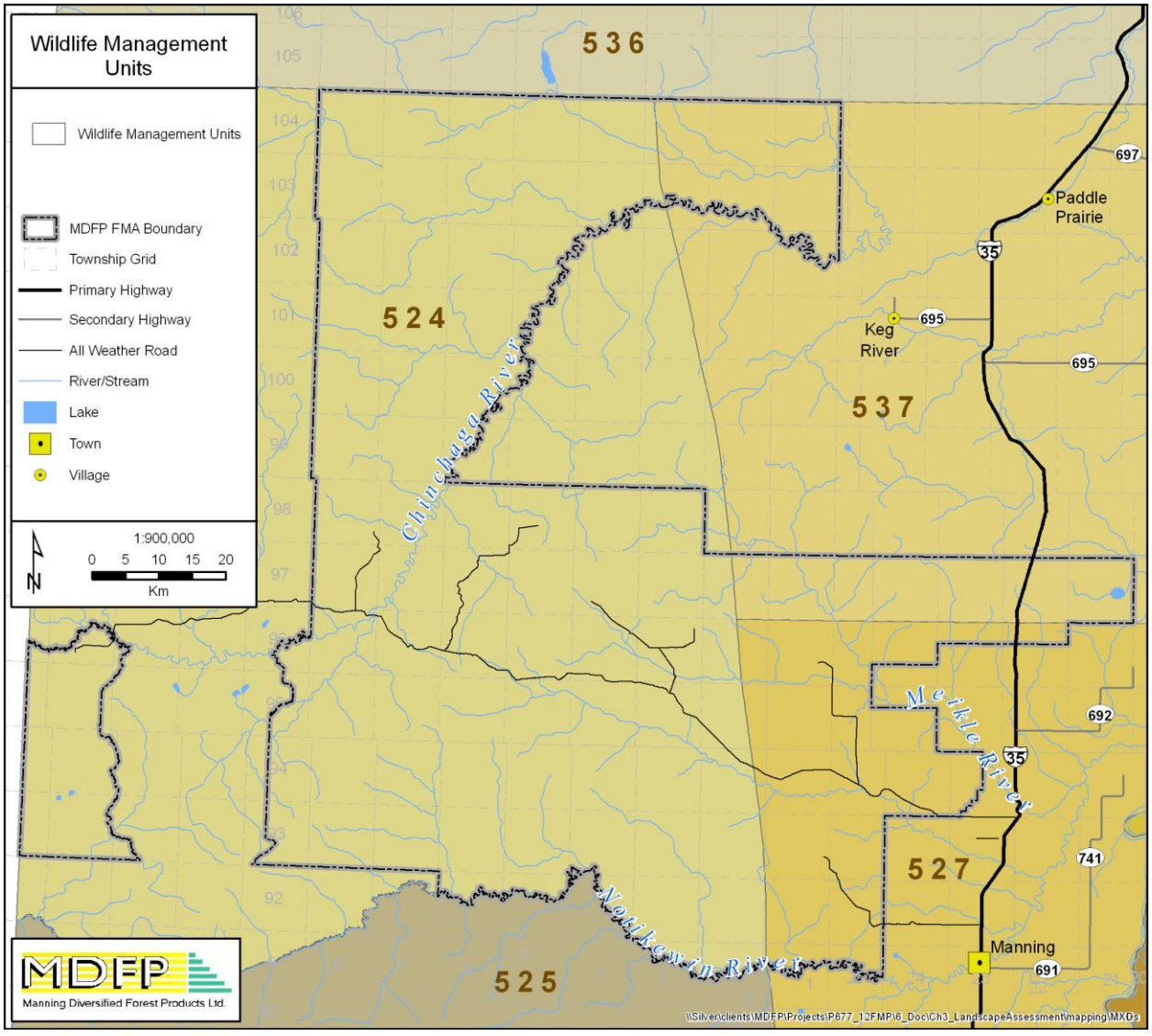


Figure 6-3. Wildlife management units within the MDFP FMA area

6.6 Historical and Cultural Resources

The Alberta Historical Resources Act (2010) requires that FMA area holders include historical resource concerns within the management planning process. The Listing of Historic Resources identifies lands that contain or are believed to contain historic resources, including primarily archaeological and paleontological sites, Aboriginal traditional use sites of a historic resource nature, and historic structures. This listing provides industry and other developers with advance notification of possible historic resource concerns. The listing is constantly being updated as new resources are found and updates are issued semi-annually.

The listing of historical resources is divided into distinct categories, of which two are found in the MDFP FMA area (Figure 6-4).

- Paleontological – natural features containing evidence of extinct multicellular beings (*e.g.,* fossils and dinosaur bones).

- Archaeological – prehistoric and historic cultural artifacts for which no written record exists.

No resources categorized as historical, cultural, geological or natural occur within the FMA area.

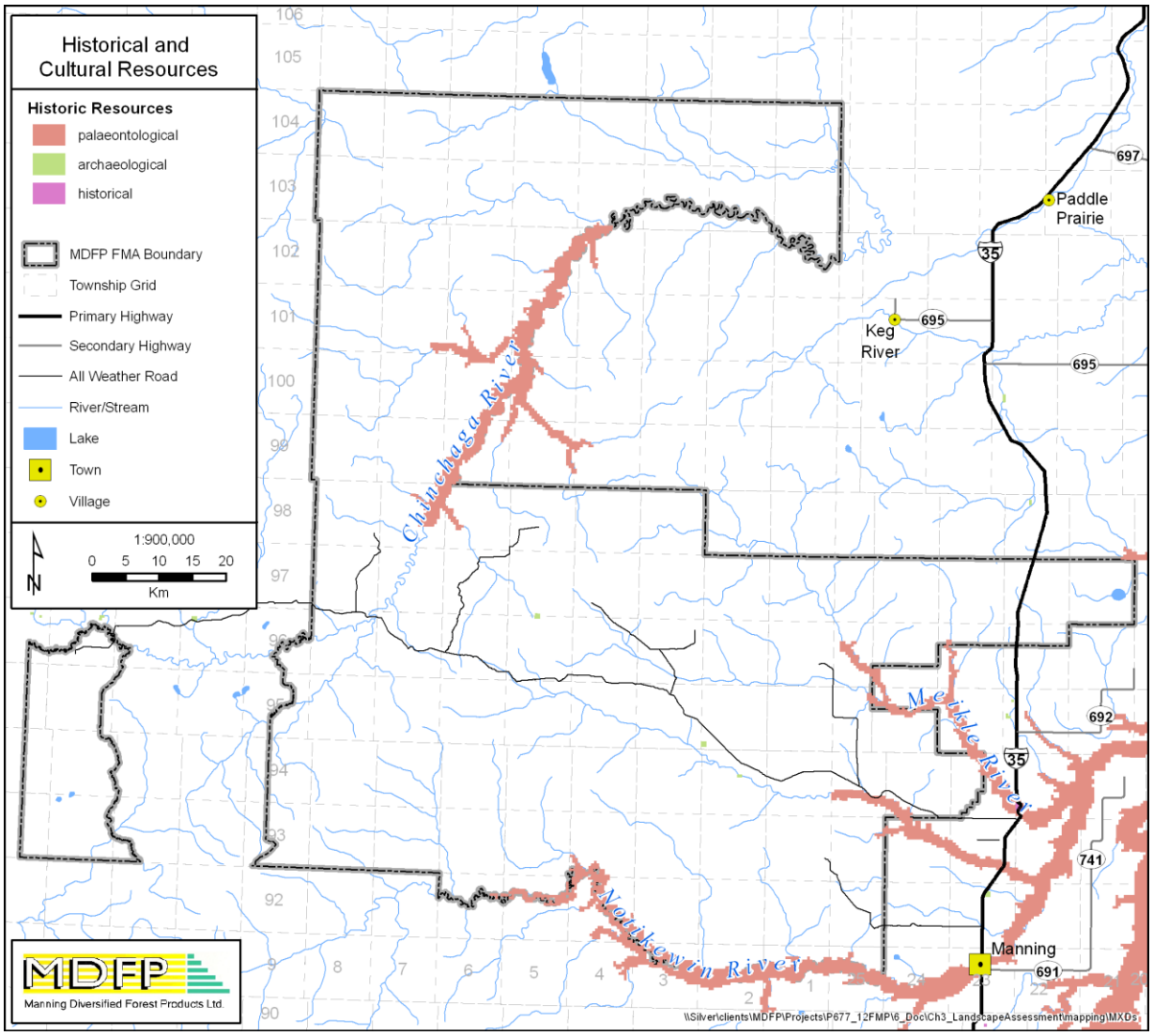


Figure 6-4. Historical and cultural resources in the MDFP FMA area

6.7 Visual Resources

There are no identified visual resources within the FMA area.

6.8 Fish and Wildlife Resources

6.8.1 General Wildlife

The FMA area supports an abundance of wildlife resources. Large-bodied mammals, such as moose, deer, elk, black bear, grizzly bear, cougar and lynx move in and out of the FMA area boundaries because their home ranges encompass the various habitat types making up the FMA area. In addition, the FMA area is home year-round to a large number of furbearers (listed in Section 6.2) and resident bird species,

with additional neotropical migrants and waterfowl nesting and feeding during the summer months. Many species require a combination of forested and non-forested areas to satisfy specific needs.

6.8.2 Species at Risk

Only the woodland caribou and trumpeter swan have been identified as management concerns in the FMA area.

Woodland Caribou

Caribou occur throughout Canada, across a wide variety of habitat types. Woodland caribou represent a subspecies that occurs in the forested and mountainous regions of Canada, including northern and west-central Alberta. At the national level, the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC) considers the boreal population of woodland caribou Threatened since 2000 (COSEWIC 2002), whereas provincially it is designated as Threatened under the Alberta Wildlife Act (2012). This status is based on reductions in distribution, declines in regional populations and a threat of further population declines associated with human activities.

As part of the Province's Species at Risk program, an evaluation of the status of the Woodland Caribou was completed in 2001. Unless indicated, the information in this section of is derived from the species status report (Dzus 2001).

Two ecotypes of woodland caribou are often described with the distinction being based on behavior, habitat use and/or morphology. The mountain ecotype winters in the forested foothills of the Rocky Mountains and migrates in the summer to higher alpine areas. The boreal ecotype spends the entire year in forested habitats, moving extensively throughout the year but not following a predictable migration pattern. The woodland caribou in the vicinity of the MDFP FMA area belong to the boreal ecotype.

Distribution of woodland caribou is linked to availability of terrestrial lichens, which are a primary food source for both ecotypes. In winter, woodland caribou use mature and old-growth coniferous forests that contain large quantities of terrestrial and arboreal lichens. These forests are generally associated with peatland complexes, marshes, bogs, lakes and rivers. In summer, the caribou occasionally feed in younger stands after fire or logging, but generally avoid clear cuts, shrub-rich habitat and hardwood-dominated stands.

The rut (mating) period for caribou usually occurs in late September and the first half of October. Caribou cows begin breeding by the time they are 28 months of age and tend to breed annually. They typically give birth to a single calf the following spring (mid-May to mid-June). Survival rates for calves typically average between 30% and 50%. Many factors interact to determine calf survival, including quality and quantity of forage (for pregnant females and in the first year of life), number of predators, and weather.

The males are able to breed at 18 to 20 months of age, but most probably have no opportunity before their third or fourth year because of mating competition among males. During the rut, males use their antlers to engage in frequent and furious sparring battles. Females travel to isolated, relatively predator-free areas such as islands in lakes and peatlands to calve.

Predation by wolves is considered to be the leading cause of natural mortality in caribou herds (Seip 1992, Stuart-Smith et al. 1997). Other predators such as bear, coyote, wolverine, and Canada lynx may also prey on caribou. For young calves, considerable natural mortality may result from starvation, inclement weather and low birth-weights resulting from hard winters.

Anthropogenic limiting factors are primarily associated with habitat loss through access and fragmentation. Human disturbance associated with agriculture, forestry and oil and gas activity reduce the availability of older forests, which represent important habitat.

Woodland caribou occur at very low densities, with approximately 0.03 to 0.12 caribou per square kilometer (100 ha) (Seip 1992, Stuart-Smith et al. 1997). It is believed that this population pattern helps the species avoid predation. Population estimation is difficult for caribou because of their low densities and the census methods available (aerial surveys are not very effective because of the difficulty seeing caribou under conifer tree cover). Despite these limitations, the Alberta population has been estimated at 2264-2473 mature individuals (Alberta SRD and Alberta Conservation Association 2010). The Chinchaga herd, along with most of the Alberta herds, has shown population decline: current population numbers range from 400-500 (Alberta SRD and Alberta Conservation Association 2010).

The Province has identified areas that are key habitat for woodland caribou and designated them as Woodland Caribou Management Zones (Figure 6-5). Two areas in the eastern portion of the FMA area and a large portion along the western edge lie within Woodland Caribou Management Zones. Forest management operations within these zones must consider caribou habitat requirements.

Current research initiatives related to the boreal ecotype of the woodland caribou are spearheaded by the Alberta Caribou Committee, through the Research and Monitoring Subcommittee. The Committee is composed of representatives of the Provincial Government and the forestry and energy sectors.

ESRD oversees operating guidelines in the Caribou Management Zones through their Land Management Planning Systems. Each planning level involves discussion of caribou range/recovery plan information. Provincial caribou zone boundaries as of May 2012 were used in the TSA and shown in Figure 6-5.

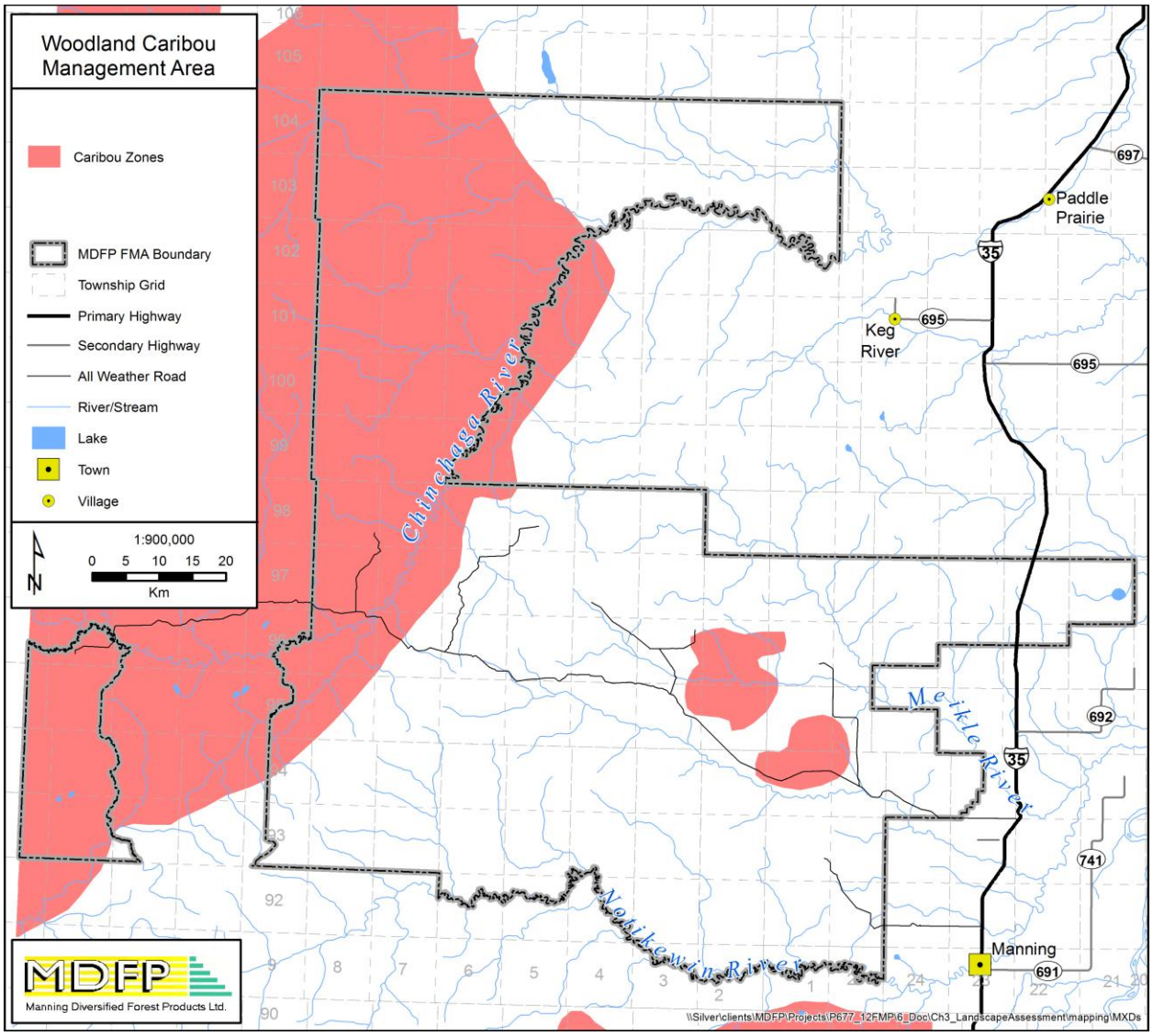


Figure 6-5. Woodland caribou management zones in the MDFP FMA area

Trumpeter Swan

The trumpeter swan is the largest waterfowl native to North America. This species was originally distributed fairly extensively throughout the prairie provinces, but was thought to have been extirpated in the early 1900s. A flock was later discovered in the Grande Prairie area and with increased protection from human disturbance, the species has made a comeback. The population of trumpeter swans has increased to the point where, in 1996, their status was upgraded from *Vulnerable* to *Not at Risk* according to COSEWIC. Provincially the species is considered at risk and is classified as *Threatened* under the Alberta Wildlife Act (2012). Several waterbodies in the FMA area have been designated as trumpeter swan protected areas (Figure 6-6).

The following description of the species' habitat and biology is primarily from James (2000)

During the summer breeding months, trumpeter swans inhabit lakes and marshes in the Mixedwood and Boreal Natural Subregions. The birds arrive from their wintering grounds in mid-April to early May. They form life-long mating pairs and take approximately 5 years to reach breeding age. Generally, a single pair will nest on an appropriate breeding lake or pond and they will return to the same location each year.

Breeding habitat requires the following characteristics:

- adequate room to take off (approximately 100 m);
- accessible forage;
- shallow stable levels of clean fresh water;
- emergent vegetation;
- low level of human disturbance; and
- structure for a nest site (*e.g.,* muskrat or beaver lodge, small island).

Nesting females will lay 3-9 eggs, which are incubated for approximately 5 weeks. Resulting brood size is approximately 3 birds, based on data collected from the Grande Prairie area. The young feed on aquatic invertebrates and crustaceans, before switching to the adult diet that relies on aquatic plants.

Trumpeter swans begin staging on larger lakes in mid-September, about a month prior to migrating to their wintering grounds. The trumpeter swan population in northwestern Alberta is referred to as the Canadian Rocky Mountain subpopulation, which migrates to wintering grounds in the Montana-Idaho-Wyoming boundary area.

The Province published recommended land use guidelines for Trumpeter Swan Waterbodies and Watercourses (October 30, 2010, Fish and Wildlife Division). Guidelines directed at all activities in swan habitat areas (lakes or water bodies) include the following.

- April 1 to Sept. 30: no activity within 800 m of the high water mark.
- April 1 to Sept. 30: no flightpaths for aircraft.
- No long term development (roads, wells, pipelines, *etc.*) within 500 m of the high water mark.

Guidelines related specifically to timber harvesting include the following:

- no timber harvesting within 200 m of the high water mark; and

- establishment of a special management zone for timber harvesting 200-500 m from high water mark, with a detailed plan required.

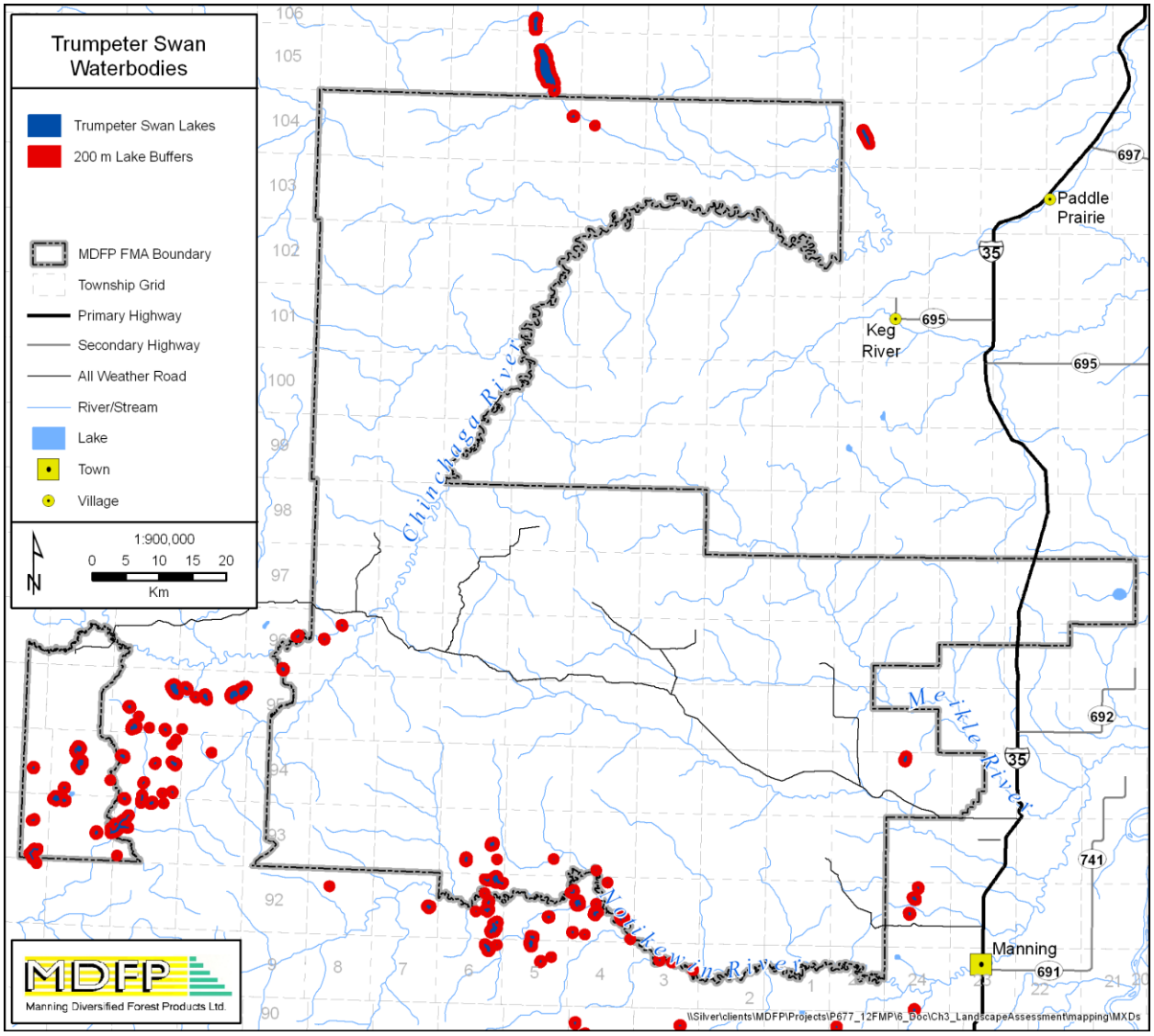


Figure 6-6. Trumpeter swan protected areas in and around the MDFP FMA area

6.8.3 Fisheries Resources

Several fish species are located in lakes, rivers and streams throughout the FMA area (Figure 6-7). In total, the FMA area contains 303 waterbodies identified in the AVI as lakes (*i.e.,* NWL), accounting for 2,322 ha. Most lakes within the FMA area are relatively small (*i.e.,* only 63 are greater than 10 ha). Nina Lake, the largest in the FMA area, is located in the extreme east of the FMA area and is 277 ha in area.

Major waterways within the FMA area are described in Section 2.3.

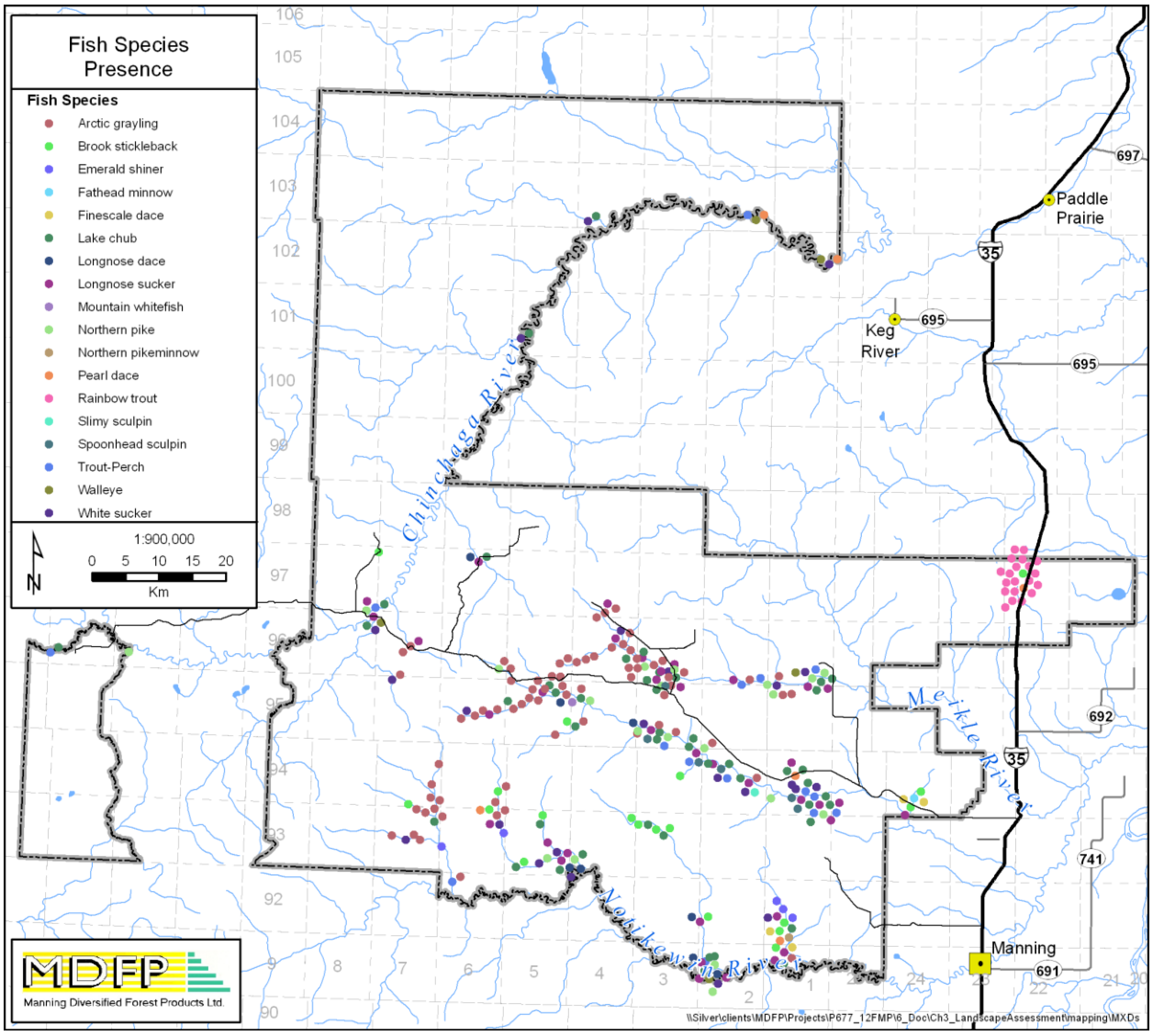


Figure 6-7. Fish species found in the MDFP FMA area (number of dots do not represent amounts)

7. References

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Appendix I Data Sources

Section	Source
1.2 Forest Management Units	AltaLIS. Forest Management Units
1.3 Natural Subregions	Alberta Tourism, Parks and Recreation. 2005. Natural Regions and Subregions of Alberta. http://tpr.alberta.ca/parks/heritageinfocentre/naturalregions/default.aspx [downloaded July 2012]
1.7 Protected Areas and Parks	AltaLIS. BF_PROVINCIAL_PARK_POLYGON, BF_WILDLAND_PARK_POLYGON, BF_PRA_POLYGON
2.1 Topography	Natural Resources Canada. 2000. Canadian Digital Elevation Data. http://www.geobase.ca/geobase/en/data/cded/index.html [downloaded Dec 2011]
2.2 Soils and Landforms	Alberta Energy and Utilities Board. 2004. Bedrock geology of Alberta (GIS data) v. 2.2. http://www.ags.gov.ab.ca/publications/DIG/ZIP/DIG_2004_0033.zip
	Soil Landscapes of Canada Working Group, 2010. Soil Landscapes of Canada version 3.2. Agriculture and Agri-Food Canada. (digital map and database at 1:1 million scale) http://sis.agr.gc.ca/cansis/nsdb/slc/v3.2/intro.html
2.3 Hydrography	Alberta ESRD. Nov 2010. 3rd order watershed polygons (Mdfp_ws2.shp)
2.4 Climate	Environment Canada. http://climate.weatheroffice.gc.ca/climate_normals/index_e.html
	Alberta Agriculture and Rural Development. 2003. Length of growing season (>5°C). http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag7019 [downloaded August 31, 2012]
	Alberta ESRD. 2005. Mean Annual Precipitation (mm per year). http://www3.gov.ab.ca/env/water/GWSW/quantity/learn/what/CLM_climate/CLM1_metdata.html [downloaded August 31, 2012]
3. Forest Landscape Pattern and Structure	Landbase version 19b (LB_V19B_TSAEL.shp)
3.5 Forest Patches	Landbase version 19b (LB_V19B_CLS.shp)
4.2.1 Mountain Pine Beetle	Alberta ESRD . 2011. Aerial survey sites 2011. [received January 2012]
4.5 Timber Harvesting	Landbase version 19b, LB_V19B_TSAEL
4.8 Monitoring Sites	Alberta Biodiversity Monitoring Institute. 2008. The Alberta Biodiversity Monitoring Institutes Survey Locations (File No. ABMI-000001)
6.2 Registered Trappers	AltaLIS. Registered fur management Areas
6.5 Guiding and Outfitting	AltaLIS. Wildlife Management Units
6.6 Historical and Cultural Resources	Alberta Culture. Listing of Historic Resources. http://culture.alberta.ca/heritage/resourcemanagement/landuseplanning/default.aspx [downloaded July 2012]
6.8.2 Woodland Caribou	Alberta ESRD. Dec 2010. Wildlife Sensitivity Data Sets. http://www.srd.alberta.ca/MapsPhotosPublications/Maps/WildlifeSensitivityMaps/Default.aspx
6.8.2 Trumpeter Swan	Wildlife Sensitivity Data Sets. July 2012. http://www.srd.alberta.ca/MapsPhotosPublications/Maps/WildlifeSensitivityMaps/Default.aspx
6.8.3 Fisheries Resources	Alberta ESRD. Aug 2012. Fish and Wildlife Management Information System Fisheries and Wildlife Data. http://www.srd.alberta.ca/FishWildlife/FWMIS/AccessFWMISData.aspx

Appendix II Glossary of Terms and Initialisms

Glossary Term		Definition
Above Mean Sea Level	AMSL	A measure of topographic elevation.
Active landbase		Areas that are available for forest management activities. That component of the physical landbase that is not deleted in the landbase netdown process. Consists of the combined coniferous and deciduous landbases. Also referred to as the timber harvesting landbase, net landbase, managed landbase or
Adaptive management		A process for continually improving of planning, implementing, and monitoring policies and practices by learning from the outcomes of previously employed policies and practices, and taking corrective actions where unplanned results occur.
Alberta Environment and Sustainable Resource Development	ESRD	Government of Alberta ministry responsible for regulating FMAs.
Alberta Regeneration Information System	ARIS	A Provincial database of silviculture treatments applied to harvested lands. Updated annually by permit and license holders. Considered to be the defacto record of treatment history and block status.
Alberta Biodiversity Monitoring Institute	ABMI	A province-wide monitoring program that collects information on about 2000 species through site visits, aerial photography and satellite imagery. ABMI provides information on the state of Alberta's biodiversity to facilitate management.
Annual Allowable Cut	AAC	The volume of timber permitted to be harvested in any one year, as stipulated in the pertinent approved FMP. In Alberta, the AAC is the quadrant cut divided by the number of years in that quadrant (usually five).
ARC Macro Language	AML	A third-generation (non-compiled) scripting language, propriety to ESRI. AML is a legacy language used commonly in early versions of ESRI software. While primarily a legacy product, it is still used for developing processes that need to run unattended.
Alberta Vegetation Inventory	AVI	The provincial standard for forest inventory information (classification and data storage).
AVI polygon		A polygon delineated based on aerial photography using AVI rules (AFLW 1991, Nesby 1997). For vegetated areas, areas must be sufficiently similar in terms of structure, moisture regime, crown closure, height, species composition and origin year to be considered a single unit or a polygon. Non-vegetated areas must have a similar nonvegetated classification.
Base natural yield curve		The "standard" set of yield curves developed for yield strata, representing the main stand types within the FMA area. Base yield curves may or may not be used to represent these stand types in the final timber supply analysis.
Biological diversity (biodiversity)		The variety, distribution, and abundance of different plants, animals, and microorganisms, the ecological functions and processes they perform, and the genetic diversity they contain at local, regional, or landscape levels of analysis.
Broad Cover Group	BCG	A classification of forest types based on coniferous and deciduous components of the AVI species composition. The broad cover groups are coniferous (C), coniferous-leading mixedwood (CD), deciduous-leading mixedwood (DC) and deciduous (D).
BCG: Pure Deciduous	D	Deciduous ≥ 80%
BCG: Deciduous-Coniferous	DC	Coniferous > 20% and Deciduous > 20%
BCG: Conifer-Deciduous	CD	Coniferous > 20% and Deciduous > 20%
BCG: Pure Coniferous	C	Coniferous ≥ 80%
Buffer		Used in several contexts: (1) In protecting critical habitat areas, the buffer is an area of forest land that reduces the impacts of adjacent activities on the critical area. (2) A strip of land between two areas under different management regimes. (3) An area maintained around a sample or experimental plot to ensure that the latter is not affected by any treatment applied to the area beyond the buffer. (4) In GIS work, a new polygon zone computed on distance from a point, line or existing polygon.
Canadian Standard Association	CSA	Not-for-profit standards organization that is is composed of representatives from industry, government, and consumer groups and which develops standards in 57 areas.
Caribou		Boreal woodland caribou can be found in forested areas across Canada. In Alberta there are two varieties of woodland caribou – the mountain caribou in foothills and mountains of west-central Alberta, and the boreal caribou in northern Alberta. Woodland caribou are listed as threatened under the Alberta Wildlife Act and federally under the Species at Risk Act (SARA).
Caribou, habitat contols		Rules/constrains applied in a hierarchical forest modeling process with considerations across various spatial and temporal scales to enhance the caribou habitat. The main controls were: (1) 30/20 rule – in the deciduous and mixedwood stratum, a maximum of 20% is allowed to be under 30 years old; (2) Patch target – a patch target that tended towards patches (under 30 years old) larger than 300 ha.
Caribou, provincial zone		Provincially-approved caribou land-use referral map layers that are inteded to alert planners when harvest plans fall in or near these special land management areas and aim to reduce the industrial footprint and impacts on caribou.

Glossary Term		Definition
Classified landbase		A spatial landbase and attribute classification generated as the second stage of the TSA process. Used to calculate the area and distribution of all features on the landscape, particularly to generate summaries of seismic detail and carry this into the modeling landbase.
Clearcutting		A regeneration system where all or most of the merchantable trees in a defined area are harvested in one cutting with reproduction obtained through artificial or natural means.
Committee on the Status of Endangered Wildlife in Canada	COSEWIC	Harvested in one cutting with reproduction obtained through artificial or natural means.
Compartment		A subsection of a Forest Management Agreement (FMA) for which operational plans are developed.
Compartment, working circles		A subsection of an FMA defined by the Manning Diversified Forest Products Ltd.
Combined Heat and Power	CHP	The simultaneous production of electricity and heat from a single fuel source
Composite yield curve		Area-weighted composite yield curves developed from empirically-fit natural stand yield curves; generally by BCG or groupings thereof.
Coniferous Timber Quota	CTQ	One of two types of volume-based long-term forest tenures (also deciduous timber allocation) for harvesting a set proportion of the coniferous AAC volume within a defined area, usually for a period of 20
Connectivity, landscape		A measure of how well different areas (patches or a landscape) are connected by linkages, such as habitat patches, single or multiple corridors, or "stepping stones" of vegetation. Landscape connectivity can be defined as the degree to which the landscape facilitates movement between resources patches.
Corrective actions		May include one or more of the following: - Address a nonconformity in a management system by identifying and eliminating the causes of a problem; - Carry-out an appropriate enforcement response; - Direct that the work to be corrected and re-submitted.
Corridor		A physical linkage connecting two areas of habitat and differing from the habitat on either side. Corridors are used by organisms to move around without having to leave the preferred habitat. A linear habitat patch through which a species must travel to reach habitat more suitable for reproduction and other life sustaining needs. Many corridors, linking several patches of habitat, form a network of habitats.
Cull deductions		Trees or portions thereof that are merchantable, but are removed because of defect.
Culmination age		The age at which the stand, for the stated diameter limit and utilization standard, achieves its maximum average rate of volume production (the Mean Annual Increment (MAI) is maximized).
Cutblock		A specified area that is either designated for harvest or has already been harvested.
Daily mean temperature		Derived on a daily basis from daily minimum and daily maximum temperatures. Daily minimums and maximums are recorded over 24 hour periods that begin and end in the morning. These values are then averaged for the entire month, over the reporting period (generally 30 years, from 1961- 1990).
Daishowa Marubeni International Ltd.	DMI	A neighbouring FMA holder and license holder inside the MDFP FMA area.
Defined Forest Area	DFA	Area of forest, including land and water (regardless of ownership or tenure), to which the requirements of the FMA apply.
Defining layer		Inventory layer used to assign strata. The defining layer may be the overstory or the understory.
Deletions		All areas excluded from the active landbase and assigned a code identifying the reason for deletion.
Digitally Integrated Disposition system	DIDs	A Provincial database and system of specific land use disposition types submitted for approval. The DIDs spatial data are managed and distributed by Alberta Public Lands.
Disturbance patch		Disturbance patches are used to describe the patch sizes of any part of the active landbase that is less than 20 years old, regardless of strata.
Deciduous Timber Allocation	DTA	One of two types of volume-based long-term forest tenures (also see coniferous timber quota) for harvesting a set proportion of the deciduous AAC volume within a defined area, usually for a period of 20
Environmental Systems Research Institute ™	ESRI	The developer of the suite of geographic information system software products commonly known as ArcInfo, ArcMap, ArcView, Spatial Analyst and others.
Environment and Sustainable Resource Development	ESRD	Alberta Environment and Sustainable Resource Development is a ministry of the Government of Alberta that brings together the former departments of Environment and Water and Sustainable Resource Development.
FireSmart		The philosophy that seeks to mitigate the likelihood of large, high intensity and severity fires.
FireSmart community zone		A standard ten kilometre radius around the community extending from the Wildland Urban Interface Zone. A unique data set will be gathered for this zone for community protection planning to provide a fundamental linkage between FireSmart Communities and FireSmart Landscapes.
FireSmart landscapes		FireSmart landscapes are designed to recognize the interaction between ecological, economic, and social impacts, thus, maximize the positive ecological impacts and minimize the negative economic and social impacts.
FireSmart landscape zone		The zone that extends beyond the FireSmart Community Zone overlapping multiple jurisdictions at a broad landscape level. This zone focuses on mitigating the likelihood of large, high intensity, high severity fires. Fire, Forest and Land Management planning are integrated and designed to reduce the negative ecological, economic, and social impacts of wildfire while maximizing the positive attributes of wildfire.
Forecasting		See Timber Supply Analysis.
Forest Management Agreement	FMA	Contract between the Province of Alberta and the FMA holder whereby the Province provides an area-based Crown timber supply. In return, the FMA holder commits to: managing the timber resource on a perpetual sustained yield basis, taking into consideration a broad range of forest values in determining forest management practices; and meeting defined economic objectives, including capital investments and job creation, and seeking out new business opportunities that provide measurable economic benefits for both the Province and the FMA holder. The FMA gives the FMA holder the right to access Crown fibre. In return, the FMA holder commits to forest management responsibilities, which may change from time to time (Alberta SRD 2006).

Glossary Term		Definition
Forest Management Plan	FMP	A document prepared by the FMA holder that describes the spatial and temporal harvest plan and forest harvest operations on Crown lands over a 10-year planning horizon (in Alberta). The document provides detailed methods, schedules, and responsibilities of the FMA holder in terms of accessing, harvesting, renewing and protecting the resource to enable site-specific operations to proceed. The document must be approved by the Government of Alberta, with input from stakeholders.
Forest Management Unit	FMU	An administrative unit of forest land designated by the Minister, as authorized under Section 14(1) of the Forests Act.
Forest patch		A stand of forest in the same seral stage that is not split by a linear feature greater than 8 m wide.
Forests Act, the		The legislative statute that authorizes the Minister to administer and manage the forested lands of Alberta.
Fully stocked		All potential growing space that is effectively occupied by merchantable tree species.
GEO	GEO	ESRI notation to for data stored in coordinates representing latitude and longitude.
Geographic Information System	GIS	A collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.
Green-up period		The time needed to re-establish vegetation after a disturbance. Specific green-up periods may be established to satisfy visual objectives or hydrological requirements, or as a means of ensuring re-establishment of vegetation (for silviculture, wildlife habitat or hydrological reasons) before adjacent
Gross volume		A term applied to tree-level, plot-level or stand-level volumes (*e.g.,* gross total tree volume, gross merchantable tree volume, gross total plot volume, gross merchantable plot volume, gross total stand volume, gross merchantable stand volume) that Indicates no defect/cull deduction has been applied.
Growing Degree Day	GDD	The sum of mean daily temperature above a baseline temperature (i.e. 5 degrees Celsius). Daily values are accumulated over the growing to determine annual values.
Growing stock		The sum (by number, basal area or volume) of trees in a forest or a specified part of it.
Harvest area		A specified land area with defined boundaries where timber harvesting is scheduled, or has occurred (commonly referred to as a cut block).
Industrial Sample Plot	ISP	A forest plot used to monitor the natural growth and yield of trees.
Influential point		An extreme data point that negatively influences model performance, resulting in failure to converge or an unacceptable curve shape.
Input datasets		Datasets received for the purpose of completing the landbase netdown. These frequently require processing to convert or add attributes, assign/add projection information, or combine with other inputs that represent the same features.
Landbase		A result of a classification process used to identify and determine areas available and suiatble for timber harvesting activities.
Landbase, active (also referred to as net, or managed, or contributing)		The landbase available for timber harvest and that comprises the net productive coniferous and net productive deciduous land bases. The active landbase is further classified into either conifer or deciduous landbase depending on species composition.
Landbase, passive (also referred to as		The landbase that is not part of the net productive coniferous or deciduous landbases
Landbase polygon		A polygon within the (classified, TSA, or modeling) landbase derived during spatial processing to incorporate various spatial layers and attributes of interest.
Managed landbase		That portion of the net landbase which is considered "managed" in the respect that the land received a harvest treatment and subsequent silviculture treatments. Note that AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any records of reforestation are not considered 'managed'.
Managed stand		Stand that is initiated by anthropogenic disturbance such as harvesting.
Managed stand yield curve		Yield curves generally created by applying regeneration lags to base natural yield curves with cull. Regeneration lags varied depending on whether cutblocks were harvested prior to or after 1993. Thus both Pre93 and Post93 managed managed stand yield curves developed.
Manning Diversified Forest Products Ltd.	MDFP	The forest products company in Alberta responsible for this FMP.
Mean Annual Increment	MAI	Average annual increase in volume of individual trees or stands up to the specified point in time. The MAI changes with different growth phases in the life of a tree, being highest in the middle years and then slowly decreasing with age. The point at which MAI peaks is commonly used to identify the biological maturity of the stand and its readiness for harvesting (Alberta SRD 2006).
Metadata		Data that describes the content, quality, conditions, use limitations and other characteristics of a dataset and which also documents bibliographic records including but not limited to information such as who collected the data, when and how it was collected, preprocessed and converted, its resolution and who presently holds the data. In summary, metadata is information about a thing, apart from the thing itself.
Merchantable volume, stand		Merchantable tree volume summed to represent volume on a per hectare basis.
Merchantable volume, tree		A tree-level term; the volume of those portions of a tree bole that meet utilization requirements (stump height, top and bottom diameter limits and log length).
Modeling landbase		A tabular and spatial landbase. Tabular data make the landbase suitable for both strategic and operational timber supply modeling. The spatial component is used for harvest scheduling.
Modeling tool, Patchworks©		A spatially-explicit wood supply planning and modeling tool developed by Spatial Planning Systems that was designed to provide the user with operational-scale decision-making capacity within a strategic analytical environment.
Modeling tool, Woodstock©		A non-spatial forest modeling tool developed by Remsoft used for harvest scheduling, wood supply analysis, wildlife management and simulation of forest ecosystems to test and compare different management assumptions.

Glossary Term		Definition
Mountain Pine Beetle	MPB	A defoliator insect species (*Dendroctonus ponderosae*) endemic to western North America that infects pine trees during its life cycle and results in tree mortality.
Natural stand		Stands developed under natural (non-anthropogenic) disturbance regimes. Stand initiation was due to natural disturbances, such as fire, pest or pathogen outbreak.
Natural stand empirical yield curve		Empirical yield curve fitted using data from all sampled natural stands within the active landbase.
Net volume		Timber volume that includes the main stem and excludes the stump, top and defective and decayed wood.
Non-linear regression		The practice of fitting a model where the dependent variable is a nonlinear function of one or more independent variables. One benefit of the nonlinear models is that they are often derived on the basis of physical and/or biological considerations.
North American Datum	NAD	A mathematical process of correcting geospatial locations relative to a fixed, known position.
Noxious weed		A plant designated under the Weed Regulation (AR 171/2001) of the Weed Control Act.
Observation		One plot measurement at a specific point in time. All TSPs have only one associated observation, whereas PSPs may have one or more observations (remeasured data) for a single plot.
Operating Ground Rules	OGR	Practices used in operational planning and for implementation of timber harvest operations.
Organic Rankine Cycle	ORC	Thermodynamic process where heat is transferred to a fluid at a constant pressure
Patch		A stand of forest in the same seral stage, and not split by a linear feature greater than 8m wide. Linear features in this definition include roads, pipelines, powerlines, and rivers, but do not include seismic lines.
Passive landbase		That part of the gross landbase that has a deletion and is excluded from the active landbase.
Permanent Sample Plot	PSP	A fixed or variable area plot established for (forest) sampling and measurement purposes, and designed for re-measurement.
Piece size		Number of trees required to obtain one cubic meter (m^3) of gross merchantable tree volume.
Plan Development Team	PDT	A group of individuals assembled for production of MDFP's Forest Management Plan that includes representatives from MDFP, DMI and Buchanan Lumber, Alberta Environment and Sustainable Resource Development, and FORCORP. The goal of the PDT is to provide a forum for facilitating efficient and productive communication and decision making.
Plot		Unit of area, within which variables of interest are assessed.
Plot volume		Gross merchantable tree volume within a plot on a per hectare basis (m^3/ha).
Polygon		A closed geometric entity used to spatially represent area features with associated attributes.
Post93 managed stand yield curve		A managed stand yield curve with a 2-year regeneration lag applied to the coniferous landbase and a 0-year regeneration lag applied to the deciduous landbase.
Pre93 managed stand yield curve		A managed stand yield curve with a 5-year regeneration lag applied to the coniferous landbase and a 2-year regeneration lag applied to the deciduous landbase.
Preferred Forest Management Scenario	PFMS	The forest management scenario that represents MDFP's preferred strategies and activities for managing the FMA area over a 200-year planning horizon.
Prescribed burn		The planned use of carefully controlled fire to accomplish various predetermined management goals: site preparation for planting; reduction of fire hazards or pest problems; improvement of the ease with which the site can be traversed; and creation of better quality browse for wildlife.
Regeneration		The renewal of a tree crop by natural or artificial means. It may also refer to the young crop itself.
Regeneration lag		The period of time between harvest and establishment of the regenerated stand.
Rotation		The period of years required to establish and grow even-aged timber crops to a specified condition of maturity.
Sensitive sites		Sites that have soil, water, slope, aesthetic, vegetation or wildlife characteristics that require special protection beyond the normal precautions described in the ground rules.
Seral stage (SS)		Stages in forest succession that are characterized by plant community conditions. The seral stage definition in this document are based on age and strata classifications
SS: Mature	Mature	Stands that are old enough for harvesting. Age: 61-100 for D and DU; Age: 71-110 for DC and CD; Age: 71-120 for PL; Age: 106-160 for SB, and 106-150 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Old	Old	Stands that are starting to break up or become stagnant. Age ≥ 101 for D and DU; Age ≥ 111 for DC and CD; Age ≥ 121 for PL; Age ≥ 161 for SB; Age ≥ 151 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Regeneration	Regeneration	Stands that are in early stages of development. Age: 0-15 for all strata classes. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Young	Young	Stands that are vigorously growing but are not yet fully grown. Age: 16-60 for D and DU; Age: 16-70 for DC, CD, and PL; Age: 16-105 for SB and SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
Silviculture		The theory and practice of controlling the establishment, composition, health, structure and growth of forests in order to achieve specified management objectives.
Sliver		Generally small polygons created in the spatial analysis due to overlapping features that do not have coincident boundaries. Typically these are artifacts of spatial processing and generally do not represent true differences in polygon differentiation with respect to landbase classification.
Soil productivity		The capacity of soil to support plant growth.
Spatial Harvest Sequence	SHS	A stand level map depicting forest stands scheduled for timber harvesting that are feasible to be operated by the organization.
Special Management Zone		An area of varying size adjacent to an area in which special management measures are necessary to protect natural resources.
Species at risk		Any species known to be "at risk" after formal detailed status assessment and designation as "Endangered" or "Threatened" in Alberta. The list of species is maintained by Alberta.

Glossary Term		Definition
Species group		A single species code used to represent one or more AVI species. For example, the AW species group consists of AVI species A and Aw; and the LT species group consists of La, Lt and Lw.
Species type		There are two species types: deciduous and coniferous. Deciduous species include aspen, birch and poplar. Coniferous species include fir, pine, larch and spruce.
Stand		A community of trees sufficiently uniform in species, age, arrangement or condition as to be distinguishable as a group in the forest or other growth in the area. A stand may also be that polygon as defined in the AVI or Phase III inventory (Alberta SRD 2006).
Stand Susceptibility Index	SSI	An indicator of the potential loss in stand basal area or volume that could occur if mountain pine beetle infested a particular stand. A susceptibility index based on four variables: relative abundance of susceptible pine basal area in a given stand, age of dominant and co-dominant live pine, the density of the stand, and the location (latitude, longitude and elevation) of the stand.
Stand volume		Gross merchantable volume within a stand on a per hectare basis (m^3/ha); also known as gross merchantable stand volume.
Strata/Stratification		A classification scheme for defining data for use in management or modeling.
Structured Query Language	SQL	A formal computer language for querying relational database system tables. The language follows an ANSI compliant format and the core set of commands are part of a common language used across many database software programs.
Submission datasets		Datasets submitted to ESRD for approval.
Temporary Sample Plot	TSP	A fixed or variable area plot established for forest sampling and measurement; usually assessed only once.
Thinning, commercial		A partial cut where trees of a merchantable size and value are removed to provide an interim harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees. Used to capture volume likely to succumb to competition pressures and be lost to disease, insects, or dieback.
Thinning, pre-commercial		A silvicultural treatment to reduce tree density in young stands, carried out before the stems reach merchantable size. The intent is to concentrate the site's growth potential on fewer trees thereby accelerating stand development and reducing the time to final harvest, retaining more live crown, creating opportunities for future commercial thinning activities and improving stand operability.
Timber Harvest Planning and Operating Ground Rules		Standards for operational planning and field practices that must be measurable and auditable and based on forest management plan objectives.
Timber Management Regulation	TMR	The legislative statute that describes the mechanism and regulations by which the forested lands of Alberta are managed. The Regulation is associated with the Forests Act.
Timber operations		Includes all activities related to timber harvesting including site assessments, planning, road construction, harvesting, reclamation and reforestation.
Timber Supply Analysis	TSA	Harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees.
TSA landbase		A spatial landbase that carries all the information of the classified landbase, with the exception of the seismic line work.
Total stand volume		Used to capture volume likely to succumb to competition pressures and be lost to disease
Tree improvement		Insect, or dieback.
Tree improvement yield curve		A modified yield curve for the PL and SW yield strata, whereby the managed stand is adjusted such that volume increase (a fixed percent) occurs at approximately the average harvest age, but the maximum total volume across all ages is unaffected.
Understorey		The trees and other woody species growing under the canopies of larger adjacent trees and other woody growth.
Ungulate		A mammal with hooves.
Universal Transverse Mercator	UTM	A method of projecting spherical shapes on a flat plane. Typically this projection is used when the features need to have good area representation and the extent of the dataset does not cover more than one predefined UTM zone (three degrees of longitude).
Unmanaged landbase		That portion of the net landbase which is considered to be on a "natural" yield projection. All unharvested areas are considered 'unmanged'. AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any record of reforestation are also considered 'unmanaged'.
Values, Objectives, Indicators and Targets	VOIT	A framework of criteria and indicators to help track progress in achieving sustainable forest planning and management under sound environmental, economic, and social objectives.
Watercourse		The bed, bank or shore of a river, stream, creek, lake or other natural body of water, whether it contains or conveys water continuously or intermittently.
Watershed		An area of land, which may or may not be under forest cover, that drains water, organic matter, dissolved nutrients and sediments into a lake or stream. The topographic boundary, usually a height of land, that marks the dividing line from which surface streams flow in two different directions.
Wildlife		Any species of amphibian, bird, fish, mammal and reptile found in the wild, living unrestrained or free roaming and not domesticated. Some definitions include plants, fungi, algae and bacteria.
Wildlife Management Unit	WMU	Areas within province of Alberta managed by ESRD and regulated by the Alberta Wildlife Act (2012).
Years Before Present	YBP	A unit of measure of historical time.
Yield curve		Graphical representation of a predictive yield equation. One yield curve in fact consists of three curves: a conifer volume-age curve, a deciduous volume-age curve and a total volume-age curve.
Yield strata (YS)		A system of stratification applied to the forested landscape based upon FMU, and defining layer and/or understory layer attributes (BCG, crown closure class, leading conifer species). Yield strata form the basis for the development of yield curves; each yield stratum has one or more associated yield curves.

Glossary Term		Definition
YS: Deciduous	D	Species grouping defined as Deciduous
YS: Deciduous w/ Conifer Understory	DU	Species grouping defined as Deciduous with Coniferous Understory
YS: Mixedwood - Deciduous	DC	Species grouping defined as Mixedwood with Deciduous leading
YS: Mixedwood - Coniferous	CD	Species grouping defined as Mixedwood with Coniferous leading
YS: Coniferous - Pine leading	PL	Species grouping defined as Coniferous with Pine leading
YS: Coniferous - Black Spruce leading	SB	Species grouping defined as Coniferous with Black Spruce leading
YS: Coniferous - White Spruce leading	SW	Species grouping defined as Coniferous with White Spruce leading
YS: No Strata (cutblocks)	XCC	No Yield Strata assignment (cutblocks)
YS: No Strata	X	No Yiel+D21d Strata assignment

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MANNING DIVERSIFIED FOREST PRODUCTS LTD.

2012-2021 Forest Management Plan

Chapter 4 Previous FMP

June 30, 2013

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1. Introduction

1.1 Background

Manning Diversified Forest Products[1] (MDFP) 2007-2017 *Forest Management Plan* (FMP) was approved on December 14, 2007 and became effective on May 1, 2007. This was MDFP's first FMP for their *Forest Management Agreement* (FMA) area.

During the period in which the 2007-2017 FMP was developed, *Environment and Sustainable Resource Development* (ESRD) was in the process of developing a new forest planning manual, the Alberta Forest Management Planning Standard (Planning Standard) (ESRD 2006). As a result, the 2007-2016 FMP was a "transition plan" that spanned the requirements of the 1998 Interim Forest Management Planning Manual and the new Planning Standard. While this transition approach is consistent with the Planning Standard, some of the components of the 2007-2017 FMP are not completely in alignment with the Planning Standard.

MDFP submitted the 2012-2021 FMP five years early in order to provide a consistent planning approach for the expanded *Forest Management Agreement* (FMA) area. As a result of the early submission, only five years had elapsed for implementing and reporting on the 2007-2017 FMP. MDFP undertakes annual stewardship reporting to provide early indication of trends and sufficient time to react to achieve targets. The company submitted a 2007-2011 Stewardship Report (Annex IV) detailing the activities undertaken over the first five years of the 2007-2017 FMP. However, care must be taken when comparing five year trends against ten year FMP targets. The shortened time period is only half of the time allotted to achieve FMP targets. The status of a target at year five is no assurance of its status at

[1] Terms and initialisms that are defined in the Glossary (Appendix III) are shown in italics the first time they are presented in this document.

year ten, but five-year targets do provide trends and indications. Major highlights of the Stewardship Report are summarized in 2007-2011 Stewardship Report Highlights (Section 3.2).

2. Description of the Past FMP

2.1 2007-2017 FMP Contents

The 2007–2017 Forest Management Plan is comprised of ten sections, including the following:

1. Introduction and Plan Development – Introduces the companies operating on the FMA and describes the FMP development process, including the public consultation process. Includes the FMP Standards Checklist.

2. FMA Area – Describes the physical environment of the FMA Area.

3. FMA Resources – Describes the natural resources within the FMA Area.

4. *Values, Objectives, Indicators and Targets* (VOITs) – Details the values, objectives, indicators and targets that were instrumental in selecting the Preferred Forest Management Strategy and in developing forest management strategies for the FMP.

5. Forest Landscape Metrics – Presents specific information regarding forest vegetation composition and natural disturbance within the FMA Area and/or northwestern Alberta to address VOIT requirements.

6. *Landbase* Netdown – Provides a detailed description of the landbase netdown process, in preparation for the Timber Supply Analysis.

7. *Yield Curves* – Documents the volume sampling and yield curve development process.

8. *Timber Supply Analysis* – Describes how the *Preferred Forest Management Scenario* (PFMS), which was selected to meet Values and Objectives, was incorporated into the Timber Supply Analysis and provides an *Annual Allowable Cut* (AAC) for both the coniferous and deciduous landbases.

9. Implementation – Describes the forest management strategies and operations that will be used to implement the FMP and help ensure that indicators and targets are met.

10. Monitoring and Research – Describes monitoring commitments required to ensure indicators and targets are tracked and describes MDFP's approach to supporting research.

The Preferred Forest Management Scenario was developed by planning teams with representation from *Daishowa-Marubeni International* (DMI) and the Alberta government. The teams addressed major issues such as the development of the first VOITs for the FMA, caribou management strategies, understory protection treatments and the sequencing of deciduous stands with coniferous *understory*. To support the timber supply determination and PFMS, analyses were completed on wildfire risk, *FireSmart*, and hydrological impacts. Major products were the development of MDFP's first *Spatial Harvest Sequence* (SHS) and a detailed FMP implementation plan.

Successes and challenges in implemented the 2007-2017 FMP were identified and addressed in the 2012-2021 FMP.

3. Performance of the Past FMP

Documentation of the performance of the 2007-2017 FMP began after FMP approval. The status of ESRD's Approval Conditions placed upon the 2007-2017 FMP is summarized. MDFP addressed all of the Approval Conditions in timely manner. This is followed by highlights from the 2007-2011 Stewardship Report which demonstrates MDFP's progress in achieving forest management targets established in the 2007-2017 FMP.

3.1 Approval Condition Summary

MDFP's 2007-2017 FMP was approved subject to twelve Approval Conditions as summarized in Table 3-1. An update on the status of each Approval Condition follows.

Table 3-1. 2007-2017 FMP Approval Conditions and status

Condition	Requirement	Due Date	Status
Approval Condition 6.1	Public and First Nation Consultation	On-going	Addresssed
Approval Condition 7.1(i)	Timber Supply Analysis (TSA)	On-going	Addresssed
Approval Condition 7.1 (ii)	TSA Technical Issues	March 1, 2008	Completed
Approval Condition 8.1	Productive Land Base Losses	April 30, 2008	Completed
Approval Condition 9.1	Stand Level Structure Retention	On-going	Addressed
Approval Condition 10.1	Pine Strategy Performance Monitoring and Reporting	On-going	Addressed
Approval Condition 12.1(i)	Alternative Regeneration Strategy (ARS)	February 1, 2008	Completed
Approval Condition 12.1 (ii)	ARS Implementation	May 1, 2010	Completed
Approval Condition 14.1	Spatial Harvest Sequence	On-going	Addressed
Approval Condition 15.1	Growth and Yield	April 30, 2008	Completed
Approval Condition 16.1	Watershed Management	March 12, 2017	Addressed
Approval Condition 17.1	Performance Monitoring and Reporting	October 1, 2012	Completed

Approval Condition 6.1 Public and First Nation Consultation

i. In the event that new information is provided to SRD indicating a need for First Nations consultation, MDFP will be required to develop a consultation plan for that purpose.

ii. MDFP shall keep written documentation of all issues and comments raised by the public as well as the company's responses to address the concerns.

Status – The first new direction on First Nations Consultation from ESRD to MDFP was provided during the development of the 2012-2021 FMP. MDFP responded to the new direction to consult with the Dene Thá First Nation when first received. Refer to this chapter (Chapter 2) for more information. MDFP maintains written documentation of issues and comments raised by the public as well as the company's response to these issues. Refer to Value 6.1.1 in the Stewardship Report (Annex IV).

Approval Condition 7.1 – Timber Supply Analysis

i. As a priority, MDFP and Daishowa-Marubeni International shall jointly manage the flow and utilization of secondary coniferous and deciduous timber volumes produced from each company's operations. Annual Operating Plans and General Development Plans shall demonstrate that full utilization of secondary species volumes is addressed.

ii. By March 1, 2008, MDFP shall develop an action plan to address the technical issues presented in the Timber Supply Analysis review comments. The action plan shall be acceptable to the Senior Manager, Forest Planning Section.

Status – MDFP and DMI manage the flow of secondary and coniferous and deciduous timber on an ongoing basis. Secondary volume predictions have been reported in AOPs and GDPs.

MDFP submitted a response to the technical issues identified in the Timber Supply Analysis review. Condition was satisfied.

Approval Condition 8.1 - Productive Land Base Losses

i. By April 30, 2008, MDFP shall develop a monitoring and reporting program to quantify productive forest land base losses due to roads and decking areas. The program must be, acceptable to the Senior Manager, Forest Planning Section and incorporated into the Growth and Yield Plan. Failure to meet this deadline will result in a reduction of the FMA AAC by 5% effective May 1, 2007 (see Table 3).

Status – MDFP submitted a response for productive landbase loses and the condition was satisfied.

Approval Condition 9.1 – Stand Level Structure Retention

i. All operators on the FMA will plan and carry out their operations to achieve the FMP structure retention target for coniferous and deciduous land base. Species composition and timber profile of the original stand conditions shall be retained for the *merchantable* component to achieve acceptable *biodiversity* results.

ii. *Merchantable volume* retained for structure is chargeable as AAC production and shall be reconciled every five years at the end of each cut control period.

Status – MDFP developed and implemented a program to determine the volume of timber left for stand-level retention and to charge this to the appropriate AAC. This information is summarized in the Stewardship report under Value 1.1.2 (Annex VI).

Approval Condition 10.1 – Pine Strategy Performance Monitoring and Reporting

i. MDFP will prepare summary reports on the FMP implementation, from time to time, at the department's request.

Status – No additional information has been requested by ESRD. The forest products companies in the north-west MPB region, in cooperation with ESRD, led a study into MPB behavior across the region (The Forestry Corp. 2012). This information was used in the development of the 2012-2021 FMP. Refer to Chapter 6 - Preferred Forest Management Scenario; and Chapter 7 - FMP Implementation for more information.

Approval Condition 12.1 – Alternative Regeneration Strategy

i. By February 1, 2008, MDFP shall meet with the Senior Manager, Reforestation Section to discuss its plans for initiating ARS for the FMA.

ii. By May 1, 2010, MDFP shall implement an ARS on the FMA to the satisfaction of the Senior Manager, Reforestation Section.

Status – In 2010, the Regenerated Standards of Alberta (RSA) replaced the requirement for ARS. MDFP has been following RSA targets and protocols since 2009.

Approval Condition 14.1 – Spatial Harvest Sequence

i. MDFP shall follow the mapped 20-year harvest sequence as presented in the FMP.

ii. To address operational planning concerns, all timber disposition holders are authorized to modify the SHS by deleting no more than 20% of the total sequenced area in each compartment by decade, while harvesting no more than 100% of the total area within the SHS by compartment, by decade.

   a. Preference should be given to selecting stands from the second 10-year period of the SHS (years 2017-2027) when replacing deleted stands (from ii above). Where this is not feasible, replacements may be from any other stands identified in the approved net landbase of the FMP, with priority given to pine stands that are ranked highly susceptible to MPB infestations.

iii. Where timber operators exceed the variance described in (ii), the Area Manager, may require the completion of a compartment assessment and the Senior Manager, Forest Planning Section may recommend the adjustment of the approved annual allowable cut (AAC) to reflect the impact of the variance.

iv. The department requires the variance from the SHS to be reported annually, and the 5-year Stewardship Report to analyze the variance from the SHS.

v. The department will generally not request a modification of the approved harvest sequence for the first 15 years of the planning period unless required by a change in legislation or a policy approved by the Minister.

Status – These approval conditions were typical conditions applied to SHS implementation in FMPs approved around the time when MDFP's 2007-2017 FMP was approved. MDFP has followed SHS implementation rules and reported SHS variance in their annual Stewardship reports. Refer to tables 8, 9, and 10 in the Stewardship Report for compartment level SHS variance (Annex IV).

Approval Condition 15.1 – Growth and Yield Plan

i. By April 30, 2008, MDFP shall submit the revised manual to the Department.

Status – MDFP's revised growth and yield plan was submitted and the condition was satisfied.

Approval Condition 16.1 – Watershed Management

i. The next FMP (due 2017) MDFP shall revisit the SHS in the next FMP with consideration for reducing long-term impacts to watersheds and stream morphology.

Status – Since the 2007-2017 FMP was submitted, ESRD has assumed responsibility for watershed analysis associated with FMPs. Watershed management was incorporated into the 2012-2021 FMP using ESRD's delineated watersheds and analysis tools. MDFP elected to integrate ESRD's predicted runoff equations directly into the 2012-2021 FMP forecasting in order to efficiently develop a SHS that reduced long term impacts on watershed runoff. Refer to Chapter 6 - Preferred Forest Management Scenario for more information.

Approval Condition 17.1 – Performance Monitoring and Reporting

i. MDFP shall submit Annual Reports and Stewardship Reports that document the operational performance of the Company's activities in implementing the FMP. Where variances from the planned outcomes exist, an analysis shall discuss the reason for the variance and the Company's corrective action taken or proposed.

ii. A Stewardship Report acceptable to the Senior Manager, Forest Planning Section shall be submitted by October 1, 2012.

Status – Each year since approval of the 2007-2017 FMP, MDFP has created and submitted Annual Stewardship Reports to ESRD. The 2007-2011 Stewardship Report was submitted to ESRD in June 2012 (refer to Appendix II). The 2007-2011 Stewardship Report is located in Annex IV and the content is outlined and summarized in the following section (Section 3.2).

3.2 2007-2011 Stewardship Report Highlights

MDFP has met Stewardship Reporting requirements by submitting Annual Stewardship Reports to ESRD beginning with 2007 and the five year 2007-2011 Stewardship Report. These Annual Reports address all of the reporting requirements of the five year Stewardship Reports. Each year an additional year of reporting is added. This approach permits early indications of success in achieving FMP targets and provides time to alter implementation tactics and direction so that targets will be achieved over the ten year FMP period.

Under the timelines of the 2007-2017 FMP, a second Stewardship Report based on the 2007-2017 FMP reporting protocols would have been due at the end of the 2016/17 timber year. With the new FMP, reporting protocols will be altered to reflect protocols detailed in the2012-2021 FMP. Refer to Chapter 7 - FMP Implementation for more information.

Information in MDFP's 2007-2011 Stewardship Report is presented in two sections: operational reporting and VOIT reporting. Highlights from both sections are presented below.

3.2.1 Operational Reporting

Operational reporting addresses those metrics from MDFP's ongoing operations which are either required by subsequent VOITs or by other requirements. Highlights are:

- MDFP's delivered timber volumes have ranged from 314,671 m^3/yr to 345,360 m^3/yr;
- 9.9 million trees have been planted by MDFP over the five year period;
- 5,855 ha of establishment surveys and 4,989 ha of performance surveys under the new RSA protocols have been completed; and
- SHS variance reporting – MDFP reports variance at the working circle level. Final working circle variance requires all of the SHS to the harvested or deferred.

3.2.2 VOIT Reporting

All of the VOITs are addressed in the Stewardship Report. However, not all VOITs require reporting in the Stewardship Report. Highlights from the reporting period are:

Value: 1.1.1 – Landscape Scale Biodiversity

- Many of these metrics associated with this value require reporting at the next FMP. Refer to Chapter 5 - VOITs, for metrics associated with the 2012-2021 FMP. MDFP's harvesting operations are following the SHS as required. No all weather roads have been constructed and the length of forestry roads open each year, at less than 200 km, is below the 350 km maximum targets.
- No operations were conducted in rare plant communities and no new rare plant communities were identified.
- There was no burned area salvage harvested during the reporting period.
- MDFP was in compliance with the Operating Ground Rules (OGR).

Value: 1.1.2 – Local/Stand Scale Biodiversity

- Retention targets were a minimum of 3% for the merchantable timber types and a maximum of 3% for the unmerchantable timber types. MDFP achieved 3.4% in merchantable timber types and 3% in unmerchantable timber types.
- Downed Woody Debris (DWD) surveys were conducted to ensure that sufficient amounts of DWD remained on site following harvest. The target was 50% of harvested areas will have DWD equivalent to pre-harvest conditions. Based on the 58 plots surveyed, MDFP achieved 77.6% of the harvested areas having DWD equivalent or greater than pre-harvest conditions.

Value: 1.2.1. – Viable Populations of Identified Plant and Animal Species

- The indicators and targets under this value are related to population levels or habitat distribution. Habitat distribution is predicted during FMP development (refer to Chapter 6 - Preferred Forest Management Scenario). FMP implementation targets are adherence SHS and the OGR. MDFP's SHS variance and OGR compliance are reported in the operational section. No additional habitat analysis was undertaken during the reporting period.
- MDFP is a partner in the Foothills Model Forest Grizzly Bear Program, but grizzly bear analysis has not completed on the FMA and there is no primary or secondary grizzly bear range in the FMA area.
- The Chinchaga Caribou Landscape Planning Team has not been formed.
- No new wildlife species of concern were identified during the reporting period (or the 2012-2021 FMP development)
- MDFP implemented best management practices for caribou. Caribou wildlife zones were officially updated by ESRD in the spring of 2013, after the stewardship reporting period. As per ESRD direction to the PDT, the 2012-2021 FMP was developed using the 1991 caribou range boundaries. Development of caribou range plans for the FMA area is anticipated over the next 3 years.

Value: 1.3.1 – Genetic Integrity of Natural Tree Populations

- ESRD has not completed the evaluation of the number of required in-situ genetic conversation areas.
- MDFP remained a participant in the regional tree improvement programs and manages the amount of seed stored at the Alberta Tree Improvement and Seed Centre in Smokey Lake.

Value: 1.4.1 – Ensure Protection of Protected Areas and Sites of Biological Significance

- MDFP did not harvest within the Notikewin River valley or within 2 km of the Twin Lakes Lodge or Twin Lakes Recreation Area.

Value: 2.1.1 – Reforested Harvest Areas

- Reforestation protocols changed in 2010 with the approval of Reforestation Standards of Alberta. Under this protocol, MDFP completed performance surveys on 290 blocks and MAI targets were achieved.

Value: 2.2.2 – Maintenance of Forest Landbase

- MDFP's roads are available for other companies to use. MDFP has not refused a request to utilize their roads.
- MDFP has created no permanent clearings during the reporting period.

- MDFP has worked with ESRD to manage significant outbreaks or infestations when requested. MDFP has deployed 24 spruce budworm traps.
- Since 2008, MDFP engaged with ESRD and other companies to better manage MPB in the FMA area and the surrounding region. The 2012-2021 FMP contains a MPB strategy built-in part on the work undertaken during the reporting period.

Value: 2.1.3 – Control of Invasive Species

- MDFP has developed and implemented a weed management plan that is submitted annually with the GDP.

Value: 3.1.1 – Soil Productivity

- Only in those blocks with extenuating circumstances are roads and landings to exceed 5% of the block area. 14% of MDFP's blocks exceeded this threshold, but these were for small blocks, irregular shapes, other industrial activity or longer-term access.
- To reduce erosion, MDFP reclaimed all water crossings, installs erosion control and monitors until vegetation is established.

Value: 3.2.1 – Water Quality and Quantity

- MDFP incurred no penalties under the Water Act.

Value: 3.2.2 – Effective Riparian Habitat

- Riparian buffers were maintained as outlined in the OGR. MDFP had no riparian area infractions.

Value: 4.1.1 – Impact of Forestry on Carbon Budgets

- MDFP participated with other forest companies to develop a forest management carbon baseline for Alberta.

Value: 4.2.1 – Forest Land Conversion

- MDFP's roads are available for other companies to use. MDFP has not refused a request to utilize their roads.
- MDFP has created no permanent clearings during the reporting period.

Value: 5.1.1 – Sustainable Timber Supplies

- The AAC was adjusted when the P18 was incorporated. As an interim measure conservative measure, P18 AAC values were added to P16 AAC values to obtain interim AAC values for P20. Applying sustainable forest management practices, a new recommended AAC was developed for P20 in the 2012-2021 FMP which better represents the expanded FMA area.

Value: 5.2.1 – Risk to Communities and Landscape Values from Wildfire is Low

- There are no FireSmart Community Zones within the expanded FMA boundary.
- MDFP implements the SHS to reduce the amount of area in the extreme and high Fire Behaviour Potential (FBP) categories.

Value: 5.2.2 – Provide Opportunities to Derive Benefits from and Participation in Use and Management of the Forest

- Unless access restrictions are required by Alberta, MDFP's roads are available for other commercial and public use. MDFP signed several road use agreements for commercial use.
- MDFP attempts to notify trappers affected by harvesting operations prior to AOP submission. 100% of the affected trappers were notified during the reporting period.
- No guides or outfitters were affected or notified.
- Harvesting layout and operations, including road right-of-ways, within the Special Management Zone for Aesthetic Concerns were adjusted to achieve aesthetic objectives for the zone.
- Paddle Prairie Community did not request any contributions from MDFP regarding a fire protection plan.

Value: 5.2.3 – Forest Productivity

- MDFP is adhering to the RSA protocols to ensure their reforestation treatments maintain long term forest productivity.

Value: 6.1.1 – Compliance with Government Regulations and Policies

- MDFP implemented the approved Public Consultation Plan (PCP). Highlights were:
    - Ongoing Consultation with the Duncan's First Nation
    - Consultation with the Dene Thá begin in 2010 as part of the 2012-2021 FMP
    - Regular meetings were held with Paddle Prairie
- The PCP was adjusted for the 2012-2021 FMP to reflect new direction and circumstances.

Value: 6.2.1 – Meaningful Public Involvement is Achieved

- MDFP completed public consultation as per the PCP.
- During the reporting period, 33 meetings were held with the public and identified groups.

4. Significant Events

Several significant events affected the FMA area since the 2007-2017 FMP was approved. Responses to these events are described in the Chapter 6 - Preferred Forest Management Scenario and in Chapter 7 - FMP Implementation. Major significant events since 2007 are summarized below.

Expanded FMA Area

In May of 2009, MDFP's FMA area was expanded to include Forest Management Unit (FMU) P18. FMUs P16 and P18 were subsequently amalgamated to a single FMU for the expanded FMA area: FMU P20. In addition to the creation of FMU P20, the expanded FMA area triggered several actions that are documented in this FMP:

- Early development of the next FMP to provide a consistent planning approach across the expanded FMA area;
- Addition of Buchanan Lumber as a quota holder in MDFP's FMA area; and
- Alignment of quotas, timber rights and quadrants for FMU P20.

Mountain Pine Beetle Infestation

In 2009, a large in-flight from BC established *Mountain Pine Beetle* (MPB) across much of the southern portion of the FMA area. Subsequent monitoring has demonstrated that beetle populations have expanded producing considerable pine tree mortality, especially in the south central portion of the FMA area. To address this infestation, a MPB strategy was developed and implemented in the 2012-2021 FMP. Refer to Chapter 6 - Preferred Forest Management Scenario and Chapter - 7 FMP Implementation for details on the MPB strategy and potential impacts.

Economic Conditions

The forest industry experienced prolonged economic contraction over much of the last five years. MDFP managed to work within the SHS to manage delivered woods costs and to maintain a viable operation.

Due to challenging economic conditions, MDFP was unable to respond in a more proactive manner to the MPB infestation. While challenges remain, the MPB strategy developed for the 2012-2021 may permit a more proactive approach leading to mitigation of the MPB impact.

Third Party Certification

In 2012, MDFP obtained third party certification for forestry operations on FMU P20 and chain of custody under Sustainable Forestry Initiative (SFI) protocols. These programs assist in demonstrating MDFP's sustainable forest management practices.

Provincial Growth and Yield

Over the previous several years, ESRD and the forest products industry have been negotiating growth and yield issues at a provincial level. Part of these discussions is the rationalization of the companies' and government's Permanent Sample Plot programs. In anticipation of joining the provincial initiative, MDFP has suspended additional PSP measurements and revisions to their growth and yield program pending the outcome of the provincial growth and yield negotiations. Refer to Chapter 7 - FMP Implementation for more information.

Management of Deciduous Stands with Coniferous Understory

Management of deciduous stands with coniferous understory is a large issue in FMU P20. After considerable effort, strategies to manage this issue were developed and approved in the 2007-2017 FMP. However, additional concerns arose during implementation of the 2007-2017 FMP. To address these and other concerns in the 2012-2021 FMP, MDFP and DMI reached an agreement for the management of deciduous stands with coniferous understory. MDFP and DMI formalized this agreement in a Memorandum of Understanding (MOU) between the two companies and subsequently applied the MOU in the development of the 2012-2021 FMP. For more information refer to Chapter 6 - Preferred Forest Management Scenario and to Chapter 7 - FMP Implementation.

5. References

ESRD 2006. Alberta Forest Management Standard. Public Lands and Forests Division, Forest Management Branch Version 4.1 – April 2006. 110 pages.

The Forestry Corp. 2012. Mountain Pine Beetle Forecasting in the Northwest Region – Final Report. June 27, 2012. The Forestry Corp. 44 pages plus appendices.

Appendix I 2007-2017 FMP Approval Decision

Forest Management Plan Approval Decision for MDFP FMA #0200041, December 14, 2007.

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

Forest Management Plan Approval Decision

Manning Diversified Forest Products Ltd. Manning, Alberta

Forest Management Agreement # 0200041

Date: December 14, 2007
Effective: May 1, 2007

Approved by:

Original Signed By

D. (Doug) A. Sklar, RPF
Executive Director
Forest Management Branch
Forestry Division

Executive Summary

The Conditions herein are consistent with the terms of the Forest Management Agreement (FMA) and failure by Manning Diversified Forest Products (MDFP) to fulfill the direction provided in this Approval Decision will place the Company in default of its FMA.

The Forest Management Plan (FMP) has been validated[1] by a Regulated Forestry Professional (RFP). The department recognizes RFP-validated work as complete, accurate, and prepared with professional due diligence. The FMP has been reviewed and approved by government RFPs.

Approval Decision Conditions

Condition	***Requirement***	***Approval Authority***	***Date***
Approval Condition 6.1	*Public and First Nation Consultation*	*Senior Manager, Forest Planning Section*	*On-going*
Approval Condition 7.1(i)	*Timber Supply Analysis (TSA)*	*Senior Manager, Forest Planning Section*	*On-going*
Approval Condition 7.1 (ii)	*TSA Technical Issues*	*Senior Manager, Forest Planning Section*	*March 1, 2008*
Approval Condition 8.1	*Productive Land Base Losses*	*Senior Manager, Forest Planning Section*	*April 30, 2008*
Approval Condition 9.1	*Stand Level Structure Retention*	*Senior Manager, Forest Planning Section*	*On-going*
Approval Condition 10.1	*Pine Strategy Performance Monitoring and Reporting*	*Senior Manager, Forest Planning Section*	*On-going*
Approval Condition 12.1(i)	*Alternative Regeneration Strategy (ARS)*	*Senior Manager, Reforestation Section*	*February 1, 2008*
Approval Condition 12.1 (ii)	*ARS Implementation*	*Senior Manager, Reforestation Section*	*May 1 , 2010*
Approval Condition 14.1	*Spatial Harvest Sequence*	*Senior Manager, Forest Planning Section*	*On-going*
Approval Condition 15.1	*Growth and Yield*	*Senior Manager, Forest Planning Section*	*April 30, 2008*
Approval Condition 16.1	*Watershed Management*	*Senior Manager, Forest Planning Section*	*March12, 2017*
Approval Condition 17.1	*Performance Monitoring and Reporting*	*Senior Manager, Forest Planning Section*	*October 1, 2012*

[1] Refer to the Alberta Forest Management Planning Standard, Annex 2 for professional validation requirements.

Approved Annual Allowable Cuts

Refer to Tables 1 and 2, Historical Allocations and Approved Annual Allowable Cuts.
Refer to Tables 3 and 4, Quadrant Allowable Cuts.

Authorization

This FMP replaces the approved MDFP Preliminary Forest Management Plan dated May 17, 2004.

The Forest Management Plan 2007 – 2017 for the Manning Diversified Forest Products FMA area dated May 31, 2007 is approved subject to the Approval Conditions and the Annual Allowable Cuts presented in this Approval Decision.

The Annual Allowable Cuts are effective beginning May 1, 2007.

The next FMP is due by March 11, 2017.

Table of Contents

1.0 Introduction

Manning Diversified Forest Products (MDFP) prepared its forest management plan concurrent with the province developing the *Alberta Forest Management Planning Standard*. Consistent with the Standard, this FMP is a transition plan that spans the requirements of the *1998 Interim Forest Management Planning Manual* and the *Alberta Forest Management Planning Standard*. I appreciate the Company's cooperation in meeting the intent of the new Standard and recognize that the transition from one process to another added some complexity to the path originally embarked upon. The professionalism and diligent work of company staff to complete this plan is recognized and greatly appreciated.

The Conditions herein are consistent with the terms of the Forest Management Agreement (FMA) and failure by MDFP to fulfill the direction provided in this Approval Decision will place the Company in default of its FMA. The Conditions contained herein are non-negotiable.

The FMP has been validated[2] by a Regulated Forestry Professional (RFP). The department recognizes RFP-validated work as complete, accurate, and prepared with professional due diligence. The FMP has been reviewed and approved by government RFPs.

2.0 Forest Management Planning Area

The area under consideration is the Forest Management Agreement area of MDFP FMA #0200041 allocated to MDFP via legislative Order-in-Council (O.C. 28/2002), dated February 6, 2002.

The FMA is located in northwestern Alberta. The FMA falls predominantly within the Lower Boreal Highlands Natural Sub-region and to a lesser degree, the Central Mixedwood, Dry Mixedwood, and Upper Boreal Sub-regions. The forest management unit P16 is geographically separated into two management areas (formerly designated as FMU P6 (south portion), and FMU P9 (north portion)).

3.0 Background

The department approved MDFP's Preliminary Forest Management Plan on July 22, 2004. This FMP replaces the preliminary plan and introduces new information used in planning, implementing and monitoring forestry operations on the FMA. This Approval Decision represents the culmination of the department's appraisal process.

[2] Refer to the Alberta Forest Management Planning Standard, Annex 2 for professional validation requirements.

4.0 Approval Decision Scope

This Approval Decision relates to the MDFP FMP dated May 31, 2007. All timber operators within the FMA area (FMU P16) shall conduct their activities in accordance with the approved FMP and the conditions of this Approval Decision.

MDFP shall meet the requirements (dates and content) of the Approval Decision conditions unless the Executive Director, Forest Management Branch, agrees to alternate requirements in writing.

In this Approval Decision **bolded text** identifies specific timelines, requirements and the department manager responsible for the review. Non-bolded text provides the rationale for the condition and specific considerations to be addressed in meeting the condition.

In the event of an inconsistency between the FMP, the Approval Decision and existing, new or revised legislation or regulation, the legislation or regulation shall apply.

5.0 Forest Management Plan

The Approval Conditions contained herein direct MDFP to complete additional work to enhance the information presented and to further align the FMP with the *Alberta Forest Management Planning Standard*. At the completion of this work, the FMP shall be amended to reflect the changes and additions.

The department posts approved FMPs on its website for enhanced public access to plans. This does not release MDFP from its obligations for making the FMP available to the public.

6.0 Public and First Nations Consultation

MDFP took a different approach to public consultation than is commonly practiced by FMA holders. The Company does not have a Public Forest Advisory Committee but relies on one-on-one meetings and larger group meetings where individuals receive an invitation to participate. Although not a standard practice in the industry, this approach worked well for the company and achieved the results expected by the department for public consultation.

Regardless of the process used, opportunities for meaningful public involvement must be made available. Meaningful public involvement is characterized by sincere efforts to explain the issues and seek practical and sensible solutions to issues. The objective is to ensure that those who are interested and/or affected are able to become informed of the planned activities, may express their concerns, and receive an answer that explains how their concerns are addressed, or if not addressed, why.

The department acknowledged that there were no first nations residing in the FMA area and advised MDFP to not include aboriginal consultation in its plans for public involvement. This

direction was appropriate at the time and the department has not received any comments or recognized any first nations issues to date in this area.

Considering this, the following applies:

Approval Condition 6.1 – Public and First Nations Consultation

i. **In the event that new information is provided to SRD indicating a need for First Nations consultation, MDFP will be required to develop a consultation plan for that purpose.**

ii. **MDFP shall keep written documentation of all issues and comments raised by the public as well as the company's responses to address the concerns.**

7.0 Timber Supply Analysis

MDFP proposes an increase from the historic coniferous and deciduous timber supplies. The increases are attributed to several key inputs that have been updated for this FMP. Namely, a new net landbase, a new Alberta Vegetation Inventory, management of the coniferous understorey, and developing a Pine Strategy for mountain pine beetle susceptibility reduction. The timber supply is reasonable and fully supported by the information provided. The department has approved similar harvest level changes in FMPs as updated data and new management strategies are incorporated into FMPs.

Of note is the significant decrease in the contribution of the D/u(a) stratum to the timber supply decreases after 20 years. The current harvest level for this stratum must be re-assessed in future FMPs, but it is appropriate to utilize this fibre now. In addition, a large proportion of the deciduous harvest results from secondary species on the coniferous landbase. Secondary species volumes have traditionally been difficult to manage and therefore operators must be vigilant to maintain consistent flows while staying within the approved harvest levels.

For completeness, some additional technical data and descriptions are required. These will have no measurable impact on the harvest levels or forest sustainability but will make the document more complete. The department will provide these under separate cover.

The following applies:

Approval Condition 7.1 – Timber Supply Analysis

i. **As a priority, MDFP and Daishowa-Marubeni International shall jointly manage the flow and utilization of secondary coniferous and deciduous timber volumes produced from each company's operations. Annual Operating Plans and General Development Plans shall demonstrate that full utilization of secondary species volumes is addressed.**

ii. **By March 1, 2008, MDFP shall develop an action plan to address the technical issues presented in the Timber Supply Analysis review comments. The action plan shall be acceptable to the Senior Manager, Forest Planning Section.**

8.0 Productive Land Base Losses

MDFP does not present its methodology to gather data and assess the success of reforestation on roads and timber decking areas. Without measuring the impacts of roads and decking areas, the forest manager cannot effectively manage for, or be certain forest productivity is maintained.

The monitoring and reporting program, as discussed in section 8.0 above, shall be incorporated into the Growth and Yield Plan and be submitted no later than April 30, 2008 (see approval condition 8.1).

The MDFP Regulated Forestry Professional (RFP) validated checklist describes the FMP's compliance with the Forest Management Planning Standard (FMPS). It is a compilation of the standards from the FMPS and demonstrates the accountable RFP's due diligence in meeting each standard. The validated checklist is intended to guide the department's appraisal of the adequacy of the submitted FMP. During its review, Alberta noted that standard 5.9.9 (i) was not met whereas the checklist indicates it was. The department holds accountable the RFP's validating the work. RFP validation provides assurance to Alberta that the work is complete and accurate and has been prepared with due diligence.

Approval Condition 8.1 - Productive Land Base Losses

i. **By April 30, 2008, MDFP shall develop a monitoring and reporting program to quantify productive forest land base losses due to roads and decking areas. The program must be, acceptable to the Senior Manager, Forest Planning Section and incorporated into the Growth and Yield Plan. Failure to meet this deadline will result in a reduction of the FMA AAC by 5% effective May 1, 2007 (see Table 3).**

9.0 Stand Level Structure Retention

Throughout the province, forest industries practice green tree retention within harvested areas to create residual stand structure. A variety of approaches and retention targets have been approved in FMPs with the view that the result will be a range of forest conditions that when assessed will enable a refinement of future targets. MDFP proposes a target of 6% that is the sum of *"a minimum of 3% merchantable + a maximum of 3% non-merchantable"*.

The strategy applies to all operators on the FMA and I support the single integrated approach by the coniferous and deciduous operators for both implementation and monitoring.

I agree with this reasonable and practical approach to stand level structure retention and encourage the companies to continue to investigate their options for achieving the desired result while reducing the associated costs.

The following applies:

Approval Condition 9.1 – Stand Level Structure Retention

i. **All operators on the FMA will plan and carry out their operations to achieve the FMP structure retention target for coniferous and deciduous land base. Species composition and timber profile of the original stand conditions shall be retained for the merchantable component to achieve acceptable biodiversity results.**

ii. **Merchantable volume retained for structure is chargeable as AAC production and shall be reconciled every five years at the end of each cut control period.**

10.0 Forest Health

Alberta is experiencing a significant outbreak of mountain pine beetle (MPB) and is implementing control strategies with respect to this outbreak and strategies to prevent future outbreaks[3]. MPB and Spruce Beetle are noted as the most important forest health issues on the FMA area. MDFP has sequenced the four MPB priority areas to target the highest ranked stands in response to SRD requirements.[4].

It is important to note that the implementation of this plan is not intended to control the current MPB outbreak but rather to take actions over the next twenty years to create a forest that is more resistant to such outbreaks by dramatically reducing overall susceptibility of the pine forest (Pine Strategy). This is a prudent and necessary strategy to avoid the types of catastrophic changes being seen in British Columbia's pine forests, if the extent of the current outbreak is limited. However, if the current outbreak in Alberta expands as rapidly as the British Columbia outbreak, the strategies in this plan will have to be modified to address that reality.

Alberta's goal is to mitigate the effects of MPB on the social, environmental, and economic values of Alberta's forests. To achieve this goal, Alberta must make trade-offs which involve achieving a desired result, generally at the complete or partial expense of something else. Stakeholders are often interested in only one value and are not prepared to consider trade-offs; whereas Alberta must make trade-off decisions in order to reasonably meet its goal for the overall benefit of Alberta.

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[3] See the *Mountain Pine Beetle Action Plan for Alberta* (AP) and the Interpretive Bulletin *Planning Mountain Pine Beetle Response Operations* (IP) on the Department of Sustainable Resource Development website http://www.srd.alberta.ca/forests/managing/manuals

[4] See the Interpretive Bulletin *Planning Mountain Beetle Response Operations* on SRD website. http://www.srd.alberta.ca/forests/managing/manuals

It is crucial to take all appropriate steps to limit the extent of the current outbreak which means that execution of control activities (Level 1 and Level 2[5]) takes priority over the spatial sequence. It is most likely that activities over the next few years will be a combination of control and prevention, and changes to the sequence necessary to do both will be handled through the annual operating plan.

Approval Condition 10.1 – Pine Strategy Performance Monitoring and Reporting

The effective implementation of the Pine Strategy throughout Alberta is very important and timely information is vital to ensuring the best decisions are made and the most appropriate management strategies are developed. Considering this, the department will require Pine Strategy progress reports to be prepared to keep the department, other agencies and the public knowledgeable and current on the work completed. The department will publish these requirements at a later date.

i. **MDFP will prepare summary reports on the FMP implementation, from time to time, at the department's request.**

11.0 Silviculture Strategy

Defining the silviculture practices that will be used to establish managed stands is important. FMPs must present the reforestation strategies to be used to achieve the projected timber yields from the regenerated stands. The knowledge, expertise and experience of forestry professionals are relied on for selecting silvicultural practices appropriate for the local range of conditions.

The companies have agreed to jointly access the coniferous D/u(a) landbase (see FMP TSA Section 6.1.3, p 52) to more fully utilize the deciduous fibre and manage each company's reforestation liabilities. The success of the D/u (a) strategy (including reforestation to the DC standard, coniferous understorey protection techniques, and the maintenance of incidental timber volumes) will be assessed for its continued use in future FMPs.

A reforestation monitoring program will be developed as part of the Alternative Regeneration Strategy (see Approval Condition 12.1) to ensure that volume commitments including incidental volumes will be met.

12.0 Alternative Regeneration Strategy

The department requires that all FMA holders implement alternative regeneration strategies (ARS) by May 1, 2010. MDFP is not currently working on ARS. ARS will benefit the company by increasing regeneration survey efficiency, realizing AAC gains through effective management treatments, and validating timber supply analysis assumptions and projections.
The following applies:

[5] See AP for definitions

Approval Condition 12.1 – Alternative Regeneration Strategy

i. **By February 1, 2008, MDFP shall meet with the Senior Manager, Reforestation Section to discuss its plans for initiating ARS for the FMA.**

ii. **By May 1, 2010, MDFP shall implement an ARS on the FMA to the satisfaction of the Senior Manager, Reforestation Section.**

13.0 Caribou Habitat Supply

The FMP maintains and manages caribou habitat within the caribou zone and through vegetation management strategies outside the zone to augment the available habitat. Forest management is a practical tool to create landscape conditions suitable for a variety of species. Rational designs, responsive timing and well implemented operations contribute to the effective management of wildlife habitat.

The FMP has addressed the planning aspects of caribou habitat management in a practical and feasible way. The company is well advised to follow the discussions of the future Chinchaga Caribou Landscape Team. The outcomes from this team will have implications for forestry operations on the FMA and for future forest management planning.

14.0 Spatial Harvest Sequence

The spatial (mapped) harvest sequence (SHS) is the most important output of the FMP as it implements the strategies the companies must follow to achieve the predicted future forest condition. While dependent on many factors, the future forest condition is strongly influenced by harvest patterns, intensity and schedules. It presents spatially and temporally how the integration of environmental, economic, and social values will be achieved on the FMA. Adherence to a properly planned harvest sequence is imperative to achieving the forecasted future forest. The department recognizes that changes to the SHS will be required to manage future mountain pine beetle infestations as they are found. MDFP commits to following the SHS and tracking variance.

The following is required:

Approval Condition 14.1 – Spatial Harvest Sequence

i. **MDFP shall follow the mapped 20-year harvest sequence as presented in the FMP.**

ii. **To address operational planning concerns, all timber disposition holders are authorized to modify the SHS by deleting no more than 20% of the total sequenced area in each compartment by decade, while harvesting no more than 100% of the total area within the SHS by compartment, by decade.**

a. **Preference should be given to selecting stands from the second 10-year period of the SHS (years 2017-2027) when replacing deleted stands (from ii above). Where this is not feasible, replacements may be from any other stands identified in the approved net landbase of the FMP, with priority given to pine stands that are ranked highly susceptible to MPB infestations.**

iii. **Where timber operators exceed the variance described in (ii), the Area Manager, may require the completion of a compartment assessment and the Senior Manager, Forest Planning Section may recommend the adjustment of the approved annual allowable cut (AAC) to reflect the impact of the variance.**

iv. **The department requires the variance from the SHS to be reported annually, and the 5-year Stewardship Report to analyze the variance from the SHS.**

v. **The department will generally not request a modification of the approved harvest sequence for the first 15 years of the planning period unless required by a change in legislation or a policy approved by the Minister.**

15.0 Growth and Yield

A credible Growth and Yield Program gathers key information to use in future timber supply analyses and monitors and verifies FMP timber yield assumptions. The Growth and Yield Plan of the 2007-2017 Forest Management Plan indicates that the PSP field manual is being revised to reflect the data collection protocols and will be submitted for Department approval.

Approval Condition 15.1 – Growth and Yield Plan

i. **By April 30, 2008, MDFP shall submit the revised manual to the Department.**

16.0 Watershed Management

Water management and the provision of continuous supplies of high quality water is a priority for the Government of Alberta and a significant value for Albertans. Forest managers must assess the impacts their plans will have on water and mitigate the long-term impacts. **MDFP completed a watershed assessment on a selected set of watersheds in the Forest Management Agreement Area.**

Approval Condition 16.1 – Watershed Management

i. **The next FMP (due 2017) MDFP shall revisit the SHS in the next FMP with consideration for reducing long-term impacts to watersheds and stream morphology.**

17.0 Performance Monitoring and Reporting

Annual reports and 5-year Stewardship reports are used to monitor the successful implementation of FMPs.

Approval Condition 17.1 – Performance Monitoring and Reporting

i. **MDFP shall submit Annual Reports and Stewardship Reports that document the operational performance of the Company's activities in implementing the FMP. Where variances from the planned outcomes exist, an analysis shall discuss the reason for the variance and the Company's corrective action taken or proposed.**

ii. **A Stewardship Report acceptable to the Senior Manager, Forest Planning Section shall be submitted by October 1, 2012.**

18.0 Approved Annual Allowable Cuts

Refer to Tables 1 and 2, Historical Allocations and Approved Annual Allowable Cuts.
Refer to Tables 3 and 4, Quadrant Allowable Cuts.

19.0 Authorization

This FMP replaces the approved MDFP Preliminary Forest Management Plan dated May 17, 2004.

The Forest Management Plan 2007 – 2017 for the Manning Diversified Forest Products FMA area dated May 31, 2007 is approved subject to the Approval Conditions and the Annual Allowable Cuts presented in this Approval Decision.

The Annual Allowable Cuts are effective beginning May 1, 2007.

The next FMP is due by March 11, 2017.

Table 1.0 FMU P16 Historical Allocations and Annual Allowable Cuts
Effective Date of AACs – May 1, 2002

Company Name	Disposition #	FMU	Utilization	Coniferous AAC (m^3)		Deciduous AAC (m^3)			Total AAC (m^3)	
				Primary	Secondary	Primary	Secondary		Coniferous	Deciduous
Manning Diversified Forest Products Ltd.	FMA0200041	P16	15/11	196,897	14,404				211,301	
Daishowa-Marubeni International Ltd.	DTAP 160001	P16	15/10			129,849		42,692		172,541

Table 2.0 FMU P16 Allocations and Approved Annual Allowable Cuts
Effective Date – May 1, 2007

Company Name	Disposition #	FMU	Utilization	Coniferous AAC (m^3)		Deciduous AAC (m^3)			Total AAC (m^3)		Annual Allowable Cut with 5% Reduction Applied (m^3)[2]	
				Primary	Secondary	Primary	Secondary		Coniferous Dispositions	Deciduous[1] Dispositions	Coniferous Dispositions	Deciduous[1] Dispositions
							D/u(a)[1]	Other				
Manning Diversified Forest Products Ltd.	FMA0200041	P16	15/11	301,817	12,736				314,553		298,825	
Daishowa-Marubeni International Ltd.	DTAP 160001	P16	15/10			73,619	26,081	72,841		172,541		163,914
Unallocated	n/a	P16	15/10				80,376	0		80,376		76,357
FMU Total	n/a	P16	n/a	301,817	12,736	73,619	106,457	72,841	314,553	252,917	298,825	240,271

Notes:
[1] The current volume contributed by the D/u(a) landbase is not available after the first 20 years.
[2] The 5% AAC reduction will apply if approval condition 8.1"Productive Land Base Losses" is not addressed by April 30, 2008.

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Table 3.0 FMU P16 Periodic Allowable and Quadrant Cuts for 2004 to 2012

Company Name	Disposition Number	FMU	Periodic/Quadrant Cut Control Period	Approved Reconciliation Volume (m^3)	Primary Coniferous Periodic/ Quadrant Allowable Cut[1] (m^3)	Secondary Coniferous Periodic/ Quadrant Allowable Cut (m^3)	Primary Deciduous Periodic/ Quadrant Allowable Cut[1] (m^3)	Secondary Deciduous Periodic/ Quadrant Allowable Cut (m^3)	Total Periodic/ Quadrant Allowable Cut (m^3)	Comments
Manning Diversified Forest Products Ltd.	FMA0200041	P16	May 1, 2007 to April 30, 2012	-36,496	1,472,589	63,680	0	0	1,536,269	Assuming 5 yrs. x 301,817 m^3/yr primary coniferous at 15/11/30 cm - 36,496 m^3 primary coniferous overcut at 15/11/30 cm from 2002-2007. Assuming 5 yrs. x 12,736 m^3/yr secondary coniferous at 15/11/30 cm.
Daishowa-Marubeni International Ltd.	DTAP 160001	P16	May 1, 2004 to April 30, 2009	18,915	0	0	555,700	325,920	881,620	Assuming (3 yrs. (May 1, 2004 to Apr. 31, 2007) x 129,849 m^3/yr primary deciduous at 15/10/30 cm. + (2yrs. (May 1, 2007 to Apr. 30, 2009) x 73,619 m3/yr. primary deciduous at 15/10/30 cm + 18,915 m^3 primary deciduous AAC reconciliation volume at 15/10/30
Unallocated	n/a	P16	May 1, 2007 to April 30, 2012	0	0	0	0	401,880	401,880	Assuming 5 yrs. (May 1, 2007 to April 30, 2012) at 80,376 m^3 secondary deciduous at 15/10/30 cm.

