2014 Detailed Forest Management Plan

November 17, 2016 (re) Submission Date (revised November 10, 2017)

Hinton Wood Products
A division of West Fraser Mills Ltd.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1.0 EXECUTIVE SUMMARY

Hinton Wood Products (a division of West Fraser Mills Ltd.) has prepared a Detailed Forest Management Plan (DFMP) for the Forest Management Unit E14 as required under its Forest Management Agreement #8800025. This submission fulfills the obligations detailed within that agreement and adheres to the 2006 Alberta Forest Management Planning Standard.

This DFMP provides a landscape assessment and statements of goals, values, objectives, indicators and targets as outlined in the 2006 Alberta Forest Management Planning Standard. Extensive public involvement, defined in the Public Involvement Program, helped develop these targets. The DFMP is intended to operationally cover a span of 10 years and includes a 20 year spatial harvest sequence. The DFMP outlines a complete set of strategies, reporting and monitoring protocols. These are designed to achieve the desired state of the future forest as detailed in the Preferred Forest Management Strategy (PFMS).

The PFMS and the SHS will be the basis for future operations within the FMA area. Managing the forest sustainability is the main focus of this DFMP. This DFMP differs from previous DFMPs submitted in Alberta in that it has been built around the concept of managing forests and their associated habitats within their Natural Range of Variation (NRV). In particular, natural disturbance regimes have been researched, analysed and modelled with the goal being to maintain seral stages, forest cover types, patch sizes and residual stand structure within their NRV (or when out of NRV, moving back toward NRV). Also included in this DFMP is a new method of identifying watercourses, a new methodology for identifying riparian areas, and a new strategy in the management of riparian areas.

This DFMP also provides analysis and strategies around non-timber values such as caribou, grizzly bear, water yield impacts, FireSmart, uncommon plant communities, coarse woody debris, and noxious weeds.

A new Timber Supply Analysis was completed in support of this new Detailed Forest Management Plan which has been prepared to meet the requirements of the Alberta Forest Management Planning Standard Version 4.1 (April 2006). The new Annual Allowable Cut (AAC) proposed in this plan, based on tree length utilization standards, is 1,630,701m^3 of coniferous and 346,691m^3 of deciduous in the first 10 year period (May 1, 2013 to April 30, 2023). When the unused volume from the previous 10-year period is incorporated into the first 10-year period, the AAC moves to 1,849,991m^3 of coniferous and 385,335m^3 of deciduous.

After the first ten year period, the cut is projected to drop to 1,453,826m^3 of coniferous and 281,741m^3 of deciduous for the next ten years (May 2023 to April 2033). After the second period, the goal of reducing 75% of MPB susceptible pine in 20 years will be partially reached (but not fully reached for another 20 years).

The best information available was used in the development of the plan. HWP is committed to continuous validation and monitoring of the plan to ensure that the objectives have been met. More specifically, HWP also remains committed to jointly developing a Monitoring and Measuring Program associated with the implementation of its new Riparian Management Strategy. Communication with stakeholders and public was ongoing throughout the Plan development. First Nation communities identified by the Government of Alberta (GoA) have been included in a consultation process.

A Performance Stewardship Report will be submitted five years from the approval date of this DFMP. A new DFMP will be scheduled for submission by May 1, 2026.

2.0 INTRODUCTION

On January 14, 2008 the Government of Alberta signed a Forest Management Agreement (FMA #8800025 – O.C. 565/2007)) with West Fraser Mills Ltd., the parent company of Hinton Wood Products (HWP). The Hinton FMA is the oldest in Alberta, with the first FMA agreement being signed with the province on June 8, 1951.

The FMA agreement requires companies to "follow sound forest management practices designed to provide a perpetual sustained yield of timber from the productive forest land, while not reducing the productivity of the land". This requirement is primarily implemented through the development of this Detailed Forest Management Plan (DFMP). The 2008 FMA required this DFMP to be completed by September 30, 2009, but this date was subsequently extended to September 30, 2014 and then to October 31, 2014 for a number of reasons, which are outlined in section 3.2. The first edition of HWP's DFMP was submitted to the GoA on October 31, 2014.

Over the course of the next year, the GoA provided HWP with three review letters outlining a number of deficiencies, omissions, clarifications, and/or required changes with respect to the October 31, 2014 submission. The December 23, 2015 resubmission of HWP's DFMP contained a number of changes from the October 31, 2014 submission that can be summarized as follows:

- There were a number of issues that were corrected with the Timber Supply Analysis, some of which required some changes to the second decade of the Spatial Harvest Sequence (i.e. harvested areas in the second decade were removed in order to meet seral stage targets).
- For the seral stage Target #1, the "late mature" and "old" seral stages were combined into a new seral stage called "late mature plus old".
- The target (#1) for seral stage was changed to be between the 12.5 and 87.5 percentile on the gross and contributing landbase and the acceptable variance was changed to be within NRV.
- The stand structure retention target (islands within cutblocks) was changed to reflect the GoA's requirement that the structure being left within cutblocks be merchantable. HWP then dropped four stand structure targets it had been proposing instead of leaving merchantable volume in cutblocks – those targets were event size, island remnants, matrix remnants, and island plus matrix remnants.
- A number of clarifications were made in the silviculture section of the DFMP (section 7.3) including around deployment of improved stock, the Silviculture Matrix, and how the blocks logged as part of the Riparian Management Strategy would be dealt with silviculturally.
- A new section and appendices have been added to this DFMP document that address the requirements of the Planning Standard to have a summary of any previous FMP and management outcomes including the learning associated with management review.