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Table 4.0 FMU P16 Periodic Allowable and Quadrant Cuts For 2007 to 2017

Company Name	Disposition Number	FMU	Periodic/Quadrant Cut Control Period	Primary Coniferous Periodic/ Quadrant Allowable Cut (m^3)	Secondary Coniferous Periodic/ Quadrant Allowable Cut (m^3)	Primary Deciduous Periodic/ Quadrant Allowable Cut (m^3)	Secondary[1] Deciduous Periodic/ Quadrant Allowable Cut (m^3)	Total Periodic/ Quadrant Allowable Cut (m^3)	Comments
Manning Diversified Forest Products Ltd.	FMA0200041	P16	May 1, 2012 to April 30, 2017	1,509,085	63,680	0	0	1,572,765	Assuming 5 yrs. (May 1, 2012 to April 30, 2017) x 301,817 m^3 primary coniferous at 15/11/30 cm. Assuming 5 yrs. x 12,736 m^3 secondary coniferous at 15/11/30 cm.
Daishowa-Marubeni International Ltd.	DTAP 160001	P16	May 1, 2009 to April 30, 2014	0	0	368,095	494,610	862,705	Assuming 5 yrs. (May 1, 2009 to April 30, 2014) x 73,619 m^3/yr. primary deciduous at 15/10/30 cm and 98,922 m^3/yr. secondary deciduous at 15/10/30 cm.
Unallocated	n/a	P16	May 1, 2007 to April 30, 2012	0	0	0	401,880	401,880	Assuming 5 yrs. (May 1, 2012 to April 30, 2017) x 80,376 m^3/yr. secondary deciduous at 15/10/30 cm.

Note: [1] The current volume contributed by the D/u(a) landbase is not available after the first 20 years.

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Appendix II ESRD Stewardship Report Letter

Letter from ESRD acknowledging receipt of MDFP's 2007-2012 Stewardship Report

Alberta Environment and Sustainable Resource Development

Forestry Division
Forest Management Branch
7th Floor, Great West Life Building
9920 – 108 Street
Edmonton, Alberta T5K 2M4
Telephone: 780-427-8474
www.alberta.ca

File: 06302-F02-04

December 17, 2012

Mr. Steve Blanton
Woodlands Manager
Manning Diversified Forest Products Ltd.
Box 370
Manning, AB T0H 2M0

Dear Mr. Blanton:

Subject: **Manning Diversified Forest Products Ltd.**
STEWARDSHIP REPORT FOR FMA0200041

We were pleased to receive Manning Diversified Forest Products Ltd. (MDFP) 2007-2011 Stewardship Report.

Your efforts to provide a reasonably complete and timely submission are appreciated. The Report provides excellent evidence of MDFP's commitment to sustainable forest management, by tracking progress toward achieving Forest Management Plan targets and explaining variances.

We are currently reviewing our Stewardship Monitoring and Reporting program and may require information in addition to that published in your report. We will keep you informed as we proceed with our work.

Please contact Brendan Hemens at (780) 643-6778 with any questions.

Sincerely,

Robert W. Stokes, RPF
Senior Manager, Forest Planning Section

c: Shawn Barraclough, Forestry Program Manager, Peace Area
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Appendix III Glossary of Terms and Initialisms

Glossary Term		Definition
Above Mean Sea Level	AMSL	A measure of topographic elevation.
Active landbase		Areas that are available for forest management activities. That component of the physical landbase that is not deleted in the landbase netdown process. Consists of the combined coniferous and deciduous landbases. Also referred to as the timber harvesting landbase, net landbase, managed landbase or contributing landbase.
Adaptive management		A process for continually improving of planning, implementing, and monitoring policies and practices by learning from the outcomes of previously employed policies and practices, and taking corrective actions where unplanned results occur.
Alberta Environment and Sustainable Resource Development	ESRD	Government of Alberta ministry responsible for regulating FMAs.
Alberta Regeneration Information System	ARIS	A Provincial database of silviculture treatments applied to harvested lands. Updated annually by permit and license holders. Considered to be the defacto record of treatment history and block status.
Alberta Biodiversity Monitoring Institute	ABMI	A province-wide monitoring program that collects information on about 2000 species through site visits, aerial photography and satellite imagery. ABMI provides information on the state of Alberta's biodiversity to facilitate management.
Annual Allowable Cut	AAC	The volume of timber permitted to be harvested in any one year, as stipulated in the pertinent approved FMP. In Alberta, the AAC is the quadrant cut divided by the number of years in that quadrant (usually five).
ARC Macro Language	AML	A third-generation (non-compiled) scripting language, propriety to ESRI. AML is a legacy language used commonly in early versions of ESRI software. While primarily a legacy product, it is still used for developing processes that need to run unattended.
Alberta Vegetation Inventory	AVI	The provincial standard for forest inventory information (classification and data storage).
AVI polygon		A polygon delineated based on aerial photography using AVI rules (AFLW 1991, Nesby 1997). For vegetated areas, areas must be sufficiently similar in terms of structure, moisture regime, crown closure, height, species composition and origin year to be considered a single unit or a polygon. Non-vegetated areas must have a similar nonvegetated classification.
Base natural yield curve		The "standard" set of yield curves developed for yield strata, representing the main stand types within the FMA area. Base yield curves may or may not be used to represent these stand types in the final timber supply analysis.
Biological diversity (biodiversity)		The variety, distribution, and abundance of different plants, animals, and microorganisms, the ecological functions and processes they perform, and the genetic diversity they contain at local, regional, or landscape levels of analysis.
Broad Cover Group	BCG	A classification of forest types based on coniferous and deciduous components of the AVI species composition. The broad cover groups are coniferous (C), coniferous-leading mixedwood (CD), deciduous-leading mixedwood (DC) and deciduous (D).
BCG: Pure Deciduous	D	Deciduous ≥ 80%
BCG: Deciduous-Coniferous	DC	Coniferous > 20% and Deciduous > 20%
BCG: Conifer-Deciduous	CD	Coniferous > 20% and Deciduous > 20%
BCG: Pure Coniferous	C	Coniferous ≥ 80%
Buffer		Used in several contexts: (1) In protecting critical habitat areas, the buffer is an area of forest land that reduces the impacts of adjacent activities on the critical area. (2) A strip of land between two areas under different management regimes. (3) An area maintained around a sample or experimental plot to ensure that the latter is not affected by any treatment applied to the area beyond the buffer. (4) In GIS work, a new polygon zone computed on distance from a point, line or existing polygon.
Canadian Standard Association	CSA	Not-for-profit standards organization that is composed of representatives from industry, government, and consumer groups and which develops standards in 57 areas.
Caribou		Boreal woodland caribou can be found in forested areas across Canada. In Alberta there are two varieties of woodland caribou – the mountain caribou in foothills and mountains of west-central Alberta, and the boreal caribou in northern Alberta. Woodland caribou are listed as threatened under the Alberta Wildlife Act and federally under the Species at Risk Act (SARA).
Caribou, habitat contols		Rules/constrains applied in a hierarchical forest modeling process with considerations across various spatial and temporal scales to enhance the caribou habitat. The main controls were: (1) 30/20 rule – in the deciduous and mixedwood stratum, a maximum of 20% is allowed to be under 30 years old; (2) Patch target – a patch target that tended towards patches (under 30 years old) larger than 300 ha.
Caribou, provincial zone		Provincially-approved caribou land-use referral map layers that are inteded to alert planners when harvest plans fall in or near these special land management areas and aim to reduce the industrial footprint and impacts on caribou.

Glossary Term		Definition
Classified landbase		A spatial landbase and attribute classification generated as the second stage of the TSA process. Used to calculate the area and distribution of all features on the landscape, particularly to generate summaries of seismic detail and carry this into the modeling landbase.
Clearcutting		A regeneration system where all or most of the merchantable trees in a defined area are harvested in one cutting with reproduction obtained through artificial or natural means.
Committee on the Status of Endangered Wildlife in Canada	COSEWIC	Harvested in one cutting with reproduction obtained through artificial or natural means.
Compartment		A subsection of a Forest Management Agreement (FMA) for which operational plans are developed.
Compartment, working circles		A subsection of an FMA defined by the Manning Diversified Forest Products Ltd.
Combined Heat and Power	CHP	The simultaneous production of electricity and heat from a single fuel source
Composite yield curve		Area-weighted composite yield curves developed from empirically-fit natural stand yield curves; generally by BCG or groupings thereof.
Coniferous Timber Quota	CTQ	One of two types of volume-based long-term forest tenures (also deciduous timber allocation) for harvesting a set proportion of the coniferous AAC volume within a defined area, usually for a period of 20 years.
Connectivity, landscape		A measure of how well different areas (patches or a landscape) are connected by linkages, such as habitat patches, single or multiple corridors, or "stepping stones" of vegetation. Landscape connectivity can be defined as the degree to which the landscape facilitates movement between resources patches.
Corrective actions		May include one or more of the following: - Address a nonconformity in a management system by identifying and eliminating the causes of a problem; - Carry-out an appropriate enforcement response; - Direct that the work to be corrected and re-submitted.
Corridor		A physical linkage connecting two areas of habitat and differing from the habitat on either side. Corridors are used by organisms to move around without having to leave the preferred habitat. A linear habitat patch through which a species must travel to reach habitat more suitable for reproduction and other life sustaining needs. Many corridors, linking several patches of habitat, form a network of habitats.
Cull deductions		Trees or portions thereof that are merchantable, but are removed because of defect.
Culmination age		The age at which the stand, for the stated diameter limit and utilization standard, achieves its maximum average rate of volume production (the Mean Annual Increment (MAI) is maximized).
Cutblock		A specified area that is either designated for harvest or has already been harvested.
Daily mean temperature		Derived on a daily basis from daily minimum and daily maximum temperatures. Daily minimums and maximums are recorded over 24 hour periods that begin and end in the morning. These values are then averaged for the entire month, over the reporting period (generally 30 years, from 1961- 1990).
Daishowa Marubeni International Ltd.	DMI	A neighbouring FMA holder and license holder inside the MDFP FMA area.
Defined Forest Area	DFA	Area of forest, including land and water (regardless of ownership or tenure), to which the requirements of the FMA apply.
Defining layer		Inventory layer used to assign strata. The defining layer may be the overstory or the understory.
Deletions		All areas excluded from the active landbase and assigned a code identifying the reason for deletion.
Digitally Integrated Disposition system	DIDs	A Provincial database and system of specific land use disposition types submitted for approval. The DIDs spatial data are managed and distributed by Alberta Public Lands.
Disturbance patch		Disturbance patches are used to describe the patch sizes of any part of the active landbase that is less than 20 years old, regardless of strata.
Deciduous Timber Allocation	DTA	One of two types of volume-based long-term forest tenures (also see coniferous timber quota) for harvesting a set proportion of the deciduous AAC volume within a defined area, usually for a period of 20 years.
Environmental Systems Research Institute ™	ESRI	The developer of the suite of geographic information system software products commonly known as ArcInfo, ArcMap, ArcView, Spatial Analyst and others.
Environment and Sustainable Resource Development	ESRD	Alberta Environment and Sustainable Resource Development is a ministry of the Government of Alberta that brings together the former departments of Environment and Water and Sustainable Resource Development.
FireSmart		The philosophy that seeks to mitigate the likelihood of large, high intensity and severity fires.
FireSmart community zone		A standard ten kilometre radius around the community extending from the Wildland Urban Interface Zone. A unique data set will be gathered for this zone for community protection planning to provide a fundamental linkage between FireSmart Communities and FireSmart Landscapes.
FireSmart landscapes		FireSmart landscapes are designed to recognize the interaction between ecological, economic, and social impacts, thus, maximize the positive ecological impacts and minimize the negative economic and social impacts.
FireSmart landscape zone		The zone that extends beyond the FireSmart Community Zone overlapping multiple jurisdictions at a broad landscape level. This zone focuses on mitigating the likelihood of large, high intensity, high severity fires. Fire, Forest and Land Management planning are integrated and designed to reduce the negative ecological, economic, and social impacts of wildfire while maximizing the positive attributes of wildfire.
Forecasting		See Timber Supply Analysis.
Forest Management Agreement	FMA	Contract between the Province of Alberta and the FMA holder whereby the Province provides an area-based Crown timber supply. In return, the FMA holder commits to: managing the timber resource on a perpetual sustained yield basis, taking into consideration a broad range of forest values in determining forest management practices; and meeting defined economic objectives, including capital investments and job creation, and seeking out new business opportunities that provide measurable economic benefits for both the Province and the FMA holder. The FMA gives the FMA holder the right to access Crown fibre. In return, the FMA holder commits to forest management responsibilities, which may change from time to time (Alberta SRD 2006).

Glossary Term		Definition
Forest Management Plan	FMP	A document prepared by the FMA holder that describes the spatial and temporal harvest plan and forest harvest operations on Crown lands over a 10-year planning horizon (in Alberta). The document provides detailed methods, schedules, and responsibilities of the FMA holder in terms of accessing, harvesting, renewing and protecting the resource to enable site-specific operations to proceed. The document must be approved by the Government of Alberta, with input from stakeholders.
Forest Management Unit	FMU	An administrative unit of forest land designated by the Minister, as authorized under Section 14(1) of the Forests Act.
Forest patch		A stand of forest in the same seral stage that is not split by a linear feature greater than 8 m wide.
Forests Act, the		The legislative statute that authorizes the Minister to administer and manage the forested lands of Alberta.
Fully stocked		All potential growing space that is effectively occupied by merchantable tree species.
GEO	GEO	ESRI notation to for data stored in coordinates representing latitude and longitude.
Geographic Information System	GIS	A collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.
Green-up period		The time needed to re-establish vegetation after a disturbance. Specific green-up periods may be established to satisfy visual objectives or hydrological requirements, or as a means of ensuring re-establishment of vegetation (for silviculture, wildlife habitat or hydrological reasons) before adjacent stands can be harvested.
Gross volume		A term applied to tree-level, plot-level or stand-level volumes (*e.g.,* gross total tree volume, gross merchantable tree volume, gross total plot volume, gross merchantable plot volume, gross total stand volume, gross merchantable stand volume) that Indicates no defect/cull deduction has been applied.
Growing Degree Day	GDD	The sum of mean daily temperature above a baseline temperature (i.e. 5 degrees Celsius). Daily values are accumulated over the growing to determine annual values.
Growing stock		The sum (by number, basal area or volume) of trees in a forest or a specified part of it.
Harvest area		A specified land area with defined boundaries where timber harvesting is scheduled, or has occurred (commonly referred to as a cut block).
Industrial Sample Plot	ISP	A forest plot used to monitor the natural growth and yield of trees.
Influential point		An extreme data point that negatively influences model performance, resulting in failure to converge or an unacceptable curve shape.
Input datasets		Datasets received for the purpose of completing the landbase netdown. These frequently require processing to convert or add attributes, assign/add projection information, or combine with other inputs that represent the same features.
Landbase		A result of a classification process used to identify and determine areas available and suiatble for timber harvesting activities.
Landbase, active (also referred to as net, or managed, or contributing)		The landbase available for timber harvest and that comprises the net productive coniferous and net productive deciduous land bases. The active landbase is further classified into either conifer or deciduous landbase depending on species composition.
Landbase, passive (also referred to as non-		The landbase that is not part of the net productive coniferous or deciduous landbases
Landbase polygon		A polygon within the (classified, TSA, or modeling) landbase derived during spatial processing to incorporate various spatial layers and attributes of interest.
Managed landbase		That portion of the net landbase which is considered "managed" in the respect that the land received a harvest treatment and subsequent silviculture treatments. Note that AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any records of reforestation are not considered 'managed'.
Managed stand		Stand that is initiated by anthropogenic disturbance such as harvesting.
Managed stand yield curve		Yield curves generally created by applying regeneration lags to base natural yield curves with cull. Regeneration lags varied depending on whether cutblocks were harvested prior to or after 1993. Thus both Pre93 and Post93 managed managed stand yield curves developed.
Manning Diversified Forest Products Ltd.	MDFP	The forest products company in Alberta responsible for this FMP.
Mean Annual Increment	MAI	Average annual increase in volume of individual trees or stands up to the specified point in time. The MAI changes with different growth phases in the life of a tree, being highest in the middle years and then slowly decreasing with age. The point at which MAI peaks is commonly used to identify the biological maturity of the stand and its readiness for harvesting (Alberta SRD 2006).
Metadata		Data that describes the content, quality, conditions, use limitations and other characteristics of a dataset and which also documents bibliographic records including but not limited to information such as who collected the data, when and how it was collected, preprocessed and converted, its resolution and who presently holds the data. In summary, metadata is information about a thing, apart from the thing itself.
Merchantable volume, stand		Merchantable tree volume summed to represent volume on a per hectare basis.
Merchantable volume, tree		A tree-level term; the volume of those portions of a tree bole that meet utilization requirements (stump height, top and bottom diameter limits and log length).
Modeling landbase		A tabular and spatial landbase. Tabular data make the landbase suitable for both strategic and operational timber supply modeling. The spatial component is used for harvest scheduling.
Modeling tool, Patchworks©		A spatially-explicit wood supply planning and modeling tool developed by Spatial Planning Systems that was designed to provide the user with operational-scale decision-making capacity within a strategic analytical environment.
Modeling tool, Woodstock©		A non-spatial forest modeling tool developed by Remsoft used for harvest scheduling, wood supply analysis, wildlife management and simulation of forest ecosystems to test and compare different management assumptions.

Glossary Term		Definition
Mountain Pine Beetle	MPB	A defoliator insect species (*Dendroctonus ponderosae*) endemic to western North America that infects pine trees during its life cycle and results in tree mortality.
Natural stand		Stands developed under natural (non-anthropogenic) disturbance regimes. Stand initiation was due to natural disturbances, such as fire, pest or pathogen outbreak.
Natural stand empirical yield curve		Empirical yield curve fitted using data from all sampled natural stands within the active landbase.
Net volume		Timber volume that includes the main stem and excludes the stump, top and defective and decayed wood.
Non-linear regression		The practice of fitting a model where the dependent variable is a nonlinear function of one or more independent variables. One benefit of the nonlinear models is that they are often derived on the basis of physical and/or biological considerations.
North American Datum	NAD	A mathematical process of correcting geospatial locations relative to a fixed, known position.
Noxious weed		A plant designated under the Weed Regulation (AR 171/2001) of the Weed Control Act.
Observation		One plot measurement at a specific point in time. All TSPs have only one associated observation, whereas PSPs may have one or more observations (remeasured data) for a single plot.
Operating Ground Rules	OGR	Practices used in operational planning and for implementation of timber harvest operations.
Organic Rankine Cycle	ORC	Thermodynamic process where heat is transferred to a fluid at a constant pressure
Patch		A stand of forest in the same seral stage, and not split by a linear feature greater than 8m wide. Linear features in this definition include roads, pipelines, powerlines, and rivers, but do not include seismic lines.
Passive landbase		That part of the gross landbase that has a deletion and is excluded from the active landbase.
Permanent Sample Plot	PSP	A fixed or variable area plot established for (forest) sampling and measurement purposes, and designed for re-measurement.
Piece size		Number of trees required to obtain one cubic meter (m^3) of gross merchantable tree volume.
Plan Development Team	PDT	A group of individuals assembled for production of MDFP's Forest Management Plan that includes representatives from MDFP, DMI and Buchanan Lumber, Alberta Environment and Sustainable Resource Development, and FORCORP. The goal of the PDT is to provide a forum for facilitating efficient and productive communication and decision making.
Plot		Unit of area, within which variables of interest are assessed.
Plot volume		Gross merchantable tree volume within a plot on a per hectare basis (m^3/ha).
Polygon		A closed geometric entity used to spatially represent area features with associated attributes.
Post93 managed stand yield curve		A managed stand yield curve with a 2-year regeneration lag applied to the coniferous landbase and a 0-year regeneration lag applied to the deciduous landbase.
Pre93 managed stand yield curve		A managed stand yield curve with a 5-year regeneration lag applied to the coniferous landbase and a 2-year regeneration lag applied to the deciduous landbase.
Preferred Forest Management Scenario	PFMS	The forest management scenario that represents MDFP's preferred strategies and activities for managing the FMA area over a 200-year planning horizon.
Prescribed burn		The planned use of carefully controlled fire to accomplish various predetermined management goals: site preparation for planting; reduction of fire hazards or pest problems; improvement of the ease with which the site can be traversed; and creation of better quality browse for wildlife.
Regeneration		The renewal of a tree crop by natural or artificial means. It may also refer to the young crop itself.
Regeneration lag		The period of time between harvest and establishment of the regenerated stand.
Rotation		The period of years required to establish and grow even-aged timber crops to a specified condition of maturity.
Sensitive sites		Sites that have soil, water, slope, aesthetic, vegetation or wildlife characteristics that require special protection beyond the normal precautions described in the ground rules.
Seral stage (SS)		Stages in forest succession that are characterized by plant community conditions. The seral stage definition in this document are based on age and strata classifications
SS: Mature	Mature	Stands that are old enough for harvesting. Age: 61-100 for D and DU; Age: 71-110 for DC and CD; Age: 71-120 for PL; Age: 106-160 for SB, and 106-150 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Old	Old	Stands that are starting to break up or become stagnant. Age ≥ 101 for D and DU; Age ≥ 111 for DC and CD; Age ≥ 121 for PL; Age ≥ 161 for SB; Age ≥ 151 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Regeneration	Regeneration	Stands that are in early stages of development. Age: 0-15 for all strata classes. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Young	Young	Stands that are vigorously growing but are not yet fully grown. Age: 16-60 for D and DU; Age: 16-70 for DC, CD, and PL; Age: 16-105 for SB and SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
Silviculture		The theory and practice of controlling the establishment, composition, health, structure and growth of forests in order to achieve specified management objectives.
Sliver		Generally small polygons created in the spatial analysis due to overlapping features that do not have coincident boundaries. Typically these are artifacts of spatial processing and generally do not represent true differences in polygon differentiation with respect to landbase classification.
Soil productivity		The capacity of soil to support plant growth.
Spatial Harvest Sequence	SHS	A stand level map depicting forest stands scheduled for timber harvesting that are feasible to be operated by the organization.
Special Management Zone		An area of varying size adjacent to an area in which special management measures are necessary to protect natural resources.
Species at risk		Any species known to be "at risk" after formal detailed status assessment and designation as "Endangered" or "Threatened" in Alberta. The list of species is maintained by Alberta.

Glossary Term		Definition
Species group		A single species code used to represent one or more AVI species. For example, the AW species group consists of AVI species A and Aw; and the LT species group consists of La, Lt and Lw.
Species type		There are two species types: deciduous and coniferous. Deciduous species include aspen, birch and poplar. Coniferous species include fir, pine, larch and spruce.
Stand		A community of trees sufficiently uniform in species, age, arrangement or condition as to be distinguishable as a group in the forest or other growth in the area. A stand may also be that polygon as defined in the AVI or Phase III inventory (Alberta SRD 2006).
Stand Susceptibility Index	SSI	An indicator of the potential loss in stand basal area or volume that could occur if mountain pine beetle infested a particular stand. A susceptibility index based on four variables: relative abundance of susceptible pine basal area in a given stand, age of dominant and co-dominant live pine, the density of the stand, and the location (latitude, longitude and elevation) of the stand.
Stand volume		Gross merchantable volume within a stand on a per hectare basis (m^3/ha); also known as gross merchantable stand volume.
Strata/Stratification		A classification scheme for defining data for use in management or modeling.
Structured Query Language	SQL	A formal computer language for querying relational database system tables. The language follows an ANSI compliant format and the core set of commands are part of a common language used across many database software programs.
Submission datasets		Datasets submitted to ESRD for approval.
Temporary Sample Plot	TSP	A fixed or variable area plot established for forest sampling and measurement; usually assessed only once.
Thinning, commercial		A partial cut where trees of a merchantable size and value are removed to provide an interim harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees. Used to capture volume likely to succumb to competition pressures and be lost to disease, insects, or dieback.
Thinning, pre-commercial		A silvicultural treatment to reduce tree density in young stands, carried out before the stems reach merchantable size. The intent is to concentrate the site's growth potential on fewer trees thereby accelerating stand development and reducing the time to final harvest, retaining more live crown, creating opportunities for future commercial thinning activities and improving stand operability.
Timber Harvest Planning and Operating Ground Rules		Standards for operational planning and field practices that must be measurable and auditable and based on forest management plan objectives.
Timber Management Regulation	TMR	The legislative statute that describes the mechanism and regulations by which the forested lands of Alberta are managed. The Regulation is associated with the Forests Act.
Timber operations		Includes all activities related to timber harvesting including site assessments, planning, road construction, harvesting, reclamation and reforestation.
Timber Supply Analysis	TSA	Harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees.
TSA landbase		A spatial landbase that carries all the information of the classified landbase, with the exception of the seismic line work.
Total stand volume		Used to capture volume likely to succumb to competition pressures and be lost to disease
Tree improvement		Insect, or dieback.
Tree improvement yield curve		A modified yield curve for the PL and SW yield strata, whereby the managed stand is adjusted such that volume increase (a fixed percent) occurs at approximately the average harvest age, but the maximum total volume across all ages is unaffected.
Understorey		The trees and other woody species growing under the canopies of larger adjacent trees and other woody growth.
Ungulate		A mammal with hooves.
Universal Transverse Mercator	UTM	A method of projecting spherical shapes on a flat plane. Typically this projection is used when the features need to have good area representation and the extent of the dataset does not cover more than one predefined UTM zone (three degrees of longitude).
Unmanaged landbase		That portion of the net landbase which is considered to be on a "natural" yield projection. All unharvested areas are considered 'unmanged'. AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any record of reforestation are also considered 'unmanaged'.
Values, Objectives, Indicators and Targets	VOIT	A framework of criteria and indicators to help track progress in achieving sustainable forest planning and management under sound environmental, economic, and social objectives.
Watercourse		The bed, bank or shore of a river, stream, creek, lake or other natural body of water, whether it contains or conveys water continuously or intermittently.
Watershed		An area of land, which may or may not be under forest cover, that drains water, organic matter, dissolved nutrients and sediments into a lake or stream. The topographic boundary, usually a height of land, that marks the dividing line from which surface streams flow in two different directions.
Wildlife		Any species of amphibian, bird, fish, mammal and reptile found in the wild, living unrestrained or free roaming and not domesticated. Some definitions include plants, fungi, algae and bacteria.
Wildlife Management Unit	WMU	Areas within province of Alberta managed by ESRD and regulated by the Alberta Wildlife Act (2012).
Years Before Present	YBP	A unit of measure of historical time.
Yield curve		Graphical representation of a predictive yield equation. One yield curve in fact consists of three curves: a conifer volume-age curve, a deciduous volume-age curve and a total volume-age curve.
Yield strata (YS)		A system of stratification applied to the forested landscape based upon FMU, and defining layer and/or understory layer attributes (BCG, crown closure class, leading conifer species). Yield strata form the basis for the development of yield curves; each yield stratum has one or more associated yield curves.

Glossary Term		Definition
YS: Deciduous	D	Species grouping defined as Deciduous
YS: Deciduous w/ Conifer Understory	DU	Species grouping defined as Deciduous with Coniferous Understory
YS: Mixedwood - Deciduous	DC	Species grouping defined as Mixedwood with Deciduous leading
YS: Mixedwood - Coniferous	CD	Species grouping defined as Mixedwood with Coniferous leading
YS: Coniferous - Pine leading	PL	Species grouping defined as Coniferous with Pine leading
YS: Coniferous - Black Spruce leading	SB	Species grouping defined as Coniferous with Black Spruce leading
YS: Coniferous - White Spruce leading	SW	Species grouping defined as Coniferous with White Spruce leading
YS: No Strata (cutblocks)	XCC	No Yield Strata assignment (cutblocks)
YS: No Strata	X	No Yiel+D21d Strata assignment

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MANNING DIVERSIFIED FOREST PRODUCTS LTD.

2012-2021 Forest Management Plan

Chapter 5 Values, Objectives, Indicators and Targets (VOITs)

June 30, 2013 (Draft)

October 1, 2013 (Approved)

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1. Introduction

1.1 Background

This chapter presents the performance standards for the 2012-2021 *Forest Management Plan*[1] (FMP) for *Manning Diversified Forest Products Ltd* (MDFP). Performance standards were used to develop the *Preferred Forest Management Scenario* (PFMS), while taking into account the natural processes which influence the landscape. Performance standards are applicable for plan implementation, monitoring and reporting.

Performance standards take form of *Values, Objectives, Indicators and Targets* (VOITs). The Alberta Forest Management Planning Standard version 4.1 (Planning Standard) contains the minimum VOITs required for Forest Management Plans in Alberta. However, the government has approved new policies since 2006 when the VOITS were created, and thus some of the VOITs are no longer in alignment with current policies. The *Plan Development Team* (PDT) recognized this and modified some of the VOITs for the 2012-2021 FMP. Changes from the Planning Standard are identified in this section.

All of the commitments in the 2012-2021 FMP, including monitoring and reporting commitments are identified in Chapter 7 FMP Implementation. These commitments include the reporting field as described in the detailed VOITs.

[1] Terms and initialisms that are defined in the Glossary (Appendix I) are shown in italics the first time they are presented in this document.

1.2 Development Approach

MDFP's approach to the development of VOITs for the 2012-2021 FMP was to use the PDT to review, modify and approve VOITs. Development of VOITs began at the first PDT meeting on June 28, 2010 and was completed on the 15th PDT meeting on October 31, 2011. MDFP's intent was to seek only minor changes from the provincial VOITs in the Planning Standard. The approach was to compare MDFP's 2007-2017 FMP VOITS with those in the Planning Standard and recommend changes to align with new policies and corporate direction. Recommended wording was discussed by the PDT and input from external ESRD staff was incorporated as appropriate. For VOITs dependent upon the PFMS, numerical values were added as a final step to produce the VOITs presented in this chapter. ESRD has replaced earlier initialisms in this chapter.

1.3 Agreement-In-Principle

The Terms of Reference for MDFP's 2012-2021 FMP identified Agreement-In-Principle for VOITs by ESRD as a milestone for FMP development. Individual VOITs were reviewed by the PDT and the VOIT agreed to as proposed wording was developed. Text for the final four VOITs was accepted by the PDT at the 15th PDT meeting on October 31, 2011.

2. VOIT Summary Table

Table 2-1 provides a summary of the 2012-2021 FMP VOITs. This table is provided as a reference, as each VOIT is more thoroughly described in Section 4.

VOIT 24 (3.1.1.1) revised October 1, 2013.

Table 2-1. VOIT Summary Table

ID	Objective	Indicator	Target	Means to Identify Target	Legal/Policy Requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Reporting	Acceptable Variance	Response
CCFM Criterion 1 - Biological Diversity										
CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.										
Value - 1.1.1 Landscape scale biodiversity.										
1	1.1.1.1 Maintain biodiversity by retaining the full range of cover types and seral stages.	Area of Old, Mature and Regenerating forest in the FMA area by Cover Class.	Over the 200-year planning horizon; a) Gross landbase: greater than 8% Old forest, greater than 40% Mature plus Old forest, less than 3% Regenerating forest; and b) Net landbase: greater than 14% Old forest, greater than 34% Mature plus Old forest, less than 5% Regenerating forest Note: Old forest retention shall include the full natural range of ages. - **Actual values will be determined from Forecasting process.**	Targets and seral stage definitions shall be based on sound science, ecological considerations, wildlife zones, and disturbance regimes. Target shall ensure representation of natural range of ecosystem attributes (e.g., productivity class).	Planning Standard.	Spatial Harvest Sequence.	Regular updates to FMA area inventory.	**FMP:** - Tables of indicators (values and targets) at 0, 10, 50, 100 and 200 years. - Maps of indicators at 0, 10 and 50 years. **Performance:** - Stewardship Report - Table summarizing variance from the SHS.	Area (ha) of Old and Mature plus Old forest in the FMA area by Cover Class shall be between 90% and 100% of target. Area of Regenerating forest in the FMA area by Cover Class shall not exceed 110% of target area.	Adjust strategies in subsequent FMP.
2	1.1.1.2 Maintain biodiversity by avoiding landscape fragmentation.	a) Range of patch sizes on the FMA area.	A distribution of harvest area sizes that will result in a patch size pattern over the 200 year planning horizon approximating patterns created by natural disturbances.	Targets shall be based on sound science, ecological considerations, wildlife zones, and disturbance regimes. Target shall ensure representation of natural range of ecosystem attributes (e.g. cover class and productivity class).	Planning Standard.	Spatial and temporal harvest planning. Patch size distribution targets are set for forest patches less than 20 years old.	Regular updates to FMA inventory.	**FMP:** - Tables of area of forest in each patch size class on the FMA area at 0, 10, and 50 yrs (or end of first rotation). Maps of patch size classes at 0, 10, and 50 yrs, (or end of first rotation). **Performance:** - Stewardship Report - Table summarizing variance from the SHS.	At the end of the 10-year FMP term the target distribution is achieved; or demonstrated progress to achieving target in one rotation where the pattern has deviated significantly from the target.	Adjust strategies in subsequent FMP.
3		b) Area of old interior forest of each Cover Class on the FMA area.	b) Area of old interior forest will not be less than 19% of each cover class over the next 200 years. - **Actual values will be determined from Forecasting process.**	Targets shall be based on sound science, ecological considerations, wildlife zones, and disturbance regimes. Target shall ensure representation of natural range of ecosystem attributes (e.g. productivity class).	Planning Standard.	Spatial Harvest Sequence.	Regular updates to forest inventory.	**FMP:** - Tables of indicators (values and targets) at Year 0, 10 and 50. - Maps of idicators at Year 0, 10 and 50. **Performance:** - Stewardship Report - Table summarizing variance to the SHS.	b) Target is achieved for at least 80% of the planning period with variance not exceeding 20% below target.	Adjust strategies in subsequent FMP.
4	1.1.1.3 Maintain biodiversity by minimizing access.	a) Open all-weather forestry road density on the FMA area.	Less than 0.01076 km/km (approximates 100 km) of open all-weather forestry road.	Targets shall be based on sound science, ecological considerations, harvest planning, wildlife zones, and social values.	Planning Standard.	Develop a strategy that coordinates access with other resource users, spatial/temporal sequencing of harvest, road closures and decommissioning. (SHS and long-term corridor access plan).	Regular updates to forest inventory.	**FMP:** - Table of forestry road density on FMA area at 0 and 10 years. - Map of existing and proposed open and closed forestry all weather roads. **Performance:** - Stewardship Report - Open all-weather forestry road density on FMA area by year.	A variance not exceeding +20% must be achieved.	Adjust strategies in subsequent FMP.

ID	Objective	Indicator	Target	Means to Identify Target	Legal/Policy Requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Reporting	Acceptable Variance	Response
5	1.1.1.3 Maintain biodiversity by minimizing access.	b) Open seasonal / temporary forestry road length on the FMA area.	Less than 450 km of seasonal / temporary forestry roads on the FMA area annually.	Targets shall be based on sound science, ecological considerations, harvest planning, wildlife zones, and social values.	Planning Standard.	Road construction, maintenance and reclamation activities.	Road plan OGR 11.2.	**AOP:** - Listing and map of seasonal / temporary forestry roads planned for use in upcoming Operating Year. **Performance:** - Stewardship Report - Length of open seasonal / temporary forestry road length on FMA area by year.	A variance not exceeding +20% must be achieved.	Adjust strategies in subsequent AOPs.
6	1.1.1.4 Maintain plant communities uncommon in FMA or province.	Maintained area or occurrence of each identified uncommon plant community within the FMA area.	When encountered, Maintain 80% of the identified uncommon plant community area, for each community confirmed to exist within the FMA, as defined within the Alberta Conservation Information Management System (ACIMS).	GIS analysis, AVI, ecosite phases, Alberta Conservation Information Management System (ACIMS) plant community classification and tracking list. Predict and identify occurrence of uncommon plant community.	Planning Standard.	Implement MDFP's Uncommon Plant Community Maintenance Policy. Coordinating with other resource users, spatial planning of harvest and road construction, OGR.	Regular updates to inventory.	**FMP:** - Table with descriptive list of identified uncommon plant communities and targets. - Map(s) displaying known locations of uncommon plant communities. **Performance:** - Stewardship Report - Uncommon plant communities identified and percent area maintained.	At the end of the 10-year FMP term the target is achieved.	Adjust strategies in subsequent AOPs.
7	1.1.1.5 Maintain unique habitats provided by wildfire and blowdown events.	a) Area unsalvaged in burned forest.	**Live trees:** - Retain all unburned trees in green islands and retained patches recognizing timber condition, access, non-timber needs. **Burned trees - Compartment Scale:** - Retain greater than 10% of merchantable black trees in patches greater than 100 ha. **Burned trees - Harvest Area Scale:** - Retain greater than 10% of merchantable black trees in patches 10 -100 ha; and - Retain greater than 5% of merchantable black trees in small patches, single trees according to loggers choice.	Targets based on "Fire Salvage Strategy: Forest Management Planning and Operations 2002" Ensure consistency with FireSmart objectives.	Fire Salvage Strategy: Forest Management Planning and Operations 2002 (Forest Operations Branch, Alberta).	Salvage planning.	Organization reports, air photo interpretation, ground surveys, post harvest assessments.	**FMP:** - Table and map of fire disturbances within the last 10 years - salvaged and unsalvaged. Report area (ha). **Performance:** Stewardship Report - Table of fire disturbances with summary of salvaged and unsalvaged area (ha).	At the end of the 10-year FMP term the target is achieved or exceeded.	Adjust strategies in subsequent AOPs.
8		b) Area of unsalvaged blowdown.	In areas of significant blowdown greater than 10% area will be left unsalvaged.	Targets are to be based on sound science, ecological considerations and disturbance regimes.	Planning Standard.	Salvage planning.	Inventory updates.	**FMP:** - Table and map of blowdown within the last 10 years - salvaged and unsalvaged. Report area (ha). **Performance:** Stewardship Report - Table of blowdown disturbances - salvaged and unsalvaged.	At the end of the 10-year FMP term the target is achieved or exceeded.	Adjust strategies in subsequent AOPs.
9	1.1.1.6 Retain ecological values and functions associated with riparian zones.	Compliance with Operating Ground Rules (OGR).	Consistent with OGR.	OGR.	Federal Fisheries Act, Water Act.	Planning, TSA, OGR.	Organization reports, air photo interpretation, ground surveys, post harvest assessments or other existing compliance monitoring systems.	**Performance:** - Stewardship Report - Compliance with OGRs.	No variance.	Immediate remedial action and / or administrative penalty.

ID	Objective	Indicator	Target	Means to Identify Target	Legal/Policy Requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Reporting	Acceptable Variance	Response
Value - 1.1.2 Local/stand scale biodiversity.										
10	1.1.2.1. Retain stand level structure.	a) Percent area with residual structure (both living and dead) within a harvest area, representative of the status (live/dead), sizes, and species of the overstorey trees within the FMA area.	A combination of merchantable single stems, clumps, and islands, that are representative of the stands harvested, comprising 3% of the harvested area within the FMA area. Note: A wide range in variability in harvest area-level retention within a subunit is desired as long as the target level is achieved.	Wildlife zones, roadside vegetation screens, recreational values, aesthetics, local knowledge, ANHIC, Biodiversity / Species Observation Database (BSOD).	Occupational Health and Safety Act, Forest and Prairie Protection Act.	Implement residual structure retention strategies in OGRs.	Organization reports, air photo interpretation, ground surveys, post harvest assessments.	**Performance:** - Stewardship Report - Percent of structure retention in harvest areas on the FMA area.	At the end of the 10-year FMP term the target is achieved or exceeded.	Adjust strategies in subsequent FMP.
11	1.1.2.1. Retain stand level structure.	b) Percentage of harvested area within the FMA with downed woody debris equivalent to preharvest conditions.	50 % of compartment harvest area having downed woody debris retained on site.	Assess preharvest downed woody debris condition by subunit or stand level average.	Planning Standard.	Post harvest treatments that reduce DWD (ie. brush raking) are considered to have less DWD compared to pre-harvest.	Organization developed during FMP planning.	**Performance:** - Report % of harvest areas with retained downed woody debris (area without DWD reducing treatment applied).	FMP determined.	Adjust strategies in subsequent FMP.
12	1.1.2.2. Maintain integrity of sensitive sites.	Sensitive sites (e.g. mineral licks, major game trails) within the FMA area.	Implement MDFP's Unique Finds Policy and adhere to OGRs.	Local knowledge, ANHIC, Biodiversity / Species Observation Database (BSOD).	Planning Standard.	Implement MDFP's Unique Find Policy and strategies in OGRs (7.7).	Organization reports, air photo interpretation, ground surveys.	**Performance:** - Stewardship Report - Compliance with internal protocols and OGRs.	None	Adjust strategies in subsequent AOPs.
13	1.1.2.3. Maintain aquatic biodiversity by minimizing impacts of water crossings.	Forestry water crossings in compliance with Code of Practice for Water Course Crossings within each subunit.	Designs meet standards of the Code of Practice for Water Course Crossings.	Code of Practice for Water Course Crossings: Sections 7 - 9 and Schedule 2.	Code of Practice for Water Course Crossings.	Road construction, maintenance and reclamation activities.	Road plan and OGR 11.4 (Watercourse Crossings).	**Performance:** AOP: - Number of forestry road crossings by type within the AOP area. Stewardship Report: - Compliance with Codes of Practice for Water Course Crossings.	None.	Act immediately to eliminate problems and adjust strategies in subsequent AOPs.
CSA SFM Element - 1.2 Species Diversity: Conserve species diversity by ensuring that habitats for the native species found in the FMA are maintained throughout time.										
Value - 1.2.1. Viable populations of identified plant and animal species.										
14	1.2.1.1. Maintain habitat for identified high value species (i.e., economically valuable, socially valuable, species at risk, species of management concern).	a) Successful implementation of Caribou Habitat Strategy within the Caribou Zone.	Incorporate caribou habitat strategy into TSA and SHS and operational activities within the Caribou Zone.	Based on sound science, ecological considerations, wildlife zones, Committee on the Status of Endangered Wildlife in Canada (COSEWIC) list, provincially listed species, BSOD, ANHIC, Recovery plans, Fish and Wildlife Division priorities, public consultation, habitat suitability analysis, literature review, observation data, local and traditional knowledge.	Recovery plans for species at risk, Federal Species at Risk Act.	Implementation of MDFP's Woodland Caribou Habitat Strategy, Spatial Harvest Sequence, harvesting plans, road construction, OGR, planning and implementation, adherence to provincial wildlife guidelines.	Regular updates to forest inventory, habitat assessment mapping.	**Performance:** Stewardship Report - Adherence to Spatial Harvest Sequence.	+/- 20% variance of SHS.	Adjust strategies in subsequent AOPs.
15		b) Retained habitat for trumpeter swan.	Maintain a 200 m buffer around all lakes with trumpeter swan nesting sites.	OGR.	FMP, OGR.	Spatial harvest sequence.	Regular updates to inventory.	**FMP:** - Map of trumpeter swan nesting lakes buffered and excluded from AAC. **Performance:** Stewardship Report - Retention of trumpeter swan buffer areas.	None.	Act immediately to eliminate problems.

ID	Objective	Indicator	Target	Means to Identify Target	Legal/Policy Requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Reporting	Acceptable Variance	Response
CSA SFM Element - 1.3 Genetic Diversity: Conserve genetic diversity by maintaining the variation of genes within species.										
Value - 1.3.1. Genetic integrity of natural tree populations.										
16	1.3.1.1. Retain wild forest populations for each tree species in each seed zone through establishment of in-situ reserves, with an approved controlled parentage program (CPP).	The appropriate number and area (ha) of in-situ tree gene conservation reserves as directed by the FGRMCS.	The appropriate number of in-situ tree gene conservation reserves per wild forest tree species as directed by FGRMCS and the conservation zones within MDFP's sphere of interest in CPP Region G2 and J for Seed Zones UBH 1.3 and LBH 1.6. This target to be established in consultation with associate FMA holders in the CPP Region and in cooperation with SRD and Alberta Toursim, Parks and Recreation.	Direction and detail as per FGRMCS Section 20.0, "In-situ Gene Conservation", in consultation with the other associate FMA holders.	Standards regulated through Timber Management Regulation 144.2 and the FGRMCS.	Field reconnaisance or survey to locate appropriate in-situ tree gene conservation reserves on the ground. Establish protective notation to identify in-situ tree gene conservation reserves in land standing records, and management plan to protect genetic resources.	Periodic assessment of condition and extent of trees and stands contributing to in-situ tree gene conservation reserves.	Report to SRD Area the establishment of the in-situ tree gene conservation reserves and locations as soon as completed. Report condition and maintenance of wild populations in Stewardship Report.	None. Achieve establishment, mapping and assessment of in-situ tree gene conservation reserves prior to the end of the first stewardship period.	None
17	1.3.1.2 Retain wild forest genetic resources through ex-situ conservation for species under CPP programs.	Number of provenances and genetic lines in ex-situ gene banks and trials.	Establish and maintain active ex-situ conservation program for species under CPP programs in cooperation with SRD and in accordance with FGRMCS Section 17 and 29 and ex-situ conservation critera (Appendix 4, Footnote 1). Subject also to Section 6.3 of the Gene Conservation Plan for Native Trees of Alberta (2008).	Adequacy of the ex-situ conservation program to capture a representative sample of wild tree genetic resources in ex-situ gene archives. Information for this to be provided by ASRD.	Standards regulated through Timber Management Regulation 144.2 and the FGRMCS.	Seed collections, clone banking and establishment of genetic lines in genetic trials.	Quantify the number of seed collections, clones in clone banks and genetic lines in genetic trials. Information for this to be provided by ASRD.	Report to SRD Area the quantification of the number of seed collections, clones in clone banks and genetic lines in genetic trials in the Stewardship Report. Information for this to be provided by ASRD.	None.	Review of program adequacy.
CSA SFM Element - 1.4 Protected Area: Respect protected areas identified through government processes.										
Value - 1.4.1. Areas with minimal human disturbances within managed landscapes.										
18	1.4.1.1 Integrate transboundary values and objectives into forest management.	Stakeholder consultation.	Ongoing consultation with relevant protected areas agencies.	Link to consultation objective in Planning Standard or other existing consultation processes.	Planning Standard.	Management planning and adherence to MDFP's Public Consultation Plan.	Documentation of consultation processes.	**Performance:** Stewardship Report - Summary of consultation initiatives undertaken.	None.	Adjust strategies in subsequent FMP.
CCFM Criterion 2 - Ecosystem Productivity										
CSA SFM Element - 2.1 Ecosystem Resilience:										
Value - 2.1.1 Reforested harvest areas.										
19	2.1.1.1 Ensure all harvested areas are immediately replaced with a forest alligned with the regenerating forest approved in the TSA.	% of reforested openings that meet SR requirements at time of establishment survey.	100% of the reforested openings achieve SR status to their declared stratum at time of establishment survey.	ARIS or equivalent reports.	Timber Management Regulation and Reforestation Standards of Alberta (RSA).	Applying the appropriate silviculture prescription (see Silviculture Matrix).	RSA and approved MDFP Regeneration Survey Quality Control and Assessment Program.	**Performance:** Stewardship Report - Number and area of reforested openings surveyed in a given year and % of total that are SR status. Review and assess cumulative results over time to determine continued relevancy of silviculture prescriptions, targets and achievements.	None.	None.
20	2.1.1.2 Establish regenerating stands that adhere to the assumptions used in the FMP specific timber supply analysis.	% of reforested openings that achieve the MAI and structure targets at time of Performance Survey.	100% of the reforested openings achieve their required MAI and structure targets at time of Performance Survey.	ARIS or equivalent reports.	Timber Management Regulation and Reforestation Standards of Alberta (RSA).	Applying the appropriate silviculture prescription (see Silviculture Matrix).	RSA and approved MDFP Regeneration Survey Quality Control and Assessment Program.	**Performance:** Stewardship Report - Number and area of reforested openings surveyed in a given year and the % of the total that meet their MAI and structure targets. Review and assess cumulative results over time to determine continued relevancy of silviculture prescriptions, targets and achievements.	None.	Alberta adjusts QAC (5 year term) as a well as silvicultural strategies (if required).

ID	Objective	Indicator	Target	Means to Identify Target	Legal/Policy Requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Reporting	Acceptable Variance	Response
Value - 2.1.2 Maintenance of forest landbase.										
21	2.1.2.1 Limit conversion of productive forest landbase to other uses.	Implementation of forest landbase maintenance program.	Implement MDFP's Forest Landbase Maintenance Program to minimize amount of change in the forest landbase area.	Forest inventory and land use data.	Planning Standard.	Maintain current forest cover inventory and land use updates.	Inventory and land use systems.	**Performance:** Stewardship Report: - Revision and additions to program. - Change in area (ha and %) of gross forest landbase.	Report actual.	Adjust net landbase projections in next TSA.
22	2.1.2.2 Recognize lands affected by insects, disease or natural calamities.	Implementation of forest health agent identification and reporting program.	Implement MDFP's Forest Health Agent Recognition and Reporting Program.	SRD forest health surveys, inventory updates .	Planning Standard, Alberta Forest Health Strategy and Shared Roles and Responsibilities between SRD and the Forest Industry.	Maintain up-to-date information.	Alberta surveys with industry cooperation.	**Performance:** Stewardship Report: - Revision and additions to program; and - Number of forest health agents incidents reported. AOP: - Note harvest operations specifically scheduled to address FH agent incidence.	Report actual.	Event specific.
Value - 2.1.3 Control invasive species										
23	2.1.3.1 Control non-native plant species (weeds).	Noxious weed program.	Noxious weed program in place and implemented.	Field inventories.	Directive 2001-06.	Co-operative programs.	Field inventories.	**Performance:** Stewardship Report - Inspection summary.	Report actuals.	Improve weed program.
CCFM Criterion 3 - Soil and Water Resources										
CSA SFM Element - 3.1 Soil quantity and quality - Conserve soil resources by maintaining soil quality and quantity.										
Value - 3.1.1 Soil productivity.										
24	3.1.1.1 Minimize impact of roading and bared areas in forest operations.	Compliance with OGRs.	In-block road and/or bared areas not to exceed 5% of the gross block area on an annual timber year basis.	Direction from Alberta.	OGRs and Soils Guidelines.	Effective planning and supervision of operations and adherence to relevant OGRs.	Field inspection reports and audits.	**Performance:** Inspection reporting. **Stewardship Report:** - Report annual % of in-block road and/or bared areas.	None.	Immediate remedial action to correct.
25	3.1.1.2 Minimize incidence of soil erosion and slumping.	Compliance with OGRs and Forest Soils Conservation Guidlines regarding soil erosion and slumping.	Complete compliance.	Direction from Alberta.	OGRs and Soils Guidelines.	Effective planning and supervision of operations and adherence to relevant OGRs.	Field inspection reports and audits.	Inspection reporting.	None.	Immediate remedial action to correct.
CSA SFM Element - 3.2 Water quantity and quality - Conserve water resources by maintaining water quality, flow regime and water quantity.										
Value - 3.2.1 Water quantity and quality.										
26	3.2.1.1 Limit impact of planned timber harvesting on water yield.	Compliance with the SHS and adjustment of operations to mitigate significant predicted water yield impacts.	Comply with SHS, and where operationally feasible adjust operations to mitigate water yield impacts associated with harvesting, as predicted by SRD's water yield forcasting on the SHS.	Direction from Alberta.	Planning Standard.	Adherence to forecast harvest sequence.	Report on area (ha) harvested compared with planned harvest area.	**Performance:** Stewardship Report: - Planned vs Actual area harvested in each watershed.	Report actuals.	Adjust harvest pattern if problems arise.
27	3.2.1.2 Limit impact of timber harvesting on water yield.	Number of Water Act penalties associated with timber harvesting.	Zero (0) Water Act penalties associated with timber harvesting.	Direction from Alberta.	Water Act, Planning Standard.	Adherence to Water Act, OGRs.	Field inspection reports and audits.	**Performance:** Stewardship Report: - Number of Water Act penalties associated with timber harvesting. - Inspection reporting.	None.	Immediate remedial action to correct.
Value - 3.2.2 Effective riparian habitats.										
28	3.2.2.1 Minimize impact of operations in riparian areas.	Riparian buffers maintained as outlined in OGRs.	Complete compliance.	Direction from Alberta.	OGRs.	Effective planning and supervision of operations and adherence to relevant OGRs.	Field inspection reports and audits.	Inspection reporting.	None.	Immediate correction and / or administrative penalty.

ID	Objective	Indicator	Target	Means to Identify Target	Legal/Policy Requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Reporting	Acceptable Variance	Response
CCFM Criterion 4 - Global Ecological Cycles										
CSA SFM Element - 4.1 Carbon uptake and storage										
Value - 4.1.1 Impact of forestry operations on carbon budgets.										
29	4.1.1.1 Further the understanding of the impact of forest management on carbon cycles.	Monitoring and assessing developments and requirements for carbon management and reporting.	Monitor, assess and report on developments in the area of carbon management practices that directly impact MDFP's operations on the FMA area, which MDFP has become aware of.	Direction from Alberta.	Planning Standard.	Work with Alberta in assessing carbon management practices and the practices' applicability to MDFPs FMA area.	Maintain communications with Alberta or other specialist in the area of carbon management.	**Performance:** Stewardship Report: - Summarize new developments in the area of carbon management (that MDFP has become aware of) that impact, or have the potential to impact forest management on the FMA area.	None.	Revise monitoring, assessing and/or reporting practices.
CSA SFM Element - 4.2 Forest land conversion										
30	See VOIT ID 21 (2.1.2.1) above .									
CCFM Criterion 5 - Multiple Benefits to Society										
CSA SFM Element - 5.1 Timber and non-timber benefits										
Value - 5.1.1 Sustainable timber supplies.										
31	5.1.1.1 Establish appropriate AACs.	Process described in Annex 1 is followed and standards are met.	Complete compliance.	Consultation in planning process.	Forests Act and Timber Management Regulation.	Effective implementation of planning process.	Multiple means: TPRS, ARIS, AOPs, Stewardship Reports, filed inspection reports.	Progressive and continuous.	Issue specific.	Adjust AAC using most current and relevant information.
CSA SFM Element - 5.2 Communities and sustainability										
Value - 5.2.1 Risk to communities and landscape values from wildfire is low.										
32	5.2.1.1 To reduce wildfire threat potential by reducing fire behaviour, fire occurrence, threats to values at risk and enhancing fire suppression capability.	1) Percentage reduction in Fire Behaviour Potential area (ha) within the FireSmart Community Zone.	Reduce the area (ha) in the extreme and high Fire Behaviour Potential rating categories within the FireSmart Community Zone by the percent determined through SRD's analysis of the FMP's final SHS.	Wildfire Threat Assessment completed by SRD on SHS.	Planning Standard.	Spatial harvest sequence, thinning, partial harvest techniques, prescribed burns.	AOPs, Compartment Assessments.	**FMP:** - Maps and Tables of indicator at 0, 10, 20, and 50 yrs. **Performance:** Stewardship Report - Table summarizing variance from SHS.	Issue specific.	Adjust harvest sequence.
33		2) Percentage reduction in Fire Behaviour Potential area (ha) across the FMA area, now and over the planning horizon.	Reduce the area (ha) in the extreme and high Fire Behaviour Potential rating categories across the FMA area by the percent determined through SRD's analysis of the FMP's final SHS.	Wildfire Threat Assessment completed by SRD on SHS.	Planning Standard.	Spatial harvest sequence, thinning, partial harvest techniques, prescribed burns.	AOPs, Compartment Assessments.	**FMP:** - Maps and Tables of indicator at 0, 10, 20, and 50 yrs. **Performance:** Stewardship Report - Table summarizing variance from SHS.	Issue specific.	Adjust harvest sequence.
Value - 5.2.2 Provide opportunities to derive benefits and participate in use and management										
34	5.2.2.1 Integrate other uses and timber management activities.	a) Availability of MDFP roads for use by other commercial forest users and the public.	All MDFP roads will be made available for use by other commercial forest users and the public (unless access restrictions are required by Alberta).	Consultation in planning process.	FMP.	Maintain current forest cover inventory and land use updates.	Inventory and land use systems.	**Performance:** Stewardship Report: - Proportion of roads available for use by other users.	Report actual.	Adjust net landbase projections in next TSA.
35		b) Communication with Twin Lakes Lodge when operating near Twin Lakes.	Contact the owners/operators of the lodge when operation are planned within 2 km of the lodge or recreation area.	Social considerations.	FMP.	AOPs, Public Consultation Plan.	Documentation of consultation processes.	**Performance:** Stewardship Report: - Record of operations near Twin Lakes Lodge and the communication events with the owners/operators.	Report actual.	None.

ID	Objective	Indicator	Target	Means to Identify Target	Legal/Policy Requirements	Means of Achieving Objective and Target	Monitoring and Measurement	Reporting	Acceptable Variance	Response
36		c) Protection of aesthetic resources along Highway 35 and the Chinchaga Forestry Road.	Incorporate aesthetic concerns into operational planning along Highway 35 and the Chinchaga Forestry Road (designated a Special Management Zone).	Target based on social/aesthetic concerns, consultation.	FMP.	Effective planning within the Special Management Zone.	AOPs, as-built plans, road-side inspections.	**Performance:** AOP: - incorporate aesthetic concerns within the Special Management Zone.	Report actual.	Adjust future operations.
Value - 5.2.3 Forest productivity.										
37	5.2.3.1 Maintain Long	Regenerated stand yield	No net decrease from the natural stand productivity.	FMP Timber Supply	Planning Standard.	Effective implementation	Stewardship Report.	Timber Supply Analysis,	Report actual.	Adjust AAC using
CCFM Criterion 6 - Accepting Society's Responsibility for Sustainable Development										
CSA SFM Element - 6.1 Aboriginal and treaty rights and Aboriginal forest values										
Value - 6.1.1 Compliance with government regulations and policies.										
38	6.1.1.1 Implement Public Involvement Program.	Meet Alberta's current expectations for First Nations consultation.	Consult at the community level with designated representatives of affected First Nations.	Alberta to provide direction.	Planning Standard.	Effective implementation of Alberta's First Nation consultation requirements.	Reports, documentation of communications.	**FMP:** - Summary of First Nation consultation in FMP development process. **Performance:** - Summary of First Nation consultation reported annually in GDP.	Report actual.	Adjust activities.
CSA SFM Element - 6.2 Public participation and information for decision-making										
Value - 6.2.1 Meaningful public involvement is achieved.										
39	6.2.1.1 Implement Public Consultation Process (PCP).	Meet expectations of Section 5 of CSA Z809-02.	Implement SRD approved Public Consultation Plan.	Development and SRD approval of Public Consultation Plan.	Planning Standard.	Effective implementation of MDFP's approved Public Consultation Plan.	Reports, documentation of communications.	**FMP:** Summary of public consultation in FMP development process. **Performance:** Stewardship Report: Timing and nature of consultation initiatives.	Report actual.	Adjust activities.

3. Detailed VOITs

This section provides detailed information for each of the 2012-2021 FMP VOITs. If required FMP reporting is described within these detailed descriptions.

3.1 Biological Diversity

VOIT 1 - Area of Old, Mature and Regenerating forest in the Forest Management Area (FMA) by Cover Class (1.1.1.1).

CCFM Criterion: 1. *Biological Diversity*.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.1 Landscape scale *biodiversity*.

Objective - 1.1.1.1 Maintain biodiversity by retaining the full range of cover types and *seral stages*.

Target

Over the 200-year planning horizon:
a) Gross *landbase*: greater than 8% Old forest, greater than 40% Mature plus Old forest, less than 3% Regenerating forest; and

b) Net landbase: greater than 14% Old forest, greater than 34% Mature plus Old forest, less than 5% Regenerating forest

Note: Old forest retention shall include the full natural range of ages.

- Actual values will be determined from *Forecasting* process.

Target Supporting Information

Targets and seral stage definitions shall be based on sound science, ecological considerations, *wildlife* zones, and disturbance regimes. Target shall ensure representation of natural range of ecosystem attributes (e.g., productivity class).

Means of Achieving Target

Spatial Harvest Sequence (SHS).

Target Monitoring

Regular updates to FMA area inventory.

Reporting

FMP:

- Tables of indicators (values and targets) at 0, 10, 50, 100 and 200 years.

- Maps of indicators at 0, 10 and 50 years.

Performance:

- Stewardship Report - Table summarizing variance from the SHS.

Acceptable Variance

Area (ha) of Old and Mature plus Old forest in the FMA area by Cover Class shall be between 90% and 100% of target. Area of Regenerating forest in the FMA area by Cover Class shall not exceed 110% of target area.

Response

Adjust strategies in subsequent FMP.

Legal/Policy Requirement

This VOIT is requirement of the Planning Standard.

Definitions

Cover Class - AVI cover type groupings as follows:
1. D (Deciduous): >= 80% decid composition w/o understory, or with understory conifer component <= 20%
2. DU (Deciduous Understory): >= 80% decid with conifer understory > 20%
3. DC (Deciduous Coniferous): > 50% decid and < 80% decid, or = 50% decid where species 1 is decid
4. CD (Coniferous Deciduous): > 20% decid and < 50% decid, or = 50% decid where species 1 is not decid
5. PL (Lodgepole Pine): >= 80% conifer and leading species = Pl
6. SB (Black Spruce): >= 80% conifer and leading species = Sb
7. SW (White Spruce): >= 80% conifer and leading species = Sw

Seral Stages by Cover Class - defined according to AVI stand age/age class (years) as follows:
1. D - Regeneration (0-15), Young (16-60), Mature (61-100), Old (101+)
2. DU - Regeneration (0-15), Young (16-60), Mature (61-100), Old (101+)
3. DC - Regeneration (0-15), Young (16-70), Mature (71-110), Old (111+)
4. CD - Regeneration (0-15), Young (16-70), Mature (71-110), Old (111+)
5. PL - Regeneration (0-15), Young (16-70), Mature (71-120), Old (121+)
6. SB - Regeneration (0-15), Young (16-105), Mature (106-160), Old (161+)
7. SW - Regeneration (0-15), Young (16-105), Mature (106-150), Old (151+)

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Table 3-1, Table 3-2, Table 3-3, Table 3-4, Table 3-5, Table 3-6, Table 3-7, Table 3-8, Table 3-9, Table 3-10, Table 3-11, Table 3-12, Table 3-13, Table 3-14, Table 3-15, and Table 3-16 provide the summary (Table 3-1, Table 3-2, Table 3-3, Table 3-4), old (Table 3-5, Table 3-6, Table 3-7, Table 3-8), mature + old (Table 3-9, Table 3-10, Table 3-11, Table 3-12) and regenerating (Table 3-13, Table 3-14, Table 3-15, Table 3-16) seral stage area for the gross and net MDFP forested landbase at years 0, 10, 50, 100 and 200 of the 200-year planning horizon.

Notes

The Old and Mature Seral Stages are defined by strata using different age ranges for each stratum.

Table 3-1. Gross Forested Landbase Seral Stage Area Summary by Strata (ha)

Area of Old, Old and Mature and Regeneration seral stages by broad cover class								
	Area (ha) by Stratum							
Seral stages	PL	SW	SB	CD	DC	D	DU	Total (ha)
Year 0								
Old	3,152	12,812	2,211	8,193	8,784	11,913	30,405	77,470
Old + Mature	26,140	47,553	45,730	15,359	24,357	114,311	102,474	375,924
Regeneration	1,206	10,695	0	3,404	4,148	6,639	125	26,218
Year 10								
Old	7,817	11,641	4,053	8,032	10,369	16,785	41,432	100,129
Old + Mature	46,523	42,982	57,955	18,226	24,997	117,504	100,584	408,772
Regeneration	3,940	17,548	0	2,753	7,283	12,453	125	44,102
Year 50								
Old	10,137	19,502	44,949	9,819	10,810	73,604	76,633	245,454
Old + Mature	73,884	35,668	206,169	22,617	15,393	86,898	82,519	523,147
Regeneration	14,089	10,731	0	10,235	10,806	17,221	0	63,081
Year 100								
Old	30,260	21,646	204,330	9,947	7,233	39,059	37,984	350,459
Old + Mature	46,663	24,744	243,108	20,134	23,060	83,829	37,984	479,523
Regeneration	11,453	10,801	0	9,461	12,747	15,919	0	60,381
Year 200								
Old	24,538	9,442	186,071	12,585	12,378	46,403	11,220	302,638
Old + Mature	46,218	13,556	186,071	25,583	32,462	80,912	11,309	396,112
Regeneration	15,218	21,672	36,731	11,911	16,757	18,679	4,014	124,983

Table 3-2. Gross Forested Landbase Seral Stage Area Summary by Strata (%)

Area of Old, Old and Mature and Regeneration seral stages by broad cover class								
	Area (%) by Stratum							
Seral stages	PL	SW	SB	CD	DC	D	DU	Total (ha)
Year 0								
Old	0	1	0	1	1	1	3	8
Old + Mature	3	5	5	2	3	12	11	40
Regeneration	0	1	0	0	0	1	0	3
Year 10								
Old	1	1	0	1	1	2	4	11
Old + Mature	5	5	6	2	3	13	11	44
Regeneration	0	2	0	0	1	1	0	5
Year 50								
Old	1	2	5	1	1	8	8	26
Old + Mature	8	4	22	2	2	9	9	56
Regeneration	2	1	0	1	1	2	0	7
Year 100								
Old	3	2	22	1	1	4	4	38
Old + Mature	5	3	26	2	2	9	4	52
Regeneration	1	1	0	1	1	2	0	6
Year 200								
Old	3	1	20	1	1	5	1	33
Old + Mature	5	1	20	3	3	9	1	43
Regeneration	2	2	4	1	2	2	0	13

Table 3-3. Net Forested Landbase Seral Stage Area Summary by Strata (ha)

Area of Old, Old and Mature and Regeneration seral stages by broad cover class								
	Area (ha) by Stratum							
Seral stages	PL	SW	SB	CD	DC	D	DU	Total (ha)
Year 0								
Old	2,874	10,730	94	7,090	8,496	10,486	29,434	69,205
Old + Mature	24,508	38,193	1,279	12,151	23,061	98,991	97,351	295,534
Regeneration	1,201	10,671	0	3,404	4,146	6,305	125	25,851
Year 10								
Old	7,270	8,581	19	6,595	9,916	14,227	39,866	86,474
Old + Mature	43,187	31,902	1,653	13,935	22,967	100,998	95,002	309,644
Regeneration	3,940	17,543	0	2,753	7,281	12,453	125	44,095
Year 50								
Old	8,505	8,422	500	5,528	8,779	57,097	71,052	159,884
Old + Mature	61,200	18,156	2,473	17,745	13,011	69,593	76,806	258,985
Regeneration	14,089	10,731	0	10,235	10,806	17,221	0	63,081
Year 100								
Old	17,576	3,875	713	5,065	4,851	21,632	32,271	85,985
Old + Mature	33,974	6,431	855	15,253	20,675	66,403	32,271	175,861
Regeneration	11,453	10,794	0	9,461	12,747	15,919	0	60,375
Year 200								
Old	12,572	2,197	121	9,140	10,447	30,402	6,479	71,358
Old + Mature	34,195	6,307	121	22,088	30,527	64,891	6,553	164,682
Regeneration	14,773	15,997	15	10,956	16,426	17,612	3,130	78,908

Table 3-4. Net Forested Landbase Seral Stage Area Summary by Strata (%)

Area of Old, Old and Mature and Regeneration seral stages by broad cover class								
	Area (%) by Stratum							
Seral stages	PL	SW	SB	CD	DC	D	DU	Total (ha)
Year 0								
Old	1	2	0	1	2	2	6	14
Old + Mature	5	8	0	2	5	20	20	61
Regeneration	0	2	0	1	1	1	0	5
Year 10								
Old	1	2	0	1	2	3	8	18
Old + Mature	9	7	0	3	5	21	20	64
Regeneration	1	4	0	1	1	3	0	9
Year 50								
Old	2	2	0	1	2	12	15	33
Old + Mature	13	4	1	4	3	14	16	53
Regeneration	3	2	0	2	2	4	0	13
Year 100								
Old	4	1	0	1	1	4	7	18
Old + Mature	7	1	0	3	4	14	7	36
Regeneration	2	2	0	2	3	3	0	12
Year 200								
Old	3	0	0	2	2	6	1	15
Old + Mature	7	1	0	5	6	13	1	34
Regeneration	3	3	0	2	3	4	1	16

Table 3-5. Gross Old Forested Landbase Seral Stage Area by Strata (ha)

FMA - Active landbase - Area of Old seral stages, by strata								
	Area (ha) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	3,152	12,812	2,211	8,193	8,784	11,913	30,405	77,470
10	7,817	11,641	4,053	8,032	10,369	16,785	41,432	100,129
50	10,137	19,502	44,949	9,819	10,810	73,604	76,633	245,454
100	30,260	21,646	204,330	9,947	7,233	39,059	37,984	350,459
200	24,538	9,442	186,071	12,585	12,378	46,403	11,220	302,638

Table 3-6. Gross Old Forested Landbase Seral Stage Area by Strata (%)

FMA - Active landbase - Area of Old seral stages, by strata								
	Area (%) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	0	1	0	1	1	1	3	8
10	1	1	0	1	1	2	4	11
50	1	2	5	1	1	8	8	26
100	3	2	22	1	1	4	4	38
200	3	1	20	1	1	5	1	33

Table 3-7. Net Old Forested Landbase Seral Stage Area by Strata (ha)

FMA - Active landbase - Area of Old seral stages, by strata								
	Area (ha) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	2,874	10,730	94	7,090	8,496	10,486	29,434	69,205
10	7,270	8,581	19	6,595	9,916	14,227	39,866	86,474
50	8,505	8,422	500	5,528	8,779	57,097	71,052	159,884
100	17,576	3,875	713	5,065	4,851	21,632	32,271	85,985
200	12,572	2,197	121	9,140	10,447	30,402	6,479	71,358

Table 3-8. Net Old Forested Landbase Seral Stage Area by Strata (%)

FMA - Active landbase - Area of Old seral stages, by strata								
	Area (%) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	1	2	0	1	2	2	6	14
10	1	2	0	1	2	3	8	18
50	2	2	0	1	2	12	15	33
100	4	1	0	1	1	4	7	18
200	3	0	0	2	2	6	1	15

Table 3-9. Gross Old and Mature Forested Landbase Seral Stage Area by Strata (ha)

FMA - Active landbase - Area of Old and Mature seral stages, by strata								
	Area (ha) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	26,140	47,553	45,730	15,359	24,357	114,311	102,474	375,924
10	46,523	42,982	57,955	18,226	24,997	117,504	100,584	408,772
50	73,884	35,668	206,169	22,617	15,393	86,898	82,519	523,147
100	46,663	24,744	243,108	20,134	23,060	83,829	37,984	479,523
200	46,218	13,556	186,071	25,583	32,462	80,912	11,309	396,112

Table 3-10. Gross Old and Mature Forested Landbase Seral Stage Area by Strata (%)

FMA - Active landbase - Area of Old and Mature seral stages, by strata								
	Area (%) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	3	5	5	2	3	12	11	40
10	5	5	6	2	3	13	11	44
50	8	4	22	2	2	9	9	56
100	5	3	26	2	2	9	4	52
200	5	1	20	3	3	9	1	43

Table 3-11. Net Old and Mature Forested Landbase Seral Stage Area by Strata (ha)

FMA - Active landbase - Area of Old and Mature seral stages, by strata								
	Area (ha) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	24,508	38,193	1,279	12,151	23,061	98,991	97,351	295,534
10	43,187	31,902	1,653	13,935	22,967	100,998	95,002	309,644
50	61,200	18,156	2,473	17,745	13,011	69,593	76,806	258,985
100	33,974	6,431	855	15,253	20,675	66,403	32,271	175,861
200	34,195	6,307	121	22,088	30,527	64,891	6,553	164,682

Table 3-12. Net Old and Mature Forested Landbase Seral Stage Area by Strata (%)

FMA - Active landbase - Area of Old and Mature seral stages, by strata								
	Area (%) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	5	8	0	2	5	20	20	61
10	9	7	0	3	5	21	20	64
50	13	4	1	4	3	14	16	53
100	7	1	0	3	4	14	7	36
200	7	1	0	5	6	13	1	34

Table 3-13. Gross Regenerating Forested Landbase Seral Stage Area by Strata (ha)

FMA - Active landbase - Area of Regeneration, by strata								
	Area (ha) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	1,206	10,695	0	3,404	4,148	6,639	125	26,218
10	3,940	17,548	0	2,753	7,283	12,453	125	44,102
50	14,089	10,731	0	10,235	10,806	17,221	0	63,081
100	11,453	10,801	0	9,461	12,747	15,919	0	60,381
200	15,218	21,672	36,731	11,911	16,757	18,679	4,014	124,983

Table 3-14. Gross Regenerating Forested Landbase Seral Stage Area by Strata (%)

FMA - Active landbase - Area of Regeneration, by strata								
	Area (%) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	0	1	0	0	0	1	0	3
10	0	2	0	0	1	1	0	5
50	2	1	0	1	1	2	0	7
100	1	1	0	1	1	2	0	6
200	2	2	4	1	2	2	0	13

Table 3-15. Net Regenerating Forested Landbase Seral Stage Area by Strata (ha)

FMA - Active landbase - Area of Regeneration, by strata								
	Area (ha) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	1,201	10,671	0	3,404	4,146	6,305	125	25,851
10	3,940	17,543	0	2,753	7,281	12,453	125	44,095
50	14,089	10,731	0	10,235	10,806	17,221	0	63,081
100	11,453	10,794	0	9,461	12,747	15,919	0	60,375
200	14,773	15,997	15	10,956	16,426	17,612	3,130	78,908

Table 3-16. Net Regenerating Forested Landbase Seral Stage Area by Strata (%)

FMA - Active landbase - Area of Regeneration, by strata								
	Area (%) by Stratum							
Year	PL	SW	SB	CD	DC	D	DU	Total (ha)
0	0	2	0	1	1	1	0	5
10	1	4	0	1	1	3	0	9
50	3	2	0	2	2	4	0	13
100	2	2	0	2	3	3	0	12
200	3	3	0	2	3	4	1	16

Figure 3-1, Figure 3-2, Figure 3-3, Figure 3-4, Figure 3-5, Figure 3-6, Figure 3-7, Figure 3-8, Figure 3-9, Figure 3-10, Figure 3-11, Figure 3-12, Figure 3-13, Figure 3-14, Figure 3-15, Figure 3-16, Figure 3-17, and Figure 3-18 demonstrate the distribution of gross and net old (Figure 3-1, Figure 3-2, Figure 3-3, Figure 3-4, Figure 3-5, Figure 3-6), gross and net old + mature (Figure 3-7, Figure 3-8, Figure 3-9, Figure 3-10, Figure 3-11, Figure 3-12), and gross and net regenerating (Figure 3-13, Figure 3-14, Figure 3-15, Figure 3-16, Figure 3-17, Figure 3-18) seral stage classes on the forested landbase at years 0, 10 and 50, respectively.

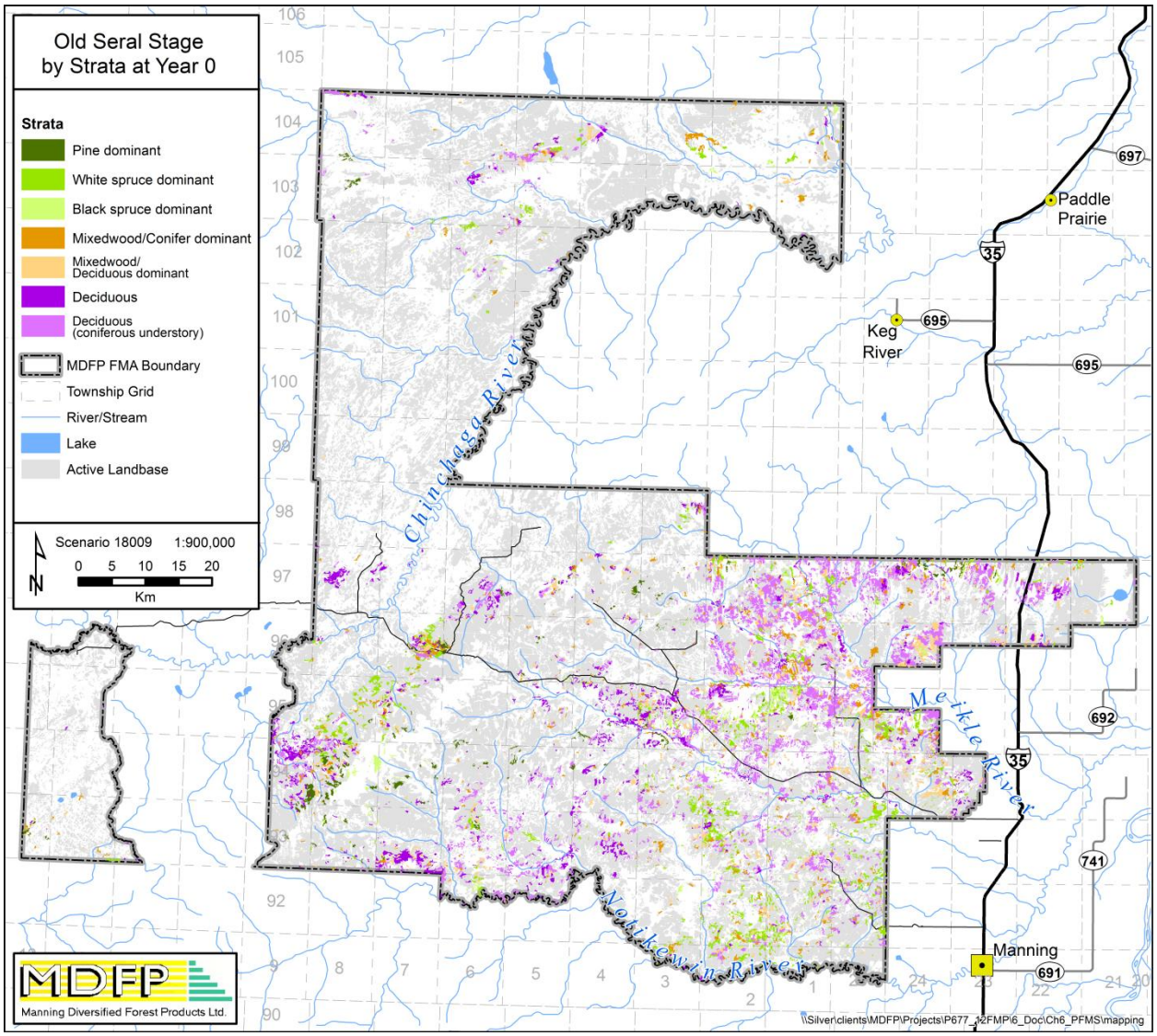

Figure 3-1. Area of Gross Old Forest in the FMA Area by Strata at Year 0

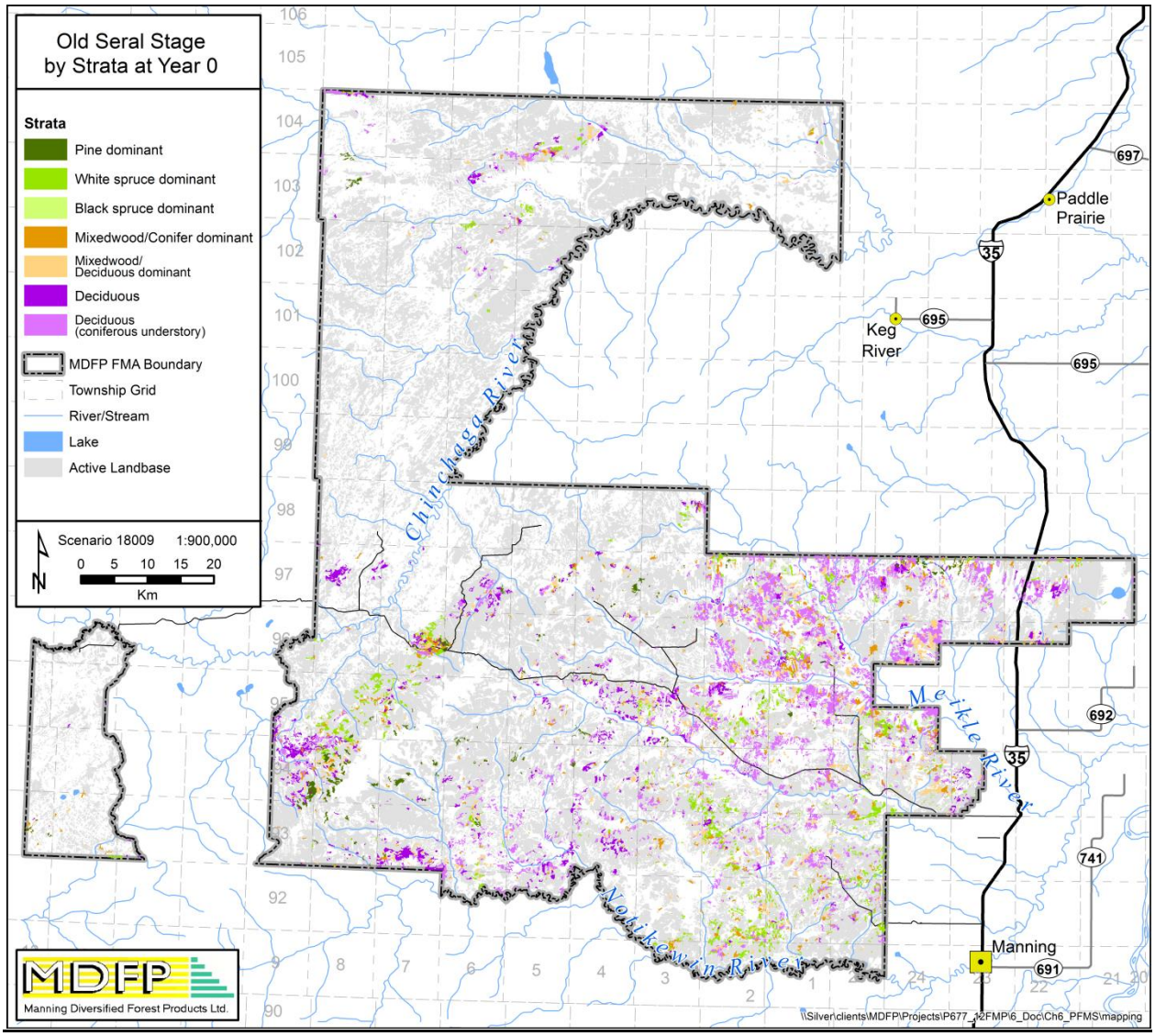

Figure 3-2. Area of Net Old Forest in the FMA Area by Strata at Year 0

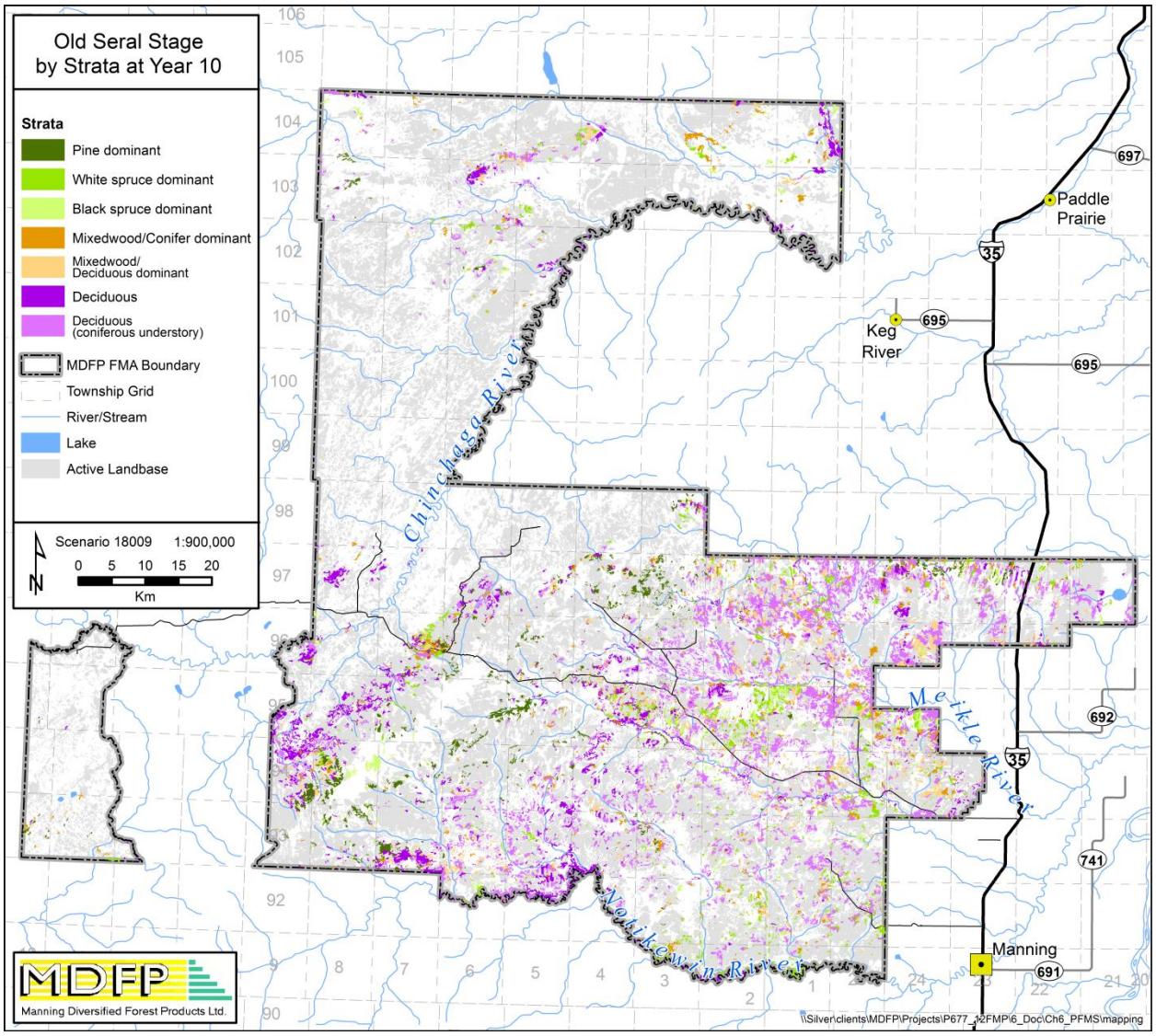

Figure 3-3. Area of Gross Old Forest in the FMA Area by Strata at Year 10

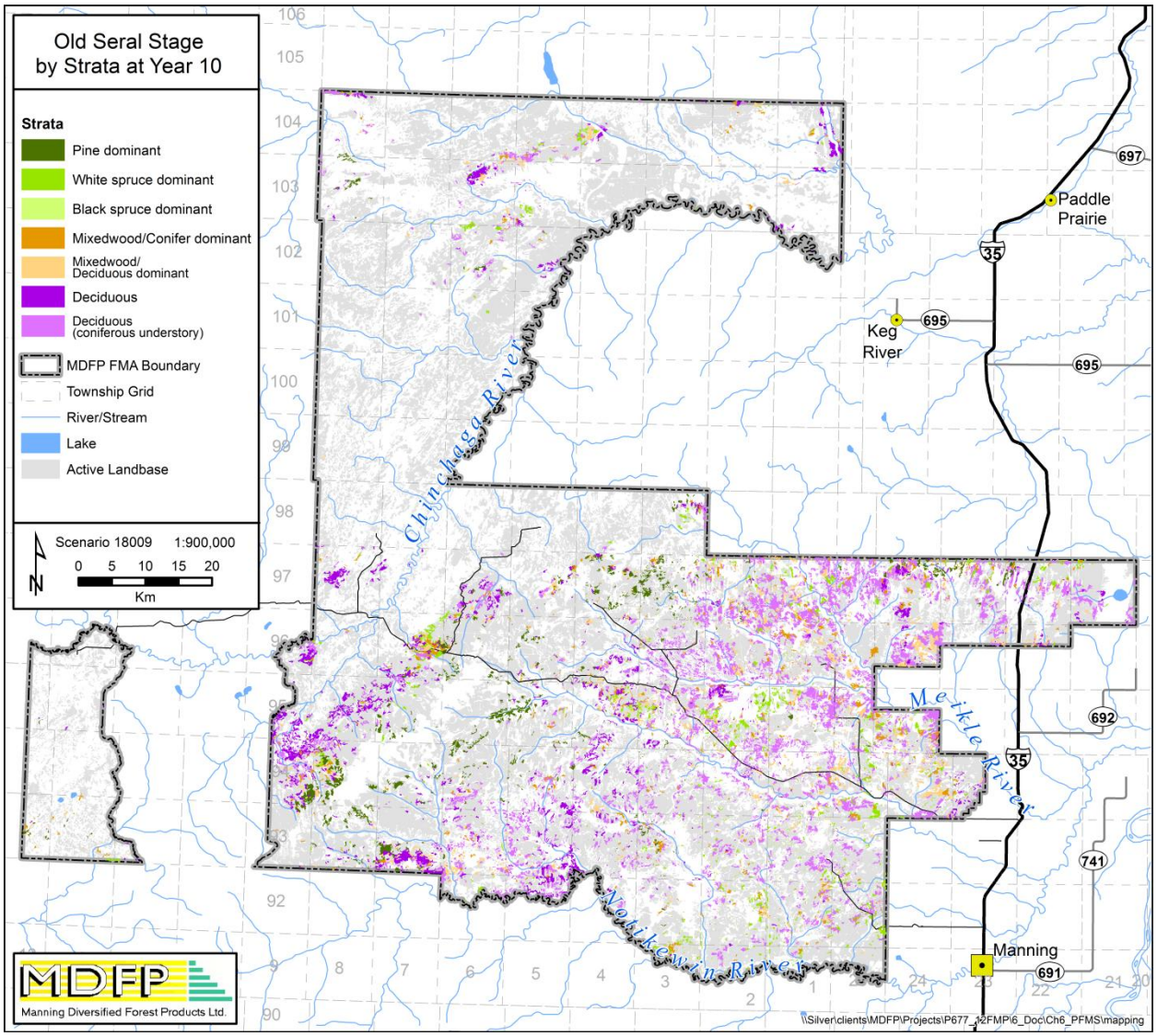

Figure 3-4. Area of Net Old Forest in the FMA Area by Strata at Year 10

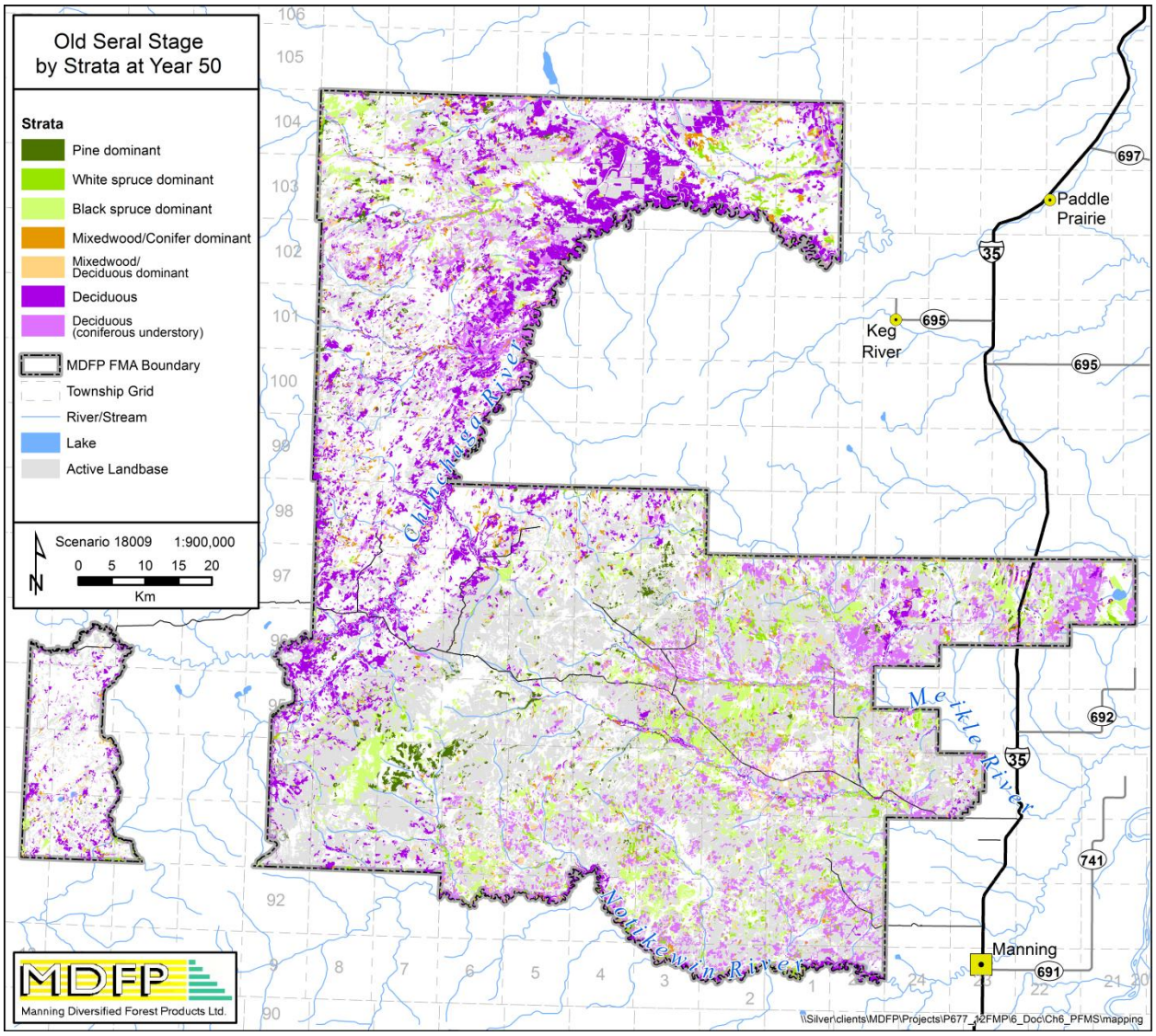

Figure 3-5. Area of Gross Old Forest in the FMA Area by Strata at Year 50

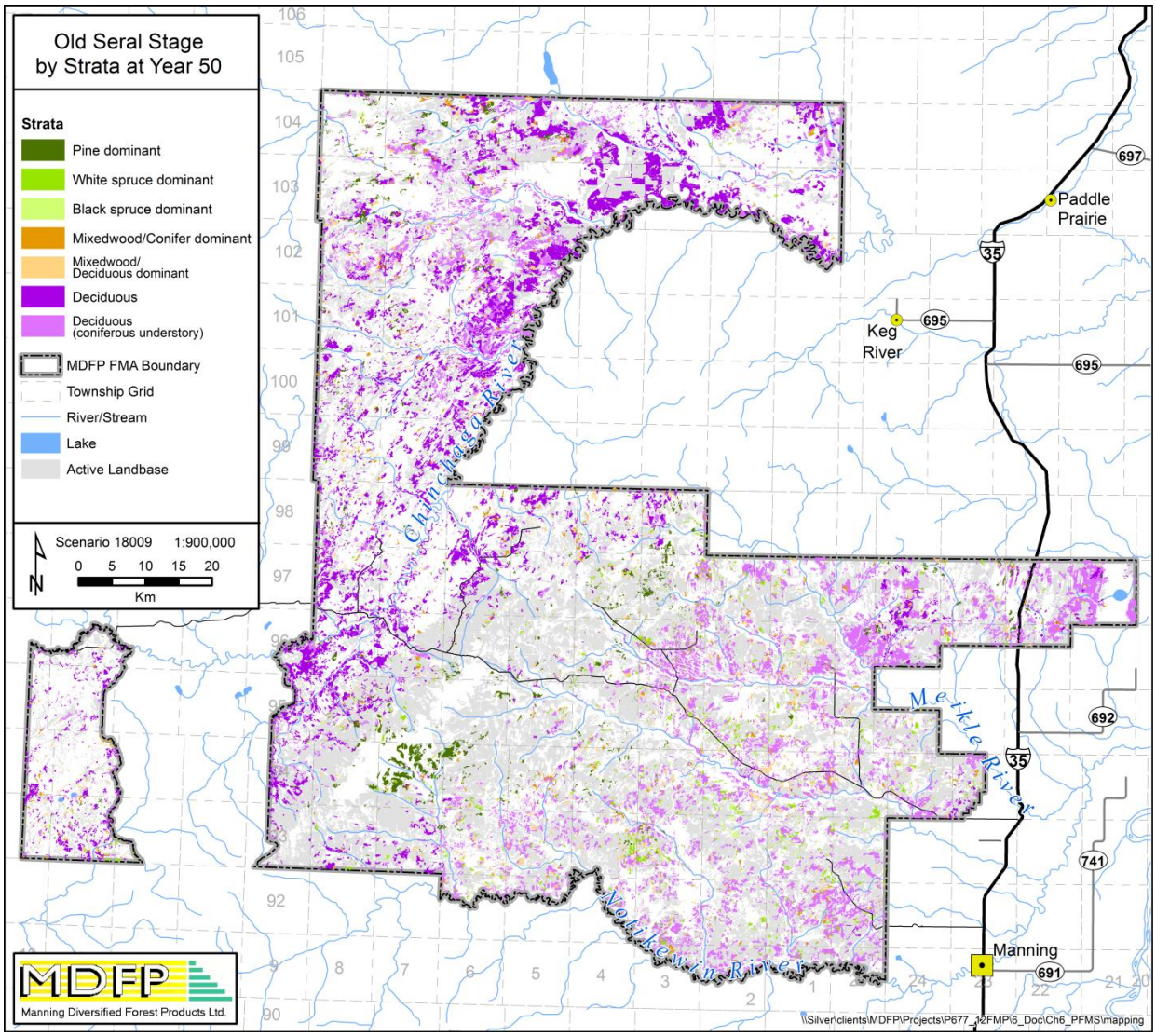

Figure 3-6. Area of Net Old Forest in the FMA Area by Strata at Year 50

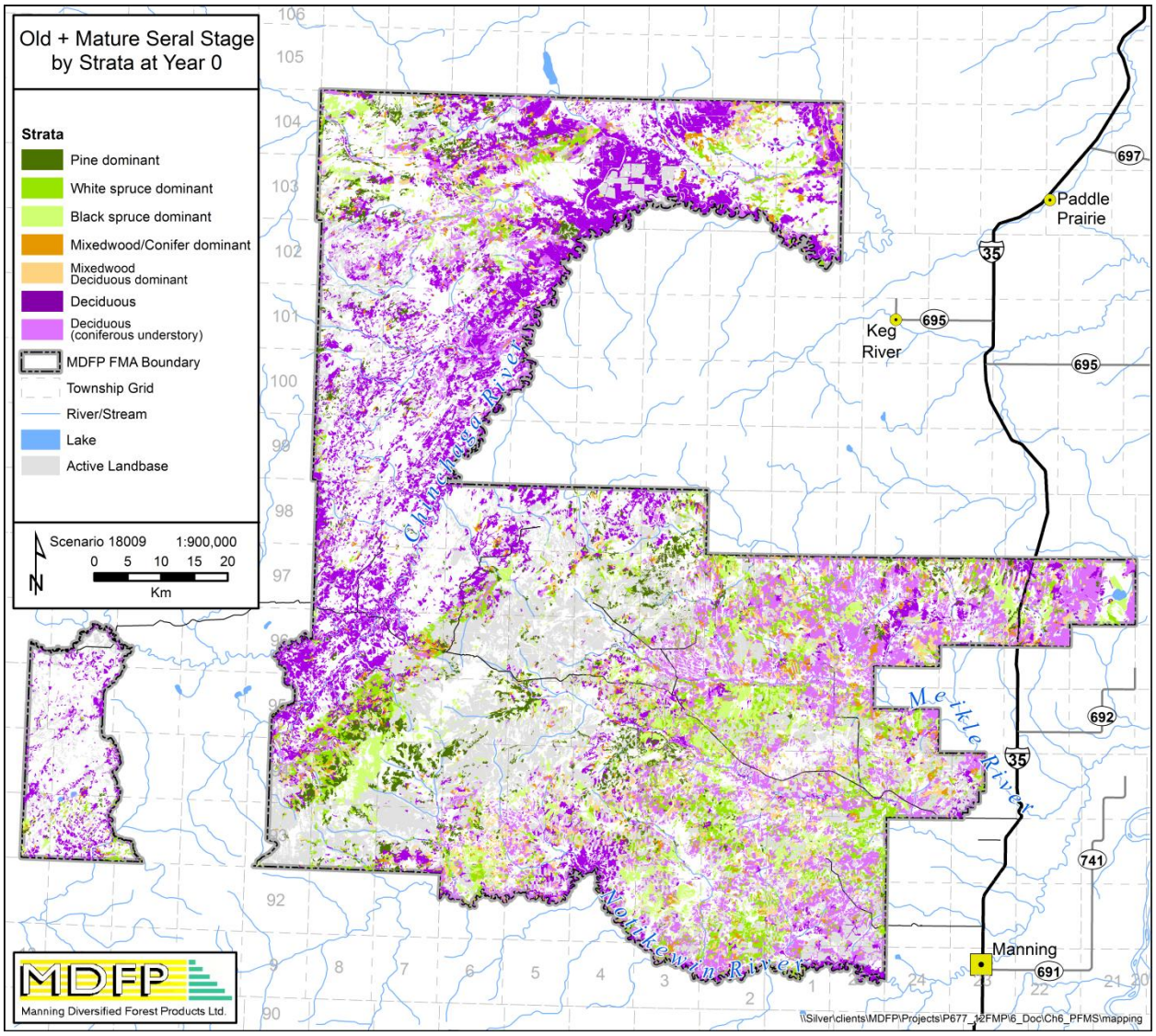

Figure 3-7. Area of Gross Old and Mature Forest in the FMA Area by Strata at Year 0

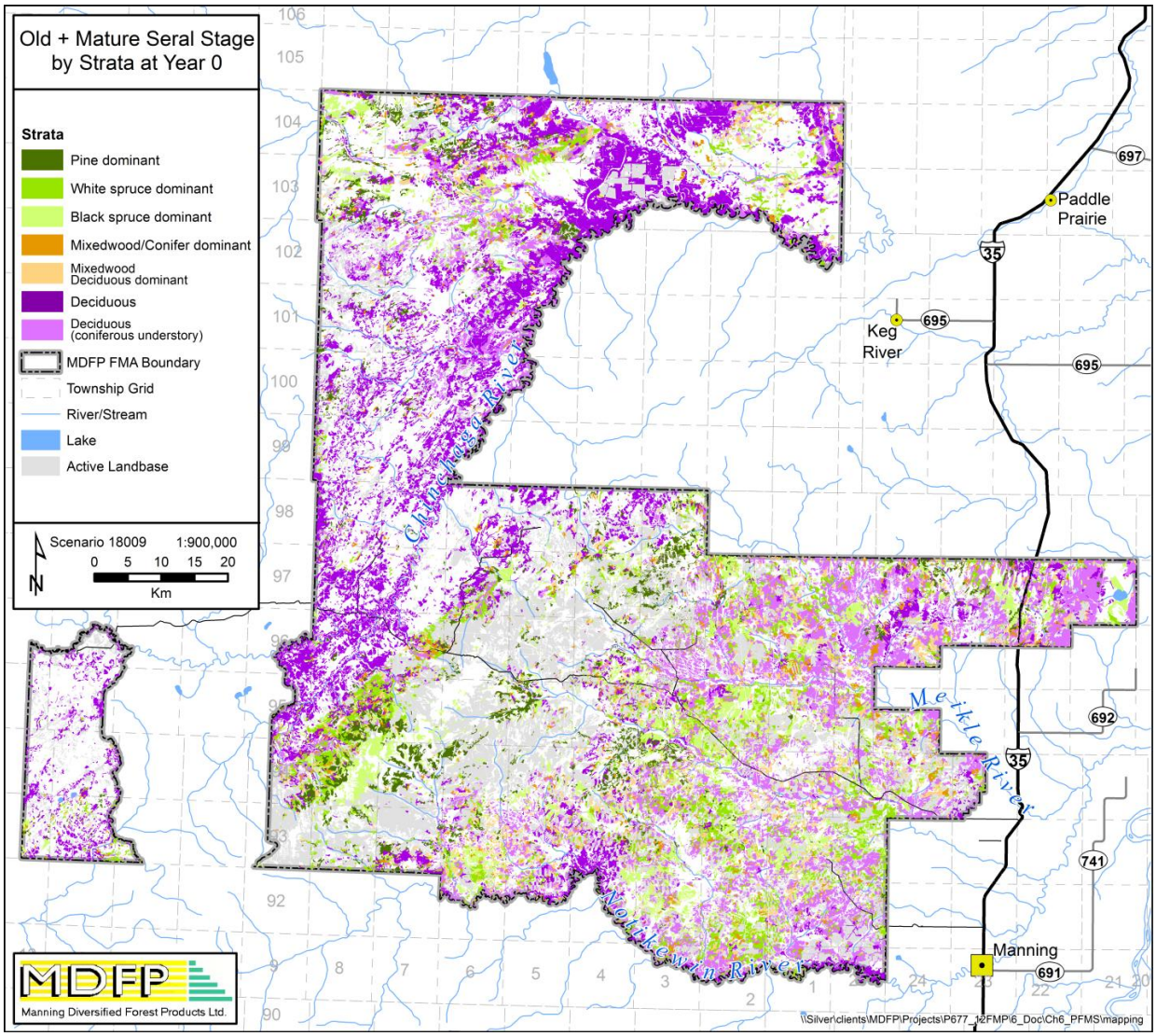

Figure 3-8. Area of Net Old and Mature Forest in the FMA Area by Strata at Year 0

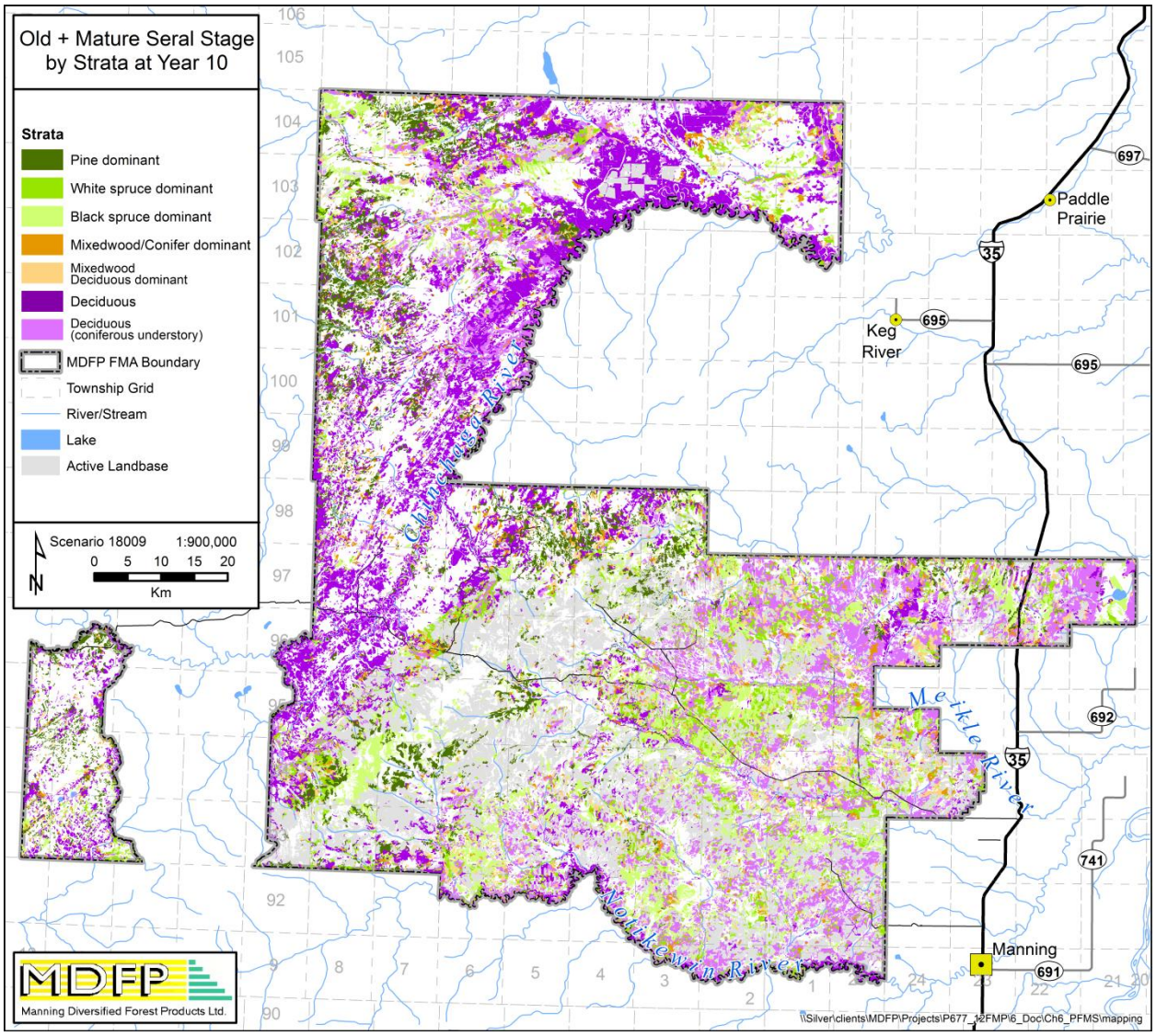

Figure 3-9. Area of Gross Old and Mature Forest in the FMA Area by Strata at Year 10

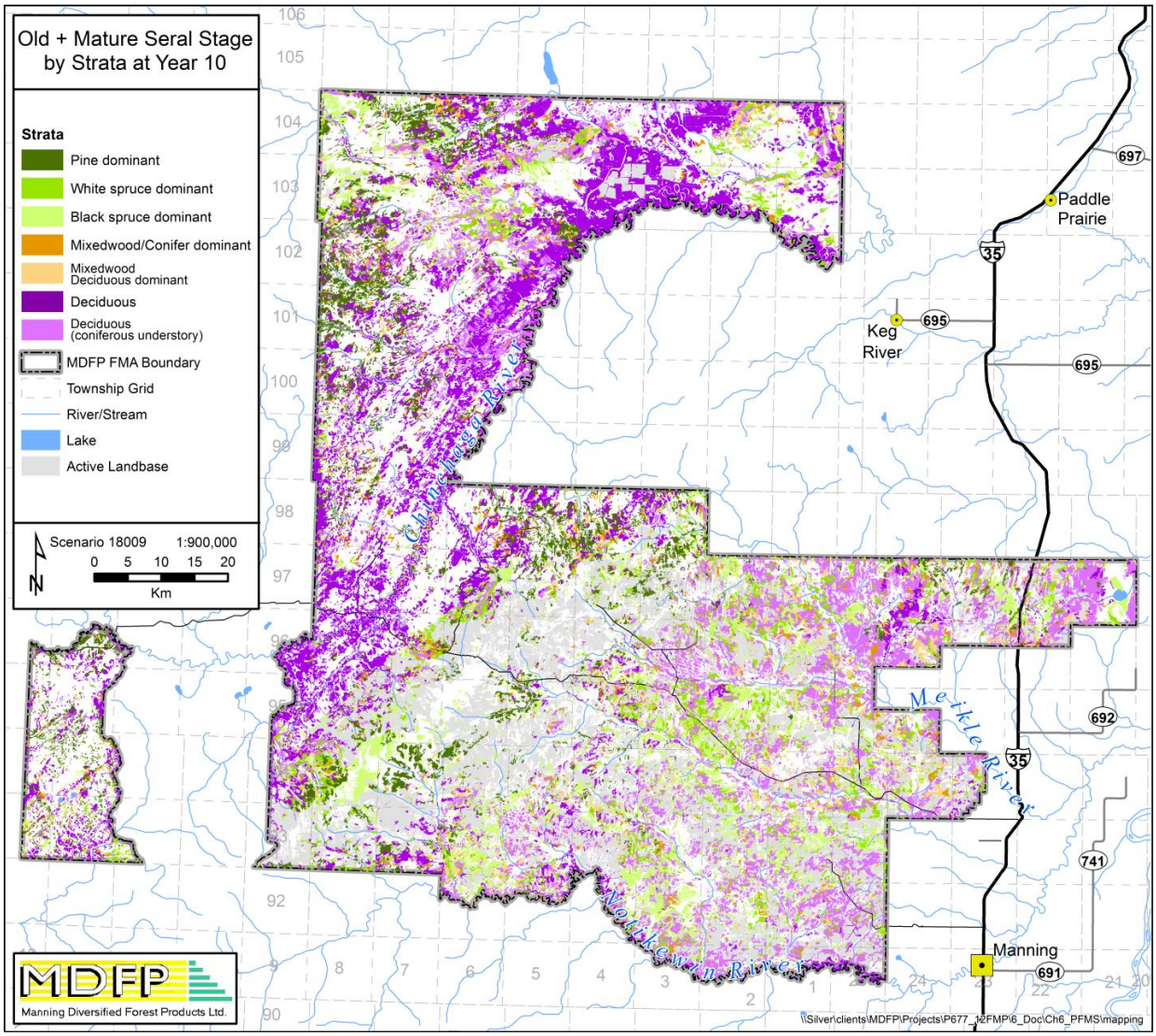

Figure 3-10. Area of Net Old and Mature Forest in the FMA Area by Strata at Year 10

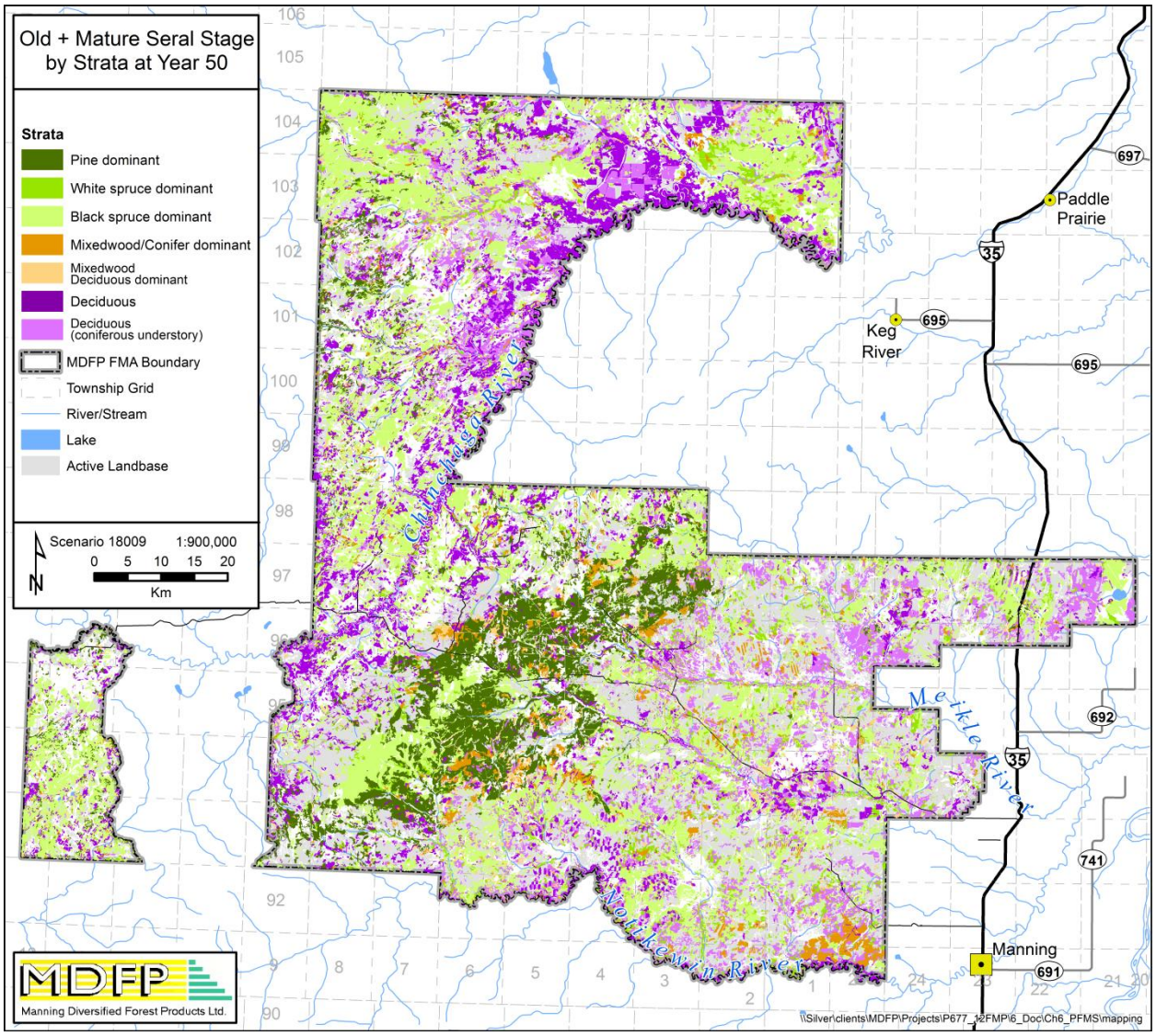

Figure 3-11. Area of Gross Old and Mature Forest in the FMA Area by Strata at Year 50

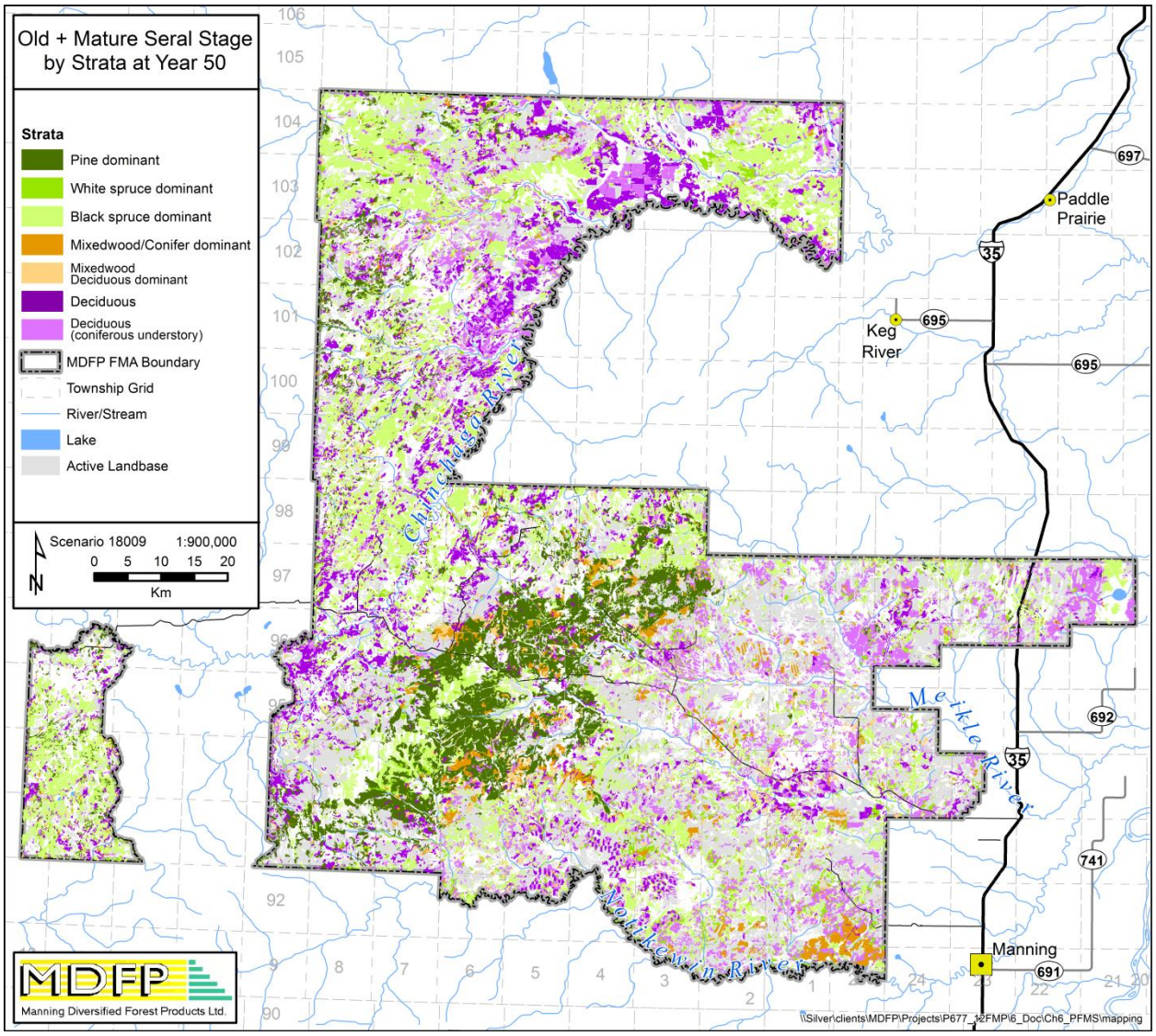

Figure 3-12. Area of Net Old and Mature Forest in the FMA Area by Strata at Year 50

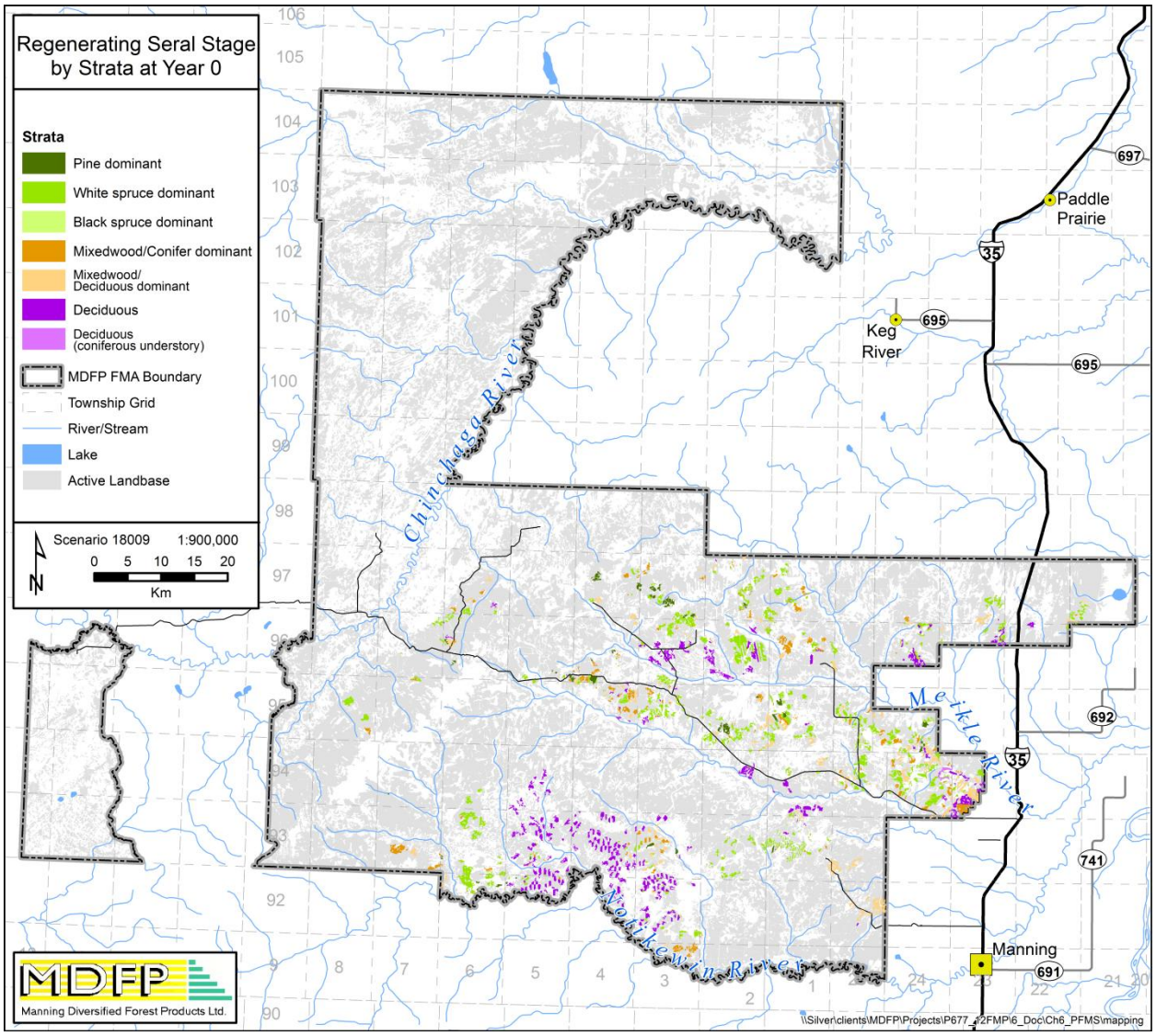

Figure 3-13. Area of Gross Regenerating Forest in the FMA Area by Strata at Year 0

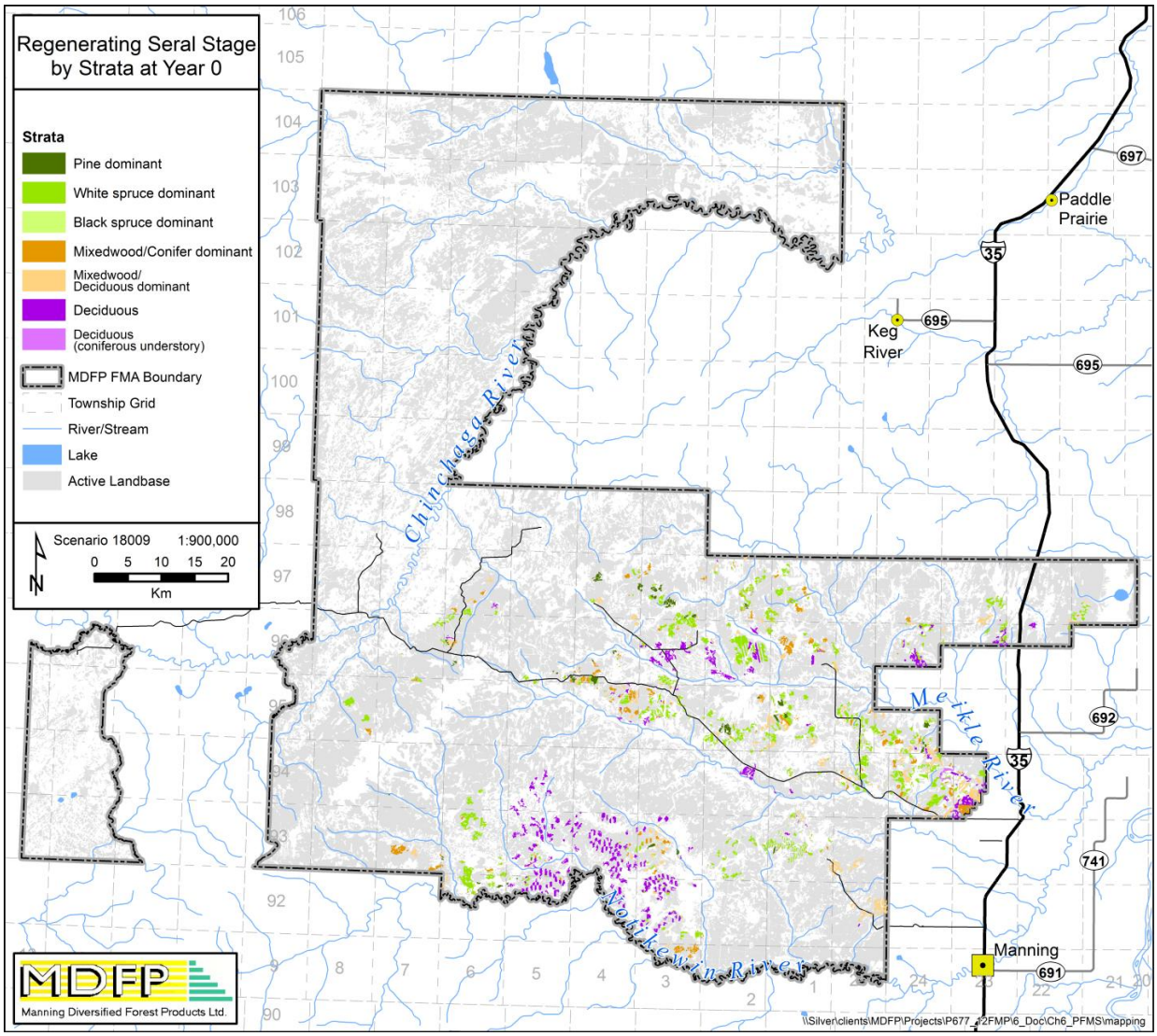

Figure 3-14. Area of Net Regenerating Forest in the FMA Area by Strata at Year 0

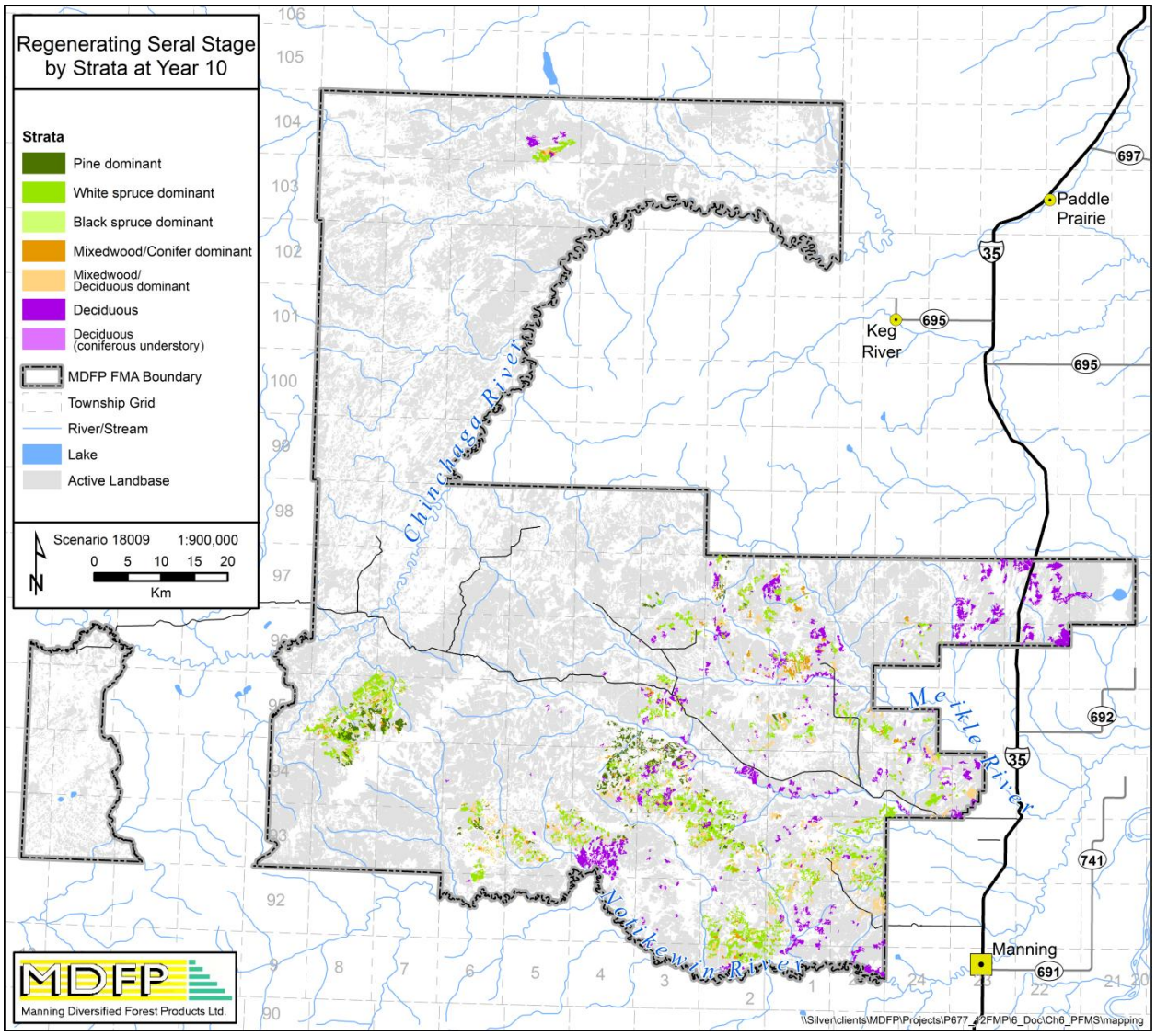

Figure 3-15. Area of Gross Regenerating Forest in the FMA Area by Strata at Year 10

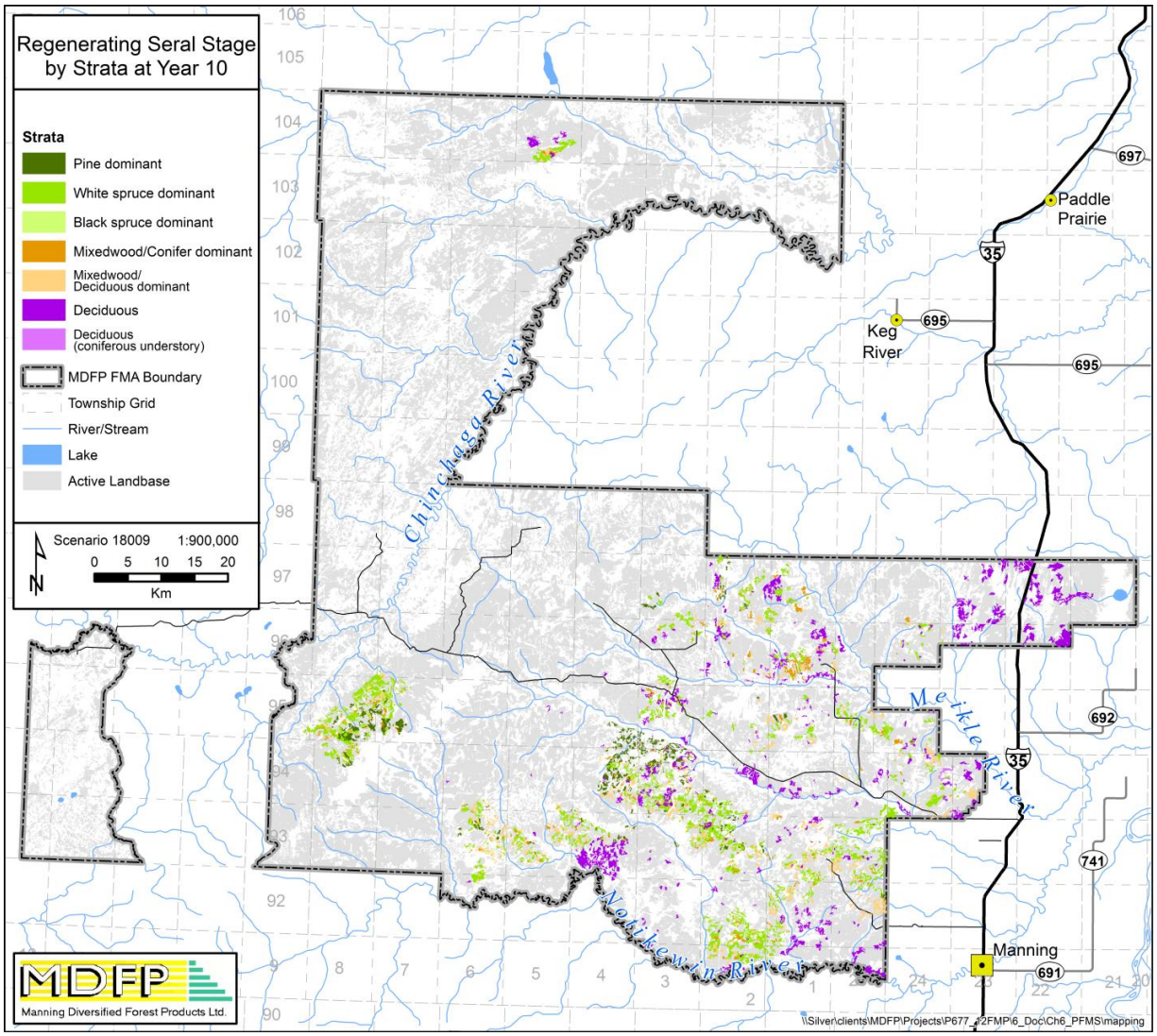

Figure 3-16. Area of Net Regenerating Forest in the FMA Area by Strata at Year 10

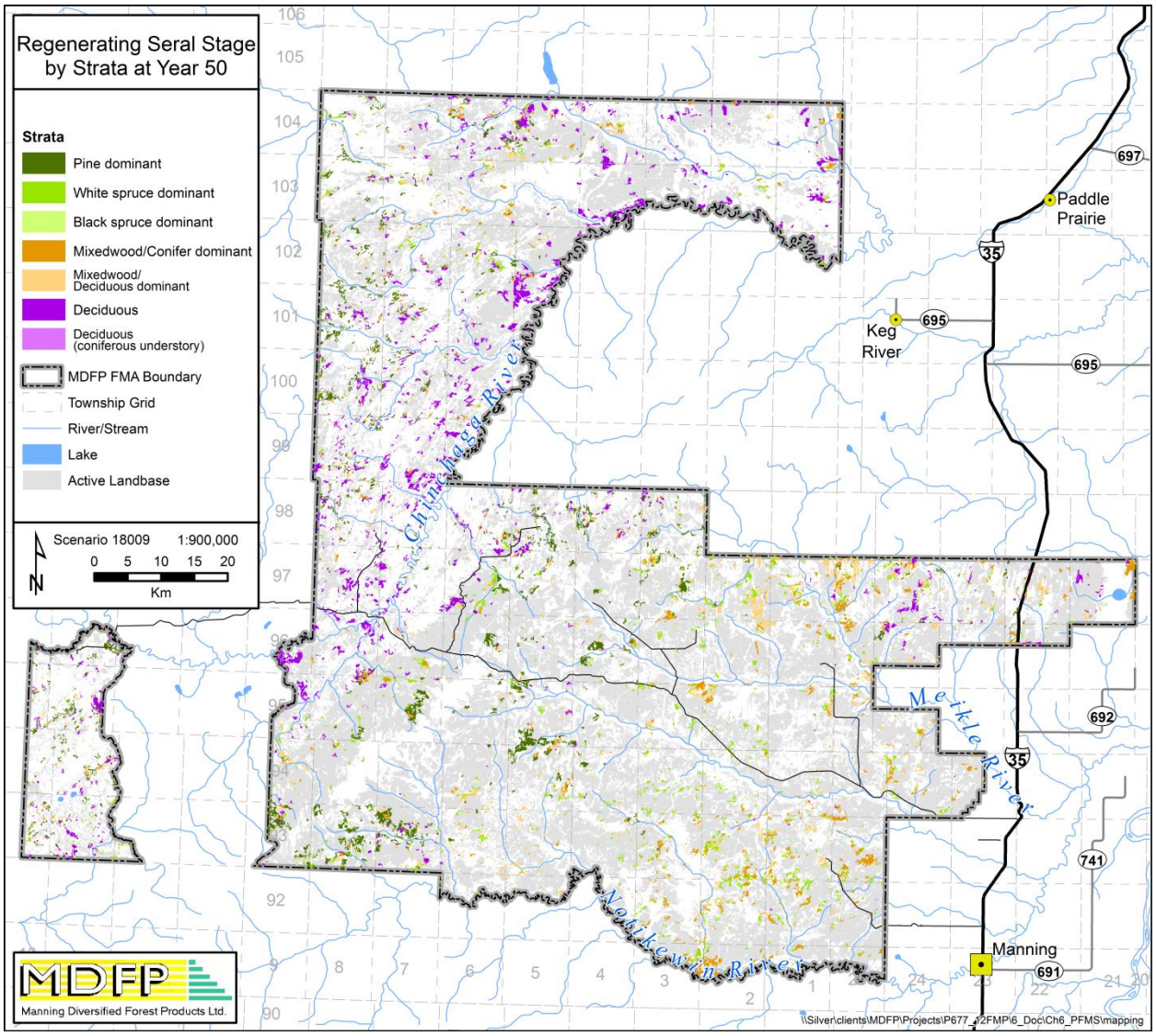

Figure 3-17. Area of Gross Regenerating Forest in the FMA Area by Strata at Year 50

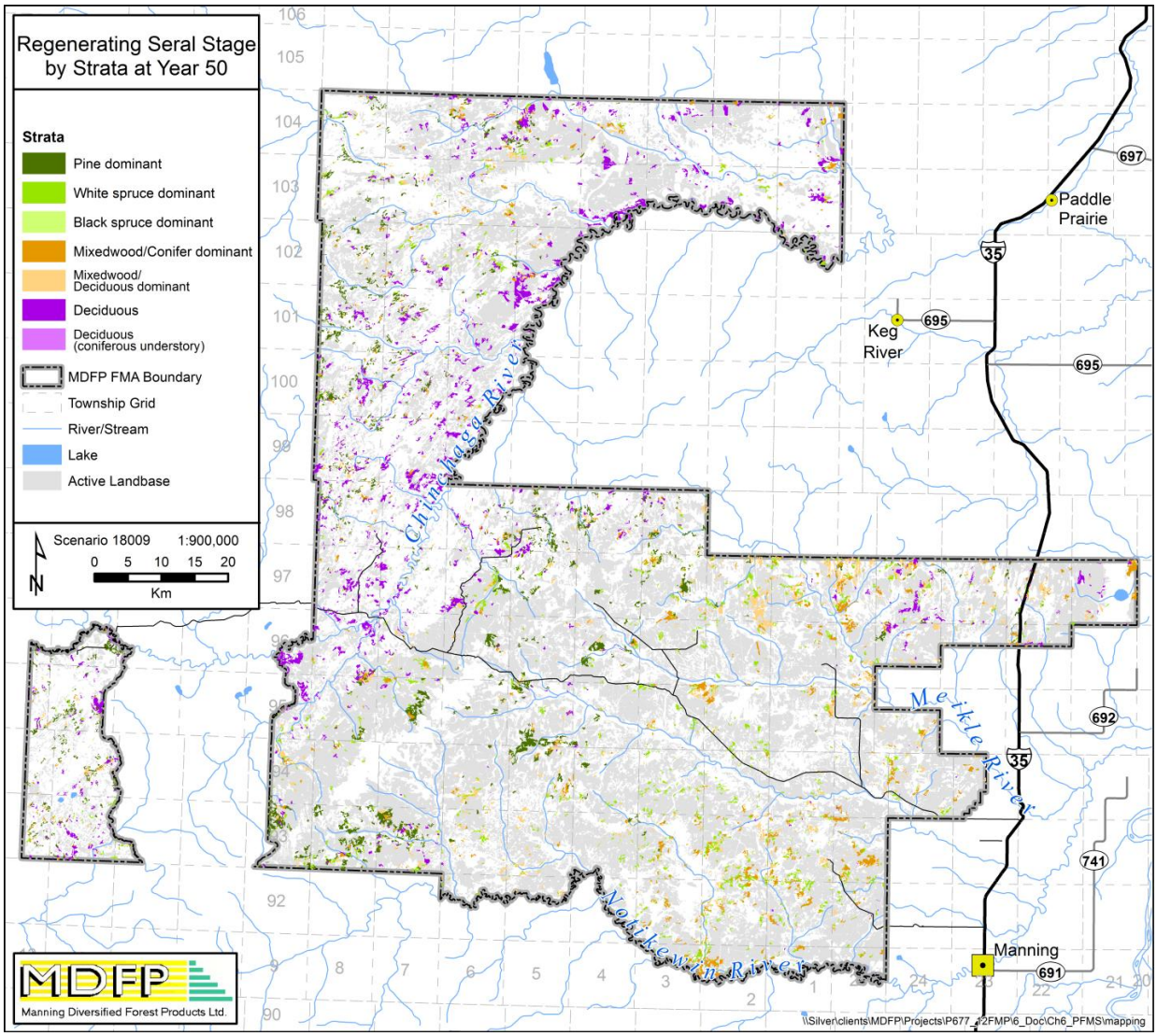

Figure 3-18. Area of Net Regenerating Forest in the FMA Area by Strata at Year 50

VOIT 2 – Range of patch sizes on the FMA area (1.1.1.2A).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.1 Landscape scale biodiversity.

Objective - 1.1.1.2 Maintain biodiversity by avoiding landscape fragmentation.

Target

A distribution of *harvest area* sizes that will result in a *patch* size pattern over the 200 year planning horizon approximating patterns created by natural disturbances.

Target Supporting Information

Targets shall be based on sound science, ecological considerations, wildlife zones, and disturbance regimes. Target shall ensure representation of natural range of ecosystem attributes (e.g. cover class and productivity class).

Means of Achieving Target

Spatial and temporal harvest planning. Patch size distribution targets are set for forest patches less than 20 years old.

Target Monitoring

Regular updates to FMA inventory.

Reporting

FMP:

- Tables of area of forest in each patch size class on the FMA area at 0, 10, and 50 yrs (or end of first rotation). Maps of patch size classes at 0, 10, and 50 yrs, (or end of first rotation).

Performance:

- Stewardship Report - Table summarizing variance from the SHS.

Acceptable Variance

At the end of the 10-year FMP term the target distribution is achieved; or demonstrated progress to achieving target in one rotation where the pattern has deviated significantly from the target.

Response

Adjust strategies in subsequent FMP.

Legal/Policy Requirement

This VOIT is requirement of Planning Standard.

Definitions

Patch - A stand of forest in the same seral stage, and not split by a linear feature greater than 8m wide. Linear features in this definition include roads, pipelines, powerlines, and rivers, but do not include seismic lines. Patch size classes are as follows:

a. 0.0 - 7.0 ha
b. 7.1 - 60.0 ha
c. 60.1 - 200.0 ha
d. 200.1 ha +

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Table 3-17, Table 3-18, Table 3-19, and Table 3-20 summarize gross and net forested areas of forest disturbance patch sizes by species strata at years 0, 10, and 50.

Table 3-17. Gross Forest Disturbance Patch Sizes Summary by Strata (ha)

Disturbance patch sizes by strata								
Disturbance patch size (ha)	Area (ha) by Stratum							Total (ha)
	PL	SW	SB	CD	DC	D	DU	
Year 0								
0-7	85	593	0	404	283	419	0	1,784
7.1-60	1,041	5,309	0	3,461	2,212	5,762	0	17,786
60.1-200	523	4,358	0	1,306	1,427	1,656	0	9,270
200+	242	2,527	0	607	892	523	125	4,916
Total	1,891	12,788	0	5,778	4,815	8,360	125	33,756
Year 10								
0-7	165	589	0	196	372	365	0	1,686
7.1-60	1,647	5,612	0	1,302	2,724	3,729	0	15,014
60.1-200	1,170	5,966	0	937	2,434	5,075	0	15,581
200+	1,581	9,446	0	1,405	3,035	4,592	125	20,184
Total	4,563	21,613	0	3,839	8,565	13,761	125	52,466
Year 50								
0-7	1,603	1,639	0	659	713	2,032	0	6,646
7.1-60	7,594	7,173	0	4,829	6,122	10,432	0	36,150
60.1-200	4,492	3,562	0	3,790	3,320	6,104	0	21,268
200+	5,135	2,421	0	3,371	4,770	4,831	0	20,529
Total	18,824	14,795	0	12,649	14,925	23,400	0	84,593

Table 3-18. Gross Forest Disturbance Patch Sizes Summary by Strata (%)

Disturbance patch sizes by strata								
Disturbance patch size (ha)	Area (%) by Stratum							
	PL	SW	SB	CD	DC	D	DU	Total (%)
Year 0								
0-7	0	0	0	0	0	0	0	0
7.1-60	0	1	0	0	0	1	0	2
60.1-200	0	0	0	0	0	0	0	1
200+	0	0	0	0	0	0	0	1
Total	0	1	0	1	1	1	0	
Year 10								
0-7	0	0	0	0	0	0	0	0
7.1-60	0	1	0	0	0	0	0	2
60.1-200	0	1	0	0	0	1	0	2
200+	0	1	0	0	0	0	0	2
Total	0	2	0	0	1	1	0	
Year 50								
0-7	0	0	0	0	0	0	0	1
7.1-60	1	1	0	1	1	1	0	4
60.1-200	0	0	0	0	0	1	0	2
200+	1	0	0	0	1	1	0	2
Total	2	2	0	1	2	3	0	

Table 3-19. Net Forest Disturbance Patch Sizes Summary by Strata (ha)

Disturbance patch sizes by strata								
Disturbance patch size (ha)	Area (ha) by Stratum							
	PL	SW	SB	CD	DC	D	DU	Total (ha)
Year 0								
0-7	85	593	0	404	283	419	0	1,784
7.1-60	1,041	5,309	0	3,461	2,212	5,762	0	17,786
60.1-200	523	4,358	0	1,306	1,427	1,656	0	9,270
200+	242	2,527	0	607	892	523	125	4,916
Total	1,891	12,788	0	5,778	4,815	8,360	0	33,756
Year 10								
0-7	165	589	0	196	372	365	0	1,686
7.1-60	1,647	5,612	0	1,302	2,724	3,729	0	15,014
60.1-200	1,170	5,966	0	937	2,434	5,075	0	15,581
200+	1,581	9,446	0	1,405	3,035	4,592	125	20,184
Total	4,563	21,613	0	3,839	8,565	13,761	0	52,466
Year 50								
0-7	1,603	1,639	0	659	713	2,032	0	6,646
7.1-60	7,594	7,173	0	4,829	6,122	10,432	0	36,150
60.1-200	4,492	3,562	0	3,790	3,320	6,104	0	21,268
200+	5,135	2,421	0	3,371	4,770	4,831	0	20,529
Total	18,824	14,795	0	12,649	14,925	23,400	0	84,593

Table 3-20. Net Forest Disturbance Patch Sizes Summary by Strata (%)

Disturbance patch sizes by strata								
Disturbance patch size (ha)	Area (%) by Stratum							Total (%)
	PL	SW	SB	CD	DC	D	DU	
Year 0								
0-7	0	0	0	0	0	0	0	0
7.1-60	0	1	0	0	0	1	0	2
60.1-200	0	0	0	0	0	0	0	1
200+	0	0	0	0	0	0	0	1
Total	0	1	0	1	1	1	0	
Year 10								
0-7	0	0	0	0	0	0	0	0
7.1-60	0	1	0	0	0	0	0	2
60.1-200	0	1	0	0	0	1	0	2
200+	0	1	0	0	0	0	0	2
Total	0	2	0	0	1	1	0	
Year 50								
0-7	0	0	0	0	0	0	0	1
7.1-60	1	1	0	1	1	1	0	4
60.1-200	0	0	0	0	0	1	0	2
200+	1	0	0	0	1	1	0	2
Total	2	2	0	1	2	3	0	

Figure 3-19, Figure 3-20, Figure 3-21, Figure 3-22, Figure 3-23, and Figure 3-24 display areas of forest disturbance patch sizes by seral stage at year 0, 10, and 50, respectively.

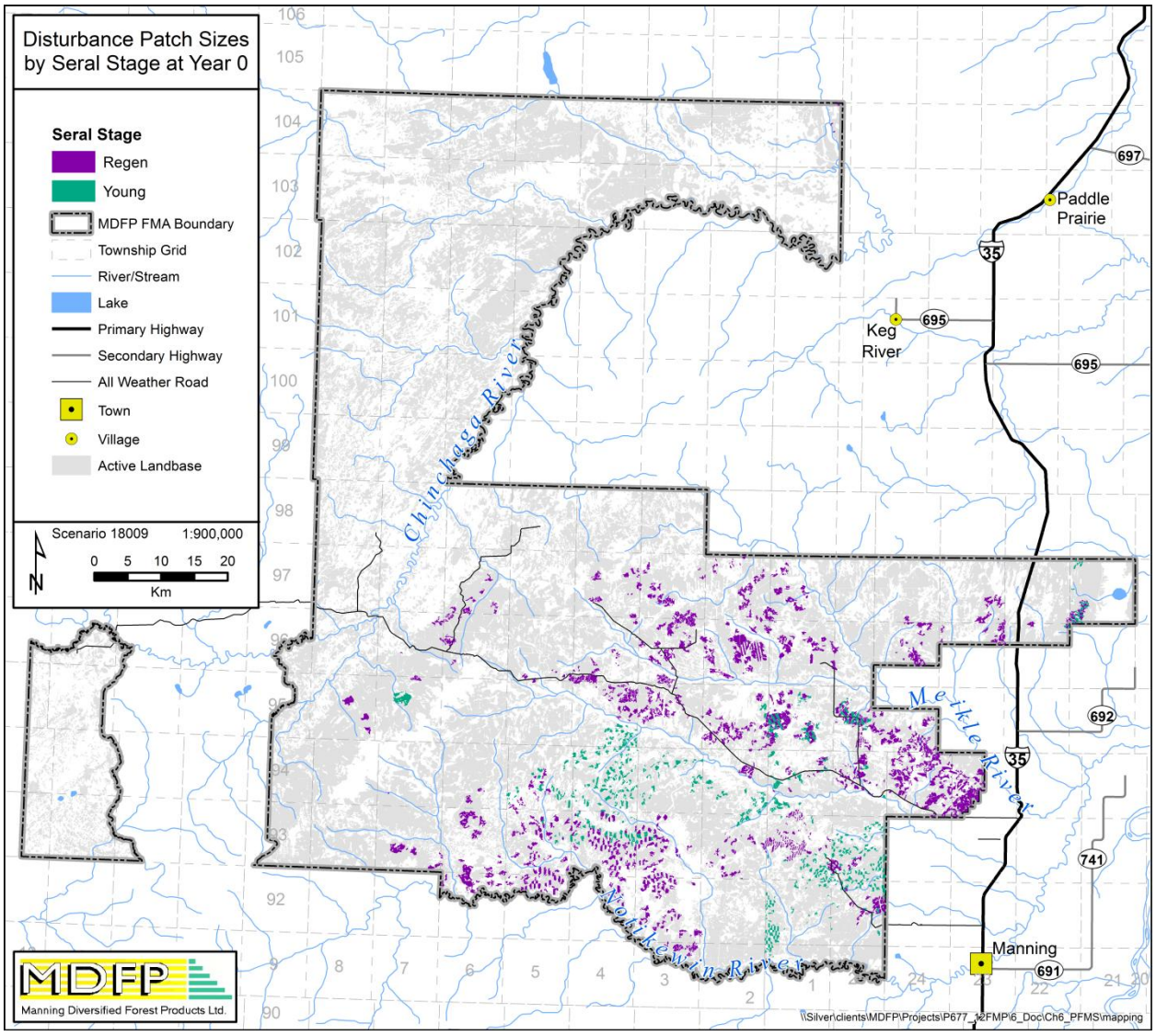

Figure 3-19. Area of Gross Forest Disturbance Patch Sizes by Seral Stage at Year 0

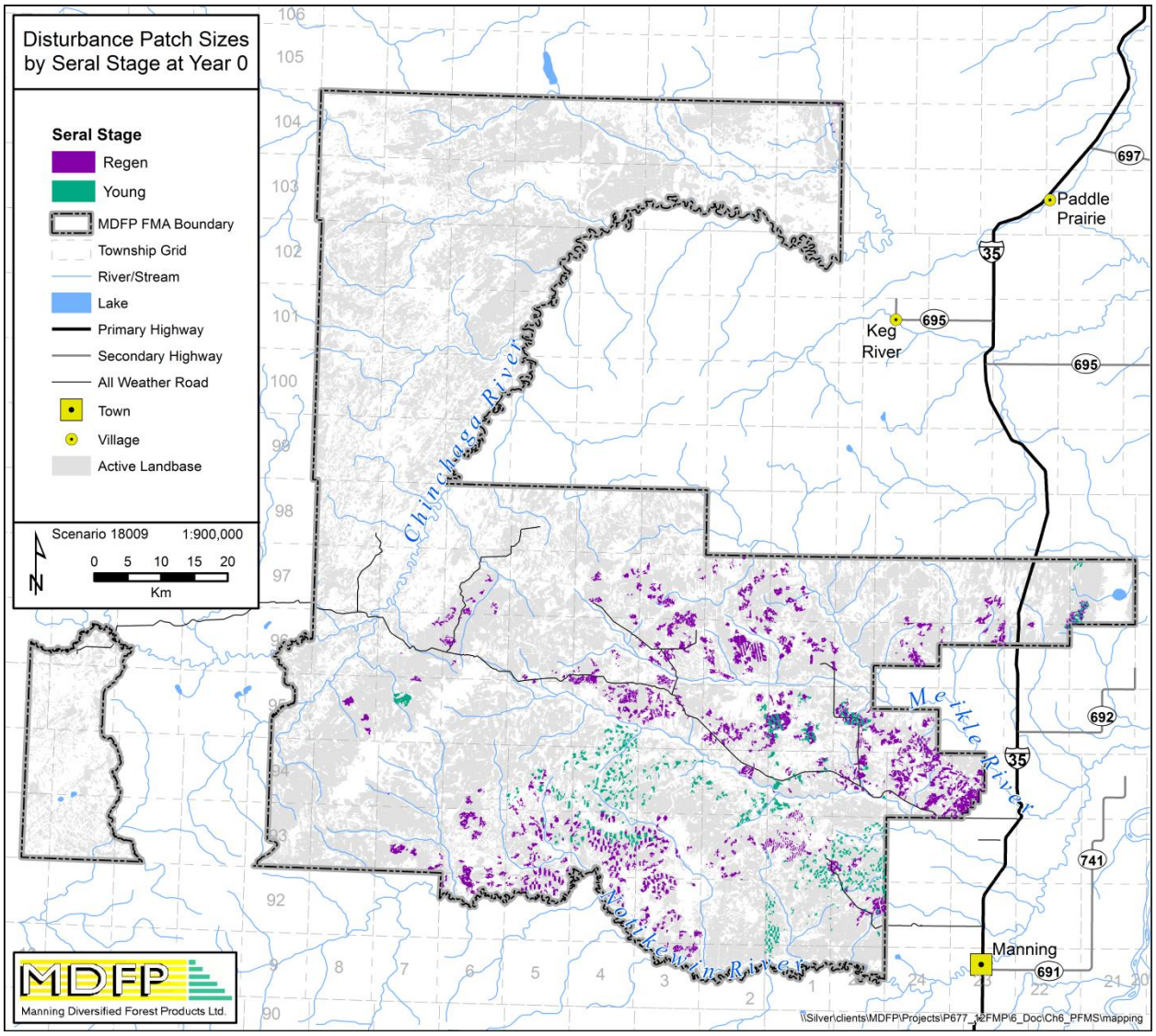

Figure 3-20. Area of Net Forest Disturbance Patch Sizes by Seral Stage at Year 0

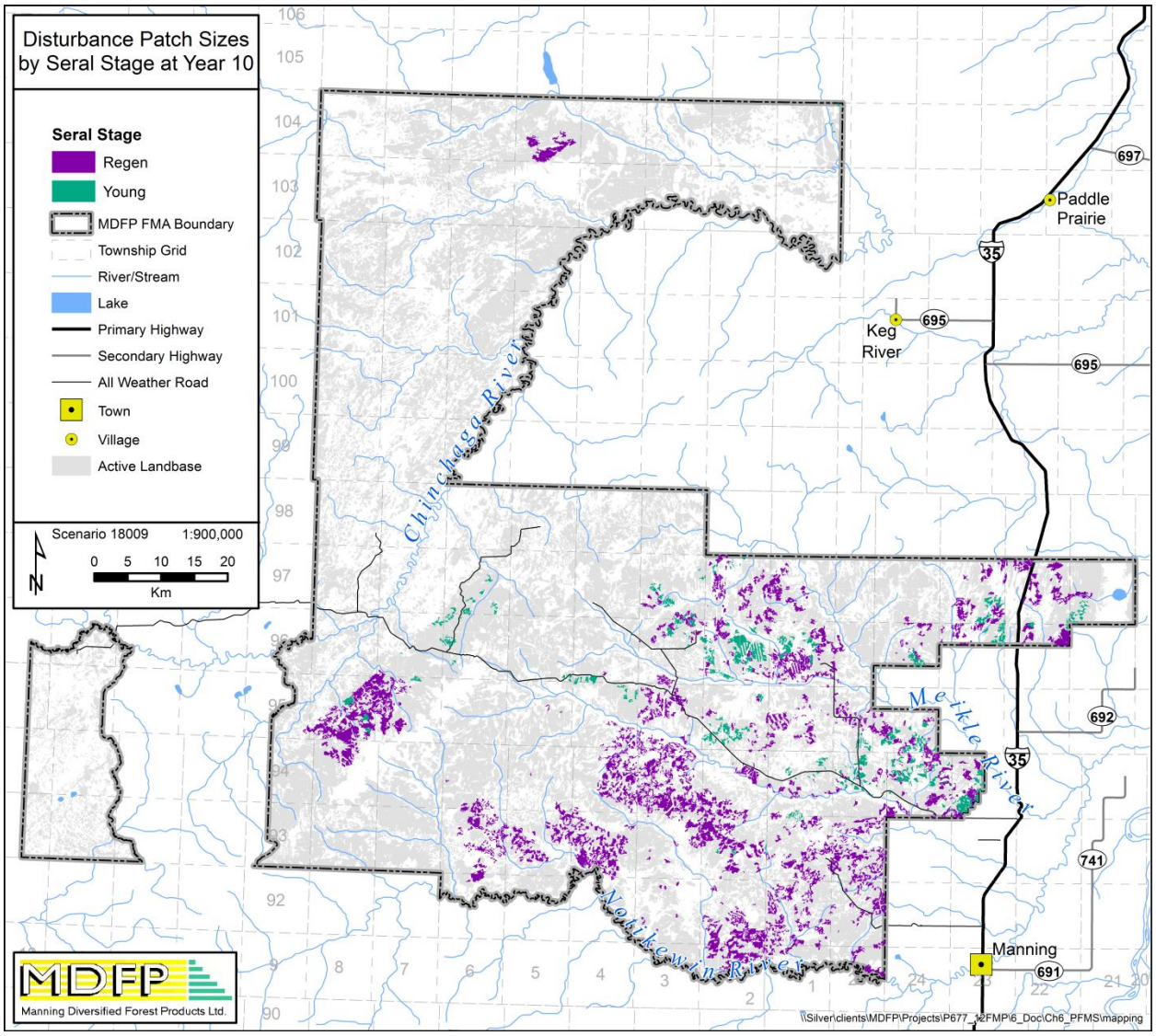

Figure 3-21. Area of Gross Forest Disturbance Patch Sizes by Seral Stage at Year 10

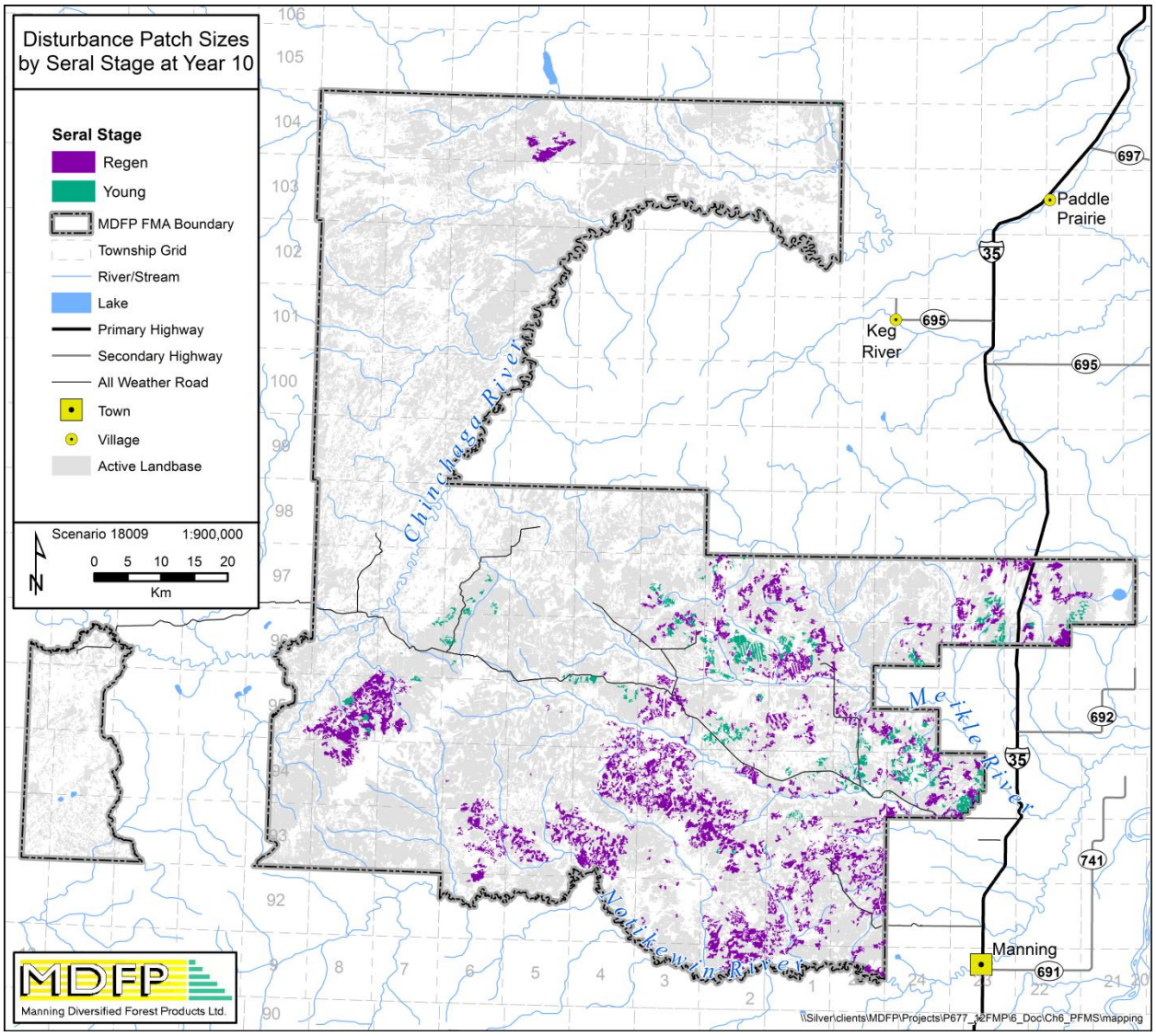

Figure 3-22. Area of Net Forest Disturbance Patch Sizes by Seral Stage at Year 10

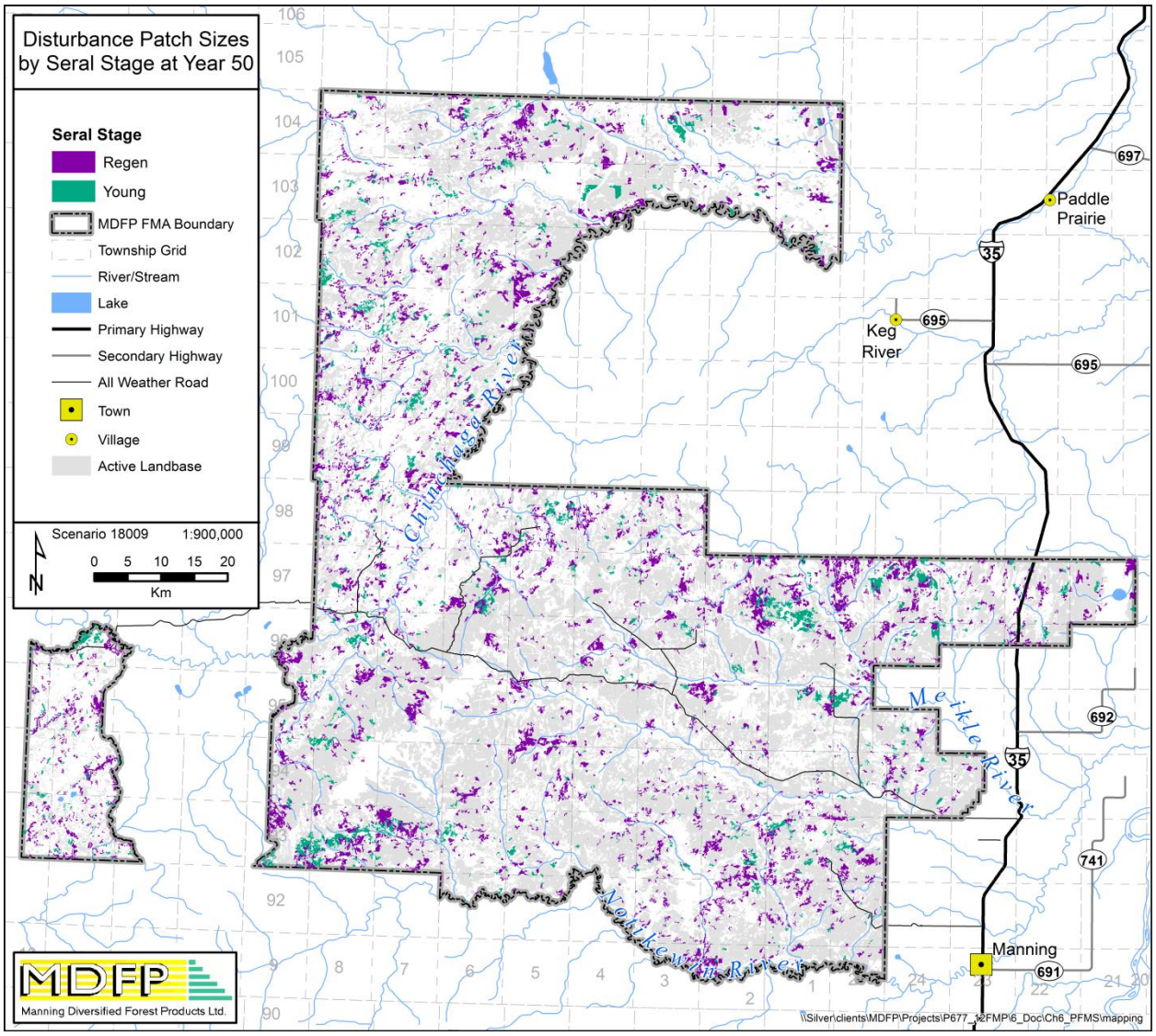

Figure 3-23. Area of Gross Forest Disturbance Patch Sizes by Seral Stage at Year 50

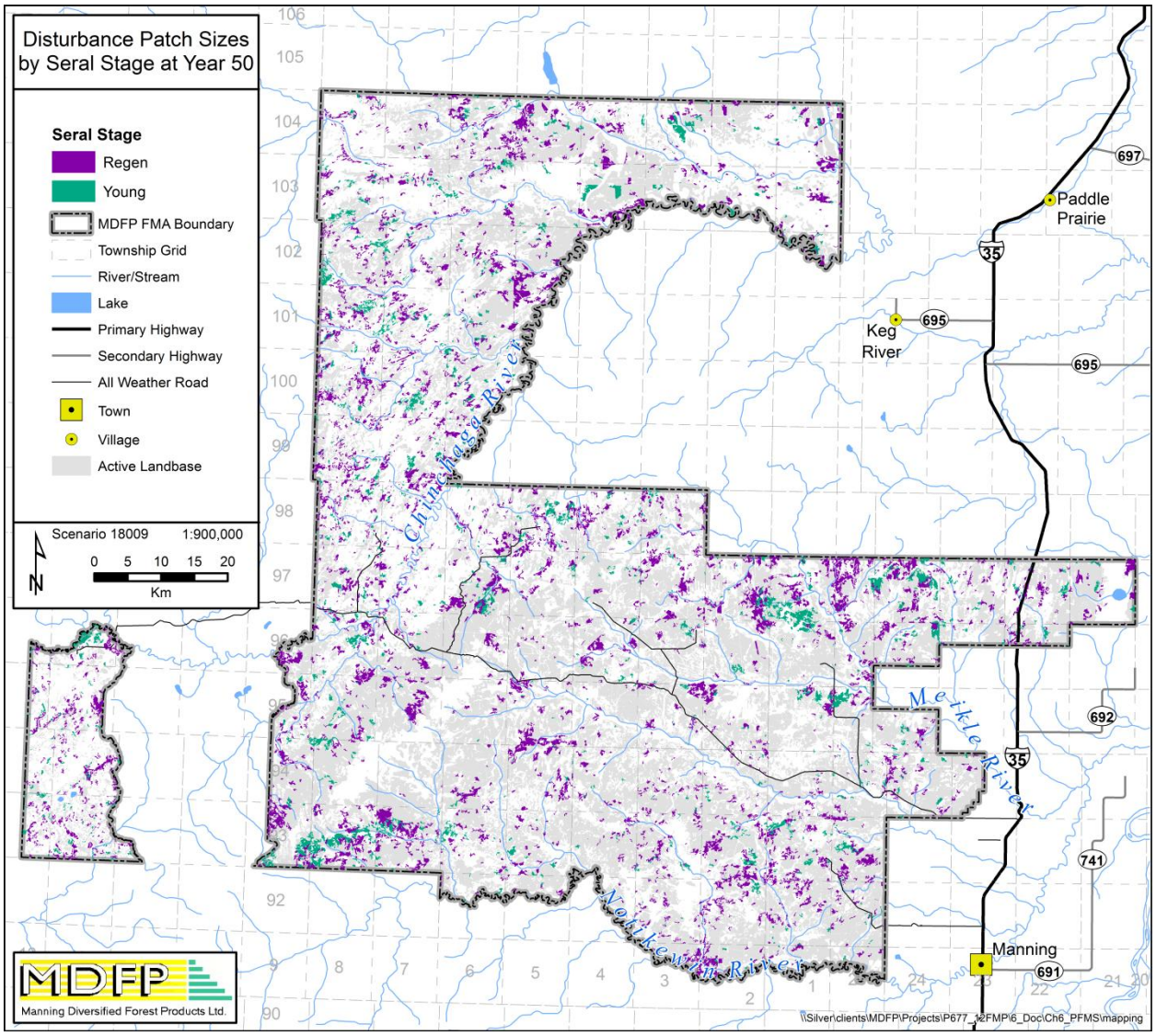

Figure 3-24. Area of Net Forest Disturbance Patch Sizes by Seral Stage at Year 50

VOIT 3 – Area of old interior forest of each Cover Class on the FMA area (1.1.1.2B).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.1 Landscape scale biodiversity.

Objective - 1.1.1.2 Maintain biodiversity by avoiding landscape fragmentation.

Target

Area of old interior forest will not be less than 19% of each cover class over the next 200 years.

- Actual values will be determined from Forecasting process.

Target Supporting Information

Targets shall be based on sound science, ecological considerations, wildlife zones, and disturbance regimes. Target shall ensure representation of natural range of ecosystem attributes (e.g. productivity class).

Means of Achieving Target

Spatial Harvest Sequence.

Target Monitoring

Regular updates to forest inventory.

Reporting

FMP:

- Tables of indicators at Year 0, 10 and 50.

- Maps of indicators at Year 0, 10 and 50.

Performance:

- Stewardship Report - Table summarizing variance to the SHS.

Acceptable Variance

Target is achieved for at least 80% of the planning period with variance not exceeding 20% below target.

Response

Adjust strategies in subsequent FMP.

Legal/Policy Requirement

This VOIT is requirement of Planning Standard.

Definitions

Old Interior Forest - A contiguous forest patch with an age >= 120 years with an area of 120ha, which serves as a proxy for a 100ha patch located beyond the edge effect buffer zone along the edge of a forest.

a. Edge effect buffer zone - 60m where adjacent area is non-forested or is less than 40 years old; 30m where adjacent forest stand is >= 40 years and less and mature forest; 0m where adjacent stand is mature forest.
b. Forest edge - any of the following: a) a linear disruption in forest cover greater than 8m in width, or, b) the line along which forest seral stage class changes.

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Table 3-21, Table 3-22, Table 3-23, and Table 3-24 summarize gross and net areas of old interior forest patch sizes by strata at year 0, 10, and 50.

Notes

Old Interior Forest patches are defined as any stands that are older than 120 years old and patches that are greater than 120 ha.

Table 3-21. Gross Old Interior Forest Patch Sizes Summary by Strata (ha)

Old Interior Forest patches by strata								
Old Interior patch size (ha)	Area (ha) by Stratum							
	PL	SW	SB	CD	DC	D	DU	Total (ha)
Year 0								
0-120	1,946	19,581	10,579	3,067	1,260	790	1,485	38,708
120+	372	4,590	0	1,245	1,618	994	167	8,985
Total	2,318	24,171	10,579	4,312	2,877	1,784	1,652	47,693
Year 10								
0-120	4,119	18,757	19,002	3,412	2,301	2,936	5,608	56,136
120+	2,028	12,243	160	1,651	3,909	4,359	3,505	27,854
Total	6,147	31,000	19,161	5,063	6,210	7,295	9,113	83,990
Year 50								
0-120	2,923	8,990	29,664	2,207	3,157	10,654	12,432	70,026
120+	6,682	3,427	295	1,861	2,092	6,892	7,576	28,824
Total	9,605	12,417	29,959	4,068	5,249	17,546	20,008	98,851

Table 3-22. Gross Old Interior Forest Patch Sizes Summary by Strata (%)

Old Interior Forest patches by strata								
Old Interior patch size (ha)	Area (%) by Stratum							Total (%)
	PL	SW	SB	CD	DC	D	DU	
Year 0								
0-120	4	41	22	6	3	2	3	81
120+	1	10	0	3	3	2	0	19
Total	5	51	22	9	6	4	3	100
Year 10								
0-120	5	22	23	4	3	3	7	67
120+	2	15	0	2	5	5	4	33
Total	7	37	23	6	7	9	11	100
Year 50								
0-120	3	9	30	2	3	11	13	71
120+	7	3	0	2	2	7	8	29
Total	10	13	30	4	5	18	20	100

Table 3-23. Net Old Interior Forest Patch Sizes Summary by Strata (ha)

Old Interior Forest patches by strata								
Old Interior patch size (ha)	Area (ha) by Stratum							Total (ha)
	PL	SW	SB	CD	DC	D	DU	
Year 0								
0-120	1,758	15,738	112	2,694	1,139	590	1,448	23,479
120+	372	4,590	0	1,245	1,618	994	167	8,985
Total	2,130	20,328	112	3,939	2,756	1,585	1,614	32,464
Year 10								
0-120	3,790	13,865	529	2,897	2,068	1,874	5,293	30,316
120+	2,028	12,243	0	1,651	3,909	4,359	3,505	27,695
Total	5,818	26,109	529	4,549	5,976	6,232	8,798	58,011
Year 50								
0-120	2,342	5,675	353	1,358	2,094	5,177	10,836	27,835
120+	6,682	3,427	0	1,861	2,092	6,892	7,349	28,303
Total	9,024	9,102	353	3,219	4,186	12,069	18,186	56,138

Table 3-24. Net Old Interior Forest Patch Sizes Summary by Strata (%)

Old Interior Forest patches by strata								
Old Interior patch size (ha)	Area (%) by Stratum							Total (%)
	PL	SW	SB	CD	DC	D	DU	
Year 0								
0-120	5	48	0	8	4	2	4	72
120+	1	14	0	4	5	3	1	28
Total	7	63	0	12	8	5	5	100
Year 10								
0-120	7	24	1	5	4	3	9	52
120+	3	21	0	3	7	8	6	48
Total	10	45	1	8	10	11	15	100
Year 50								
0-120	4	10	1	2	4	9	19	50
120+	12	6	0	3	4	12	13	50
Total	16	16	1	6	7	21	32	100

Figure 3-25, Figure 3-26, Figure 3-27, Figure 3-28, Figure 3-29, and Figure 3-30 illustrate old forest interior patch sizes at year 0, 10, and 50, respectively.

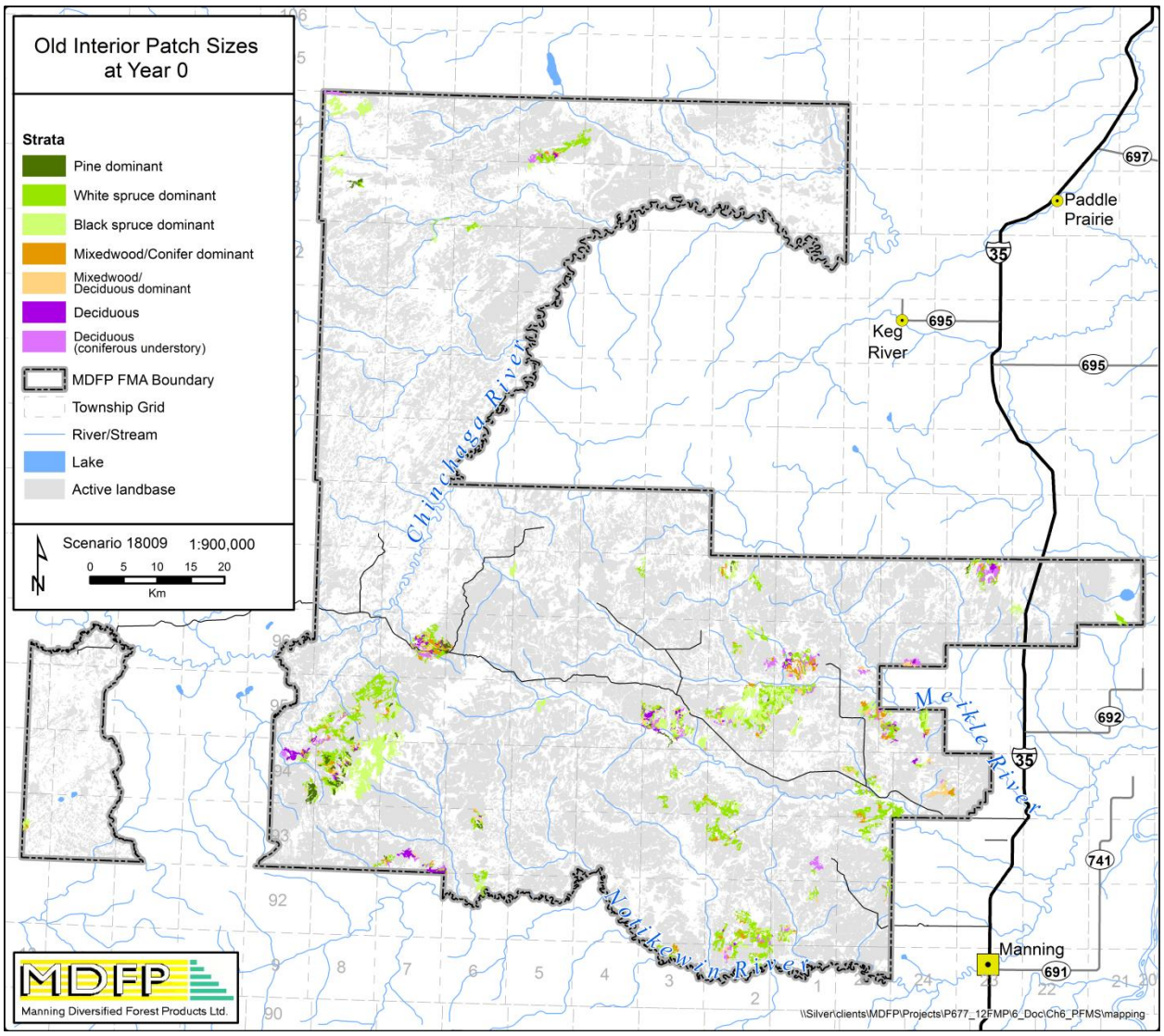

Figure 3-25. Area of Gross Old Forest Interior Patch Sizes by Strata at Year 0

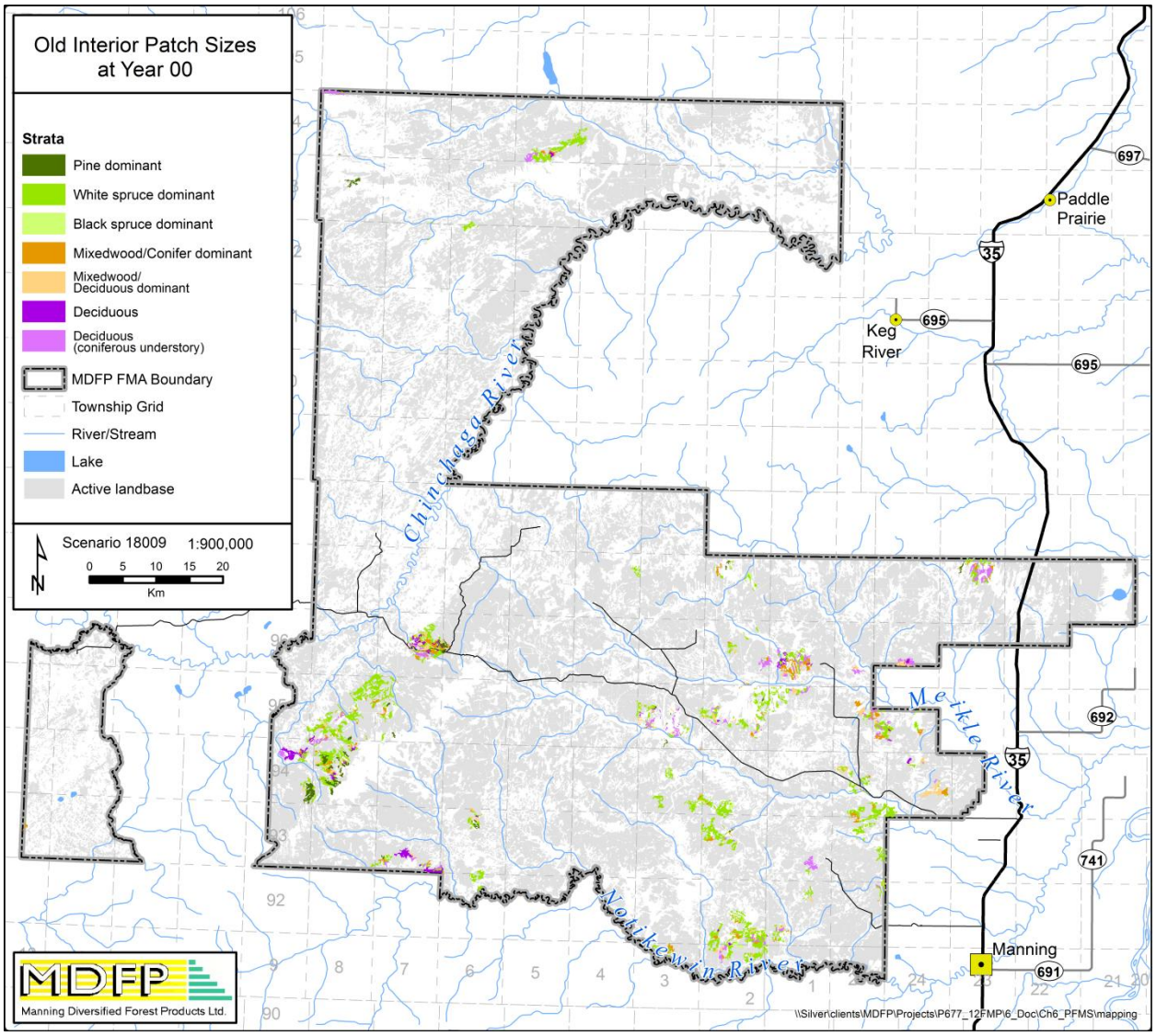

Figure 3-26. Area of Net Old Forest Interior Patch Sizes by Strata at Year 0

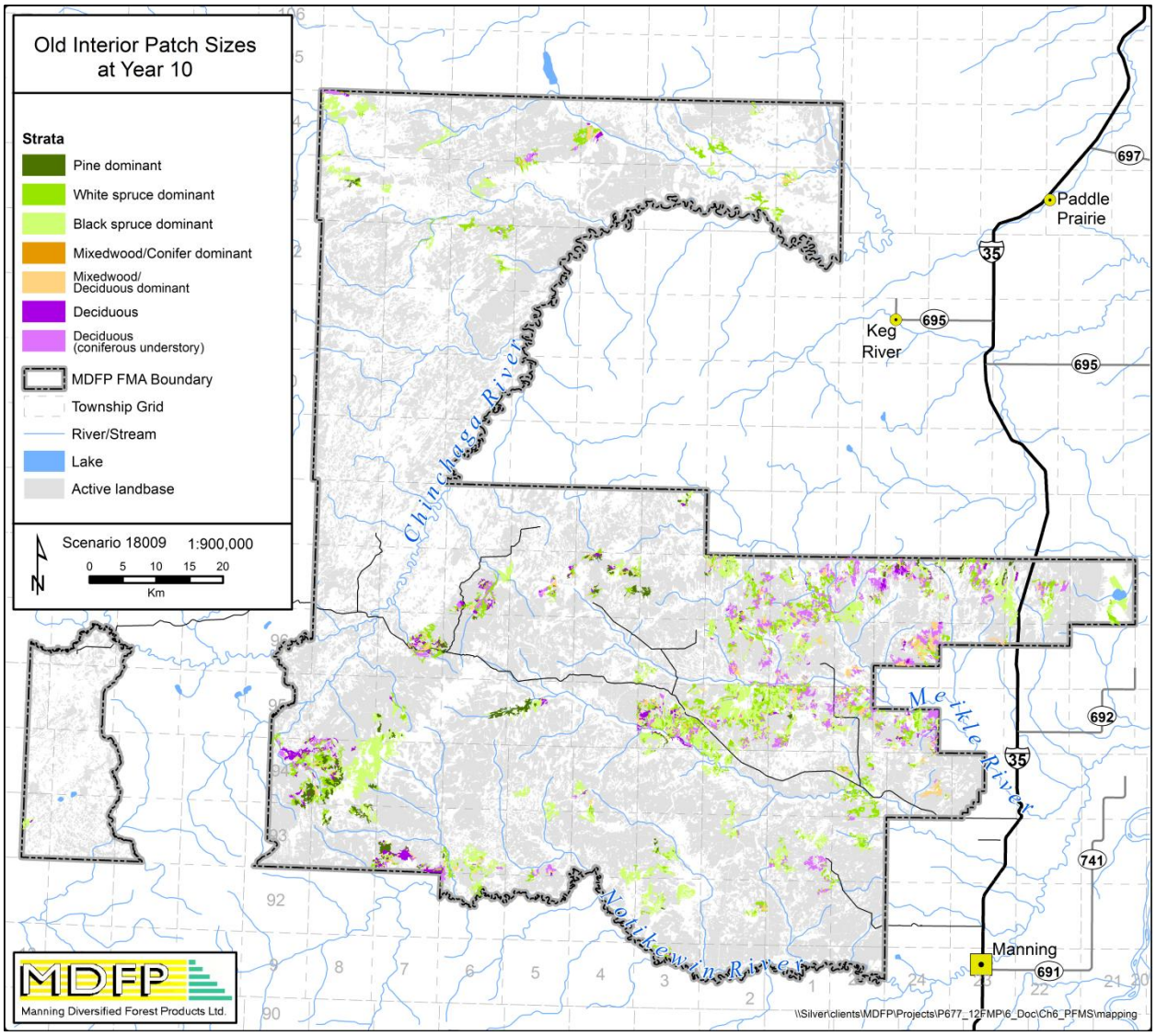

Figure 3-27. Area of Gross Old Forest Interior Patch Sizes by Strata at Year 10

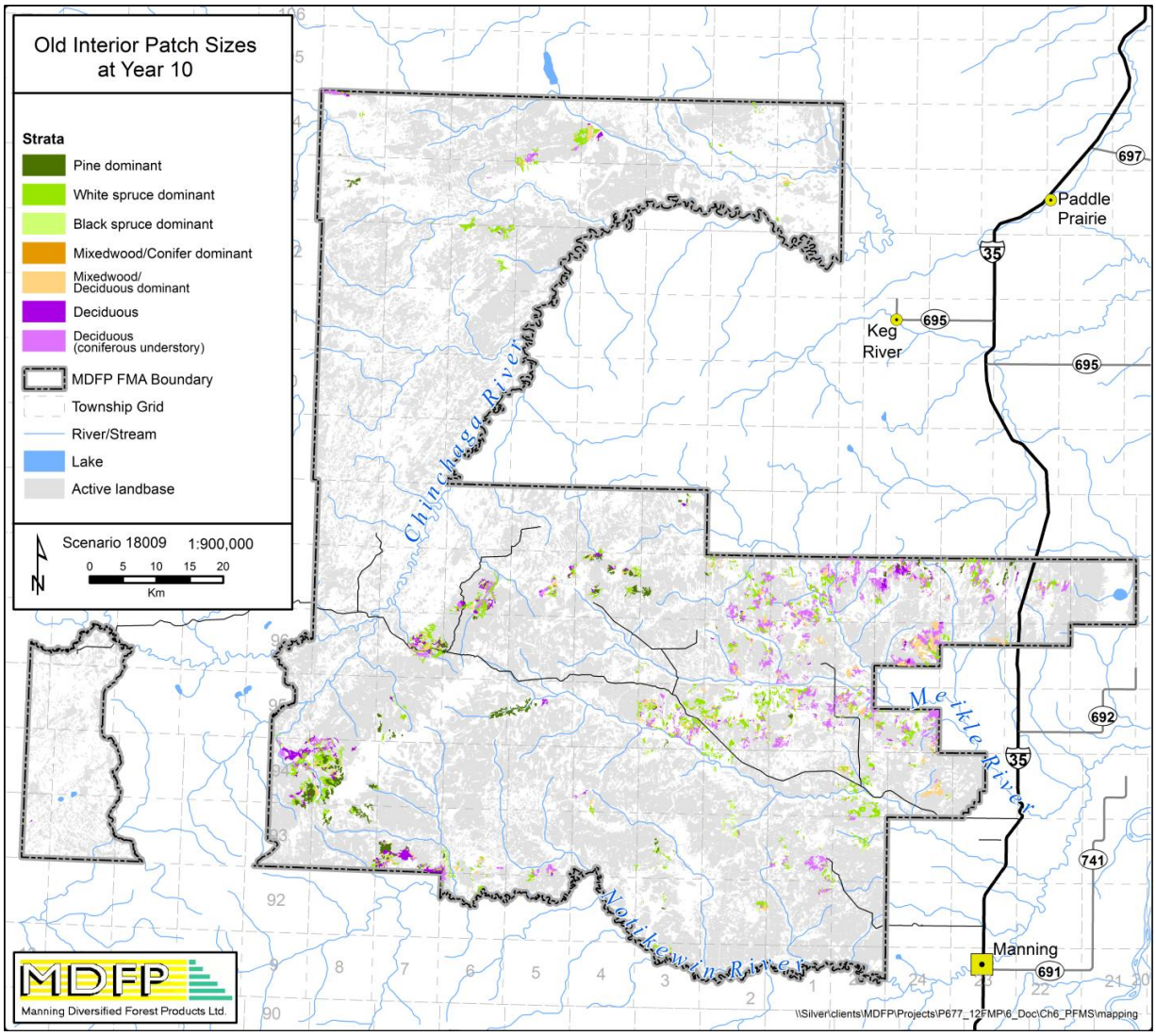

Figure 3-28. Area of Net Old Forest Interior Patch Sizes by Strata at Year 10

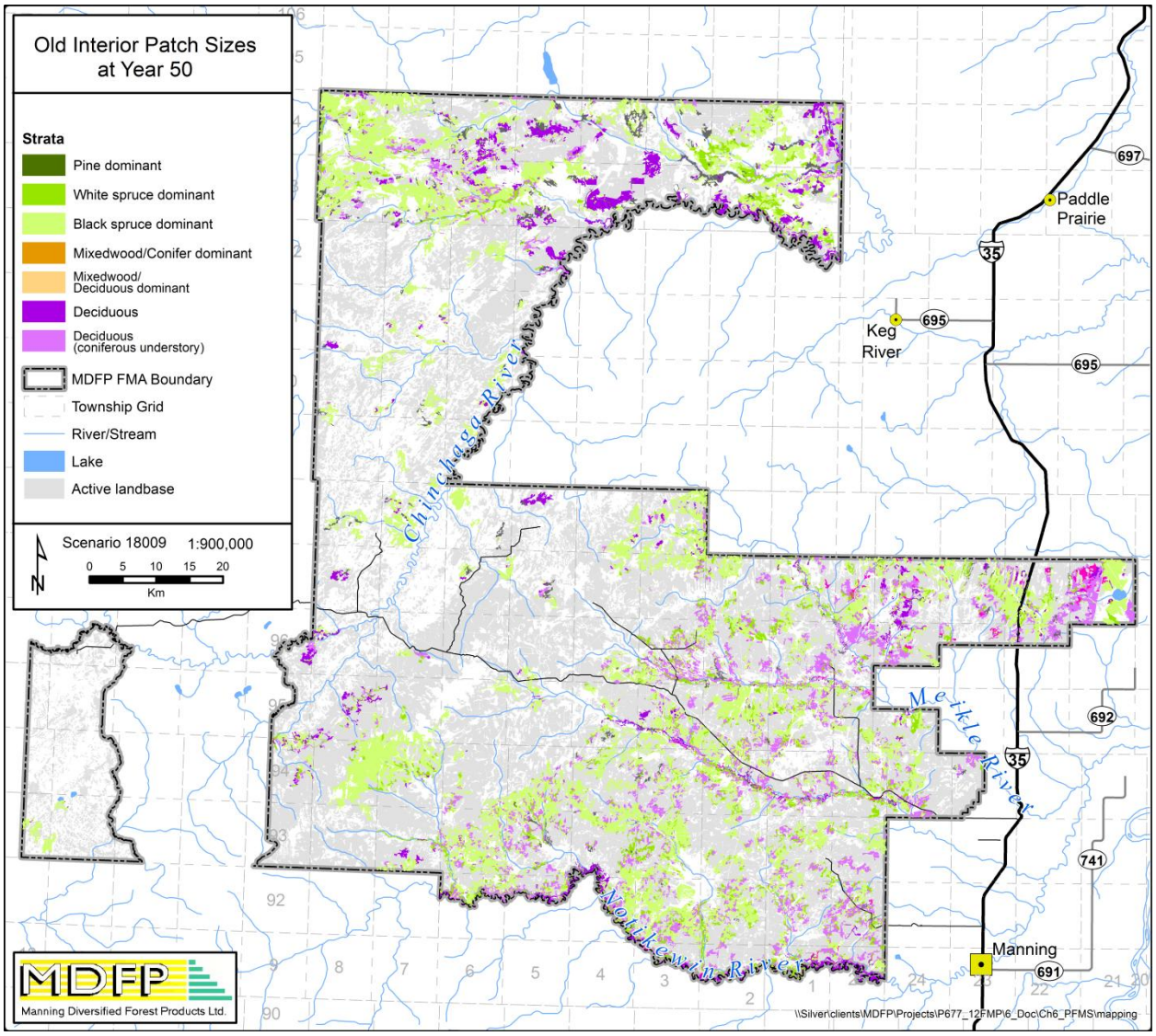

Figure 3-29. Area of Gross Old Forest Interior Patch Sizes by Strata at Year 50

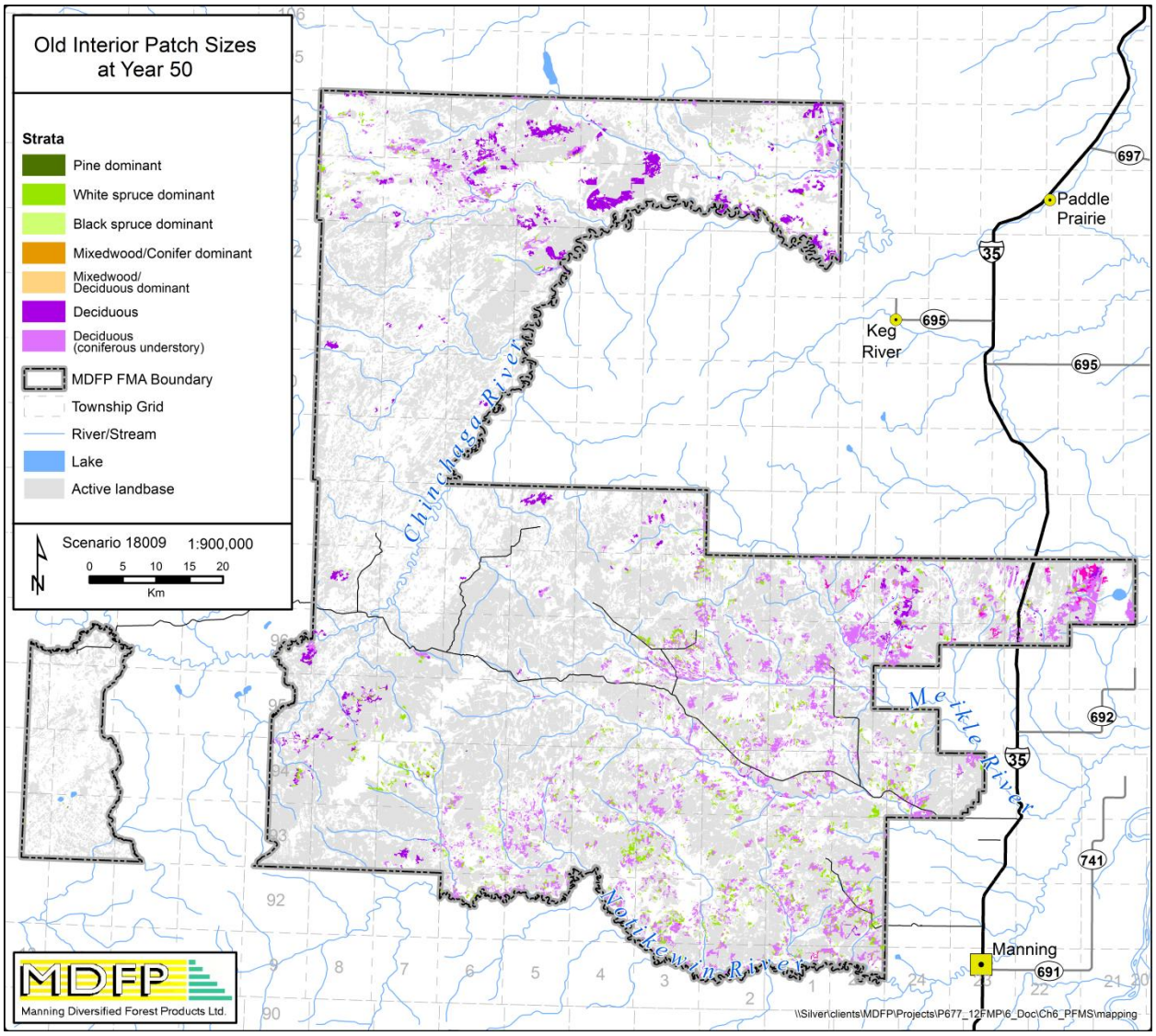

Figure 3-30. Area of Net Old Forest Interior Patch Sizes by Strata at Year 50

VOIT 4 – Open all-weather forestry road density on the FMA area (1.1.1.3A).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.1 Landscape scale biodiversity.

Objective - 1.1.1.3 Maintain biodiversity by minimizing access.

Target

Less than 0.017 km/km^2 (approximates 100 km) of open all-weather forestry road.

Target Supporting Information

Targets shall be based on sound science, ecological considerations, harvest planning, wildlife zones, and social values.

Means of Achieving Target

Develop a strategy that coordinates access with other resource users, spatial/temporal sequencing of harvest, road closures and decommissioning. (SHS and long-term corridor access plan).

Target Monitoring

Regular updates to forest inventory.

Reporting

FMP:

- Table of forestry road density on FMA area at 0 and 10 years.

- Map of existing and proposed open and closed forestry all weather roads.

Performance:

- Stewardship Report - Open all-weather forestry road density on FMA area by year.

Acceptable Variance

A variance not exceeding +20% must be achieved.

Response

Adjust strategies in subsequent FMP.

Legal/Policy Requirement

This VOIT is requirement of Planning Standard.

Definitions

All-weather forestry road - Roads constructed for all weather access that are held under License of Occupation (LOC)

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Table 3-25 provides a summary of the existing forestry roads and other access roads inside of the FMA area only. The total length of the Existing All Weather Forestry Roads is 5.8 km making up a density of 0.00062 km/km^2.

Table 3-25. Summary of the Existing Forestry Roads and Other Access Roads

Open All-Weather Forestry Road Density	
Road Type	**Length (km)**
Existing All Weather Forestry Roads	5.8
Planned All Weather Forestry Roads	0.0
Other All Weather Roads	662.9
Other LOC and Winter Roads	9,005.9
Total	9,674.6

Figure 3-31 maps the roads which could be used by forestry operators for access on the FMA.

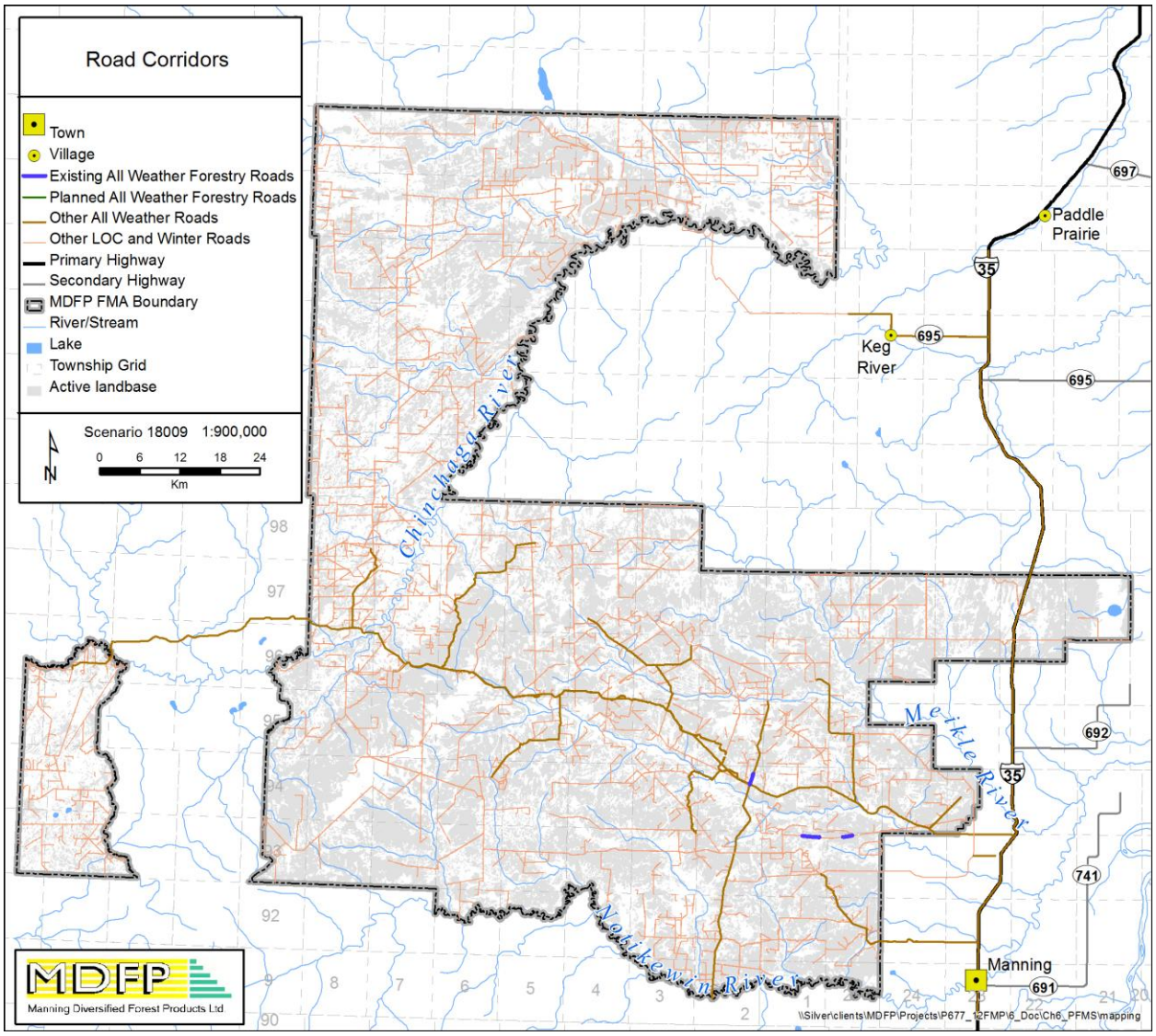


Figure 3-31. Existing Forestry Roads and Other Access Roads

VOIT 5 – Open seasonal/temporary forestry road length on the FMA area (1.1.1.3B).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.1 Landscape scale biodiversity.