In early 2016, HWP then received some further feedback from the GoA regarding the way the reconciliation volume was calculated (Appendix 21). We have now corrected the adjustment factors used (reconciliation volume of 2,192,901m^3 and actual (TPRS) volume harvested in 2013 of 1,362,860m^3) to be tree length volumes instead of cut to length volumes and corresponding tables in this document have been changed accordingly. In addition to this minor issue, HWP received another review letter from the GoA dated February 29, 2016, which outlined some deficiencies in HWP's Growth and Yield Program (Appendix 23) and asked that HWP develop and provide the following to address these issues:

- A listing of plot types (permanent or temporary sample plots), the number of measurements and a schedule of measurements
- A robust monitoring program for the population of managed stands that is designed to test the yield estimates and supporting growth assumptions for managed stands.
- A monitoring component to explicitly evaluate realized gains for Tree Improvement in managed stand strata.
- An accounting of the measurement activities since the last Growth and Yield Program, including a complete history of measurements.

This Growth and Yield Program was updated to address these issues and is found in Appendix 23.

The February 29, 2016 review letter also asked that HWP submit an additional appendix to the DFMP containing the harvest profile in a format that is modified from section 6.2 of the Planning Standard and includes the proposed Spatial Harvest Sequence harvest area distribution by compartment. The Strata Description Table has been completed and can be found in Appendix 26.

HWP was prepared to resubmit another revised FMP in the summer of 2016; however, during that summer some additional issues were raised by the GoA. On September 27, 2016, HWP and GoA representatives met in Edmonton to discuss some further requirements that the GoA would like HWP to address before resubmitting the DFMP. Specifically, the GoA wanted HWP to develop a timber supply analysis showing the difference in timber supply with HWP's Riparian Management Strategy fully implemented (i.e. operable landbase in what were typically riparian buffers have been included in the net landbase) and without implementing HWP's Riparian Management Strategy (i.e. riparian buffers have been removed from the net landbase). HWP was also asked to present the Timber Supply Analysis in a specific format (Excel spreadsheet subsequently supplied by the GoA), which included how the unused volume from the previous 10-year period was broken out and incorporated into both scenarios (i.e. buffers in and buffers out). This has been completed and can be found in the Timber Supply Analysis document (Appendix 21).

HWP had submitted a draft of its revised Growth and Yield Plan to the GoA on September 6, 2016. GoA and HWP met to discuss this draft on October 7, 2016. Subsequent to that meeting, the GoA provided another review letter dated October 26, 2017 that outlined further wording, descriptions and commitments that they wanted to see incorporated into the Growth and Yield Plan. This Growth and Yield Program was further updated to address the October 26th GoA comments and is found in Appendix 23.

This final version of the DFMP (November 16, 2016) now incorporates and/or addresses all of the comments found in the five official GoA DFMP review letters received by HWP since its original DFMP submission on October 31, 2014, as well as addressing less formal comments in the numerous meetings and emails between the GoA and HWP during that same time.

Background

Previous to this DFMP submission, a Terms of Reference (Appendix 1) was developed jointly by representatives from the GoA and HWP, which provided direction and a framework for the development of this DFMP. HWP's FMA applies to Forest Management Unit (FMU) E14 – this FMU boundary is used to define the extent of HWP's landbase. The total area associated with FMU E14 is called the FMA area (or Defined Forest Area - DFA) and is 1,022,465 hectares in size.

HWP is the primary timber tenure holder on the FMA area, although the FMA does provide Alberta the right, after consulting with the Company, to issue timber dispositions on the FMA area not exceeding two years in length, to provide timber for local use in construction and maintenance of public works by any local authority, municipality, county, the Crown, and for local residents for their own use and sale provided, however, that the total volume of timber cut under authority of such permits on the FMA area in any timber operating year does not exceed 8,500 cubic metres (m^3) of coniferous timber annually and 1,500 cubic m^3 of deciduous timber annually. There is no other embedded timber quota on the FMA area.

There are numerous other types of non-timber tenure, permits, leases, and other similar agreements that fall within the FMA area. These rights and responsibilities will generally be set out in agreements between government and the organization. HWP respects all the legal rights and responsibilities of other parties in the FMA area. Examples of other agreements include various grazing tenures, registered fur management areas (traplines), pipeline agreements, pipeline installation leases, road agreements, well-site leases, mining leases, powerline agreements, vegetation control easements, gravel pit leases, and other miscellaneous leases. HWP works with all of the other organizations on the FMA area to ensure that their rights and responsibilities are respected as HWP goes about its forest management activities within the FMA area.

In the development of this DFMP, and in particular the Values, Objectives, Indicators, and Targets (VOITs) found in section 6.0, HWP tried to be as inclusive as possible. Over the last three years, HWP's Forest Resources Advisory Group (FRAG) has reviewed and had the opportunity to provide input into all of the VOITs found within this plan. FRAG membership includes representatives from the Alberta Trappers Association, the Hinton ATV club, the local Fish & Game club, the Coal Association of Canada, local, county and municipal governments, the Athabasca Watershed Council, the Chamber of Commerce, and local unions (to name only a few). FRAG operates under a "Terms of Reference", and for this DFMP, a set of "Basic Operating Rules for the DFMP Public Participation Process". Both these documents clearly describe the respective roles and responsibilities of the parties involved.

In addition, each year also HWP places an "Annual Report to the Community" notice in the local newspaper, which summarizes what the FRAG has been doing over the previous year and invites anyone interested to apply to join FRAG. Annually, since 2012, HWP has also sent letters to specific stakeholders – these letters and accompanying attachments provided information about this DFMP and how they could provide input into it. Stakeholder letters went to all trappers on the FMA, local provincial, county, and municipal government representatives, ENGOs, HWP's logging contractors, local energy sector companies (e.g. oil & gas, coal) , and local media. In addition, HWP has also held open houses annually since 2012 in which notices were placed in local newspapers advertising the open houses and that information about HWP's 2014 DFMP would be available at these open houses. The public participation process used in the development of this DFMP is described in more detail in section 5.1. The First Nations and local non-status Aboriginal communities were also consulted during the development of this plan – that process is described in more detail in section 5.2.