Objective - 1.1.1.3 Maintain biodiversity by minimizing access.

Target

Less than 450 km of seasonal / temporary forestry roads on the FMA area annually.

Target Supporting Information

Targets shall be based on sound science, ecological considerations, harvest planning, wildlife zones, and social values.

Means of Achieving Target

Road construction, maintenance and reclamation activities.

Target Monitoring

Road plan OGR 11.2.

Reporting

AOP:

- Listing and map of seasonal / temporary forestry roads planned for use in upcoming Operating Year.

Performance:

- Stewardship Report - Length of open seasonal / temporary forestry road length on FMA area by year.

Acceptable Variance

A variance not exceeding +20% must be achieved.

Response

Adjust strategies in subsequent AOPs.

Legal/Policy Requirement

This VOIT is requirement of Planning Standard.

Definitions

Seasonal/temporary forestry road - Roads constructed for seasonal or temporary access that are used by a forest products company, in a given timber year, excluding in-block roads.

VOIT 6 – Maintained area or occurrence of each identified uncommon plant community within the FMA area (1.1.1.4).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.1 Landscape scale biodiversity.

Objective - 1.1.1.4 Maintain plant communities uncommon in FMA or province.

Target

When encountered, maintain 80% of the identified uncommon plant community area, for each community confirmed to exist within the FMA, as defined within the Alberta Conservation Information Management System (ACIMS).

Target Supporting Information

GIS analysis, *AVI*, ecosite phases, Alberta Conservation Information Management System (ACIMS) plant community classification and tracking list. Predict and identify occurrence of uncommon plant community.

Means of Achieving Target

Implement MDFP's Uncommon Plant Community Maintenance Policy. Coordinating with other resource users, spatial planning of harvest and road construction, OGR.

Target Monitoring

Regular updates to inventory.

Reporting

FMP:

- Table with descriptive list of identified uncommon plant communities and targets.

- Map(s) displaying known locations of uncommon plant communities. There is one area identified on the FMA for uncommon plant protection.

Performance:

- Stewardship Report - Uncommon plant communities identified and percent area maintained.

Acceptable Variance

At the end of the 10-year FMP term the target is achieved.

Response

Adjust strategies in subsequent AOPs.

Legal/Policy Requirement

This VOIT is requirement of Planning Standard.

2012-2021 FMP Reporting

Figure 3-32 displays extent of the Twisted Bog Moss protected area at Twin lakes.

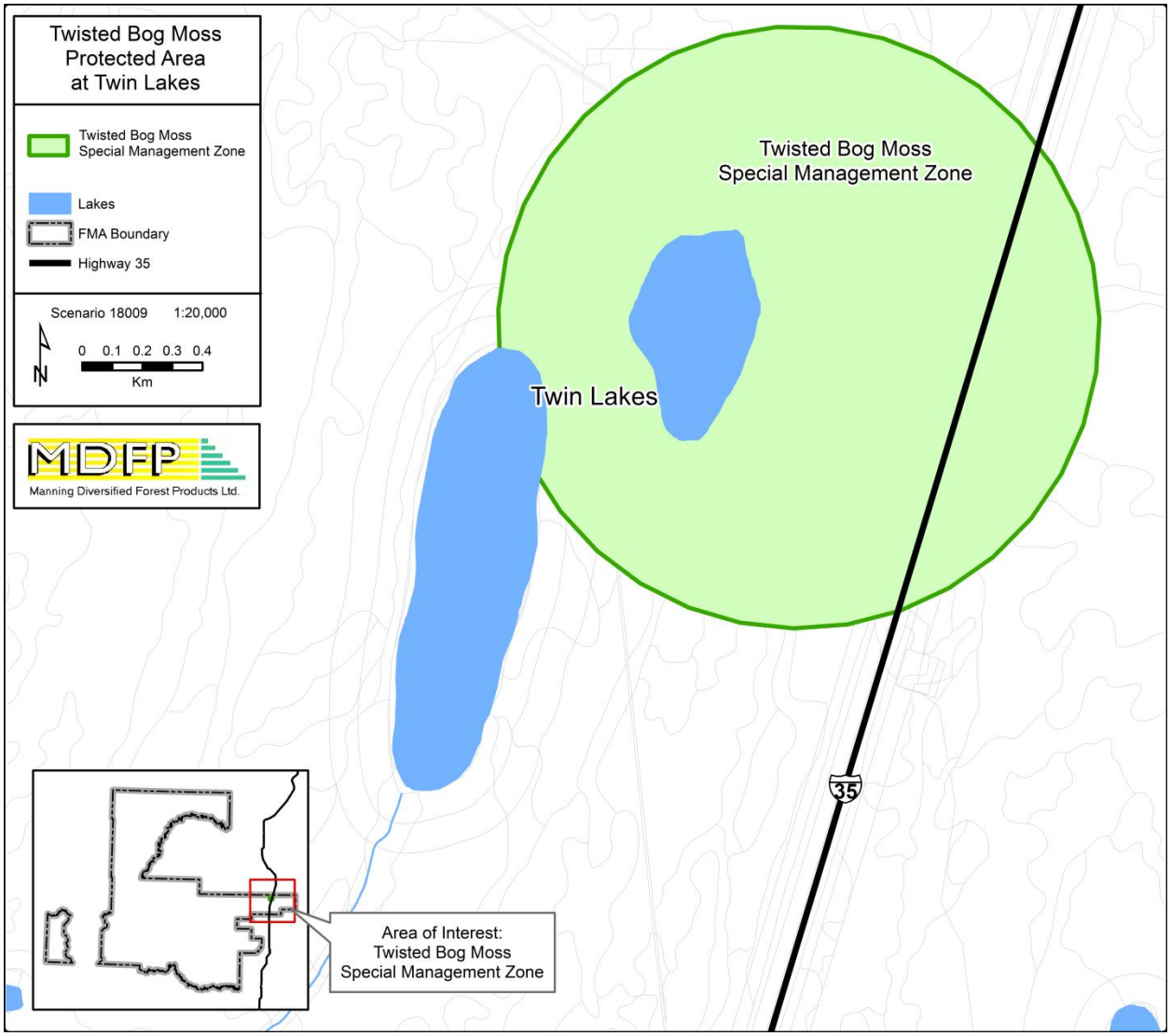


Figure 3-32. Twisted Bog Moss Protected Area

VOIT 7 – Area unsalvaged in burned forest (1.1.1.5A).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.1 Landscape scale biodiversity.

Objective - 1.1.1.5 Maintain unique habitats provided by wildfire and blowdown events.

Target

Live trees:

- Retain all unburned trees in green islands and retained patches recognizing timber condition, access, non-timber needs.

Burned trees - *Compartment* Scale:

- Retain greater than 10% of merchantable black trees in patches greater than 100 ha.

Burned trees - Harvest Area Scale:

- Retain greater than 10% of merchantable black trees in patches 10 -100 ha; and

- Retain greater than 5% of merchantable black trees in small patches, single trees according to loggers choice.

Target Supporting Information

Targets based on "Fire Salvage Strategy: Forest Management Planning and Operations 2002" Ensure consistency with *FireSmart* objectives.

Means of Achieving Target

Salvage planning.

Target Monitoring

Organization reports, air photo interpretation, ground surveys, post harvest assessments.

Reporting

FMP:

- Table and map of fire disturbances within the last 10 years – salvaged (%) and unsalvaged (100%). Report area (ha).

Performance:

Stewardship Report - Table of fire disturbances with summary of salvaged (0%) and unsalvaged (100%) area (ha).

Acceptable Variance

At the end of the 10-year FMP term the target is achieved or exceeded.

Response

Adjust strategies in subsequent AOPs.

Legal/Policy Requirement

Fire Salvage Strategy: Forest Management Planning and Operations 2002 (Forest Operations Branch, Alberta).

2012-2021 FMP Reporting

Table 3-26 summarizes the fire disturbance areas that took place in past 10 years.

Table 3-26. Area of Forest Fire Disturbances within the last 10 Years by Strata

Natural Disturbances (fires) in past 10 years							
Area (ha) by Stratum							
PL	SW	SB	CD	DC	D	DU	Total (ha)
7,140	879	6,725	771	127	173	105	15,920

Figure 3-33 displays the extent of forest fire disturbances during the last 10 years.

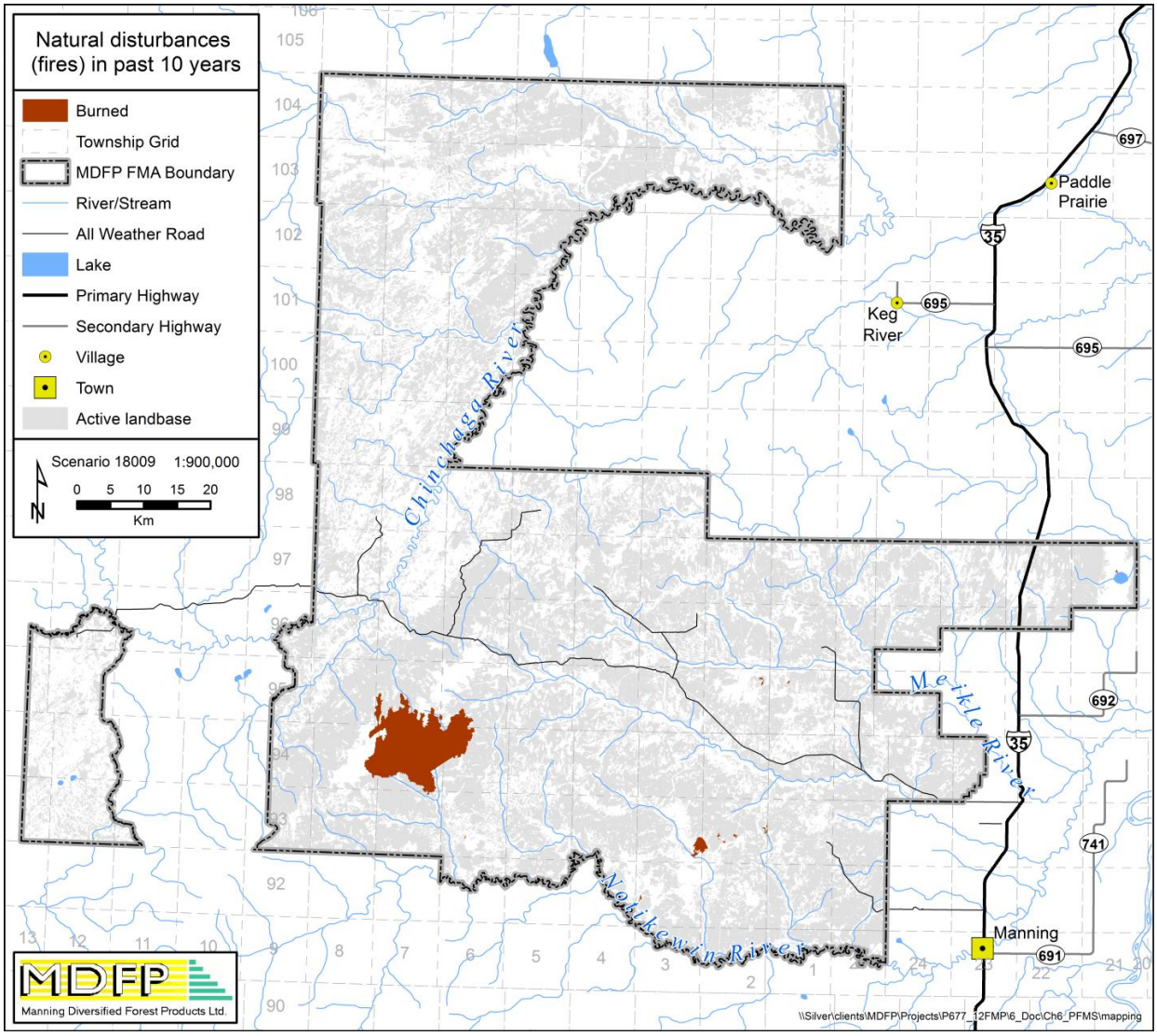


Figure 3-33. Area of Forest Fire Disturbance in Past 10 Years

VOIT 8 – Area of unsalvaged blowdown forest (1.1.1.5B).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.1 Landscape scale biodiversity.

Objective - 1.1.1.5 Maintain unique habitats provided by wildfire and blowdown events.

Target

In areas of significant blowdown greater than 10% area will be left unsalvaged.

Target Supporting Information

Targets are to be based on sound science, ecological considerations and disturbance regimes.

Means of Achieving Target

Salvage planning.

Target Monitoring

Inventory updates.

Reporting

FMP:

- Table and map of blowdown within the last 10 years - salvaged and unsalvaged. Report area (ha).

Performance:

Stewardship Report - Table of blowdown disturbances - salvaged and unsalvaged.

Acceptable Variance

At the end of the 10-year FMP term the target is achieved or exceeded.

Response

Adjust strategies in subsequent AOPs.

Legal/Policy Requirement

This VOIT is requirement of Planning Standard.

2012-2021 FMP Reporting

No blow down areas have been salvaged by MDFP in the previous 10 years.

VOIT 9 – Compliance with Operating Ground Rules (OGR) (1.1.1.6).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.1 Landscape scale biodiversity.

Objective - 1.1.1.6 Retain ecological values and functions associated with riparian zones.

Target

Consistent with OGR.

Target Supporting Information

OGR.

Means of Achieving Target

Planning, TSA, OGR.

Target Monitoring

Organization reports, air photo interpretation, ground surveys, post harvest assessments or other existing compliance monitoring systems.

Reporting

Performance:

- Stewardship Report - Compliance with OGRs.

Acceptable Variance

No variance.

Response

Immediate remedial action and / or administrative penalty.

Legal/Policy Requirement

Federal Fisheries Act, Water Act.

VOIT 10 – Percent area with residual structure (both living and dead) within a harvest area, representative of the status (live/dead), sizes, and species of the overstorey trees within the FMA area (1.1.2.1A).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.2 Local/stand level Biodiversity.

Objective - 1.1.2.1 Retain stand level structure.

Target

A combination of merchantable single stems, clumps, and islands, that are representative of the stands harvested, comprising 3% of the harvested area within the FMA area.

Note: A wide range in variability in harvest area-level retention within a subunit is desired as long as the target level is achieved.

Target Supporting Information

Wildlife zones, roadside vegetation screens, recreational values, aesthetics, local knowledge, ANHIC, Biodiversity / Species Observation Database (BSOD).

Means of Achieving Target

Implement residual structure retention strategies in OGRs.

Target Monitoring

Organization reports, air photo interpretation, ground surveys, post harvest assessments.

Reporting

Performance:

- Stewardship Report - Percent of structure retention in harvest areas on the FMA area, as identified in the Structure Retention Strategy (Chapter 7).

Acceptable Variance

At the end of the 10-year FMP term the target is achieved or exceeded.

Response

Adjust strategies in subsequent FMP.

Legal/Policy Requirement

Occupational Health and Safety Act, Forest and Prairie Protection Act.

VOIT 11 – Percentage of harvested area within the FMA with downed woody debris equivalent to preharvest conditions (1.1.2.1B).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.2 Local/stand scale biodiversity.

Objective - 1.1.2.1 Retain stand level structure.

Target

50 % of compartment harvest area having downed woody debris retained on site.

Target Supporting Information

Assess pre-harvest downed woody debris condition by subunit or stand level average.

Means of Achieving Target

Post harvest treatments that reduce DWD (i.e. brush raking) are considered to have less DWD compared to pre-harvest.

Target Monitoring

Organization developed during FMP planning.

Reporting

Performance:

- Report % of harvest areas with retained DWD (area without DWD reducing treatment applied).

Acceptable Variance

None.

Response

Adjust strategies in subsequent FMP.

Legal/Policy Requirement

This VOIT is requirement of Planning Standard.

Definitions

Downed woody debris - Wood lying at an angle of less than 45 degrees from the ground and having a diameter.

VOIT 12 – Sensitive sites (e.g. mineral licks, major game trails) within the FMA area (1.1.2.2).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.2 Local/stand scale biodiversity.

Objective - 1.1.2.2 Maintain integrity of sensitive sites.

Target

Implement MDFP's Unique Finds Policy and adhere to OGRs.

Target Supporting Information

Local knowledge, ANHIC, Biodiversity / Species Observation Database (BSOD).

Means of Achieving Target

Implement MDFP's Unique Find Policy and strategies in OGRs.

Target Monitoring

Organization reports, air photo interpretation, ground surveys.

Reporting

Performance:

- Stewardship Report - Compliance with internal protocols and OGRs.

Acceptable Variance

None.

Response

Adjust strategies in subsequent AOPs.

Legal/Policy Requirement

This VOIT is requirement of Planning Standard.

VOIT 13 – Forestry water crossings in compliance with Code of Practice for Watercourse Crossings within each subunit (1.1.2.3).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.1 Ecosystem Diversity: Conserve ecosystem diversity at the landscape level by maintaining the variety of communities and ecosystems that occur naturally in the FMA.

Value - 1.1.2 Local/stand scale biodiversity.

Objective - 1.1.2.3 Maintain aquatic biodiversity by minimizing impacts of water crossings.

Target

Designs meet standards of the Code of Practice for Watercourse Crossings.

Target Supporting Information

Code of Practice for Watercourse Crossings: Sections 7 - 9 and Schedule 2.

Means of Achieving Target

Road construction, maintenance and reclamation activities.

Target Monitoring

Road plan and OGR 11.4 (Watercourse Crossings).

Reporting

Performance:

AOP:

- Number of forestry road crossings by type within the AOP area.

Stewardship Report:

- Compliance with Codes of Practice for Watercourse Crossings.

Acceptable Variance

None.

Response

Act immediately to eliminate problems and adjust strategies in subsequent AOPs.

Legal/Policy Requirement

Code of Practice for Watercourse Crossings.

VOIT 14 – Successful implementation of Caribou Habitat Strategy within the Caribou Zone (1.2.1.1A).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.2 Species Diversity: Conserve species diversity by ensuring that habitats for the native species found in the FMA are.

Value - 1.2.1 Viable populations of identified plant and animal species.

Objective - 1.2.1.1 Maintain habitat for identified high value species (i.e., economically valuable, socially valuable, species at risk, species of management concern).

Target

Incorporate caribou habitat strategy into TSA and SHS and operational activities within the Caribou Zone.

Target Supporting Information

Based on sound science, ecological considerations, wildlife zones, Committee on the Status of Endangered Wildlife in Canada (COSEWIC) list, provincially listed species, BSOD, ANHIC, Recovery plans, Fish and Wildlife Division priorities, public consultation, habitat suitability analysis, literature review, observation data, local and traditional knowledge.

Means of Achieving Target

Implementation of MDFP's Woodland Caribou Habitat Strategy, Spatial Harvest Sequence, harvesting plans, road construction, OGR, planning and implementation, adherence to provincial wildlife guidelines.

Target Monitoring

Regular updates to forest inventory, habitat assessment mapping.

Reporting

Performance:

Stewardship Report - Adherence to Spatial Harvest Sequence.

Acceptable Variance

+/- 20% variance of SHS.

Response

Adjust strategies in subsequent AOPs.

Legal/Policy Requirement

Recovery plans for species at risk, Federal Species at Risk Act.

VOIT 15 – Retained Habitat for trumpeter swan (1.2.1.1B).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.2 Species Diversity: Conserve species diversity by ensuring that habitats for the native species found in the FMA are.

Value - 1.2.1 Viable populations of identified plant and animal species.

Objective - 1.2.1.1 Maintain habitat for identified high value species (i.e., economically valuable, socially valuable, species at risk, species of management concern).

Target

Maintain a 200 m buffer around all lakes with trumpeter swan nesting sites.

Target Supporting Information

OGR.

Means of Achieving Target

Spatial harvest sequence.

Target Monitoring

Regular updates to inventory

Reporting

FMP:

- Map of trumpeter swan nesting lakes buffered and excluded from AAC.

Performance:

Stewardship Report - Retention of trumpeter swan buffer areas.

Acceptable Variance

None.

Response

Act immediately to eliminate problems.

Legal/Policy Requirement

FMP, OGR.

2012-2021 FMP Reporting

Trumpeter swan buffers and protection zones are reported in Table 3-27 and Table 3-28 and in Figure 3-34 and Figure 3-35.

Table 3-27. Gross Forested Area of Trumpeter Swan Nesting Lakes and Buffered Zones by Strata

Trumpeter swan nesting lakes buffered and excluded from AAC								
	Area (ha) by Stratum							
Area zone	PL	SW	SB	CD	DC	D	DU	Total (ha)
Buffer around lake	35	94	373	10	95	131	53	792
Swan protection zone	116	386	1,005	45	167	538	286	2,544
Total	151	480	1,378	55	262	669	340	3,336

Table 3-28. Net Forested Area of Trumpeter Swan Nesting Lakes and Buffered Zones by Strata

Trumpeter swan nesting lakes buffered and excluded from AAC								
	Area (ha) by Stratum							
Area zone	PL	SW	SB	CD	DC	D	DU	Total (ha)
Buffer around lake	0	0	0	0	0	0	0	0
Swan protection zone	110	275	2	37	150	355	196	1,124
Total	110	275	2	37	150	355	196	1,124

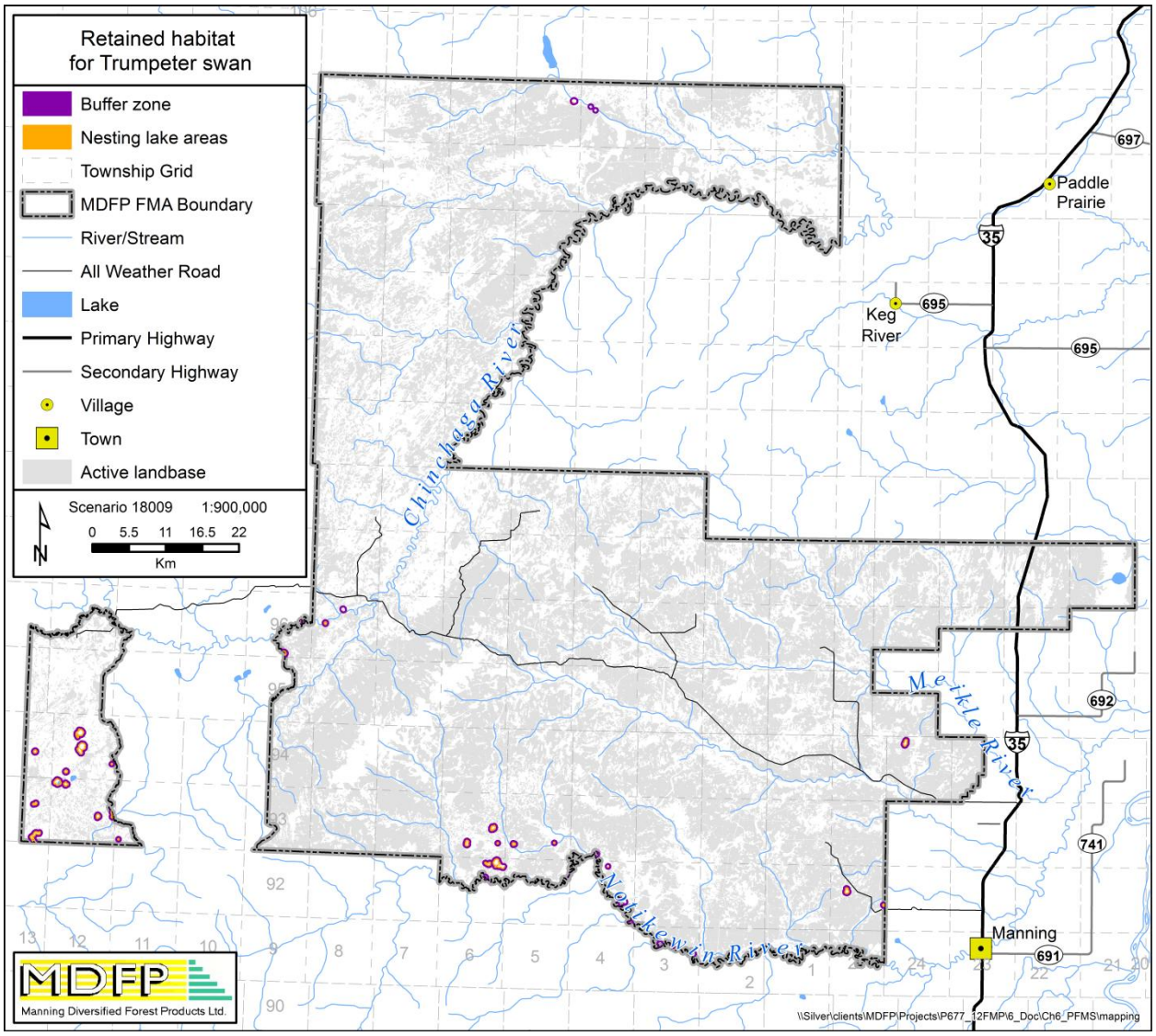


Figure 3-34. Gross Areas of Trumpeter Swan Nesting Lakes and Buffer Zones

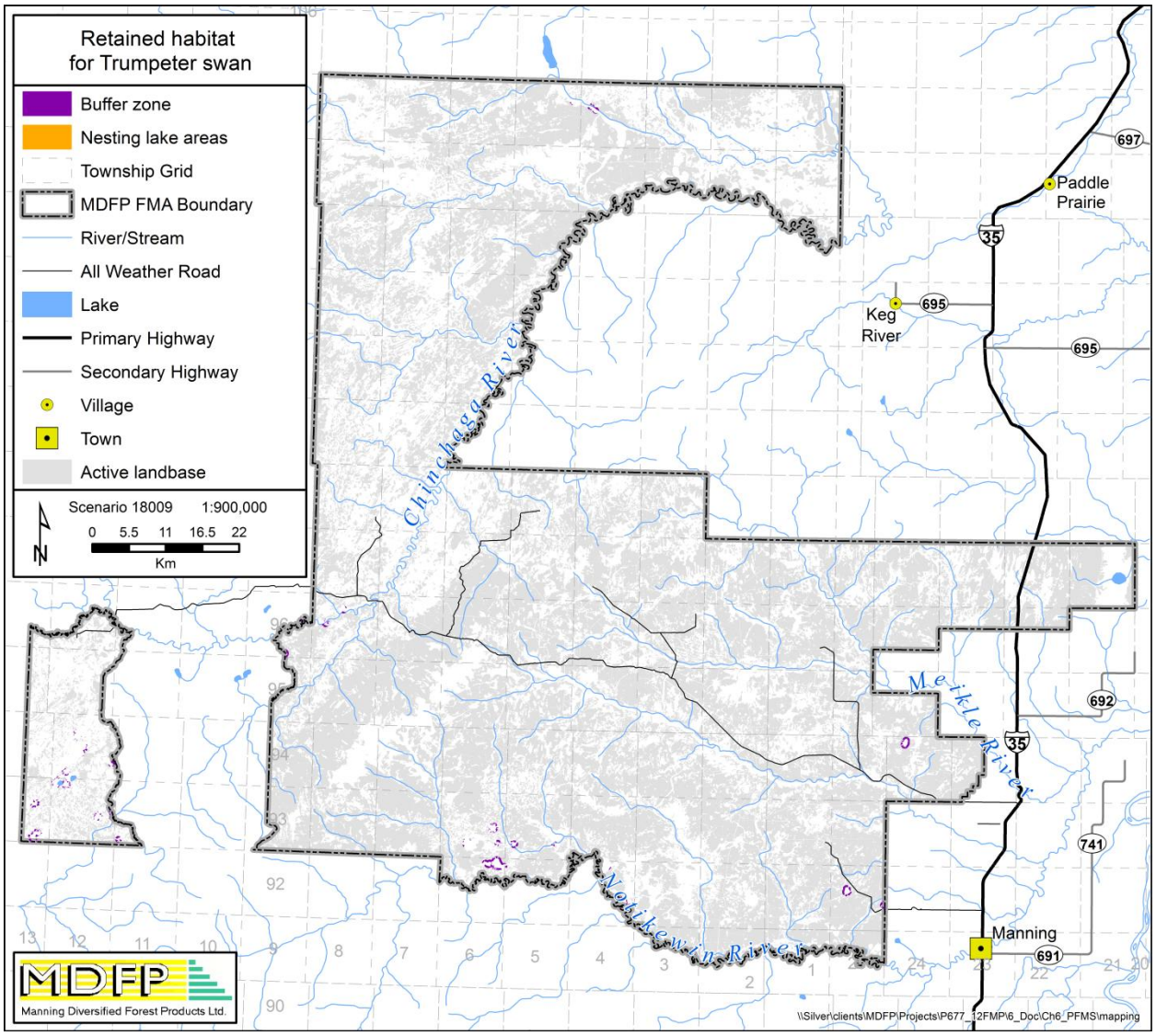


Figure 3-35. Net Areas of Trumpeter Swan Nesting Lakes and Buffer Zones

VOIT 16 – The appropriate number and area (ha) of in-situ tree gene conservation reserves as directed by the FGRMCS (1.3.1.1).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.3 Genetic Diversity: Conserve genetic diversity by maintaining the variation of genes within species.

Value - 1.3.1 Genetic integrity of natural tree populations.

Objective - 1.3.1.1 Retain wild forest populations for each tree species in each seed zone through establishment of in-situ reserves, with an approved controlled parentage program (CPP).

Target

The appropriate number of in-situ tree gene conservation reserves per wild forest tree species as directed by FGRMCS and the conservation zones within MDFP's sphere of interest in CPP Region G2 and J for Seed Zones UBH 1.3 and LBH 1.6. This target to be established in consultation with associate FMA holders in the CPP Region and in cooperation with SRD and Alberta Toursim, Parks and Recreation.

Target Supporting Information

Direction and detail as per FGRMCS Section 20.0, "In-situ Gene Conservation", in consultation with the other associate FMA holders.

Means of Achieving Target

Field reconnaissance or survey to locate appropriate in-situ tree gene conservation reserves on the ground. Establish protective notation to identify in-situ tree gene conservation reserves in land standing records, and management plan to protect genetic resources.

Target Monitoring

Periodic assessment of condition and extent of trees and stands contributing to in-situ tree gene conservation reserves.

Reporting

Report to ESRD Area the establishment of the in-situ tree gene conservation reserves and locations as soon as completed. Report condition and maintenance of wild populations in Stewardship Report.

Acceptable Variance

None. Achieve establishment, mapping and assessment of in-situ tree gene conservation reserves prior to the end of the first stewardship period.

Response

None.

Legal/Policy Requirement

Standards regulated through *Timber Management Regulation* 144.2 and the FGRMCS.

Definitions

Wild refers to genetic materials of native species originating from natural regeneration.

VOIT 17 – Number of provenances and genetic lines in ex-situ gene banks and trials (1.3.1.2).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.3 Genetic Diversity: Conserve genetic diversity by maintaining the variation of genes within species.

Value - 1.3.1 Genetic integrity of natural tree populations.

Objective - 1.3.1.2 Retain wild forest genetic resources through ex-situ conservation for species under CPP programs.

Target

Establish and maintain active ex-situ conservation program for species under CPP programs in cooperation with SRD and in accordance with FGRMCS Section 17 and 29 and ex-situ conservation criteria (Appendix 4, Footnote 1). Subject also to Section 6.3 of the Gene Conservation Plan for Native Trees of Alberta (2008).

Target Supporting Information

Adequacy of the ex-situ conservation program to capture a representative sample of wild tree genetic resources in ex-situ gene archives. Information for this to be provided by ESRD.

Means of Achieving Target

Seed collections, clone banking and establishment of genetic lines in genetic trials.

Target Monitoring

Quantify the number of seed collections, clones in clone banks and genetic lines in genetic trials. Information for this to be provided by ESRD.

Reporting

Report to ESRD Area the quantification of the number of seed collections, clones in clone banks and genetic lines in genetic trials in the Stewardship Report. Information for this to be provided by ESRD.

Acceptable Variance

None.

Response

Review of program adequacy.

Legal/Policy Requirement

Standards regulated through Timber Management Regulation 144.2 and the FGRMCS.

VOIT 18 – Stakeholder consultation (1.4.1.1).

CCFM Criterion: 1. Biological Diversity.

CSA SFM Element - 1.4 Protected Area: Respect protected areas identified through government processes.

Value - 1.4.1 Areas with minimal human disturbances within managed landscapes.

Objective - 1.4.1.1 Integrate transboundary values and objectives into forest management.

Target

Ongoing consultation with relevant protected areas agencies.

Target Supporting Information

Link to consultation objective in Planning Standard or other existing consultation processes.

Means of Achieving Target

Management planning and adherence to MDFP's Public Consultation Plan.

Target Monitoring

Documentation of consultation processes.

Reporting

Performance:

Stewardship Report - Summary of consultation initiatives undertaken.

Acceptable Variance

None.

Response

Adjust strategies in subsequent FMP.

Legal/Policy Requirement

This VOIT is requirement of the Planning Standard.

3.2 Ecosystem Productivity

VOIT 19 – Percent of reforested openings that meet SR requirements at time of establishment survey (2.1.1.1).

CCFM Criterion: 2 – Ecosystem Productivity

CSA SFM Element – 2.1 Ecosystem Resilience

Value – 2.1.1 Reforested harvest areas

Objective - 2.1.1.1 Ensure all harvested areas are immediately replaced with a forest alligned with the regenerating forest approved in the TSA.

Target

100% of the reforested openings achieve SR status to their declared stratum at time of establishment survey.

Target Supporting Information

ARIS or equivalent reports.

Means of Achieving Target

Applying the appropriate *silviculture* prescription (see Silviculture Matrix).

Target Monitoring

RSA and approved MDFP Regeneration Survey Quality Control and Assessment Program.

Reporting

Performance:

Stewardship Report - Number and area of reforested openings surveyed in a given year and % of total that are SR status. Review and assess cumulative results over time to determine continued relevancy of silviculture prescriptions, targets and achievements.

Acceptable Variance

None.

Response

None.

Legal/Policy Requirement

Timber Management Regulation and Reforestation Standards of Alberta (RSA).

VOIT 20 – Percent of reforested openings that achieve the MAI and structure targets at time of Performance Survey (2.1.1.2).

CCFM Criterion: 2 - Ecosystem Productivity

CSA SFM Element - 2.1 Ecosystem Resilience

Value - 2.1.1 Reforested harvest areas

Objective - 2.1.1.2 Establish regenerating stands that adhere to the assumptions used in the FMP specific *timber supply analysis*.

Target

100% of the reforested openings achieve their required MAI and structure targets at time of Performance Survey.

Target Supporting Information

ARIS or equivalent reports.

Means of Achieving Target

Applying the appropriate silviculture prescription (see Silviculture Matrix).

Target Monitoring

RSA and approved MDFP Regeneration Survey Quality Control and Assessment Program.

Reporting

Performance:

Stewardship Report - Number and area of reforested openings surveyed in a given year and the % of the total that meet their MAI and structure targets. Review and assess cumulative results over time to determine continued relevancy of silviculture prescriptions, targets and achievements.

Acceptable Variance

None.

Response

Alberta adjusts QAC (5 year term) as a well as silvicultural strategies (if required).

Legal/Policy Requirement

Timber Management Regulation and Reforestation Standards of Alberta (RSA).

VOIT 21 – Implementation of forest landbase maintenance program (2.1.2.1).

CCFM Criterion: 2 - Ecosystem Productivity
CSA SFM Element - 2.1 Ecosystem Resilience
Value - 2.1.2 Maintenance of forest landbase
Objective - 2.1.2.1 Limit conversion of productive forest landbase to other uses.

Target

Implement MDFP's Forest Landbase Maintenance Program to minimize amount of change in the forest landbase area.

Target Supporting Information

Forest inventory and land use data.

Means of Achieving Target

Maintain current forest cover inventory and land use updates.

Target Monitoring

Inventory and land use systems.

Reporting

Performance:

Stewardship Report:

- Revision and additions to program.

- Change in area (ha and %) of gross forest landbase.

Acceptable Variance

Report actual.

Response

Adjust net landbase projections in next TSA.

Legal/Policy Requirement

This VOIT is requirement of the Planning Standard.

VOIT 22 – Implementation of forest health agent identification and reporting program (2.1.2.2).

CCFM Criterion: 2 - Ecosystem Productivity
CSA SFM Element - 2.1 Ecosystem Resilience
Value - 2.1.2 Maintenance of forest landbase
Objective - 2.1.2.2 Recognize lands affected by insects, disease or natural calamities.

Target

Implement MDFP's Forest Health Agent Recognition and Reporting Program.

Target Supporting Information

ESRD forest health surveys, inventory updates.

Means of Achieving Target

Maintain up-to-date information.

Target Monitoring

Alberta surveys with industry cooperation.

Reporting

Performance:

Stewardship Report:

- Revision and additions to program; and

- Number of forest health agents incidents reported.

AOP:

- Note harvest operations specifically scheduled to address FH agent incidence.

Acceptable Variance

Report actual.

Response

Event specific.

Legal/Policy Requirement

Planning Standard, Alberta Forest Health Strategy and Shared Roles and Responsibilities between ESRD and the Forest Industry.

VOIT 23 – Noxious weed program (2.1.3.1).

CCFM Criterion: 2 - Ecosystem Productivity.
CSA SFM Element - 2.1 Ecosystem Resilience.
Value - 2.1.3 Control invasive species.
Objective - 2.1.3.1 Control non-native plant species (weeds).

Target

Noxious weed program in place and implemented.

Target Supporting Information

Field inventories.

Means of Achieving Target

Co-operative programs.

Target Monitoring

Field inventories.

Reporting

Performance:

Stewardship Report - Inspection summary.

Acceptable Variance

Report actual.

Response

Improve weed program.

Legal/Policy Requirement

Directive 2001-06.

3.3 Soil and Water Resources

This VOIT revised October 1, 2013

VOIT 24 – Compliance with OGRs (3.1.1.1).

CCFM Criterion: 3 - Soil and Water Resources.

CSA SFM Element - 3.1 Soil quantity and quality - Conserve soil resources by maintaining soil quality and quantity.

Value - 3.1.1 Soil productivity.

Objective - 3.1.1.1 Minimize impact of roading and bared areas in forest operations.

Target

In-block road and/or bared areas not to exceed 5% of the gross block area on an annual timber year basis.

Target Supporting Information

Direction from Alberta.

Means of Achieving Target

Effective planning and supervision of operations and adherence to relevant OGRs.

Target Monitoring

Field inspection reports and audits.

Reporting

Performance:

Inspection reporting.

Stewardship Report:

- Stewardship Report: Report annual % of in-block road and/or bared areas.

Acceptable Variance

None.

Response

Immediate remedial action to correct.

Legal/Policy Requirement

OGRs and Soils Guidelines.

VOIT 25 – Compliance with OGRs and Forest Soils Conservation Guidelines regarding soil erosion and slumping (3.1.1.2).

CCFM Criterion: 3 - Soil and Water Resources.

CSA SFM Element - 3.1 Soil quantity and quality – Conserve soil resources by maintaining soil quality and quantity.

Value - 3.1.1 Soil productivity.

Objective - 3.1.1.2 Minimize incidence of soil erosion and slumping.

Target

Complete compliance.

Target Supporting Information

Direction from Alberta.

Means of Achieving Target

Effective planning and supervision of operations and adherence to relevant OGRs..

Target Monitoring

Field inspection reports and audits.

Reporting

Inspection reporting.

Acceptable Variance

None.

Response

Immediate remedial action to correct.

Legal/Policy Requirement

OGRs and Soils Guidelines.

VOIT 26 – Compliance with the SHS and adjustment of operations to mitigate significant predicted water yield impacts (3.2.1.1).

CCFM Criterion: 3 - Soil and Water Resources.

CSA SFM Element - 3.2 Water quantity and quality - Conserve water resources by maintaining water quality, flow regime and water quality.

Value - 3.2.1 Water quantity and quality.

Objective - 3.2.1.1 Limit impact of planned timber harvesting on water yield.

Target

Comply with SHS, and where operationally feasible adjust operations to mitigate water yield impacts associated with harvesting, as predicted by SRD's water yield forecasting on the SHS.

Target Supporting Information

Direction from Alberta.

Means of Achieving Target

Adherence to forecast harvest sequence.

Target Monitoring

Report on area (ha) harvested compared with planned harvest area.

Reporting

Performance:

Stewardship Report:

- Planned vs. Actual area harvested in each watershed.

Acceptable Variance

Report actual.

Response

Adjust harvest pattern if problems arise.

Legal/Policy Requirement

This VOIT is requirement of the Planning Standard.

VOIT 27 – Number of Water Act penalties associated with timber harvesting (3.2.1.2).

CCFM Criterion: 3 - Soil and Water Resources.

CSA SFM Element - 3.2 Water quantity and quality - Conserve water resources by maintaining water quality, flow regime and water quality.

Value - 3.2.1 Water quantity and quality.

Objective - 3.2.1.2 Limit impact of timber harvesting on water yield.

Target

Zero (0) Water Act penalties associated with timber harvesting.

Target Supporting Information

Direction from Alberta.

Means of Achieving Target

Adherence to Water Act, OGRs.

Target Monitoring

Field inspection reports and audits.

Reporting

Performance:

Stewardship Report:

- Number of Water Act penalties associated with timber harvesting.

- Inspection reporting.

Acceptable Variance

None.

Response

Immediate remedial action to correct.

Legal/Policy Requirement

Water Act, Planning Standard.

VOIT 28 – Riparian buffers maintained as outlined in OGRs (3.2.2.1).

CCFM Criterion: 3 - Soil and Water Resources.

CSA SFM Element - 3.2 Water quantity and quality - Conserve water resources by maintaining water quality, flow regime and water quality.

Value - 3.2.2 Effective riparian habitats.

Objective - 3.2.2.1 Minimize impact of operations in riparian areas.

Target

Complete compliance.

Target Supporting Information

Direction from Alberta.

Means of Achieving Target

Effective planning and supervision of operations and adherence to relevant OGRs.

Target Monitoring

Field inspection reports and audits.

Reporting

Inspection reporting.

Acceptable Variance

None.

Response

Immediate correction and / or administrative penalty.

Legal/Policy Requirement

OGRs.

3.4 Global Ecological Cycles

VOIT 29 – Monitoring and assessing developments and requirements for carbon management and reporting (4.1.1.1).

CCFM Criterion: 4 - Global Ecological Cycles

CSA SFM Element - 4.1 Carbon uptake and storage

Value - 4.1.1 Impact of forestry operations on carbon budgets.

Objective - 4.1.1.1 Further the understanding of the impact of forest management on carbon cycles.

Target

Monitor, assess and report on developments in the area of carbon management practices that directly impact MDFP's operations on the FMA area, which MDFP has become aware of.

Target Supporting Information

Direction from Alberta.

Means of Achieving Target

Work with Alberta in assessing carbon management practices and the practices' applicability to MDFPs FMA area.

Target Monitoring

Maintain communications with Alberta or other specialist in the area of carbon management.

Reporting

Performance:

Stewardship Report:

- Summarize new developments in the area of carbon management (that MDFP has become aware of) that impact, or have the potential to impact forest management on the FMA area.

Acceptable Variance

None.

Response

Revise monitoring, assessing and/or reporting practices.

Legal/Policy Requirement

This VOIT is requirement of the Planning Standard.

VOIT 30 – See VOIT ID 21 (2.1.2.1) above.

CCFM Criterion: 4 - Global Ecological Cycles
CSA SFM Element - 4.2 Forest land conversion
Value - See VOIT ID 21 (2.1.2.1) above
Objective - See VOIT ID 21 (2.1.2.1) above

3.5 Multiple Benefits to Society

VOIT 31 – Process described in Annex 1 is followed and standards are met (5.1.1.1).

CCFM Criterion: 5 - Multiple Benefits to Society.
CSA SFM Element - 5.1 Timber and non-timber benefits.
Value - 5.1.1 Sustainable timber supplies.
Objective - 5.1.1.1 Establish appropriate AACs.

Target

Complete compliance.

Target Supporting Information

Consultation in planning process.

Means of Achieving Target

Effective implementation of planning process.

Target Monitoring

Multiple means: TPRS, ARIS, AOPs, Stewardship Reports, filed inspection reports.

Reporting

Progressive and continuous.

Acceptable Variance

Issue specific.

Response

Adjust *Annual Allowable Cut* (AAC) using most current and relevant information.

Legal/Policy Requirement

Forests Act and Timber Management Regulation.

VOIT 32 – Percentage reduction in Fire Behavior Potential area (ha) within the FireSmart Community Zone (5.2.1.1A).

CCFM Criterion: 5 - Multiple Benefits to Society.

CSA SFM Element - 5.2 Communities and sustainability.

Value - 5.2.1 Risk to communities and landscape values from wildfire is low.

Objective - 5.2.1.1 To reduce wildfire threat potential by reducing fire behavior, fire occurrence, threats to values at risk and enhancing fire suppression capability.

Target

Reduce the area (ha) in the extreme and high Fire Behaviour Potential rating categories within the *FireSmart Community Zone* by the percent determined through ESRD's analysis of the FMP's final SHS.

No FireSmart Community Zones in the FMA (refer to Action Item 26-001).

Target Supporting Information

Wildfire Threat Assessment completed by SRD on SHS.

Means of Achieving Target

Spatial harvest sequence, *thinning*, partial harvest techniques, *prescribed burns*.

Target Monitoring

AOPs, Compartment Assessments.

Reporting

FMP:

- Maps and Tables of indicator at 0, 10, 20, and 50 yrs.

Performance:

Stewardship Report

- Table summarizing variance from SHS.

Acceptable Variance

Issue specific.

Response

Adjust harvest sequence.

Legal/Policy Requirement

This VOIT is requirement of the Planning Standard.

2012-2021 FMP Reporting

There are no FireSmart community zones in the FMA

VOIT 33 – Percentage reduction in Fire Behaviour Potential area (ha) across the FMA area, now and over the planning horizon (5.2.1.1B).

CCFM Criterion: 5 - Multiple Benefits to Society.

CSA SFM Element - 5.2 Communities and sustainability.

Value - 5.2.1 Risk to communities and landscape values from wildfire is low.

Objective - 5.2.1.1 To reduce wildfire threat potential by reducing fire behaviour, fire occurrence, threats to values at risk and enhancing fire suppression capability.

Target

Reduce the area (ha) in the extreme and high Fire Behaviour Potential rating categories across the FMA area by the percent determined through SRD's analysis of the FMP's final SHS.

ESRD determined the percent reduction target to be 2% (refer to PDT Action Item 26-001).

Target Supporting Information

Wildfire Threat Assessment completed by SRD on SHS.

Means of Achieving Target

Spatial harvest sequence, thinning, partial harvest techniques, prescribed burns.

Target Monitoring

AOPs, Compartment Assessments.

Reporting

FMP:

- Maps and Tables of indicator at 0, 10, 20, and 50 yrs.

Performance:

Stewardship Report

- Table summarizing variance from SHS.

Acceptable Variance

Issue specific.

Response

Adjust harvest sequence.

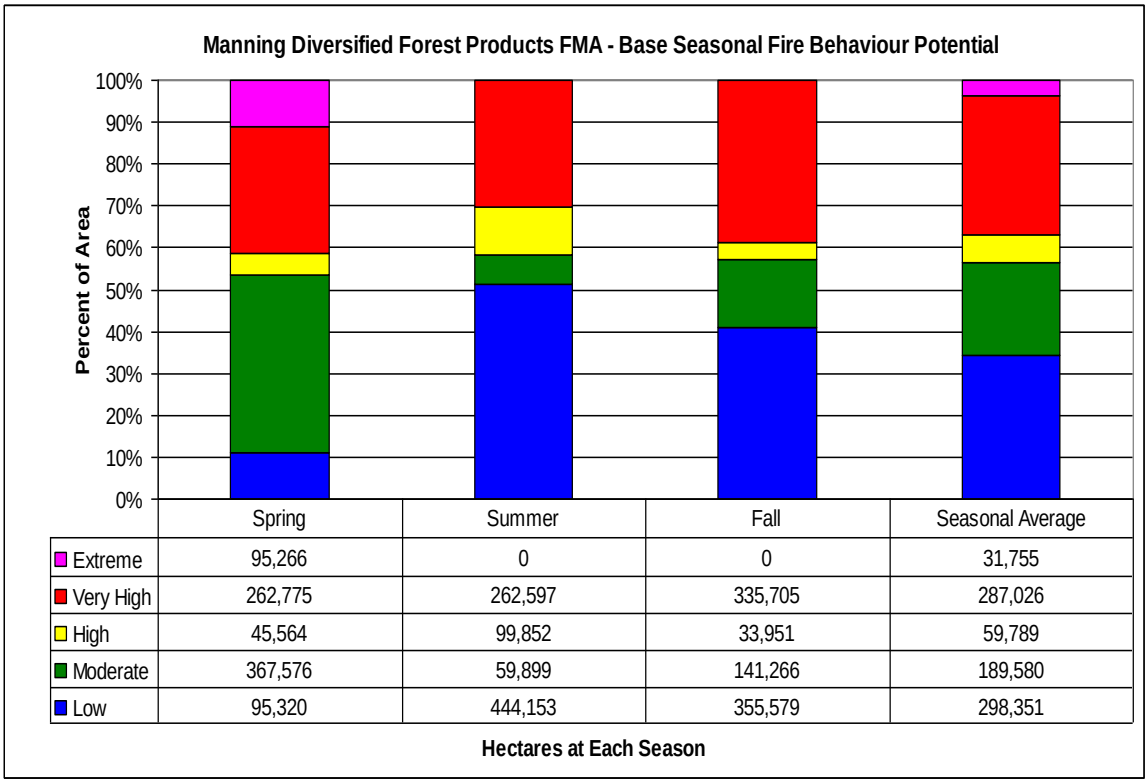
Legal/Policy Requirement

This VOIT is requirement of the Planning Standard.

2012-2021 FMP Reporting

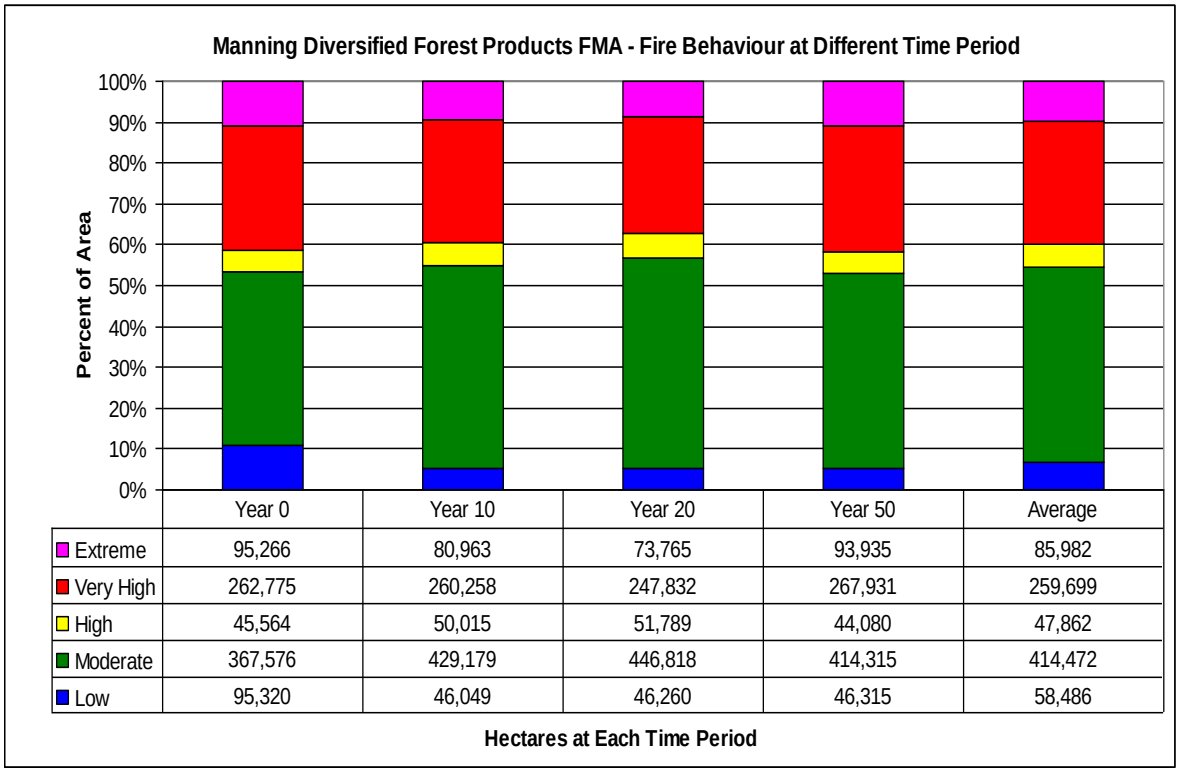
Changes over time in the FireSmart fire rating potential area distribution from ESRD's January 2013 analysis are presented in Table 3-29 to Table 3-31 and Figure 3-36 to Figure 3-39.

Table 3-29. Seasonal Fire Behaviour Potential for the MDFP FMA at the Current Forest State



	Spring	Summer	Fall	Seasonal Average
Extreme	95,266	0	0	31,755
Very High	262,775	262,597	335,705	287,026
High	45,564	99,852	33,951	59,789
Moderate	367,576	59,899	141,266	189,580
Low	95,320	444,153	355,579	298,351

Table 3-30. Seasonal Fire Behaviour Potential for the MDFP FMA at the Different Time Slices



	Year 0	Year 10	Year 20	Year 50	Average
Extreme	95,266	80,963	73,765	93,935	85,982
Very High	262,775	260,258	247,832	267,931	259,699
High	45,564	50,015	51,789	44,080	47,862
Moderate	367,576	429,179	446,818	414,315	414,472
Low	95,320	46,049	46,260	46,315	58,486

Table 3-31. Seasonal Fire Behaviour Potential for the MDFP FMA at the Current Forest State

Fire Behaviour Potential	Year 0 Percent	Year 10 Percent	Year 20 Percent	Year 50 Percent	Average
Low	10%	5%	5%	5%	6%
Moderate	40%	46%	48%	45%	45%
High	5%	5%	6%	5%	5%
Very High	28%	28%	27%	29%	28%
Extreme	10%	9%	8%	10%	9%
Non-fuel	7%	7%	7%	7%	7%
Total	100%	100%	100%	100%	100%

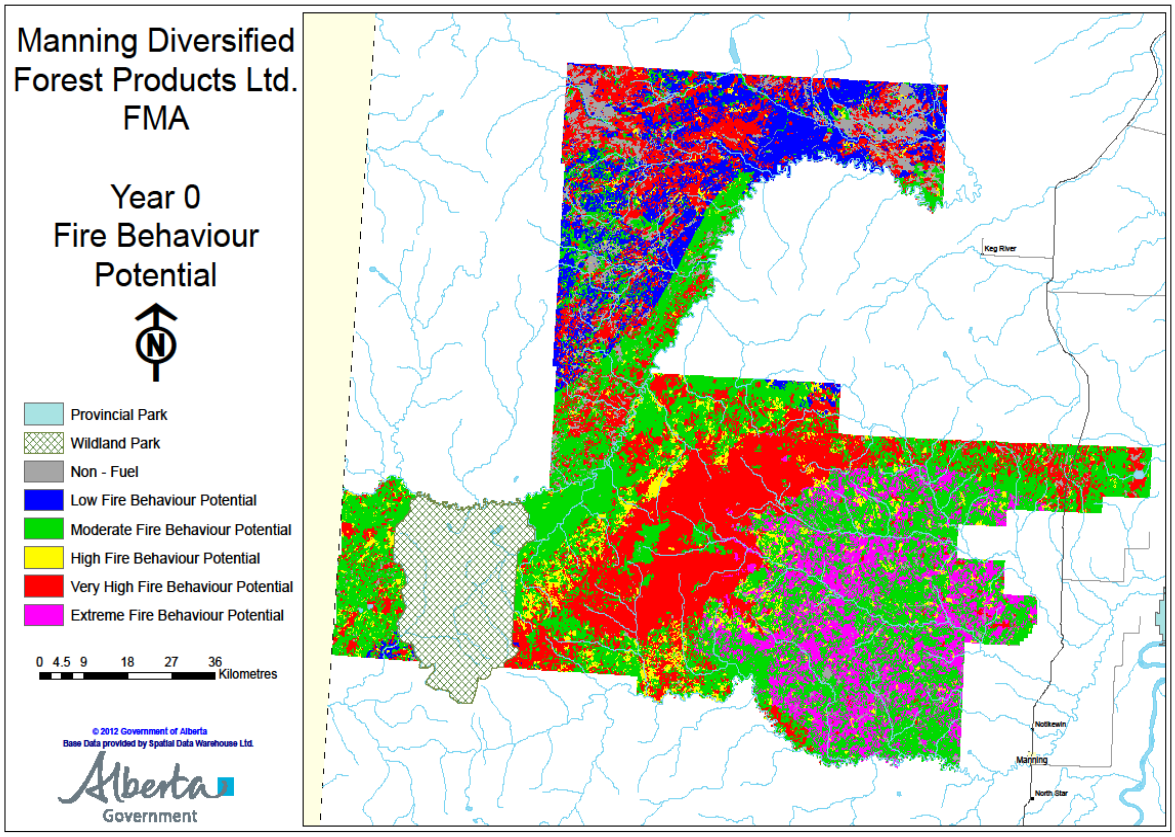


Figure 3-36. Fire Behavior Potential Map at Year 0

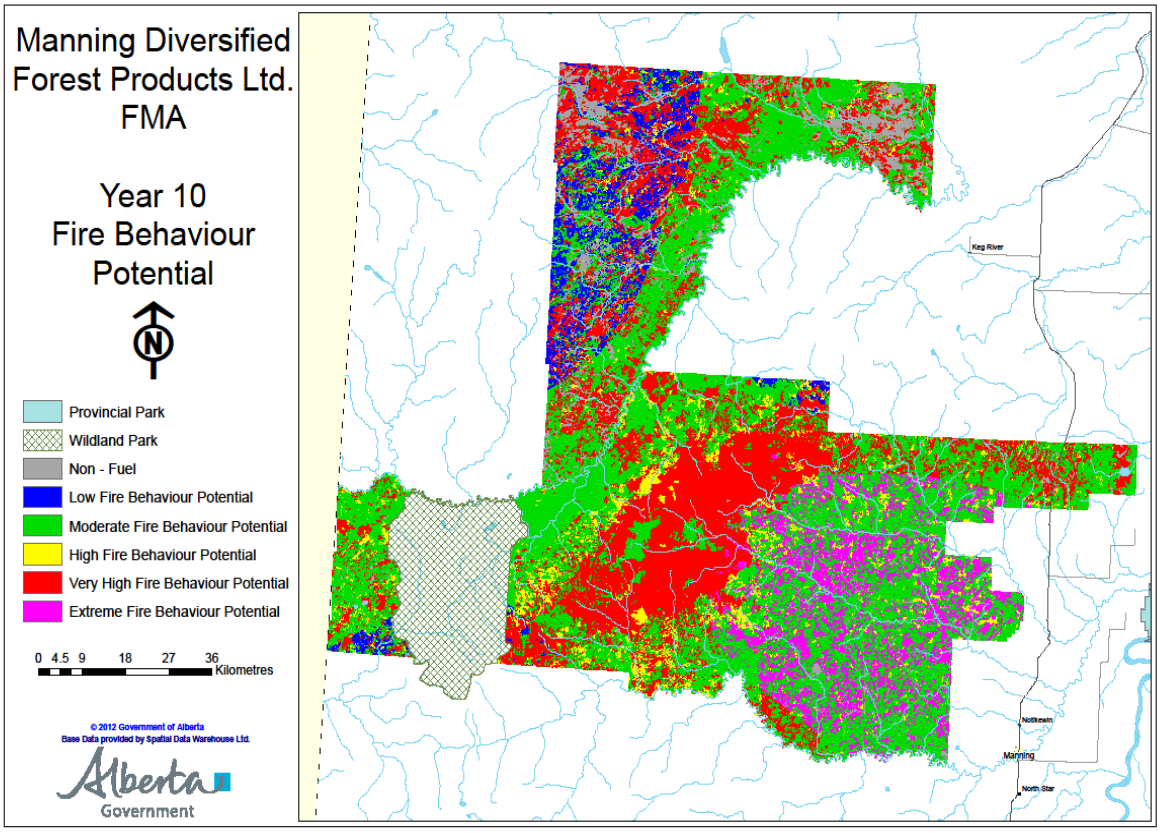


Figure 3-37. Fire Behavior Potential Map at Year 10

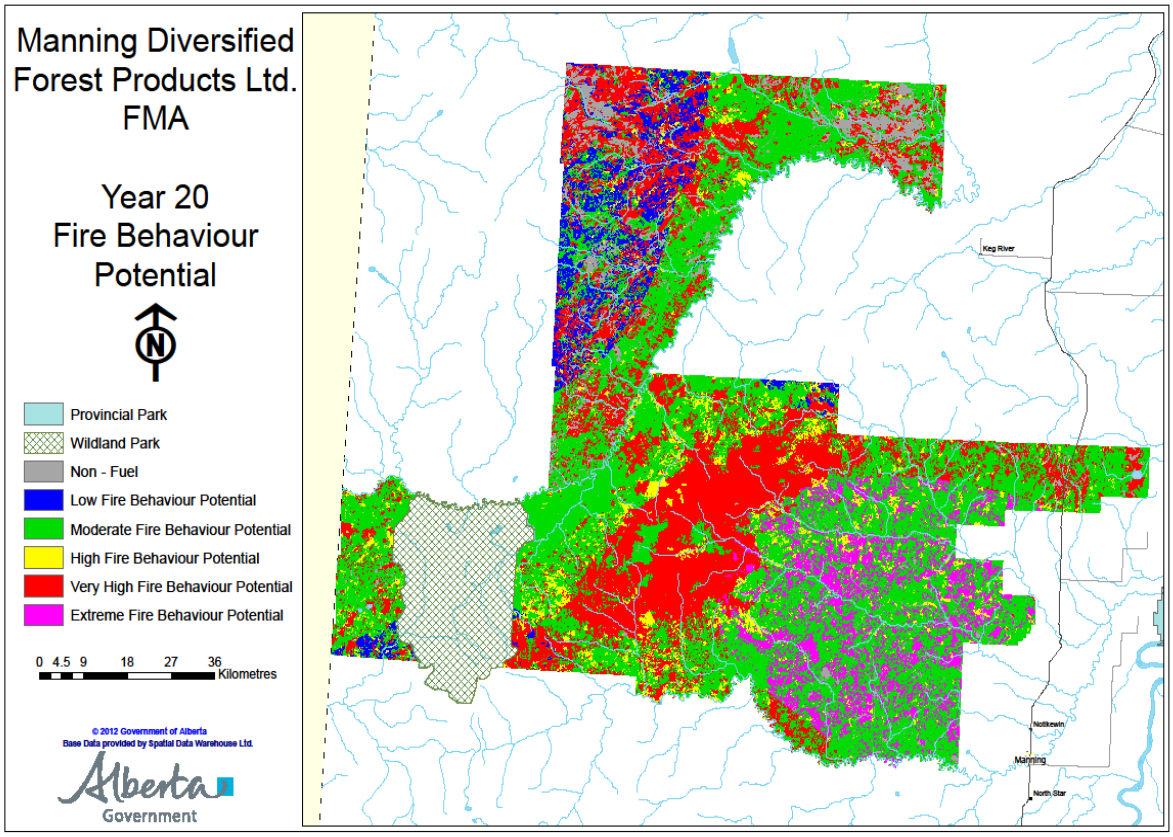


Figure 3-38. Fire Behavior Potential Map at Year 20

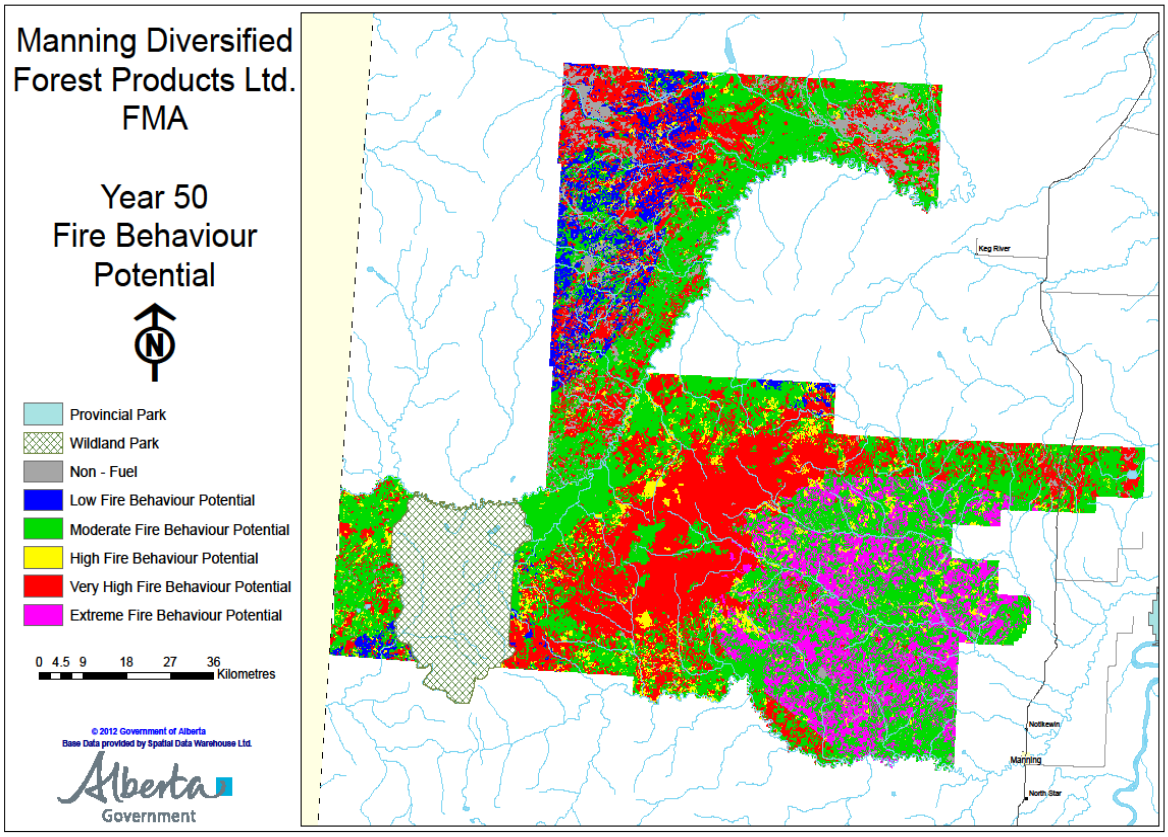


Figure 3-39. Fire Behavior Potential Map at Year 50

VOIT 34 – Availability of MDFP roads for use by other commercial forest users and the public (5.2.2.1A).

CCFM Criterion: 5 - Multiple Benefits to Society.

CSA SFM Element - 5.2 Communities and sustainability.

Value - 5.2.2 Provide opportunities to derive benefits and participate in use and management

Objective - 5.2.2.1 Integrate other uses and timber management activities.

Target

All MDFP roads will be made available for use by other commercial forest users and the public (unless access restrictions are required by Alberta).

Target Supporting Information

Consultation in planning process.

Means of Achieving Target

Maintain current forest cover inventory and land use updates.

Target Monitoring

Inventory and land use systems.

Reporting

Performance:

Stewardship Report:

- Proportion of roads available for use by other users.

Acceptable Variance

Report actual.

Response

Adjust net landbase projections in next TSA.

Legal/Policy Requirement

FMP.

VOIT 35 – Communication with Twin Lakes Lodge when operating near Twin Lakes (5.2.2.1B).

CCFM Criterion: 5 - Multiple Benefits to Society.

CSA SFM Element - 5.2 Communities and sustainability.

Value - 5.2.2 Provide opportunities to derive benefits and participate in use and management

Objective - 5.2.2.1 Integrate other uses and timber management activities.

Target

Contact the owners/operators of the lodge when operations are planned within 2 km of the lodge or recreation area.

Target Supporting Information

Social considerations.

Means of Achieving Target

AOPs, Public Consultation Plan.

Target Monitoring

Documentation of consultation processes.

Reporting

Performance:

Stewardship Report:

- Record of operations near Twin Lakes Lodge and the communication events with the owners/operators.

Acceptable Variance

Report actual.

Response

None.

Legal/Policy Requirement

FMP.

VOIT 36 – Protection of aesthetic resources along Highway 35 and the Chinchaga Forestry Road (5.2.2.1C).

CCFM Criterion: 5 - Multiple Benefits to Society.
CSA SFM Element - 5.2 Communities and sustainability.
Value - 5.2.2 Provide opportunities to derive benefits and participate in use and management
Objective - 5.2.2.1 Integrate other uses and timber management activities.

Target

Incorporate aesthetic concerns into operational planning along Highway 35 and the Chinchaga Forestry Road (designated a *Special Management Zone*).

Target Supporting Information

Target based on social/aesthetic concerns, consultation.

Means of Achieving Target

Effective planning within the Special Management Zone.

Target Monitoring

AOPs, as-built plans, road-side inspections.

Reporting

Performance:

AOP:

- incorporate aesthetic concerns within the Special Management Zone.

Acceptable Variance

Report actual.

Response

Adjust future operations.

Legal/Policy Requirement

FMP.

VOIT 37 – Regenerated stand yield compared to natural stand yield (5.2.3.1).

CCFM Criterion: 5 - Multiple Benefits to Society.
CSA SFM Element - 5.2 Communities and sustainability.
Value - 5.2.3 Forest productivity
Objective - 5.2.3.1 Maintain Long Run Sustained Yield Average.

Target

No net decrease from the natural stand productivity.

Target Supporting Information

FMP Timber Supply Analysis.

Means of Achieving Target

Effective implementation of plans.

Target Monitoring

Stewardship Report.

Reporting

Timber Supply Analysis, Stewardship Report.

Acceptable Variance

Report actual.

Response

Adjust AAC using most current and relevant information.

Legal/Policy Requirement

This VOIT is requirement of the Planning Standard.

3.6 Accepting Society's Responsibility for Sustainable Development

VOIT 38 - Meet Alberta's current expectations for First Nations consultation (6.1.1.1).

CCFM Criterion: 6 - Accepting Society's Responsibility for Sustainable Development.

CSA SFM Element - 6.1 Aboriginal and treaty rights and Aboriginal forest values.

Value - 6.1.1 Compliance with government regulations and policies.

Objective - 6.1.1.1 Implement Public Involvement Program.

Target

Consult at the community level with designated representatives of affected First Nations.

Target Supporting Information

Alberta to provide direction.

Means of Achieving Target

Effective implementation of Alberta's First Nation consultation requirements.

Target Monitoring

Reports, documentation of communications.

Reporting

FMP:

- Summary of First Nation consultation in FMP development process.

Performance:

- Summary of First Nation consultation reported annually in GDP.

Acceptable Variance

Report actual.

Response

Adjust activities.

Legal/Policy Requirement

This VOIT is requirement of the Planning Standard.

2012-2021 FMP Reporting

MDFP completed a comprehensive First Nation Consultation program for the 2012-2021 FMP. Refer to Chapter 2 for information.

VOIT 39 - Meet expectations of Section 5 of CSA Z809-02 (6.2.1.1).

CCFM Criterion: 6 - Accepting Society's Responsibility for Sustainable Development.

CSA SFM Element - 6.2 Public participation and information for decision-making

Value - 6.2.1 Meaningful public involvement is achieved

Objective - 6.2.1.1 Implement Public Consultation Process (PCP).

Target

Implement ESRD approved Public Consultation Plan.

Target Supporting Information

Development and ESRD approval of Public Consultation Plan.

Means of Achieving Target

Effective implementation of MDFP's approved Public Consultation Plan.

Target Monitoring

Reports, documentation of communications.

Reporting

FMP:

Summary of public consultation in FMP development process.

Performance:

Stewardship Report: Timing and nature of consultation initiatives.

Acceptable Variance

Report actual.

Response

Adjust activities.

Legal/Policy Requirement

This VOIT is requirement of the Planning Standard.

2012-2021 FMP Reporting

Refer to Chapter 2 for a summary of the public consultation completed for the 2012-2021 FMP.

Appendix I Glossary of Terms and Initialisms

Glossary Term		Definition
Above Mean Sea Level	AMSL	A measure of topographic elevation.
Active landbase		Areas that are available for forest management activities. That component of the physical landbase that is not deleted in the landbase netdown process. Consists of the combined coniferous and deciduous landbases. Also referred to as the timber harvesting landbase, net landbase, managed landbase or
Adaptive management		A process for continually improving of planning, implementing, and monitoring policies and practices by learning from the outcomes of previously employed policies and practices, and taking corrective actions where unplanned results occur.
Alberta Environment and Sustainable Resource Development	ESRD	Government of Alberta ministry responsible for regulating FMAs.
Alberta Regeneration Information System	ARIS	A Provincial database of silviculture treatments applied to harvested lands. Updated annually by permit and license holders. Considered to be the defacto record of treatment history and block status.
Alberta Biodiversity Monitoring Institute	ABMI	A province-wide monitoring program that collects information on about 2000 species through site visits, aerial photography and satellite imagery. ABMI provides information on the state of Alberta's biodiversity to facilitate management.
Annual Allowable Cut	AAC	The volume of timber permitted to be harvested in any one year, as stipulated in the pertinent approved FMP. In Alberta, the AAC is the quadrant cut divided by the number of years in that quadrant (usually five).
ARC Macro Language	AML	A third-generation (non-compiled) scripting language, propriety to ESRI. AML is a legacy language used commonly in early versions of ESRI software. While primarily a legacy product, it is still used for developing processes that need to run unattended.
Alberta Vegetation Inventory	AVI	The provincial standard for forest inventory information (classification and data storage).
AVI polygon		A polygon delineated based on aerial photography using AVI rules (AFLW 1991, Nesby 1997). For vegetated areas, areas must be sufficiently similar in terms of structure, moisture regime, crown closure, height, species composition and origin year to be considered a single unit or a polygon. Non-vegetated areas must have a similar nonvegetated classification.
Base natural yield curve		The "standard" set of yield curves developed for yield strata, representing the main stand types within the FMA area. Base yield curves may or may not be used to represent these stand types in the final timber supply analysis.
Biological diversity (biodiversity)		The variety, distribution, and abundance of different plants, animals, and microorganisms, the ecological functions and processes they perform, and the genetic diversity they contain at local, regional, or landscape levels of analysis.
Broad Cover Group	BCG	A classification of forest types based on coniferous and deciduous components of the AVI species composition. The broad cover groups are coniferous (C), coniferous-leading mixedwood (CD), deciduous-leading mixedwood (DC) and deciduous (D).
BCG: Pure Deciduous	D	Deciduous ≥ 80%
BCG: Deciduous-Coniferous	DC	Coniferous > 20% and Deciduous > 20%
BCG: Conifer-Deciduous	CD	Coniferous > 20% and Deciduous > 20%
BCG: Pure Coniferous	C	Coniferous ≥ 80%
Buffer		Used in several contexts: (1) In protecting critical habitat areas, the buffer is an area of forest land that reduces the impacts of adjacent activities on the critical area. (2) A strip of land between two areas under different management regimes. (3) An area maintained around a sample or experimental plot to ensure that the latter is not affected by any treatment applied to the area beyond the buffer. (4) In GIS work, a new polygon zone computed on distance from a point, line or existing polygon.
Canadian Standard Association	CSA	Not-for-profit standards organization that is is composed of representatives from industry, government, and consumer groups and which develops standards in 57 areas.
Caribou		Boreal woodland caribou can be found in forested areas across Canada. In Alberta there are two varieties of woodland caribou – the mountain caribou in foothills and mountains of west-central Alberta, and the boreal caribou in northern Alberta. Woodland caribou are listed as threatened under the Alberta Wildlife Act and federally under the Species at Risk Act (SARA).
Caribou, habitat contols		Rules/constrains applied in a hierarchical forest modeling process with considerations across various spatial and temporal scales to enhance the caribou habitat. The main controls were: (1) 30/20 rule – in the deciduous and mixedwood stratum, a maximum of 20% is allowed to be under 30 years old; (2) Patch target – a patch target that tended towards patches (under 30 years old) larger than 300 ha.
Caribou, provincial zone		Provincially-approved caribou land-use referral map layers that are inteded to alert planners when harvest plans fall in or near these special land management areas and aim to reduce the industrial footprint and impacts on caribou.

Glossary Term		Definition
Classified landbase		A spatial landbase and attribute classification generated as the second stage of the TSA process. Used to calculate the area and distribution of all features on the landscape, particularly to generate summaries of seismic detail and carry this into the modeling landbase.
Clearcutting		A regeneration system where all or most of the merchantable trees in a defined area are harvested in one cutting with reproduction obtained through artificial or natural means.
Committee on the Status of Endangered Wildlife in Canada	COSEWIC	Harvested in one cutting with reproduction obtained through artificial or natural means.
Compartment		A subsection of a Forest Management Agreement (FMA) for which operational plans are developed.
Compartment, working circles		A subsection of an FMA defined by the Manning Diversified Forest Products Ltd.
Combined Heat and Power	CHP	The simultaneous production of electricity and heat from a single fuel source
Composite yield curve		Area-weighted composite yield curves developed from empirically-fit natural stand yield curves; generally by BCG or groupings thereof.
Coniferous Timber Quota	CTQ	One of two types of volume-based long-term forest tenures (also deciduous timber allocation) for harvesting a set proportion of the coniferous AAC volume within a defined area, usually for a period of 20
Connectivity, landscape		A measure of how well different areas (patches or a landscape) are connected by linkages, such as habitat patches, single or multiple corridors, or "stepping stones" of vegetation. Landscape connectivity can be defined as the degree to which the landscape facilitates movement between resources patches.
Corrective actions		May include one or more of the following: - Address a nonconformity in a management system by identifying and eliminating the causes of a problem; - Carry-out an appropriate enforcement response; - Direct that the work to be corrected and re-submitted.
Corridor		A physical linkage connecting two areas of habitat and differing from the habitat on either side. Corridors are used by organisms to move around without having to leave the preferred habitat. A linear habitat patch through which a species must travel to reach habitat more suitable for reproduction and other life sustaining needs. Many corridors, linking several patches of habitat, form a network of habitats.
Cull deductions		Trees or portions thereof that are merchantable, but are removed because of defect.
Culmination age		The age at which the stand, for the stated diameter limit and utilization standard, achieves its maximum average rate of volume production (the Mean Annual Increment (MAI) is maximized).
Cutblock		A specified area that is either designated for harvest or has already been harvested.
Daily mean temperature		Derived on a daily basis from daily minimum and daily maximum temperatures. Daily minimums and maximums are recorded over 24 hour periods that begin and end in the morning. These values are then averaged for the entire month, over the reporting period (generally 30 years, from 1961- 1990).
Daishowa Marubeni International Ltd.	DMI	A neighbouring FMA holder and license holder inside the MDFP FMA area.
Defined Forest Area	DFA	Area of forest, including land and water (regardless of ownership or tenure), to which the requirements of the FMA apply.
Defining layer		Inventory layer used to assign strata. The defining layer may be the overstory or the understory.
Deletions		All areas excluded from the active landbase and assigned a code identifying the reason for deletion.
Digitally Integrated Disposition system	DIDs	A Provincial database and system of specific land use disposition types submitted for approval. The DIDs spatial data are managed and distributed by Alberta Public Lands.
Disturbance patch		Disturbance patches are used to describe the patch sizes of any part of the active landbase that is less than 20 years old, regardless of strata.
Deciduous Timber Allocation	DTA	One of two types of volume-based long-term forest tenures (also see coniferous timber quota) for harvesting a set proportion of the deciduous AAC volume within a defined area, usually for a period of 20
Environmental Systems Research Institute ™	ESRI	The developer of the suite of geographic information system software products commonly known as ArcInfo, ArcMap, ArcView, Spatial Analyst and others.
Environment and Sustainable Resource Development	ESRD	Alberta Environment and Sustainable Resource Development is a ministry of the Government of Alberta that brings together the former departments of Environment and Water and Sustainable Resource Development.
FireSmart		The philosophy that seeks to mitigate the likelihood of large, high intensity and severity fires.
FireSmart community zone		A standard ten kilometre radius around the community extending from the Wildland Urban Interface Zone. A unique data set will be gathered for this zone for community protection planning to provide a fundamental linkage between FireSmart Communities and FireSmart Landscapes.
FireSmart landscapes		FireSmart landscapes are designed to recognize the interaction between ecological, economic, and social impacts, thus, maximize the positive ecological impacts and minimize the negative economic and social impacts.
FireSmart landscape zone		The zone that extends beyond the FireSmart Community Zone overlapping multiple jurisdictions at a broad landscape level. This zone focuses on mitigating the likelihood of large, high intensity, high severity fires. Fire, Forest and Land Management planning are integrated and designed to reduce the negative ecological, economic, and social impacts of wildfire while maximizing the positive attributes of wildfire.
Forecasting		See Timber Supply Analysis.
Forest Management Agreement	FMA	Contract between the Province of Alberta and the FMA holder whereby the Province provides an area-based Crown timber supply. In return, the FMA holder commits to: managing the timber resource on a perpetual sustained yield basis, taking into consideration a broad range of forest values in determining forest management practices; and meeting defined economic objectives, including capital investments and job creation, and seeking out new business opportunities that provide measurable economic benefits for both the Province and the FMA holder. The FMA gives the FMA holder the right to access Crown fibre. In return, the FMA holder commits to forest management responsibilities, which may change from time to time (Alberta SRD 2006).

Glossary Term		Definition
Forest Management Plan	FMP	A document prepared by the FMA holder that describes the spatial and temporal harvest plan and forest harvest operations on Crown lands over a 10-year planning horizon (in Alberta). The document provides detailed methods, schedules, and responsibilities of the FMA holder in terms of accessing, harvesting, renewing and protecting the resource to enable site-specific operations to proceed. The document must be approved by the Government of Alberta, with input from stakeholders.
Forest Management Unit	FMU	An administrative unit of forest land designated by the Minister, as authorized under Section 14(1) of the Forests Act.
Forest patch		A stand of forest in the same seral stage that is not split by a linear feature greater than 8 m wide.
Forests Act, the		The legislative statute that authorizes the Minister to administer and manage the forested lands of Alberta.
Fully stocked		All potential growing space that is effectively occupied by merchantable tree species.
GEO	GEO	ESRI notation to for data stored in coordinates representing latitude and longitude.
Geographic Information System	GIS	A collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.
Green-up period		The time needed to re-establish vegetation after a disturbance. Specific green-up periods may be established to satisfy visual objectives or hydrological requirements, or as a means of ensuring re-establishment of vegetation (for silviculture, wildlife habitat or hydrological reasons) before adjacent
Gross volume		A term applied to tree-level, plot-level or stand-level volumes (*e.g.,* gross total tree volume, gross merchantable tree volume, gross total plot volume, gross merchantable plot volume, gross total stand volume, gross merchantable stand volume) that Indicates no defect/cull deduction has been applied.
Growing Degree Day	GDD	The sum of mean daily temperature above a baseline temperature (i.e. 5 degrees Celsius). Daily values are accumulated over the growing to determine annual values.
Growing stock		The sum (by number, basal area or volume) of trees in a forest or a specified part of it.
Harvest area		A specified land area with defined boundaries where timber harvesting is scheduled, or has occurred (commonly referred to as a cut block).
Industrial Sample Plot	ISP	A forest plot used to monitor the natural growth and yield of trees.
Influential point		An extreme data point that negatively influences model performance, resulting in failure to converge or an unacceptable curve shape.
Input datasets		Datasets received for the purpose of completing the landbase netdown. These frequently require processing to convert or add attributes, assign/add projection information, or combine with other inputs that represent the same features.
Landbase		A result of a classification process used to identify and determine areas available and suiatble for timber harvesting activities.
Landbase, active (also referred to as net, or managed, or contributing)		The landbase available for timber harvest and that comprises the net productive coniferous and net productive deciduous land bases. The active landbase is further classified into either conifer or deciduous landbase depending on species composition.
Landbase, passive (also referred to as		The landbase that is not part of the net productive coniferous or deciduous landbases
Landbase polygon		A polygon within the (classified, TSA, or modeling) landbase derived during spatial processing to incorporate various spatial layers and attributes of interest.
Managed landbase		That portion of the net landbase which is considered "managed" in the respect that the land received a harvest treatment and subsequent silviculture treatments. Note that AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any records of reforestation are not considered 'managed'.
Managed stand		Stand that is initiated by anthropogenic disturbance such as harvesting.
Managed stand yield curve		Yield curves generally created by applying regeneration lags to base natural yield curves with cull. Regeneration lags varied depending on whether cutblocks were harvested prior to or after 1993. Thus both Pre93 and Post93 managed managed stand yield curves developed.
Manning Diversified Forest Products Ltd.	MDFP	The forest products company in Alberta responsible for this FMP.
Mean Annual Increment	MAI	Average annual increase in volume of individual trees or stands up to the specified point in time. The MAI changes with different growth phases in the life of a tree, being highest in the middle years and then slowly decreasing with age. The point at which MAI peaks is commonly used to identify the biological maturity of the stand and its readiness for harvesting (Alberta SRD 2006).
Metadata		Data that describes the content, quality, conditions, use limitations and other characteristics of a dataset and which also documents bibliographic records including but not limited to information such as who collected the data, when and how it was collected, preprocessed and converted, its resolution and who presently holds the data. In summary, metadata is information about a thing, apart from the thing itself.
Merchantable volume, stand		Merchantable tree volume summed to represent volume on a per hectare basis.
Merchantable volume, tree		A tree-level term; the volume of those portions of a tree bole that meet utilization requirements (stump height, top and bottom diameter limits and log length).
Modeling landbase		A tabular and spatial landbase. Tabular data make the landbase suitable for both strategic and operational timber supply modeling. The spatial component is used for harvest scheduling.
Modeling tool, Patchworks©		A spatially-explicit wood supply planning and modeling tool developed by Spatial Planning Systems that was designed to provide the user with operational-scale decision-making capacity within a strategic analytical environment.
Modeling tool, Woodstock©		A non-spatial forest modeling tool developed by Remsoft used for harvest scheduling, wood supply analysis, wildlife management and simulation of forest ecosystems to test and compare different management assumptions.

Glossary Term		Definition
Mountain Pine Beetle	MPB	A defoliator insect species (*Dendroctonus ponderosae*) endemic to western North America that infects pine trees during its life cycle and results in tree mortality.
Natural stand		Stands developed under natural (non-anthropogenic) disturbance regimes. Stand initiation was due to natural disturbances, such as fire, pest or pathogen outbreak.
Natural stand empirical yield curve		Empirical yield curve fitted using data from all sampled natural stands within the active landbase.
Net volume		Timber volume that includes the main stem and excludes the stump, top and defective and decayed wood.
Non-linear regression		The practice of fitting a model where the dependent variable is a nonlinear function of one or more independent variables. One benefit of the nonlinear models is that they are often derived on the basis of physical and/or biological considerations.
North American Datum	NAD	A mathematical process of correcting geospatial locations relative to a fixed, known position.
Noxious weed		A plant designated under the Weed Regulation (AR 171/2001) of the Weed Control Act.
Observation		One plot measurement at a specific point in time. All TSPs have only one associated observation, whereas PSPs may have one or more observations (remeasured data) for a single plot.
Operating Ground Rules	OGR	Practices used in operational planning and for implementation of timber harvest operations.
Organic Rankine Cycle	ORC	Thermodynamic process where heat is transferred to a fluid at a constant pressure
Patch		A stand of forest in the same seral stage, and not split by a linear feature greater than 8m wide. Linear features in this definition include roads, pipelines, powerlines, and rivers, but do not include seismic lines.
Passive landbase		That part of the gross landbase that has a deletion and is excluded from the active landbase.
Permanent Sample Plot	PSP	A fixed or variable area plot established for (forest) sampling and measurement purposes, and designed for re-measurement.
Piece size		Number of trees required to obtain one cubic meter (m^3) of gross merchantable tree volume.
Plan Development Team	PDT	A group of individuals assembled for production of MDFP's Forest Management Plan that includes representatives from MDFP, DMI and Buchanan Lumber, Alberta Environment and Sustainable Resource Development, and FORCORP. The goal of the PDT is to provide a forum for facilitating efficient and productive communication and decision making.
Plot		Unit of area, within which variables of interest are assessed.
Plot volume		Gross merchantable tree volume within a plot on a per hectare basis (m^3/ha).
Polygon		A closed geometric entity used to spatially represent area features with associated attributes.
Post93 managed stand yield curve		A managed stand yield curve with a 2-year regeneration lag applied to the coniferous landbase and a 0-year regeneration lag applied to the deciduous landbase.
Pre93 managed stand yield curve		A managed stand yield curve with a 5-year regeneration lag applied to the coniferous landbase and a 2-year regeneration lag applied to the deciduous landbase.
Preferred Forest Management Scenario	PFMS	The forest management scenario that represents MDFP's preferred strategies and activities for managing the FMA area over a 200-year planning horizon.
Prescribed burn		The planned use of carefully controlled fire to accomplish various predetermined management goals: site preparation for planting; reduction of fire hazards or pest problems; improvement of the ease with which the site can be traversed; and creation of better quality browse for wildlife.
Regeneration		The renewal of a tree crop by natural or artificial means. It may also refer to the young crop itself.
Regeneration lag		The period of time between harvest and establishment of the regenerated stand.
Rotation		The period of years required to establish and grow even-aged timber crops to a specified condition of maturity.
Sensitive sites		Sites that have soil, water, slope, aesthetic, vegetation or wildlife characteristics that require special protection beyond the normal precautions described in the ground rules.
Seral stage (SS)		Stages in forest succession that are characterized by plant community conditions. The seral stage definition in this document are based on age and strata classifications
SS: Mature	Mature	Stands that are old enough for harvesting. Age: 61-100 for D and DU; Age: 71-110 for DC and CD; Age: 71-120 for PL; Age: 106-160 for SB, and 106-150 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Old	Old	Stands that are starting to break up or become stagnant. Age ≥ 101 for D and DU; Age ≥ 111 for DC and CD; Age ≥ 121 for PL; Age ≥ 161 for SB; Age ≥ 151 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Regeneration	Regeneration	Stands that are in early stages of development. Age: 0-15 for all strata classes. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Young	Young	Stands that are vigorously growing but are not yet fully grown. Age: 16-60 for D and DU; Age: 16-70 for DC, CD, and PL; Age: 16-105 for SB and SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
Silviculture		The theory and practice of controlling the establishment, composition, health, structure and growth of forests in order to achieve specified management objectives.
Sliver		Generally small polygons created in the spatial analysis due to overlapping features that do not have coincident boundaries. Typically these are artifacts of spatial processing and generally do not represent true differences in polygon differentiation with respect to landbase classification.
Soil productivity		The capacity of soil to support plant growth.
Spatial Harvest Sequence	SHS	A stand level map depicting forest stands scheduled for timber harvesting that are feasible to be operated by the organization.
Special Management Zone		An area of varying size adjacent to an area in which special management measures are necessary to protect natural resources.
Species at risk		Any species known to be "at risk" after formal detailed status assessment and designation as "Endangered" or "Threatened" in Alberta. The list of species is maintained by Alberta.

Glossary Term		Definition
Species group		A single species code used to represent one or more AVI species. For example, the AW species group consists of AVI species A and Aw; and the LT species group consists of La, Lt and Lw.
Species type		There are two species types: deciduous and coniferous. Deciduous species include aspen, birch and poplar. Coniferous species include fir, pine, larch and spruce.
Stand		A community of trees sufficiently uniform in species, age, arrangement or condition as to be distinguishable as a group in the forest or other growth in the area. A stand may also be that polygon as defined in the AVI or Phase III inventory (Alberta SRD 2006).
Stand Susceptibility Index	SSI	An indicator of the potential loss in stand basal area or volume that could occur if mountain pine beetle infested a particular stand. A susceptibility index based on four variables: relative abundance of susceptible pine basal area in a given stand, age of dominant and co-dominant live pine, the density of the stand, and the location (latitude, longitude and elevation) of the stand.
Stand volume		Gross merchantable volume within a stand on a per hectare basis (m^3/ha); also known as gross merchantable stand volume.
Strata/Stratification		A classification scheme for defining data for use in management or modeling.
Structured Query Language	SQL	A formal computer language for querying relational database system tables. The language follows an ANSI compliant format and the core set of commands are part of a common language used across many database software programs.
Submission datasets		Datasets submitted to ESRD for approval.
Temporary Sample Plot	TSP	A fixed or variable area plot established for forest sampling and measurement; usually assessed only once.
Thinning, commercial		A partial cut where trees of a merchantable size and value are removed to provide an interim harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees. Used to capture volume likely to succumb to competition pressures and be lost to disease, insects, or dieback.
Thinning, pre-commercial		A silvicultural treatment to reduce tree density in young stands, carried out before the stems reach merchantable size. The intent is to concentrate the site's growth potential on fewer trees thereby accelerating stand development and reducing the time to final harvest, retaining more live crown, creating opportunities for future commercial thinning activities and improving stand operability.
Timber Harvest Planning and Operating Ground Rules		Standards for operational planning and field practices that must be measurable and auditable and based on forest management plan objectives.
Timber Management Regulation	TMR	The legislative statute that describes the mechanism and regulations by which the forested lands of Alberta are managed. The Regulation is associated with the Forests Act.
Timber operations		Includes all activities related to timber harvesting including site assessments, planning, road construction, harvesting, reclamation and reforestation.
Timber Supply Analysis	TSA	Harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees.
TSA landbase		A spatial landbase that carries all the information of the classified landbase, with the exception of the seismic line work.
Total stand volume		Used to capture volume likely to succumb to competition pressures and be lost to disease
Tree improvement		Insect, or dieback.
Tree improvement yield curve		A modified yield curve for the PL and SW yield strata, whereby the managed stand is adjusted such that volume increase (a fixed percent) occurs at approximately the average harvest age, but the maximum total volume across all ages is unaffected.
Understorey		The trees and other woody species growing under the canopies of larger adjacent trees and other woody growth.
Ungulate		A mammal with hooves.
Universal Transverse Mercator	UTM	A method of projecting spherical shapes on a flat plane. Typically this projection is used when the features need to have good area representation and the extent of the dataset does not cover more than one predefined UTM zone (three degrees of longitude).
Unmanaged landbase		That portion of the net landbase which is considered to be on a "natural" yield projection. All unharvested areas are considered 'unmanged'. AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any record of reforestation are also considered 'unmanaged'.
Values, Objectives, Indicators and Targets	VOIT	A framework of criteria and indicators to help track progress in achieving sustainable forest planning and management under sound environmental, economic, and social objectives.
Watercourse		The bed, bank or shore of a river, stream, creek, lake or other natural body of water, whether it contains or conveys water continuously or intermittently.
Watershed		An area of land, which may or may not be under forest cover, that drains water, organic matter, dissolved nutrients and sediments into a lake or stream. The topographic boundary, usually a height of land, that marks the dividing line from which surface streams flow in two different directions.
Wildlife		Any species of amphibian, bird, fish, mammal and reptile found in the wild, living unrestrained or free roaming and not domesticated. Some definitions include plants, fungi, algae and bacteria.
Wildlife Management Unit	WMU	Areas within province of Alberta managed by ESRD and regulated by the Alberta Wildlife Act (2012).
Years Before Present	YBP	A unit of measure of historical time.
Yield curve		Graphical representation of a predictive yield equation. One yield curve in fact consists of three curves: a conifer volume-age curve, a deciduous volume-age curve and a total volume-age curve.
Yield strata (YS)		A system of stratification applied to the forested landscape based upon FMU, and defining layer and/or understory layer attributes (BCG, crown closure class, leading conifer species). Yield strata form the basis for the development of yield curves; each yield stratum has one or more associated yield curves.

Glossary Term		Definition
YS: Deciduous	D	Species grouping defined as Deciduous
YS: Deciduous w/ Conifer Understory	DU	Species grouping defined as Deciduous with Coniferous Understory
YS: Mixedwood - Deciduous	DC	Species grouping defined as Mixedwood with Deciduous leading
YS: Mixedwood - Coniferous	CD	Species grouping defined as Mixedwood with Coniferous leading
YS: Coniferous - Pine leading	PL	Species grouping defined as Coniferous with Pine leading
YS: Coniferous - Black Spruce leading	SB	Species grouping defined as Coniferous with Black Spruce leading
YS: Coniferous - White Spruce leading	SW	Species grouping defined as Coniferous with White Spruce leading
YS: No Strata (cutblocks)	XCC	No Yield Strata assignment (cutblocks)
YS: No Strata	X	No Yiel+D21d Strata assignment

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MANNING DIVERSIFIED FOREST PRODUCTS LTD.

2012-2021 Forest Management Plan

Chapter 6 Preferred Forest Management Scenario

June 30, 2013 (Draft)

October 1, 2013 (Approved)

EXECUTIVE SUMMARY

This chapter outlines the Preferred Forest Management Scenario (PFMS) that determines the harvest activities over the life of the Forest Management Plan (FMP). This includes a summary of the landbase and yield curve used in the timber supply model, and a review of the assumptions and outputs. For a more in-depth review of scenarios leading up to the PFMS, see Annex VII.

The following table outlines the harvest levels from the PFMS and the allocation to the companies operating under Forest Management Agreement (FMA), conifer quotas and deciduous timber permits. These numbers are subject to approval by Environment and Sustainable Resource Development (ESRD).

AAC Assignment

FMU	Company Name	Disposition Number	Landbase Management Type	Source	Cover Group/ Species	Primary Disposition Allocation %	Primary AAC 15+/11/30 cm m3/yr	Secondary Disposition Allocation %	Secondary AAC 15+/10/30 cm m3/yr	Total AAC m3/yr
Coniferous										
P20	*Manning Diversified Forest Products Ltd*	*FMA0200041*	*Separate Distinct*	*FMA-Only*	*C, CD, DC, D*		*506,172*		*58,953*	*565,125*
P20		*Local Use [1]*	*Separate Distinct*	*FMA-Only*	*C, CD, DC, D*		*5,113*		*595*	*5,708*
P20	FMA AAC Subtotal	FMA0200041	Separate Distinct	FMA-Only	C, CD, DC, D	97.1102%	511,285	91.3311%	59,548	570,833
P20	Gordon Buchannan Enterprises Ltd.	CTQP180002	Separate Distinct	All-FMU	C, CD, DC, D	2.8898%	15,215	8.6689%	5,652	20,867
P20	Total						526,500		65,200	591,700
Deciduous										
P20	*Daishowa-Marubeni International Ltd.*	*DTAP200001*	*Separate Distinct*	*All-FMU*	*C, CD, DC, D*		*172,359*		*149,886*	*322,245*
P20		*Local Use [2]*	*Separate Distinct*	*All-FMU*	*C, CD, DC, D*		*1,741*		*1,514*	*3,255*
P20	DTAP20001 Total	DTAP200001	Separate Distinct	All-FMU	C, CD, DC, D		174,100		151,400	325,500

1. Any unused coniferous local use volume (1% of FMA AAC) is available for MDFP to harvest.
2. Any unused deciduous local use volume (1% of DTA) is available for DMI to harvest.

All AAC numbers are reduced for cull, 3.7% for coniferous and 9% for deciduous.

Page revised October 1, 2013: corrections to "AAC Assignment" Table

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2012-2021 FMP Components

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1. Introduction

The major driver in preparing the 2013 *Forest Management Plan*[1] (FMP) was the addition of *Forest Management Unit* (FMU) P18 to the existing *Forest Management Agreement* (FMA) area. *Manning Diversified Forest Products* (MDFP) desired to incorporate the P18 *landbase* into the same planning framework as used in the rest of the existing FMA. The 2007-20017 FMP served as the basis for the technical *forecasting* and *timber supply analysis* (TSA), and it started with a review of the 2007-2017 FMP assumptions to carry forward into the new 2012-2021 FMP.

The analysis was undertaken in a series of non-spatial *Woodstock* scenarios and a series of spatially explicit *Patchworks* scenarios. A total of 24 Woodstock scenarios were used to evaluate basic parameters such as separate or combined landbases and separate or combined *yield curves*. Additional 22 Woodstock scenarios were used to evaluate *growing stock* constraints. A further 12 scenarios in Woodstock were used to evaluate various options during the evolution of the *DU* Strategy (Deciduous *stands* with coniferous *understory*).

Twenty two (22) Patchworks scenarios were then used to evaluate various spatial issues. The spatial issues range from landscape level objectives such as interior core forest to operational objectives such as block size and block patterns.

Topics evaluated throughout the forecasting process included the following;

- *Spatial Harvest Sequence* (SHS) operational design,
- Balancing haul distance,
- Sequencing deciduous stands with coniferous understory,
- Reforestation treatments affecting post harvest transitions,
- Coniferous and deciduous landbase assignments and transitions,

[1] Terms and initialisms that are defined in the Glossary (Appendix I) are shown in italics the first time they are presented in this document.

- Minimum merchantable timber growing stock levels,
- Impacts of harvesting lower productivity stands ('A" density),
- Timing of compartment sequencing,
- Impacts of sub-FMU area yield curves,
- *Mountain Pine Beetle* (MPB) impacts and control strategies,
- Hydrologic impacts from harvesting,
- Understory protection harvesting response and impacts, and
- Impacts of planting improved stock.

The scenarios were discussed and reviewed within MDFP and at the *Plan Development Team* (PDT) meetings by quota holders and *Environment and Sustainable Resource Development* (ESRD) staff. Of the 28 PDT meetings, approximately 14 focused on the analysis results and the direction the next analysis should take. This allowed all members of the PDT to participate and provide input into the timber supply analysis.

The purpose of this chapter is to describe and document the *Preferred Forest Management Scenario* (PFMS), with details on the scenarios leading up to the PFMS are described in Annex VII. The PFMS is the final scenario resulting from the series of scenarios. The PFMS describes the actions that the forest companies plan to take in the form of harvesting and *silviculture*, and the response of the forest to these actions over a 200 year planning horizon. The final PFMS documentation is presented as a series of indicators that describe the products taken off the landbase and the landbase status over time. Examples of the landbase products are harvest volume and area harvested, and examples of landbase status are growing stock, *seral stage* and species habitat. A total of 46 forecasting related products such as scenario outputs, maps, and scenario comparisons describing the impact of specific strategies were distributed, reviewed and discussed at PDT meetings. The outputs derived from the PFMS are directly used to provide indicators and targets for the VOITs (Chapter 5) and are incorporated into the guidelines for FMP implantation over the 10-year period from May 1, 2012 to April 30, 2022 as documented in FMP Implementation (Chapter 7).

1.1 Management Philosophy

The management philosophy for the PFMS is to implement forest management practices which result in a sustainable flow of high quality economically viable fiber to maintain mill operations.

1.1.1 Management Objectives

- Establish even flow and sustainable harvest levels that balance biological, economic and social objectives
- Apply an extensive forest management regime
- Apply a coarse filter approach to the maintenance of *biodiversity*
- Design the harvest sequence to manage *caribou habitat* as per the approved caribou management strategy
- Prompt conifer *regeneration* to establish productive stands to provide options and support future harvest levels
- Apply vegetation management techniques to enhance conifer survival and productivity
- Use winter harvesting operations to reduce ecological impacts

- Balance log haul distances over the next 20 years
- Manage the delivered log size distribution over the next 20 years
- Integrate conifer and deciduous harvesting operations, where possible, to reduce the annual footprint
- Develop harvest sequence to reduce MPB impacts
- Provide harvesting access to deciduous volume in low density conifer understory stands
- Plan for limited operational implementation of understory protection treatments in DU stands with B density conifer understory to develop effective and acceptable treatments

1.1.2 PFMS Strategies

- 200 year planning horizon for strategic analysis
- Distinct coniferous and deciduous landbases
- Even flow for primary conifer and primary deciduous harvest volumes
- Operational sequencing constraints on deciduous incidental harvest volumes
- Minimum harvest ages based on minimum piece size requirements (80 years for conifer and deciduous *clearcut* and 60 years for understory protection)
- Post-harvest *strata* distribution to be the same as the pre-harvest distribution with the exception of deciduous with coniferous understory stands which transition to either pure deciduous or mixedwood strata
- Non-declining conifer and deciduous growing stock over the last 50 years
    - deciduous targets does not constrain *Annual Allowable Cut* (AAC) due to the younger starting age class distribution
- Planned blocks forced in the Spatial Harvesting Sequence (SHS) to improve operability and reduce variance
- Understory protection treatments applied in mid density deciduous over coniferous stands up to a maximum of 1,000 ha for the first 10 years. This allows the companies to improve understory protection techniques and establish information on initial stand responses.
- Stand selection as per caribou strategy and *operating ground rules* (OGR) to reduce impacts on caribou
- Maintain 10% of the managed forest as old forest and 25% percent in contiguous patches greater than 120 ha
- Balance haul distances by managing the distribution of stands for harvest in eastern and western portions through a primary conifer harvest target ratio of 70% in the eastern part of the operating area and 30% in the western part for the first 20 years of the planning horizon
- No harvesting in the old FMU P09 for the first 20 years except for planned blocks
- Identify and sequence for harvesting, a limited number of deciduous stands with low density conifer understory (DU-A) for clearcut harvesting treatments that employ understory avoidance and transition to pure deciduous stands (D-BCD) post-harvest as per Memorandum of Understanding (MOU) between MDFP and *Daishowa Marubeni International Ltd.* (DMI)

2. Landbase Summary

To address specific modeling and reporting requirements, landbases in three formats were created, which contain essentially the same information but at different resolutions and some additional classification:

- Classified landbase – with the highest spatial resolution;
- Timber Supply Analysis *(TSA) landbase* – with a lower level of spatial resolution; and
- *Modeling landbase* – with special modeling attributes added to the TSA landbase.

All three landbases cover the same extent and contain the same description of the forest. For instance, the information contained in the greater spatial resolution of the classified landbase (e.g. seismic lines) is carried as attributes in the TSA and modeling landbases. Refer to Appendix V: Landbase Development for a full description of the process used to create the landbases. (As the Modeling landbase is the one used for forecasting and references to landbases in the forecasting document refer to Modeling landbase).

The landbase used in the PFMS is similar to the landbase submitted for Approval in Principle. The changes to the landbase are all related to updates in the planned and existing blocks, and with the small 2012 fire in the south west portion of the FMA.

2.1 Classified Landbase

The classified landbase (version 20) consisted of 526,634 polygons with a total area of 930,100 ha. The managed landbase consists of 486,606 ha and represents 52% of the classified landbase.

Table 2-1 summarizes the gross landbase by deletions and Table 2-2 and Table 2-3 summarize the managed landbase by yield strata (F_YC2) and yield class (F_YC). The tables can be duplicated by grouping the landbase on the F_YC , F_YC2 or F_DEL field and summarizing on AREAHA_CLS. The managed landbase is shown in Table 2-1.

Deletions accounted for 48% or 443,494 ha of the total landbase area. Non-forest area constituted 10% of the unmanaged landbase (Table 2-1).

Table 2-1. Summary of MDFP Landbase

MDFP Landbase Summary by Source FMU							
Landbase Category	Landbase Detail	Reference Section	Source FMU P6	Source FMU P9	Source FMU P18	Total (ha)	Percent of Gross LB
Gross Landbase			**295,749**	**299,672**	**334,679**	**930,100**	**100.00**
Disposed Land (D_STATUS)							
PNT	Protected Areas	4.7.1	18	0	32	51	0.01
PSP	SRD PSP Buffers	4.7.1	239	0	0	239	0.03
Total			257	0	32	290	0.03
Access (D_ACCESS, D_SEISMIC)							
PIPE	Pipelines	4.7.2	1,720	1,712	1,611	5,044	0.54
ROAD	Roads	4.7.2	3,262	1,859	2,069	7,190	0.77
SEISMIC	Cutline/Trails	4.7.3	2,453	2,829	4,213	9,495	1.02
Total			7,435	6,400	7,894	21,729	2.34
Block Deletions (D_BLOCK)							
BLK_DEL	Identified Deletions	4.7.4	1,035	0	12	1,047	0.11
BLK_AVI	Blocks with No AVI	4.7.4	1,682	0	398	2,080	0.22
HKISS_US	Hotchkiss US Research Proj.	4.7.4	470	0	0	470	0.05
Total			3,188	0	410	3,598	0.39
Non-Forested Deletions (D_NONFOR)							
ANTHRO	Man-made NonVeg	4.7.5	1,094	1,007	933	3,034	0.33
NNF	Naturally NonForest	4.7.5	27,637	20,941	25,404	73,982	7.95
NNV	Naturally NonVegetated	4.7.5	2,441	3,632	1,285	7,358	0.79
WATER	Waterbodies	4.7.5	2,940	2,988	2,829	8,757	0.94
Total			34,112	28,568	30,451	93,131	10.01
Burns (D_BURN)							
BURN	Burns from 2000	4.7.6	255	3	6	265	0.03
Total			255	3	6	265	0.03
Site Productivity (D_TPR)							
F	Pure D-Fair Sites	4.7.9	1,103	8,127	1,144	10,375	1.12
U	Unproductive Sites	4.7.9	26,235	13,461	14,597	54,292	5.84
Total			27,339	21,588	15,740	64,667	6.95
Buffers (D_BUF)							
RIVBRK	Steep Slope Riverbanks	4.7.7	8,069	14,040	5,921	28,030	3.01
SWAN	Swan No Harvest Zone	4.7.7	82	0	629	711	0.08
WBUF	Watercourse Buffers	4.7.7	460	667	3132	4,259	0.46
Total			8,611	14,708	9,682	33,001	3.55
Subjective Deletions (D_SUBJ, D_ISO)							
WETLAND	Wetland	4.7.10	29,997	96,867	77,158	204,022	21.94
ADEN	A Density Stands	4.7.10	1,234	4,194	3,636	9,063	0.97
LARCH	Larch Component	4.7.10	77	22	3	102	0.01
SBLEAD	SB Leading where TPR<>G	4.7.10	2,814	854	9,957	13,625	1.46
CBUPL	Caribou Zone - Pine	4.7.10	0	0	0	0	0.00
CBUSB	Caribou Zone - Black Spruce	4.7.10	0	0	0	0	0.00
CBUSW	Caribou Zone - White Spruce	4.7.10	0	0	0	0	0.00
ISO	Isolated Stands	4.7.8	0	0	2	2	0.00
Total			34,121	101,937	90,757	226,815	24.39
Grand Total	All Deletions		115,318	173,203	154,973	443,494	47.68
Grand Total	**Active Landbase**		**180,431**	**126,469**	**179,706**	**486,606**	**52.32**

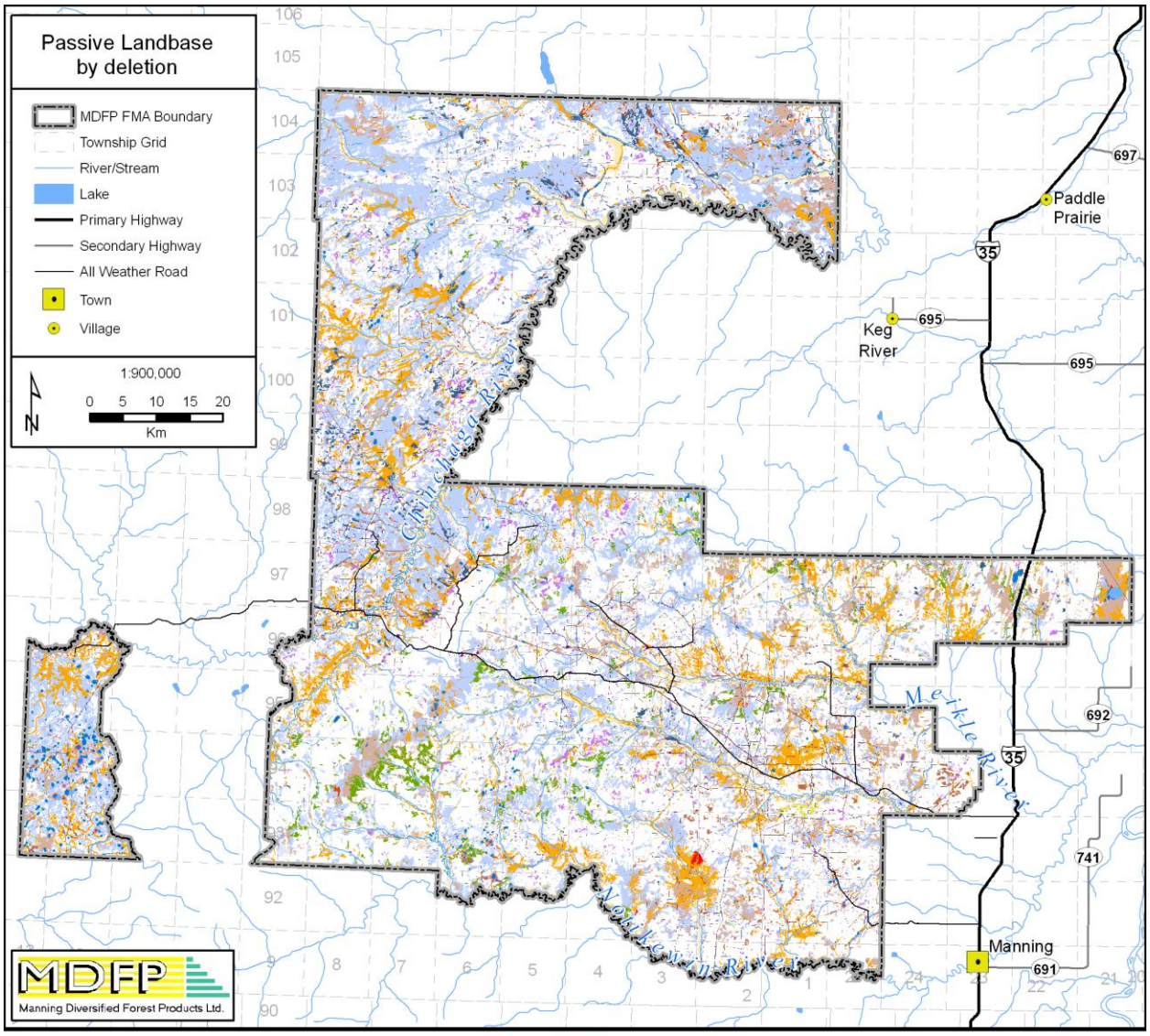
MDFP has a divided coniferous and deciduous landbase. 38% of the managed landbase is pure coniferous, 15% is mixedwood strata, 25% is pure deciduous and 22% is deciduous with a coniferous understory as shown in Table 2-2 and Table 2-3.

Table 2-2. Distribution of Yield Strata by FMU over the Managed Landbase

	FMU			Total	Pct
Strata	P6	P9	P18	(ha)	%
D	15,546	60,388	44,101	120,035	0.25
DU	71,035	23,991	11,812	106,839	0.22
DC	16,353	7,231	13,872	37,456	0.08
CD	17,381	4,331	13,143	34,855	0.07
PL	7,582	19,367	70,325	97,274	0.20
SB	2,691	1,853	1,867	6,410	0.01
SW	49,842	9,308	24,587	83,737	0.17
Grand Total	180,431	126,469	179,706	486,606	1.00

Table 2-3. Distribution of Yield Classes by FMU over the Managed Landbase

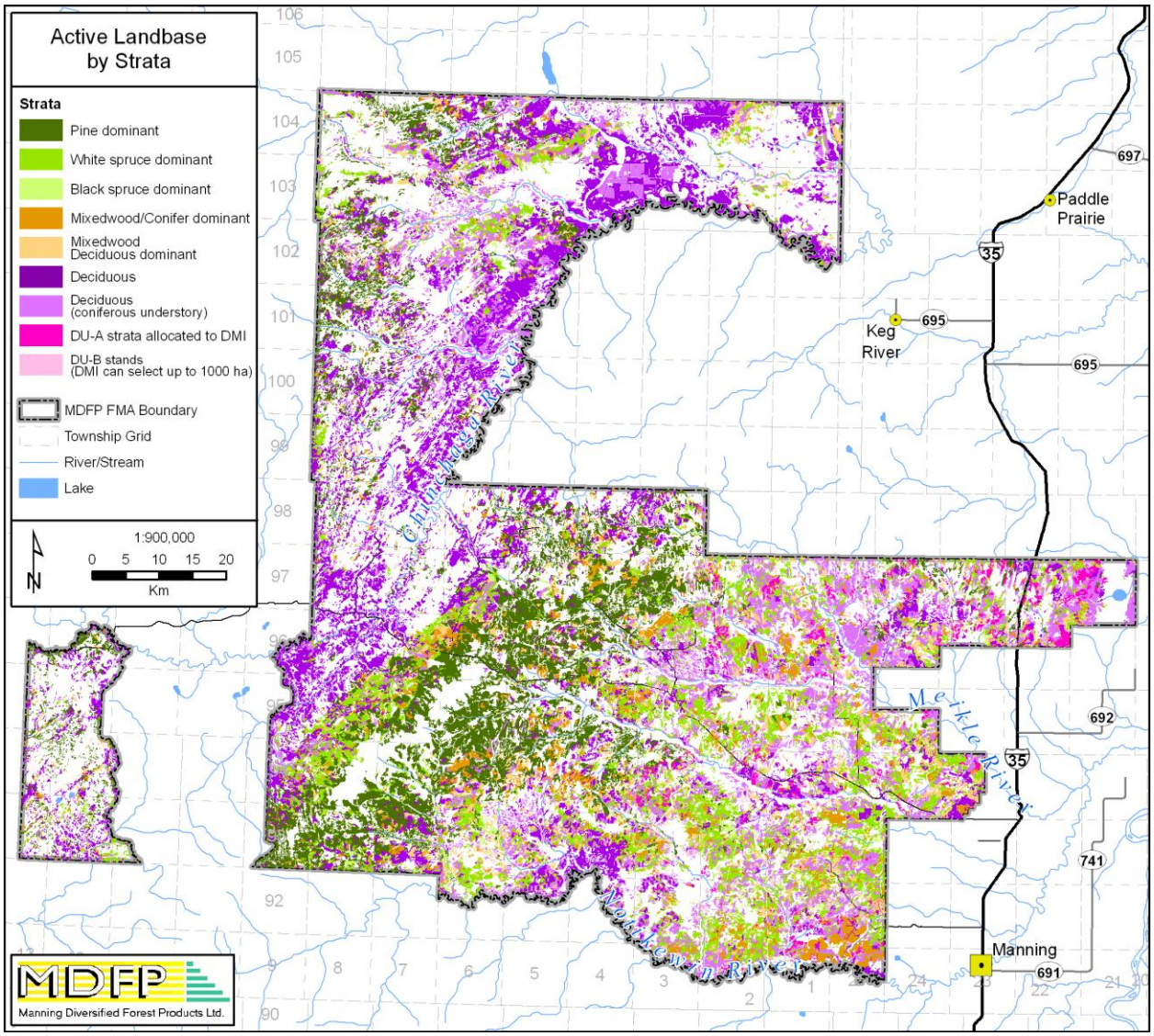
Yield Class	FMU			Total	Pct
(Strata/Density)	P6	P9	P18	(ha)	%
D-B	2,609	12,783	5,146	20,538	0.04
D-CD	12,937	47,605	38,955	99,497	0.20
DU-A	43,746	13,537	10,505	67,788	0.14
DU-BCD	27,290	10,454	1,307	39,051	0.08
DC-BCD	16,353	7,231	13,872	37,456	0.08
CD-A	95	219	627	941	0.00
CD-BCD	17,286	4,112	12,516	33,914	0.07
PL-A	838	509	2,345	3,692	0.01
PL-BCD	6,744	18,858	67,980	93,582	0.19
SB-BCD	2,691	1,853	1,867	6,410	0.01
SW-A	931	338	880	2,150	0.00
SW-B	19,214	5,195	9,951	34,361	0.07
SW-CD	29,697	3,774	13,756	47,226	0.10
Grand Total	180,431	126,469	179,706	486,606	1.00



Deletions

- SRD PSPs deleted
- Reservations/Notations deleted
- Pipeline features (AVI and dispositions)
- Road features (AVI and dispositions)
- Specific block planning deletions
- AVI polygons with no block information
- Hotchkiss Understory Protection Study blocks
- Dispositions now not forested
- Non forest
- Non vegetated
- Water (from AVI or Hydrologic data)
- AVI and post-AVI identified fires
- Steep slopes along rivers
- No harvest zone around trumpeter swan sites
- Buffers around water features
- Fair sites in pure Decid strata
- Unproductive sites (all strata)
- Wetlands
- A Density
- Larch as primary conifer
- Black spruce leading
- Isolated/trapped timber

Map 2-1. Passive landbase by deletion.



Map 2-2. Active landbase by strata.

The spatial arrangement of *passive* and *active landbase* has clear trends. The north-west portion of the FMA is largely a mixture of deciduous stands mixed with unproductive wetlands. Much of this area is young due to a large firte in the 1950's. The south-east portion of the FMA is generally more productive, with a large mixture of coniferous, deciduous and mixedwood stands.

2.2 TSA Landbase

The TSA landbase (version 20) consisted of 205,758 polygons; a 58% reduction in the number of polygons. The reduction in polygons is helpful in creating a more operationally feasible SHS that does not split blocks by seismic lines.

The landbase deletions and managed landbase strata areas listed in Table 2-1, Table 2-2 and Table 2-3 are applicable to the TSA landbase with two exceptions. The exceptions are the area of deletions for

seismic lines and the managed area with no strata definition. Within the TSA landbase, seismic lines are an attribute and are not spatially included as described Annex V: Landbase Development. The area field used for forecasting in the TSA landbase is AREAHA_PW, which contains a reduced polygon area based on the polygon size minus the seismic line area.

The X and XCC areas within the managed landbase are not considered operable in the forecasting as there is no associated yield curve. The managed area based on the AREAHA_PW is ha in the TSA landbase.

2.3 Modeling Landbase

The modeling landbase uses the same polygons as the TSA landbase with themes and other modeling fields added. The landbase deletions and managed landbase strata areas listed in Table 2-1, Table 2-2 and Table 2-3 are also applicable to the modeling landbase with the exceptions described for the TSA landbase. Final calculations of the landbase file's fields are listed in Annex V: Landbase Development.

3. Yield Curve Summary

Timber yield curves are a primary input of the forecasting required in the development of Forest Management Plans. This section provides a broad overview of the yield curve development used to generate the yield curves used in the forecasting model. Refer to Annex VI: Yield Curve Development for the complete documentation of the process used to develop the yield curves.

The yield curves used in the PFMS are the exact same curves as submitted for Approval in Principal. Furthermore, these curves used the same approach as the 2007 FMP. All regenerated curves are the same as standing timber, with a *regeneration lag* applied. They were not derived from Reforestation Standard of Alberta (RSA) due to insufficient data.

3.1 Overview

Natural stand yield curves were developed using the empirically fitted "volume over age" approach from volume sampling plots installed on the FMA area between 2000 and 2009. Based on these curves, *managed stand*, *tree improvement* and area weighted *composite timber yield curves* were constructed. All curves represent *gross merchantable volume* with a coniferous utilization standard of 15/11 and a deciduous utilization standard of 15/10. Piece size curves were constructed to complement the standing timber yield curves.

The FMP yield strata, the strata total area, the total number of plots measured, and the number of plots eligible for curve development in each stratum are presented in Table 3-1.

Table 3-1. MDFP Yield Strata and Number of Eligible Plots

Landbase	Strata Group	FMP Yield Strata	Active Landbase Area (ha)			Total Active Landbase (ha)	Number of Plots	
			Natural	Mgd. Pre93[2]	Mgd. Post93[3]		Eligible	Total
Deciduous	D	D-B	20,551	-	-	20,551	66	75
		D-CD	89,414	819	9,299	99,532	105	139
Coniferous	DU[1]	DU-A	66,973	710	159	67,841	108	116
		DU-BCD	36,223	2,840	1	39,064	88	95
	DC	DC-BCD	32,629	284	4,561	37,474	144	164
	CD	CD-A	941	-	-	941	-	1
		CD-BCD	22,017	6,511	5,416	33,944	116	149
	C	PL-A	3,692	-	-	3,692	2	4
		PL-BCD	91,274	648	1,697	93,619	149	168
		SB-BCD	6,396	14	1	6,411	61	104
		SW-A	2,154	-	-	2,154	4	7
		SW-B	34,474	-	-	34,474	139	157
		SW-CD	34,646	629	12,018	47,293	145	183
Unassigned Plots							-	53
Grand Total			441,385	12,455	33,151	486,992	1,127	1,415

[1]Overstory is in broad cover group D and understory is in broad cover group DC, CD, C.

[2]Stands harvested prior to April 30th, 1993.

[3]Stands harvested on or after May 1st, 1993.

3.2 Timber Yield Curves

The natural yield curves are derived from empirically fitted "volume over age" data and the managed stand yield curves, including understory protection. The timber yield curves as used in the TSA are presented in Table 3-2, Figure 3-1 and Figure 3-2.

Table 3-2. Yield curves used in the timber supply analysis

Landbase	Strata Group	FMP Yield Strata	Old FMU	Natural Stand	Pre93 Managed Stand[1]	Post93 Managed Stand[2]
Deciduous	D	D-B	P6, P9, P18	Base Natural Curves	Pre93 Managed Stand	Post93 Managed Stand
		D-CD	P6, P9, P18	Base Natural Curves	Pre93 Managed Stand	Post93 Managed Stand
Coniferous	DU	DU-A	P6, P9, P18	Base Natural Curves	Pre93 Managed Stand	Post93 Managed Stand
		DU-BCD	P6, P9, P18	Base Natural Curves	Pre93 Managed Stand	Post93 Managed Stand
	DC	DC-BCD	P6, P9, P18	Base Natural Curves	Pre93 Managed Stand	Post93 Managed Stand
	CD	CD-A	P6, P9, P18	Base Natural Curves	N/A	N/A
		CD-BCD	P6, P9, P18	Base Natural Curves	Pre93 Managed Stand	Post93 Managed Stand
		CD-BCD-PROT	P6, P9, P18			Understory Protection Yield Curve
	C	PL-A	P6, P9, P18	Base Natural Curves	N/A	N/A
		PL-BCD	P6, P9, P18	Base Natural Curves	Pre93 Managed Stand	Post93 Managed Stand
		SB-BCD	P6, P9, P18	Base Natural Curves	Pre93 Managed Stand	Post93 Managed Stand
		SW-A	P6, P9, P18	Base Natural Curves	N/A	N/A
		SW-B	P6, P9, P18	Base Natural Curves	Pre93 Managed Stand	Post93 Managed Stand
		SW-CD	P6, P9, P18	Base Natural Curves	Pre93 Managed Stand	Post93 Managed Stand

[1] These yield curves are used for existing cutblocks only; future cutblocks are expected to regenerate to one of the yield strata described in Post93 Managed Stand.

[2] The Post93 Managed Stand yield curve will be replaced by understory protection yield curve for yield stratum DC-BCD.

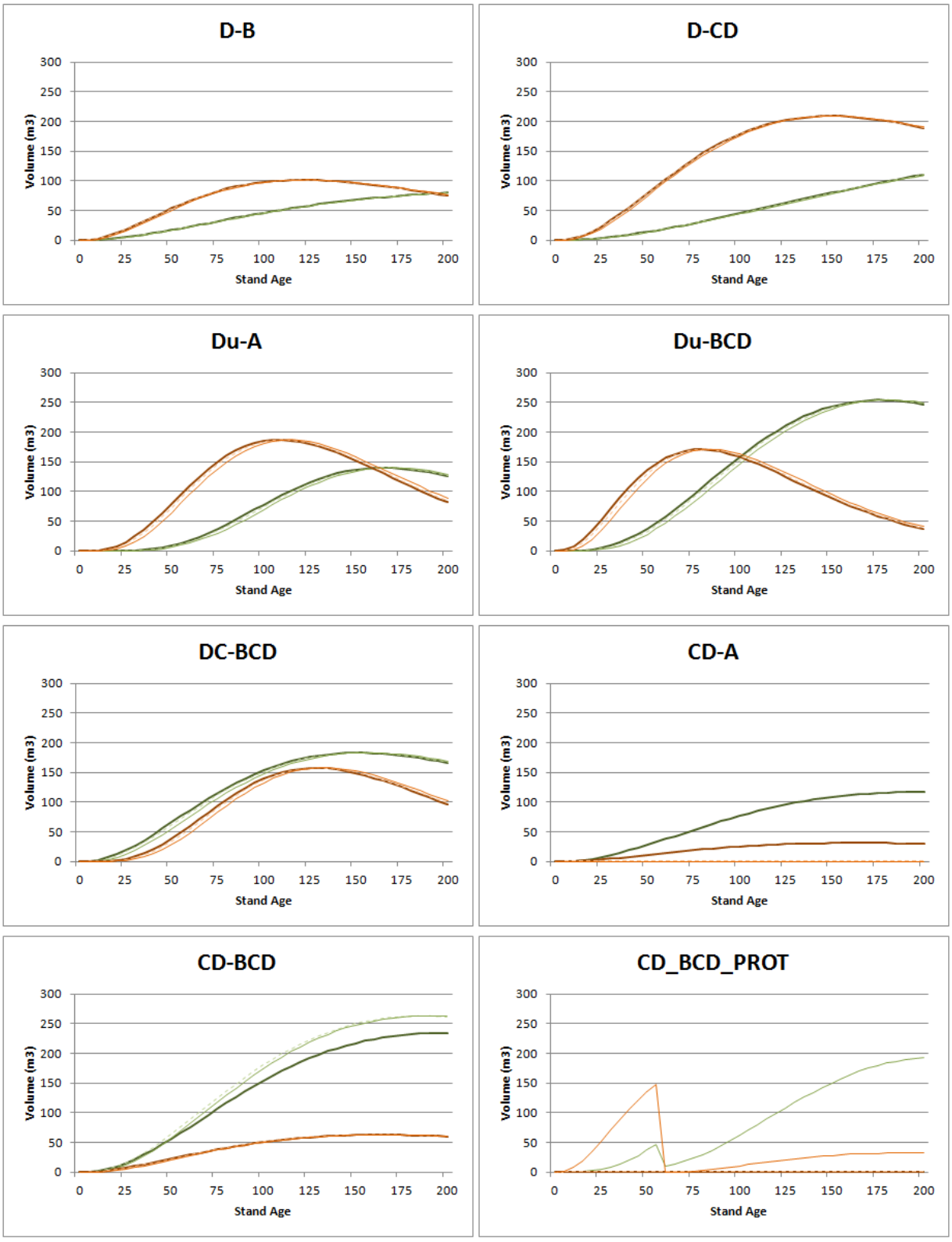


Figure 3-1. Deciduous and mixedwood yield curves used in the PFMS

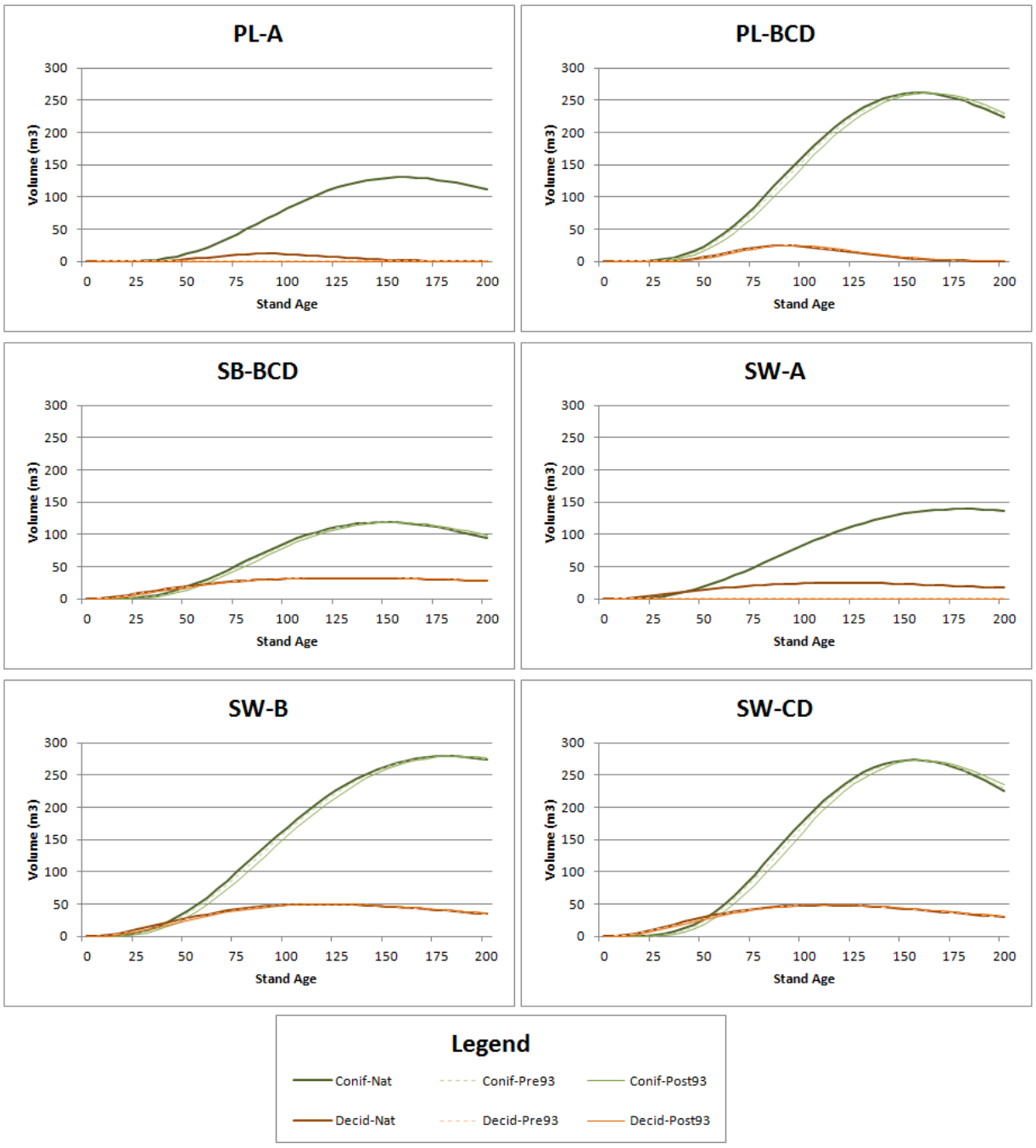


Figure 3-2. Pure coniferous yield curves used in the PFMS

3.2.1 Utilization

All curves represent gross merchantable volume with a coniferous utilization standard of 15/11 and a deciduous utilization standard of 15/10 (Table 3-3).

Table 3-3. Utilization Standards by Species Group

MDFP Utilization standards by species group		
Utilization Criterion	Conifer Species	Deciduous Species
Stump height	0.3	0.3
Minimum log length	2.6	2.6
Minimum stump diameter outside bark	15.0	15.0
Minimum top diameter inside bark	11.0	10.0

3.2.2 Cull

Cull was not applied to the yield curves. Cull was only applied to the final AAC as a reduction to the PFMS harvest volume. The *cull reduction* is 3.7% for coniferous components and 9% for deciduous components.

3.2.3 Regeneration Lag

Regeneration lag was applied to the managed yield curves. The Pre-1993 managed yield curves applied a two year regeneration lag to the conifer component of all curves by shifting the curves to the right 2 years.

3.2.4 Green Tree Retention

A green tree retention factor was not applied to the yield curves for forecasting. Retention is included in the harvest level and will be left in the harvested areas and charged as AAC drain post harvest. More information is in Chapter 7, FMP Implementation.

4. PFMS Assumptions and Goals

This section describes the final inputs and assumptions used in forecasting the PFMS. The term "goal" is used to distinguish what was to be achieved in the forecasting models from the "targets" associated with VOITs.

4.1 Standard Assumptions

The PFMS applied the following standard assumptions:

- Even flow harvest of primary conifer and deciduous harvest volumes,
- Secondary volumes are tracked but not constrained,
- Planning horizon 200 years, and
- Operable growing stock is constrained to not decline in the last quarter of the plan.

4.2 Harvest and Planting Treatments

There are two harvesting treatments used; clearcut and understory protection. Clearcut is used in the majority of harvest, and understory protection is limited to a maximum of 1,000 ha in the first ten years.

The majority of the coniferous and mixedwood stands are planted after harvesting, assuming appropriate site preparation and stand tending to ensure success. A small portion of MPB impacted pine stands will be left for natural (LFN). These are placed on a reduced volume A-density pine curve after harvest.

The transitions and eligible age range for each strata and treatment are defined in Table 4-1. The Actions in this table describe the combination of harvesting treatment and silviculture treatment as used in the timber supply models.

Table 4-1. Strata transitions and minimum harvest ages

Original			Harvest	Post Treatment		
Strata	Crown Closure	Origin	Age Range	Strata	Crown Closure	Age
CLEARCUT Action						
D	ABCD	Natural or Clearcut	80 - 130	D	CD	0
DU	A	Natural or Clearcut	>= 140	DC	CD	0
DU	BCD	Natural or Clearcut	>= 110	CD	CD	0
DUA_DMI	A	Natural or Clearcut	>= 70	D	CD	0
DU_PROT	B	Understory Protection	>= 140	DC	CD	0
DC	ABCD	Natural or Clearcut	>= 80	DC	CD	0
CD	ABCD	Natural or Clearcut	>= 80	CD	CD	0
SW	ABCD	Natural or Clearcut	>= 80	SW	CD	0
PL	ABCD	Natural or Clearcut	>= 80	PL	CD	0
SB	ABCD	Natural or Clearcut	>= 80	SW	CD	0
Understory Protection Action						
DUB_DMI	B	Natural or Clearcut	50 - 100	DU_PROT	B	60
Pine Leave for Natural Action						
PL	ABCD	Natural or Clearcut	>= 80	PL	A	0

NOTE: Minimum harvest ages may be lower for planned blocks

4.3 Succession and Lifespan

If a stand is not harvested before it dies, it age is reset back to age 0. Table 4-2 defines the ages in which stands die if not harvested.

Table 4-2. Lifespan ages

Strata	Death age (years)
D	160
DU	200
DC	200
CD	200
PL	200
SB	200
SW	200

4.4 Seral Stages

Seral stages that classified stands by ecological development phase were developed for the FMU (Table 4-3). Age ranges were based on the ecology of the primary tree species in each stratum. Forecasting used the regeneration seral stage as the age range of the young patch indicator and the old seral stages were used to maintain a minimum 10 % old forest on the managed landbase.

Table 4-3. Seral Stages

Strata	Seral Stage			
	Regeneration	Young	Mature	Old
D	0-15	16-60	61-100	101+
DU	0-15	16-60	61-100	101+
DC	0-15	16-70	71-110	111+
CD	0-15	16-70	71-110	111+
PL	0-15	16-70	71-120	121+
SB	0-15	16-105	106-160	161+
SW	0-15	16-105	106-150	151+

4.5 Deciduous Overstory with Conifer Understory

MDFP and DMI have negotiated an MOU regarding the DU strata. The history and details of the agreement are covered in FMP Implementation (Chapter 7) and the technical analysis used in the transition to the new MOU are in Annex VII - Forecasting. In essence, the agreement has two clauses that impact the PFMS:

- Up to 1,000 ha of DU B density stands are available for harvest as Understory Protection in the first 10 years, and
- 10,700 ha of DU A density stands are available for harvest in the first 10 years by DMI and regenerated back to D strata and the deciduous landbase.

4.6 Caribou Habitat

The objective of the caribou habitat strategy is to mitigate the impacts of harvesting on the caribou habitat within FMU P20. This is accomplished through the selection of stands for harvest and the patterns of the remaining mature forest areas in such a way as to mitigate the short term impact on caribou habitat within selected locations across the FMU.

The caribou habitat strategy was developed using local expert knowledge and available caribou telemetry data because the localized models and tools to predict woodland caribou habitat values are under development by the Government of Alberta and are not in a condition where they can be used for this FMP. Applying the precautionary approach, harvesting was deferred from selected areas of caribou range for the next ten years and harvest patterns and intensity will be modified in other areas in order to mitigate the impacts on caribou habitat. Details on the harvest sequencing development process are described below. Figure 4-1 identifies three zones within FMU P20 and their designation in relation to the caribou habitat strategy which are:

1991 Caribou Boundary

At the time of the FMP development, the 1991 caribou boundary was the approved caribou boundary for the region. In FMU P09, there are no additions or subtractions to the official 1991 boundary. In FMU P06, the official boundary is incorporated into the 2007 APMA. In FMU P18, the official boundary is augmented by the “Specified Area”.

2007 APMA (Alternative Patch Management Area)

The 2007-2017 FMP contained an additional area surrounding the caribou zones where caribou habitat constraints were applied to the harvesting operations. The APMA includes the two portions of the 1991 caribou boundary within FMU P06. This APMA was carried over into the PFMS.

P18 Specified Area

The FMU P18 specified area will be managed in addition to the 1991 caribou boundary and both areas will have caribou habitat constraints applied to the harvesting operations. MDFP worked with the Plan Development Team (PDT) to create the specified area as shown. As part of MDFP's consultation process, Duncan's First Nation reviewed the proposed specified area and recommended expansion of the specified area as identified in Figure 4-1. MDFP has accepted this recommendation and the P18 specified area will be expanded to include the area identified as Duncan's First Nation recommendation.

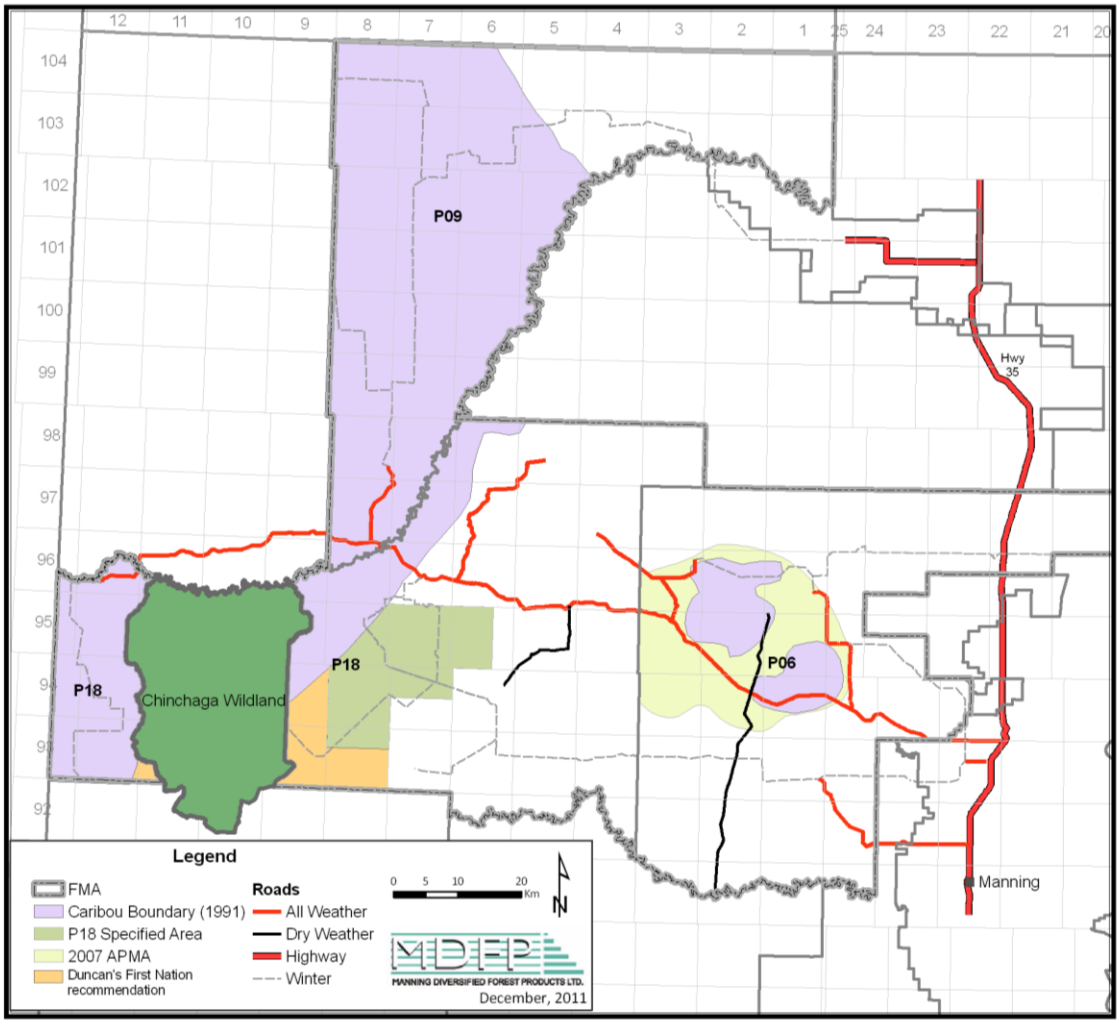


Figure 4-1. Caribou areas in FMU P20

4.6.1 Caribou 30/20 rule

Development of the harvest patterns within the areas specified above is accomplished through the 30/20 rule. The 30/20 rule is applied to reduce the amount of habitat preferred by *ungulates* other than caribou (*i.e.* moose and deer) in an effort to reduce predator populations. The other ungulate habitat is composed of deciduous and mixedwood stand types, referred to here as "applicable strata" (D, DU, DC, DCU, CD or CDU) that is less than 30 years old. There are two methods in which the 30/20 rule is applied:

- The first method is a simple non-spatial rule where the target is: the applicable strata area which is less than 30 years old comprises no more than 20% of the total area of applicable strata. This will limit the amount of younger deciduous and mixedwood stands preferred by other ungulate species in the areas where the rule is applied.
- The second method involves controlling the spatial arrangement of the stands which comprise the 30/20 rule. Patch sizes greater than 300 ha will be maximized to increase the grouping of harvest blocks. The target for the patch size will be set so as to reduce the number of patches in the 0-300 ha range, not to eliminate them. This patch target is an effective way to increase the average harvest patch size, which reduces the number of harvesting entries and the access required for harvesting, as well as concentrating the other ungulate habitat in fewer but larger patches while maintaining larger patches of preferred habitat for caribou.

FMU P06

The APMA from the 2007-2017 FMP has been carried over into the new 2012-2021 FMP and the following will apply:

- The 30 / 20 rule will apply to deciduous and mixedwood stands;
- Patch size targets will apply to deciduous and mixedwood stands;
- Black spruce (SB), wet pine and wet white spruce stands will remain in the net land base but no harvesting will be sequenced in these stands for the first 10 years. Caribou prefer the wet forested areas, which will remain unharvested in the Alternative Patch Management Area (APMA) for the next 10 years; and
- As much as possible within the strata balancing guidelines, MDFP will attempt to reforest stands as pure conifer (C strata) within the APMA in exchange for mixedwoods outside the APMA. This will have the effect of reducing desirable habitat for other ungulate species within the APMA.

FMU P18

There is no "official" APMA in P18, but there is a "specified area" that augments the official 1991 boundary and the following is applied to the combined official and specified areas in FMU P18:

- No deciduous harvesting will occur for the first 10 years. Deferring deciduous harvest avoids generating desirable habitat for other ungulates;
- The 30 / 20 rule will apply to deciduous and mixedwood stands;

- Patch size targets will apply to deciduous and mixedwood stands;
- SB, wet pine and wet white spruce stands will remain in the net land base and be available for harvest but no harvesting will be sequenced in these stands for the first 10 years; and
- As much as possible within the strata balancing guidelines, MDFP will attempt to reforest stands as pure conifer (C strata) within the combined area in exchange for mixedwoods outside the combined area. This will have the effect of reducing desirable habitat for other ungulate species within the combined area

FMU P09

The official 1991 boundary applies in P09 but no harvesting will occur in the 1991 official caribou area for the first 10 years.

4.7 Interior Old Forest

The TSA model defines Old Interior forest patches as any patch greater than 120 ha that is comprised of stands greater than 120 years old. Patches are composed of both the active and passive landbase and include all strata.

4.8 Landbase Losses

Two mechanisms account for large scale productivity losses on the landbase. The first is an AAC recalculation trigger. When the managed landbase is reduced by more than 2.5% from the current level, a reduction is applied to the AAC, which may be a percent reduction based on the landbase loss or a recalculation of the harvest level based on the new reduced landbase. This mechanism is designed to deal with catastrophic losses.

The second mechanism is based on the historical method of dealing with fire within the TSA. Burnt areas are not included in the active landbase for the TSA until the area is inventoried or surveyed to confirm regeneration. These areas are not in the active landbase even though they are very likely to regenerate to forest, since most of the forest types in Alberta are adapted to frequent fires. It can be assumed that as fires are burning on the landbase area and are 'removed from the landbase' due to fire for the next recalculation, and that other areas that have previously been burned and removed from the landbase will be returning to the landbase. Therefore fire has inherently been accounted into the harvest level calculations through both a recalculation trigger and post fire area removal.

4.9 Natural Disturbances

In the Patchworks model, patch size targets were used to control the spatial harvest patterns. The patch size of 60-200 ha was maximized to encourage the model to group operations and to mimic the range of natural disturbances. Smaller patch sizes automatically happen on the landscape, as the spatial arrangement of existing forest structure requires some smaller patches to be harvested. Larger patch sizes greater than 200 ha also occur in limited quantities.

4.10 Mountain Pine Beetle

The mountain pine beetle strategy as described in Chapter 7 was modeled in the PFMS. Furthermore, the potential impacts of MPB were modeled using the ESRD MPB disaster scenario and the MPB spread model. These were tested in various scenarios and described in Annex VII.

4.11 Operational Considerations

The development of a 20 year SHS as part of the forecasting supports forest sustainability by tightening the relationship between strategic planning and field operations. It ensures that the long term consequences of the field operations are incorporated into the forecasting and that harvesting activity reflects the strategically determined allowable cut. For this to be effective, the SHS must be operationally feasible. Operators requested that annual harvesting operations be somewhat grouped and that merchantable patches left behind for future harvest be large enough to harvest at a later date. Operational considerations were addressed in the forecasting process by the following techniques.

4.11.1 Annual Harvest Patches

Annual harvesting was controlled by creating patch goals comprised of only recently harvested stands with an age of zero or one year. By setting the topology distance to 200 m and constraining the 100+ ha and 250+ ha patch goals to minimum levels, the model was encouraged to create several clusters of stands each year. This technique removed the requirement to restrict harvesting to annually identify operating unit boundaries.

4.11.2 Operational Leave Patches

One concern when developing operational plans is the amount of standing merchantable timber left behind after harvesting. Leave patches that are eligible for harvest in the future should be large enough to make it economical to return to harvest them. A patch goal was created comprised of merchantable timber in the managed landbase and of a size class of 0-40 ha based on 15 m topology distance. This patch goal was set to a maximum of 2% of the leave patches to be less than 40 ha. This was to encourage the model to minimize the merchantable patches less than 40 ha in size.

4.11.3 Operating Units

MDFP uses *working circles* to restrict access in certain time periods. The operating units were created to help the model combine harvest activities into operationally feasible groups for the remainder of the planning horizon after the SHS period (which covers the first 20 years of the planning horizon). These operating units were constrained using the Access Control feature within Patchworks. In the first 20 years, an effort was made to balance the coniferous landbase harvest between operating units between the original FMU P6 and the original FMU P18.

4.11.4 Stand Height

Stand height was used to control the conifer harvest in the first 10 years. To refine the operability of stands, a minimum height for each strata was employed. Table 4-4 outlines the criteria for tall stands, and the remaining landbase is considered short.

Table 4-4. Criteria for tall stands, all other considered short.

F_YC2	ULEAD_CON	F_HGT	UHEIGHT
PL	NA	>=21	NA
SW, SB	NA	>=23	NA
DU	NA	NA	>=20
CD, DC	SW	>=23	NA
CD, DC	PL, OTHER	>=21	NA
CD, DC	NA	>=21	NA

4.11.5 Opening Patch Sizes

Opening patch size refers to the size distributions of the regeneration seral stage. The size groupings were: 0-2 ha, 2-200 ha, 200-500 ha and 500+ ha. The patch size goals used a topology distance of 5 m.

The model was constrained to have at least 90% of the regeneration patches in the 2-200 ha patch size and up to 10% of the patches in the 200-500 ha patch size class.

4.12 Target Weightings

The weighting of individual targets impacts the models ability to achieve the target values desired by the management team. However, the weighting of the targets is not a mathematical process of determining the actual weights but a process of ensuring desired outcome of the target values. Some targets are desired to be even flow, some are required to meet a minimum or maximum, with fluctuations allowed above or below the minimum or maximum, and still others can have significant deviation from the target value and still be within accepted values. Once the desired effect is agreed upon, the weights are adjusted to achieve the targets.

Some targets are difficult to achieve and the weighting will be higher than other targets. Other targets will achieve their values with very little encouragement, so very little weighting is required. The relative weighting between targets does not reflect their relative importance, but simply reflects the required weighting to achieve the desired outcome.

5. PFMS

The Preferred Forest Management Scenario (PFMS) is the result of combining the decisions from earlier analysis, the targets for values of interest, and the biological and anthropogenic assumptions with operational considerations. A PFMS is not the result of a computer analysis but rather the analysis that was used to provide information to the PDT who combined this information with their knowledge of the forest and forest management to refine each successive scenario until the overall results were satisfactory. The result is an ecologically, socially and economically reasonable forest management scenario to direct forest management practices: harvesting, regeneration and access for the next 10 to 20 years. The ecological indicators include the seral stage, growing stock, caribou and Equivalent Clearcut Area (ECA) indicators. The social indicators are the use of the P18 Specified Area for caribou as defined in First Nation consulting.

This section presents the PFMS in detail including both strategic and operational targets and their associated results. The section is organized by indicator with the action based indicators presented first, followed by the inventory indicators and the patch targets. The PFMS is scenario P20_P18009.

An integral part of the PFMS is the SHS which is the first 20 years of harvest beginning in the 2012/13 timber year and is divided into years 1-10 and 11-20. This sequence was generated by using the yield curves, landbase, and timber supply assumptions in the Patchworks modeling environment.

5.1 Forest Products - Harvest Volume

Both the conifer and deciduous primary harvest volumes achieved +/- 10% even flow harvest volume through the whole planning horizon. The unconstrained incidental volumes fluctuated over time and are presented as average volumes for the appropriate periods. Gross harvest volumes for the 20 year SHS and the remainder of the planning horizon are shown in Table 5-1 and are not reduced to account for structural retention or cull.

Table 5-1. Gross harvest volume from the PFMS.

Operator	Primary m3/yr	Secondary m3/yr	Total m3/yr
Coniferous	526,500	65,200	591,700
Deciduous	174,100	151,400	325,500

5.1.1 Coniferous Harvest

The coniferous harvest level is even flow for the full planning horizon. The coniferous harvest target is shown in Figure 5-1 and the harvest volume by strata is shown in Figure 5-2. The first ten years are an average of 2.8% below the 200 year average harvest level of 546,800 m^3/yr.

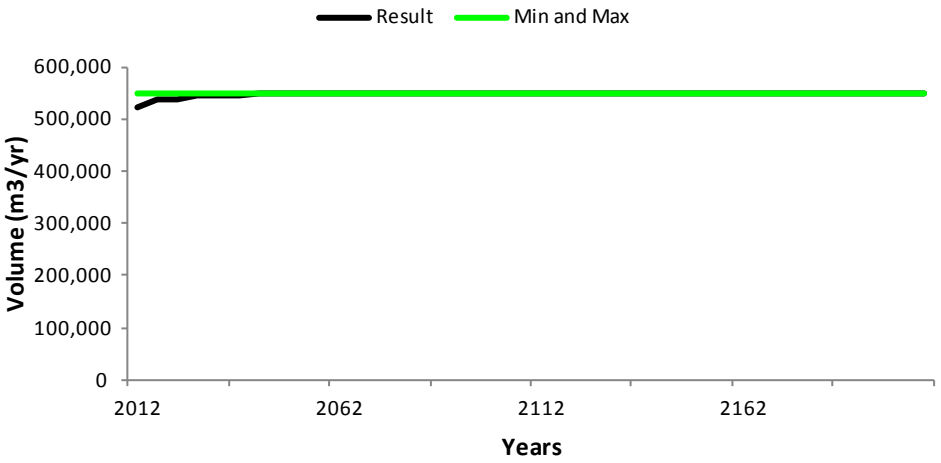


Figure 5-1. Coniferous harvest target.

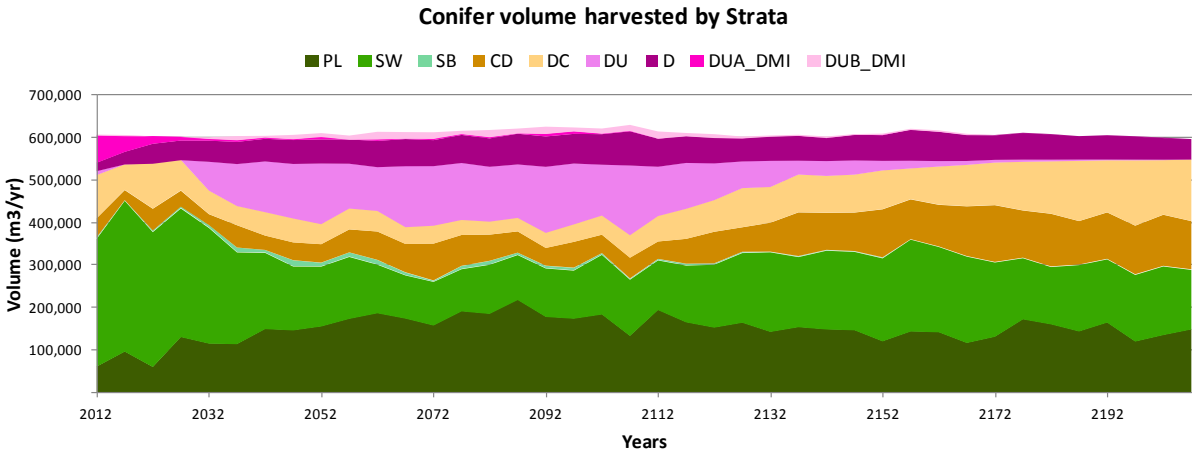


Figure 5-2. Coniferous harvest volume by strata.

5.1.2 Deciduous Harvest

The deciduous harvest level is even flow for the planning horizon. The deciduous harvest target is shown in Figure 5-3 and the harvest volume by strata is shown in Figure 5-4. The first ten years are 1.4% above the 200 year average harvest level of 191,400 and the second ten years are 6.7% below the harvest level. The primary volume harvest level in the first 10 years contains a large portion of volume from the DU strata as per the Du MOU.

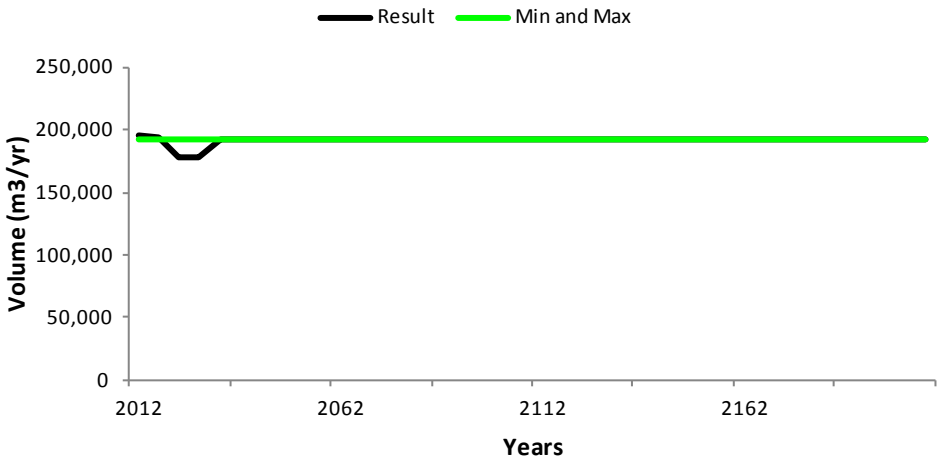


Figure 5-3. Deciduous harvest target.

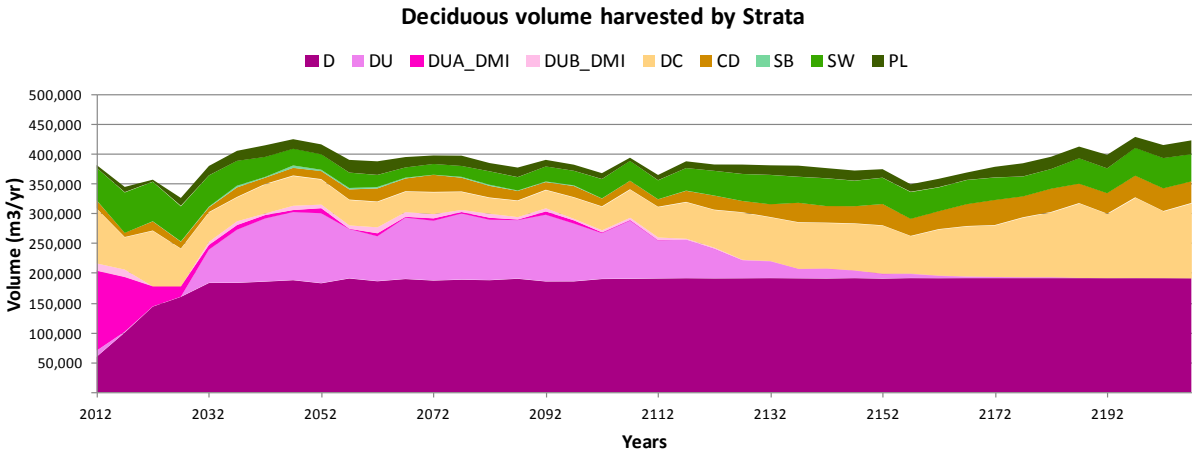


Figure 5-4. Deciduous harvest volume by strata.

5.2 Forest Products - Area Harvested

The area harvested varies throughout the planning horizon. This section shows the area harvested by strata and age class.

5.2.1 Strata

The area harvested by strata shows the combination of the coniferous and deciduous harvests. After the first rotation, there is an increase in the total area harvested due to the harvest of younger stands with less volume as the forest approaches a regulated state. Figure 5-5 shows the area harvested by strata and Map 5-1 and Map 5-2 show the strata harvested in the first and second decades of the SHS.

The deciduous landbase harvest area actually decreases in the second rotation as more of the area is harvested closer to the maximum volumes obtained than at the younger ages.

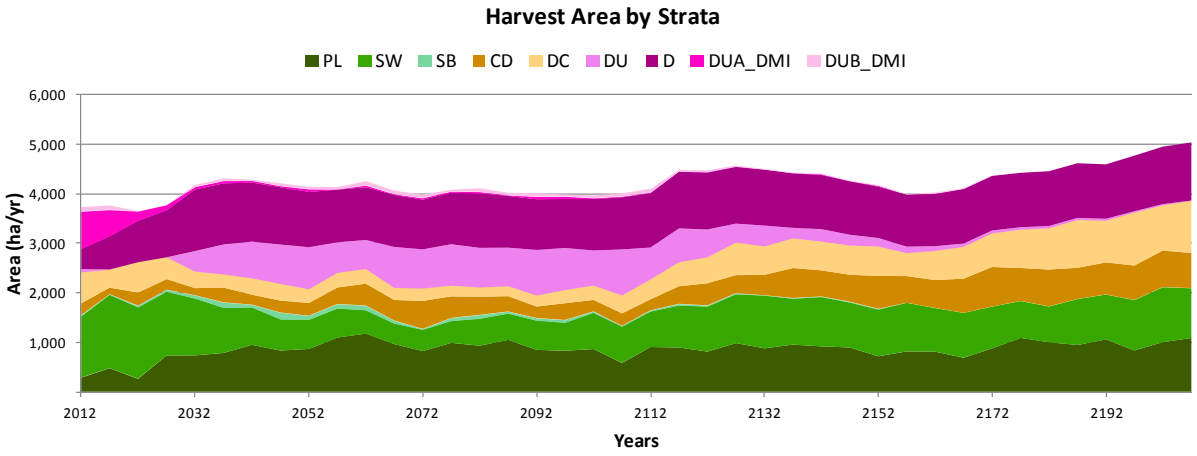
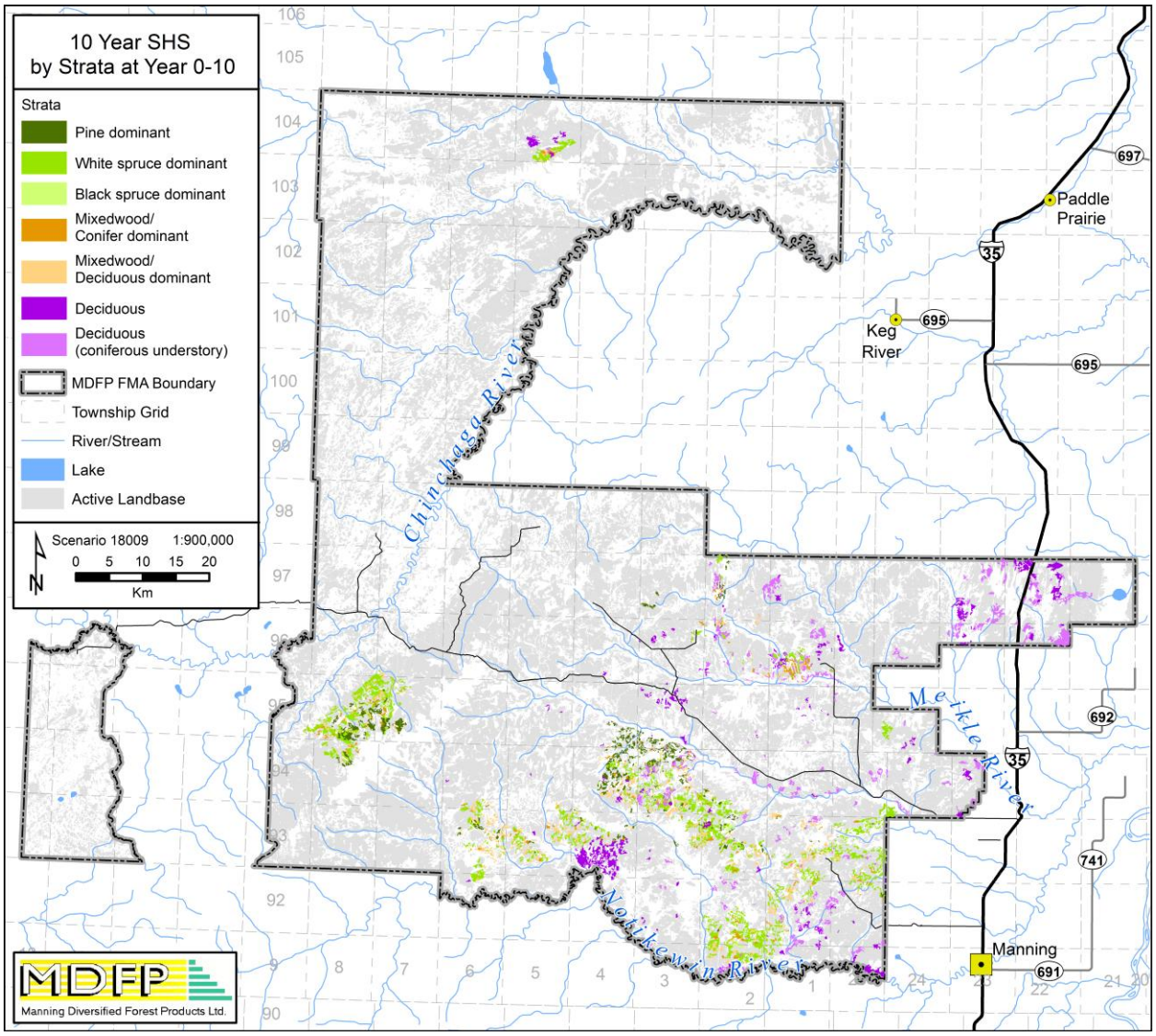
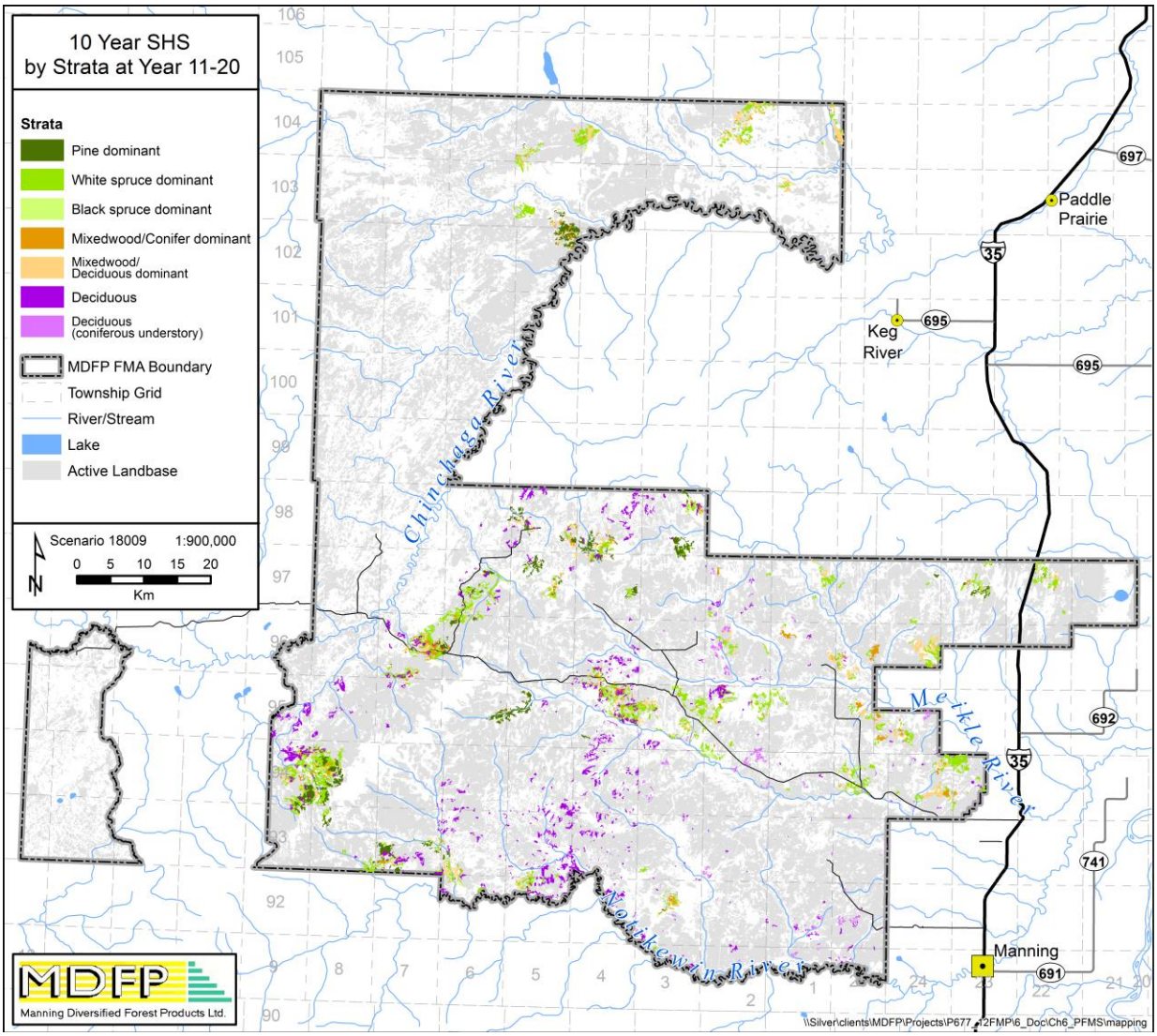


Figure 5-5. Area harvested by strata.



Map 5-1. 2012-2021 SHS by strata.



Map 5-2. 2022-2031 SHS by strata.

5.2.2 Age Class

The average harvest age for each stratum fluctuates over time (Figure 5-6). For the first 60 years, increasing area in older age classes is harvested to a point where 80% of the harvested stands are greater than 120 years old. Then as the forest transitions closer to a regulated state, younger age classes are harvested to a point where the average of the harvested stands are approaching a harvest age of 100 years old. In the second half of the planning horizon, the forest is close to a regulated state and the age class distribution remains fairly stable. Two strata are exceptions to this trend, SB and DU, demonstrating increase in harvest age over time due to the very low levels of harvest of these strata in the second half of the planning horizon.

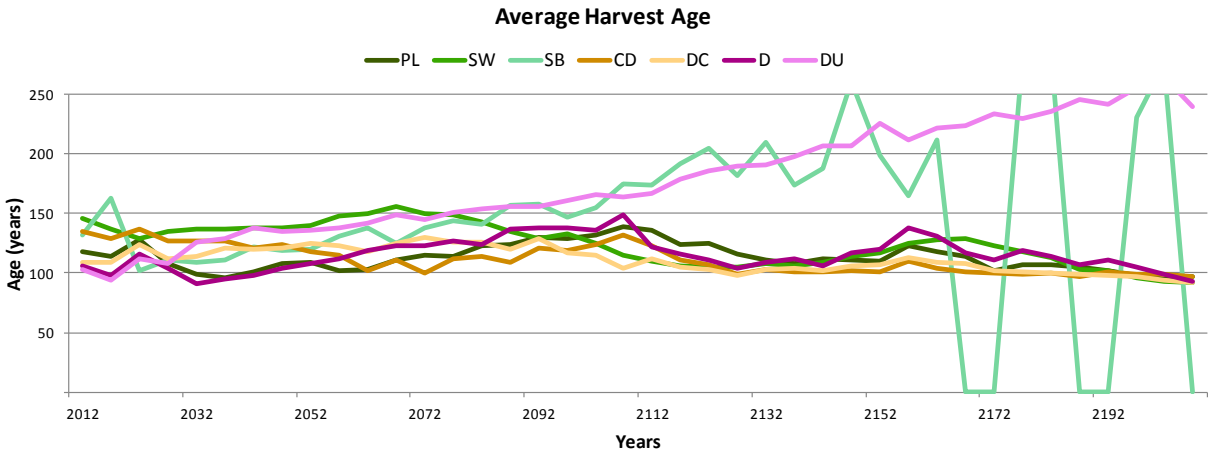


Figure 5-6. Average harvest age by strata.

Table 5-2 shows the area harvested in each strata by age class for the first and second decades of the PFMS. The table also shows the managed landbase area and percentages of area which demonstrate that the SHS is harvesting close to the existing landbase strata profile. The current landbase has a large amount of immature PL strata resulting in a lower percentage of pine harvest compared to the managed landbase.

Table 5-2. Area harvested by age class and strata.

Strata	Density	Managed Landbase		Year of SHS					
				1-10		11-20		1-20	
		ha	%	ha	%	ha	%	ha	%
D	ABCD	119,944	22%	5,390	14%	8,939	24%	14,329	19%
DU	A	67,780	13%	6,561	18%	1,435	4%	7,995	11%
DU	BCD	94,920	18%	848	2%	0	0%	848	1%
DC	ABCD	37,403	7%	5,017	13%	5,345	14%	10,362	14%
CD	ABCD	34,738	6%	1,832	5%	2,386	6%	4,218	6%
SW	ABCD	83,637	15%	13,636	37%	13,684	37%	27,321	37%
PL	ABCD	97,245	18%	3,782	10%	4,947	13%	8,729	12%
SB	ABCD	6,410	1%	165	0%	344	1%	509	1%
Total		542,076	100%	37,231	100%	37,080	100%	74,312	100%

5.2.3 Piece Size

Piece size curves were developed as described in the yield section and they were used to generate average harvested piece sizes. Figure 5-7 shows the average tree size over time, with lower trees per m^3 values representing larger trees. The trends show that the average piece size will decrease during the mid portion of the planning horizon and then increase to approximately the same as current levels near the end of the planning horizon.

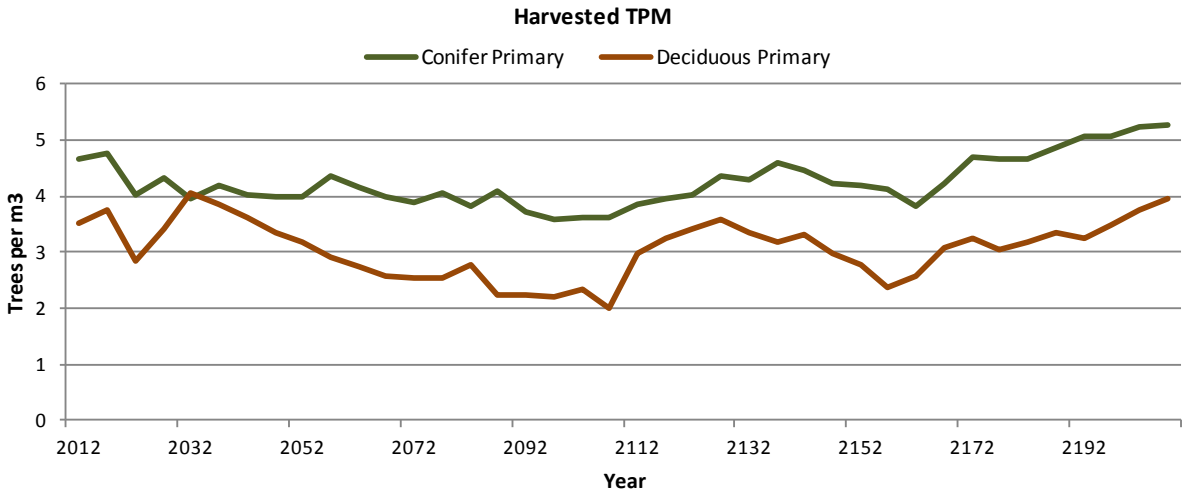


Figure 5-7. Tree piece size of harvested stands

5.2.4 Action/Intensity/Reforestation

The primary silviculture system employed in P20 is clearcut followed by artificial regeneration, with understory protection where appropriate. Table 5-3 shows the area by strata that is harvested and regenerated for the first and second decade of the PFMS. DU_PROT is a special case, and its curve is similar to a CD curve.

Table 5-3. Area harvested and regenerated in the first two decades of the PFMS.

Original			SHS Harvest 1-10	SHS Harvest 11-20	Post Treatment	
Strata	Density	Origin	ha	ha	Strata	Density
CLEARCUT Action						
D	ABCD	Natural or Clearcut	5,390	8,939	D	CD
DU	A	Natural or Clearcut	167	0	DC	CD
DU	BCD	Natural or Clearcut	188	0	CD	CD
DUA_DMI	A	Natural or Clearcut	6,394	1,435	D	CD
DU_PROT	B	Understory Protection	0	0	DC	CD
DC	ABCD	Natural or Clearcut	5,017	5,345	DC	CD
CD	ABCD	Natural or Clearcut	1,832	2,386	CD	CD
SW	ABCD	Natural or Clearcut	13,636	13,684	SW	CD
PL	ABCD	Natural or Clearcut	490	4,947	PL	CD
SB	ABCD	Natural or Clearcut	165	344	SW	CD
Understory Protection Action						
DUB_DMI	B	Natural or Clearcut	848	0	DU_PROT	B
Pine Leave for Natural Action						
PL	ABCD	Natural or Clearcut	3,292	0	PL	A

5.3 Forest Condition - Growing Stock

Growing stock represents the total volume of all the trees on the landbase. In this document, only the primary growing stock (excludes the incidental volume) is considered as primary volume, which is the controlling volume for timber supply. Two different representations of growing stock exist, managed growing stock and operable growing stock. Managed growing stock represents the volume at the appropriate utilization standard in forested stands within the managed stands, regardless of stand age. Operable growing stock is a sub-set of the managed growing stock that only includes the volume from stands at, or above, the minimum operable age. The model is only constrained by operable growing stock.

The managed conifer and deciduous growing stock levels in the PFMS are not substantially impacted by the harvest activities.

The operable coniferous primary growing stock increases in the first 50 years and then declines over the rest of the planning horizon. The operable deciduous primary growing stock is very low for the first 20 years, increasing sharply as the landbase matures, and then slowly declines when approaching current levels for the entire second rotation (Figure 5-8).

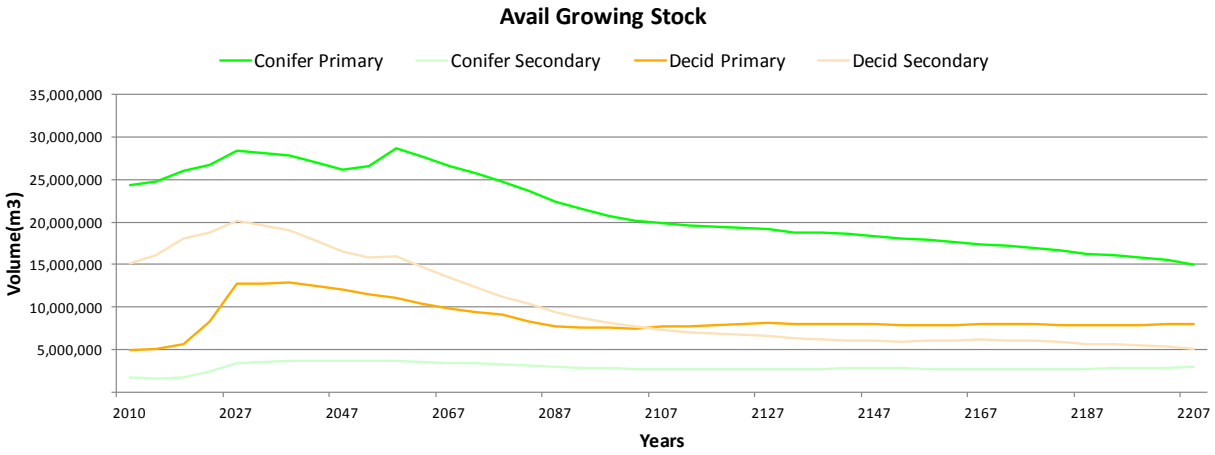


Figure 5-8. Available growing stock on the managed landbase.

5.3.1 Operable Growing Stock Constraints

The operable growing stock for the coniferous primary volume is controlled by a target in the model. The deciduous primary growing stock was left uncontrolled as it has an acceptable trend without constraints.

The planning standard specifies that the operable growing stock must be stable, or non-declining over the final 50 years of the planning horizon. Patchworks is not the most optimal tool for creating a non-declining constraint, so a similar level from Woodstock was applied as a minimum growing stock goal for the length of the planning horizon. The model met this target in the coniferous landbase (Figure 5-9) at each point in time, but was not non-declining. The target for the coniferous growing stock was set using

the non-declining growing stock from a comparable Woodstock scenario. At no time does the growing stock fall below that target.

A sensitivity analysis regarding the growing stock is presented in Annex VII (Forecasting). In this analysis, the last 50 years of growing stock were compared for the scenarios completed over the planning process. The final growing stock is very similar in all scenarios, regardless of the harvest level and the percent decline in the last 50 years. The essence of the sensitivity analysis shows that the growing stock levels in the middle years of the planning horizon are larger than current levels, and will decrease from that point forward, regardless of the harvest level.

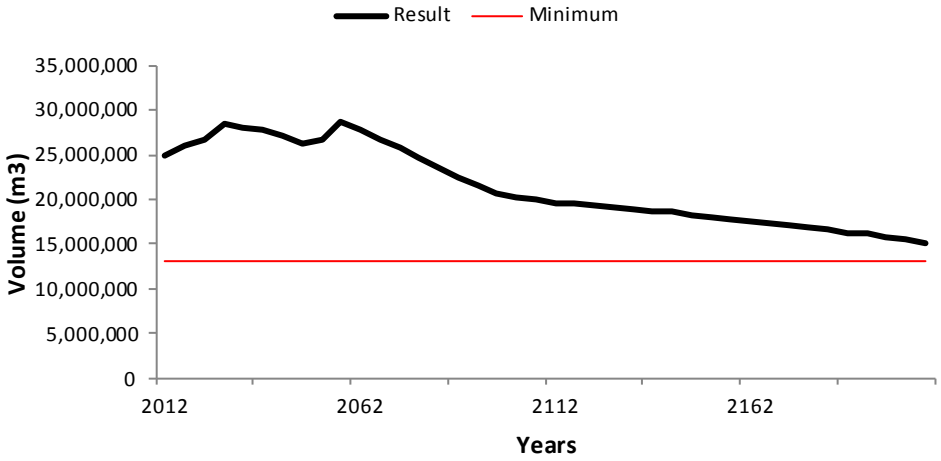


Figure 5-9. Target of operable coniferous growing stock.

The operable deciduous growing stock was unconstrained (Figure 5-10). Once the forest is in a regulated state with a larger amount of younger deciduous stands, the growing stock stabilizes.

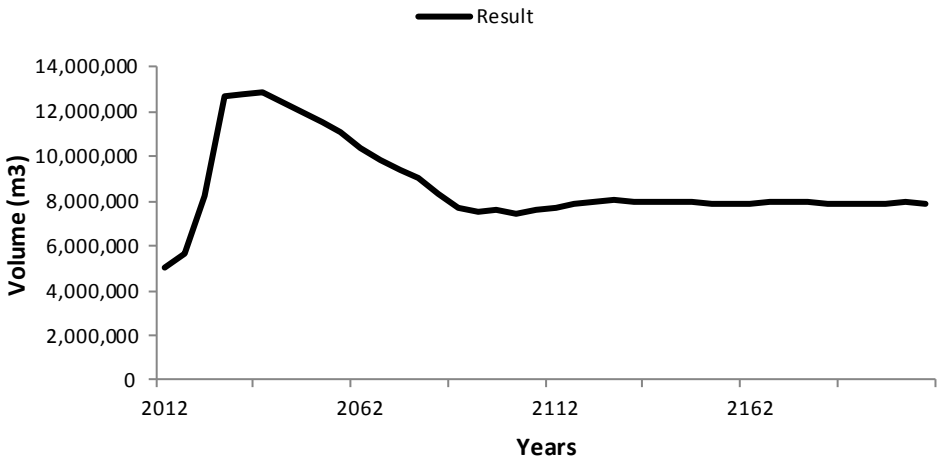


Figure 5-10. Target of operable deciduous growing stock.

5.4 Forest Condition – Area Summaries

This section describes the status of the landbase over the 200 year planning horizon. Note that the forest is in a regulated condition roughly 100 years in the future, where most indicators are stable in the second 100 years.

5.4.1 Strata

The majority of area in each strata in the managed landbase stays constant over time. Approximately 25% of the landbase is pure deciduous with the second largest category being pure conifer of white spruce, black spruce and pine (Figure 5-11). The conversion of the DU strata to other strata is clearly visible.

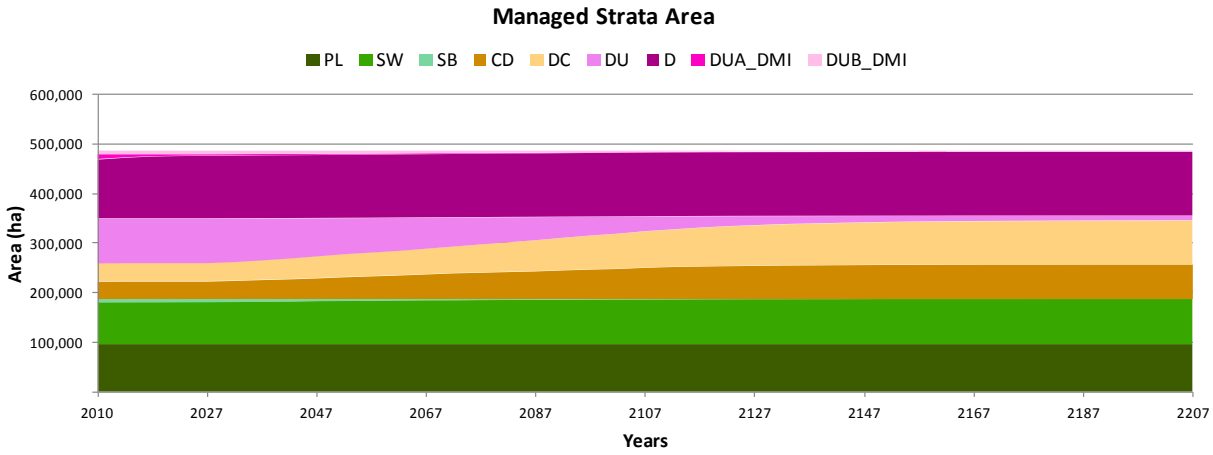


Figure 5-11. Area by strata on the managed landbase.

5.4.2 Stand Origin

At the beginning of the planning horizon, stands in the P20 FMU are predominantly natural, or fire origin. As harvest activity progresses, the managed landbase is converted to a managed state (Figure 5-12).

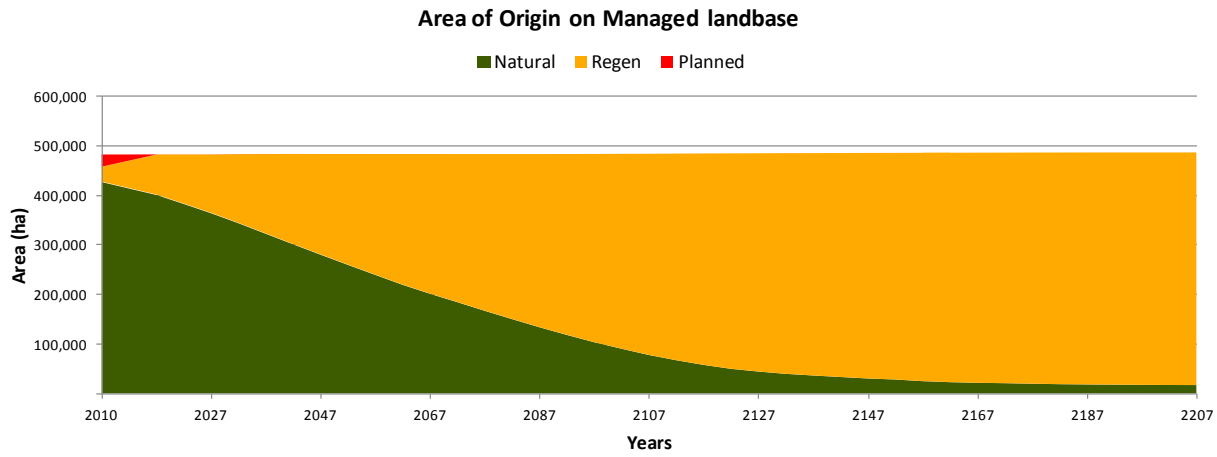


Figure 5-12. Area by origin on the managed landbase.

5.4.3 Age Class

As the forest moves from a natural state to a regulated state, the age class distribution of both the gross landbase and the managed landbase becomes younger. Figure 5-13 shows the managed landbase age class distribution. There is some managed landbase area that is never harvested as it contributes to the old seral stage constraints.

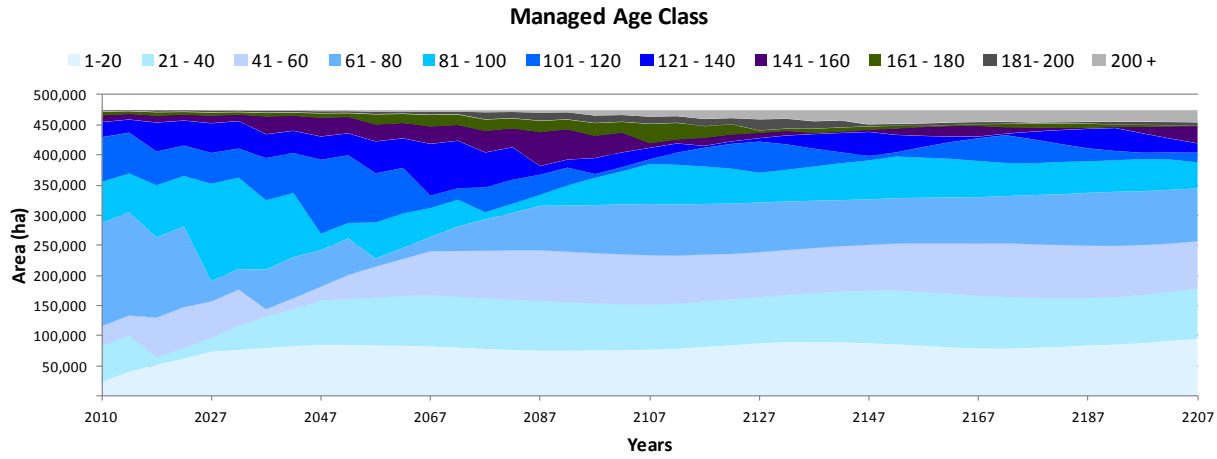


Figure 5-13. Area by age class on the managed landbase.

5.4.4 Seral Stage

The old seral stage was controlled in the model to maintain at least 10% of the managed landbase in the old seral stage (Figure 5-14).

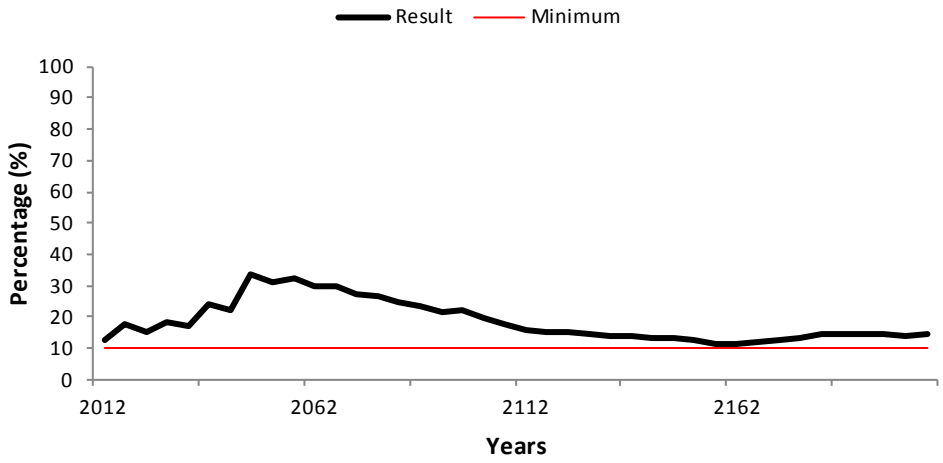


Figure 5-14. Managed landbase old seral stage target.

Figure 5-15 and Figure 5-16 show the seral stages of the gross and managed landbases. As the seral stages mimic the age class graphs, the trend of shifting towards a younger forest is also seen in the managed landbase seral stages.

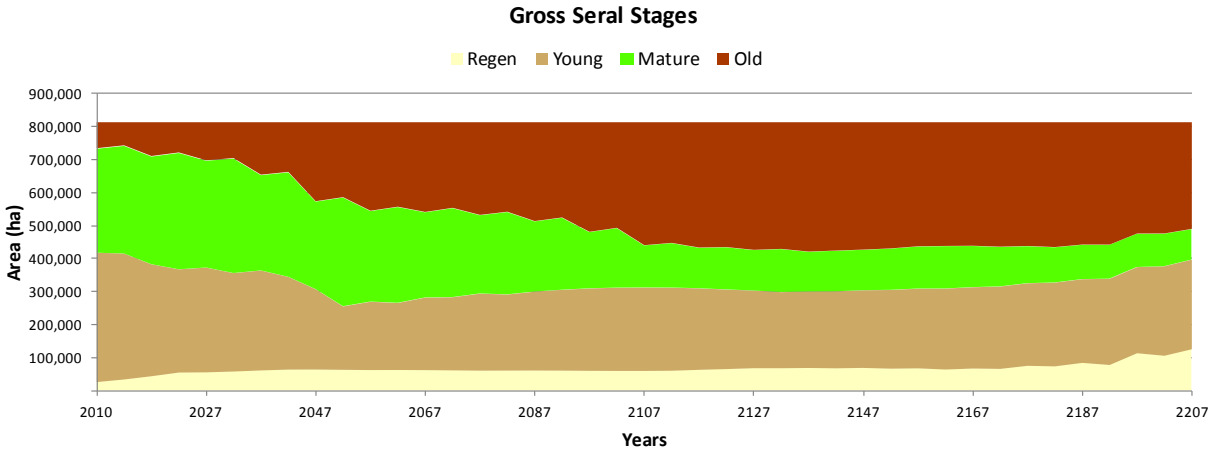


Figure 5-15. Area by seral stages on the gross landbase.

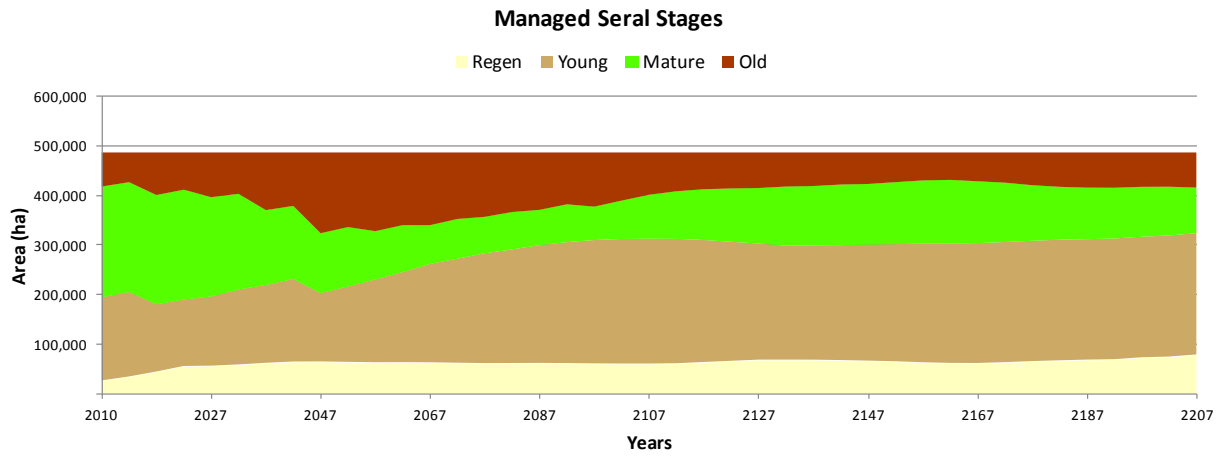


Figure 5-16. Area by seral stages on the managed landbase.

The old seral stage is further broken down by strata in the managed landbases as shown in Figure 5-17. The distribution of strata in the old seral stage at the end of the planning horizon is similar as it exists today, but there is more D and PL strata and less DU and SW strata.

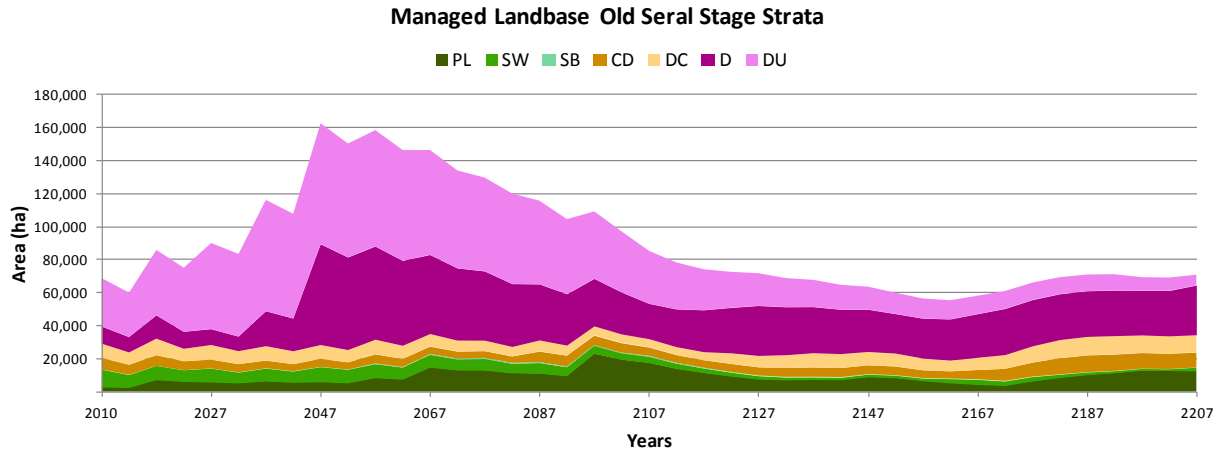


Figure 5-17. Area of strata in the old seral stage on the managed landbase.

5.4.5 Caribou

The Caribou habitat is modeled as a series of targets controlling other ungulate habitat using the 30/20 rule.

Caribou 30/20 rule

Development of the harvest patterns within the areas specified above is accomplished through the 30/20 rule. The 30/20 rule will be applied to reduce the amount of habitat preferred by other than caribou ungulates (*i.e*. moose and deer) in an effort to reduce predator populations. The other ungulate habitat is composed of deciduous and mixedwood stand types, referred here as “applicable strata” (D,

DU, DC, DCU, CD or CDU) that is less than 30 years old. There are two methods in which the 30/20 rule is applied:

- The first method is a simple non-spatial rule where the target is the applicable strata area which is less than 30 years old and that comprises no more than 20% of the total area of applicable strata. This will limit the amount of younger deciduous and mixedwood stands preferred by other ungulate species in the areas where the rule is applied.
- The second method involves controlling the spatial arrangement of the stands which comprise the 30/20 rule. Patch sizes greater than 300 ha will be maximized to increase the grouping of harvest blocks. The target for the patch size will be set so as to reduce the number of patches in the 0-300 ha range, and not to eliminate them. This patch target is an effective way to increase the average harvest patch size, which reduces the number of harvesting entries and the access required for harvesting, as well as concentrating the other ungulate habitat in fewer but larger patches while maintaining larger patches of preferred habitat for caribou.

The 30/20 rule was applied separately for the APMA in FMU P6 and P18. In the context of this analysis, the caribou constraint applied to the APMA, the specified area and the official caribou zone. For simplicity, it is referred as the APMA for each of the FMU's. The applicable strata area that counts towards other ungulate habitat is 24,660 ha (13.7% of managed landbase) in P18 and 32,400 ha in P6 (18.0% of managed landbase). The ratio of 30/20 had a soft target of 20% for each FMU (Figure 5-18 and Figure 5-19). For most of the planning horizon, the P18 target result was slightly above the target of 20%. This is due to a smaller proportion of applicable strata that is in the P18 APMA when compared to the P6 APMA. The smaller area in combination with much of the area becoming merchantable approximately 20 years later means that a large part of the harvest moves into this area, thus driving up the percentage that is greater than 20%.

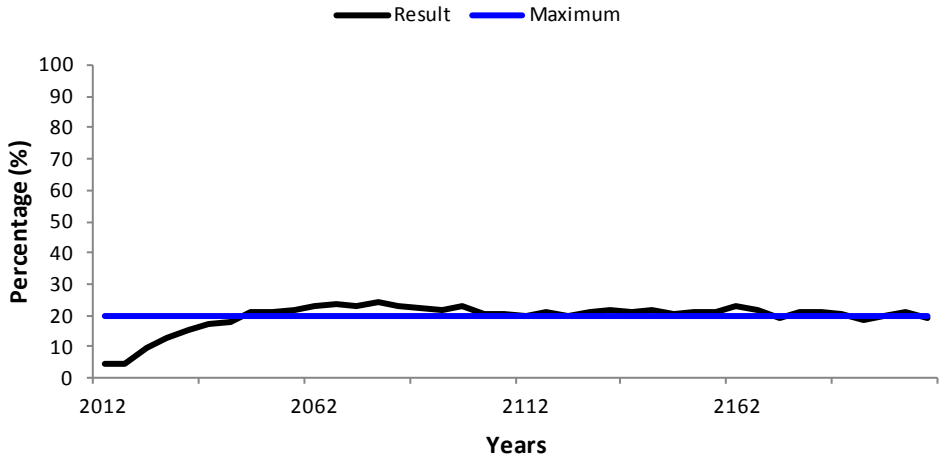


Figure 5-18. Ratio of 30/20 operating area in FMU P18.