Sustainable Forest Management is defined in the Alberta Forest Management Planning Manual as "management to maintain and enhance the long-term health of the forest ecosystems, while providing ecological, economic, social and cultural opportunities for the benefit of present and future generations." This DFMP outlines the details of where, when and how trees within the FMA area will be harvested and sustainably managed. Once the new DFMP is approved it will replace the previous plan for this area.

The development of a DFMP is a long and involved process that incorporates new knowledge from research, changes in policy and legislation, changes to the landbase, and society's shifting views. It addresses a number of management elements as outlined below.

- Managing a perpetual and sustainable fibre supply to meet the needs of the processing facilities
- Accurate and timely forest and timber data collection for landbase updates and growth and yield projections
- Regeneration strategies and commitments
- Mitigation of impacts on soil and water resources
- Communication and consultation with the public and affected First Nations
- Balancing economic, environmental and social values with timber harvesting
- Incorporation of local interests in fibre and non-timber benefits
- Strategies for fish and wildlife management
- Analysis of potential wildfire risks, and insect and disease threats
- Participation in forest research (section 9.0)

The DFMP also describes the current and future condition of the forest management area. HWP's management philosophies and objectives are outlined and broken down to measurable objectives. Through implementation, monitoring, and reporting systems (section 8.0), HWP will meet the targets described in this plan (section 6.0). The Alberta government will evaluate the Company's performance against these targets. Two key components of the DFMP are the determination of a sustainable Annual Allowable Cut (Section 7.0) harvest rate and a Spatial Harvest Sequence that outlines where HWP will be harvesting in the next 10 year period. The operational components of a DFMP are prepared for a 10-year term and are revised every ten years in a new DFMP.

HWP's overall management approach is based on a philosophy of approximating natural disturbance patterns and quantities and is described in more detail in section 3.0 and in HWP's Natural Disturbance Strategy found in Appendix 2.

A. Corporate Overview

West Fraser was founded in 1955 when three brothers – Sam, Bill and Pete Ketcham - pooled their resources to buy a small planing mill in Quesnel, B.C. From that early entrepreneurial spark, West Fraser has grown to be the largest lumber producer in North America.

An integrated North American wood products company, West Fraser operates more than 35 mills across Western Canada and the southern United States. The Company's main product is lumber – spruce/pine/fir (SPF) and southern yellow pine (SYP). West Fraser also produces panels (plywood, MDF and LVL), pulp (NBSK and BCTMP), newsprint, treated wood (e.g. decking), and wood chips.

West Fraser's operations located in western Canada manufacture all of the Company's products except southern yellow pine lumber. The Company's southern United States mills produce SYP lumber and wood chips.

B. Alberta Manufacturing Facilities

In recent years, West Fraser has significantly increased its forestry assets in Alberta with the recent purchases of Sundance Forest Industries Ltd. (now Edson Forest Products) and Gordon Buchanan Enterprises Ltd. (now High Prairie Forest Products). West Fraser now has the following manufacturing facilities in Alberta:

- Alberta Newsprint Company – Located in Whitecourt, this mill produces newsprint (it is a joint venture, in which West Fraser owns 50% but is not the managing partner).
- Alberta Plywood – Located in Edmonton, this mill produces plywood.
- Blue Ridge Lumber – Located in Blue Ridge (near Whitecourt), this mill produces lumber.
- Edson Forest Products – Located just outside of Edson, this mill produces lumber.
- High Prairie Forest Products – Located in High Prairie, this mill produces lumber.
- Hinton Pulp – Located in Hinton, this mill produces pulp.
- Hinton Wood Products – Located in Hinton, this mill produces lumber.
- Ranger Board – Located in Blue Ridge (near Whitecourt), this mill produces medium density fibreboard (MDF).
- Slave Lake Pulp – Located near Slave Lake, this mill produces pulp.
- Slave Lake Veneer – Located near Slave Lake, this mill makes veneer and studs.
- Sundre Forest Products – Located in Sundre, this mill produces lumber and treated wood products.
- West Fraser LVL – Located near Rocky Mountain House, this mill produces laminated veneer lumber (LVL).

C. Hinton Manufacturing Facilities

Hinton Wood Products currently produces approximately 360,000 thousand board feet of lumber (mfb) annually, with an annual capacity of 375,000 mfb. HWP employs approximately 300 full-time personnel with an additional 175 full-time equivalent contractors (e.g. logging, trucking, etc.). All waste from the milling process, including bark, sawdust and fines are used to generate electricity on the site. Chips from the HWP are moved by a conveyor belt to Hinton Pulp. That facility produced approximately 420,000 tonnes of pulp annually and employs 301 full time personnel. Waste associated with the pulping process is also used to generate power on the site.

To ensure the most value is extracted from the log, a portion of the logs harvested from the Hinton FMA as part of the Annual Allowable Cut (AAC) are commonly sold or traded to other West Fraser owned manufacturing facilities, as well as manufacturing facilities owned by other forest companies (e.g. Weyerhaeuser's OSB mill in Edson). Also as demand dictates, HWP utilizes logs that are below the utilization standards associated with the AAC – these logs are brought in to HWP, chipped, and used to supply additional chips to Hinton Pulp.