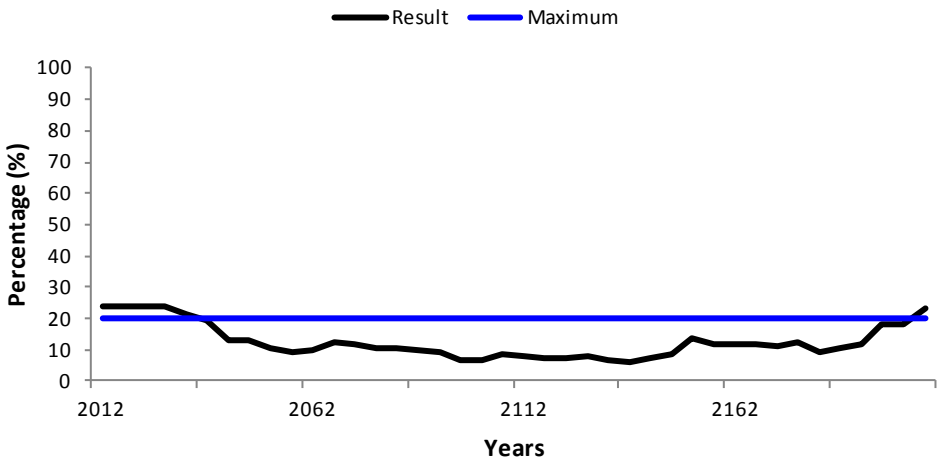


Figure 5-19. Ratio of 30/20 operating area in FMU P6.

Figure 5-20 and Figure 5-21 show the other ungulate habitat patch size targets. Once again, the smaller amount of applicable strata in P18 makes a low patch target very difficult to achieve, as a result, the patch target in P18 is set at 80%. The patch target in P6 is initially high, but is reduced to lower levels after 40 years.

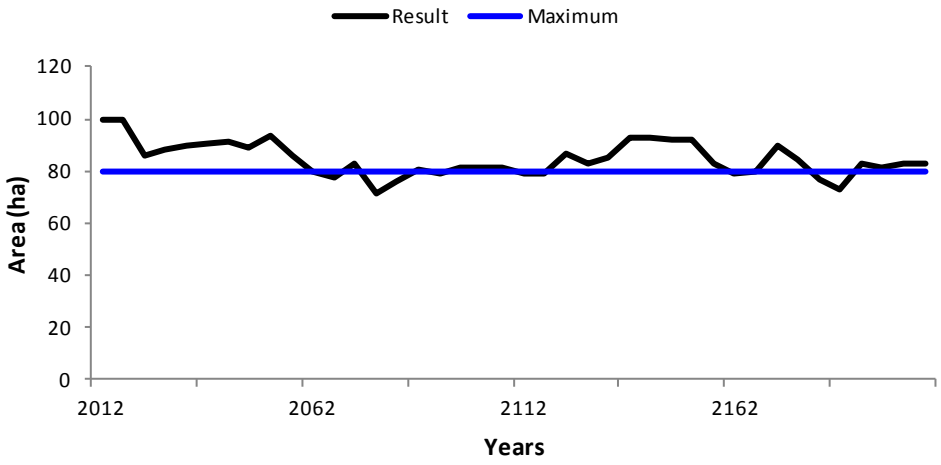


Figure 5-20. Other ungulate habitat patches less than 300 ha in FMU P18.

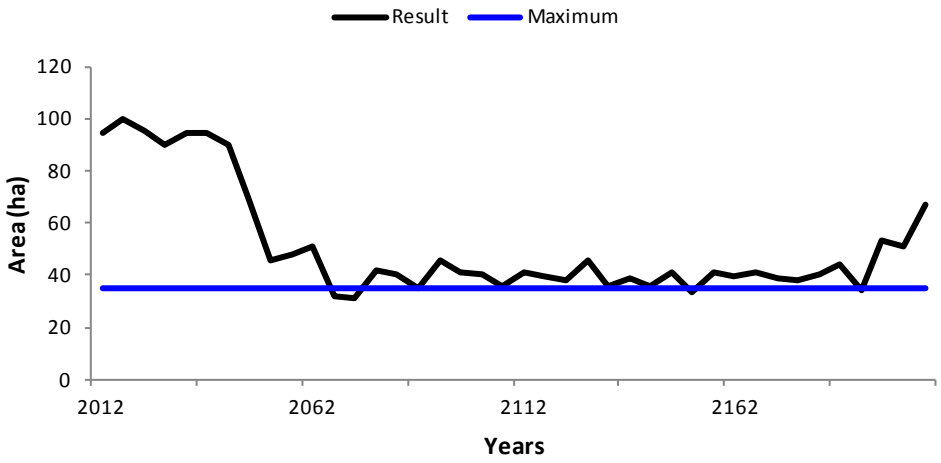
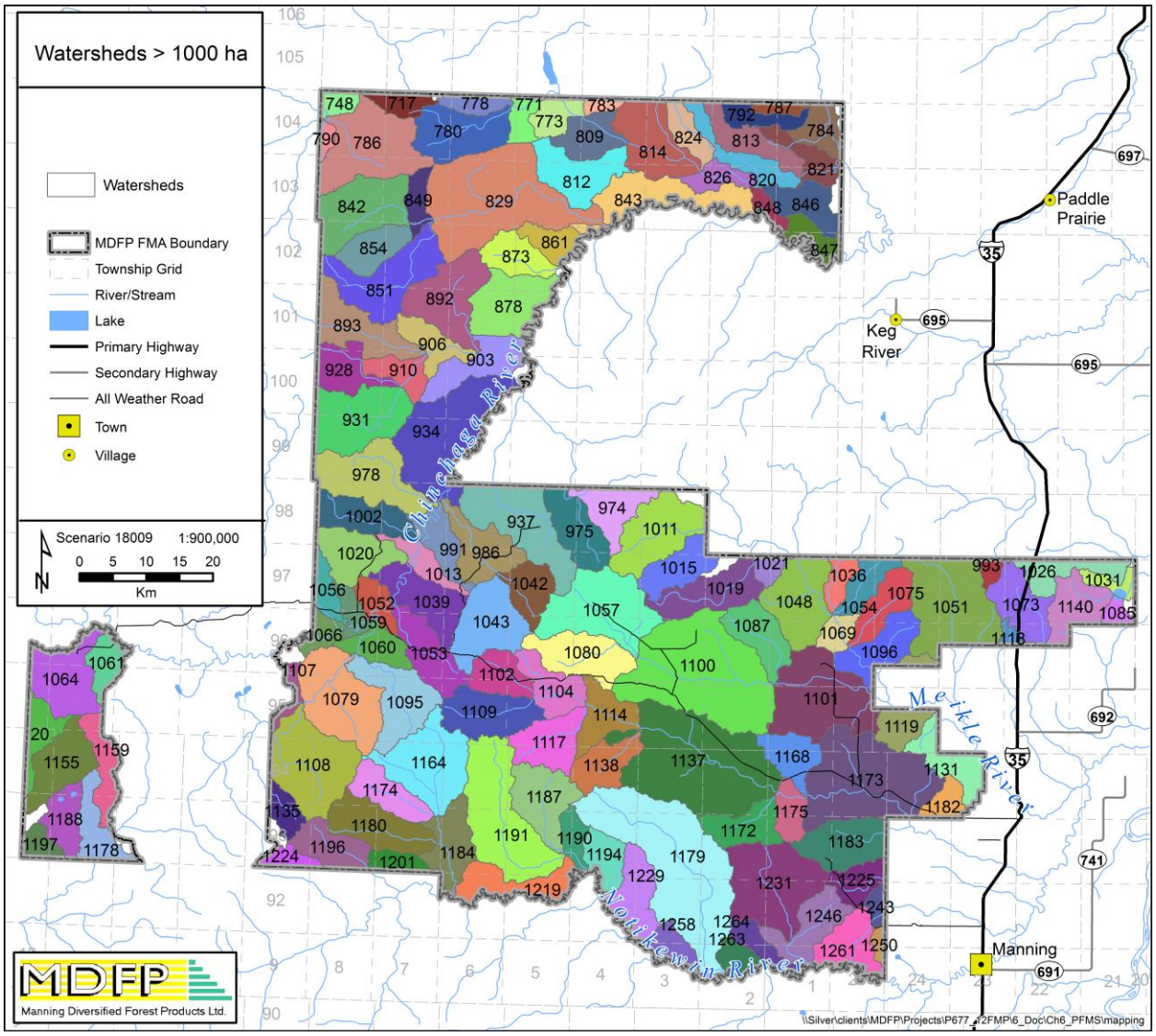


Figure 5-21. Other ungulate habitat patches less than 300 ha in FMU P6.

5.4.6 ECA Analysis

ECA curves were built into the model to estimate the impact on watersheds. The inclusion does not preclude an analysis by ESRD, but rather allows MDFP to assess any potential issues due to harvesting within watersheds. Map 5-3 shows the third order watersheds as supplied by ESRD. Watersheds less than 1000 ha are not shown as they were not used in the analysis.



Map 5-3. Third order watersheds.

The summary of ECA outputs shown in Figure 5-22 outlines a number of important features. The top left table describes the number of watersheds used and the top right shows the area and percent of watersheds that cross the 30% and 50% thresholds sometime in the first 80 years of analysis. The larger table located below this small table further breaks down the number of watersheds in each threshold category by year. The charts below the larger table graphically represent the information in the table, showing the trends over the 80 year period. Note that the time scale changes on the graphs and the table, with 5 year increments up to year 20 and then 20 year increments after that. The bottom of the figure shows the calculations and curves used in the analysis.

Map 5-4 through to Map 5-7 show the arrangement of watershed values for each time step.

It is important to note that all but one watershed that exceed the 50% threshold are the results of naturally occurring historical fires. The one watershed that exceeds the threshold due to harvesting activities occurs at the very corner of FMA and is only a partially contained within the FMA (#1224)

ECA Results

Summary of Watersheds that are greater than 1,000 ha

Total of 140 watersheds, 9 are less than 1,000 ha

NR Range - As defined by ESRD

0 - 30: Low or no impacts
30 - 50: Medium impacts
> 50: High impacts

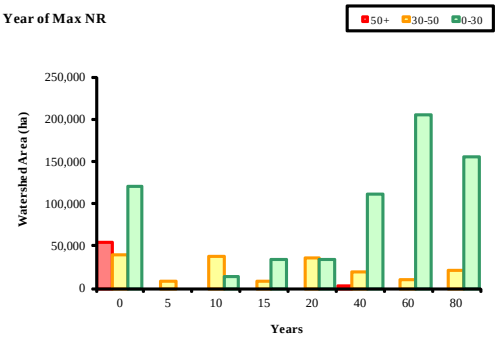
NR Range

NR %	Watersheds		Area	
Range	Count	%	ha	%
50.1 +	7	5%	56,218	6%
30.1 - 50	31	24%	180,545	20%
0 - 30	93	71%	673,973	74%
Total	131		910,736	

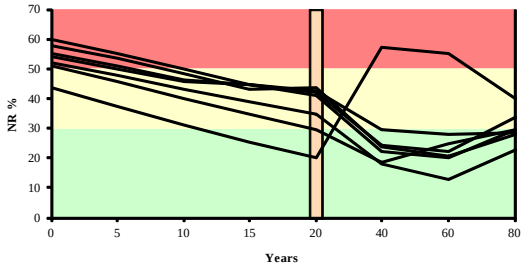
NR Range and Year of Max NR

Year of	Max NR > 50				Max NR = 30 - 50				Max NR = 0 - 30			
	Watersheds		Area		Watersheds		Area		Watersheds		Area	
Max NR	Count	%	ha	%	Count	%	ha	%	Count	%	ha	%
0	6	86%	54,180	96%	6	19%	39,701	22%	21	23%	120,565	18%
5	0	0%	0	0%	1	3%	8,278	5%	0	0%	0	0%
10	0	0%	0	0%	5	16%	36,967	20%	1	1%	13,250	2%
15	0	0%	0	0%	2	6%	8,739	5%	3	3%	33,504	5%
20	0	0%	0	0%	5	16%	35,184	19%	2	2%	34,884	5%
40	1	14%	2,039	4%	4	13%	19,864	11%	13	14%	110,678	16%
60	0	0%	0	0%	3	10%	11,008	6%	29	31%	205,808	31%
80	0	0%	0	0%	5	16%	20,805	12%	24	26%	155,284	23%
Total	7		56,218		31		180,545		93		673,973	

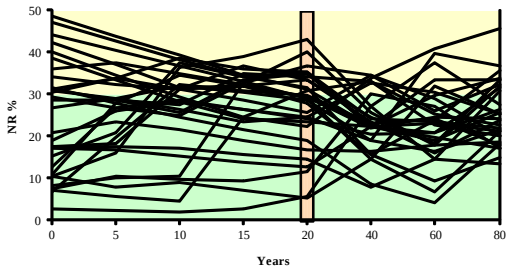
Year of Max NR



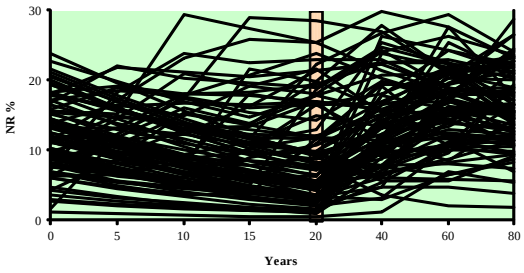
Watersheds with Max NR > 50



Watersheds with Max NR 30 - 50



Watersheds with Max NR 0 - 30



NR is calculated as: $\frac{\text{ECA Area}}{\text{Total Watershed Area}}$

ECA Area is based on ECA yield curves.
Curve value = 1 when stand age is 0
Curve decreases over time in relation to the total volume
Curve reaches 0 when volume reaches max MAI

Each stand: ECA Area = Stand Area * ECA Curve
Each Watershed: ECA Area = sum of Stand ECA Area

ECA Curves used in Model

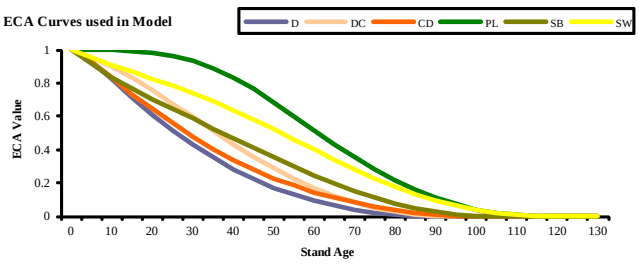
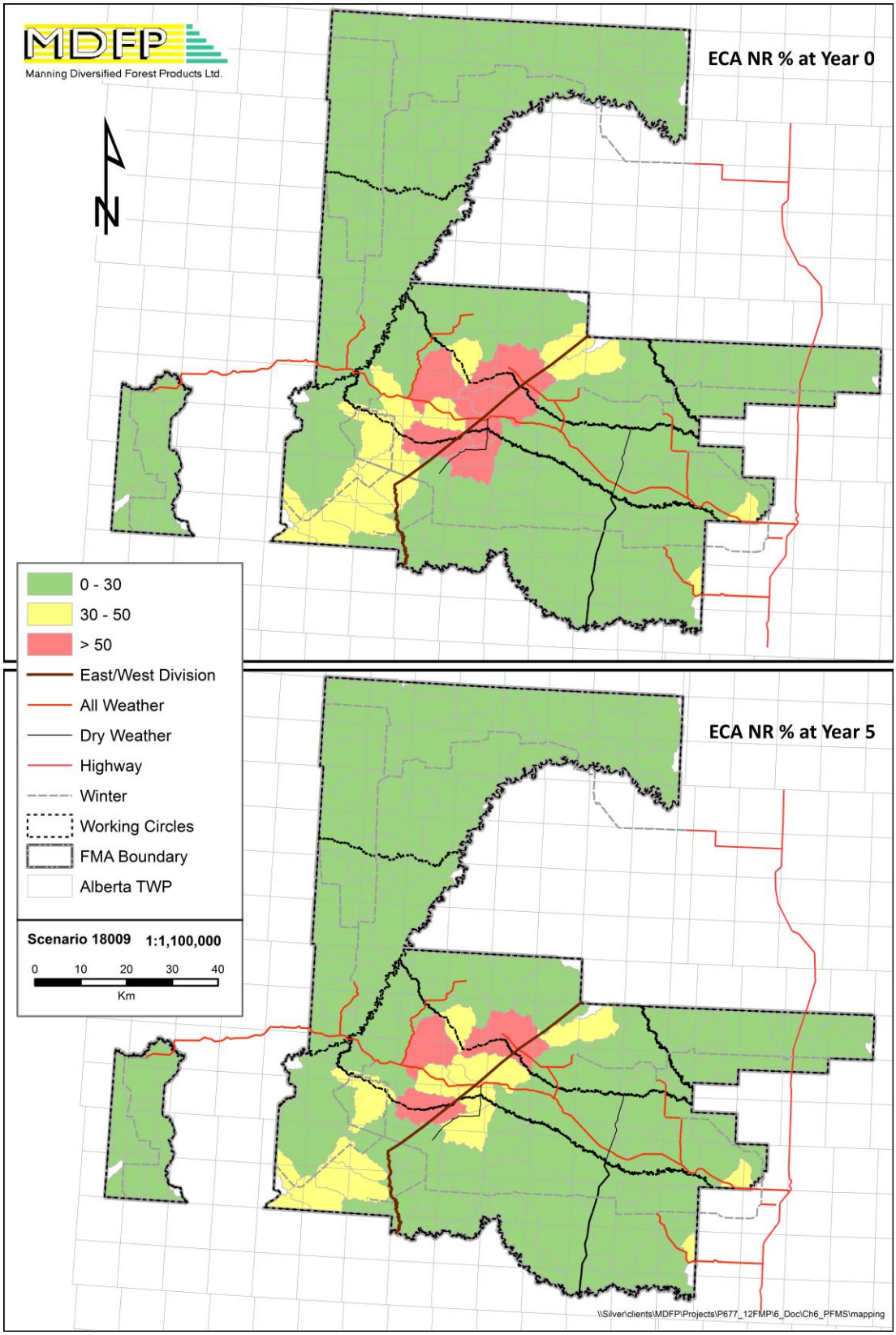
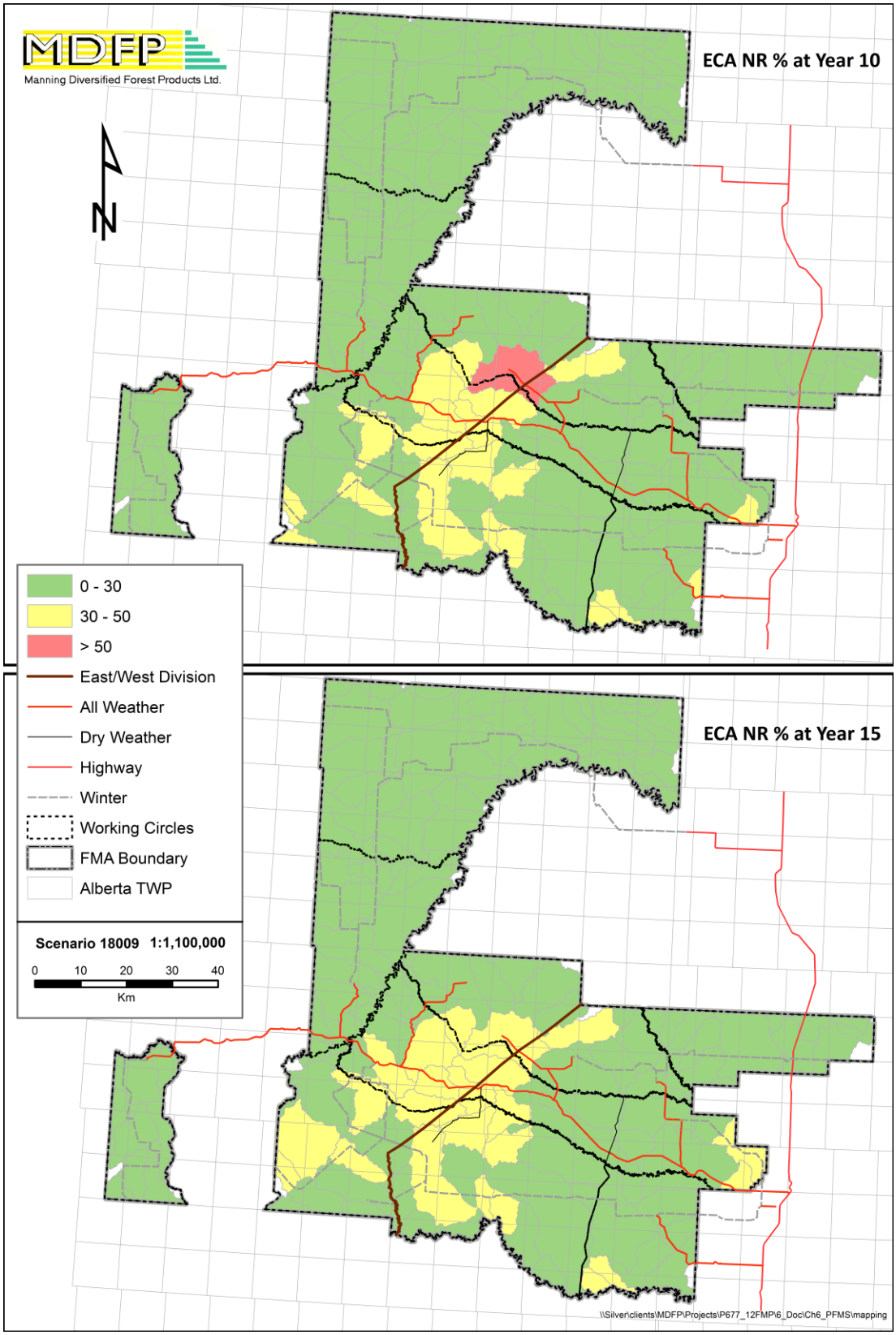


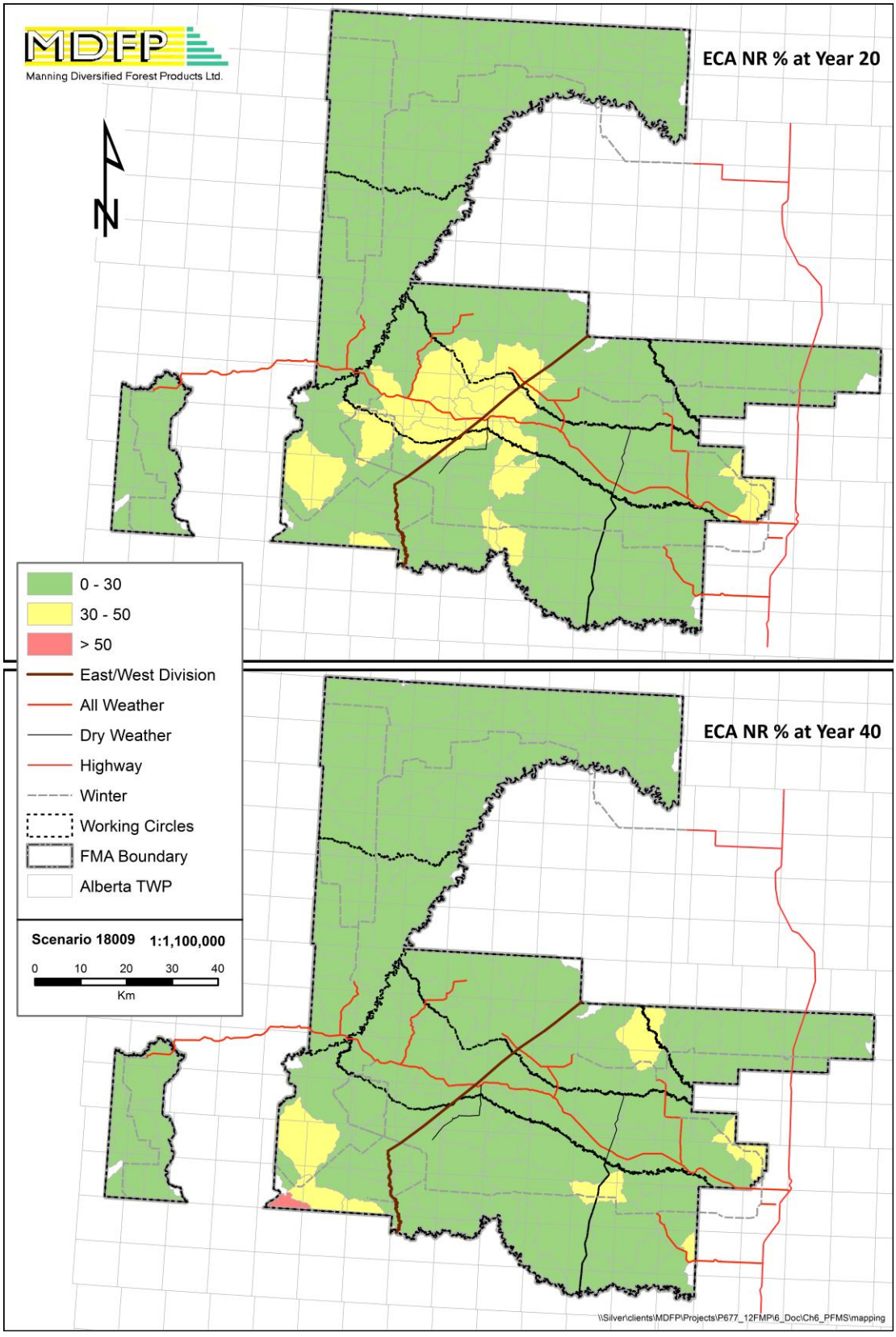
Figure 5-22. Summary of ECA analysis.



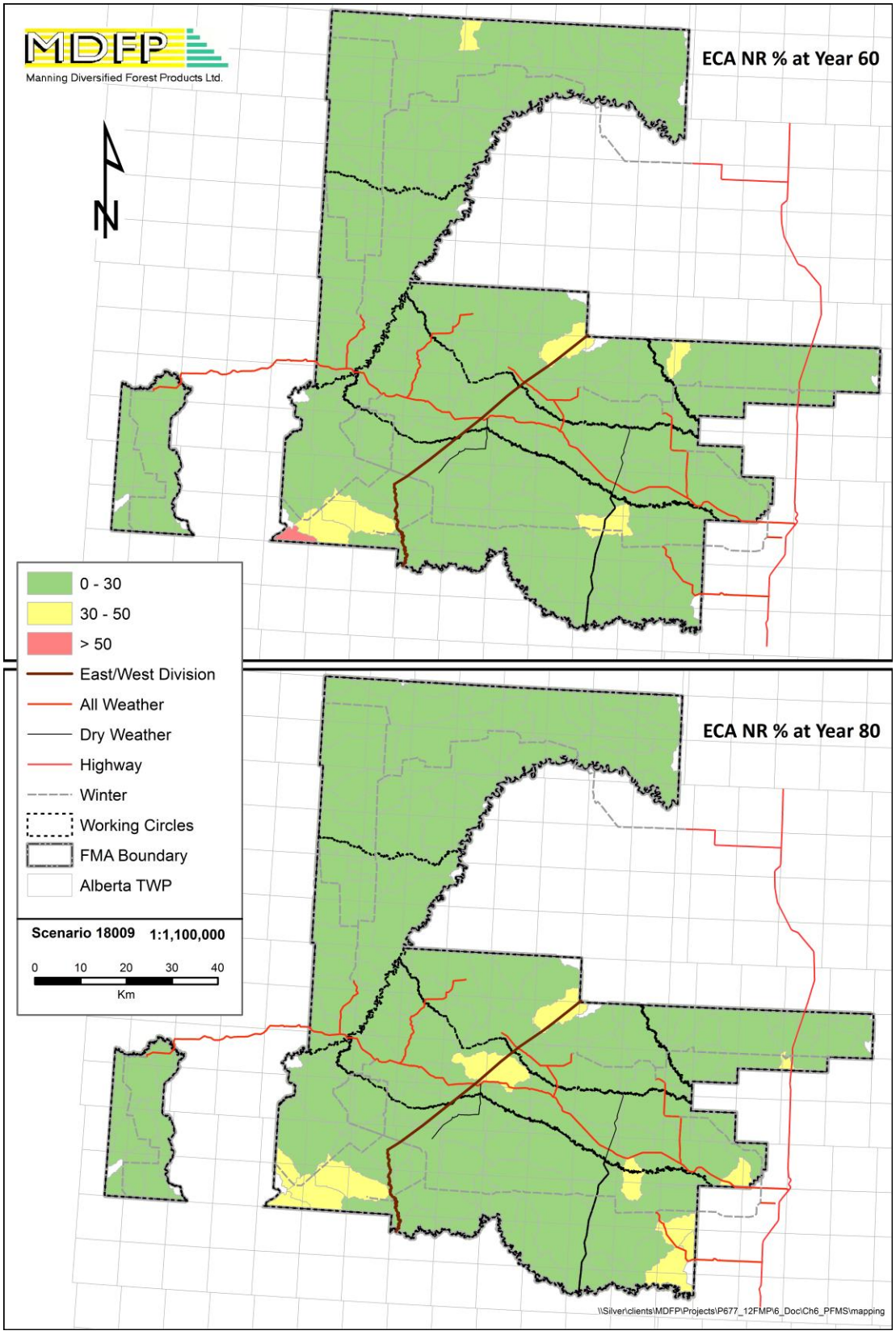
Map 5-4. ECA analysis, years 0 and 5.



Map 5-5. ECA analysis, years 10 and 15.



Map 5-6. ECA analysis, years 20 and 40.



Map 5-7. ECA analysis, years 60 and 80.

5.5 Operational Constraints

The operational constraints used in the model were added strictly to control model behaviour so that the outcome was more operational or realistic. The only constraints that apply to operations were specifically stated in the FMP and in other documents such as the operating ground rules. Operational constraints were designed to create an operationally acceptable harvest pattern on the landscape by balancing several competing objectives. Many of the targets were constrained lightly and were designed to move the SHS towards an operationally feasible solution while still meeting other objectives.

5.5.1 Access Control

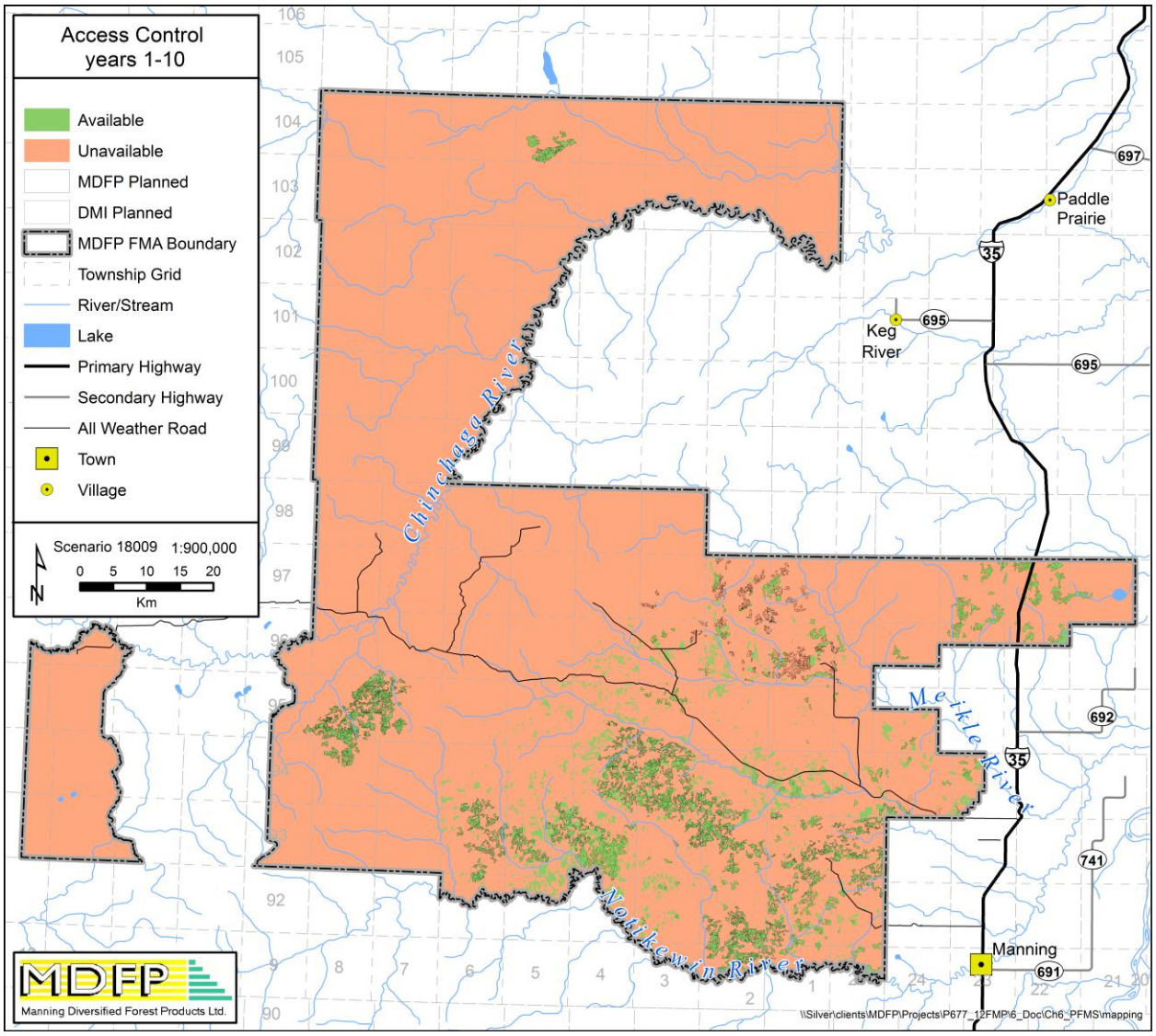
Access control was used to limit harvest to certain zones and evolved through the development of the PFMS. Initially, the sequence was only slightly constrained, which then evolved into a sequence that both MDFP and DMI agreed upon. For the first 10 years, the final PFMS has all harvest blocks predetermined in that only planned blocks are eligible for harvest.

Figure 5-23 shows the access control table that was used in Patchworks to control the available stands. Green colour means that the stands are available for harvest. Yellow means that any predefined blocks must be harvested. Red means that harvest is not permitted in these years.

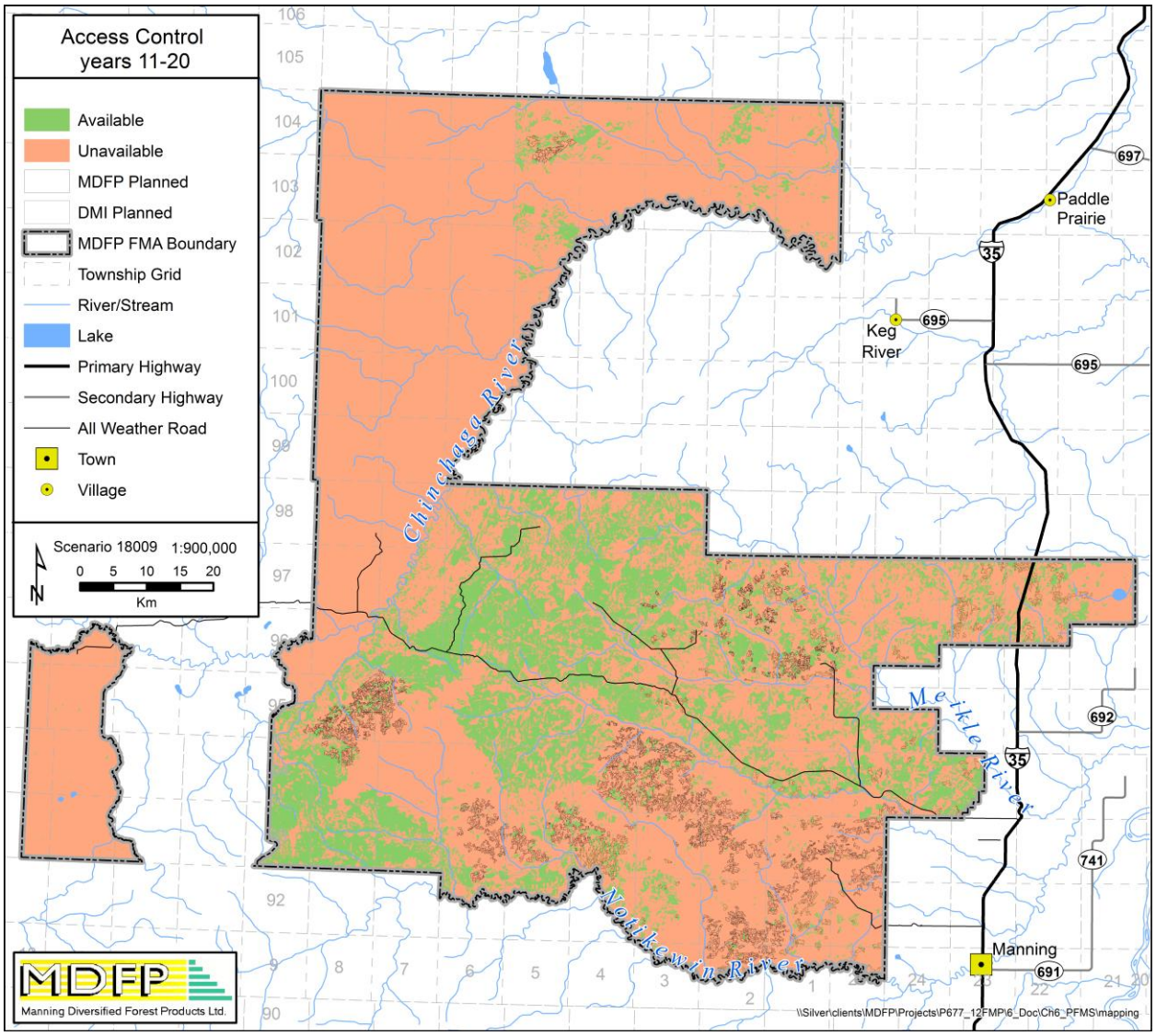
		Years							
Label	**Description**	**1 - 5**	**6 - 10**	**11 - 15**	**16 - 20**	**21 - 25**	**26 - 30**	**31 - 35**	**36 - 40**
DEL	Deleted from Landbase								
DMI_PL_P2P3	Planned DMI years 1-10								
L410	Defer for 10 years								
L420	Defer for 20 years								
L470	Defer for 70 years								
OTHDECID	Non-planned deciduous								
PL_MDFP	Planned MDFP years 1-10								
PL_P2	Planned in first 5 years								

Figure 5-23. Access control used in PFMS scenario.

Map 5-8 and Map 5-9 show the graphical representation of this table for the SHS period.



Map 5-8. Access control for years 1-10.



Map 5-9. Access control for years 11-20.

5.5.2 Annual Harvest Patches

Annual harvest patches were implemented to increase operability and to decrease potential SHS variance in the future. The patches encourage the model to cluster the stands of each year's harvest in an effort to simulate the harvest patterns of annual camps that are not limited to hard-coded operating unit boundaries. The values that the targets are set at were not weighted heavily and meant to push the model towards having grouped patches, and were not meant to be an overriding factor. Not achieving these targets does not indicate a concern, as they are only meant to create a spatial harvest pattern that is operationally feasible for MDFP and DMI.

Four patch targets were implemented; two for each coniferous and deciduous landbases, 100+ ha (Figure 5-24 and Figure 5-26) and 250+ ha (Figure 5-25 and Figure 5-27). The topology distance was set

to 200 m. They were constrained to minimum levels, with a heavier weighting during the first 20 years of the planning horizon. The objective of these targets was to produce an acceptable harvest pattern. The deciduous targets were difficult to achieve due to the scattered nature of the deciduous landbase stands that are eligible for harvest. These targets grouped them as much as reasonably can be achieved.

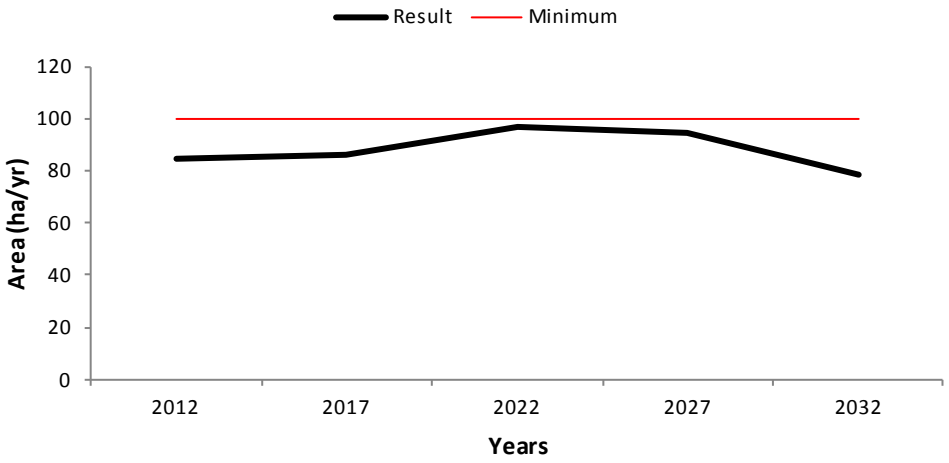


Figure 5-24. Target of annual coniferous patches > 100 ha

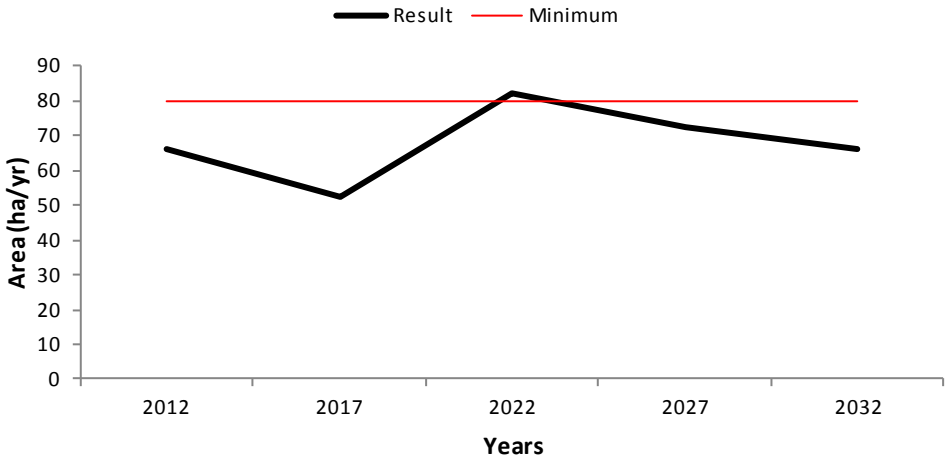


Figure 5-25. Target of annual coniferous patches > 250 ha

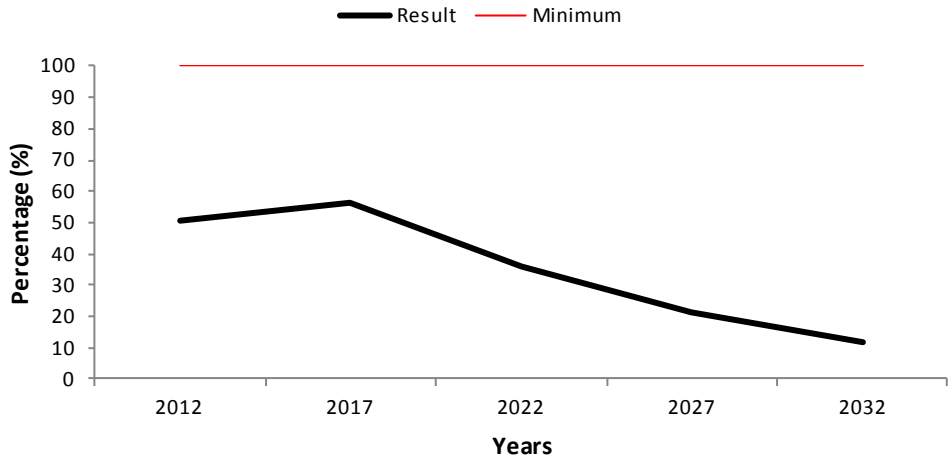


Figure 5-26. Target of annual deciduous patches > 100 ha

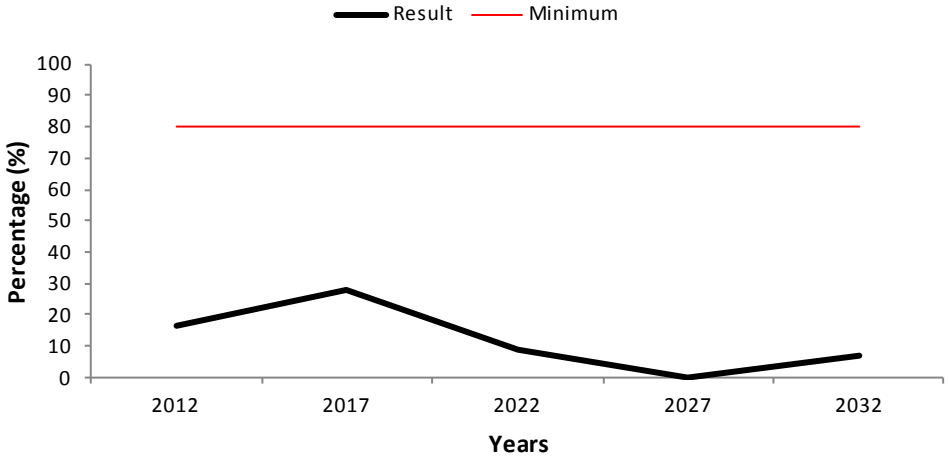


Figure 5-27. Target of annual deciduous patches > 250 ha

5.5.3 Operational Leave Patches

Operational leave patches are implemented to ensure that the forested stands remaining after each year of harvest are large enough to be worth returning for. All stands in the managed landbase that are not in the regen seral stage contribute to this patch target. The maximum value is set to 2% and is weighted heavily to reduce the number of operable patches that are less than 40 ha in size (Figure 5-28).

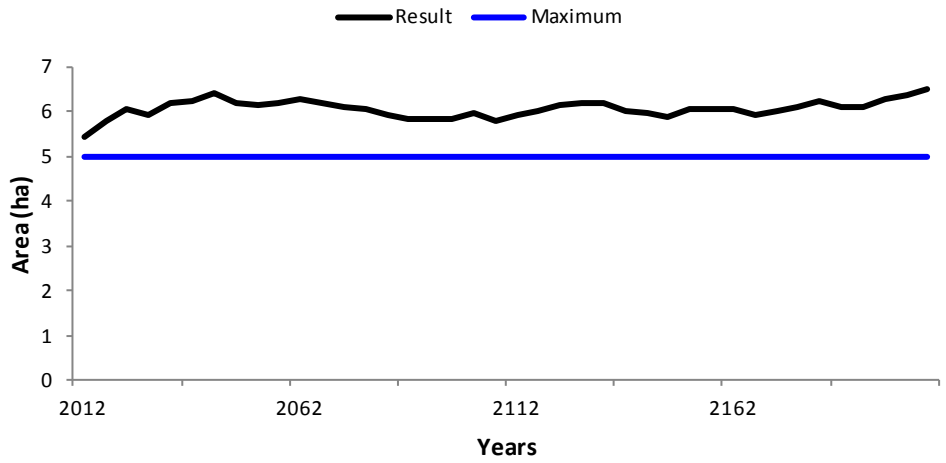


Figure 5-28. Leave patches less than 40 ha which are older than the regen seral stage.

5.5.4 Opening Patch Size

The opening patch sizes were constrained so that at least 90% of the blocks would be in opening patches of 5 to 200 ha. The 0-5 ha size class was constrained to zero, but due to spatial arrangement of managed landbase polygons, a very small percentage of the area was present in this size class. The resulting opening size classes are shown in Figure 5-29.

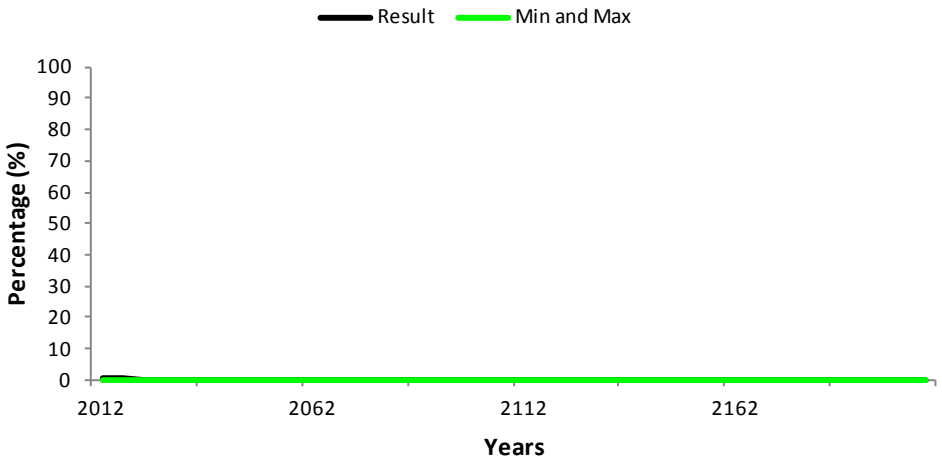


Figure 5-29. Opening patch sizes less than 5 ha.

5.5.5 Short Conifer

For the first 10 years of the SHS, short conifer stands were minimized to increase the tree size that will be harvested. The short stands are constrained in this target (Figure 5-30).

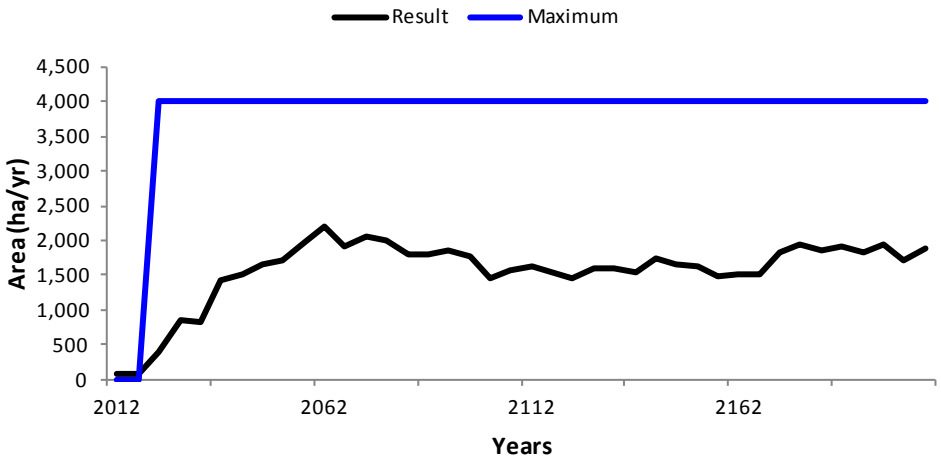


Figure 5-30. Target showing constraint on short conifer stands.

5.6 Interior Core Patches

The interior core patch target as defined in the ESRD planning standard is more complex than what can be included in the modeling framework. A proxy that created larger patches than ESRD's standard was used to account for the reduction in complexity. In the model, core patches that were made up of mature and old seral stages on the gross landbase, were grouped into patches greater than 120 ha. Figure 5-31 shows the percentage of old forest area that is in patches greater than 120 ha, and Figure 5-32 shows the total area of old forest area in those patches greater than 120 ha. The total interior core contained within 120 ha patches is always higher than the amount at the beginning of the planning horizon.

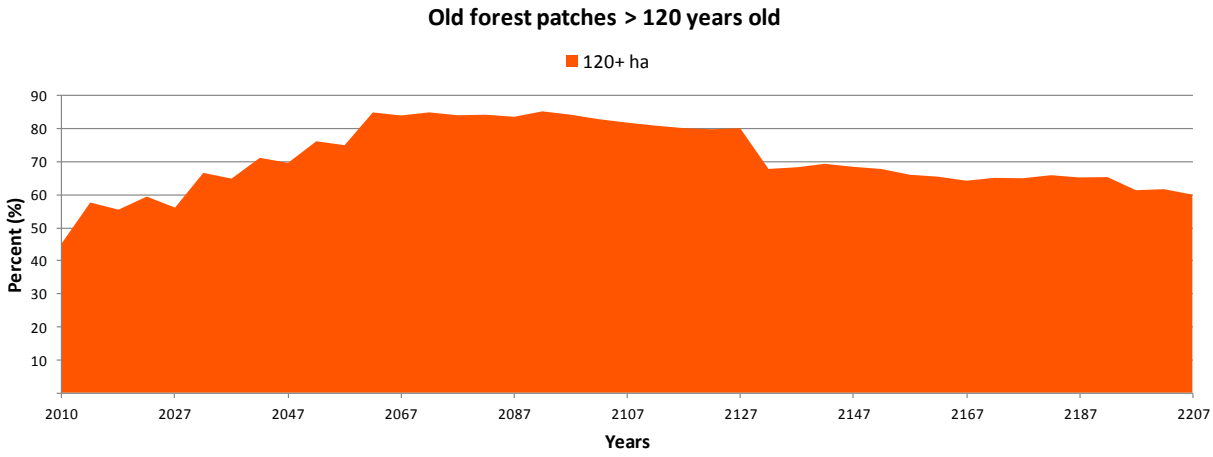


Figure 5-31. Percentage of interior core forest in patches greater than 120 ha.

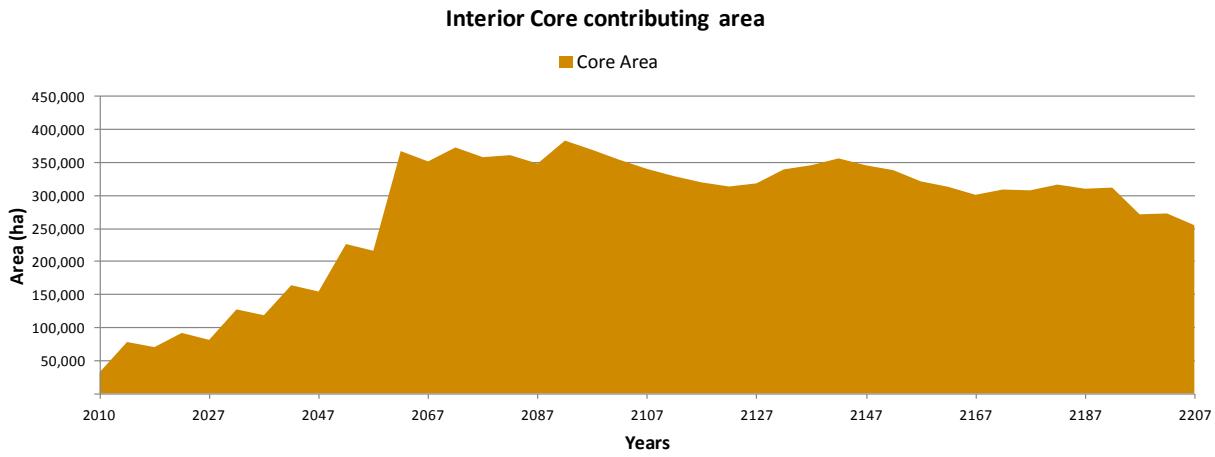


Figure 5-32. Area of interior core forest contained in patches greater than 120 ha.

5.7 FireSmart Management

A *FireSmart* Management and Wildfire Threat Assessment was completed by ESRD in January 2013 on one of the final draft versions of the Spatial Harvest Sequence (Scenario P20_P18007). This scenario is almost identical to the PFMS, the only difference being a few of the planned blocks in the first 10 years changed. This assessment is referred to in Action Item 27-002 in the meeting minutes (Annex III).

The assessment in January resulted in a few recommendations:

- A target was established to reduce the area in the extreme and high fire behavior potential rating by at least 2% across the FMA over the 20 year spatial harvest sequence.
- The potential to create a wildfire containment strategy on the FMA by aligning harvest and other disturbances should be explored.
- Merchantable stands located near settled areas and other values (recreation areas, other infrastructure) should be considered for harvest disturbances to reduce the exposure of these values to potential wildfire.

MDFP has reviewed the assessment and has implemented the following response to these recommendations. The first recommendation has been incorporated in the VOIT's section of the FMP:

- The assessment indicated that the target of reducing the extreme and high fire behavior rating by at least 2% was met by the spatial harvest sequence.
- MDFP's FMA has an unusually high percentage (48%) of unmanaged landbase. This largely consists of unmerchantable stand types such as black spruce muskegs, bogs and fens. The extreme fire behavior potential of these stand types coupled with the large percentage of the landbase that these stands occupy preclude the ability of MDFP to align harvest and other disturbances in order to create a wildfire containment strategy.

- There are no communities within the FireSmart Zone of MDFP's FMA, however, there is one recreation area (Twin Lakes) and numerous other infrastructure (usually oil and gas related) which are scattered throughout the FMA. MDFP developed the spatial harvest sequence with a mountain pine beetle strategy that takes precedence over protecting other infrastructure from potential wildfire.

As a result of the above assessment, the Preferred Forest Management Scenario is adequate for FireSmart Management and minimizing Wildfire Threat given the other values and issues that must also be managed.

Appendix I Glossary of Terms and Initialisms

Glossary Term		Definition
Above Mean Sea Level	AMSL	A measure of topographic elevation.
Active landbase		Areas that are available for forest management activities. That component of the physical landbase that is not deleted in the landbase netdown process. Consists of the combined coniferous and deciduous landbases. Also referred to as the timber harvesting landbase, net landbase, managed landbase or
Adaptive management		A process for continually improving of planning, implementing, and monitoring policies and practices by learning from the outcomes of previously employed policies and practices, and taking corrective actions where unplanned results occur.
Alberta Environment and Sustainable Resource Development	ESRD	Government of Alberta ministry responsible for regulating FMAs.
Alberta Regeneration Information System	ARIS	A Provincial database of silviculture treatments applied to harvested lands. Updated annually by permit and license holders. Considered to be the defacto record of treatment history and block status.
Alberta Biodiversity Monitoring Institute	ABMI	A province-wide monitoring program that collects information on about 2000 species through site visits, aerial photography and satellite imagery. ABMI provides information on the state of Alberta's biodiversity to facilitate management.
Annual Allowable Cut	AAC	The volume of timber permitted to be harvested in any one year, as stipulated in the pertinent approved FMP. In Alberta, the AAC is the quadrant cut divided by the number of years in that quadrant (usually five).
ARC Macro Language	AML	A third-generation (non-compiled) scripting language, propriety to ESRI. AML is a legacy language used commonly in early versions of ESRI software. While primarily a legacy product, it is still used for developing processes that need to run unattended.
Alberta Vegetation Inventory	AVI	The provincial standard for forest inventory information (classification and data storage).
AVI polygon		A polygon delineated based on aerial photography using AVI rules (AFLW 1991, Nesby 1997). For vegetated areas, areas must be sufficiently similar in terms of structure, moisture regime, crown closure, height, species composition and origin year to be considered a single unit or a polygon. Non-vegetated areas must have a similar nonvegetated classification.
Base natural yield curve		The "standard" set of yield curves developed for yield strata, representing the main stand types within the FMA area. Base yield curves may or may not be used to represent these stand types in the final timber supply analysis.
Biological diversity (biodiversity)		The variety, distribution, and abundance of different plants, animals, and microorganisms, the ecological functions and processes they perform, and the genetic diversity they contain at local, regional, or landscape levels of analysis.
Broad Cover Group	BCG	A classification of forest types based on coniferous and deciduous components of the AVI species composition. The broad cover groups are coniferous (C), coniferous-leading mixedwood (CD), deciduous-leading mixedwood (DC) and deciduous (D).
BCG: Pure Deciduous	D	Deciduous ≥ 80%
BCG: Deciduous-Coniferous	DC	Coniferous > 20% and Deciduous > 20%
BCG: Conifer-Deciduous	CD	Coniferous > 20% and Deciduous > 20%
BCG: Pure Coniferous	C	Coniferous ≥ 80%
Buffer		Used in several contexts: (1) In protecting critical habitat areas, the buffer is an area of forest land that reduces the impacts of adjacent activities on the critical area. (2) A strip of land between two areas under different management regimes. (3) An area maintained around a sample or experimental plot to ensure that the latter is not affected by any treatment applied to the area beyond the buffer. (4) In GIS work, a new polygon zone computed on distance from a point, line or existing polygon.
Canadian Standard Association	CSA	Not-for-profit standards organization that is is composed of representatives from industry, government, and consumer groups and which develops standards in 57 areas.
Caribou		Boreal woodland caribou can be found in forested areas across Canada. In Alberta there are two varieties of woodland caribou – the mountain caribou in foothills and mountains of west-central Alberta, and the boreal caribou in northern Alberta. Woodland caribou are listed as threatened under the Alberta Wildlife Act and federally under the Species at Risk Act (SARA).
Caribou, habitat contols		Rules/constrains applied in a hierarchical forest modeling process with considerations across various spatial and temporal scales to enhance the caribou habitat. The main controls were: (1) 30/20 rule – in the deciduous and mixedwood stratum, a maximum of 20% is allowed to be under 30 years old; (2) Patch target – a patch target that tended towards patches (under 30 years old) larger than 300 ha.
Caribou, provincial zone		Provincially-approved caribou land-use referral map layers that are inteded to alert planners when harvest plans fall in or near these special land management areas and aim to reduce the industrial footprint and impacts on caribou.

Glossary Term		Definition
Classified landbase		A spatial landbase and attribute classification generated as the second stage of the TSA process. Used to calculate the area and distribution of all features on the landscape, particularly to generate summaries of seismic detail and carry this into the modeling landbase.
Clearcutting		A regeneration system where all or most of the merchantable trees in a defined area are harvested in one cutting with reproduction obtained through artificial or natural means.
Committee on the Status of Endangered Wildlife in Canada	COSEWIC	Harvested in one cutting with reproduction obtained through artificial or natural means.
Compartment		A subsection of a Forest Management Agreement (FMA) for which operational plans are developed.
Compartment, working circles		A subsection of an FMA defined by the Manning Diversified Forest Products Ltd.
Combined Heat and Power	CHP	The simultaneous production of electricity and heat from a single fuel source
Composite yield curve		Area-weighted composite yield curves developed from empirically-fit natural stand yield curves; generally by BCG or groupings thereof.
Coniferous Timber Quota	CTQ	One of two types of volume-based long-term forest tenures (also deciduous timber allocation) for harvesting a set proportion of the coniferous AAC volume within a defined area, usually for a period of 20
Connectivity, landscape		A measure of how well different areas (patches or a landscape) are connected by linkages, such as habitat patches, single or multiple corridors, or "stepping stones" of vegetation. Landscape connectivity can be defined as the degree to which the landscape facilitates movement between resources patches.
Corrective actions		May include one or more of the following: - Address a nonconformity in a management system by identifying and eliminating the causes of a problem; - Carry-out an appropriate enforcement response; - Direct that the work to be corrected and re-submitted.
Corridor		A physical linkage connecting two areas of habitat and differing from the habitat on either side. Corridors are used by organisms to move around without having to leave the preferred habitat. A linear habitat patch through which a species must travel to reach habitat more suitable for reproduction and other life sustaining needs. Many corridors, linking several patches of habitat, form a network of habitats.
Cull deductions, reduction		Trees or portions thereof that are merchantable, but are removed because of defect.
Culmination age		The age at which the stand, for the stated diameter limit and utilization standard, achieves its maximum average rate of volume production (the Mean Annual Increment (MAI) is maximized).
Cutblock		A specified area that is either designated for harvest or has already been harvested.
Daily mean temperature		Derived on a daily basis from daily minimum and daily maximum temperatures. Daily minimums and maximums are recorded over 24 hour periods that begin and end in the morning. These values are then averaged for the entire month, over the reporting period (generally 30 years, from 1961- 1990).
Daishowa Marubeni International Ltd.	DMI	A neighbouring FMA holder and license holder inside the MDFP FMA area.
Defined Forest Area	DFA	Area of forest, including land and water (regardless of ownership or tenure), to which the requirements of the FMA apply.
Defining layer		Inventory layer used to assign strata. The defining layer may be the overstory or the understory.
Deletions		All areas excluded from the active landbase and assigned a code identifying the reason for deletion.
Digitally Integrated Disposition system	DIDs	A Provincial database and system of specific land use disposition types submitted for approval. The DIDs spatial data are managed and distributed by Alberta Public Lands.
Disturbance patch		Disturbance patches are used to describe the patch sizes of any part of the active landbase that is less than 20 years old, regardless of strata.
Deciduous Timber Allocation	DTA	One of two types of volume-based long-term forest tenures (also see coniferous timber quota) for harvesting a set proportion of the deciduous AAC volume within a defined area, usually for a period of 20
Environmental Systems Research Institute ™	ESRI	The developer of the suite of geographic information system software products commonly known as ArcInfo, ArcMap, ArcView, Spatial Analyst and others.
Environment and Sustainable Resource Development	ESRD	Alberta Environment and Sustainable Resource Development is a ministry of the Government of Alberta that brings together the former departments of Environment and Water and Sustainable Resource Development.
FireSmart		The philosophy that seeks to mitigate the likelihood of large, high intensity and severity fires.
FireSmart community zone		A standard ten kilometre radius around the community extending from the Wildland Urban Interface Zone. A unique data set will be gathered for this zone for community protection planning to provide a fundamental linkage between FireSmart Communities and FireSmart Landscapes.
FireSmart landscapes		FireSmart landscapes are designed to recognize the interaction between ecological, economic, and social impacts, thus, maximize the positive ecological impacts and minimize the negative economic and social impacts.
FireSmart landscape zone		The zone that extends beyond the FireSmart Community Zone overlapping multiple jurisdictions at a broad landscape level. This zone focuses on mitigating the likelihood of large, high intensity, high severity fires. Fire, Forest and Land Management planning are integrated and designed to reduce the negative ecological, economic, and social impacts of wildfire while maximizing the positive attributes of wildfire.
Forecasting		See Timber Supply Analysis.
Forest Management Agreement	FMA	Contract between the Province of Alberta and the FMA holder whereby the Province provides an area-based Crown timber supply. In return, the FMA holder commits to: managing the timber resource on a perpetual sustained yield basis, taking into consideration a broad range of forest values in determining forest management practices; and meeting defined economic objectives, including capital investments and job creation, and seeking out new business opportunities that provide measurable economic benefits for both the Province and the FMA holder. The FMA gives the FMA holder the right to access Crown fibre. In return, the FMA holder commits to forest management responsibilities, which may change from time to time (Alberta SRD 2006).

Glossary Term		Definition
Forest Management Plan	FMP	A document prepared by the FMA holder that describes the spatial and temporal harvest plan and forest harvest operations on Crown lands over a 10-year planning horizon (in Alberta). The document provides detailed methods, schedules, and responsibilities of the FMA holder in terms of accessing, harvesting, renewing and protecting the resource to enable site-specific operations to proceed. The document must be approved by the Government of Alberta, with input from stakeholders.
Forest Management Unit	FMU	An administrative unit of forest land designated by the Minister, as authorized under Section 14(1) of the Forests Act.
Forest patch		A stand of forest in the same seral stage that is not split by a linear feature greater than 8 m wide.
Forests Act, the		The legislative statute that authorizes the Minister to administer and manage the forested lands of Alberta.
Fully stocked		All potential growing space that is effectively occupied by merchantable tree species.
GEO	GEO	ESRI notation to for data stored in coordinates representing latitude and longitude.
Geographic Information System	GIS	A collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.
Green-up period		The time needed to re-establish vegetation after a disturbance. Specific green-up periods may be established to satisfy visual objectives or hydrological requirements, or as a means of ensuring re-establishment of vegetation (for silviculture, wildlife habitat or hydrological reasons) before adjacent
Gross volume		A term applied to tree-level, plot-level or stand-level volumes (*e.g.,* gross total tree volume, gross merchantable tree volume, gross total plot volume, gross merchantable plot volume, gross total stand volume, gross merchantable stand volume) that Indicates no defect/cull deduction has been applied.
Growing Degree Day	GDD	The sum of mean daily temperature above a baseline temperature (i.e. 5 degrees Celsius). Daily values are accumulated over the growing to determine annual values.
Growing stock		The sum (by number, basal area or volume) of trees in a forest or a specified part of it.
Harvest area		A specified land area with defined boundaries where timber harvesting is scheduled, or has occurred (commonly referred to as a cut block).
Industrial Sample Plot	ISP	A forest plot used to monitor the natural growth and yield of trees.
Influential point		An extreme data point that negatively influences model performance, resulting in failure to converge or an unacceptable curve shape.
Input datasets		Datasets received for the purpose of completing the landbase netdown. These frequently require processing to convert or add attributes, assign/add projection information, or combine with other inputs that represent the same features.
Landbase		A result of a classification process used to identify and determine areas available and suiatble for timber harvesting activities.
Landbase, active (also referred to as net, or managed, or contributing)		The landbase available for timber harvest and that comprises the net productive coniferous and net productive deciduous land bases. The active landbase is further classified into either conifer or deciduous landbase depending on species composition.
Landbase, passive (also referred to as		The landbase that is not part of the net productive coniferous or deciduous landbases
Landbase polygon		A polygon within the (classified, TSA, or modeling) landbase derived during spatial processing to incorporate various spatial layers and attributes of interest.
Managed landbase		That portion of the net landbase which is considered "managed" in the respect that the land received a harvest treatment and subsequent silviculture treatments. Note that AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any records of reforestation are not considered 'managed'.
Managed stand		Stand that is initiated by anthropogenic disturbance such as harvesting.
Managed stand yield curve		Yield curves generally created by applying regeneration lags to base natural yield curves with cull. Regeneration lags varied depending on whether cutblocks were harvested prior to or after 1993. Thus both Pre93 and Post93 managed managed stand yield curves developed.
Manning Diversified Forest Products Ltd.	MDFP	The forest products company in Alberta responsible for this FMP.
Mean Annual Increment	MAI	Average annual increase in volume of individual trees or stands up to the specified point in time. The MAI changes with different growth phases in the life of a tree, being highest in the middle years and then slowly decreasing with age. The point at which MAI peaks is commonly used to identify the biological maturity of the stand and its readiness for harvesting (Alberta SRD 2006).
Metadata		Data that describes the content, quality, conditions, use limitations and other characteristics of a dataset and which also documents bibliographic records including but not limited to information such as who collected the data, when and how it was collected, preprocessed and converted, its resolution and who presently holds the data. In summary, metadata is information about a thing, apart from the thing itself.
Merchantable volume, stand		Merchantable tree volume summed to represent volume on a per hectare basis.
Merchantable volume, tree		A tree-level term; the volume of those portions of a tree bole that meet utilization requirements (stump height, top and bottom diameter limits and log length).
Modeling landbase		A tabular and spatial landbase. Tabular data make the landbase suitable for both strategic and operational timber supply modeling. The spatial component is used for harvest scheduling.
Modeling tool, Patchworks©		A spatially-explicit wood supply planning and modeling tool developed by Spatial Planning Systems that was designed to provide the user with operational-scale decision-making capacity within a strategic analytical environment.
Modeling tool, Woodstock©		A non-spatial forest modeling tool developed by Remsoft used for harvest scheduling, wood supply analysis, wildlife management and simulation of forest ecosystems to test and compare different management assumptions.

Glossary Term		Definition
Mountain Pine Beetle	MPB	A defoliator insect species (*Dendroctonus ponderosae*) endemic to western North America that infects pine trees during its life cycle and results in tree mortality.
Natural stand		Stands developed under natural (non-anthropogenic) disturbance regimes. Stand initiation was due to natural disturbances, such as fire, pest or pathogen outbreak.
Natural stand empirical yield curve		Empirical yield curve fitted using data from all sampled natural stands within the active landbase.
Net volume		Timber volume that includes the main stem and excludes the stump, top and defective and decayed wood.
Non-linear regression		The practice of fitting a model where the dependent variable is a nonlinear function of one or more independent variables. One benefit of the nonlinear models is that they are often derived on the basis of physical and/or biological considerations.
North American Datum	NAD	A mathematical process of correcting geospatial locations relative to a fixed, known position.
Noxious weed		A plant designated under the Weed Regulation (AR 171/2001) of the Weed Control Act.
Observation		One plot measurement at a specific point in time. All TSPs have only one associated observation, whereas PSPs may have one or more observations (remeasured data) for a single plot.
Operating Ground Rules	OGR	Practices used in operational planning and for implementation of timber harvest operations.
Organic Rankine Cycle	ORC	Thermodynamic process where heat is transferred to a fluid at a constant pressure
Patch		A stand of forest in the same seral stage, and not split by a linear feature greater than 8m wide. Linear features in this definition include roads, pipelines, powerlines, and rivers, but do not include seismic lines.
Passive landbase		That part of the gross landbase that has a deletion and is excluded from the active landbase.
Permanent Sample Plot	PSP	A fixed or variable area plot established for (forest) sampling and measurement purposes, and designed for re-measurement.
Piece size		Number of trees required to obtain one cubic meter (m^3) of gross merchantable tree volume.
Plan Development Team	PDT	A group of individuals assembled for production of MDFP's Forest Management Plan that includes representatives from MDFP, DMI and Buchanan Lumber, Alberta Environment and Sustainable Resource Development, and FORCORP. The goal of the PDT is to provide a forum for facilitating efficient and productive communication and decision making.
Plot		Unit of area, within which variables of interest are assessed.
Plot volume		Gross merchantable tree volume within a plot on a per hectare basis (m^3/ha).
Polygon		A closed geometric entity used to spatially represent area features with associated attributes.
Post93 managed stand yield curve		A managed stand yield curve with a 2-year regeneration lag applied to the coniferous landbase and a 0-year regeneration lag applied to the deciduous landbase.
Pre93 managed stand yield curve		A managed stand yield curve with a 5-year regeneration lag applied to the coniferous landbase and a 2-year regeneration lag applied to the deciduous landbase.
Preferred Forest Management Scenario	PFMS	The forest management scenario that represents MDFP's preferred strategies and activities for managing the FMA area over a 200-year planning horizon.
Prescribed burn		The planned use of carefully controlled fire to accomplish various predetermined management goals: site preparation for planting; reduction of fire hazards or pest problems; improvement of the ease with which the site can be traversed; and creation of better quality browse for wildlife.
Regeneration		The renewal of a tree crop by natural or artificial means. It may also refer to the young crop itself.
Regeneration lag		The period of time between harvest and establishment of the regenerated stand.
Rotation		The period of years required to establish and grow even-aged timber crops to a specified condition of maturity.
Sensitive sites		Sites that have soil, water, slope, aesthetic, vegetation or wildlife characteristics that require special protection beyond the normal precautions described in the ground rules.
Seral stage (SS)		Stages in forest succession that are characterized by plant community conditions. The seral stage definition in this document are based on age and strata classifications
SS: Mature	Mature	Stands that are old enough for harvesting. Age: 61-100 for D and DU; Age: 71-110 for DC and CD; Age: 71-120 for PL; Age: 106-160 for SB, and 106-150 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Old	Old	Stands that are starting to break up or become stagnant. Age ≥ 101 for D and DU; Age ≥ 111 for DC and CD; Age ≥ 121 for PL; Age ≥ 161 for SB; Age ≥ 151 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Regeneration	Regeneration	Stands that are in early stages of development. Age: 0-15 for all strata classes. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Young	Young	Stands that are vigorously growing but are not yet fully grown. Age: 16-60 for D and DU; Age: 16-70 for DC, CD, and PL; Age: 16-105 for SB and SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
Silviculture		The theory and practice of controlling the establishment, composition, health, structure and growth of forests in order to achieve specified management objectives.
Sliver		Generally small polygons created in the spatial analysis due to overlapping features that do not have coincident boundaries. Typically these are artifacts of spatial processing and generally do not represent true differences in polygon differentiation with respect to landbase classification.
Soil productivity		The capacity of soil to support plant growth.
Spatial Harvest Sequence	SHS	A stand level map depicting forest stands scheduled for timber harvesting that are feasible to be operated by the organization.
Special Management Zone		An area of varying size adjacent to an area in which special management measures are necessary to protect natural resources.
Species at risk		Any species known to be "at risk" after formal detailed status assessment and designation as "Endangered" or "Threatened" in Alberta. The list of species is maintained by Alberta.

Glossary Term		Definition
Species group		A single species code used to represent one or more AVI species. For example, the AW species group consists of AVI species A and Aw; and the LT species group consists of La, Lt and Lw.
Species type		There are two species types: deciduous and coniferous. Deciduous species include aspen, birch and poplar. Coniferous species include fir, pine, larch and spruce.
Stand		A community of trees sufficiently uniform in species, age, arrangement or condition as to be distinguishable as a group in the forest or other growth in the area. A stand may also be that polygon as defined in the AVI or Phase III inventory (Alberta SRD 2006).
Stand Susceptibility Index	SSI	An indicator of the potential loss in stand basal area or volume that could occur if mountain pine beetle infested a particular stand. A susceptibility index based on four variables: relative abundance of susceptible pine basal area in a given stand, age of dominant and co-dominant live pine, the density of the stand, and the location (latitude, longitude and elevation) of the stand.
Stand volume		Gross merchantable volume within a stand on a per hectare basis (m^3/ha); also known as gross merchantable stand volume.
Strata/Stratification		A classification scheme for defining data for use in management or modeling.
Structured Query Language	SQL	A formal computer language for querying relational database system tables. The language follows an ANSI compliant format and the core set of commands are part of a common language used across many database software programs.
Submission datasets		Datasets submitted to ESRD for approval.
Temporary Sample Plot	TSP	A fixed or variable area plot established for forest sampling and measurement; usually assessed only once.
Thinning, commercial		A partial cut where trees of a merchantable size and value are removed to provide an interim harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees. Used to capture volume likely to succumb to competition pressures and be lost to disease, insects, or dieback.
Thinning, pre-commercial		A silvicultural treatment to reduce tree density in young stands, carried out before the stems reach merchantable size. The intent is to concentrate the site's growth potential on fewer trees thereby accelerating stand development and reducing the time to final harvest, retaining more live crown, creating opportunities for future commercial thinning activities and improving stand operability.
Timber Harvest Planning and Operating Ground Rules		Standards for operational planning and field practices that must be measurable and auditable and based on forest management plan objectives.
Timber Management Regulation	TMR	The legislative statute that describes the mechanism and regulations by which the forested lands of Alberta are managed. The Regulation is associated with the Forests Act.
Timber operations		Includes all activities related to timber harvesting including site assessments, planning, road construction, harvesting, reclamation and reforestation.
Timber Supply Analysis	TSA	Harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees.
TSA landbase		A spatial landbase that carries all the information of the classified landbase, with the exception of the seismic line work.
Total stand volume		Used to capture volume likely to succumb to competition pressures and be lost to disease
Tree improvement		Insect, or dieback.
Tree improvement yield curve		A modified yield curve for the PL and SW yield strata, whereby the managed stand is adjusted such that volume increase (a fixed percent) occurs at approximately the average harvest age, but the maximum total volume across all ages is unaffected.
Understorey		The trees and other woody species growing under the canopies of larger adjacent trees and other woody growth.
Ungulate		A mammal with hooves.
Universal Transverse Mercator	UTM	A method of projecting spherical shapes on a flat plane. Typically this projection is used when the features need to have good area representation and the extent of the dataset does not cover more than one predefined UTM zone (three degrees of longitude).
Unmanaged landbase		That portion of the net landbase which is considered to be on a "natural" yield projection. All unharvested areas are considered 'unmanged'. AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any record of reforestation are also considered 'unmanaged'.
Values, Objectives, Indicators and Targets	VOIT	A framework of criteria and indicators to help track progress in achieving sustainable forest planning and management under sound environmental, economic, and social objectives.
Watercourse		The bed, bank or shore of a river, stream, creek, lake or other natural body of water, whether it contains or conveys water continuously or intermittently.
Watershed		An area of land, which may or may not be under forest cover, that drains water, organic matter, dissolved nutrients and sediments into a lake or stream. The topographic boundary, usually a height of land, that marks the dividing line from which surface streams flow in two different directions.
Wildlife		Any species of amphibian, bird, fish, mammal and reptile found in the wild, living unrestrained or free roaming and not domesticated. Some definitions include plants, fungi, algae and bacteria.
Wildlife Management Unit	WMU	Areas within province of Alberta managed by ESRD and regulated by the Alberta Wildlife Act (2012).
Years Before Present	YBP	A unit of measure of historical time.
Yield curve		Graphical representation of a predictive yield equation. One yield curve in fact consists of three curves: a conifer volume-age curve, a deciduous volume-age curve and a total volume-age curve.
Yield strata (YS)		A system of stratification applied to the forested landscape based upon FMU, and defining layer and/or understory layer attributes (BCG, crown closure class, leading conifer species). Yield strata form the basis for the development of yield curves; each yield stratum has one or more associated yield curves.

Glossary Term		Definition
YS: Deciduous	D	Species grouping defined as Deciduous
YS: Deciduous w/ Conifer Understory	DU	Species grouping defined as Deciduous with Coniferous Understory
YS: Mixedwood - Deciduous	DC	Species grouping defined as Mixedwood with Deciduous leading
YS: Mixedwood - Coniferous	CD	Species grouping defined as Mixedwood with Coniferous leading
YS: Coniferous - Pine leading	PL	Species grouping defined as Coniferous with Pine leading
YS: Coniferous - Black Spruce leading	SB	Species grouping defined as Coniferous with Black Spruce leading
YS: Coniferous - White Spruce leading	SW	Species grouping defined as Coniferous with White Spruce leading
YS: No Strata (cutblocks)	XCC	No Yield Strata assignment (cutblocks)
YS: No Strata	X	No Yiel+D21d Strata assignment

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MANNING DIVERSIFIED FOREST PRODUCTS LTD.

2012-2021 Forest Management Plan

Chapter 7 FMP Implementation

June 30, 2013 (Draft)

October 1, 2013 (Approved)

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1. FMP Commitments

All of the commitments made by *Manning Diversified Forest Products Ltd.*[1] (MDFP) during the development of the 2012-2021 *Forest Management Plan* (FMP) that are applicable to the implementation of the plan are listed in this chapter. Unless specifically referenced in this chapter, there are no commitments elsewhere in the 2012-2021 FMP document. In addition to FMP commitments, this chapter describes the strategies for successful implementation and monitoring of the 2012-2021 FMP. The commitments and strategies identified here will become effective upon FMP approval for the 10-year period of the plan or until replaced by a subsequent plan or strategy.

Most of the 2012-2021 commitments arise from Chapter 4: *Values Objectives Indicators and Targets* (VOIT) and from Chapter 6: *Preferred Forest Management Scenario* (PFMS). The relevant parts of each chapter are listed. The intent of this chapter is to aid plan implementation by clearly summarizing the actions necessary for successful implementation in order to achieve sound environmental stewardship of MDFP's *Forest Management Agreement* (FMA) Area.

This chapter begins with a review of the hierarchy and relationships of the components of Alberta's forest management planning processes. This is followed by a summary of the products developed during the planning process which will guide FMP implementation. Following this are specific strategies for:

- Access management;
- Timber harvesting ;
- *Silviculture*;
- Forest protection;
- Protection of forest resources; and

[1] Terms and initialisms that are defined in the Glossary (Appendix XVII) are shown in italics the first time they are presented in this document.

- Maintenance of *biodiversity*.

Appendices contain current versions of reference material for implementation. New versions will from time to time replace the reference material included.

2. Planning Hierarchy

The FMP represents only a single step in the forest management planning process. The FMP is a long-term, forest-level plan that provides the following:

- Sets the general direction for forest management within the FMA for the FMP period.
- Establishes a set of values and objectives for the FMA and identifies indicators and targets for measuring the success of forest management activities over the FMP period. These are used to derive a Preferred Forest Management Strategy (PFMS).
- Determines an *Annual Allowable Cut* (AAC) and the *Spatial Harvest Sequence* (SHS) for the FMP period that is consistent with PFMS.
- Identifies the monitoring requirements required to evaluate FMP indicators and targets.

Successful implementation of the FMP relies on coordinated operational planning to translate the forest-level values, objectives and strategies into operational realities. At the same time, operational constraints may impact the ability to fully implement the FMP and the impact of these deviations may need to be evaluated in the context of the overall FMP.

Timber harvesting operators, including FMA holders, within Alberta are required to submit operational plans each year. The companies submit a General Development Plan (GDP), Final Harvest Plans (FHP), Annual Operating Plans (AOP) and an Annual Silviculture Plan. These operating plans are all submitted to Alberta for approval. Approval of the AOP by Alberta provides the Company with authorization to harvest for the timber operating year (May 1 to April 30). The FMP relates directly to the GDP, FHP and the AOP through the SHS. An overview of the planning hierarchy and the feedback from operational plans back to the FMP SHS implementation (via monitoring protocols) is provided in Figure 2-1. The operational plan development process is briefly outlined in the following sections. The role played by the *Timber Harvest Planning and Operating Ground Rules* (OGR) is also identified.

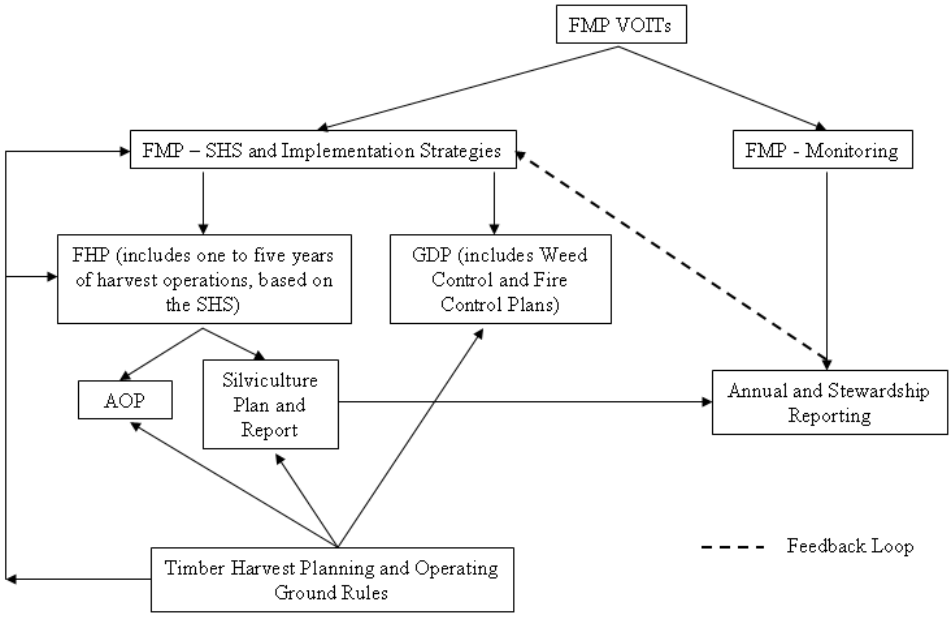

Figure 2-1. Overview of forest management planning hierarchy

2.1 General Development Plan

Both FMA holders and quota holders are required to submit a GDP annually. The GDP projects forest management activities for a five year period and is updated annually. Its goal is to assist with the integration of activities, particularly with regard to road development, to help scheduling and to control harvesting and other management activities. The GDP helps ensure that all concerns are identified and addressed early in the planning process to an appropriate level of detail.

2.1.1 Weed Management Plan

A Weed Management Plan is submitted annually by June 1st. This plan summarizes weed control activities completed the previous year as well as the activities planned for the coming year. Activities including training, inspections and control initiatives (e.g., spraying, picking, no action) are noted, along with a list of locations of weed infestations that MDFP is responsible for. Responsibility for weed infestations will be transferred to other operators through their use of areas that have weeds on site.

2.1.2 Fire Control Plan

A Fire Control Plan is submitted annually. The Fire Control Plan outlines all activities and preparations related to fire prevention, detection, reporting, pre-suppression and suppression. The plan describes and maps the location of any operations planned during the fire season such as harvesting (limited

because of emphasis on winter harvest operations), planting, debris disposal, surveying, etc. Training activities are identified and included in the Plan along with the detailed emergency contact information.

2.2 Final Harvest Plan

The Final Harvest Plan (FHP) describes in detail the timber harvesting operations in a specified area and is approved for five timber years. It includes areas and volumes to be harvested and any special operational considerations. The Final Harvest Plan includes details regarding road construction (the Road Construction, Maintenance and Abandonment Plan), operational integration with other resource users (where appropriate) and production reports for previous years.

The SHS, developed as a component of the PFMS, identifies the stands scheduled for harvest. The SHS identifies where harvesting will occur for the 10-year term of the FMP (timber years 2012-2021) and the following 10-year period (timber years 2022-2031). The SHS will guide the preparation of Final Harvest Plans.

2.3 Annual Operating Plan

The Annual Operating Plan (AOP) identifies the areas within the Final Harvest Plan that will be operated in the timber year as well as silviculture activities not included in the silviculture plan.

2.4 Annual Silviculture Plan

The Annual Silviculture Plan describes how forest renewal will be implemented on the ground. It identifies silviculture systems, strategies and tactics and operational silviculture details for all harvest areas. It also describes any silviculture treatments planned for existing regeneration such as manual tending and herbicide application, as well any reclamation activities that may be undertaken.

2.5 Timber Harvest Planning and Operating Ground Rules

Timber Harvest Planning and Operating Ground Rules (OGR) provide direction to timber operators for operational planning and for implementation of timber operations. OGR include standards and guidelines for timber harvest, road development, reclamation, reforestation and integration of timber harvesting with other forest uses.

Alberta requires FMA holders to develop FMA-specific Ground Rules, usually within six months of plan approval. The current OGRs for the FMA will be updated to reflect the new FMP.

3. FMP Products

During the development of the 2012-2021 FMP, a number of FMP products which are influencing both development and implementation of the plan were produced and approved by the *Plan Development Team* (PDT). FMP products range from digital files such as the SHS, to documents describing how field operations should be undertaken. Many of FMP products are applicable over a range of areas from harvesting to reforestation and thus are not easily described within a single implementation component. Only some of the many FMP products are summarised in this chapter and its appendices.

3.1 PDT Documents

The following PDT documents were all reviewed and accepted by the PDT with the intent that they will be included in the FMP as guidance for FMP implementation. Some of the primary PDT documents are:

- AAC Drain;
- DMI and MDFP Memorandum of Understanding Summary;
- Strategy to address the MPB Infestation for MDFP's 2012-2021 FMP;
- Woodland Caribou Habitat Strategy for MDFP's 2012-2021 FMP;
- Contingency Plans for Operating Outside the SHS within the Caribou Range; and
- Structure Retention Strategy.

Each of these primary documents is briefly summarised below.

3.1.1 MDFP and DMI MOU Summary

MDFP and DMI negotiated a Memorandum of Understanding (MOU) to formalize, for the 10-year term of this plan, operational issues and a management approach for deciduous stands with an identified coniferous understory. The MOU document remains confidential but a summary was produced for the PDT to provide clarification (Appendix I). The PDT accepted the summary, not the MOU, and agreed with the approach for the management of deciduous stands with an identified coniferous understory for this planning period. The MOU summary describes:

- MOU expires in 10 years or until replaced by a subsequent plan;
- Identification of DU-A stands for DMI to sequence and reforest to D-BCD;
- DU-A stand criteria;

- Identification of DU-BCD stands for DMI to apply understory protection treatments;
- DU-BCD stand criteria; and
- DMI secondary deciduous volume commitment.

The MOU required a significant amount of time to finalize and develop an approach to manage the deciduous stands with coniferous understory was a major milestone that involved considerable input from the PDT. Selected MOU criteria are identified in the SHS for operational implementation. Three additional "DUA_DMI" blocks were added late in the FMP process for DMI to harvest and reforest to D. MDFP has agreed that while these blocks were conifer blocks and do not meet the DUA_DMI selection criteria, DMI had laid them out and would be permitted to operate them. Block numbers for the three blocks are: 0443; 0449 and 0452 (landbase ukey_tsa = 102952, 105677 or 102358).

The MOU permitted DMI to access stands on the coniferous landbase. For timber supply modeling purposes, it was assumed that the MOU would continue to be in effect for the second 10 years and that DMI would harvest the remaining DU_DMI stands in the second 10 years. However, with a new inventory due before the next FMP and with the MOU expiring, there is no guarantee that DMI will have access to stands on the coniferous *landbase* in the future.

The deciduous AAC is based on the assumption that the MOU remains in effect during the FMP period. Should the MOU be cancelled, the pure D stands sequenced in the first 10 years of the SHS contain only enough volume to support a harvest level of 75,200 m^3/yr. MDFP and DMI have agreed to inform ESRD should the MOU be cancelled (refer to Action Item 22-002, July 4, 2012 PDT meeting).

3.1.2 Strategy to Address the MPB Infestation

A strategy to address the MPB infestation for the 2012-2021 FMP, dated November 28, 2012, was developed by MDFP with considerable input from the other members of the PDT and approved by the PDT on January 9, 2013 (Appendix III). Over the last few years, the MPB situation in the Peace River Region has exploded to become one of the hardest hit areas in the province with some of the highest MPB increases. The MPB strategy balances the current large scale infestation and the potential future impacts with the economic reality of addressing the infestation in the region. Documented in the MPB strategy are:

- A description of the MPB situation;
- A sequencing strategy to target high risk stands; and
- A reforestation strategy with reduced MAI targets for selected stands to enable more area to be actively managed.

The MPB strategy influenced the selection of stands included in the SHS and reforestation targets.

3.1.3 Woodland Caribou Habitat Strategy

MDFP developed a strategy to manage habitat for woodland caribou in the FMA Area (Appendix IV). The woodland caribou habitat strategy had a large impact on the development of the 2012-2021 FMP and is reflected in the location of access for harvesting, the selection of stands in the SHS as well as harvesting and reforestation treatments to be completed under the plan. Addressed in the strategy are:

- The current boundaries and permissible activities used to manage caribou habitat;

- Expanded boundaries and permissible activities used to manage caribou habitat in the expanded FMA Area; and
- Best management practices for managing caribou habitat.

While the SHS is the primary and most effective mechanism for managing caribou habitat in the FMP, operational rules that prescribe the details for forestry operations within caribou areas such as the timing of operations and access route management are contained in the Operating Ground Rules (OGR) for FMU P20. OGR will be updated to reflect the strategies contained in the new FMP.

3.1.4 Contingency Plans for Operating Outside the SHS within the Caribou Range

The PDT developed a comprehensive strategy for woodland caribou which was reflected in the development of the SHS. However, forest management is conducted in a natural realm with uncertainty; a situation which is addressed by Alberta's planning processes. The PDT recognized the need for clarity related to the caribou strategy and developed rules for contingency plans for operating outside the SHS and within the caribou range. Refer to Section 3.4 and Appendix IV for more information.

3.1.5 Structure Retention Strategy

Strategies for the maintenance and tracking of structure retention within harvested areas were developed for the current FMP. These strategies were based on current strategies but updated for the 2012-2021 FMP and accepted by the PDT on January 9, 2012 (Appendix V). Key points in the structure retention strategy are:

- A definition of structure;
- At a landscape level, approximately 35% of the total *landbase* is forested but will not be harvested and should continue to provide ecological structure;
- Within harvested areas, 3% of harvested block area will retained to support structure
- Structure will be retained distributed across a range of defined *patch* sizes; and
- A methodology for merchantable timber volumes to be calculated as prescribed and drained against the appropriate operator's AAC.

3.2 Preferred Forest Management Scenario

The Preferred Forest Management Scenario (PFMS) is the culmination of the forest management objectives and strategies developed for the 2012-2021 FMP. The PFMS is modeled in the forecasting and implemented by strategies and tactics described in this chapter. The AAC, SHS, road access, harvesting and reforestation strategies are all part of the PFMS. VOITs guide both the development of the PFMS and its implementation. Through the application of the forest management strategies referenced in this chapter, the PFMS will be successfully implemented thus achieving MDFP's sustainable forest management objectives.

3.3 Annual Allowable Cut

ESRD establishes AAC based on the timber supply analysis which is part of the PFMS. Upon approval of the timber supply analysis, an AAC will be established for FMU P20 and allocated to each operator based on their timber rights. AAC is regulated through the 5-year quadrant cuts determined for each operator by ESRD. Strategies for charging the timber harvested by each operator ("AAC drain") are included.

3.4 Spatial Harvest Sequence

The SHS is one of the key components of this FMP providing linkages from the FMP to operational planning and implementation on the ground. It describes the stands to be harvested over the next 10 years and the stands which are likely to be harvested over the following 10 years. The SHS is derived from the PFMS and is a reflection of the selected management strategies, VOITs and the AAC. Adherence to the SHS on the ground ensures that FMP targets can be achieved.

The SHS file identifies the stands to be harvested for first two 10-year periods of the plan (*i.e.* timber years 2012 to 2021 and timber years 2022 to 2031). MDFP and DMI expended considerable effort in creating an SHS that can be operationally implemented.

In the SHS shapefile stands are assigned to three operators: MDFP, DMI and Buchanan Lumber. Generally, each operator will harvest the blocks assigned to them in the SHS. Other than alterations for operational efficiency, DMI will harvest their stands identified in the SHS. To more effectively manage the periodic nature of Buchanan Lumber's harvesting strategy in the FMA, MDFP and Buchanan have agreed to a random assignment of conifer landbase blocks to Buchanan within the old P18 FMU. In the year(s) when Buchanan will harvest in the FMA, both operators will cooperate to manage access and operations will be planned regardless of conifer operator assignment in the SHS. In other years MDFP will harvest blocks in this area as appropriate for efficient operations, regardless of conifer operator assignment in the SHS. The stands from the SHS to be harvested each year will be identified in the AOP. To provide clarity and improve the review and approval process, any changes to the operator(s) identified in the SHS will be identified in the AOP (from Action Item 18-005). Reforestation liability is created by the harvesting operation and not by the operator assignment in the SHS.

The SHS is a plan for harvesting stands over the first two periods of the FMP. All operators will attempt to follow the SHS but some variance is anticipated. Rules for variance from the SHS are indentified in ESRD policy and the OGR.

Alberta's planning processes recognize that uncertainty is a reality which must be addressed in forest management and thus, Alberta has developed processes and procedures to manage uncertainty. Due to unexpected events, it may be either impossible to implement the SHS or, depending upon the situation, perhaps even desirable to deviate from the SHS. Not excluding other potential sources, some examples of uncertainty where the SHS can no longer be implemented are: forest fires, insect and disease infestations, species of special management concern, a major change in landuse direction or an unacceptable variance of >20% (2009 MDFP OGR).

The caribou strategy incorporated into the 2012-2021 FMP was developed to guide the SHS development in such a way as to mitigate the impact of the next 10 years of harvesting on caribou

habitat within selected areas of the FMA. However, if the SHS cannot be implemented, then the Woodland Caribou Ground Rules as described in the current Operating Ground Rules (OGR) section 7.7.2, page 39, or its replacement, shall be utilized for the development and approval of Final Harvest Plans for areas within areas managed for caribou (i.e. the 1991 caribou boundary, APMA and specified areas, or their replacement(s). Operations outside the SHS must be in alignment with the Provincial Caribou Recovery Plan.

3.5 VOITs

Chapter 4: Objective, Values, Indicators and Targets (VOITs) described in detail the VOITs applicable to the 2012-2021 FMP. MDFP developed 39 VOITs for the 2012-2021 FMP. The VOITs are based on those in the Alberta Forest Management Planning Standard Version 4.1 – April 2006 (Planning Standard) (ASRD 2006) but were modified by the PDT to address recent forest management policy and a few local conditions. Most of the VOITs have only slight changes or remain unchanged.

Implementation and reporting commitments are identified in the reporting section for each VOIT. The timing for VOIT reporting is specified as either at FMP or the Performance Report. Reporting associated with the 2012-2021 FMP is included in Chapter 4, concluding the reporting requirements for this FMP.

Many of the VOITs are addressed through successful implementation of the FMA's OGRs. However, some of the VOITs require specific policies and procedures to provide guidance to specific components of access, harvesting and reforestation activities. MDFP reviewed, and revised if required, policies and procedures for the following VOITs:

- Access strategy and road *corridor* plan (#4, 1.1.1.3);
- Uncommon plant communities (#6, 1.1.1.4);
- Residual structure retention (#10, 1.1.2.1);
- Unique finds (#12, 1.1.2.2);
- Woodland caribou habitat (#14, 1.2.1.1);
- Public consultation (#18, 1.4.1.1; #39, 6.2.1.1);
- Landbase maintenance (#21, 2.1.2.1);
- Forest health reporting (#22, 2.1.2.2);
- *Noxious weed* program (#23, 2.1.3.1);
- Aesthetics in the *Special Management Zone* (#36, 5.2.2.1c); and
- First Nation Consultation (#38, 6.1.1.1).

Performance reporting as identified in the “Reporting” column will be completed by MDFP, DMI and Buchanan. MDFP is responsible for preparing and submitting FMA wide reports but the other operators must provide information to MDFP related to their operations.

4. Access Planning and Development

Access planning, construction, maintenance and reclamation play a key role in forest management. Roads are used to transport the harvested timber from the *cutblocks* to the mill in a safe and efficient manner. They also provide access for personnel and equipment for harvesting, scarification, reforestation and monitoring activities.

Road construction is essential for forestry operations, but long-term roads also remove land from timber production. Development of any type of access has implications on non-timber resources because of the increased ability for other users to access areas. Construction, maintenance and reclamation of roads, when not conducted carefully, has the potential for negative impacts on the soil resource (e.g., erosion, slumping) and on watercourses (e.g., soil erosion into streams). Road construction often requires construction of watercourse crossings which, in addition to soil and water quality concerns, have the potential to obstruct passage of fish if not constructed properly. Companies also need to ensure that their operations can be accessed safely and economically.

4.1 Access Planning

The FMA is accessed by resource roads and seismic lines which have been constructed by the oil and gas sector or by roads constructed by Municipalities. Year-round access into the southern and eastern portion of the FMA is provided by all-weather municipal and industrial roads. Access into the northern and western portions is almost exclusively restricted to winter. Few of the all-weather roads are timber operator's roads (i.e., all are either Municipal roads or other industrial roads).

It is the Companies' intent to continue past practices of limiting the amount of new all weather road construction within the FMA Area. MDFP and Buchanan and, to a large extent, DMI, conduct operations during the winter season to reduce the impact on soils and water courses. Access planning strategies are utilized by the Companies' to ensure planned access:

1. Minimizes area of productive forest lost to access development;
2. Maintains soil and water quality;

3. Maintains habitat, wildlife and other resource values (i.e., limiting open access, timing access, etc.);
4. Provides safe roads for staff, contractors, other commercial users and the public; and
5. Minimizes access development costs.

Access planning strategies include:

- Reuse of existing access (addresses points 1, 2, 3 and 5)
- Improving/upgrading of existing access only if required (addresses points 1, 2, 3 and 5)
- Minimizing length of new road construction (addresses points 1, 2, 3 and 5)
- Joint access development (addresses points 1, 2, 3 and 5)
- Conducting winter operations (winter only for MDFP, primarily winter for DMI) (addresses points 2 and 5).
- Minimizing number of watercourse crossings (addresses points 2 and 5)
- Selecting appropriate watercourse crossing locations and structures (addresses points 2 and 4)
- Reclaiming decommissioned roadways (addresses points 1 and 2)
- Locating new access routes on non-productive landbase (addresses point 1)
- Construction appropriate to planned utilization (addresses points 4 and 5)
- Access development and utilization will follow requirements associated with special management zones (e.g., access control, timing constraints, etc.).

Strategies which address safety concerns specifically include:

- Development of access suitable for expected traffic (season, type and volume);
- Safety programs for staff and contractors;
- Appropriate road signage; and
- Stakeholder communications regarding log haul.

Where the existing access options do not meet Company requirements, the Companies evaluate options associated with creating new access routes. Planning new road access involves selecting the best route, to move the timber from one location to another for the expected life of the road. For a main road this means determining the best route from the harvest area to the mill. Where practical, the existing roads and corridors are used. For an inner-block road, road planning involves determining the best route within the block and to the nearest inter-block road to promote efficient harvesting. In all cases, the following factors are taken into account:

- slopes,
- watercourses,
- ground conditions,
- environmental impact, and
- road standard.

Details regarding the implications of these factors on route selection, road planning and watercourse crossing construction are provided in the MDFP's Road Planning, Construction, Maintenance, Reclamation and Monitoring Strategy (Appendix VI).

MDFP's main objective relating to road development is to construct cost-effective, safe roads that minimize environmental disturbance and limit loss of the productive landbase.

Road construction requirements vary greatly, from all-season main roads to temporary in-block roads. Roads may be built and maintained for years (e.g., main haul roads) or may be very temporary (e.g., winter in-block roads). The amount of traffic a road receives will also vary and will, to some extent, help determine the type of road constructed.

MDFP's road program addresses three types or grades of road:

- Main roads - Connecting main harvest areas with the mill, used for multiple seasons and thousands of loads.
- Inter-block roads - Roads connecting individual blocks to each other and/or main roads, used for one or two seasons and several hundred loads.
- In-block roads - Road systems within block boundaries to facilitate harvest of the block and accommodating relatively small numbers of loads.

Where road construction or upgrading is required, the following steps are taken to ensure protection of forest, land and water resources is considered during the construction of new roadways.

- Construction of new, permanent access will be planned and presented as part of the GDP.
- Stream crossings are constructed in a manner that minimizes risk of erosion and does not impede stream flow.
- Road construction and related stream crossing construction will follow rules and guidelines contained within the Timber Harvesting and Operating Ground Rules.
- Reporting of all road construction activities annually in the Road Construction, Maintenance and Abandonment Plan, submitted as a part of the GDP.
- A summary of permanent, seasonal and temporary road construction undertaken for forestry operations within the FMA Area will be summarized as part of the Stewardship Report.

Additional details regarding MDFP's road planning, construction, maintenance, reclamation and monitoring are provided in Appendix VI.

4.2 Corridor Plan

MDFP prepared an access corridor plan for the FMA to manage access forest management over the long-term. Figure in Appendix VII shows the general location of access corridors that will be utilized on the FMA Area. Key components of the Corridor Plan include:

- The Companies will not construct a loop road from Highway 35 across the Botha River to the Chinchaga Forestry Road nor will they construct a road that crosses the Botha River to gain access to Highway 35.
- The Companies will not create any new access within the Twin Lakes Recreation Area buffer, or any other Special Management Zone without appropriate consultation.

- The Companies will make use of existing corridors (cutlines, roads, other dispositions) in their operations, however, safety is paramount, and extra (new cut) roads or loop roads may be required.

The Corridor Plan is included as Appendix VII.

5. Timber Harvesting

Careful planning and implementation of the timber harvesting program assist MDFP, Buchanan Lumber and DMI in achieving their forest management objectives while ensuring the Companies are able to supply their processing facilities with an economically viable source of raw materials.

The companies work cooperatively during the harvest planning process and during harvest operations to ensure that the environmental and economic considerations are addressed.

5.1 Annual Allowable Cut

5.1.1 AAC Levels

Recommend net AAC levels for FMU P20 at 15/11 coniferous and 15/10 deciduous utilization are summarised for the 2012-2021 FMP period (May 2012 to April 2021) in Table 5-1. Details on the harvest level and AAC determination are documented in Chapter 6.

Table 5-1. Net FMU P20 coniferous and deciduous AAC for 2012-2021 FMP

Species	Utilization	Primary m3/yr	Secondary m3/yr	Total m3/yr
Coniferous	15+/11/30 cm	526,500	65,200	591,700
Deciduous	15+/10/30 cm	174,100	151,400	325,500
Total		700,600	216,600	917,200

All AAC numbers are reduced for cull: 3.7% for coniferous and 9% for deciduous.

Timber rights and the recommended AAC allocation for each operator are summarized in Table 5-2 and in Table 5-3. Buchanan Lumber's allocation is sourced and sequenced from the old FMU P18 area as identified in the SHS.

Table 5-2. Coniferous operator timber rights and recommended 2012-2021 FMP AAC

FMU	Company Name	Disposition Number	Primary Disposition Allocation %	Primary AAC 15+/11/30 cm m3/yr	Secondary Disposition Allocation %	Secondary AAC 15+/11/30 cm m3/yr	Total Approved AAC m3/yr
Coniferous							
P20	*Manning Diversified Forest Products Ltd*	*FMA0200041*		*506,172*		*58,953*	*565,125*
P20		*Local Use* [1]		*5,113*		*595*	*5,708*
P20	FMA AAC Subtotal	FMA0200041	97.1102%	511,285	91.3311%	59,548	570,833
P20	Gordon Buchannan Enterprises Ltd.	CTQP180002	2.8898%	15,215	8.6689%	5,652	20,867
P20	Total			526,500		65,200	591,700

1. Any unused coniferous local use volume (1% of FMA AAC) is available for MDFP to harvest.

All AAC numbers are reduced for cull, 3.7% for coniferous and 9% for deciduous.

Table 5-3. Deciduous operator timber rights and recommended 2012-2021 FMP AAC

FMU	Company Name	Disposition Number	Primary Disposition Allocation %	Primary AAC 15+/10/30 cm m3/yr	Secondary Disposition Allocation %	Secondary AAC 15+/10/30 cm m3/yr	Total Approved AAC m3/yr
Deciduous							
P20	*Daishowa-Marubeni International Ltd.*	*DTAP200001*		*172,359*		*149,886*	*322,245*
P20		*Local Use* [2]		*1,741*		*1,514*	*3,255*
P20	DTAP20001 Total	DTAP200001		174,100		151,400	325,500

2. Any unused deciduous local use volume (1% of DTA) is available for DMI to harvest.

All AAC numbers are reduced for cull, 3.7% for coniferous and 9% for deciduous.

5.1.2 Alternative Coniferous Utilization Standards

MDFP may apply to operate at a different conifer utilization standard than the 15/11 standard used to derive the AAC. To aid in approving requests to use alternative coniferous utilization standards, coniferous plot volumes were calculated for two coniferous alternative utilization standards based on the specifications in Table 5-4. Using the alternative plot level volumes, average percentage changes for each yield stratum were determined. The strata averages were then area-weighted using the planned harvest areas during the first ten years of the SHS to produce conifer AAC adjustment rates to account for changes in coniferous harvested volumes from the 15/11 utilization standard used for the AAC determination (Table 5-5).

Table 5-4. Alternative utilization standard specifications

Species Type	Log Length (m)	Stump DOB (cm)	Top DIB (cm)	Stump Height (m)
Coniferous	2.6	15.0	13.0	0.30
	2.6	13.0	7.0	0.30

Page revised October 1, 2013:
corrections to Tables 5-2 and 5-3

Table 5-5. Alternative coniferous volume utilization adjustment rates

Landbase	Adjustment Rate from 15/11 (%)	
	Utilization 13/7	Utilization 15/13
Deciduous (secondary volume)	11	-9
Coniferous (primary volume)	12	-10

5.1.3 AAC Drain

Procedures to charge all timber harvested on the FMA were developed and approved by the PDT on July 4th, 2012 under Action Item 22-002 (ID: 365) and are summarized in Appendix I. Procedures address all timber uses and sources including timber volumes related to:

- Mill deliveries;
- Structure retention;
- Alternative utilization standards;
- Log fills;
- Coniferous field cull; and
- Other landuse industrial dispositions.

5.2 Harvest System and Methods

Much of the current forest in the FMA is in a mixedwood state supporting either mixed conifer (pine and spruce) or mixed conifer-deciduous (spruce and aspen) forests. Utilizing a patch harvest system that focuses on protection of existing conifer understory and maintenance of structure, it is MDFP's intent to maintain a similar diversity of mixedwood ecosystems.

The patch harvest system with coniferous understory protection, in conjunction with appropriate stand establishment and tending practices, is well suited to regenerating the predominant species currently found within the FMA Area (i.e., white spruce, lodgepole pine and aspen).

MDFP currently utilizes full tree harvest systems, with road-side processing. This system is efficient, both from an economic and recovery perspective, for patch harvesting in the types of stands the Company operates. The roadside debris is subsequently piled and burned. Operating procedures and the structure of the forests being harvested helps ensure that significant woody debris is maintained within the block. MDFP continually reviews its systems and processes and may consider employing alternative harvest systems such as cut-to-length in the future.

DMI also harvests using a patch harvest system, with an emphasis on maintaining the existing conifer understory and preserving some in-block structure as appropriate. DMI utilizes in-bush chippers in its harvest operations. Utilizing portable chippers increases fibre recovery by utilizing the entire tree (trees are not delimbed prior to chipping) and reducing breakage. Much of the fibre waste generated in the chipping process (primarily bark) is returned to the block by skidders outfitted with grapples. A portion of the deciduous volume from the FMA Area is delivered as tree length.

As per the MOU (Appendix I), DMI has scheduled 848 ha in the first 10 years of the SHS for understory protection in deciduous stands with higher density coniferous understory. This treatment designed to

develop operational harvesting and monitoring procedures in these stand types as well as assess the release of the conifer. Understory protection treatments are to be identified in the GDP, FHP and AOP. Additional requirements for understory protection are identified in section 6.2.3 Understory Protection.

MDFP, DMI and Buchanan Lumber have agreed to cooperate in the development of harvest planning and forestry operations. MDFP and DMI have formalized their relationship in an MOU.

5.3 Harvest Season

MDFP has traditionally restricted all its harvest operations to the winter months (November 1 to March 31), when soils are most likely to be dry or frozen. Operating on dry or frozen ground helps minimize soil disturbance within harvest blocks and on access routes. Frozen soils are not susceptible to compaction or erosion.

Exclusive winter operation has, until now, allowed the Company to access its timber supply without the need for construction of any permanent roads. Existing public and resource roads, combined with winter roads, have proved sufficient for harvest activities.

DMI conducts approximately 80% of its operations within the winter months. DMI limits its summer harvest operations to areas which have summer access and to harvest sites which have appropriate soil characteristics (i.e., soils that are resistant to compaction, erosion).

5.4 In-block Roads and Landings

Conducting forest harvesting operations requires development of temporary roads and landings within harvest blocks. The Provincial Timber Harvest Planning and Operating Ground Rules require that these areas account for less than 5% of the block area. Manning Diversified and DMI both plan harvest operations so that less than 5% of the block area is comprised of in-block roads and landings and, as a whole, the Companies are able to comply with this requirement. However, in some cases (*e.g.*, very small blocks or blocks with very unusual configurations, or other landuse constraints such as oil and gas infrastructure) the 5% limit may be exceeded in a particular block.

In-block roads and landings are considered part of the block for silviculture operations and are generally reforested along with the rest of the block. In-block roads and landing are always surveyed as part of the harvest block reforestation extent.

5.5 Structure Retention

The emulation of natural disturbances is component of sustainable forest management. For the boreal forest of Alberta, the natural disturbance agent is predominantly fire. Historical fire patterns and the forest structures and patterns they produce are commonly used as a guide for emulating the natural disturbance paradigm. Retention of structure is a component of the natural disturbance paradigm. MDFP, in conjunction with the PDT, developed a Structure Retention Strategy to guide retention placement, measurement, reporting and reconciliation of merchantable timber volumes harvested on the FMA. This strategy was last revised on November 28, 2012 and was approved by the PDT on January 9, 2013 (Appendix V). Highlights of the Structure Retention Strategy are:

- Both landscape and stand level scales are addressed;
- A distribution of patch sizes is required for stand level retention;
- 3% of the merchantable area harvested must be retained as stand level structure;
- Procedures for the calculation of merchantable timber volumes present in the retained stand level structure patches; and
- To ensure sustainable harvest levels are achieved, procedures for charging structure retention volume against the appropriate operators' AAC.

The Structure Retention Strategy applies to all timber operators harvesting on the FMA. For more information refer to the Structure Retention Strategy in Appendix V.

5.6 Post-Harvest Block Inspections

ESRD requires that all harvest blocks are inspected after harvesting is completed to ensure compliance with Timber Harvest Planning and Operating Ground Rules. Minimum inspection criteria for the post-harvest inspection have been identified by ESRD and include:

- Area associated with in-block roads and landings;
- Presence of rutting;
- Adherence to utilization requirements;
- Maintenance of riparian buffers; and
- Adherence to any special conditions.

MDFP continually monitors its harvest operations to ensure compliance with the Timber Harvest Planning and Operating Ground Rules as well as conducting the more formal post-harvest inspection.

6. Silviculture Program

MDFP's silviculture program relies on field assessments both pre and post-harvest to ensure that the silviculture decisions made are appropriate for the site conditions. Post-silviculture treatment assessments are also utilized, providing timely feedback on success of the reforestation treatments applied.

Since MDFP began harvesting in the FMA area in 1993, the Company has developed expertise in successful reforestation over the range of sites it operates. This experience and expertise have been formalized in this section. The silviculture program outlines, for the FMA, the types of sites that are harvested, what the reforestation objective is and what treatments will be utilized to achieve the reforestation objective. Silviculture strategies are aligned with harvesting and strata transitions used in the Forecasting (Annex IX) and PFMS (Chapter 6).

Buchanan Lumber will follow the silviculture program for the stands harvested under their authority on the FMA. Buchanan's reforestation strategies will be similar to those of MDFP.

DMI's reforestation objectives and treatments, will be implemented on the stands they harvest, those being primarily on the deciduous landbase within the FMA Area, are also outlined in this section. DMI and MDFP negotiated a MOU on the management of deciduous stands with identified coniferous understory as well as other operational considerations. The MOU's influences on the silviculture program are described in this section.

MDFP participates in two regional tree improvement programs, one each for white spruce and lodgepole pine. While MDFP does not have an annual cut effect calculated as part of the annual allowable cut, they may deploy improved stock during the 2012 – 2021 FMP period. As with all other reforestation activities, deployed improved stock will be tracked and reported to ARIS.

6.1 Reforestation

6.1.1 Objectives

The reforestation objectives of MDFP, Buchanan and DMI are twofold:

- To ensure that harvested areas are established and grow according to the assumptions in the Forecasting and the PFMS. Because these assumptions are used to determine the AAC, sustainability will be achieved if the actual growth of the stands meets the yield assumptions in the PFMS; and
- To ensure that the legislated requirements are met as per the Forests Act, the Timber Management Regulations and the Forest Management Agreement.

6.1.2 Responsibility

The 2012-2021 FMP maintains separate coniferous and deciduous landbases within the FMA Area. As a general rule, MDFP and Buchanan Lumber have responsibility for harvest planning/operations and reforestation on the coniferous landbase while DMI has the responsibility for harvest planning/operations and reforestation on the deciduous landbase. As a guide, each stand in the SHS has been assigned an operator. The current assumption will be that reforestation responsibility for a particular cutblock is assumed by the operator that harvests the cutblock, which may not be the same as the operators identified in the SHS. Any changes to this assumption will be reflected in the AOP or an amendment to the AOP.

6.1.3 Growth Targets

Reforestation targets applicable to the PFMS were developed following the policies described in ESRD's Regenerated Standards of Alberta (RSA). Targets are expressed as Mean Annual Increment (MAI) values for each of the reforested strata (Table 6-1). All operators are required to adhere to the currently approved RSA program to manage MAI targets. ESRD is continually updating and refining the RSA program.

Table 6-1. Reforestation Standard of Alberta Mean Annual Increment targets

FMP Yield Strata	Base 10 Strata	FMU	Yield Curve Type	Species of Primary Management	Culmination Stand Age (yr)	MAI (m^3/ha/yr)	
						Coniferous	Deciduous
D-CD	I-D	P20	Post93 Managed Stand	Deciduous	83	0.41	1.83
DC-BCD	II-DC-PL	P20	Post93 Managed Stand	Coniferous	86	1.56	1.36
DC-BCD	III-DC-SX	P20	Post93 Managed Stand	Coniferous	86	1.56	1.36
CD-BCD	IV-CD-SW	P20	Post93 Managed Stand	Coniferous	105	1.85	0.52
CD-BCD	V-CD-PL	P20	Post93 Managed Stand	Coniferous	105	1.85	0.52
CD-BCD-PROT	IV-CD-SW	P20	Understory Protection Yield Curve	Coniferous	78	1.68	0.33
PL-A	VIII-C-PL	P20	Base Natural Curves	Coniferous	127	0.92	0.05
PL-BCD	VIII-C-PL	P20	Post93 Managed Stand	Coniferous	127	1.84	0.11
SW-CD	VII-C-SW	P20	Post93 Managed Stand	Coniferous	124	1.97	0.38

In addition to the above MAI targets, the operators' expect to meet species proportions for conifer and deciduous as detailed in each of the regenerated stand trajectories as documented in the silviculture matrix (Table 6-3).

6.1.4 Composition Targets

Generally, the operators' regeneration programs within the FMA Area are designed to create regenerating stands that are similar in composition to the pre-harvest stand, while incorporating the requirements of the Reforestation Standards of Alberta. Table 6-2 identifies the planned transitions from the pre-harvest strata to post-harvest strata during the FMA period. These transitions are an integral part of the forest management strategy and are present in the PFMS. They provide direction for silviculture program implementation. The "FMP Ref# MDFP-"column provides a link to the FMP Reference Number in the silviculture matrix (Table 6-3) and the "YC Doc Appendix" column lists the Appendix containing the yield curves in the Yield Curve document (Annex VIII).

Table 6-2. Stratum transition table for planned regenerated stands in 2012-2021

Landbase	Strata Group	Initial Strata	Treatment	Strata After Treatment	FMP Ref# MDFP-	YC Doc Appendix
Deciduous	D	D-B	CC	D-CD Post93 Managed Stands	1201	V
		D-CD	CC	D-CD Post93 Managed Stands	1201	V
Coniferous	DU	DU-A	CC - by DMI	D-CD Post93 Managed Stands	1201	V
		DU-A	CC - by MDFP	DC-BCD Post93 Managed Stands	1202/1203	V
		DU-BCD	CC	CD-BCD Post93 Managed Stands	1204/1205	V
		DU-BCD	Understory protection	CD-BCD-PROT Understory Protection	1206	VI
	DC	DC-BCD	CC	DC-BCD Post93 Managed Stands	1202/1203	V
	CD	CD-A	CC	CD-BCD Post93 Managed Stands	1204/1205	V
		CD-BCD	CC	CD-BCD Post93 Managed Stands	1204/1205	V
	C	PL-A	CC	PL-BCD Post93 Managed Stands	1207	V
		PL-BCD	CC	PL-BCD Post93 Managed Stands	1207	V
		PL-BCD	CC-MPB-LFN	PL-A Base Natural Curves	1208	III
		SB-BCD	CC	SW-CD Post93 Managed Stands	1209	V
		SW-A	CC	SW-CD Post93 Managed Stands	1209	V
		SW-B	CC	SW-CD Post93 Managed Stands	1209	V
		SW-CD	CC	SW-CD Post93 Managed Stands	1209	V

Column 'FMP Ref# MDFP-' refers to the reference number in the silviculture matrix table where numbers are formatted as: MDFP-120X

6.2 Treatments

6.2.1 Silviculture Systems

Clearcutting followed by reforestation is the primary silviculture system employed on the FMA area. In order to take advantage of natural ecological dynamics and to address other values, not all areas are clearcut. Where appropriate, partial harvesting systems such as understory avoidance or understory protection, will be employed.

6.2.2 Understory Avoidance

DMI and MDFP developed an MOU to address, in part, the sequencing, harvesting and reforestation of deciduous stands with coniferous understory (refer to Appendix I for a summary of the MOU). The 2012-2021 FMP identified deciduous stands with low density coniferous understory (*i.e.* DU-A) for DMI to harvest and reforest to fully stocked deciduous (*i.e.* D-CD). This outcome is identified in the

silviculture matrix reference number MDFP1201 and was included as an input into the timber supply analysis supporting the PFMS, refer to Table 6-2 and Table 6-3. DMI will apply understory avoidance techniques in these stands, as well as all D stands to protect future coniferous secondary timber volumes and to assist in meeting secondary coniferous reforestation targets.

6.2.3 Understory Protection

Understory protection is a partial harvesting system where portions of the merchantable overstory are harvested and smaller unmerchantable trees are protected during harvest to form a new stand. The MOU and SHS identified stands for the application of full understory protection treatments. As part of the MOU, DMI was permitted access to up to 1,000 ha of deciduous stands with higher levels of coniferous understory in order to test and refine the application of understory protection techniques and to establish and refine monitoring protocols. DMI sequenced 848 ha over the first ten years of the SHS, which were included in the timber supply and forecasting for the PFMS.

While the decision to harvest these stands in the 2012-2021 FMP period is optional for DMI, the application of full understory protection treatment is mandatory if the harvesting occurs. Requirements for understory protection are described in the MOU summary (Appendix I) and summarized below (from Action Item 19-001):

- Full understory protection harvesting to be applied;
- Must meet understory protection Operating Ground Rules to be jointly developed by DMI and MDFP;
- DMI will assume reforestation liability and obligations;
- Must achieve the MAI reforestation targets from the understory protection yield curve created for this FMP; and
- DMI will develop and implement an ESRD approved Permanent Sample Plot program to measure the response and development of this treatment.

The silviculture matrix treatment for understory protection is described by FMP reference number MDFP1206. MDFP, DMI and ESRD developed the understory protection regenerated yield curve by combining existing yield curves based on the assumed proportion of the regenerated stand each stratum would occupy. Refer to the yield curve chapter for more information.

The understory protection treatment assumes a transition from a deciduous with coniferous understory stand (*i.e.* DU-BCD strata) to a multi-aged conifer dominated mixedwood (*i.e.* CD-BCD-PROT). The premise is that proper understory protection applied to the appropriate stand structures will, through release of the conifer, produce a conifer dominated stand, similar to the transitions observed in the Hotchkiss experimental understory treatments.

Monitoring will be central in demonstrating the effectiveness of the understory protection treatment in capturing deciduous timber volumes while increasing coniferous growth. Currently no RSA standards exist for understory protection and efficient long term monitoring is required to demonstrate the response. DMI will work with MDFP and ESRD to develop and approve understory protection OGRs and a monitoring program before the understory protection treatment is applied (from Action Item 17-003).

Understory protection treatments are to be identified in the GDP, FHP and AOP (from Action Item 17-003).

6.2.4 Clearcut and Reforestation

Most harvested areas that are harvested by MDFP and Buchanan Lumber will be replanted to ensure rapid initiation of reforestation. On MDFP's recently harvested areas, this has represented approximately 1,500 hectares per year, with approximately 75% planted to white spruce and 25% planted to lodgepole pine.

The operators' intend to meet the commitments made in Table 6-2, however in some cases a species may be planted that was not originally on site. This may be done for a variety of reasons such as:

- Ecological site conditions;
- Reforestation strata balancing requirements;
- Insect or disease considerations;
- FMP strata transitions assumptions;
- Accommodate other values (e.g., caribou habitat); or
- Availability of seedlings.

DMI successfully reforests stands managed for deciduous production through natural regeneration by suckering. This treatment is referred to as deciduous Leave or Natural (LFN).

A summary of the proposed silviculture treatments, by strata, is presented in Table 6-3.

Table 6-3. Silviculture Matrix: Summary of proposed silviculture treatments for the 2012-2021 FMP

FMP Reference Number	Regenerated Yield Trajectory (Leading + secondary species)	Strata Standard (C, CD, DC, D)	Transition Toward Climax	Species Proportions	Limitations to Crop Establishment	Silviculture System	Site Prep	Seedling Establishment (includes LFN)	Regeneration Target Density (stems/ha)	Reforestation Stage Intervention
MDFP1201	D-CD	D	No transition	Minimum 60% Deciduous	Winter desiccation, low moisture events (droughts), poor microsites (cold/wet soils) etc., vegetation competition (grasses, deciduous, shrubs), insects, micro fauna.	Clear cut with understory avoidance, may include retention	Raised bed. None where straight plant option exists for coniferous stablishment	LFN for deciduous suckering, plant for white spruce if needed to meet MAI target	5000 deciduous, coniferous as required to meet MAI target	Chemical, mechanical or fill-in-plant strategies for maintenance of coniferous if required
MDFP1202	DC-CD (Aw-Sw)	DC	No transition	Minimum 50% deciduous Minimum 30% Sw leading coniferous	Winter desiccation, low moisture events (droughts), poor microsites (cold/wet soils) etc., vegetation competition (grasses, deciduous, shrubs), insects, micro fauna.	Clear cut; may include retention	Raised bed. None where straight plant option exists.	Plant for white spruce, LFN for deciduous suckering	Minimum 500 Sw leading coniferous and 700 deciduous	Chemical or mechanical for grass or competition. Fill-in-plant for mortality if required
MDFP1203	DC-CD (Aw-Pl)	DC	No transition	Minimum 50% deciduous Minimum 30% Pl leading conifer	Winter desiccation, low moisture events (droughts), vegetation competition (grasses, deciduous, shrubs), insects, micro fauna.	Clear cut; may include retention	Raised bed. Chain Drags. None where straight plant option exists.	Plant for lodgepole pine, LFN for deciduous suckering	Minimum 500 Pl leading coniferous and 700 deciduous	Chemical or mechanical for grass or competition. Fill-in-plant for mortality if required
MDFP1204	CD-CD (Sw-Aw)	CD	No transition	Minimum 50% Sw leading coniferous Minimum 30% dediduous	Winter desiccation, poor microsites (cold/wet soils) etc., vegetation competition (grasses, deciduous, shrubs), insects, micro fauna.	Clear cut; may include retention	Raised bed. None where straight plant option exists.	Plant for white spruce, LFN for deciduous suckering	Minimum 800 coniferous and 400 deciduous	Chemical or mechanical for grass or competition. Fill-in-plant for mortality if required
MDFP1205	CD-CD (Pl-Aw)	CD	No transition	Minimum 50% Pl leading coniferous, Minimum 30% dediduous	Winter desiccation, low moisture events (droughts), vegetation competition (grasses, deciduous, shrubs), insects, micro fauna.	Clear cut; may include retention	Raised bed. Chain Drags. None where straight plant option exists.	Plant or LFN for lodgepole pine when in combination with chain drag scarification. LFN for deciduous suckering	Minimum 800 coniferous and 400 deciduous	Chemical or mechanical for grass or competition. Fill-in-plant for mortality if required
MDFP1206	CD-CD-PROT	CD	These stands will transition from a deciduous dominated overstory with a white spruce understory to the understory protection yield curve	Minimum 50% Sw leading coniferous, Minimum 30% dediduous	Winter desiccation, poor microsites (cold/wet soils) etc., vegetation competition (grasses, deciduous, shrubs), insects, micro fauna.	Understory Protection	None	LFN for coniferous and for deciduous suckering	Minimum 800 coniferous and 400 deciduous	Chemical or mechanical for grass or competition. Fill-in-plant for mortality if required

FMP Reference Number	Regenerated Yield Trajectory (Leading + secondary species)	Strata Standard (C, CD, DC, D)	Transition Toward Climax	Species Proportions	Limitations to Crop Establishment	Silviculture System	Site Prep	Seedling Establishment (includes LFN)	Regeneration Target Density (stems/ha)	Reforestation Stage Intervention
MDFP1207	PL-CD	C	No transition	Minimum 80% Pl leading coniferous in UBH. Minimum 70% Pl leading coniferous in all other seedzones	Winter desiccation, poor microsites (cold/wet soils) etc., vegetation competition (grasses, deciduous, shrubs), insects, micro fauna.	Clear cut; may include retention	Raised bed, Chain Drags, None where straight plant option exists.	Plant or LFN for lodgepole pine when in combination with chain drag scarification. LFN for deciduous suckering	Minimum 1000 coniferous	Chemical or mechanical for grass or competition. Fill-in-plant for mortality if required
MDFP1208	PL-A-MPB	C	These stands will transition to PL-A yield curve	To be determined after consulting with the Establsihment Standard Technical Working Group	Winter desiccation, low moisture events (droughts), vegetation competition (grasses, deciduous, shrubs), insects, micro fauna.	Clear cut; may include retention	None	LFN for pine and for deciduous suckering	Minimum 500 coniferous	None
MDFP1209	SW-CD	C	No transition	Minimum 80% Sw leading coniferous in UBH. Minimum 70% Pl leading coniferous in all other seedzones	Winter desiccation, poor microsites (cold/wet soils) etc., vegetation competition (grasses, deciduous, shrubs), insects, micro fauna.	Clear cut; may include retention	Raised bed. None where straight plant option exists.	Plant for white spruce. LFN for deciduous suckering	Minimum 1000 coniferous	Chemical or mechanical for grass or competition. Fill-in-plant for mortality if required
N/A	Roads, Landings and Bared Areas	Same as adjacent regenerating stand	This is not a regenerated yield trajectory and is not intended to be treated as such. It will regenerate to the same strata standard as the adjacent stand unless indicated otherwise. Roads, Landings and Bared areas have been placed in a seperate category because they are more intenstly disturbed than the remaining stand and may therefore have different limitations to crop establishment, and may require a different treatment.	Same as adjacent regenerating stand unless indicated otherwise	Limitations to reforestation may result from equipment impact and may include: 1) damage to the natural soil structure through compaction, loss or aeration, soil displacement. 2) removal of root propagules required for successful vegatative reforestation. 3) excessive debris loading.	Clearcut, which may be followed by soil displacement and subsequent rollback of surface soils.	Reclamation treatment is determined by assessment of soil condition at time of entry for harvest and extent and type of damage.	Same as adjacent regenerating stand unless indicated otherwise	Same as adjacent regenerating stand unless indicated otherwise	Same as adjacent regenerating stand unless indicated otherwise

6.3 Reforestation Prescriptions

6.3.1 Pre and Post-harvest Assessments

MDFP's reforestation program begins with a pre-harvest assessment for every block scheduled for harvesting. The pre-harvest assessment reviews the current vegetative and site conditions of the proposed block, providing information needed for planning silviculture treatments. Pertinent information for silviculture planning collected as part of the pre-harvest assessment includes:

- Stand type;
- Soil texture;
- Understory species and density; and
- Vegetative competition (*Calamagrostis*).

Based on the information collected at the time of the pre-harvest assessment, the following initial treatment decisions are made:

- Site preparation – Whether or not the site preparation will be conducted and, if it will, what type;
- Plant – Whether or not the block will be planted and, if it will, what species and stock type will be utilized.

Information from the pre-harvest site assessment and prescription is transferred to the block map once harvest operations are underway. Immediately post-harvest, the block is inspected to confirm, refine or revise the preliminary silviculture prescription and these results in a final silviculture prescription for the block. The post-harvest inspection also provides the opportunity to assess debris and retention conditions, which may have an influence on the final silviculture prescription.

MDFP's selection of reforestation prescriptions for specific areas is guided by a silviculture prescription selection decision tree (Figure 6-1). This is a generalized approach to initial silviculture decisions and may not necessarily be followed under all instances.

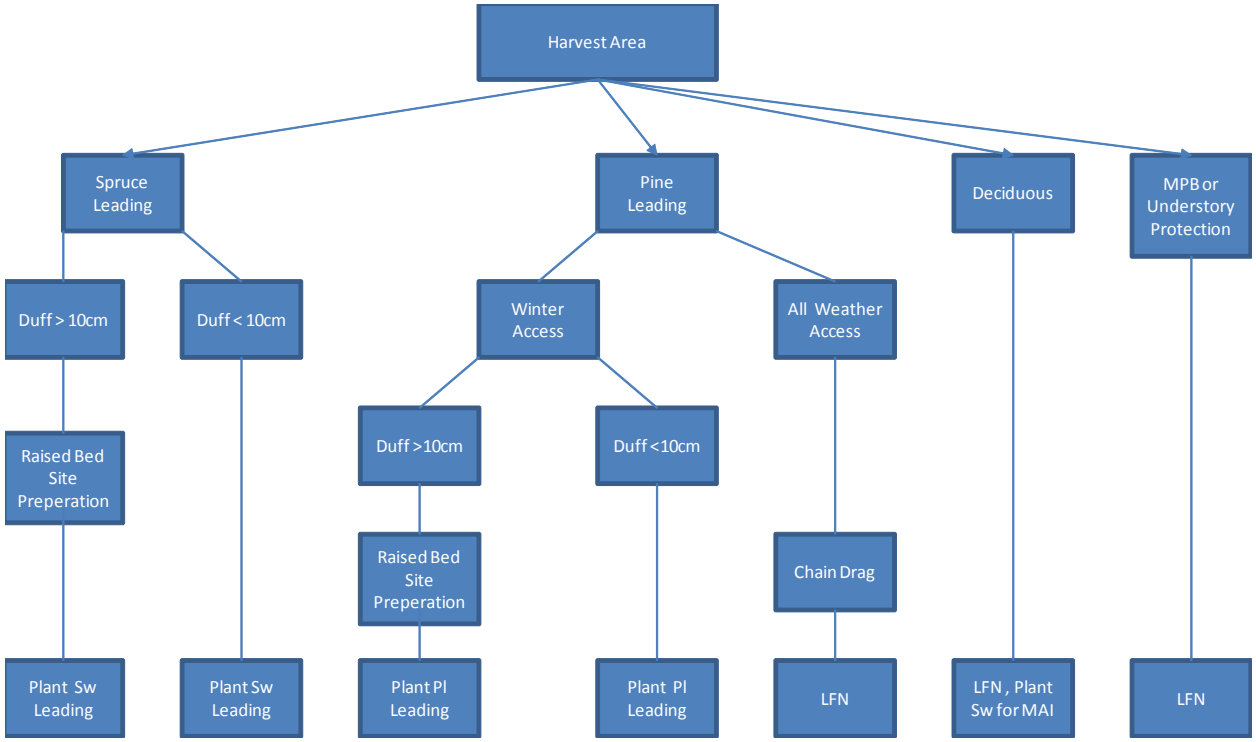

Figure 6-1. Silviculture prescription decision tree

6.3.2 Site Preparation

MDFP has traditionally used scarification as effective site preparation technique that increases seedling survival and growth. The decision to scarify a block is made initially pre-harvest and then reviewed post-harvest.

Site preparation is generally scheduled for the same winter season as harvesting. In some instances, the site preparation may be delayed until the following year due to a variety of reasons (*e.g.* equipment problems, weather, etc.). Occasionally, summer site preparation such as dragging will be utilized, but the appropriate sites that are summer accessible are rare in MDFP's FMA. Winter site preparation helps reduce the risk of soil compaction or erosion within the harvest areas. It also ensures that MDFP's access needs are restricted to the winter season, further reducing the risk to soil and water quality posed by access development and maintenance.

Two types of scarification equipment are generally used by MDFP (a third type – drags are used on occasion if site and access allow it). Ripper scarification is most common and accounts for approximately 75% of the scarification in most years. Ripper scarification is used on mesic sites. Mounding scarification is used on the harvest areas with excess moisture (low, wet, poorly drained) and accounts for approximately 25% of the scarification in most years. Steep slopes, areas with shallow organic layers and draws and watercourses are not site prepared to reduce the chance of damage to the soil.

DMI reforests stands managed for deciduous production through natural regeneration by suckering without any site preparation. Disturbed areas such as in-block roads, chipper sites and burn pile locations are reclaimed and treated as required to retain the productivity of the block.

6.3.3 Planting

Planting is usually scheduled for the spring or summer after harvesting. The preferred stock for both white spruce and lodgepole pine is 1+0 or 2+0 412B. MDFP's long term performance results indicate that a higher microsite is the preferred location for planting.

After stock is planted, empty seedling boxes will be placed securely within debris burn piles for burning (*i.e.* boxes could not be exposed by strong winds or wildlife).

Reforestation activities will be applied along with the remainder of the harvest block on inactive seismic lines not required for access (i.e. – trappers).

6.3.4 Stand Tending

On richer coniferous dominated sites, tending of regenerating stands is usually required to reduce mortality of crop trees and to achieve the species proportion targets of the PFMS. MDFP conducts assessments of planted harvest blocks for the first three years after harvest. This assessment is completed aerially and is used to assess the general status of the reforestation and to identify areas which may benefit from a release treatment.

Selected treatment areas are scheduled for ground verification to confirm seedling condition and the need for treatment. MDFP has developed a decision tree to guide tending prescriptions to specific sites (Figure 6-2). This decision tree represents a general approach to stand tending decisions and may not necessarily be followed in all instances. If the ground inspection confirms that a treatment is required, they are then scheduled for an aerial herbicide treatment. MDFP completes aerial herbicide treatments annually in order to control the vegetation that is in competition with the coniferous seedlings.

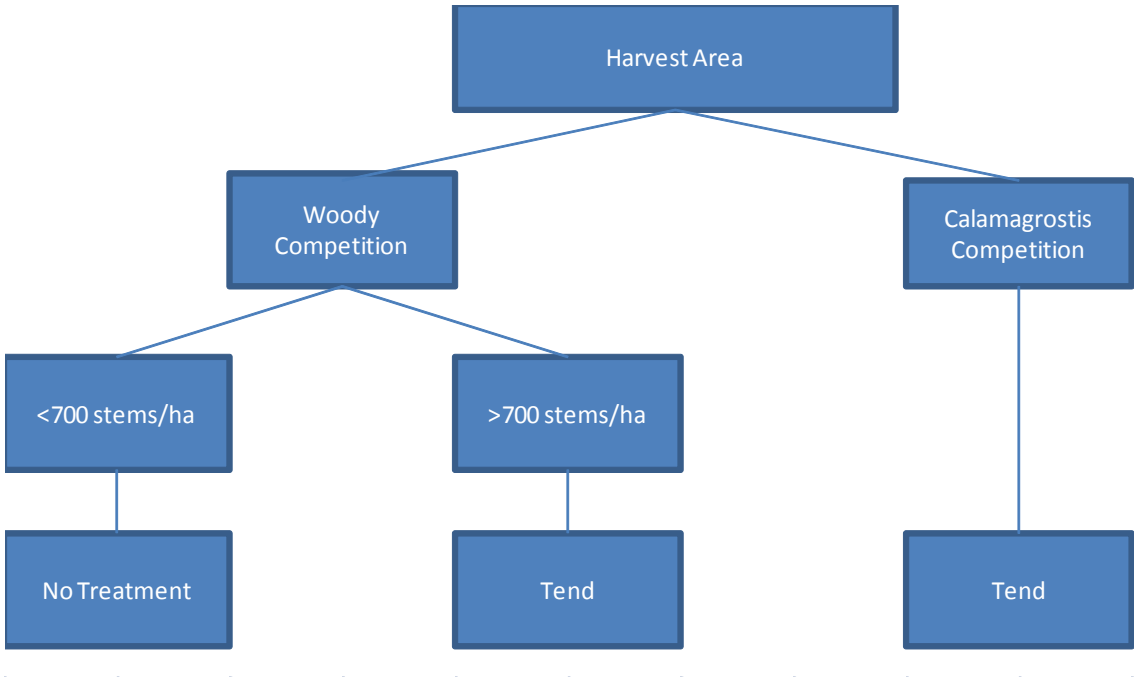

Figure 6-2. Tending prescription decision tree

Occasionally, MDFP will access additional funding (i.e. FRIAA) and complete a stand tending treatment on harvest areas that are no longer MDFP responsibility (i.e. MOF blocks or blocks for which performance surveys have been completed). These treatments often use alternatives to aerial herbicide application such as brush saw or ground application of herbicide.

6.4 Genetic Resources and Tree Improvement Program

In 1995 MDFP, along with several industrial partners and ESRD, began implementation of regional genetic resource and tree improvement programs. These programs include the following components:

- Control of collection and transfer of wild seed/stock for reforestation activities.
- Implementation of controlled parentage programs for both lodgepole pine (Breeding Region J) and white spruce (Breeding Region G2).

6.4.1 Wild Seed/Stock

Alberta requires that all seed and stock utilized for reforestation purposes originate within the Seed Zone in which it is deployed. This ensures that forests are replaced with trees that are genetically similar to previous forest stands, are sufficiently diverse genetically and are adapted to local conditions.

Currently the Provincial Seed Zones are consistent with the 2005 version of Alberta's Natural Sub-regions (Table 6-4). In total, five Seed Zones are located within the FMA Area (Figure 6-3). The FMA Area is predominantly within the Lower Boreal Highlands Sub-region/Seed Zone, with lesser portions in the other seed zones (Table 6-4). The FMA portion within LBH 1.1 represents only approximately 0.1% of the FMA Area and is in located at the extreme northern boundary. MDFP ensures that adequate quantities of seed are collected from each Seed Zone to accommodate its projected reforestation requirements.

Table 6-4. Seed Zone Composition within the FMA Area

Seed Zone	Area (Ha)	Percentage (%)
CM 1.3	83,721	9
DM 1.2	27,500	3
LBH 1.1	1,498	0
LBH 1.6	735,292	79
UBH 1.3	82,089	9
Total	930,100	100

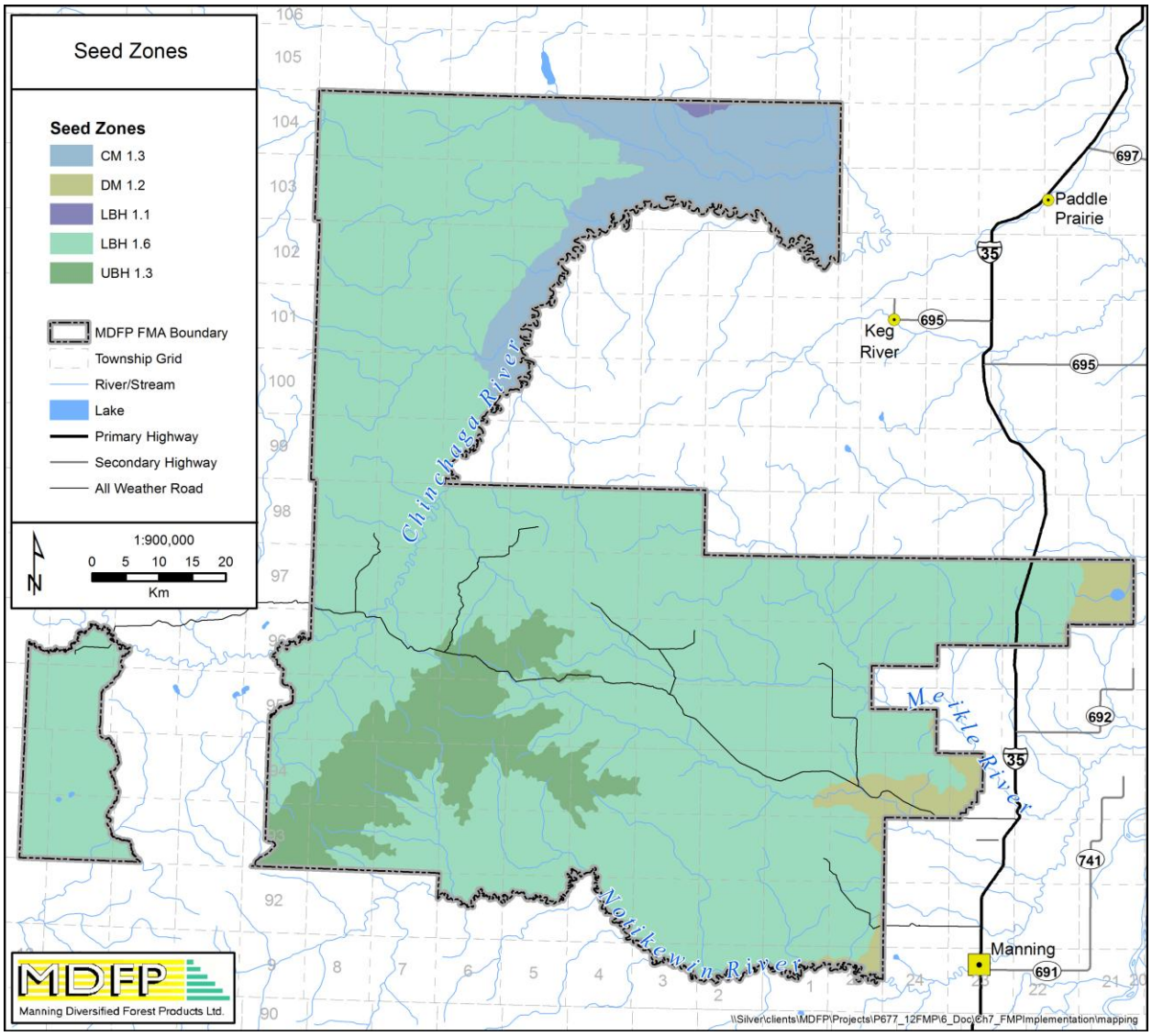

Figure 6-3. Provincial Seed Zones within the FMA Area

6.4.2 Seed Requirements

MDFP manages the amounts of tree seed on hand to adequately meet reforestation requirements. Table 6-5 summaries by seed zone, the amount for seed required to reforest the coniferous landbase portion of the SHS and the seed currently in storage as of May 2013.

Table 6-5. Seed requirements and availability

Seed Zone	Seed Inventory (kg)	Number of seedlings that could be planted with current seed inventory	Area that could be planted with current seed inventory (ha)	Approximate 4rea to be cut in next 10 years (ha) (run 18009)	Seed required for next 10 years (kg)	Required to collect (kg)
White Spruce						
G2 (Stream 2)	7.19	1,055,831	704			
CM 1.3	14.20	4,003,464	2,669	0	0.00	n/a
DM 1.2	15.32	2,716,353	1,811	399	3.38	n/a
LBH 1.6	172.04	30,603,474	20,402	19,694	166.07	n/a
UBH 1.3	6.85	1,236,873	825	1,194	9.92	3.07
Lodgepole Pine						
J (Stream 2)	0.92	2,171	1			n/a
CM 1.3	0.00	0	0	0	0.00	n/a
DM 1.2	0.00	6,387	4	4	0.05	0.05
LBH 1.6	46.83	6,170,769	4,114	3,842	43.74	n/a
UBH 1.3	43.18	6,253,476	4,169	1,378	14.27	n/a

6.4.3 Tree Improvement Program

In 1995, MDFP, along with several other industrial partners and ESRD, began the implementation of a regional tree improvement cooperative program. Programs are Region G2 for White Spruce and Region J for Lodgepole Pine (Figure 6-4). These programs are managed by the Forest Genetics Alberta Association (FGAA). FGAA north-west is a cooperative with membership from MDFP, ESRD and Tolko Forest Industries High Level. Each member has shares in Region G2 and J and the costs are split by membership share. Generally, the industry members carry out the implementation of the programs while ESRD provides scientific and technical expertise. The stream 2 seed production resulting from the programs is split according to each partner membership share.

Seed orchards for Regions J and G2 are located in Northstar, Alberta (Figure 6-5). Progeny trials have also been initiated for Regions J and G2. FGAA north-west has established one progeny trial, with white spruce, on private land near Battle Tower (Figure 6-5). A second site, located at Hotchkiss, has also been planted to white spruce and lodgepole pine, but still has room for additional plantings. FGAA north-west also maintains a progeny trial site at Sweeney Creek (northwest of Worsley and southwest of the FMA) which also contains spruce and pine stock. A pine trial site is planned for Zama Ridge, north of the FMA Area. Refer to Appendix VIII and Appendix IX for Controlled Parentage Program reports for Regions J and G2.

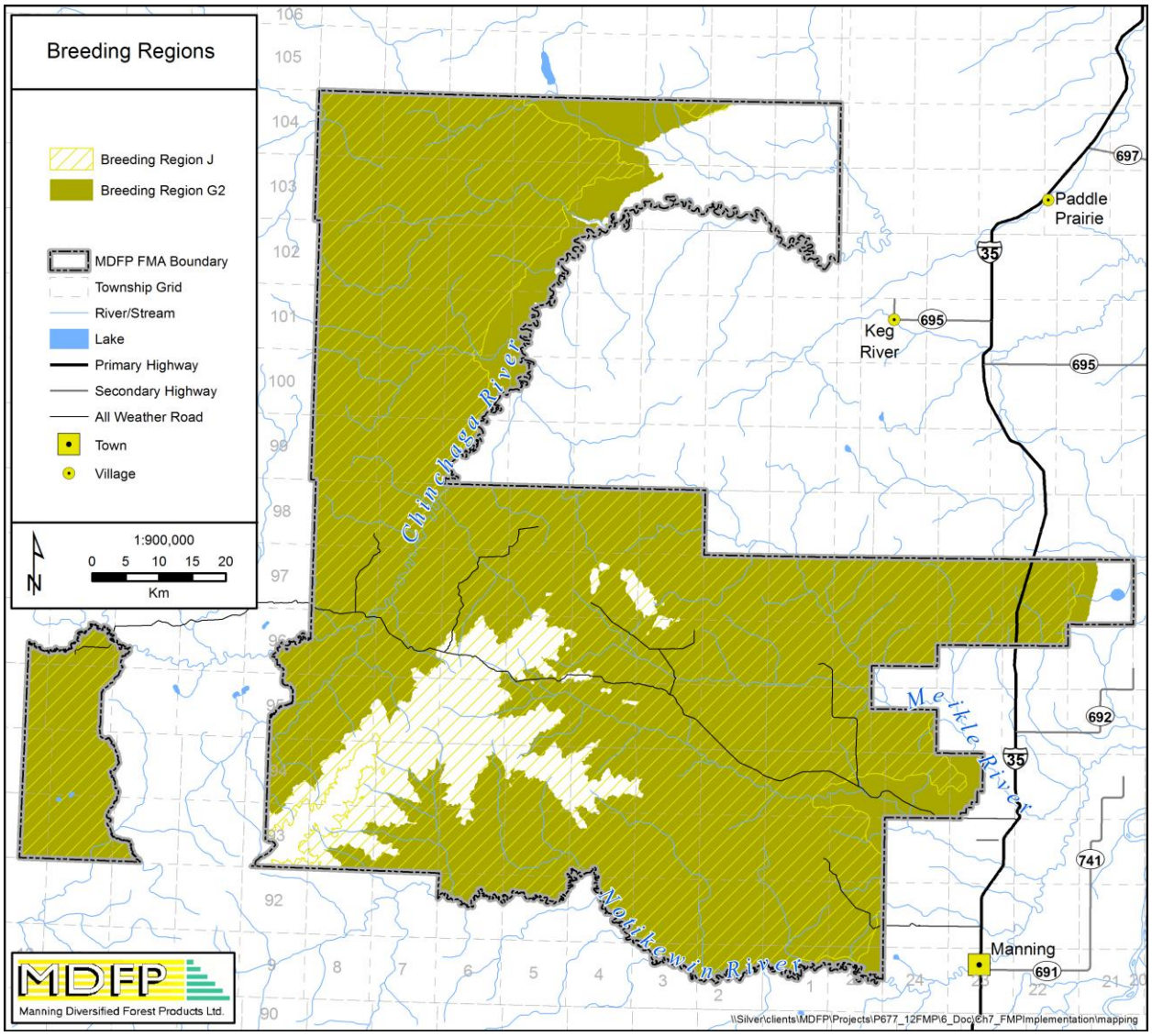

Figure 6-4. Breeding regions encompassing MDFP's FMA Area (Region J for lodgepole pine and Regions G2 for white spruce)

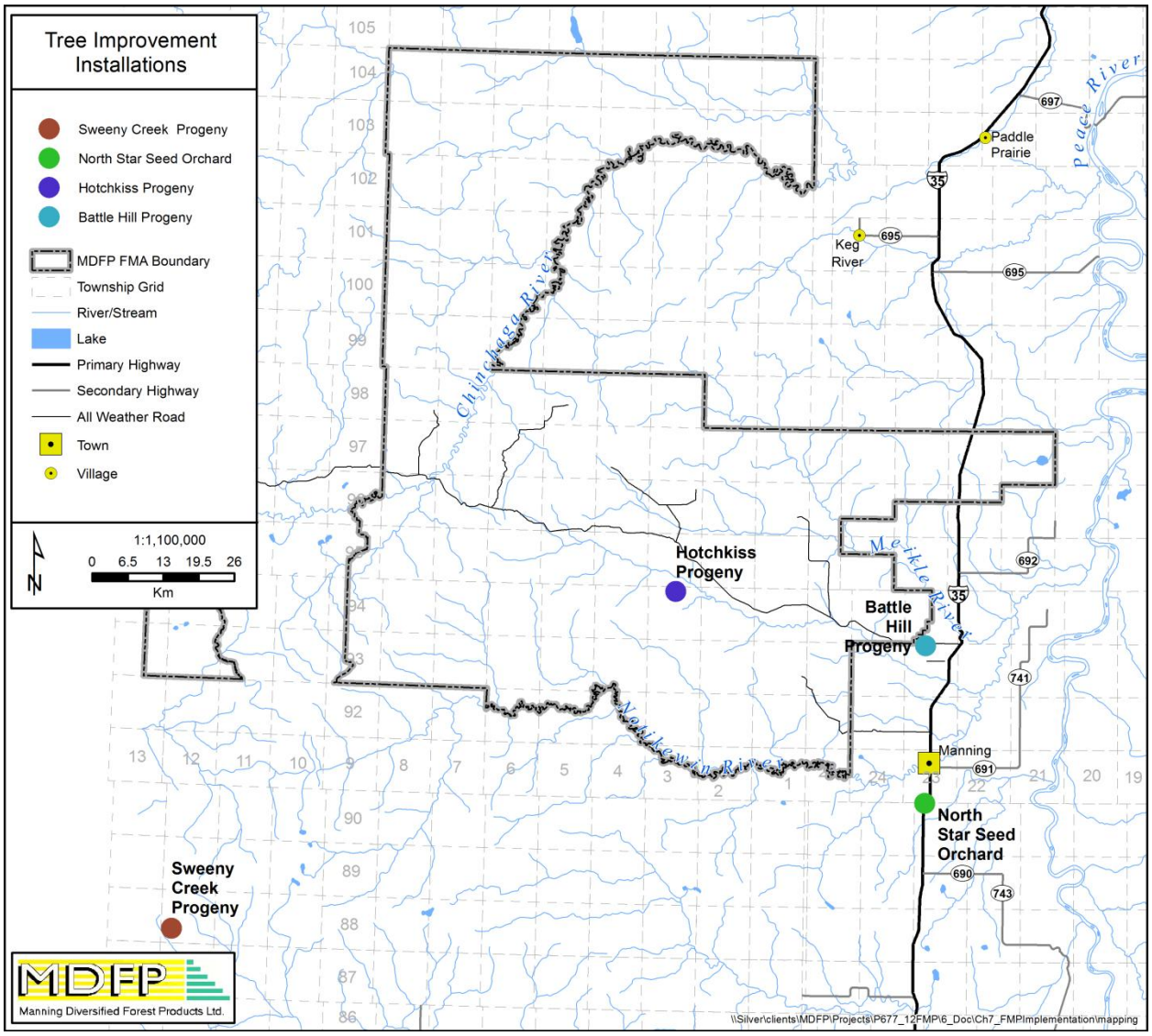

Figure 6-5. Location of seed orchard and progeny trial sites.

To maintain wild seed sources, in-situ genetic conservation areas are required for each seed zone. The need for in-situ genetic conservation areas regionally and within the FMA Area has not yet been determined by ESRD.

For the 2012-2021 FMP, MDFP did not include an annual cut effect from tree improvement. Improved seed yield curves were not present in the PFMS. At this time, MDFP will continue to be a member of FGAA and bank their share of seed. The G2 and J breeding region boundaries are different than the provincial seed zone boundaries and as a result, there may be some limited deployment of improved stock using stream 2 seed in the seed zones that MDFP has insufficient stream 1 seed. Any deployment of improved stock will be reported to ARIS (from Action Item 21-005).

6.5 Enhanced Forest Management

Manning Diversified does not have an enhanced forest management program. No enhanced forest management scenarios were investigated in the development of the 2012-2021 FMP.

7. Forest Protection

Wildfire and forest pathogens are natural components of the forested ecosystems of northwest Alberta. The forests within the FMA Area developed under conditions dominated by wildfires. Insects and diseases are generally present at low levels within these forests however severe infestations can occur and may destroy or weaken extensive tracts of forest.

MDFP's forest protection strategies are aimed at reducing the risk, occurrence and severity of wildfires and pathogen outbreaks. The company also addresses the risk associated with windthrow which has the potential to affect standing timber adjacent to forest harvesting operations.

7.1 Fire Protection Strategy

The forests of northwest Alberta developed under conditions in which wildfires were a dominant landscape factor. Wildfire has the potential to significantly impact the timber resources within the FMA Area. The Company also utilizes fire in its forestry operations (i.e., burning of debris piles). The Fire Protection Strategy addresses both wildfires and operational use of fire.

The Company's Fire Protection Strategy includes the following components:

- Education – Field staff training is two-pronged, focusing on prevention and wildfire control.
- Detection – Field staff will likely be the first to encounter a wildfire, particularly a fire ignited as a result of field operations or a fire associated with a debris pile. Procedures related to equipment checks and debris pile checks are designed to help ensure early detection of an ignition.
- Reporting – Fire reporting requirements are reviewed with field staff and contractors. The Fire Control Plan outlines Company reporting requirements.
- Prevention – Fire prevention strategies include:
  - Reliance on winter harvesting operations

- Incorporation of FireSmart modeling in the FMP.
- Strict procedures related to burning of debris piles.

- Pre-suppression – Assist ESRD staff in their pre-suppression efforts (when MDFP staff members are available).
- Suppression – Assist ESRD staff in suppression efforts (when MDFP staff members are available).

The Company's Fire Protection Strategy is provided in Appendix X.

Wildfire events are a natural part of the boreal ecosystem. They create unique habitats and are important from a biodiversity perspective. Within the FMA Area, the following strategies will be implemented when harvesting burned areas, to comply with the VOIT #7 (1.1.1.5a) for the FMP:

- Whenever feasible, all unburned trees in green islands will be retained (i.e., recognizing timber condition, access and other non-timber values)
- At the Compartment scale, retain a minimum of 10% of the merchantable black trees in patches greater than 100 hectares.
- At the harvest area scale, retain a minimum of 10% of the merchantable black trees in patches 10 – 100 hectares and retain a minimum of 5% of black trees in small patches and single stems.

7.2 Forest Health Strategy

The FMA forests, like all natural ecosystems, have developed in conjunction with numerous pests. Generally, these pests are endemic and present at low intensity. Occasionally, pest epidemics occur, generally associated with one of a handful of insect species. Epidemics may be cyclical or may be related to vegetation or climatic factors.

MDFP's Forest Health Strategy was developed with a focus on detection of pest outbreaks. The Forest Health Strategy includes the following components:

- Education – Field staff will be provided with the training required to recognize pests and/or signs of infestation.
- Detection – Field staff will likely be the first to encounter forest pests and the importance of their role in detection will be stressed. MDFP often contributes to regional detection programs (e.g., detection traps, survey assistance, etc.).
- Reporting - Infestation must be reported internally and MDFP will forward any significant sightings to ESRD.
- Control - Pest control is the mandate of ESRD, but MDFP has the ability to aid their efforts through its harvesting and silvicultural practices.
- Develop targeted programs to address infestations where appropriate.

The Company's Forest Health Strategy is provided in Appendix XI.

A MPB strategy was developed for the 2012-2021 FMP to address the unprecedented MPB infestation in the FMA. This comprehensive strategy influenced all phases of MDFP forest management from access to harvesting and reforestation (refer to Appendix III for more information).

7.3 Windthrow

Windthrow is a natural event which can occur in any forest given sufficient winds. There is very little that MDFP can do to prevent windthrow from occurring in mature, natural origin stands. However, the Company can address increased windthrow potential associated with forestry operations.

Forestry operations can increase windthrow potential by creating openings and exposing non-windfirm forest. This is especially a concern in structure retention and watercourse buffers, because of the spatial arrangement of the residual standing forest cover.

Strategies to address windthrow concerns include:

- Incorporation of windthrow concerns into the structure retention strategy (i.e., significant retention in patches rather than single-stem retention).
- Design of harvest blocks to reduce potential windthrow (e.g., potential to incorporate adjacent areas into a harvest block if they are not windfirm).

Natural windthrow events (i.e., not related to forestry operations) create unique habitats and are important from a biodiversity perspective. Within the FMA area, 10% of stems associated with natural blowdown events will be left unsalvaged.

7.4 Invasive Species

MDFP, Buchanan Lumber and DMI are some of the many commercial stakeholders that operate within the FMA area. All commercial stakeholders that operate within the FMA Area as well as recreation users have a potential to introduce invasive plant species into the area, particularly if they are involved in road construction or other land clearing operations.

Forestry companies within the FMA area are required to submit annual Weed Management Plans.

Strategies employed by MDFP to reduce the risk of introducing invasive species include:

- Minimize clearing of land that will require reclamation;
- Consider the use of native plant species for reclamation purposes, once appropriate alternatives are available;
- Require that all construction and harvest equipment entering the FMA area on the company's behalf to be clean;
- Report infestations to ESRD; and
- Continue to cooperate with Alberta on invasive species initiatives.

8. Protection of Forest Resources

8.1 Forest Soils

Forest soils support the growth of trees and other vegetation. Productivity of forest stands is generally directly related to the nutrient status of a soil and its ability to store and provide water to the vegetation. Maintenance of forest soil quality is important for sustaining forest growth.

Forestry operations can impact soils in the following ways:

1. Nutrient source removal – During forest harvesting trees are removed from the site, rather than burning/decaying or decaying and being incorporated into the soil matrix by decay organisms.
2. Decreased ability to transpire moisture – Vegetation removes moisture from the soil as the vegetation transpires. If forest cover is removed from wetter sites, excess water may create problems for re-growth of vegetation.
3. Compaction – Soils can be compacted during harvesting or silviculture operations by machinery traffic. Compacted soils are less able to support re-growth of vegetation.
4. Erosion and slumping – Removal of the organic soil layer or agitation of soils can result in soil erosion and slumping. Soil erosion and slumping are particularly a concern in the vicinity of riparian areas where the sediment can impact water quality.

MDFP has identified strategies to reduce the risk of impacting soils during forest operations within the FMA Area.

8.1.1 Nutrient Source Removal

The Structure Retention Strategy (Appendix V) ensures at least 3% of harvested areas are retained as non-harvested areas within the harvest block boundaries. As the retention trees die and decay, they provide additional soil nutrients.

Extensive forest management strategy with associated long rotation ages. Regenerated stands are usually not available for harvest for at least 60 years after the last treatment, providing the soil time between harvest activities to replenish nutrients.

8.1.2 Moisture Transpiration

Forest stands that are likely to have excess moisture concerns have been excluded from the active landbase and will not be harvested. Black spruce and larch stands, which tend to be associated with wet sites, are not available for harvesting unless the Timber Productivity Rating is 'Good'.

The Structure Retention Strategy (Appendix V) ensures that at least 3% of harvest areas are retained as structure within the harvest block boundaries. The retained trees utilize soil moisture to continue their growth.

MDFP's silviculture program results in rapid and successful regeneration of harvested areas (see section 6). MDFP utilizes site preparation equipment that leaves significant amounts of lesser vegetation on-site and, on moist sites, uses equipment that produces raised planting sites. DMI's deciduous harvest operations rely on suckering to rapidly re-establish its harvest blocks. The newly established trees, along with the lesser vegetation retained on the site all utilize soil moisture to support their growth.

8.1.3 Compaction

MDFP conducts forest harvesting and site preparation operations during the winter months, when forest soils are generally frozen. DMI also conducts the majority of its operations during the winter months. Frozen ground resists compaction from the operational equipment.

In-block roads and landings are subjected to repeated machine traffic and have a higher risk of being compacted than other areas of the harvest block. The Provincial Timber Harvest Planning and Operating Ground Rules require that these areas account for less than 5% of the block area.

8.1.4 Erosion and Slumping

Conducting forestry operations during winter months, maintaining structure retention, rapid regeneration of harvested areas and site preparation techniques that leave significant amounts of lesser vegetation on-site help reduce the risk of soil erosion and slumping within harvest blocks.

Soil erosion and slumping are also a major consideration for access construction. Watercourse crossings are a particular concern, because sediment has the potential to impact water quality. The FMA's Road Planning, Construction, Maintenance, Reclamation and Monitoring Strategy (Appendix VI) provides details regarding incorporation of erosion and slumping concerns into the development and construction of access and watercourse crossings.

8.2 Hydrologic Resources

Forestry operations impact hydrologic resources in two basic ways. At a landscape level, harvesting affects watershed dynamics by removing forest cover (which reduces water capture/uptake), resulting in potentially increased run-off over the short term until the forest cover is restored. At a site-specific level, operations could impact water quality by interrupting/altering stream flows, introducing sediment into the water, increasing debris within channels, etc. Because lakes, rivers, streams and associated riparian zones provide specific habitats for fish and other fauna, any impacts related to water quality may also impact habitat quality.

There are two general approaches used within the FMA Area to protect hydrologic resources: avoidance (through buffering) and operational practices, primarily related to access development and watercourse crossings.

The following buffers have been incorporated into the forecasting and the PFMS and are excluded from forestry operations (*i.e.* not part of the active landbase):

1. Watercourse buffers within harvest areas, as outlined in the Timber Harvest Planning and Operating Ground Rules
2. 200 m buffers around all trumpeter swan nesting lakes
3. Establishment of the Notikewin Habitat Zone along the Notikewin, Meikle, Hotchkiss and Botha Rivers.

Because forest harvest operations avoid riparian areas, the operational considerations relating to protecting hydrologic resources generally address access development, construction and maintenance. Selection of access routes takes hydrologic resources into consideration. It is, however, not possible to avoid hydrologic features completely when planning and constructing access. Construction of watercourse crossings are a particular concern, because sediment has the potential to impact water quality as well as change stream flow and create barriers to fish passage. The FMA's Road Planning, Construction, Maintenance, Reclamation and Monitoring Strategy (Appendix VI) provides details regarding incorporation of water quality concerns into the development and construction of access, including watercourse crossing selection, installation, maintenance, removal and rehabilitation.

Operational practices designed to minimize the impact on hydrologic resources were identified by MDFP and accepted by the PDT as part of the hydrologic analysis (Action Item 25-004). Good operational practices providing sufficient mitigation measures are:

1. Good road location practices and the use of tools such as wet areas mapping. This is especially important for summer operations.
2. Timely removal of temporary roads.
3. Watercourse crossings will adhere to the Operating Ground Rules and Code of Practice.
4. Tools such as wet areas mapping will be used for summer operations to avoid sensitive and wet soil areas in order to minimize site disturbance associated with road construction and skidding.
5. Proper timing and location of proposed operations will be used in order to minimize the risk of erosion. Wetter areas will generally be operated during times of frozen ground and summer operations will be shut down in the event of excessive precipitation.

The details pertaining to the above will be clarified in the ORGs which will be developed after the approval of the FMP.

8.3 Aesthetics

Aesthetics is a highly individualized concept. Landscapes that appeal to one person may not be pleasing to another. The forests of northwestern Alberta developed under fire regimes which included large wildfires. Today, these large wildfires would likely be considered unattractive to the public. Aesthetics are important to forest resource managers because it puts a visible face to forestry activities; forest management may be judged by the public on the basis of aesthetics.

MDFP recognizes the importance of aesthetic considerations along the major travel corridors within the FMA Area. However, the Company is also aware that good forest management practices may not always be compatible with preserving current viewscapes.

Within Canada, much of the public perception of forest management is formed by the aesthetics associates with patch (clear cut) harvest systems. The trees are harvested, leaving a tangled mess of scattered standing trees and woody debris. The general public sees an unaesthetic, 'impacted' landscape. However, patch harvesting is an important component in management of boreal forests. Sound forest management practices need to incorporate patch harvesting where it is appropriate, despite potential public concern regarding the aesthetics of the practice.

MDFP's strategy for managing aesthetic resources along travel corridors will incorporate three steps:

- Highway Management Zone was created along Highway 35 and the Chinchaga Forestry Road (125 m wide, along each side of the roadway); refer to Annex VII for more information. Within this Zone, aesthetic concerns will be a high priority.
- Design timber harvesting and other forest operations within the Highway Management Zone with the intent of softening the impacts on the viewscapes. Harvest block design will be the primary means of helping to maintain aesthetic values within the Zone.
- Where viewscapes are negatively impacted, incorporate appropriate educational materials into the Company's Public Consultation Plan to educate the public regarding the role of clear cut harvesting and other activities in renewing the forest.

Management for aesthetic resources will be initiated with the development of Final Harvest Plans for any harvest areas within the Highway Management Zone. The GDP will recognize the need for addressing aesthetic concerns in these areas and will provide an overview of how the harvesting will be approached. At this stage (GDP), the Company will include information regarding its operations within the Highway Management Zone into its Public Consultation process. Input from the Public Consultation process will then be incorporated into the Final Harvest Plan.

9. Maintenance of Biodiversity

Biodiversity refers to the variability of living organisms. Like ecosystems, biodiversity can be assessed at different scales, from the landscape level to that of individual species. In 1995, the Canadian Council of Forest Ministers recognized three distinct components of overall biodiversity:

- Ecosystem;
- Species; and
- Genetic diversity.

Ecosystem diversity is, to some extent, dictated by regional landforms and climate and their interactions. Landforms as diverse as riparian areas and plateaus occur within the FMA Area, setting the stage for a wide range of vegetation and related wildlife communities.

Species diversity refers to the range of plant and wildlife species present within an area. Species richness and abundance varies between different habitat types and between seral stages. Some habitats tend to produce communities with a rich mix of species, while others may be more limited.

Genetic diversity addresses the inherent variability within the genes of an individual species. Genetic diversity reflects the evolutionary history of a species and its historic and current distribution. Species vary considerably in their genetic variability.

All three components of biodiversity are important for maintaining the range of habitat types and species that currently and historically have existed within the FMA Area. MDFP's approach to biodiversity maintenance will focus primarily on ecosystem and species components. Genetic diversity is a consideration primarily from the perspective of regeneration of commercial tree species. The Company will utilize a coarse-filter approach to ensure retention of a diversity of ecosystems. This will, in turn, help secure the future of the most of wildlife species. Several wildlife species that are considered to be at risk will be the focus of additional management efforts.

9.1 Ecosystem Diversity

Conservation of ecosystem diversity will be a primary focus for MDFP's biodiversity conservation efforts. According to Smith (1980), 'ecosystems may be as large as vast, unbroken tracts of forest or as small or smaller than a pond'. The ultimate purpose of conserving ecosystem diversity is to ensure that current ecological functioning is maintained at all scales. To ensure the spatial and temporal distribution of future forests are similar to current (and historic) conditions, targets were established for seral stage representation and for Old Interior Forest analysis. Unique or rare habitats, communities and ecosystems are addressed through a number of management commitments and policies designed to identify and protect these resources.

9.1.1 Seral Stage Representation

The distribution seral stage, over the 200 year planning horizon, was ensured through the forecasting (refer to Chapter 6 - PFMS). The area of each seral stage was provided as indicator, to facilitate determination of the PFMS and the PFMS was selected to ensure appropriate seral stage representation. The strategy for maintenance of seral stage representation will be the implementation of the SHS.

9.1.2 Old Interior Forest

Maintenance of Old Interior Forest, over the 200 year planning horizon, was ensured through the PFMS. An Old interior forest target was included as a strategy in the forecasting. The PFMS was selected to ensure appropriate area was maintained as Old Interior Forest. The strategy for maintenance of Old Interior Forest will be the implemented through SHS.

9.1.3 Disturbance Patches

A management objective was, over the 200 year planning horizon to create a distribution of disturbance patches that mimics natural variation. The PFMS contains specific targets for the creation of disturbance patches to reflect this management objective and the outcome is reflected in the SHS. Implementation of the SHS as planned will create a distribution of disturbance patches that meets management objectives and targets. Refer to Chapter 6 for more information.

9.1.4 Wetlands

Wetland ecosystems represent some of the most productive habitat from a wildlife perspective and play a key role in watershed dynamics. Some wetland sites may support forest stands, generally black spruce and larch. These stands have been excluded from the landbase managed for timber operations and are not available for harvesting (refer to Annex VII for more information).

9.1.5 Structure Retention

A structure retention strategy for the FMA Area was developed to ensure harvesting more closely emulates fire at a stand level. The structure retention strategy is described in Appendix V.

9.1.6 Downed Woody Debris

Downed woody debris plays an important role in ecosystem functions, providing wildlife habitat and contributing to soil nutrient cycles. Forest harvesting operations generally result in an increase in Downed woody debris within a harvest block, since debris is generated but not removed. Control of excess downed woody debris within harvest blocks is maintained by burning of piled debris after completion of harvest activities.

9.1.7 Unique and Rare Components

MDFP is committed to protecting unique and rare sites within its FMA Area. Unique and rare sites can be identified on the basis of a wide variety of criteria, including:

- Ecological
- Archaeological
- Geological
- Environmental
- Cultural.

MDFP has implemented several initiatives to help identify and protect unique and rare sites. The Company's Unique Find Policy outlines the process used for identifying unique finds and ensuring adequate protection measures are identified and implemented. The Unique Find Policy is geared to identification and protection of sites that are relatively small spatially and have not yet been identified. Protection of larger significant sites is generally accommodated through the identification of special management zones (e.g., Notikewin Habitat Zone, Highway Management Zone, etc.).

Protection of rare plant communities, whose locations are not yet known, will fall under the Unique Finds Policy and protection requirements will be implemented in consultation with Alberta Natural Heritage Information Centre.

Unique Finds Policy

The Unique Finds Policy is designed to identify and protect relatively small sites that are likely to be identified during the course of forest management activities. Examples of Unique Finds include eagle nests, mineral licks, burial sites, rock outcrops, rare plants or plant communities, potential recreation sites, etc. The locations of these sites are not all known. Unique Finds are identified on an on-going basis, as staff and contractors work in the field.

MDFP's Unique Find Policy requires:

- The employees and contractors of MDFP will report any unique areas that they find through the normal course of their work, using the Unique Find Reporting Form. Finds will be reported to the woodlands manager.

The woodlands manager, in conjunction with the employee or contractor, will make the decision as to whether the site should be considered as a 'Unique Find'. Once a site is considered a Unique Find, the following steps are taken:

- Recommendations for protection will be discussed and the appropriate information recorded on the Reporting Form. A map and photo will be provided where possible. The recommendation for protection must be completed.
- A file of all Unique Finds will be kept and their locations tracked digitally.
- All finds will be reported to appropriate government agencies and, if applicable, to DMI and Buchanan Lumber for incorporation into their planning and operations.

A copy of the Company's Unique Find Policy and associated reporting form is provided in Appendix XII.

Special Management Zones

Special management zones have been identified within the FMA Area to facilitate protection of existing sites with unique values (*e.g*. habitat, recreation, aesthetics, etc.). The zones are used to identify the location and extent of sites that require special consideration in terms of forest management and/or operations. Special management zones are addressed in the in Landbase Documentation (Annex VII) and include:

Notikewin Habitat Zone

The Notikewin Habitat Zone is located along the Notikewin, Meikle, Hotchkiss and Botha Rivers. Harvest and other forest operations were excluded from the Notikewin Habitat Zone in the 2021-2021 FMP. Operations within this zone may be contemplated if required for non-timber values (e.g., reduction of blowdown, habitat maintenance, etc.).

Twisted Bog Moss Management Zone

A twisted bog moss sighting has been identified by Alberta Conservation Information Management System (ACIMS) within the vicinity of Twin Lakes Recreation Area in FMU P20. In order to protect this moss, a 1,000 m buffer was used to delineate a zone for the application of VOIT #6 (1.1.1.4): When encountered, Maintain 80% of the identified uncommon plant community area, for each community confirmed to exist within the FMA, as defined within the Alberta Conservation Information Management System (ACIMS).

Twin Lakes Lodge

Twin Lakes Lodge is a commercial stakeholder located within the east portion of FMU P20. Forest management activities in the vicinity of the lodge are directed by VOIT 35 (5.2.2.1b): contact the owners/operators of the lodge when operations are planned within 2 km of the lodge or recreation area.

Highway Management Zone

Highway 35 traverses the eastern portion of FMU P20 and the Chinchaga Forestry Road provides westerly access into southern portion of the FMA area. Relatively heavy use of these roads by the public led MDFP to create a 250 wide zone along the roads (125 m on either side of the road centreline). Any operations scheduled to occur within this Zone will incorporate aesthetic concerns.

Watercourse Buffers

To protect water quality and riparian habitat, buffers have been established along all watercourses, using standards prescribed by the Province in the Timber Harvest Planning and Operating Ground Rules. All forestry operations are excluded from these areas and the areas are excluded from the active forest landbase.

9.2 Species Diversity

Within the FMA area, management using a coarse filter approach will be relied on to sustain the majority of the species that occur. However, a coarse filter approach alone may not be sufficient in cases where species may be at risk, either through very low population levels or discontinuous populations.

Within the FMA area, the woodland caribou was identified as a species of concern. Additional management strategies were developed for the FMA Area to specifically address woodland caribou habitat concerns.

Trumpeter swan was also identified as species of concern. Because their habitat is associated with hydrologic features, strategies to address habitat concerns are based on avoidance.

9.2.1 Caribou Habitat Management Strategy

Woodland caribou (*Rangifer tarandus*) were identified as species of concern within the FMA area at the outset of development of the 2012-2021 FMP development. Recognizing the impact forest management activities, particularly harvesting, can have on caribou habitat, woodland caribou concerns were incorporated into the FMP development process. Additional details regarding the Strategy development are provided in Appendix IV.

9.2.2 Trumpeter Swan Habitat

Two hundred metre buffers have been established around all waterbodies that have been identified as trumpeter swan nesting areas (refer to Landbase Netdown document in Annex VII). All forestry operations are excluded from these areas and the areas are not included in the productive forest landbase.

9.3 Genetic Diversity

Although very little information is available regarding the genetic diversity of species on the FMA Area, there is a general assumption that natural levels of genetic diversity exist within the regional plant and animal populations.

MDFP, Buchanan Lumber and DMI are responsible for forest management activities within the FMA Area but do not have wildlife or non-forestry vegetation management/conservation responsibility. This limits scope of the Companies' involvement in maintenance of genetic diversity to commercial tree species. The Companies, through their reforestation programs, could potentially impact the genetic

diversity of commercial tree species within the FMA Area if reforestation seed/stock was obtained from limited sources. The following strategies will ensure genetic diversity of the commercial tree species within the FMA Area is maintained:

- MDFP will continue to utilize wild seed sources and may deploy limited amounts improved seed stock;
- MDFP will follow the requirements relating to tree improvement outlined by the Alberta Forest Genetic Resource Management and Conservation Standards; and
- MDFP will adhere to the Controlled Parentage Plan for Breeding Regions G2 and J, including requirements for in-situ and ex-situ conservation.

DMI generally relies on natural regeneration for reforestation.

10. Monitoring Program

10.1 Introduction

The 2012-2021 FMP is a long-term, forest-level plan that sets the general direction for forest management within the FMA for the FMP period (*i.e.* from May 2012 to April 2021). Successful implementation of the 2012-2021 FMP relies, in part, on ongoing monitoring, to ensure that the targets established for the FMP are attained. Monitoring is an important tool in adaptive forest management because it links forest management activities with their outcome. This ensures forest management techniques improve and also improves the ability to predict outcomes for forest management activities which in turn, leads to improved forecasting.

MDFP is committed to implementing monitoring programs to track progress toward attainment of FMP targets, as well as to ensure efficacy of its forest management activities. Monitoring programs are required to:

- Meet regulatory requirements; or
- Meet FMP reporting requirements.

As quota holders within the FMA, Buchanan Lumber and DMI are required to conduct monitoring associated with regulatory requirements and to meet commitments within the 2012-2021 FMP.

The following sections outline the monitoring commitments associated with implementation of the 2012-2021 FMP for the FMA area. Monitoring programs associated with regulatory requirements are identified, but not described in detail, since they follow direction set by Alberta.

10.2 Regulatory Requirements

To meet Alberta's regulatory requirements, a number of sampling and/or monitoring programs are completed by MDFP and the other forest products companies operating on the FMA area. These reporting requirements are linked, but are not specific to the 2012-2021 FMP. Regulatory reporting is required at ongoing periodic intervals, such as during AOP and the GDP submissions. While the 2012-2021 FMP does not alter these reporting requirements, a few products developed as part of the 2012-2021 FMP process clarify regulatory reporting and are identified in this section. The information provided below is intended to serve as a listing of the requirements and guides the reader to the relevant portion of the FMP.

10.2.1AAC Drain

Procedures to charge all timber harvested on the FMA were developed and approved by the PDT on July 4th, 2012 under Action Item 22-002 (ID: 365) and are summarized in Section 5.1.3 with the procedure summarized in Appendix I.

10.2.2RSA Targets

Reforestation targets were developed following the policies described in the Regenerated Standards of Alberta (RSA). Targets are expressed as Mean Annual Increment (MAI) values for each of the reforested strata (Table 6-1). All operators are required to adhere to the currently approved RSA program to manage MAI targets. Refer to Section 6.1.3 for more information.

10.2.3Seed Requirements

Table 6-5 summaries by seed zone, the amount for seed required to reforest the coniferous landbase portion of the SHS and the seed currently in storage as of May 2013. Refer to Section 6.4.2 for more information.

10.2.4Tree Improvement Program

The AAC for the 2012-2021 FMP was determined without the use of improved stock. MDFP committed to report on any deployment of improved stock during the FMP period. Refer to Section 6.4.3 for more information.

10.3 FMP Monitoring Requirements

10.3.1VOIT Requirements

Monitoring requirements derived from the 2012-2021 FMP are identified in Chapter 5 VOITs.

Table 10-1 summarizes VOIT reporting requirements arising from the 2012-2021 FMP. Refer to the detailed description for each VOIT to determine reporting requirements.

Table 10-1. 2012-2021 FMP VOIT reporting requirements

VOIT			Required Reporting Period
ID	Objective	Indicator	
1	1.1.1.1 Maintain biodiversity by retaining the full range of cover types and seral stages.	Area of Old, Mature and Regenerating forest in the FMA area by Cover Class.	FMP, Stewardship Report
2	1.1.1.2 a) Maintain biodiversity by avoiding landscape fragmentation.	a) Range of patch sizes on the FMA area.	FMP, Stewardship Report
3	1.1.1.2 b) Maintain biodiversity by avoiding landscape fragmentation.	b) Area of old interior forest of each Cover Class on the FMA area.	FMP, Stewardship Report
4	1.1.1.3 a) Maintain biodiversity by minimizing access.	a) Open all-weather forestry road density on the FMA area.	FMP, Stewardship Report
5	1.1.1.3 b) Maintain biodiversity by minimizing access.	b) Open seasonal / temporary forestry road length on the FMA area.	AOP, Stewardship Report
6	1.1.1.4 Maintain plant communities uncommon in FMA or province.	Maintained area or occurrence of each identified uncommon plant community within the FMA area.	FMP, Stewardship Report
7	1.1.1.5 a) Maintain unique habitats provided by wildfire and blowdown events.	a) Area unsalvaged in burned forest.	FMP, Stewardship Report
8	1.1.1.5 b) Maintain unique habitats provided by wildfire and blowdown events.	b) Area of unsalvaged blowdown.	FMP, Stewardship Report
9	1.1.1.6 Retain ecological values and functions associated with riparian zones.	Compliance with Operating Ground Rules (OGR).	Stewardship Report
10	1.1.2.1 a) Retain stand level structure.	a) Percent area with residual structure (both living and dead) within a harvest area, representative of the status (live/dead), sizes, and species of the overstorey trees within the FMA area.	Stewardship Report
11	1.1.2.1 b) Retain stand level structure.	b) Percentage of harvested area within the FMA with downed woody debris equivalent to preharvest conditions.	Stewardship Report
12	1.1.2.2. Maintain integrity of sensitive sites.	Sensitive sites (e.g. mineral licks, major game trails) within the FMA area.	Stewardship Report
13	1.1.2.3. Maintain aquatic biodiversity by minimizing impacts of water crossings.	Forestry water crossings in compliance with Code of Practice for Water Course Crossings within each subunit.	AOP, Stewardship Report
14	1.2.1.1 a) Maintain habitat for identified high value species (i.e., economically valuable, socially valuable, species at risk, species of management concern).	a) Successful implementation of Caribou Habitat Strategy within the Caribou Zone.	Stewardship Report

VOIT			Required Reporting Period
ID	Objective	Indicator	
15	1.2.1.1 b) Maintain habitat for identified high value species (i.e., economically valuable, socially valuable, species at risk, species of management concern).	b) Retained habitat for trumpeter swan.	FMP, Stewardship Report
16	1.3.1.1. Retain wild forest populations for each tree species in each seed zone through establishment of in-situ reserves, with an approved controlled parentage program (CPP).	The appropriate number and area (ha) of in-situ tree gene conservation reserves as directed by the FGRMCS.	Upon completion, Stewardship Report
17	1.3.1.2 Retain wild forest genetic resources through ex-situ conservation for species under CPP programs.	Number of provenances and genetic lines in ex-situ gene banks and trials.	Stewardship Report
18	1.4.1.1 Integrate transboundary values and objectives into forest management.	Stakeholder consultation.	Stewardship Report
19	2.1.1.1 Ensure all harvested areas are immediately replaced with a forest alligned with the regenerating	Percent of reforested openings that meet SR requirements at time of establishment survey.	Stewardship Report
20	2.1.1.2 Establish regenerating stands that adhere to the assumptions used in the FMP specific timber supply analysis.	Percent of reforested openings that achieve the MAI and structure targets at time of Performance Survey.	Stewardship Report
21	2.1.2.1 Limit conversion of productive forest landbase to other uses.	Implementation of forest landbase maintenance program.	Stewardship Report
22	2.1.2.2 Recognize lands affected by insects, disease or natural calamities.	Implementation of forest health agent identification and reporting program.	AOP, Stewardship Report
23	2.1.3.1 Control non-native plant species (weeds).	Noxious weed program.	Stewardship Report
24	3.1.1.1 Minimize impact of roading and bared areas in forest operations.	Compliance with OGRs.	Stewardship Report
25	3.1.1.2 Minimize incidence of soil erosion and slumping.	Compliance with OGRs and Forest Soils Conservation Guidlines regarding soil erosion and slumping.	Inspection reporting
26	3.2.1.1 Limit impact of planned timber harvesting on water yield.	Compliance with the SHS and adjustment of operations to mitigate significant predicted water yield impacts.	Stewardship Report
27	3.2.1.2 Limit impact of timber harvesting on water yield.	Number of Water Act penalties associated with timber	Stewardship Report
28	3.2.2.1 Minimize impact of operations in riparian areas.	Riparian buffers maintained as outlined in OGRs.	Inspection reporting
29	4.1.1.1 Further the understanding of the impact of forest management on carbon cycles.	Monitoring and assessing developments and requirements for carbon management and reporting.	Stewardship Report

VOIT			Required Reporting Period
ID	Objective	Indicator	
30	See VOIT ID 21 (2.1.2.1) above .		Stewardship Report
31	5.1.1.1 Establish appropriate AACs.	Process described in Annex 1 is followed and standards are met.	Progressive and continuous (when AAC changes)
32	5.2.1.1 a) To reduce wildfire threat potential by reducing fire behaviour, fire occurrence, threats to values at risk and enhancing fire suppression capability.	1) Percentage reduction in Fire Behaviour Potential area (ha) within the FireSmart Community Zone.	FMP, Stewardship Report
33	5.2.1.1 b) To reduce wildfire threat potential by reducing fire behaviour, fire occurrence, threats to values at risk and enhancing fire suppression capability.	2) Percentage reduction in Fire Behaviour Potential area (ha) across the FMA area, now and over the planning horizon.	FMP, Stewardship Report
34	5.2.2.1 a) Integrate other uses and timber management activities.	a) Availability of MDFP roads for use by other commercial forest users and the public.	Stewardship Report
35	5.2.2.1 b) Integrate other uses and timber management activities.	b) Communication with Twin Lakes Lodge when operating near Twin Lakes.	Stewardship Report
36	5.2.2.1 c) Integrate other uses and timber management activities.	c) Protection of aesthetic resources along Highway 35 and the Chinchaga Forestry Road.	AOP
37	5.2.3.1 Maintain Long Run Sustained Yield Average.	Regenerated stand yield compared to natural stand yield.	Revised Timber Supply Analysis, Stewardship Report
38	6.1.1.1 Implement Public Involvement Program.	Meet Alberta's current expectations for First Nations consultation.	FMP, GDP, Stewardship Report
39	6.2.1.1 Implement Public Consultation Process (PCP).	Meet expectations of Section 5 of CSA Z809-02.	FMP, Stewardship Report

10.3.2DMI and MDFP MOU Requirements

Reporting requirements related to management activities described under the MOU are addressed by other programs. MDFP and DMI agreed to report to ESRD if the MOU is cancelled for any reason during the FMP period. Refer to Section 3.1.1 and Appendix I for more information.

10.4 Growth and Yield Program

MDFP developed and implemented a Growth and Yield Program for the FMA as part of the 2007-2017 FMP. MDFP implemented the program and had completed 2 measurements on all Permanent Sample Plot (PSP) before the 2012-2021 FMP was developed.

A provincial task force comprised of ESRD and forest products industry representatives are currently reviewing growth and yield programs across Alberta with the intent of developing a provincial program. MDFP anticipates participating in the provincial growth and yield program when it is formalized over the next few years. The company has therefore suspending activity on its growth and yield program pending resolution of the provincial growth and yield initiative. For more information refer to PDT Action Item 19-009 (312) and 20-003 (321) first addressed on 19th PDT meeting held on March 21, 2012.

11. References

Alberta Sustainable Resource Development. 2006. Alberta Forest Management Planning Standard. Version 4.1. Public Lands and Forests Division, Forest Management Branch. 110 pages.

Appendix I DMI and MDFP MOU Summary

DMI and MDFP Memorandum of Understanding Summary

2012-2021 FMP

DMI and Manning Diversified have signed a Memorandum of Understanding (MOU) to formalize operations in some of the deciduous stands with coniferous understories and to address business to business interests. While the companies have agreed that the MOU will remain confidential, this document has been created to describe the portions of the MOU which will influence either the FMP development or its implementation. This document is intended only to provide the necessary background for FMP direction and for FMP implementation and does not alter or influence the MOU or either of the companies' rights or obligations. The intent of the MOU is that it should remain in effect for 10 years from the approval of the 2012-2021 FMP or until it is replaced by a new FMP. Should the MOU be cancelled while the FMP is in effect, the companies have agreed to notify SRD.

Deciduous Stands with Low Levels of Coniferous Understory

MDFP has agreed to transfer a portion of the stands from coniferous landbase to deciduous landbase, specifically, some of the stands that have deciduous overstory with low levels of coniferous understory and meeting very particular characteristics for management as deciduous stands. These stands are individually identified for DMI harvest in the net landbase file as MOU_DMI = "DUA_DMI". While these stands have been classified under the FMA agreement as coniferous landbase, under the MOU they will be designated as deciduous landbase and will be regenerated to fully-stocked pure deciduous stands (D-BCD stratum) after harvest. As per the MDFP Operating Ground Rules, DMI will apply understory avoidance techniques during harvesting to assist in the protection of advanced conifer regeneration.

Stands that meet this criterion are:

- DU stratum, and AVI 2.2 attributes of:
    - deciduous overstory height greater than or equal to 16 meters; and
    - understory height greater than 5 meters and less than or equal to 12 meters; and
    - an understory crown closure code of "0" (6%-10%); or
    - deciduous overstory height greater than or equal to 16 meters; and
    - understory height less than or equal to 5 meters; and
    - understory stem classification of "1" or "2" (less than 250 stems / ha).

In addition to the stands which meet the above criteria, DMI had previously laid out blocks in other DU stand types and MDFP has agreed that these blocks can be carried over into the 2012-2021 FMP and they will be treated as deciduous stands with low levels of coniferous understory. These additional DU blocks are identified in the landbase as MOU_DMI = "SUPP_DUA". In order to maintain approximately the same area of deciduous stands with low levels of coniferous understory, DMI removed an approximately equal area of DUA_DMI stands. Removed stands have been identified in the landbase as MOU_DMI = "REMV_DMI".

Deciduous Stands with Higher Levels of Coniferous Understory

MDFP has agreed to provide an opportunity for DMI to demonstrate the benefits of operational application of understory protection treatments in stands with higher density understory. DMI has identified up to 1,000 ha of deciduous stands with higher levels of coniferous understory which are eligible to receive understory protection treatments over the next 10 years. Stands identified by DMI, from eligible DU stands as described below, have been assigned in the landbase as MOU_DMI =

"DUB_DMI"[2]. During the term of the FMP, these stands are available for treatment by DMI. If these stands are operated, full understory protection treatments will be utilized that meet understory protection operating ground rules that DMI and MDFP will jointly develop with ASRD. DMI agrees to assume reforestation liability to achieve the MAI targets in the understory protection yield curve created for the 2012-2021 FMP. DMI has also agreed to develop and implement an ASRD approved Permanent Sample Plot program to measure the response and development of this treatment.

Stands that meet this criterion are:

- DU stratum, and AVI 2.2 attributes of:
- deciduous overstory height greater than or equal to 16 meters; and
- understory height greater than 5 meters and less than or equal to 12 meters; and
- understory crown closure of "3" or "4" (31%-50%).

Secondary Deciduous Volume

DMI has agreed to accept the secondary deciduous volume from coniferous operations in P20, however, there may be some limitations on volume of secondary deciduous that DMI can accept in a given year from the western portion of the FMA (Figure).

[2] All of the stands which DMI could operate under the MOU can be identified in the net landbase by selecting from the field MOU_DMI those stands with the attributes: "DUA_DMI" and "SUPP_DUA" and "DUB_DMI". Refer to Figure.

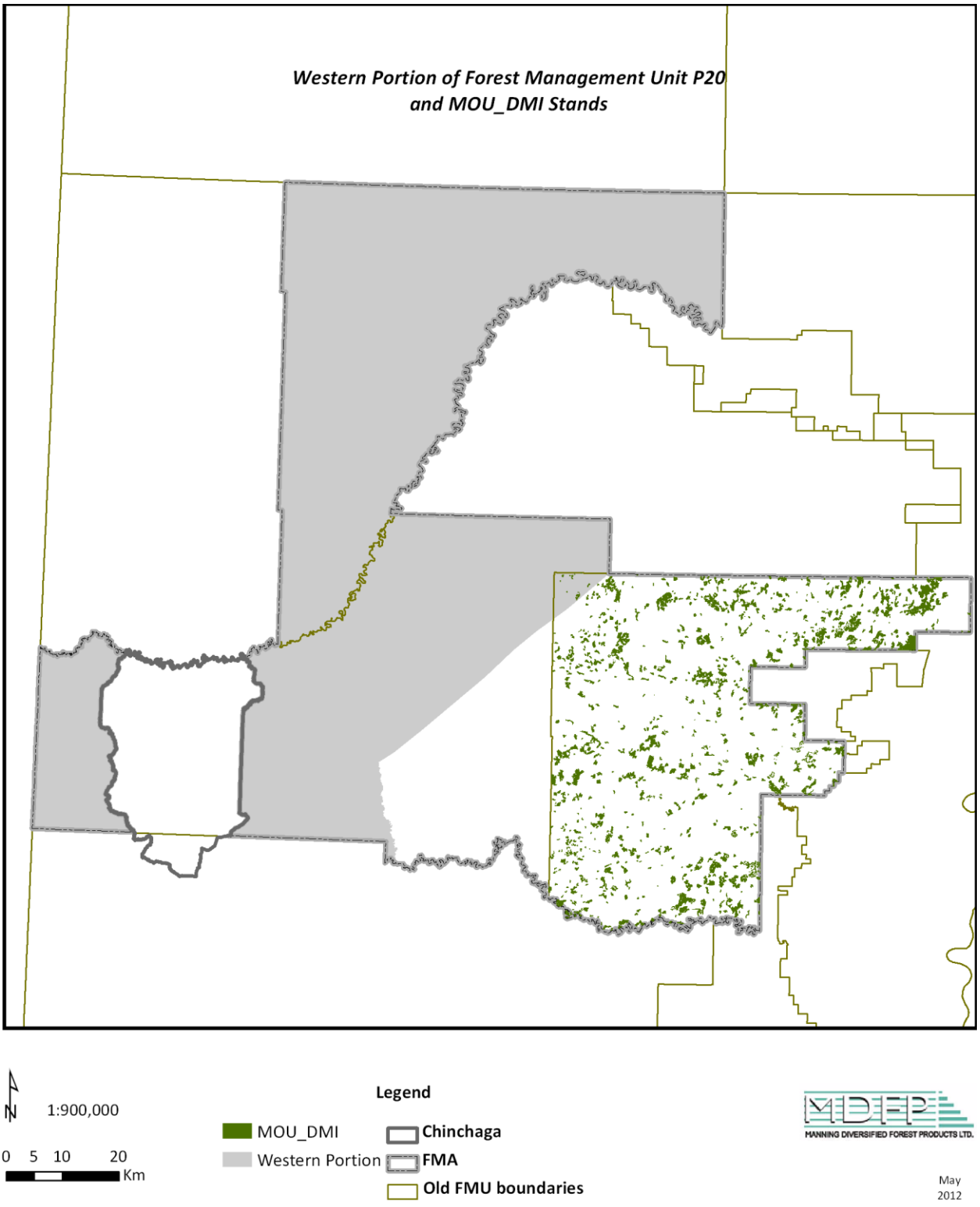

Figure 1. Operating area for deciduous secondary volume limits in the western portion of P20

Appendix II AAC Drain Procedures

The Annual Allowable Cut (AAC) Drain Procedures for MDFP's 2012-2021 FMP was approved by the PDT on July 4th, 2012 under Action Item 22-002 (ID: 365).

MDFP AAC Drain Procedures

2012-2021 FMP

July 4, 2012 (Revised June 21, 2013)

ESRD requires that all timber harvested on the FMA, regardless if it is delivered to a mill or not, be charged to (or drained against) the appropriate Annual Allowable Cut (AAC). Timber destroyed by natural processes is not drained against the AAC. The following procedures will be applied to drain harvested timber.

Mill Delivered Volume

Each operator must drain against their AAC allocation the appropriate volume harvested from FMU P20 and delivered to their mill. Mill delivered volume is reported by each disposition holder in FMU P20, to TPRS. A TPRS generated TM-7 is created each month where volume is hauled, and submitted to ESRD monthly.

Structure Retention Volume

This is the volume of merchantable trees left standing to provide structure within harvest blocks. Refer to the Structure Retention Policy for procedures for the calculation of volumes to be drained.

Structure retention volume is drained post harvest and submitted on a TM-7 by each disposition holder at the end of each timber year.

Alternate Utilization Volume

With ESRD's approval, operators may harvest timber using utilization standards which are different those used for the approved AAC. ESRD's approval to operate under different utilization standards includes an average % difference between the FMP approved utilization and the alternate approved utilization. At the end of the timber year, the total volume drained is multiplied by the % difference to determine the volume associated with the utilization relaxation. Where:

Drain Volume = (TPRS volume)/(1-%) – TPRS Volume

(for example if % is 5% and TPRS volume is 1000 m^3)

Drain Volume = 1000/0.95 – 1000 = 52.6m^3

This calculation is completed separately for volumes associated with both primary volume and secondary volume. This volume is drained post harvest and submitted on a TM-7 by each disposition holder (if applicable), at the end of each timber year.

The 2012-2021 FMP contains adjustment factors for two alternative utilization standards (*i.e.* 15/13 and 13/7) which could be used for AAC drain should MDFP chose to operation under either of the alternative utilization standards.

Log Fill Volume

The number of log fill creek crossings is tallied each year. Based on historical field measurements, each log fill is assumed to contain an average of 10 trees at 0.5 m^3 per tree. On average, 9 Deciduous trees are used one conifer tree is used per crossing.

This volume, for both coniferous and deciduous is drained post harvest and submitted on a TM-7 by each disposition holder at the end of each timber year.

Coniferous Field Cull Volume

Due to operational requirements of the Mill, MDFP removes some conifer log volume for quality control purposes in the bush. This volume is not reflected in the scaling at the mill. Therefore a joint study was conducted with ESRD and MDFP to determine the average coniferous volume in these pieces of 'field cull'. This average is $0.3m^3$ per hectare harvested.

The total coniferous drain is determined by multiplying the total hectares harvested by 0.3.

This volume is drained post harvest and submitted on a TM-7 at the end of each timber year. The Field Cull Drain method is applies only to coniferous volume received by MDFP.

Landuse Volume from Industrial Dispositions

MDFP has rights to 96.77% of the coniferous volume on FMA0200041, Buchanan Lumber has rights to 3.23% of the coniferous volume and DMI has rights to 100% of the deciduous volume.

Volume drain from industrial dispositions will be based on:

Coniferous

MDFP will drain 100% of the coniferous volume against MDFP's disposition (FMA0200041), based on the methods shown below:

1) Merchantable Volume will be calculated using the AVI Stand Type and associated Yield Curve from the active landbase for activities where spatial data is available (most major dispositions - LOC, PLA, MSL, etc). This calculated volume will be drained from MDFP's disposition. This volume will be submitted on a TM-7 at the end of each timber year. Non-merchantable volume and volume from the inactive landbase will not be drained.
2) FMA average merchantable volume (provided annually by MNP as part of the TDA Tables) will be used to calculate the merchantable volume drain for activities where spatial data is not available (typically TFA's). This volume will be submitted on a TM-7 at the end of each timber year.

Deciduous

The crown will calculate and drain from DMI's disposition, the deciduous volume resulting from all industrial activities.

Appendix III Strategy to Address the MPB Infestation

The Strategy to Address the MPB Infestation for MDFP's 2012-2021 FMP, dated November 28, 2013 was approved by the PDT on January 9, 2013.

Strategy to Address the MPB Infestation

2012-2021 FMP

November 28, 2012

Background

In 2006, an in-flight established Mountain Pine Beetle (MPB) in the western portion of P20. At the time, the MPB population was relatively small and the growth potential in an area with no history of the beetle was anticipated to be limited. MDFP's expectation was that MPB would have little impact on P20. The situation changed in 2009 when a much larger in-flight firmly established MPB across a large portion of the area between Manning and the Alberta/ BC border. Within P20, the oldest and heaviest MPB infestation is located in the south central and central portion of the Management Unit. The infestation is widespread throughout the Management Unit, with the majority of stands that have mature pine content, having some level of infestation. Working Circles 1 & 2, have the highest component of mature pine and the highest corresponding component of MPB infestation. As a result, this MPB strategy and MDFP's sequencing for the 2012 – 2021 FMP will focus on Working Circles 1 & 2.