3.0 MANAGEMENT PHILOSOPHY & APPROACH TO PLANNING AND OPERATIONS

Hinton Wood Products is committed to sustainable forest management (SFM) following the principles of ecosystem-based management with a strong focus on creating patterns on the landscape that approximate those made by natural disturbances. In fact, for HWP, and our nearly one million hectare Forest Management Agreement (FMA) area, approximating natural disturbance patterns is our core guiding principle. It has driven decisions at the highest planning level, such as the VOITS and Spatial Harvest Sequence found in this Detailed Forest Management Plan (DFMP), to decisions that will be made on the ground in operational plans like the Forest Harvest Plan.

HWP's entire Natural Disturbance Strategy, including the science behind it, our Riparian Management Strategy, is described in detail in Appendix 2.

3.1 Forest Management Approach

For HWP, managing the landscape based on natural disturbance principles means the incorporation of the following overarching strategies:

- Harvest patterns, block sizes, and seral stage targets are all managed based on natural disturbance research, with the primarily goal being maintaining these attributes within their natural range of variability wherever possible.
- Both upland and riparian areas will be managed based on natural disturbance principles – excluding riparian areas may have undesirable long term ecological consequences.
- Riparian and upland areas are identified based on their ecological and morphological characteristics.
- Approximating the variability of natural forest patterns is critical, but this strategy must be balanced with societal values, economic constraints, changing expectations, and scientific knowledge. HWP seeks to strike a balance that is scientifically sound, affordable, and acceptable to society.

All of our harvest plans include strategies to conserve important resource values, while ensuring consistency with natural forest patterns. This includes special management for special values such as aesthetics, recreation, sensitive soils, and mineral licks (to name only a few). HWP's stewardship commitment also includes careful management of habitat for species like woodland caribou, grizzly bears, uncommon plant communities, and other species of special concern.

HWP recognizes that the FMA area that we manage is public land; our ability to continue to manage this land is dependent on the public's confidence that we are managing the landbase responsibly and in their best interests. We gain that confidence by consultation and communication with the public, other tenure holders, other stakeholders, the government, First Nations, and scientists – all the feedback received has helped shaped the direction of this DFMP. Our professional staff will then use the direction provided in this DFMP to plan harvesting, reforestation, and other long-term and short-term forest management activities, which help to maintain the natural patterns of our forests and conserve the biodiversity associated with these patterns. This approach is key to safeguarding the important values of healthy forests while incorporating input from other stakeholders.

This DFMP also strives to provide a framework that is consistent with the Alberta government's objectives with respect to mountain pine beetle (MPB) management. That includes reducing the number of tree that are highly susceptible to MPB and effectively detecting, surveying, and aggressively controlling MPB infested trees.

In addition to the focus on natural disturbance principles and the MPB threat, there are a number of other principles and commitments that have helped shaped the content and approach of this DFMP. They are as follows:

- The use of CSA Z809 Sustainable Forest Management criteria as the cornerstone for the development of forest management strategies.

- The compliance with the 14 principles and 20 objectives for sustainable forestry that are described in the Sustainable Forestry Initiative (SFI) SFM Standard (http://www.sfiprogram.org/sfi-standard/sfi-standards/).
- The compliance with specific environmental policies and procedures as made under the Company's ISO 14001 (http://www.iso.org) environmental management system certification.
- The consideration of a broad range of forest values when developing strategic and operational plans.
- Ensure the economic viability of the Companies' operations by continuing to implement a consistent and reliable business model that is based in efficiency and unwavering attention to cost management. We will consistently reinvest in our operations to ensure our staff have the right resources to compete and stay ahead in a challenging industry
- Continue to implement a Public Involvement Program that consistently and regularly provides the public with multi-faceted ways to provide input into HWP's forest management activities.
- A determination and description of the desired future forest state and the development and implementation of associated management strategies to ensure the future forest state is achieved (or moved toward).
- A coarse-filter approach for setting ecological landscape management objectives in the desired future forest.
- A fine-filter approach to monitor and manage habitat for key species at risk or of special concern.
- A commitment to ensure the security and best use of the fibre supply for West Fraser mills through:
  - The prompt and effective reforestation
  - The optimum use of non-FMA fibre sources;
  - Enhanced forest management;
  - The investigation and formation of strategic partnerships with other tenure holders to provide for the efficient utilization of timber
- Continue with the implementation, maintenance, and participation within, effective growth and yield programs.
- Practice adaptive forest management, which implies a change (or adaptation) of strategic and operational practices as required.
- Establish appropriate monitoring programs and associated protocols where required.

The Company will work in close cooperation with government to define and implement the broad and specific landscape and stand-level planning strategies as described in this DFMP.

D. Legislative and other influences to the DFMP

This DFMP has been developed under the direction of legislative and supplementary documents. Legislative documents consist of acts and regulations; whereas, other documents include government policy, directives and other initiatives.

Legislative influences include the following:

- Forests Act
- Timber Management Regulation
- Water Act
- Forest And Prairie Protection Act (Part I and II)
- Federal Navigable Waters Protection Act
- Federal Fisheries Act
- Historical Resources Act of Alberta
- Public Lands Act
- Soil Conservation Act
- Weed Control Act
- Migratory Birds Convention Act
- Wildlife Act

Other influences include the following:

- Canada Forest Accord
- National Forest Strategy 1998-2003: Sustainable Forests, A Canadian Commitment
- Criteria and Indicators of Sustainable Forest Management in Canada – Technical Report 1997 Canadian Council of Ministers
- Criteria and Indicators of Sustainable Forest Management in Canada – National Status 2000
- Canadian Biodiversity Strategy
- Alberta's Forest Legacy: Implementation Framework for Sustainable Forest Management
- Alberta Forest Management Planning Manual - 2006
- Alberta Timber Harvest Planning and Operating Ground Rules 1994 and the new template for Operating Ground Rule negotiation
- Environmental Management Systems (ISO 14001)
- Canadian Standards Association – Z809-02 CSA/SFM
- Sustainable Forestry Initiative (SFI 2010-2014 Program)
- Company environmental policies
- Soil Conservation Strategy
- Alberta Mountain Pine Beetle Strategy
- Research into natural disturbance at the Foothills Research Institute (http://foothillsri.ca)

3.2 DFMP Document Development

The 1999 DFMP for HWP's FMA is the last DFMP approved for by Alberta. The goal of this plan was to maximize coniferous volume (deciduous treated as incidental). There was some natural disturbance (ND) research and analysis incorporated into this plan, but this ND research and its associated implications and implementation were only just starting to be looked at by forest companies and government. The seral stage report in the 1999 DFMP did show "old" spruce was projected to be outside of its Natural Range of Variability (NRV) later in planning horizon.

From 2005 to 2009 HWP worked continuously on a new DFMP with a planned submission date of September 2010. However, in 2008, due to a mountain pine beetle outbreak in Alberta (originating from BC), HWP was required to prepare a Mountain Pine Beetle Plan, with a submission due date of September 2009. In first 6 months of 2009, HWP was working on two separate documents – a Beetle Plan with a submission due date of September 2009 and a DFMP with a submission due date of September 2010.

In 2009 HWP asked for (and received) permission to extend the date by which the Beetle Plan had to be submitted – the submission date was moved from September 2009 to April 30, 2010. The Beetle Plan (technically an amendment to the 1999 DFMP) was approved on August 18, 2010. Highlights of this plan included:

- An accelerated harvest to deal with the large amount of MPB susceptible pine on FMA.
- A 10 year Spatial Harvest Sequence (2013-2023).
- A new Annual Allowable Cut for the first ten years of the plan with a goal to maximize total (coniferous + deciduous) volume harvested. The new AAC was:
  - Coniferous AAC = 1,766,576m3/yr
  - Deciduous AAC = 249,832m3/yr
- Some non-timber values addressed were included in the Beetle Plan such as species at risk, water and access.

In the last 6 months of 2009, HWP also asked government for (and received) an extension to submit its new DFMP from a September 2010 due date to September 30, 2014 due date. There were a number of reasons that HWP asked for, and received, a DFMP extension; which includes the following:

A. <u>A pending Land Use Plan in the Upper Athabasca Region</u> – At the time (2009), government felt a Land Use Plan in this region would be completed within a couple of years. Results from this Land Use Plan had the potential to significantly affect resource development within the FMA area (particularly the caribou area), so it was thought that extending the submission date for HWP's DFMP would allow recommendations from this Land Use Plan to be incorporated into the new DFMP. However, at this time (2014), land use planning for the Upper Athabasca Region has yet to begin.

B. The Canadian Boreal Forestry Agreement – The Canadian Boreal Forestry Agreement (CBFA) (http://www.canadianborealforestagreement.com) is an agreement signed in May 2010. Current signatories to the CBFA include the Forestry Products Association of Canada (FPAC) and its 19 member companies (which includes West Fraser), and seven leading Canadian environmental non-government organizations.

   The Agreement recognized that although the responsibility for the future of forestry and conservation in Canada's boreal forest rests primarily with governments, both industry and environmentalists have a duty to help define that future. The CBFA provides both parties with a plan to work towards a stronger, more competitive forestry industry and a more sustainably managed boreal forest.

   It entailed a commitment by the environmental groups to stop boycotting the forest companies involved. In return, the companies deferred logging operations on almost 29 million hectares of boreal, which represents virtually all boreal caribou within their operating areas.

   The suspension of forestry activities gave the signatories an opportunity to work together on a number of initiatives, including developing action plans for the recovery of caribou in specific areas and producing ecosystem-based management guidelines (such as those found in this DFMP) that participating companies can use to improve their forestry practices.

   The process involves multiple stakeholders, including Aboriginal groups, affected communities, and municipal, provincial and federal governments. The CBFA has six goals:

   1. Implement world-leading sustainable forest management practices.
   2. Accelerate the completion of the protected spaces network for the boreal forest.
   3. Fast-track plans to protect boreal forest species at risk, particularly woodland caribou.
   4. Take action on climate change as it relates to forest conservation.
   5. Improve the prosperity of the Canadian forest sector and communities that rely on it.
   6. Promote and publicize the environmental performance of the participating companies.

   Although progress has been made to date, it has been slower than anticipated. At this time (2014), there have been no land use changes (e.g. protected areas) or a new standard for world-leading forest practices that specifically affect the development of this DFMP, although many of the concepts included in the draft forest management practices standard developed through the CBFA have been included in this DFMP (such as using the concept of natural disturbance and NRV in the development of management strategies).

C. Mountain Pine Beetle outbreak – In 2006, a MPB outbreak was discovered in Wilmore Wilderness Park (which is adjacent to the Hinton FMA area). Over the following years, there were a number of other large MPB outbreaks in northwestern Alberta – all of these outbreaks originated in BC, where that province had been fighting MPB outbreaks for over a decade. The Alberta government became very concerned that these large in-flights of beetles from BC had the very really possibility of decimating pine populations in Alberta (and all provinces east). As a result, Alberta mandated forest companies to develop "Beetle Plans"; in most cases these Beetle Plans were amendments to existing DFMPs. The overall goal of these Beetle Plans was to significantly reduce (through harvesting) the population of pine trees that were susceptible to MPB or that had already been attacked.

   In 2009, when an extension to September 2014 was given to HWP for the submission of our DFMP, it was also unclear just what the impact of MPB was going to be on the FMA. A four year extension gave the Company and the government some time to see how serious of impact MPB would have on HWP's FMA area and develop strategies to address impacts.