The infested area encompasses a large part of the mature pine in P20 and thus represents a considerable risk to the forest and the company's timber supply. Addressing the infestation poses several challenges related to location of the infested stands. Specifically:

- Many of the heavily infested stands have the most costly fibre in terms of distance from the mill and access constraints which limits the amount of volume that can be sourced from this area. Annual haul distances and road costs must be balanced to maintain economic viability;
- Access to the infested stands is usually winter only, requiring up to 125 km of winter road to be constructed each year and due to the high costs, limits the number of consecutive years the that area can be accessed. The time required to construct the winter roads also limits the number of days during the winter that fibre can accessed;
- The lack of summer access prohibits large scale "dragging" site preparation which is a relatively low cost reforestation technique for pine. The lack of summer access also necessitates increased helicopter use and as a result increases the cost of other reforestation activities;
- The fibre in the infested stands is generally a smaller tree size and a lower quality than that obtained from traditional operating areas and on top of this the MPB infestation has further reduced log quality through mortality, checking and blue stain. Combined, these factors reduce the dimensions and grades of the mill's lumber, which lowers revenues and thus the company's capacity to economically operate these stands;
- This area contains the most costly fibre over the next 10 years for DMI as well, which limits the proportion of their fibre that can be sourced from this area. Since, under the current economic conditions, MDFP cannot operate this area without DMI accepting the incidental volume, the amount of conifer volume that can be sequenced over the next 10 years is also limited by the amount of incidental deciduous volume DMI will accept, further constraining MDFP's capacity to address the infestation;
- In much of the infested area, the pure pine stands contain smaller trees and a lower grade of timber than mixed species pine stands. Larger pine trees have a greater potential to produce

larger MPB populations than small pine trees and thus the mixed species pine stands pose a MPB spread risk. Economically, it is difficult to operate pure pine stands due to the small tree size, but harvesting mixed stands increases the volume of other species that are harvested along with the pine thus limiting the harvest of the trees with the greatest potential for MPB spread;

- The MPB infestation has been present for several years and recent analysis indicates a large loss in merchantable volume over the next several years providing only a short window to address the infestation ;and
- Over the past two years, areas within P20 supported some of the highest MPB growth rates in the province. This infestation has not shown any signs of ending in the P20 area.

Despite the challenges and constraints identified above, MDFP would like to address the MPB infestation to the limit of their ability and have proposed a strategy to reduce the impacts of the infestation.

Proposed MPB Strategy

The strategy consists of sequencing some moderately infested stands for harvest early in the FMP planning period and some lightly infested stands with high MPB growth potential for later in the FMP planning period along with alternative reforestation treatments. The objective in harvesting both moderately infested stands and lightly-infested older age pine stands is to improve the resistance of the forest to MPB and minimize impacts by harvesting as much pine as possible before it becomes unusable. The majority of the pine stands in the FMA are currently too young to support MPB population growth and harvesting operations. In the future, aggressive sequencing and harvesting these areas to manage the pine age class distribution will reduce the forest's susceptibility to MPB.

Sequencing

High priority MPB stands for harvesting operations will be identified within P20 based on the current red tree location, pine age and content, MDFP's ability to economically harvest, as well as the potential for spread based on the Northwest Region Mountain Pine Beetle forecasting. Stands with pine content will be ranked by height and pine content, MPB Stand Susceptibility Index (SSI) and presence of MPB in order to identify the stands that should be harvested. Operational harvest blocks will be created using the identified priority stands and the years to death maps from the MPB spread predictions undertaken as part of the North-west region MPB analysis.

There is more volume in currently infested stands than MDFP can harvest in the next 10 years and in order to harvest as much of the pine as possible, MDFP may agree to make pine volume available to DMI for chipping. This will not only increase the harvest of pine volume, but by concentrating both companies operations, will permit a wider profile of pine to be harvested than by MDFP alone. Concentrated operations reduce costs for both companies, permitting more high priority volume to be harvested.

Chasing stands infested with MPB is impossible in P20 under the current conditions. The SHS will include the high priority pine stands but the condition of the stand will change depending on MPB spread rates and timing of harvest. Many of the infested stands will be unusable by the time they can be planned and operated and thus MDFP will sequence some stands with longer years to death time periods at the expense of stands which are already heavily infested and are predicted to die in the next few years. In addition, sequenced stands may become un-merchantable by the time harvesting operations are ready. Deviation from planned harvesting and sequencing of alternative high priority pine stands will be required to maximize the harvesting of infested stands and to mitigate MPB impacts.

Reforestation

Alternative reforestation treatments are crucial to the companies' ability to operate the infested pine stands. MDFP is proposing alternative reforestation treatments to address the situation in P20 such as leave for natural, dragging where possible or low density planting for the identified high priority pine stands. Specific treatments will be identified in the AOP.

Regenerating yields from alternative reforestation treatments in pine dominated stands is expected to be lower than that from current reforestation treatments and the yield trajectory less certain. As a precautionary measure to manage uncertainly for future timber supply, MDFP is proposing that the reforestation MAI targets for coniferous and deciduous be calculated using the approved low density pine yield curve (PL-A). The MAI targets for the PL-A curve are 0.919 m^3/ha/yr for coniferous and 0.146 m^3/ha/yr for deciduous.

This alternative reforestation strategy will only be used in WC 2 and only in stands that have greater than or equal to 60% pine content in the overstory. The stands that meet these eligibility criteria will be flagged in the FMP, so they are easily identified during FHP and AOP reviews. The potential spatial harvest sequence that is currently being reviewed has approximately 3,600 ha of stands meeting these eligibility criteria that are scheduled for harvest in the first 10 years. Additions to the sequence will not be identified in the FMP, but will also be eligible for this strategy if they meet the criteria: in WC 2 and greater than or equal to 60% pine content in the overstory. This reforestation strategy will be described as a treatment and included in the silviculture matrix, along with possible alternative treatments based on pine content (higher pine content may be left for natural whereas lower pine content may require low density planting).

While the proposed strategy is not anticipated to produce the fully stocked pine stands established under normal reforestation treatments, the treatment is expected to produce young, regenerating stands which are expected to contribute to future timber supply and fulfill a different ecological niche than mature MPB killed stands. The regenerated stand composition arising from these alternative treatments are uncertain as is the future trajectory of the MPB killed pine stands which are not harvested. An initial difference between the harvested and un-harvested pine stands will be the build-up of large quantities of dead timber in the un-harvested stands and the associated increased fire hazard. Future inventories will reflect the condition and contribution of both types of stands.

Summary

The MPB infestation has arrived during difficult economic times for the forest industry. MDFP's sawmill is smaller and further from markets than many and only by maintaining a higher proportion of J-grade and larger dimension lumber (the higher value products) has the mill remained viable. The MPB strategy described here permits the harvesting and reforestation of infested stands, which will remove MPB habitat, thereby reducing the MPB populations and spread rates. Reducing MPB populations will not stop MPB spread but by slowing spread rates it will provide more time for harvest and regeneration of stands threatened by MPB thereby reducing impacts on the forest. Lower MPB populations have less capacity to spread longer distances and this coupled with the discontinuous pine in the eastern portion of the FMA could help limit the spread from the FMA to the east.

Appendix IV Woodland Caribou Habitat Strategy

The Woodland Caribou Habitat Strategy for MDFP's 2012-2021 FMP, dated December 5, 2011 was approved by the PDT on December 7, 2011.

Woodland Caribou Habitat Strategy

2012-2021 FMP

December 5, 2011

Background

Scheduled for implementation in May of 2012, Manning Diversified Forest Products Ltd.'s (MDFP) 2012-2021 Forest Management Plan (FMP) is currently under development. The FMP will direct the amount of timber harvesting as well as the locations, access and regeneration activities for all timber operators in Forest Management Unit (FMU) P20 over the next 10 years. A portion of FMU P20 is within the Chinchaga caribou range and thus the FMP is influenced by the Government of Alberta's Woodland Caribou Policy for Alberta (June 2011) and the Alberta Woodland Caribou Recovery Plan 2004/05–2013/14 (July 2005). Alberta's woodland caribou policy statement recognizes that "stabilizing, recovering and sustaining woodland caribou populations is an investment in maintaining Alberta's diverse natural environment. Successfully achieving this result will require the identification, maintenance and restoration of sufficient caribou habitat". Alberta will accomplish this through the establishment of range-specific plans containing caribou population and habitat objectives and specific measurable targets.

Caribou recovery plans identify how range-specific caribou plans will be developed and the relationships to and implications for industrial activity, which includes forestry and FMPs. Alberta has identified the Spatial Harvest Sequence (SHS) as the key component of a FMP where caribou management concerns are most effectively addressed. Without an approved caribou plan in place for the Chinchaga range to guide the development of MDFP's FMP, the forest products companies and SRD developed this caribou habitat strategy to guide the development of the SHS for this FMP.

Caribou habitat is the component of the caribou recovery plan or caribou landscape plan which forest management planning and operations can influence. The FMP and forest management companies have no control over caribou populations and non-forestry activity in P20. With caribou habitat as the focus, and without an approved Chinchaga caribou plan in place, the Woodland Caribou Habitat Strategy for MDFP's 2012-2021 FMP was developed to manage the impact on caribou habitat.

The objective of the caribou habitat strategy is to mitigate the impacts of harvesting on the caribou habitat within FMU P20. This will be accomplished through the selection of stands for harvest and the patterns of the remaining mature forest areas in such a way as to mitigate the short term impact on caribou habitat within selected locations across the FMU. The stands to be harvested will be incorporated into the FMP's SHS, which will direct harvesting operations over the next 10 years.

Caribou Habitat Strategy

The caribou habitat strategy was developed using local expert knowledge and available caribou telemetry data because the localized models and tools to predict woodland caribou habitat values are under development by the Government of Alberta and are not in a condition where they can be used for this FMP. Applying the precautionary approach, harvesting will be deferred from the majority of caribou range for the next ten years and harvest patterns and intensity will be modified in other areas in order to mitigate the impacts on caribou habitat. Details on the harvest sequencing development process are

described below. Map 1 identifies three zones within FMU P20 and their designation in relation to the caribou habitat strategy which are:

1991 Caribou Boundary

The 1991 caribou boundary is the only officially approved caribou boundary for the region. In FMU P09, there are no additions or subtractions to the official 1991 boundary. In FMU P06, the official boundary is incorporated into the 2007 APMA. In FMU P18, the official boundary is augmented by the "Specified Area".

2007 APMA (Alternative Patch Management Area)

The 2007 FMP contained an additional area where caribou habitat constraints were applied to the harvesting operations. The APMA includes the 2 portions of the 1991 caribou boundary within FMU P06.

P18 Specified Area

The FMU P18 specified area will be managed in addition to the 1991 caribou boundary and both areas will have caribou habitat constraints applied to the harvesting operations. MDFP worked with the Plan Development Team (PDT) to create the specified area as shown. As part of MDFP's consultation process, Duncan's First Nation reviewed the proposed specified area and recommended expansion of the specified area as identified in Map 1. MDFP has accepted this recommendation and the P18 specified area will be expanded to include the area identified as Duncan's First Nation recommendation.

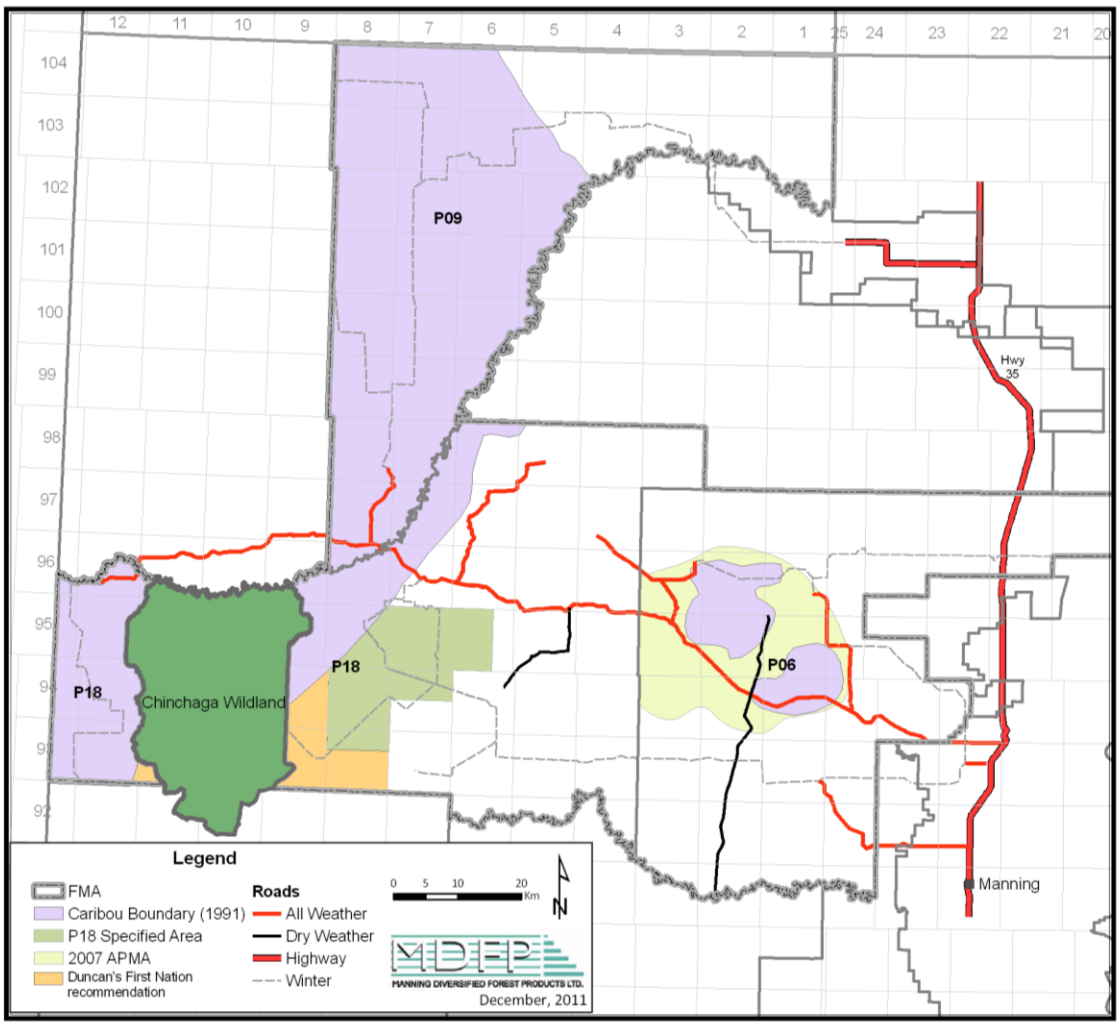

Figure 1. Caribou areas in FMU P20

Caribou 30/20 rule

Development of the harvest patterns within the areas specified above is accomplished through the 30/20 rule. The 30/20 rule will be applied to reduce the amount of habitat preferred by ungulates other than caribou (i.e. moose and deer) in an effort to reduce predator populations. The other ungulate habitat is composed of deciduous and mixedwood stand types, referred to here as "applicable strata" (D, DU, DC, DCU, CD or CDU) that is less than 30 years old. There are two methods in which the 30/20 rule is applied:

- The first method is a simple non-spatial rule where the target is: the applicable strata area which is less than 30 years old comprises no more than 20% of the total area of applicable strata. This will limit the amount of younger deciduous and mixedwood stands preferred by other ungulate species in the areas where the rule is applied.
- The second method involves controlling the spatial arrangement of the stands which comprise the 30/20 rule. Patch sizes greater than 300 ha will be maximized to increase the grouping of harvest blocks. The target for the patch size will be set so as to reduce the number of patches in the 0-300 ha range, not to eliminate them. This patch target is an effective way to increase the

average harvest patch size, which reduces the number of harvesting entries and the access required for harvesting, as well as concentrating the other ungulate habitat in fewer but larger patches while maintaining larger patches of preferred habitat for caribou.

FMU P06

The APMA from the 2007 FMP will be carried over into new 2012-2021 FMP and the following will apply:

- The 30 / 20 rule will apply to deciduous and mixedwood stands;
- Patch size targets will apply to deciduous and mixedwood stands;
- Sb, wet pine and wet white spruce stands will remain in the net land base but no harvesting will be sequenced in these stands for the first 10 years. Caribou prefer the wet forested areas, which will remain unharvested in the APMA for the next 10 years; and
- As much as possible within the strata balancing guidelines, MDFP will attempt to reforest stands as pure conifer (C strata) within the APMA in exchange for mixedwoods outside the APMA. This will have the effect of reducing desirable habitat for other ungulate species within the APMA.

FMU P18

There will be no "official" APMA in P18, but there will be a "specified area" that will augment the official 1991 boundary and the following will be applied to combined official and specified areas in FMU P18:

- No deciduous harvesting will occur for the first 10 years. The SHS will not contain any deciduous cutblocks in this area for the first 10 years. Deferring deciduous harvest, avoids generating desirable habitat for other ungulates;
- The 30 / 20 rule will apply to deciduous and mixedwood stands;
- Patch size targets will apply to deciduous and mixedwood stands;
- Sb, wet pine and wet white spruce stands will remain in the net land base and be available for harvest but no harvesting will be sequenced in these stands for the first 10 years; and
- As much as possible within the strata balancing guidelines, MDFP will attempt to reforest stands as pure conifer (C strata) within the combined area in exchange for mixedwoods outside the combined area. This will have the effect of reducing desirable habitat for other ungulate species within the combined area

FMU P09

The official 1991 boundary applies in P09 but no harvesting will occur in the 1991 official caribou area for the first 10 years.

Best Management Practices for Caribou

While the SHS is the primary and most effective mechanism for managing caribou in the FMP, operational rules that prescribe the details for forestry operations within caribou areas such as the timing of operations and access route management are contained in the Operating Ground Rules for FMU P20. Operating ground rules will be updated to reflect the strategies contained in the new FMP. The strategies for caribou in P20's current operating ground rules were developed to follow caribou best management practices. No changes are anticipated to the caribou component of the operating ground rules for 2012-2021 FMP.

Appendix V Structure Retention Strategy

MDFP's proposed structure retention strategy, dated November 28, 2012 was approved by the PDT on January 9, 2013.

Structure Retention Strategy

2012-2021 FMP

November 28, 2012

Background

As forest management moves from a sustained yield paradigm to one of sustainable forest management, emulation of natural disturbances must form a part of the strategies. For the boreal forest of Alberta, the natural disturbance agent is predominantly fire. Historical fire patterns and the forest structures and patterns they produce are commonly used as a guide for emulating the natural disturbance paradigm. There have been several studies of post-fire residual tree and forest remnants applicable to the FMA (Smyth et. al. 2005, Andison 2003 and others). All of the studies show a great degree of variability by report, by fire and by region. Confounding this, the methodologies applied to determine the fire boundaries and the fire remnants were different. This difference may be a reflection of the difficulty of a single classification scheme to adequately capture the variability that is inherent in natural ecosystems. Despite difficulties and the variability in the studies, some broad conclusions can be drawn:

1. Fire remnants, the areas inside fire boundary that were not burnt, are an important part of fire variability.
2. The remnant patch distribution tends to be closer to watercourses and this is more the case for larger watercourses than small.
3. Deciduous and mixedwood types tend to have more remnants than pure conifer sites.
4. There is an increase in remnant proportion with an increase in the fire size.
5. There is a great degree of variability within fires and between fires in the amount, size, prevelance and distribution of remnants.
6. The remnants are a mix of individual trees, partially burned areas and unburned patches. The patches, especially the larger ones, hold a larger percentage of total remnant area than the individual tree remnants.

All of the studies concentrated on single fire descriptions, bounded by the fire boundary. These studies should be considered stand level research, since the “landscape” for any given event is undetermined. When management plans are completed for a defined forest area, managers must consider stand level targets, landscape level targets and how the two interact.

These conclusions can assist in planning harvesting operations to more closely emulate fires and their remnants at the stand level. MDFP’s structure retention strategy will utilize the broad conclusions above to develop structure retention targets to achieve the objective of structure retention on the landscape. The structure retention strategy has two components:

- landscape level retention; and
- stand level retention.

This strategy will be adhered to by the company that completes the harvesting for their respective blocks. Each company will submit their summarized information to MDFP who will be responsible for reporting it to Alberta in the Stewardship Report.

Landscape Level Retention

The landscape retention is dealt with mainly at the Forest Management Planning (FMP) stage. The areas that contribute to this level of retention are areas deleted from the net landbase such as ground rule watercourse buffers, steep slope areas and other protected areas for parks, recreation areas, wildlife habitat deletions etc. These areas consist of both merchantable areas and non-merchantable areas such as black spruce and muskegs. A review of the landbase information submitted with this FMP shows that the deletions from the landbase amount to 50% of the total landbase, with two thirds of the deletions (35% of the total landbase) being forested but not a part of the active landbase. The actual area of merchantable timber within buffers is approximately 31,500 hectares, which represents approximately 6% of the merchantable landbase area.

Stand Level Retention

The stand level retention is aimed at individual, or groups of blocks to ensure that cutovers have standing residuals within the block boundaries. This structure retention strategy will use a target of 3% of the harvested area to be left as stand level retention to add to the landscape level retention described above. Stand level retention is best dealt with at the operational stage, but requires a strategy to ensure that the targets are met. The following strategy is proposed to meet those targets.

Stand Level Structure Retention Objectives

The strategy for stand level structure retention is based on the broad conclusions noted above. Retention patch size targets were developed to achieve the stand level objectives described below while keeping the strategy simple and measurable. Retention targets were derived using the following structure retention objectives:

1. The size of retention patches increases as block size increases. This is consistent with findings listed in the background information above, and will help with the other wildlife objectives in the Operating Ground Rules, such as distance to hiding cover and thermal cover. Larger retention patches will generally be located in larger blocks.
2. The majority of retention is retained in patches rather than single trees. This is consistent with findings in the literature and also safer operationally (i.e. safety of harvesting and silviculture personnel).
3. Retention will represent all harvested stand types.
4. Small retention patches (≤1 ha.) will consist of wind-firm trees that would normally stand for a minimum of 30 years. Overmature conifer retention should only be left in larger patches as it has a greater risk of blowdown.
5. A preference will be to have the retention closer to or attached (proximal) to the block boundary, although, retention may be used to accommodate other values such as wildlife hiding cover patches, environmentally sensitive areas, line of sight, etc.
6. Proximal retention will generally include only areas sequenced in the first 10 years of the spatial harvest sequence. Proximal retention may be extended to natural breaks (timber type boundaries, land use activity, etc.) when these areas would have been harvested as additions to the spatial harvest sequence (for the purposes of calculating variance, these areas will need to be considered as “additions”). Proximal retention can be used up to a maximum of one third (1/3) of the retention requirement (*i.e.* a maximum of 1% of the harvested area can be proximal retention).

7. Ground rule buffers cannot be classified as retention and will not count towards the 3% retention requirement.
8. All retention will be excluded from harvest for 70 years.

Stand Level Structure Retention Target

Three percent (3%) of the harvested area shall be left as structure retention patches distributed as:

a. Large Patches - minimum of 30% of the required retention will consist of patches greater than 5 ha;
b. Medium Patches - minimum of 30% of the required retention will consist of patches between 1 ha and 5 ha; and
c. Small Patches and Single Trees - minimum of 10% of the required retention will consist of single trees or patches smaller than 1 ha.

The 3% target shall be achieved over the 10 year FMP period. Annual and landscape variations are permitted, providing the 10 year target is achieved (refer to VOIT #10; 1.1.2.1).

Annual Allowable Cut Volume Drain

The timber volume drained from the AAC for retention consists of five steps:

1. Annually reporting the area of the retention patches to ensure the required 3% is achieved and to calculate the volume drain;
2. Assignment of the retention area to structure retention strata in order to calculate the volume drain;
3. Determination of representative coniferous and deciduous volumes per hectare for the structure retention strata;
4. Calculation of the coniferous and deciduous volumes to be drained for the retention patches reported; and
5. Annually draining the calculated volumes on a TM7 and annually report drained volume in the GDP.

Area Calculations: Retention areas 1.0 ha and larger will be GPS'd. Retention areas less than 1.0 ha will either be GPS'd, have the number of merchantable stems counted, or a GPS point will be taken so that the location can be mapped and the area estimated. Single trees will be counted. For the areas that the trees are counted, 500 trees will be assumed to represent 1.0 ha.

Strata Assignment: The assignment of a retention patch to specific structure retention strata will be determined by a field call based on the ratio of the number of merchantable coniferous and deciduous stems in the retention, not the AVI polygon. The field call for the merchantable retention will assign one of three structure retention strata. This field call is the most subjective part of the strategy. If disputes arise, a field cruise will be completed to verify and calibrate the calls. This cruise will use the ratio of the number of merchantable coniferous and deciduous stems only. The following structure retention strata will be used to classify the retention:

- Coniferous - $\geq$ 80% merchantable coniferous stems;
- Mixedwood - <80% merchantable coniferous stems and <80% merchantable deciduous stems;
- Deciduous - $\geq$80% merchantable deciduous stems.

Table 1 presents the net merchantable timber volumes to be drained for each structure retention strata with cull factors of 3.7% for conifer and 9.0% for deciduous.

Table 1. Net merchantable timber drain volumes for structure retention strata

Retention Strata	Stand Age	Conifer Volume (m^3/ha)	Deciduous Volume (m^3/ha)
Coniferous	120	206	27
Mixedwood	120	148	135
Deciduous	90	38	137

Note – The above volumes were derived from area-weighted FMP yield curves using 120 years for coniferous and mixedwood stands and 90 years for deciduous stands. Refer to Appendix I for details.

Reporting and Reconciliation

The calculated volumes from above will be drained annually by each company on a year-end TM7 and will also be reported annually by each company in their General Development Plan (GDP).

The retention will be reviewed by each company in their annual GDP to ensure the targets are achieved. If targets are not achieved, an action plan will be proposed by each company in their GDP.

Each company will submit their summarized information to MDFP who will be responsible for reporting it to Alberta in the Stewardship Report.

Timber Drain Volume Determination

Below are tables with inputs and results to determine timber drain volumes for the area-weighted structure retention strata. Merchantable landbase areas were used for area-weighting and cull values of 3.7% for conifer and 9.0% for deciduous were applied to convert the gross merchantable volumes in Table 2, Table 3, and Table 3 to the net merchantable volumes in Table 1.

Table 2. Conifer structure retention strata calculations

Strata	Stand Age	F_YC	Conifer Volume (m^3/ha)	Deciduous Volume (m^3/ha)	Area (ha)	Conifer Volume X Area	Deciduous Volume X Area
C	120	PL-A	110	8	3,692	404,769	29,964
C	120	PL-BCD	219	16	91,274	20,015,054	1,481,655
C	120	SB-A	54	16	0	0	0
C	120	SB-BCD	108	33	6,396	692,550	208,858
C	120	SW-A	108	25	2,154	233,221	53,921
C	120	SW-B	217	50	34,474	7,463,760	1,725,629
C	120	SW-CD	236	48	34,646	8,170,587	1,661,728
Area Weighted Volume			**214**	**30**	172,637	36,979,942	5,161,754

Table 3. Mixedwood structure retention strata calculations

Strata	Stand Age	F_YC	Conifer Volume (m^3/ha)	Deciduous Volume (m^3/ha)	Area (ha)	Conifer Volume X Area	Deciduous Volume X Area
MIX	120	CD-A	93	29	941	87,214	27,121
MIX	120	CD-BCD	185	58	22,017	4,079,546	1,268,646
MIX	120	DC-BCD	173	156	32,629	5,641,488	5,102,618
MIX	120	DU-A	109	184	66,973	7,295,716	12,309,141
MIX	120	DU-BCD	202	132	36,223	7,305,627	4,796,076
Area Weighted Volume			**154**	**148**	158,783	24,409,591	23,503,602

Table 4. Deciduous structure retention strata calculations

Strata	Stand Age	F_YC	Conifer Volume (m^3/ha)	Deciduous Volume (m^3/ha)	Area (ha)	Conifer Volume X Area	Deciduous Volume X Area
D	90	D-B	40.9	93.5	20,551	839,837	1,921,855
D	90	D-CD	38.7	164.1	89,414	3,462,229	14,668,390
Area Weighted Volume			**39**	**151**	109,966	4,302,066	16,590,244

Appendix VI Road Planning Construction, Maintenance, Reclamation and Monitoring Strategy

Road Planning, Construction, Maintenance, Reclamation and Monitoring Strategy

2012-2021 FMP

Background

Roads are an essential part of woodlands operations. Their main use is to move the harvested timber from the cutblocks to the mill in a safe and efficient manner. They are also used as access for personnel and equipment for harvesting, scarification and reforestation activities. They can present a significant problem from an environmental perspective in that they disturb the natural environment. The main objective relating to roads is to construct safe roads in the most cost-effective manner while minimizing the environmental and productive landbase impacts as little as possible.

As the title of this document suggests, there are five main stages of road strategy that must be considered. There are also different levels of road use, both duration of use (number of years of service), season of use (winter vs. summer) and amount of use (loads that will pass) of individual roads that contribute to the road network. The three main levels that we deal with are: main roads (connecting main harvest areas with the mill for multiple season use with thousands of loads), inter-block roads (roads connecting individual blocks to each other and/or main roads used for one or two seasons and several hundred loads) and inner-block roads (road systems within block boundaries used for the time to harvest the block and seeing relatively small numbers of loads). This strategy is simplified from the extent it could be because all of the current planning is for frozen- ground conditions. This seasonal limitation has been chosen to reduce the environmental disturbance and to reduce the landbase impact. If operations for non-frozen-ground conditions were to be planned, alternate strategies would be required.

Road Planning

Plans should be made for using existing roads where possible either in their existing condition or with slight improvements. Where the existing possibilities are not adequate, new routes need to be created. This choice is avoided as much as possible because it is a new disturbance to the environment and is generally more expensive than using existing routes. Road planning is selecting the best long-term route to move timber from the harvest area to the mill. As much as is practical, the route should be combined with multiple operating areas and other forest landbase users by using common corridors. For an inner-block road, road planning means determining the best route within the block to promote efficient harvesting and to the nearest inter-block road. In both cases, the following factors must be taken into account: slopes, watercourses, ground conditions, environmental impact and road standard.

Another significant consideration in road planning is to create a route that is safe for all travelers. This goal can be worked towards by avoiding sharp, blind corners, significant slopes, narrow sections and other hazards that could put travelers at risk. The planning stage of road development is the prime opportunity to predict hazards that could be created and takes steps to prevent them. Prevention can take the form of choosing alternate routes, specified construction standards or enhanced signage.

In all road planning, the road should be considered from the perspective of the log truck and in particular, whether it will be loaded or empty while using a section of road. This is the base point of planning because our business is to move logs from the harvest area to the mill and the loaded log truck is the most significant traveler on the roads we construct and the one most likely to have problems in difficult areas. Those roads that are planned for use by only empty log trucks can accept different road

standards such as steeper hills and sharper comers. The harvesting and silvicultural work utilize the same roads as the log trucks and moving this equipment is roughly equivalent to loaded log trucks so no special planning is required for these activities. Part of the reforestation strategy is to generally reforest all harvested areas as soon as possible after the block is harvested. This strategy allows the road system established for harvesting to be used in the same season for scarification. This reduces the impact of our roads by reducing the number of seasons they are used and not needing to re-open lines and install crossings multiple times.

Areas that are planned to have incidental deciduous volume removed using in-block chipping will require roads that take the limitations of the chip vans into account. Empty chip vans are not as versatile as empty log trucks and require roads near the condition of loaded trucks. This means that roads planned for only empty traffic that will also have chip vans on them will need to be planned with this information in mind.

Slopes

There are three types of slopes that are encountered (adverse, favorable and side-slope). The acceptable limits of slope inclination that can be tolerated are determined by the factors of intensity and duration.

- Adverse slopes are those that you have to climb. A loaded log truck can climb an adverse slope of 10% if there are no limiting factors. Some of the factors that would limit the truck include: Ground conditions - A smooth, hard, flat, dry surface is ideal. Fresh snow, poor maintenance or soft soil would reduce the chance of the truck climbing a hill. Approach - A straight approach to an adverse climb allows the truck to build up speed that will be shed as it is climbing the hill. If the approach to the hill has a corner at the bottom or part way up, the truck will have to lower its speed to be able to navigate the comer. This can mean it will not be carrying as much speed to the hill and may not be able to climb the hill. Navigating a corner also shifts the center of gravity of the load on the truck that can cause loss of traction. Duration - A truck is able to climb steeper hills for short distances because it is able to carry speed from the flat sections that will assist it part way up the steep sections. If a slope is very long and steep, a truck is less likely to be able to maintain traction on it. Empty trucks are limited by the same factors as loaded trucks but to lesser degrees. The upper limit that an empty log truck can climb is about 14 %.
- Favourable slopes have higher levels of tolerance for steepness. Loaded trucks can handle 14 % slope and empty trucks can handle 18 % if there are no other limiting factors. Ground conditions are again important. The truck will need to be able to use their engine retarder brake systems on the way down to maintain an acceptable speed and this relates directly to the ground condition factors identified above. The escape from the hill now becomes important rather than the approach. The truck must have a path available to shed speed built up on the hill that the engine retarder brake could not reduce. This means that there must not be a corner on the hill or at the bottom of a hill that is already at the maximum that the truck can tolerate. Also, the longer and steeper the slope, the longer and straighter the escape from the slope must be. The duration of the slope is again important as it was on adverse slopes but for opposite reasons. On adverse slopes, speed is lost because of gravity; on favorable slopes speed is gained because of gravity.
- Side-slopes are the sideways tilt of a road that occurs on flat sections and on hills. The intensity of the side-slope that can be tolerated changes based on the land topography and the duration of the inclination. A side-slope of five degrees can be tolerated for a short distance (less than 100 meters) on a flat location but would be unacceptable for even 10 meters on a ten percent adverse climb. The reason that side-slope is so critical is that log trucks are top-heavy which means they tip over easier than trucks with a lower center of gravity. Side-slopes can also cause loss of traction on the drive

wheels on the uphill side of the slope by altering the center of gravity of the load. Empty log trucks can handle slightly steeper side-slopes but also have their limits.

Road planning in relation to slopes comes on three forms: slopes that can be tolerated in the existing condition, slopes that can be modified to suit the truck needs and slopes that must be avoided because they do not suit the truck needs and the modification to the slope is more expensive environmentally and monetarily than an alternate route. The level of use of a road being planned also plays a part in determining the limiting factors that can be tolerated. The adverse slopes that can be tolerated on inner-block roads are higher than on a main road. This is because there will not be as many loads attempting a bad section. It may be practical to have a skidder tow 100 loads up a bad hill in a cutblock to avoid a major watercourse crossing but it would not be feasible to tow 10,000 loads up a bad section of main road.

Watercourses

Road planning for watercourses is a matter of minimizing the number of locations where watercourse crossings will be required and where they are required, choosing the sites that are the most stable. They are the most sensitive part of the environment we encounter in road planning so care must be taken to ensure proper approaches and escapes are constructed and that the crossing structures used are adequate for the watercourse. The watercourse types crossed most often are ephemeral draws, intermittent and transitional watercourses. Crossings are also required for small permanent streams and large permanent streams but more rarely. The main crossing structures used are: snow fills, log fills, culverts and bridges. The main consideration for planning is to determine if the watercourse can be safely crossed at the point on the route with minimal disturbance to the slopes near the watercourse and no disturbance to the channel of the watercourse. If these factors cannot be satisfied, an alternate route must be found by using alternate existing lines or by creating a new-cut access to obtain more favourable circumstances. The points described above in the section on slopes often are complicated by watercourse crossings because many of the slopes we encounter are associated with a watercourse. Part of the planning phase is to determine how the areas impacted will be reclaimed after the operations are completed. If the site will present serious difficulties in reclamation, consideration to rejecting it must be taken. It is usually better to make the road a few kilometers longer to avoid a bad crossing than to create an environmental problem and a reclamation liability.

Ground Conditions

The nature of frozen ground operations gives some advantages to road planning. There is an ability to predict with good confidence that the road systems will have hard running surfaces once the frost is set into the ground. This allows crossing of landforms such as muskegs that would be impractical for summer operations. It also creates a time constraint that there is no control over i.e. no control over when frost will begin or when spring breakup will happen. For road planning, a prediction must be made of how quickly each section of road will freeze up on its own and how easily frost can be put into the ground with the equipment. Areas of moist soil will freeze relatively quickly as long as the snow is kept off. Open/floating muskeg will be difficult to work on with equipment to initiate freezing but will be an excellent running surface once frost is established. Dry ground like that typically found under aspen canopies will provide relatively secure early access but is prone to losing frost earlier in the spring. The level of road activity plays a part in assessing ground conditions. A main road that is required early in the season and will be used for the whole year must be able to have frost established early and be maintained for the entire season. An inter-block road that accesses several small blocks can cross an open muskeg area by scheduling it for later in the season.

Environmental impact

This is another way of saying, how long the road is and what kind of country it crosses. The longer a road is, the more impact on the environment is created and the greater the chances of reclamation problems. As stated above in the section on watercourses, it is sometimes advantageous to plan a longer route to avoid a problem watercourse crossing but this decision does imply that the impact on the environment with a longer route is less than the impact of a watercourse crossing. Road planning is a balance of minimizing the impacts of operations while ensuring the economics of the choices are justified. A straight-line road from the blocks to the mill might be the shortest route but if it involves many major watercourse crossings and hill cuts, it is not justifiable from an environmental impact perspective or an economic perspective.

Road Standard

Road standard is a function of the level of use planned for a section of road. It describes whether the road will be single-lane or two-lane, one-way or two-way traffic and the expected speed of trucks. The standard or quality a road is built to is directly proportional to the environmental impact and the cost of construction. A single-lane inter block road with pushouts for two-way traffic on an existing line intended for 40 km/hr traffic is relatively inexpensive to build and should present few environmental impacts. A new-cut two-lane main haul road intended for 80 km/hr traffic will be expensive and have a significant environmental impact. Road planning must determine the best balance of hauling efficiency and safety compared to minimizing environmental impact by deciding the road standard appropriate to the road use level.

Road Construction

Road construction for frozen-ground operations is mostly a matter of encouraging the natural freezing process in the fall and early winter. The other parts of construction are cutting new-cut road right of ways, modifying slopes to match the road plan and installing watercourse crossings.

Freezing-in

The equipment normally used for this is snowmobiles, ATV's, "Snowcats", LGP crawler tractors, LGP rubber-tired buggies and graders. The process on existing lines begins with the lightest, lowest ground pressure units that the site will tolerate entering the site with the intent of removing and/or compacting any snow accumulations and removing as much vegetation from the road as they can without removing topsoil. The vegetation needs to be removed because it's presence under compacted snow on the running surface can cause movement between the snowpack and the soil that degrades the surface quality. This can cause road surface breakup, potholes and safety issues on the road.

Freezing-in is done as early in the season as practical (when overnight temperatures are below freezing) to try to create some frost for the heavier, high ground pressure units that will follow. The traffic of these low-ground-pressure units disturbs the natural insulating properties of loose snow and duff and allows colder air to reach the ground to start the freezing process. Light units are used at this point because while road plans typically try to use the high, dry ground in route selection, there are almost always some lower, wet areas to cross and rutting of these areas is unacceptable. The light units can cross both types of areas without causing environmental damage and start the freezing process. Small watercourses (ephemeral draws, intermittent, transitional and small permanent streams) that are encountered at this stage will have crossing structures installed, either temporary or permanent depending on the equipment onsite and the structure required Small permanent and large permanent streams that are encountered at this point that require bridges, culverts or large log fills can stop the progress of the light units until the crossing structure is installed. The light units can also start building the running surface by moving loose soil and snow into holes in the road and leveling the running

surface.

Heavier units follow the light units as soon as conditions permit. Their job is to continue the freezing process, modify slopes as required, remove any sharp humps and hollows in the road and ensure all watercourse crossings are constructed to the appropriate standard. Large crossing structures that are required usually need these heavier units to properly install them. They will also establish the running surface that the grader will enhance and maintain through the season.

Freezing-in is done throughout the season as new portions of the operating area are accessed but the main roads into an operating area and the first inter-block roads will be required early in the season. This means that there is a strong desire to start as soon as practical to ensure all work is completed during the most favourable operating season.

New-Cut Roads

New-cut roads are constructed by first removing the standing timber on the right-of-way. If there is merchantable timber, it is salvaged by standard harvesting equipment. This equipment will in almost all cases initiate the freezing-in process to the point that once the timber is removed, road construction equipment can follow. The construction equipment will first remove all stumps from the site, pile them along the side and smooth out the running surface that will be maintained by the graders.

New-cut roads through non-merchantable timber require a crawler tractor to "walk-down" the vegetation then cut it off and pile it to the side of the ROW. This can be a difficult operation because non-merchantable vegetation can indicate wet ground so extreme care must be taken to minimize environmental damage while creating a suitable road. These areas generally have only light, surface frost early in the season that must be enhanced by stripping the vegetation and exposing the soil to the freezing air to make the road suitable for our use.

Inner-block roads are constructed, in most cases, in the same manner as new-cut roads are constructed. Wet areas in the block must be entered into cautiously. Where practical, existing lines that go through the block can be used for inner-block roads and can be constructed in the same manner as inter-block roads on existing lines are constructed. Watercourse crossings installed inside block boundaries will almost always be log fills because there is rarely sufficient clean snow available after harvesting the area to construct a snow fill.

Slope Modification

This is the cutting or filling of soil on slopes to create running surfaces at the slopes acceptable for traffic as planned for in the road planning section. This is usually done with crawler tractors moving the soil with their blades from one area on the slope to another. They will also at this time construct the back-slopes required to ensure stable sites that will not contribute to potential environmental problems. Standard back-slopes for cuts are 3: 1 and for fills are 2: 1. This standard is not always practical in all situations. For example, a back-slope for a side-slope cut into a slope that is just over the tolerance level for side-slope for the road could extend a long way off the line. In this case it may be better to accept a steeper back-slope and reduce the environmental impact of the operations.

As was stated above, slope modification is often associated with watercourses and watercourse crossings so extra care must be taken by equipment operators and supervisors to ensure that no soil is allowed to enter the watercourse.

Watercourse Crossings

The most sensitive part of the environment that we impact with our operations is watercourses and the highest risk to causing environmental damage is during watercourse crossing installation and removal.

Snow or log fills are the most common structures for our seasonal watercourse crossing structures. Culverts and bridges are usually used for large permanent streams on main roads that will be used for multiple seasons. Ice crossings are also used in special circumstances. The road planning phase described above will tell the construction crew what type of crossing structure will need to be installed at each location.

Snow fills can be used for any size of stream but are limited by the availability of sufficient quantities of clean snow available at the site at the time of construction. If the crossing is on a small stream and there is sufficient snow available, the crew will simply push clean snow into the channel and pack it to the desired height to create a running surface. Care will need to be taken to minimize the amount of soil or vegetation that mixes with the snow as it is being gathered. If there is any doubt as to being able to keep the snow clean, a layer of burlap must be placed in the channel prior to moving any snow to act as a barrier between the fill and the stream channel. If there is not enough snow to complete the running surface, a layer of soil may be placed over the snow as long as the burlap layer is in place to keep the soil out of the channel. The burlap must extend at least one meter beyond the edge of where soil is to be placed. If in doubt, use more burlap to ensure that no soil enters the stream channel. As a final touch to complete a snow fill, a small snow berm or log should be placed on either side of the fill, parallel to the running surface to act as a barrier to material on the fill escaping over the edges into the channel.

Snow fills can also be constructed using snow making machines to create snow at sites where there is not enough to build the snow fill required. The sites where this option is used must be chosen with care, as there are restrictions on the machinery required to complete the construction. There must be sufficient water available on site or an adequate road to the site to allow water to be hauled in. Also, the weather will need to be cold enough to allow the snow-making machine to work -about minus 10 ^{C} is required. This method can be used on any size of crossing including large river crossings. As the snow is created, a crawler tractor will push the snow in the channel and pack it to create the running surface.

Log fills are built by placing topped, limbed and stumped trees into the stream channel to fill in most of the height to the desired running surface. If the channel has small bends in it, logs may have to be fitted into the channel to provide channel protection then a solid layer of logs will be placed to "bridge" the channel. The width of the log layer should extend up onto the channel banks to provide support and protection for the entire channel. The balance of the height is filled with soil packed in over the logs. In all cases of log fill construction, a layer of burlap is mandatory. The burlap shall extend at least one meter beyond the edge of where soil is to be placed. If in doubt, use more burlap to ensure that no soil enters the stream channel. As with the snow fill, a small berm or log should be placed along the edges of the fill to prevent soil from escaping over the edges and entering the channel.

Culverts are used for crossing installations where the road is going to be used for multiple seasons and will not be removed between seasons. This means it should only be used on main roads. Culverts are not a preferred crossing structure for operations because the installation process causes some environmental impact. This is because the installation requires that the streambed be leveled to provide support for the culvert. The culvert is then placed in the channel just at the level of the original streambed. This placement ensures that there is no erosion caused at the inlet end or the outflow end. Soil is then placed around the sides of the culvert and packed in place in layers to build up to the desired level of the running surface. Back sloping of the fill is important to prevent erosion problems. Culverts installed during the winter have a tendency to have their fill settle, which can cause erosion and washout problems. This is because the frozen soil used for fill does not compact very well. These sites will require additional monitoring to ensure they do not create an environmental liability.

Bridges are normally installed on large permanent streams on main roads. They are used in places

where the number of logs required for a log fill is too great or the reliability of snow on site or access for snow making equipment is too low. They are typically installed on sites that will be used for multiple seasons and may be left installed at a remote site pending future harvest operations. They are also used for single season applications typically on large permanent streams. The installation procedure varies with the bridge design and we usually contract professional bridge contractors to perform these tasks for us.

Ice crossings are used on ephemeral draws and on large river crossings if the conditions are right. The conditions needed for an ice crossing on an ephemeral draw are the absence of channel and slope development and the presence of a naturally frozen ground conditions. If these factors present themselves, the construction is no more than the freezing-in procedure normal for our operations as described above. It must be noted that the presence of the water at the site may be a symptom of a spring that may run all winter and create maintenance problems throughout the winter.

The other case where an ice crossing may be used is on a large river such as the Chinchaga River. The construction of this crossing will require repeated layers of flooding with water pumped from the river to build ice to the desired thickness. This task will be contracted out to experienced ice bridge builders.

Maintenance - Seasonal

The roads in our operations are maintained using graders equipped with ice cutting blades for the daily work. Crawlers may be used for special circumstances such as extreme snow-falls and major repairs to problem areas on the roads.

The objective of the grader is to provide a smooth running surface for the log trucks and maintain the road width for the traffic level indicated. The grader will also provide ground conditions suitable for the trucks to maintain traction for climbing and descending hills and on corners. The other main task of the grader is to remove snowfall accumulations during the hauling season. In areas where the grader is assigned maintenance of two-lane roads, a snow-wing attachment may be necessary to increase the speed of clearing away snow and keeping the trucks moving with full lane widths. The extra weight and cost of a snow wing may be more than made up for with reduced time to clear roads so should not cost any extra. The use of the snow wing may also be invaluable during winters with a heavy snowfall and the route assigned the grader is single lane road. A grader with a standard blade may not be able to adequately create enough storage space for snow along the road and will quickly have a road too narrow for safe travel during a heavy snowfall year. The grader will also have to maintain regular turn-outs along one-lane roads to allow for places for vehicles to meet. The grader itself will be the most common user of these turn-outs to allow the faster log trucks to proceed but unauthorized traffic may occasionally use the road in the wrong direction and need a place to meet oncoming log trucks.

The grader can help prolong the hauling season into the spring by building up a snow-pack on the running surface that will melt more slowly during spring break up. This can reduce the risk of the haul program rutting roads as operations are winding down in the spring. The grader operator will need to be cautious all season long to ensure that the material that is being moved at watercourse crossings does not enter the watercourse. The berms or logs placed at the crossings will assist in this and they will be maintained all season. If circumstances arise where continued regular maintenance may put deleterious material into a watercourse, equipment such as excavators and crawlers will be brought in to remove the material to a safe location.

Maintenance - Long Term

The long term maintenance program is tied to the monitoring program that will be discussed later in this document. It is directed at keeping the main roads in the system in satisfactory condition for use and to

correct any environmental problems that may occur. As was stated above, most of harvesting of timber occurs during frozen ground conditions. This reduces the impact roads have on the environment and it reduces the need to have these roads in a condition for use all year long. Most of the long-term maintenance takes the form of remediating problem areas and improving sections of roads that will be needed in future operations.

The most common problems that require remediation are caused by erosion. As the monitoring program identifies sites, site-specific plans are created to fix the problem. The other main problem involves permanent and semi-permanent watercourse crossing structures such as culverts and bridges that deteriorate in quality over time or are damaged. As problems are identified through the watercourse-monitoring program, plans for remediation are developed to suit the site.

Reclamation

As operations in an area are complete, the road system in that area will be De-activated or Reclaimed. The difference between the two terms is in the plans that are in place for the road and/or road system for the future. De-activation refers to removal of crossing structures, establishing erosion controls and encouraging vegetation establishment on a road that is intended to be re-opened for use in the near future. Reclamation refers to the same activities but on roads where there is no expectation of use in the near future. The activities required may change depending on the objective. For example, a road that has culverts installed for watercourse crossings would not have the culverts removed if it is being De-activated. The same site being reclaimed would have the culverts removed, vegetation encouraged, erosion controls established and soil at the site re-contoured.

The watercourse crossing removal strategy differs slightly depending on the type of crossing being removed and whether the site is being is being de-activated or reclaimed. The main strategy difference between the two objectives is where the fill material will be placed and to what degree will vegetation establishment be promoted. Fill material from a de-activated site will normally be placed in a convenient, stable location close to the crossing site to allow for it's re-use in subsequent installations. This may mean that on a particular site, the fill material may be left in a pile on a flat piece of ground near the watercourse to be re-used as a cap for a log fill that is anticipated to be installed next winter. Fill material from a reclaimed site will be placed in locations where it will not create any long-term environmental impacts from erosion or slumping. This may mean that the material is replaced in the site from which it was obtained and re-contoured to match the previously existing site. The decision on where to place fill material is made on a site-specific basis with consideration to soil stability, erosion potential and site hydrology.

The degree of vegetation establishment promotion is also determined by the objectives for the site. A site that is expected to be de-activated until the following season will have little effort put into establishing vegetation unless it is determined that the presence of vegetation is critical to inhibiting erosion for the short duration until the next activity at the site. An example of this would be a site where the fill material must be placed in a questionable location in terms of stability. In this case, the introduction of grass seed at the time of crossing removal could encourage enough immature vegetation to stabilize the soil for the season. Sites like this should be avoided at the planning stage so that this difficulty is not encountered.

Sites that are being reclaimed all require vegetation to be established to ensure site productivity and to aid in reducing erosion potential. The term that the site was in use and the amount of disturbance at the site determine how much effort will be required to re-establish vegetation. A snow fill in a natural meadow that had available clean snow to fill the channel and provide a running surface for the single year of use will require very little if any work to re-establish vegetation because the root system to

provide new growth already exists. The other extreme is a major cut and fill that was installed and used for several years. The effort to establish vegetation on this reclaimed site may extend beyond grass seed and fertilizer to planting of seedlings and shrubs. The first example described above is relatively common while the second example is rare but many variations between the two are encountered each year. Each site must therefore be evaluated individually and a prescription created to match the needs of the site.

Once the prescription for the road or road system is determined the work can begin. The work required for crossing removal depends on the type of crossing installed. Ice- crossings on ephemeral draws may need to be scraped by a smooth blade to remove accumulations of soil from operations. The ice can then be notched to ensure melting water stays in the channel. The same work is needed on large ice bridges.

A bridge construction contractor is usually required to remove a steel and/or concrete bridge and reclaim the site to its pre-construction state. These are dealt with on a site-specific basis as the site requirements, bridge type and removal techniques are all very specific to these crossing structures.

Culverts may be removed in non-frozen conditions if there is access to the site. This soil is excavated using a backhoe or an excavator and the culvert lifted out of place. This operation may be complicated by flowing water at which time job approvals will be required to disrupt or divert the water flow. Culverts removed in the winter if the water is frozen to the bottom of the channel require the soil around the culvert to be broken up prior to excavation. The channel will then be re-contoured to the original state and revegetated to provide erosion control. These sites will require extensive monitoring to ensure bank stability and vegetation success. Permits may be required to complete this work depending on the size and classification of the watercourse and the season of work and would be obtained prior to work commencing.

Log fills must be removed prior to spring breakup. The soil cap is first broken up, usually with a crawler tractor's ripper, and then the soil is removed from the crossing location. The burlap layer installed during installation will aid in ensuring that no soil from the cap enters the watercourse. The logs are then removed and placed up the slope away from the watercourse. They can be re-used for future installations at the same site. Typically, a crawler tractor equipped with a ripper working in tandem with an excavator equipped with a large capacity, smooth edge bucket or blade is used to remove these crossings.

Snow fills are removed with the same equipment using similar techniques. A dirt cap, if present is broken up and removed down to the burlap layer. If clean snow was used, it will need to be scraped then the snow notched to promote water flow in the channel. If burlap was used, it will be removed from the channel.

Soil that has been moved during construction should in most cases be placed back in the location from which it was obtained and re-contoured to match the original landform. This should not be done if replacing it will create an unstable site that could cause erosion problems. These sites should all be returned to a stable location and re-contoured so that soil will not enter watercourses if slumping or erosion occurs. Re-vegetation must be encouraged on all sites to acceptable vegetation to promote site stability. Re-contouring of hill cuts and fills is not always necessary particularly if construction established appropriate back slopes. Erosion controls including roll-back and diversion ditches may be required to ensure soil stability until vegetation is established.

Water accumulation and movement and the subsequent erosion potential can be a significant problem on sites with unstable soil. Erosion controls in MDFP's FMA are primarily intended to divert water from

these sites to more stable areas such as forested land or scarified cutblocks and to slow down the speed that the water travels at. The main area of concern for erosion potential is roads, whether inside or outside block boundaries. The steeper slopes generally are potential problem areas but as has been mentioned many times above, each site must be evaluated individually. A very steep but short slope at the crest of a hill with vegetation that will readily re-establish is more stable than a long shallow slope at the base of a large hill with highly erodible soils.

Erosion ditches are used to first minimize the accumulations of water on the roads from spring runoff and summer storms, then slow down the speed of water flow by reducing the gradient that the water is traveling down. The ditches direct the water into stable areas for dispersion. Ditches are placed at intervals on slopes angled slightly downhill and across the road. They are constructed using either a crawler tractor or an excavator or both and must extend across the full width of the road and into the dispersion area. They must extend into the dispersion area to ensure the water does not return back to the road, as this would minimize the effectiveness of ditches further down the hill.

Roll-back or the placing of woody debris removed from the site during construction can act in a similar manner to erosion ditches by diverting water from roads and to slowing down the water as it crosses an area. The technique for placing the debris back on the site is fairly easy, a crawler tractor or an excavator scatters the debris back over the exposed area then walks over it with its tracks. This establishes contact between the debris and the soil to aid in preventing erosion.

The steepness of the slope and the character of the surrounding landforms determine the frequency and size of the ditches. The installation of erosion ditches or roll-back will not indefinitely guarantee proof against erosion. A re-vegetation program must supplement them. Most sites in MDFP's FMA re-vegetate rapidly on their own but each site should be looked at for the potential of assisting nature by hand seeding and/or fertilizing to ensure prompt re-vegetation.

Monitoring

There are two phases to the monitoring program. The first is to inventory all sites as they are constructed to know what will need to be monitored in the future. The second phase is to implement the monitoring protocol of known and potential problem sites.

The inventory list starts out with all roads and watercourse crossings constructed during each harvest season. The watercourses are listed separately because they are often high-risk spots from an erosion potential perspective. Areas of roads that are deemed as high risk may also be listed separately to ensure they are not overlooked in the monitoring process.

Monitoring of the roads and watercourse crossings is done for a minimum of three years after the last activity. Roads and watercourse crossings that are used for multiple years will be on the monitoring list for three years after the last use. Monitoring takes the form of a site visit to monitor for re-vegetation success, absence of erosion or slumping or other environmental problems. Documentation of the results of the visits will provide the data needed for updating the monitoring list. Sites that prove to have been successfully re-vegetated and have no erosion or slumping issues will be removed from the list after three years. Sites that do not meet the standard will require a remediation plan.

MDFP provides ESRD with a summary of our monitoring as well as a list of the problem sites as part of our GDP "As-Built" submission. The listing includes the location of the site, the nature of the site (watercourse crossing, potential erosion site, seepage area, etc.), associated disposition, special site characteristics (if any) and comments on the site.

Appendix VII Corridor Plan

Corridor Plan

2012-2021 FMP

Background

When developing a corridor plan, there are a variety of considerations particularly to forest users. The first being season of harvest. Because of the extent of muskeg areas within the FMA, harvesting operations are generally limited to winter. This typically minimizes ground disturbance, particularly in environmentally sensitive sites.

There are also other users on the landbase from trappers to oilfield workers. It is in all operators' best interest to keep a good working relationship with other users. Along with this, there is a recreation area (Twin Lakes) within the FMA that needs consideration. There are also wildlife concerns. In fact there are policies governing access and harvesting (e.g. exit ungulate zone by January 15) in wildlife areas. The FMA corridor plan tries where possible to minimize the effects of roads on wildlife.

All timber companies need to work under the rules/regulations/acts/directives of all applicable laws, therefore no timber company will knowingly violate any legislation.

Access Planning

Many issues are factored into road planning. Issues such as safety, functionality, operations or business concerns need to be looked at. Wildlife, access management concerns, Integration with other users, watercourses and other environmental concerns must be considered. Existing versus new cut access, one way versus two way travel, anticipated years of use as well as anticipated volume of timber to be hauled are all considered when planning roads and road corridors. Analysis of all these issues results in decisions being made regarding road and road corridors. The final decisions may include two lane roads, one way roads, loop roads or a combination dependant on the results of the analysis.

Loop Roads

The Botha River is considered a break point. The timber companies will not make a loop road from highway 35 across the Botha River to the Chinchaga Forestry Road, nor will the timber companies construct a road that crosses the Botha River to gain access to highway #35.

Existing Corridors

All timber companies generally try to make use of existing corridors (cutlines, roads, other dispositions) in their operations. However safety is paramount, and extra (new cut) roads may be required.

Aquatic Habitat

The timber companies acknowledge that watercourse areas are sensitive and crossings need to properly identified and the appropriate crossing established. Typically roads are established to minimize the number of crossings. The timber companies will continue with that practice. There is also legislation that guides the crossing of watercourses. Timber Companies operating on FMA0200041 will adhere to the Codes of Practice, Water Act, Ground rule guidelines for road construction and any other pertinent rule/legislation/act or directive required.

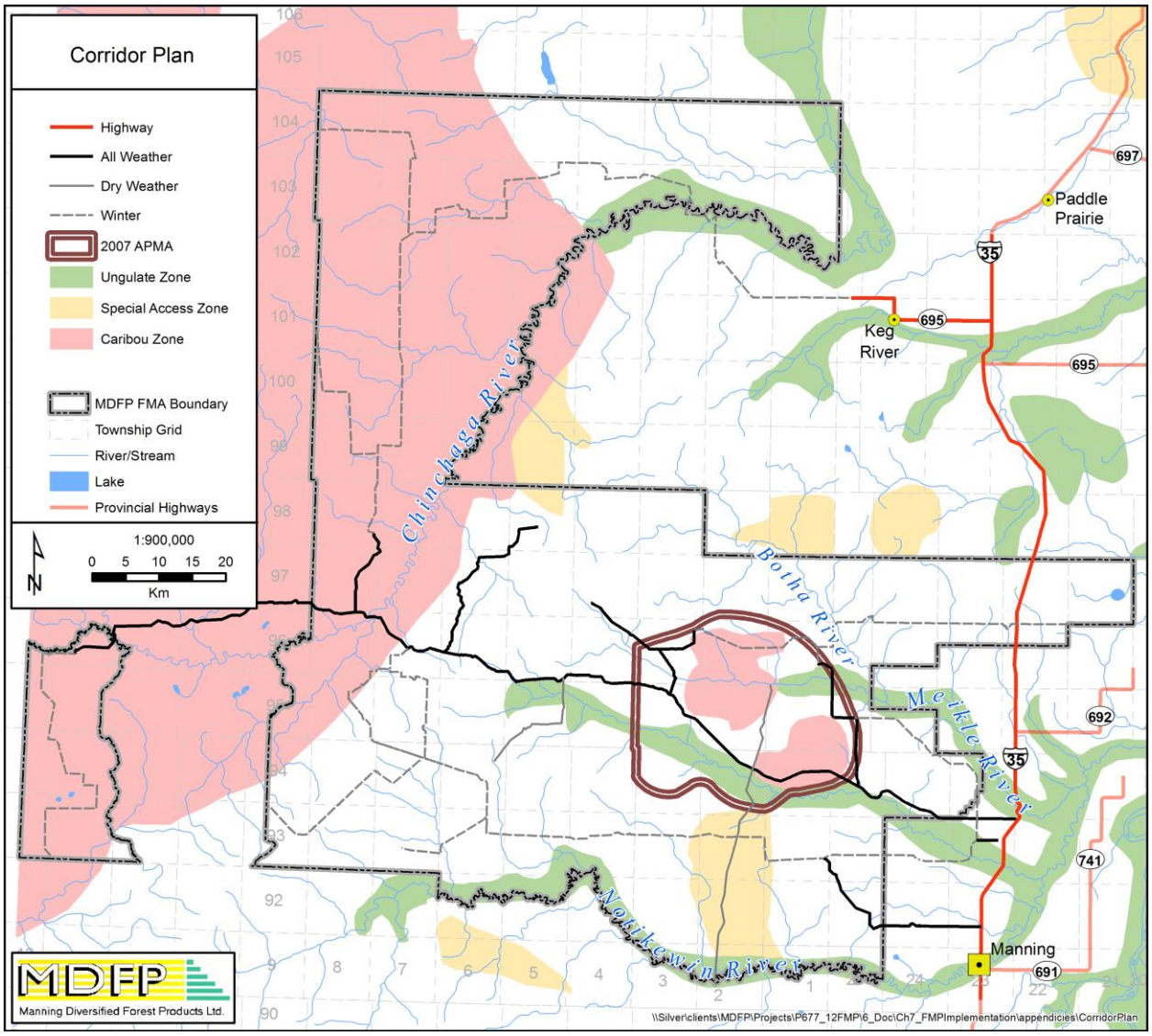

Figure 1. Road Corridor Plan for MDFP FMP.

Recreation and Protected Areas

Currently any area that has a protective notation which excludes forestry practice has been identified and mapped within the landbase documentation. In addition to this, these areas will be re-evaluated through the annual DIDs review procedure during AOP development. This process should ensure that there is consultation with the notation holder prior to harvesting. Where possible the timber companies will use existing access to cross protected areas. This should reduce or minimize road conflicts. The Twin Lakes recreation area is embedded in a buffer surrounding the lake. No new access will be created through the lake buffer without appropriate consultation.

Other Considerations

The roads on this plan are the main corridors to access compartments for harvesting operations. As such they are considered to be of long duration (>20 years) however in any particular time period they may not be used depending on how and when harvest blocks are sequenced. These roads have already been

used in the past or are currently being used. This means wherever possible the timber companies will not be constructing new main corridors for access.

With the exception of crossing the Chinchaga River, all major crossings have already been established and approved. There may be a requirement to create winter crossings on the Chinchaga River in the future due to safety concerns, but for now the timber companies propose to use existing crossings.

Appendix VIII Controlled Parentage Program Region J (PL)

Controlled Parentage Program Plan for the Region J Lodgepole Pine Tree Improvement Project in the Northwest Boreal Region in Alberta, May 2007 (Revised March 2011)

Appendix IX Controlled Parentage Program Region G2 (SW)

Controlled Parentage Program Plan for the Region G2 White Spruce Tree Improvement Project in the Northwest Boreal Region in Alberta, August 2008

Appendix X Fire Protection Strategy

Fire Protection Strategy

2012-2021 FMP

Background

Wildfire is a constant threat to the timber resource within the FMA Area. The Company also utilizes fire in its forestry operations (i.e., burning of debris piles). The Fire Protection Strategy addresses both wildfires and operational use of fire.

MDFP's Fire Protection Strategy includes education, prevention, detection, reporting, control and components.

Education

Education is always the first step in successful implementation of any strategy. Staff and contractors that are knowledgeable about the risk posed by wildfire and their role in detection, reporting and control of wildfires are essential to implementation of the Fire Protection Strategy. To this end MDFP will ensure:

- Woodland staff and contractors will be educated on the importance of prevention, wildfire detection and wildfire reporting. A clear reporting hierarchy will be established.
- Woodland staff and contractors will be advised regarding Company expectations for fire suppression equipment.
- MDFP staff and contractors will participate in fire suppression training as available.
- Woodland staff and contractors will be advised regarding Company expectations for safe and effective practices related to brush pile burning.

Prevention

Fire prevention strategies include the following:

- MDFP conducts harvesting and site preparation activities primarily during the winter months when the risk of a fire start associated with operations is significantly reduced over summer or year-round operations.
- The Company advises all staff and contractors associated with brush pile burning regarding safe and effective practices.
- FireSmart modeling has been incorporated into the Forecasting for the 2012–2021 Forest Management Plan.

Detection

Field staff and contractors will likely be the first to encounter a wildfire, particularly a fire ignited as a result of field operations or a fire associated with a burn pile.

- Woodland staff and contractors will be advised regarding Company expectations for safe and effective practices related to brush pile burning and field operations in general (particularly during operations during fire season)

Reporting

Prompt reporting of a fire start is the first step in reducing fire losses. Environment and Sustainable Resource Development (ESRD) has the mandate for fire suppression in the Province and any wildfires will be reported promptly to ESRD.

- Fire reporting requirements are reviewed annually with field staff and contractors.
- The Fire Control Plan, submitted annually, describes the Company reporting requirements.

CONTROL

Prompt control of a fire is key to reducing fire losses. Although ESRD has the mandate for fire suppression in Alberta, Company and contractor staff have the training to determine whether they can safely begin to take suppression action on a fire.

- The Fire Control Plan, submitted annually, describes the resources available for fire suppression (through Company and contractors).
- MDFP may provide staff to participate in fire suppression if available.

Appendix XI Forest Health Program

Forest Health Program

2012-2021 FMP

March 21, 2013

Background

Forest health is important to Manning Diversified Forest Products (MDFP) and the Province of Alberta. A healthy forest provides MDFP with timber it needs while maintaining other benefits to society. While MDFP has no mandate with respect to management of insects and diseases, the Company's forest management and operations impact the structure of the forest, which has the potential to mitigate or exacerbate the impacts of forest health agents.

MDFP is committed to contributing to the long term forest health and sustainability through its Forest Health Program, comprised of education, detection, reporting, control and research components, as described below.

Education

MDFP Staff and contractors that are knowledgeable about insects and disease and the potential impacts on the forest is the foundation to the Company's ability to contribute to forest health management. To this end, MDFP will ensure that woodlands staff and contractors are educated on the importance of insect and disease discovery and control through regular informal training sessions provided by MDFP, Alberta, or joint initiatives.

Detection

MDFP staff and contractors spend a large amount of time in the forest doing a variety of tasks. Given this, it is likely that they will be the first to detect any significant outbreaks. MDFP woodland staff and contractors have been instructed to report any significant insects and disease issues that they note in their day-to-day work.

Reporting

Alberta Sustainable Resource Development is responsible for Forest Protection, and all instances of suspected endemic insect or disease infestations will be reported to them (using the Suspected Endemic Forest Health Agent Reporting Form – see below), as will any data or information collected by MDFP under any ongoing insect or disease monitoring program.

Control

While the control of forest health agents is the responsibility of Alberta, MDFP will collaborate with SRD in strategic or operational initiatives to control existing, or mitigate potential forest health agents.

Historically, MDFP has participated in regional integrated pest management projects, and will consider further participation on a case by case basis, where the Company deems its support as providing value for both the Company and the sustainability of the forest.

Research

MDFP will consider participation in research initiatives on a case by case basis, where the Company deems its support as providing value for both the Company and the sustainability of the forest.

Suspected Endemic Forest Health Agent Reporting Form

Manning Diversified Forest Products Ltd. **Suspected Endemic Forest Health Agent Reporting Form (form date: January 10, 2011)**	
Date of find:	
Name(s) of individual who identified find:	
1 – Suspected Endemic Forest Health Agent description and identity	
2 – Location of find	
3 – Notification of SRD	
4 – Other notable information regarding the find	

Appendix XII MDFP's Unique Find Policy

Unique Finds Policy

2012-2021 FMP

Background

MDFP is committed to protecting unique finds within its FMA Area. These may be considered unique for ecological, archaeological, geological, environmental or cultural reasons.

The Company's Unique Finds Policy includes reporting and training components, as described below.

Training

Unique finds encompass a wide variety of features, sites, etc. Some of these are easy to identify, while others may require some additional training on the part of staff and contractors. To assist staff and contractors identify potential unique areas, MDFP is committed to providing the following training:

- New staff and/or contractors will review this policy as part of orientation/start-up.
- When a unique find is encountered that is unusual or difficult to identify, the find will be reviewed with both staff and contractors to assist in future identification. This will also provide staff and contractors with on-going reminders about the policy.
- Opportunities for more formalized staff and contractor training will be provided as appropriate.

Reporting

The following process will be followed when unique finds are encountered:

- The staff and/or contractors of MDFP will report any unique finds that they discover through the normal course of their work. The finds will be reported to the woodlands manager either directly (for staff) or through field supervisors (contractors).
- The woodlands manager, in conjunction with the employee or contractor, will make the decision as to whether the site should be considered a 'Unique Find'. Once a site is considered a Unique Find, the following steps are taken:
    - Recommendations for protection will be discussed with the Woodlands Manager and a Unique Finds Reporting Form (see below) will be completed.
    - A file of all reported unique finds will be maintained for future reference and reporting purposes.
    - The spatial location of all unique finds will be captured in the Unique Finds/Uncommon Plant Community GIS Layer.
    - These finds will be reported to appropriate government agencies.
    - On or before June 1st of each year, MDFP will distribute to the other forest product company operators on the FMA Area information regarding, Unique Finds/Uncommon Plant Communities, for their use in operational planning

Unique Finds Reporting Form

Manning Diversified Forest Products Ltd. **Unique Finds Reporting Form (form date: January 10, 2011)**	
Date of unique find:	
Name(s) of individual who identified unique find:	
1 – Unique find description	
2 – Location of unique find	**Captured in Unique Finds GIS layer? YES NO**
3 – Protection required or already employed	
4 – Notification of other interested parties (i.e., forest product companies, government, etc)	
5 – Other notable information regarding the unique find	

Appendix XIII Uncommon Plant Community Maintenance Policy

Uncommon Plant Community Maintenance Policy

2012-2021 FMP

March 21, 2013

Background

MDFP is committed to maintaining plant communities that are uncommon within the FMA Area or the province. Uncommon plant communities are defined as having the following Standard Subnational Conservation Status Ranks in the Alberta Conservation Information Management System:

Rank	Definition
SX	Taxon is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SH	Known from only historical records but still some hope of rediscovery. There is evidence that the taxon may no longer be present, but not enough to state this with certainty.
S1	Known from five or fewer occurrences, or especially vulnerable to extirpation because of other factor(s).
S2	Known from twenty or fewer occurrences, or vulnerable to extirpation because of other factors.
S3	Known from 100 or fewer occurrences, or somewhat vulnerable due to other factors, such as restricted range, relatively small population sizes, or other factors.

The Company's Uncommon Plant Community Maintenance Policy includes identification, maintenance and reporting components, as described below.

Identification & Maintenance

The following process will be used to identify and maintain uncommon plant communities on the FMA Area:

- New staff and/or contractors will review this policy as part of orientation/start-up.
- Prior to June 1st of each year, MDFP staff will query the ACIMS (or its successor) for the identity and location of confirmed rare/sensitive plant communities.
- If new occurrences of confirmed rare/sensitive plant communities are revealed, MDFP will request the detailed information of these occurrences from ACIMS, and will add it to the Company's Unique Finds/Uncommon Plant Community GIS layer.
- The Company will incorporate any new occurrence information into its upcoming AOP as required. If there is a conflict between planned operations and the occurrence, MDFP will field verify the occurrence and ensure that the planned operations are adjusted to ensure that 80% of the area covered by the occurrence is maintained.

Reporting

On or before June 1st of each year, MDFP will distribute to the other forest product company operators on the FMA Area, information regarding Unique Finds/Uncommon Plant Communities, for their use in operational planning

Appendix XIV Forest Landbase Maintenance Program

Forest Landbase Maintenance Program

2012-2021 FMP

Background

Although the maintenance of the forest landbase on the FMA Area is ultimately the responsibility of the Alberta government, MDFP has a vested interest and is committed to regulating its own activities and collaborating with other users to minimize the reduction of the landbase. MDFP's Forest Landbase Maintenance Program consists of initiatives designed to achieve this, as described below.

Forest Landbase Maintenance Program Initiatives

MDFP's Forest Landbase Maintenance Program consists of the following initiatives.

- **Limit MDFP's non-road clearing to less than 5ha annually**

MDFP will limit the area of non-road dispositions that clear productive forest, to less than 5 ha annually.

- **Make MDFP's roads available to other users**

MDFP makes available and encourages other users to utilize their roads. This increases the likelihood that other users will take advantage of MDFP's existing road infrastructure in favor of creating new access, which would generally result in reduction of the forest landbase.

- **Review disposition applications for synergies**

Upon receipt of a disposition applications from other users (primarily the oil and gas industry), MDFP will review the planned dispositions, and consider how the proposed landbase impacts may be reduced through collaboration with MDFP's planned operations. While logistically it may not always be feasible to collaborate operationally (i.e., due to timelines or future plans), the inclusion of the initiative has the potential to minimize the reduction of the forest landbase.

- **Collaborate with the other forest products company operators**

MDFP and the other forest product companies operating on the FMA Area (Buchanan and DMI) review each others' planned operations. This review provides the opportunity to consider collaboration on access to areas, as opposed to each developing access infrastructure independently. While logistically it may not always be feasible to collaborate operationally (i.e., due to timelines or future plans), the inclusion of the initiative has the potential to minimize the reduction of the forest landbase.

Appendix XV Regeneration Survey Quality Control and Assessment Program

Regeneration Survey Quality Control and Assessment Program

2012-2021 FMP

Background

MDFP has developed and implemented a quality control and assessment program to ensure that the Company's regeneration surveys (establishment and performance) meet or exceed those standards defined within the Reforestation Standard of Alberta (RSA), and those defined by the Company.

The Company's Regeneration Survey Quality Control and Assessment Program address training (including start-up meetings), field quality assessment, and data integrity, as described below.

Training

MDFP requires that all surveyors completing regeneration surveys (establishment or performance) on behalf of MDFP be trained and competent to the applicable RSA standards as well as company specific requirements. Documentation of such training will be required before the work is completed. Non-trained people or people in training will be required to work under the supervision of a trained surveyor.

Start-up Meeting

MDFP will have a pre-project meeting to ensure there is no confusion on the types or surveys to be completed and to discuss some of the minimum requirements by MDFP. This meeting will also give an opportunity to answer any questions regarding the project.

Field Quality Assessment

Correct measurements ensure quality work and true results. MDFP will complete checks on contractors to ensure the surveys are completed in a proper manner. MDFP will check 5% of the blocks within a survey year and program (establishment or performance) with a minimum of 10 plots in each check block.

Table 1 outlines MDFPs demerit program. If a survey contains 4 demerits or more the survey fails and will have to be completed again.

Table 1. Field quality assessment error and demerit definitions

Error	Demerits	# Allowed per Survey
Tallying of unacceptable tree	0.5	multiple
Tallying of trees outside of plot	0.5	multiple
Incorrect plot stocking call (SR/NSR)	1	multiple
Establishment of plot in deletion or other	0.5	once
Incorrect marking of plot center	0.5	once
Poor map quality	0.5	once
Incorrect DBH (performance only)	0.5	multiple
Incorrect Ht. (performance only)	0.5	multiple
Incorrect top ht selection (performance only)	0.5	once
Species type error (SDL/ADV) (performance only)	0.5	multiple
Age (+/-) 2 yrs	0.25	multiple
Incorrect GPS location	0.5	multiple

Reconnaissance establishment surveys with total stocking falling in the 70%-84% range will be audited by ground surveys to confirm stocking as required by the RSA manual.

Data Integrity

To ensure that submitted data is correct and recorded in a legible manner field sheets will be checked randomly prior to submission. Following data entry into MDFP's internal record keeping system, random checks of the data will be performed to ensure the data was entered correctly. Following submission to ARIS, checks will be conducted to confirm that ARIS matches MDFP's internal silviculture recording keeping system. In all cases the data will be corrected if any outages are founds.

Appendix XVI Weed Management Plan

Weed Management Program

2012-2021 FMP

Controlling or eliminating weeds is an important issue in our region. The majority of MDFP's weed problems are shared with other disposition holders and a cooperative approach to controlling or eliminating the weeds would be the preferred approach.

Objectives of MDFP's Weed Management Plan:

a) Ensure MDFP staff and contractors are actively participating in weed prevention programs that are developed.
b) Eliminate prohibited noxious weeds that are on MDFP dispositions (including cutblocks)
c) Control the spread of noxious weeds that are on MDFP dispositions (including cutblocks)
d) Participate in Regional or Co-operative weed control initiatives that MDFP believes are necessary

Strategies:

1. Continue to train MDFP staff to recognize and report prohibited noxious and noxious weeds when found. All MDFP field staff are permanent employees and no seasonal staff are hired.
2. Include a clause in our contracts for regeneration surveys and other summer field worker contracts that require the contractor to report any weeds that are found during their work. No direct training is provided by MDFP.
3. An inventory of weed sightings made by our staff and contractors will be kept on file, as sites are identified.
4. MDFP will inventory all of our Class II and III roads annually. Any infestations of prohibited noxious or noxious weeds will be documented.
5. Class IV roads are travelled by MDFP staff during summer work duties. Any weed infestations will be noted. A formal inventory will not be done on these roads, as they have not been a problem in the past. If weeds are found on them, a more intensive inventory will be planned.
6. Each location that is discovered to have weeds will be individually assessed for type, species and risk of spread. An action plan will be developed which may include but is not limited to active controls such as spraying or picking or passive controls such as monitoring with the expectation that other vegetation will occupy the site.
7. Seed purchased for reclamation and re-vegetation will have a seed test analysis completed. Only certified seed (weed free) will be used.
8. MDFP will cooperate with regional or co-operative weed management efforts if MDFP believes they are necessary.
9. Contractors are required to wash all equipment used in the white zone during the summer months prior to being hauled to the green zone. If equipment works in an infested site in the green zone it will be washed before it moves to another site. This clause has been inserted into the logging, hauling and scarification contracts. Off road equipment that is used or stored in the white zone will be washed prior to being used in the green zone.
10. If MDFP were to consider harvesting operations in non-frozen conditions, an updated weed plan would be implemented to deal with the anticipated issues arising from the proposed program.

Appendix XVII Glossary of Terms and Initialisms

Glossary Term		Definition
Above Mean Sea Level	AMSL	A measure of topographic elevation.
Active landbase		Areas that are available for forest management activities. That component of the physical landbase that is not deleted in the landbase netdown process. Consists of the combined coniferous and deciduous landbases. Also referred to as the timber harvesting landbase, net landbase, managed landbase or
Adaptive management		A process for continually improving of planning, implementing, and monitoring policies and practices by learning from the outcomes of previously employed policies and practices, and taking corrective actions where unplanned results occur.
Alberta Environment and Sustainable Resource Development	ESRD	Government of Alberta ministry responsible for regulating FMAs.
Alberta Regeneration Information System	ARIS	A Provincial database of silviculture treatments applied to harvested lands. Updated annually by permit and license holders. Considered to be the defacto record of treatment history and block status.
Alberta Biodiversity Monitoring Institute	ABMI	A province-wide monitoring program that collects information on about 2000 species through site visits, aerial photography and satellite imagery. ABMI provides information on the state of Alberta's biodiversity to facilitate management.
Annual Allowable Cut	AAC	The volume of timber permitted to be harvested in any one year, as stipulated in the pertinent approved FMP. In Alberta, the AAC is the quadrant cut divided by the number of years in that quadrant (usually five).
ARC Macro Language	AML	A third-generation (non-compiled) scripting language, propriety to ESRI. AML is a legacy language used commonly in early versions of ESRI software. While primarily a legacy product, it is still used for developing processes that need to run unattended.
Alberta Vegetation Inventory	AVI	The provincial standard for forest inventory information (classification and data storage).
AVI polygon		A polygon delineated based on aerial photography using AVI rules (AFLW 1991, Nesby 1997). For vegetated areas, areas must be sufficiently similar in terms of structure, moisture regime, crown closure, height, species composition and origin year to be considered a single unit or a polygon. Non-vegetated areas must have a similar nonvegetated classification.
Base natural yield curve		The "standard" set of yield curves developed for yield strata, representing the main stand types within the FMA area. Base yield curves may or may not be used to represent these stand types in the final timber supply analysis.
Biological diversity (biodiversity)		The variety, distribution, and abundance of different plants, animals, and microorganisms, the ecological functions and processes they perform, and the genetic diversity they contain at local, regional, or landscape levels of analysis.
Broad Cover Group	BCG	A classification of forest types based on coniferous and deciduous components of the AVI species composition. The broad cover groups are coniferous (C), coniferous-leading mixedwood (CD), deciduous-leading mixedwood (DC) and deciduous (D).
BCG: Pure Deciduous	D	Deciduous ≥ 80%
BCG: Deciduous-Coniferous	DC	Coniferous > 20% and Deciduous > 20%
BCG: Conifer-Deciduous	CD	Coniferous > 20% and Deciduous > 20%
BCG: Pure Coniferous	C	Coniferous ≥ 80%
Buffer		Used in several contexts: (1) In protecting critical habitat areas, the buffer is an area of forest land that reduces the impacts of adjacent activities on the critical area. (2) A strip of land between two areas under different management regimes. (3) An area maintained around a sample or experimental plot to ensure that the latter is not affected by any treatment applied to the area beyond the buffer. (4) In GIS work, a new polygon zone computed on distance from a point, line or existing polygon.
Canadian Standard Association	CSA	Not-for-profit standards organization that is is composed of representatives from industry, government, and consumer groups and which develops standards in 57 areas.
Caribou		Boreal woodland caribou can be found in forested areas across Canada. In Alberta there are two varieties of woodland caribou – the mountain caribou in foothills and mountains of west-central Alberta, and the boreal caribou in northern Alberta. Woodland caribou are listed as threatened under the Alberta Wildlife Act and federally under the Species at Risk Act (SARA).
Caribou, habitat contols		Rules/constrains applied in a hierarchical forest modeling process with considerations across various spatial and temporal scales to enhance the caribou habitat. The main controls were: (1) 30/20 rule – in the deciduous and mixedwood stratum, a maximum of 20% is allowed to be under 30 years old; (2) Patch target – a patch target that tended towards patches (under 30 years old) larger than 300 ha.
Caribou, provincial zone		Provincially-approved caribou land-use referral map layers that are inteded to alert planners when harvest plans fall in or near these special land management areas and aim to reduce the industrial footprint and impacts on caribou.

Glossary Term		Definition
Classified landbase		A spatial landbase and attribute classification generated as the second stage of the TSA process. Used to calculate the area and distribution of all features on the landscape, particularly to generate summaries of seismic detail and carry this into the modeling landbase.
Clearcutting		A regeneration system where all or most of the merchantable trees in a defined area are harvested in one cutting with reproduction obtained through artificial or natural means.
Committee on the Status of Endangered Wildlife in Canada	COSEWIC	Harvested in one cutting with reproduction obtained through artificial or natural means.
Compartment		A subsection of a Forest Management Agreement (FMA) for which operational plans are developed.
Compartment, working circles		A subsection of an FMA defined by the Manning Diversified Forest Products Ltd.
Combined Heat and Power	CHP	The simultaneous production of electricity and heat from a single fuel source
Composite yield curve		Area-weighted composite yield curves developed from empirically-fit natural stand yield curves; generally by BCG or groupings thereof.
Coniferous Timber Quota	CTQ	One of two types of volume-based long-term forest tenures (also deciduous timber allocation) for harvesting a set proportion of the coniferous AAC volume within a defined area, usually for a period of 20
Connectivity, landscape		A measure of how well different areas (patches or a landscape) are connected by linkages, such as habitat patches, single or multiple corridors, or "stepping stones" of vegetation. Landscape connectivity can be defined as the degree to which the landscape facilitates movement between resources patches.
Corrective actions		May include one or more of the following: - Address a nonconformity in a management system by identifying and eliminating the causes of a problem; - Carry-out an appropriate enforcement response; - Direct that the work to be corrected and re-submitted.
Corridor		A physical linkage connecting two areas of habitat and differing from the habitat on either side. Corridors are used by organisms to move around without having to leave the preferred habitat. A linear habitat patch through which a species must travel to reach habitat more suitable for reproduction and other life sustaining needs. Many corridors, linking several patches of habitat, form a network of habitats.
Cull deductions		Trees or portions thereof that are merchantable, but are removed because of defect.
Culmination age		The age at which the stand, for the stated diameter limit and utilization standard, achieves its maximum average rate of volume production (the Mean Annual Increment (MAI) is maximized).
Cutblock		A specified area that is either designated for harvest or has already been harvested.
Daily mean temperature		Derived on a daily basis from daily minimum and daily maximum temperatures. Daily minimums and maximums are recorded over 24 hour periods that begin and end in the morning. These values are then averaged for the entire month, over the reporting period (generally 30 years, from 1961- 1990).
Daishowa Marubeni International Ltd.	DMI	A neighbouring FMA holder and license holder inside the MDFP FMA area.
Defined Forest Area	DFA	Area of forest, including land and water (regardless of ownership or tenure), to which the requirements of the FMA apply.
Defining layer		Inventory layer used to assign strata. The defining layer may be the overstory or the understory.
Deletions		All areas excluded from the active landbase and assigned a code identifying the reason for deletion.
Digitally Integrated Disposition system	DIDs	A Provincial database and system of specific land use disposition types submitted for approval. The DIDs spatial data are managed and distributed by Alberta Public Lands.
Disturbance patch		Disturbance patches are used to describe the patch sizes of any part of the active landbase that is less than 20 years old, regardless of strata.
Deciduous Timber Allocation	DTA	One of two types of volume-based long-term forest tenures (also see coniferous timber quota) for harvesting a set proportion of the deciduous AAC volume within a defined area, usually for a period of 20
Environmental Systems Research Institute ™	ESRI	The developer of the suite of geographic information system software products commonly known as ArcInfo, ArcMap, ArcView, Spatial Analyst and others.
Environment and Sustainable Resource Development	ESRD	Alberta Environment and Sustainable Resource Development is a ministry of the Government of Alberta that brings together the former departments of Environment and Water and Sustainable Resource Development.
FireSmart		The philosophy that seeks to mitigate the likelihood of large, high intensity and severity fires.
FireSmart community zone		A standard ten kilometre radius around the community extending from the Wildland Urban Interface Zone. A unique data set will be gathered for this zone for community protection planning to provide a fundamental linkage between FireSmart Communities and FireSmart Landscapes.
FireSmart landscapes		FireSmart landscapes are designed to recognize the interaction between ecological, economic, and social impacts, thus, maximize the positive ecological impacts and minimize the negative economic and social impacts.
FireSmart landscape zone		The zone that extends beyond the FireSmart Community Zone overlapping multiple jurisdictions at a broad landscape level. This zone focuses on mitigating the likelihood of large, high intensity, high severity fires. Fire, Forest and Land Management planning are integrated and designed to reduce the negative ecological, economic, and social impacts of wildfire while maximizing the positive attributes of wildfire.
Forecasting		See Timber Supply Analysis.
Forest Management Agreement	FMA	Contract between the Province of Alberta and the FMA holder whereby the Province provides an area-based Crown timber supply. In return, the FMA holder commits to: managing the timber resource on a perpetual sustained yield basis, taking into consideration a broad range of forest values in determining forest management practices; and meeting defined economic objectives, including capital investments and job creation, and seeking out new business opportunities that provide measurable economic benefits for both the Province and the FMA holder. The FMA gives the FMA holder the right to access Crown fibre. In return, the FMA holder commits to forest management responsibilities, which may change from time to time (Alberta SRD 2006).

Glossary Term		Definition
Forest Management Plan	FMP	A document prepared by the FMA holder that describes the spatial and temporal harvest plan and forest harvest operations on Crown lands over a 10-year planning horizon (in Alberta). The document provides detailed methods, schedules, and responsibilities of the FMA holder in terms of accessing, harvesting, renewing and protecting the resource to enable site-specific operations to proceed. The document must be approved by the Government of Alberta, with input from stakeholders.
Forest Management Unit	FMU	An administrative unit of forest land designated by the Minister, as authorized under Section 14(1) of the Forests Act.
Forest patch		A stand of forest in the same seral stage that is not split by a linear feature greater than 8 m wide.
Forests Act, the		The legislative statute that authorizes the Minister to administer and manage the forested lands of Alberta.
Fully stocked		All potential growing space that is effectively occupied by merchantable tree species.
GEO	GEO	ESRI notation to for data stored in coordinates representing latitude and longitude.
Geographic Information System	GIS	A collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.
Green-up period		The time needed to re-establish vegetation after a disturbance. Specific green-up periods may be established to satisfy visual objectives or hydrological requirements, or as a means of ensuring re-establishment of vegetation (for silviculture, wildlife habitat or hydrological reasons) before adjacent
Gross volume		A term applied to tree-level, plot-level or stand-level volumes (*e.g.,* gross total tree volume, gross merchantable tree volume, gross total plot volume, gross merchantable plot volume, gross total stand volume, gross merchantable stand volume) that Indicates no defect/cull deduction has been applied.
Growing Degree Day	GDD	The sum of mean daily temperature above a baseline temperature (i.e. 5 degrees Celsius). Daily values are accumulated over the growing to determine annual values.
Growing stock		The sum (by number, basal area or volume) of trees in a forest or a specified part of it.
Harvest area		A specified land area with defined boundaries where timber harvesting is scheduled, or has occurred (commonly referred to as a cut block).
Industrial Sample Plot	ISP	A forest plot used to monitor the natural growth and yield of trees.
Influential point		An extreme data point that negatively influences model performance, resulting in failure to converge or an unacceptable curve shape.
Input datasets		Datasets received for the purpose of completing the landbase netdown. These frequently require processing to convert or add attributes, assign/add projection information, or combine with other inputs that represent the same features.
Landbase		A result of a classification process used to identify and determine areas available and suiatble for timber harvesting activities.
Landbase, active (also referred to as net, or managed, or contributing)		The landbase available for timber harvest and that comprises the net productive coniferous and net productive deciduous land bases. The active landbase is further classified into either conifer or deciduous landbase depending on species composition.
Landbase, passive (also referred to as		The landbase that is not part of the net productive coniferous or deciduous landbases
Landbase polygon		A polygon within the (classified, TSA, or modeling) landbase derived during spatial processing to incorporate various spatial layers and attributes of interest.
Managed landbase		That portion of the net landbase which is considered "managed" in the respect that the land received a harvest treatment and subsequent silviculture treatments. Note that AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any records of reforestation are not considered 'managed'.
Managed stand		Stand that is initiated by anthropogenic disturbance such as harvesting.
Managed stand yield curve		Yield curves generally created by applying regeneration lags to base natural yield curves with cull. Regeneration lags varied depending on whether cutblocks were harvested prior to or after 1993. Thus both Pre93 and Post93 managed managed stand yield curves developed.
Manning Diversified Forest Products Ltd.	MDFP	The forest products company in Alberta responsible for this FMP.
Mean Annual Increment	MAI	Average annual increase in volume of individual trees or stands up to the specified point in time. The MAI changes with different growth phases in the life of a tree, being highest in the middle years and then slowly decreasing with age. The point at which MAI peaks is commonly used to identify the biological maturity of the stand and its readiness for harvesting (Alberta SRD 2006).
Metadata		Data that describes the content, quality, conditions, use limitations and other characteristics of a dataset and which also documents bibliographic records including but not limited to information such as who collected the data, when and how it was collected, preprocessed and converted, its resolution and who presently holds the data. In summary, metadata is information about a thing, apart from the thing itself.
Merchantable volume, stand		Merchantable tree volume summed to represent volume on a per hectare basis.
Merchantable volume, tree		A tree-level term; the volume of those portions of a tree bole that meet utilization requirements (stump height, top and bottom diameter limits and log length).
Modeling landbase		A tabular and spatial landbase. Tabular data make the landbase suitable for both strategic and operational timber supply modeling. The spatial component is used for harvest scheduling.
Modeling tool, Patchworks©		A spatially-explicit wood supply planning and modeling tool developed by Spatial Planning Systems that was designed to provide the user with operational-scale decision-making capacity within a strategic analytical environment.
Modeling tool, Woodstock©		A non-spatial forest modeling tool developed by Remsoft used for harvest scheduling, wood supply analysis, wildlife management and simulation of forest ecosystems to test and compare different management assumptions.

Glossary Term		Definition
Mountain Pine Beetle	MPB	A defoliator insect species (*Dendroctonus ponderosae*) endemic to western North America that infects pine trees during its life cycle and results in tree mortality.
Natural stand		Stands developed under natural (non-anthropogenic) disturbance regimes. Stand initiation was due to natural disturbances, such as fire, pest or pathogen outbreak.
Natural stand empirical yield curve		Empirical yield curve fitted using data from all sampled natural stands within the active landbase.
Net volume		Timber volume that includes the main stem and excludes the stump, top and defective and decayed wood.
Non-linear regression		The practice of fitting a model where the dependent variable is a nonlinear function of one or more independent variables. One benefit of the nonlinear models is that they are often derived on the basis of physical and/or biological considerations.
North American Datum	NAD	A mathematical process of correcting geospatial locations relative to a fixed, known position.
Noxious weed		A plant designated under the Weed Regulation (AR 171/2001) of the Weed Control Act.
Observation		One plot measurement at a specific point in time. All TSPs have only one associated observation, whereas PSPs may have one or more observations (remeasured data) for a single plot.
Operating Ground Rules	OGR	Practices used in operational planning and for implementation of timber harvest operations.
Organic Rankine Cycle	ORC	Thermodynamic process where heat is transferred to a fluid at a constant pressure
Patch		A stand of forest in the same seral stage, and not split by a linear feature greater than 8m wide. Linear features in this definition include roads, pipelines, powerlines, and rivers, but do not include seismic lines.
Passive landbase		That part of the gross landbase that has a deletion and is excluded from the active landbase.
Permanent Sample Plot	PSP	A fixed or variable area plot established for (forest) sampling and measurement purposes, and designed for re-measurement.
Piece size		Number of trees required to obtain one cubic meter (m^3) of gross merchantable tree volume.
Plan Development Team	PDT	A group of individuals assembled for production of MDFP's Forest Management Plan that includes representatives from MDFP, DMI and Buchanan Lumber, Alberta Environment and Sustainable Resource Development, and FORCORP. The goal of the PDT is to provide a forum for facilitating efficient and productive communication and decision making.
Plot		Unit of area, within which variables of interest are assessed.
Plot volume		Gross merchantable tree volume within a plot on a per hectare basis (m^3/ha).
Polygon		A closed geometric entity used to spatially represent area features with associated attributes.
Post93 managed stand yield curve		A managed stand yield curve with a 2-year regeneration lag applied to the coniferous landbase and a 0-year regeneration lag applied to the deciduous landbase.
Pre93 managed stand yield curve		A managed stand yield curve with a 5-year regeneration lag applied to the coniferous landbase and a 2-year regeneration lag applied to the deciduous landbase.
Preferred Forest Management Scenario	PFMS	The forest management scenario that represents MDFP's preferred strategies and activities for managing the FMA area over a 200-year planning horizon.
Prescribed burn		The planned use of carefully controlled fire to accomplish various predetermined management goals: site preparation for planting; reduction of fire hazards or pest problems; improvement of the ease with which the site can be traversed; and creation of better quality browse for wildlife.
Regeneration		The renewal of a tree crop by natural or artificial means. It may also refer to the young crop itself.
Regeneration lag		The period of time between harvest and establishment of the regenerated stand.
Rotation		The period of years required to establish and grow even-aged timber crops to a specified condition of maturity.
Sensitive sites		Sites that have soil, water, slope, aesthetic, vegetation or wildlife characteristics that require special protection beyond the normal precautions described in the ground rules.
Seral stage (SS)		Stages in forest succession that are characterized by plant community conditions. The seral stage definition in this document are based on age and strata classifications
SS: Mature	Mature	Stands that are old enough for harvesting. Age: 61-100 for D and DU; Age: 71-110 for DC and CD; Age: 71-120 for PL; Age: 106-160 for SB, and 106-150 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Old	Old	Stands that are starting to break up or become stagnant. Age ≥ 101 for D and DU; Age ≥ 111 for DC and CD; Age ≥ 121 for PL; Age ≥ 161 for SB; Age ≥ 151 for SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Regeneration	Regeneration	Stands that are in early stages of development. Age: 0-15 for all strata classes. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
SS: Young	Young	Stands that are vigorously growing but are not yet fully grown. Age: 16-60 for D and DU; Age: 16-70 for DC, CD, and PL; Age: 16-105 for SB and SW. For definition of strata classes (D, DU, DC, CD, PL, SB, SW) see Yield Strata groupings' definition.
Silviculture		The theory and practice of controlling the establishment, composition, health, structure and growth of forests in order to achieve specified management objectives.
Sliver		Generally small polygons created in the spatial analysis due to overlapping features that do not have coincident boundaries. Typically these are artifacts of spatial processing and generally do not represent true differences in polygon differentiation with respect to landbase classification.
Soil productivity		The capacity of soil to support plant growth.
Spatial Harvest Sequence	SHS	A stand level map depicting forest stands scheduled for timber harvesting that are feasible to be operated by the organization.
Special Management Zone		An area of varying size adjacent to an area in which special management measures are necessary to protect natural resources.
Species at risk		Any species known to be "at risk" after formal detailed status assessment and designation as "Endangered" or "Threatened" in Alberta. The list of species is maintained by Alberta.

Glossary Term		Definition
Species group		A single species code used to represent one or more AVI species. For example, the AW species group consists of AVI species A and Aw; and the LT species group consists of La, Lt and Lw.
Species type		There are two species types: deciduous and coniferous. Deciduous species include aspen, birch and poplar. Coniferous species include fir, pine, larch and spruce.
Stand		A community of trees sufficiently uniform in species, age, arrangement or condition as to be distinguishable as a group in the forest or other growth in the area. A stand may also be that polygon as defined in the AVI or Phase III inventory (Alberta SRD 2006).
Stand Susceptibility Index	SSI	An indicator of the potential loss in stand basal area or volume that could occur if mountain pine beetle infested a particular stand. A susceptibility index based on four variables: relative abundance of susceptible pine basal area in a given stand, age of dominant and co-dominant live pine, the density of the stand, and the location (latitude, longitude and elevation) of the stand.
Stand volume		Gross merchantable volume within a stand on a per hectare basis (m^3/ha); also known as gross merchantable stand volume.
Strata/Stratification		A classification scheme for defining data for use in management or modeling.
Structured Query Language	SQL	A formal computer language for querying relational database system tables. The language follows an ANSI compliant format and the core set of commands are part of a common language used across many database software programs.
Submission datasets		Datasets submitted to ESRD for approval.
Temporary Sample Plot	TSP	A fixed or variable area plot established for forest sampling and measurement; usually assessed only once.
Thinning, commercial		A partial cut where trees of a merchantable size and value are removed to provide an interim harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees. Used to capture volume likely to succumb to competition pressures and be lost to disease, insects, or dieback.
Thinning, pre-commercial		A silvicultural treatment to reduce tree density in young stands, carried out before the stems reach merchantable size. The intent is to concentrate the site's growth potential on fewer trees thereby accelerating stand development and reducing the time to final harvest, retaining more live crown, creating opportunities for future commercial thinning activities and improving stand operability.
Timber Harvest Planning and Operating Ground Rules		Standards for operational planning and field practices that must be measurable and auditable and based on forest management plan objectives.
Timber Management Regulation	TMR	The legislative statute that describes the mechanism and regulations by which the forested lands of Alberta are managed. The Regulation is associated with the Forests Act.
Timber operations		Includes all activities related to timber harvesting including site assessments, planning, road construction, harvesting, reclamation and reforestation.
Timber Supply Analysis	TSA	Harvest while maintaining a high rate of growth on the remaining, well-spaced, final crop trees.
TSA landbase		A spatial landbase that carries all the information of the classified landbase, with the exception of the seismic line work.
Total stand volume		Used to capture volume likely to succumb to competition pressures and be lost to disease
Tree improvement		Insect, or dieback.
Tree improvement yield curve		A modified yield curve for the PL and SW yield strata, whereby the managed stand is adjusted such that volume increase (a fixed percent) occurs at approximately the average harvest age, but the maximum total volume across all ages is unaffected.
Understorey		The trees and other woody species growing under the canopies of larger adjacent trees and other woody growth.
Ungulate		A mammal with hooves.
Universal Transverse Mercator	UTM	A method of projecting spherical shapes on a flat plane. Typically this projection is used when the features need to have good area representation and the extent of the dataset does not cover more than one predefined UTM zone (three degrees of longitude).
Unmanaged landbase		That portion of the net landbase which is considered to be on a "natural" yield projection. All unharvested areas are considered 'unmanged'. AVI stands classified with modifier = 'CC', where there is no identified cutblock boundary, no Opening Number, nor any record of reforestation are also considered 'unmanaged'.
Values, Objectives, Indicators and Targets	VOIT	A framework of criteria and indicators to help track progress in achieving sustainable forest planning and management under sound environmental, economic, and social objectives.
Watercourse		The bed, bank or shore of a river, stream, creek, lake or other natural body of water, whether it contains or conveys water continuously or intermittently.
Watershed		An area of land, which may or may not be under forest cover, that drains water, organic matter, dissolved nutrients and sediments into a lake or stream. The topographic boundary, usually a height of land, that marks the dividing line from which surface streams flow in two different directions.
Wildlife		Any species of amphibian, bird, fish, mammal and reptile found in the wild, living unrestrained or free roaming and not domesticated. Some definitions include plants, fungi, algae and bacteria.
Wildlife Management Unit	WMU	Areas within province of Alberta managed by ESRD and regulated by the Alberta Wildlife Act (2012).
Years Before Present	YBP	A unit of measure of historical time.
Yield curve		Graphical representation of a predictive yield equation. One yield curve in fact consists of three curves: a conifer volume-age curve, a deciduous volume-age curve and a total volume-age curve.
Yield strata (YS)		A system of stratification applied to the forested landscape based upon FMU, and defining layer and/or understory layer attributes (BCG, crown closure class, leading conifer species). Yield strata form the basis for the development of yield curves; each yield stratum has one or more associated yield curves.

Glossary Term		Definition
YS: Deciduous	D	Species grouping defined as Deciduous
YS: Deciduous w/ Conifer Understory	DU	Species grouping defined as Deciduous with Coniferous Understory
YS: Mixedwood - Deciduous	DC	Species grouping defined as Mixedwood with Deciduous leading
YS: Mixedwood - Coniferous	CD	Species grouping defined as Mixedwood with Coniferous leading
YS: Coniferous - Pine leading	PL	Species grouping defined as Coniferous with Pine leading
YS: Coniferous - Black Spruce leading	SB	Species grouping defined as Coniferous with Black Spruce leading
YS: Coniferous - White Spruce leading	SW	Species grouping defined as Coniferous with White Spruce leading
YS: No Strata (cutblocks)	XCC	No Yield Strata assignment (cutblocks)
YS: No Strata	X	No Yiel+D21d Strata assignment

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