D. Grizzly Bear and Caribou Recovery plans – In 2009, Alberta's Grizzly Bear Recover Plan was still not approved; it was not approved until 2010. In 2009, there was an approved Caribou Recovery Plan, but the range plans for the Alberta herds were not completed; however, it was felt that by 2014 these plans would be complete and this would allow HWP to incorporate recommendations from these plans into the DFMP. At the time this DFMP was originally submitted (2014), the range plans for A La Peche and Little Smoky caribou herds were still in progress.

Beginning in late 2011, representatives from HWP and the GoA formed a Plan Development Team (PDT). The PDT worked together over the next three years to develop and agree upon all the requirements of this DFMP submission. Table 1 below describes the main stages and milestones of the DFMP development between 2011 and 2015.

Table 1 – Main Stages and Milestones of the 2014 DFMP Development

Date	Main stages or Milestones	Comments
December 2011	Formation of the DFMP Plan Development Team	See Table 2 for members of the PDT.
February 2012	Development of the Terms of Reference and the Public Involvement Program	
March 2012	First Nation and other stakeholder consultation	Consultation packages were sent out to four First Nations. Invitations and information packages were stent out to stakeholders. Open houses were held.
July 2012	First Riparian Management Strategy Field Trip	The focus of this field trip was looking at riparian areas in predominantly pine types.
	Values, Indicators, Objectives and Values (VOITs) as outlined in Annex 4 of the Planning Standard.	Beginning of the process to identify and agree upon all VOITs. VOITs were discussed at almost every PDT meeting between this time and May 2014.
	Landbase discussion begin	Discussions about various parameters for determining landbase.
Sept 2012	Second Riparian Management Strategy Field Trip	The focus of this field trip was looking at riparian areas in predominantly spruce types.
October 2012	Natural Range of Variation (NRV) analysis and parameters	The first meeting with Dr. Dave Andison regarding requirements and parameters for NRV analysis for DFMP.
November 2012	Riparian Management Strategy Overview	○ HWP representatives laid out, in significant detail, all of the major platforms of the Company's proposed Riparian Management Strategy. ○ Green-Link demonstrated how riparian areas would be delineated.
December 2012	Approval of the Terms of References (and the associated Public Involvement Program)	Approval in December 11, 2012 letter from Robert Stokes (GoA).
January 2013	Natural Disturbance Strategy Document	Description and agreement to the content of the Natural Disturbance Strategy document that HWP was developing for submission with the DFMP.
February 2013	Approval of HWP's Aboriginal Consultation Plan	Approval in February 11, 2013 letter from Brent Schleppe (GoA).
March 2013	First Nation and other stakeholder consultation	Consultation packages were sent out to four First Nations. Invitations and information packages were stent out to stakeholders. Open houses were held.
April 2013	Riparian Area Delineation Project	April 16 meeting at Green-Link office to demonstrate for the GoA the project to delineate all riparian areas of the FMA based on morphological and ecological features.
	LANDMINE information Meeting	April 18 meeting where Dr. Andison gave a presentation to the GoA regarding his LANDMINE model and how it works in calculating NRV (16 GoA personnel attended)
May 2013	Monitoring and Measuring Program for HWP's Riparian Management Strategy.	Initial discussions on a Monitoring and Measuring Program.

Date	Main stages or Milestones	Comments
	LANDMINE parameters (used to calculate NRV)	Parameters for the LANDMINE model were discussed and agreed upon at the May 3 and May 31, 2013 PDT meetings.
October 2013	Monitoring and Measuring Program Proposal	Detailed description of the field cards, field guide, and protocol document for HWP's proposed riparian Monitoring and Measuring Program.
January 2014	Natural Disturbance Strategy	HWP's Natural Disturbance Strategy, including the Riparian Management Strategy and Monitoring and Measuring Program were discussed and submitted to the GoA.
	Landscape Assessment and DFMP Document development	Work began on the landscape assessment and the writing of the DFMP document.
March 2014	Landscape Assessment	It was agreed that regional forest landscape assessment for the Upper Athabasca Region could be used where appropriate for the Hinton DFMP Landscape Assessment
	Landbase	The Landbase was submitted to the GoA for approval.
	Yield Curves	The Yield Analysis was submitted to the GoA for approval.
	Other stakeholder consultation	Invitations were stent out to stakeholders. Advertisements were placed in the Edson and Hinton newspapers. Two open houses were held in Hinton and Edson.
June 30, 2014	VOIT Approval	The wording of all VOITs were finalized and approved in principle in a letter dated June 30, 2014 signed by Robert Popowich (GoA).
July 11, 2014	Landbase Approval	Agreement in principle was given to HWP's Landbase in a letter dated July 11, 2014 and signed by Robert Popowich (GoA).
July 2014	First Nation consultation	Consultation packages were sent out to four First Nations – these packages included the 1st iteration of the Spatial Harvest Sequence (SHS) and the approved-in-principle VOIT table.
August 2014	First Nation consultation	A second iteration of the SHS was sent out to each of the four First Nations HWP consulted with.
	Other stakeholder consultation	Over 100 stakeholder letters and referral packages were sent out. Information included a DFMP Summary Document, which included the VOIT Table and SHS.
September 9, 2014	Riparian Management Strategy	A meeting in Edmonton between representatives from the GoA and HWP in which HWP was told to submit its RMS as part of the 2014 DFMP submission, but not its Monitoring and Measuring Program, which should be submitted separately after issues have been addressed.
October 21, 2014	Yield Curve Approval	Agreement in principle was given to HWP's Yield Curves in a letter dated October 21, 2014 and signed by Robert Popowich (GoA).
October 30, 2014	Final First Nation Consultation	The final First Nation consultation package was sent out, with a complete digital copy of the same DFMP being submitted to the GoA. The most up-to-date SHS was also sent as part of this package.
October 31, 2014	Timber Supply Analysis (TSA)	Submitted with the final DFMP submission
October 31, 2014	Original DFMP Submission	Final DFMP compilation for submission date of October 31, 2014
December 1, 2014	Riparian Management Strategy (RMS) review letter	This was the first indication from the GoA that they would not be approving HWP's RMS until additional work was being completed. Numerous conditions were described in this letter; including the statement that HWP would not be allowed to implement its RMS in any stream containing Athabasca rainbow trout or ecologically significant Athabasca rainbow trout habitat.
January 6, 2015	Interim Review Letter	This letter contained some preliminary GoA feedback primarily around the Timber Supply Analysis (TSA).
May 21, 2015	Review Letter	This letter contained GoA feedback and questions regarding: technical issues with the TSA; setting minimum seral stage targets for the contributing landbase; and combining the late

Date	Main stages or Milestones	Comments
		mature and old seral stage into one new seral stage.
October 14, 2015	Review Letter	This letter contained GoA feedback primarily around silviculture. Some general feedback for a number of other minor issues was also noted.
November 18, 2015	TSA Meeting – Edmonton	HWP representatives and GoA representatives met so that HWP could present its new Timber Supply Analysis and the key assumptions made in it. GoA representatives gave HWP permission to resubmit the DFMP based on the assumptions described at this meeting.
December 21, 2015	Revised DFMP submission	A new revised DFMP was submitted to the GoA for approval.
February 29, 2016	Review Letter	The letter contained GoA feedback primarily around deficiencies in HWP's Growth and Yield Program. There was also a requirement to add an additional appendix showing a harvest profile table.
March 4, 2015	G&Y Meeting – Edmonton	GoA and HWP representatives met to discuss HWP's Growth and Yield Plan following up from the Feb 29th review letter
September 6, 2016	Revised draft Growth & Yield Plan	A revised draft G&Y Plan was submitted to the GoA for discussion and comment.
September 27, 2016	TSA/G&Y Meeting - Edmonton	GoA and HWP representative met to discuss GoA's requirement to model two Preferred Forest Management Scenarios – one with HWP's Riparian Management Strategy fully implemented and one without. There was also further discussion about the Growth and Yield Plan.
October 7, 2016	G&Y – Conference Call	GoA and HWP representatives met via conference call to further discuss HWP's Growth and Yield Plan requirements following up for the September 27th meeting.
October 26, 2016	Review Letter	This letter contains further clarifications and feedback regarding HWP's draft Growth and Yield Plan and is a follow-up from the October 7th meeting.
November 16, 2016	Revised DFMP Submission	A new revised DFMP addressing all comments and issues over the last two years was submitted to the GoA for approval.

3.3 The Planning Team

HWP and the GoA assembled the Plan Development Team (PDT) in 2012 to assist in the development of the Detailed Forest Management Plan. Table 2 outlines the members, their affiliation and their respective responsibilities on the PDT. Membership was not static and was amended to address deficiencies in the representation and changes to organizational staff.

Review of the Landbase, Yield Curves, and Timber Supply Analysis (TSA) and the other technical documents noted in Table 1 included additional government officials and various technical advisors. Information from these technical support experts (Table 3) was shared with the members of the Plan Development Team and used to further develop and refine the DFMP.

Table 2 – Plan Development Team Membership

Name	Affiliation	**Position** (time on PDT)	General Responsibilities
Bruce Alexander	Hinton Wood Products	Woodlands Manager (2013+)	DFMP Plan development
Dan Rollert	Hinton Wood Products	Woodlands Manager (2012-2013)	DFMP Plan development
Rick Bonar	Hinton Wood Products	Chief Biologist (2012+)	DFMP Plan development; focus on natural disturbance, NRV, species at risk
Richard Briand	Hinton Wood Products	Planning Coordinator (2012-2013)	DFMP Plan development
Pat Golec	Hinton Wood Products	Forestry Manager (2013+)	DFMP Plan development; focus on Landbase, Yield Curves, and TSA
Aaron Jones	Hinton Wood Products	Management Forester (2012+)	DFMP Plan development; focus on ND Strategy, Aboriginal consultation
Glenn Buckmaster	Hinton Wood Products	Planning Forester (2012-2013)	Preparation of Net Landbase
Byron Vriend	Hinton Wood Products	Timber Supply Analyst (2014+)	Timber Supply Analysis (TSA)

Name	Affiliation	Position (time on PDT)	General Responsibilities
Brendan Hemens	GoA – Forest Planning Section (Forest Management Branch)	Lead, Forest Planning & Performance Monitoring (2012-2014)	DFMP Review – Provincial Level
Robert Stokes	GoA – Forest Planning Section (Forest Management Branch)	Senior Manager (2012-2013)	DFMP Review – Provincial Level
Steve Bradbury	GoA – Fish & Wildlife (Edson)	Resource Manager (2012+)	Advisory – Fish and Wildlife Management
Bill Tinge	GoA – Edson/Hinton	Forester (2012)	DFMP Review
Kevin Vanderhaeghe	GoA – Edson/Hinton	Integrated Operational Planning Forester (2012-2013)	DFMP Review
George Sterling	GoA – Fish & Wildlife (Edson)	Senior Fisheries Biologist (2012+)	Advisory – Fish Management
Jeff Kneteman	GoA – Fish & Wildlife (Edson)	Area Senior Wildlife Biologist (2012+)	Advisory – Wildlife and Habitat Management
Brooks Horne	GoA – Edson/Hinton GoA – Forest Management Branch	Area Forester (2012-2013) Senior Forester (2014+)	DFMP Review DFMP Review – Provincial Level
Graham Legaarden	GoA – Upper Athabasca Region (Hinton)	Senior Forester (2013+)	DFMP Review
Robert Popowich	GoA – Resource Management Branch Section	Senior Manager (2014+)	DFMP Review – Provincial Level
Dave Hugelschaffer	GoA – Land and Rangeland Management	Section Head, Operations and Approvals (2013+)	DFMP Review and Approval – Provincial Level
Seena Handel	GoA – Forest Resource Management Section	Forest Resource Management Lead (2014+)	DFMP Review and Approval – Provincial Level

Table 3 – Additional Technical Support

Name	Affiliation	Position	General Responsibilities
Derek Fisher	GreenLink Forestry Consulting	Consultant	Riparian delineation
Sharon Meredith	Sugarloaf	Consultant	Timber Supply Analysis (TSA)
Bob Held	Sundre Forest Products	Timber Supply Analyst	Landbase, Yield Curves, and TSA
Greg Greidanus	GoA – Forest Resource Analysis Section	Resource Analyst	Landbase
Darren Aitkin	GoA – Forest Resource Analysis Section	Manager, Forest Biometrics Group	Yield Curves
Wendell Pozniak	GoA – Provincial FireSmart Program	FireSmart Forest Management Specialist	Landscape Fire Assessment, Wildfire Threat Assessment, Fire Regime Analysis
Doug Crane	GoA – Forest Resource Analysis Section	Spatial Resource Analyst	Old Interior Forest calculation
Brad Tyssen	GoA – Forest Resource Analysis Section	Lead, Forest Resource Stewardship Analyst	Old Interior Forest calculation and species habitat modelling

3.4 Forest Resource Management Issues

To support adaptive management, the Company must constantly identify and evaluate forest management issues – these issues arise out of PDT meetings, the Public Involvement Process and the First Nation consultation process. Most of the issues are resolved during the DFMP development process; however, not all are, and as part of an adaptive management process, some issues will continue to be worked through after the DFMP has been submitted for approval.

The following is a list of issues that arose during the development of this DFMP and a summary of how these issues were dealt with or will be dealt with moving forward:

A. Riparian Management Strategy – HWP's Riparian Management Strategy is described in detail in Appendix 2 (Appendix 2). The basis of this strategy is that scientific research is showing that the current practice of excluding all disturbances in riparian areas (by using riparian buffers and practicing effective fire suppression) has a negative effect on riparian systems over time. To address this, HWP has proposed a measured approach to introducing some disturbance (through careful harvesting) back into riparian areas. Reaction from some GoA staff and the public has been mixed – this is a significant shift away from the current riparian management paradigm (which is based on fixed buffer widths). While agreeing in principle to the science behind this new approach, GoA feedback has been that they would like a slow roll-out of this program over time. HWP has agreed to do this; however, this does create some issues. For example, it will mean there will be different riparian standards on the FMA area depending on which riparian strategy is being used (i.e. the current one with fixed-width buffers or the new one where most fixed-width buffers are removed). This will create challenges that will have to be addressed over the coming years as HWP's Riparian Management Strategy is rolled out and implemented.

In a September 9, 2014 GoA/HWP meeting in Edmonton, it was agreed that HWP would include its new Riparian Management Strategy as part of the upcoming October 2014 DFMP submission, but the GoA asked that HWP not submit its proposed Monitoring and Measuring Program as part of this DFMP submission, but rather submit it later under a separate cover after issues raised by the GoA are all addressed. It was agreed that HWP and the GoA would work together over the upcoming months to work out outstanding issues with the Monitoring and Measuring Program. The landbase (and associated Timber Supply Analysis) for this DFMP was calculated assuming the full implementation of the Riparian Management Strategy (i.e. no fixed-width buffers except in class A and B streams).

In a December 1, 2014 letter to HWP, a month after the DFMP had been submitted, the GoA told HWP that it could now <u>not</u> implement its RMS in any stream containing Athabasca rainbow trout or ecologically significant Athabasca rainbow trout habitat. In addition, there were also numerous other conditions in this letter that included the requirement to establish a reference stream program and a calibration sampling program (to help set tolerances for the Monitoring and Measuring Program). Throughout 2015, HWP received a number of other RMS related letters from the GoA that placed further restrictions and requirements on the RMS. HWP hired contractors in 2015 to develop a reference stream program and calibrate key monitoring indicators (i.e. stream temperature and sedimentation). This work is not expected to wrap up until February 2016. Once this has been completed, HPW will meet with the GoA to discuss results and decide how to proceed from there.

B. <u>Operating Ground Rules</u> – Operating Ground Rules (OGRs) help define and implement commitments and agreements made in the DFMP. HWP currently has an approved set of OGRs, last revised in October 2011. Once this DFMP is submitted to the GoA for approval, another revision to the OGRs will need to be developed to help implement a number of new strategies found in this DFMP; for example, new riparian guidelines and new stand structure retention strategies. In addition, certain sections of the OGRs need to be better clarified; for example, the way in which variance from the Spatial Harvest Sequence is tracked.

C. <u>Holding Reservations (HRS)</u> – HWP has an issue with the HRS reservations that have been placed on the HWP landbase. They were issued on 4,361.7 hectares of the FMA landbase in 2007 without any notice or consultation. A Memorandum of Understanding (MOU) related to tourism development in the Hinton area was signed by Alberta Environment, Alberta Infrastructure, Alberta Economic Development, The Town of Hinton, Yellowhead County, Weyerhaeuser Canada and Weldwood of Canada in 1999. The MOU states:

- *4.1 c) Proponents will be required to obtain consent from existing surface disposition holders as part of the application submission.*
- *4.1 d) Some development nodes lie within a FMA. The FMA holders agree to allow withdrawals from their FMAs provided that proponents who apply for a lease within those nodes enter into a FMA Disposition Withdrawal Agreement and pay compensation to the FMA holder as identified in Schedule C attached hereto.*

The *Handbook of Instruments Pursuant to Public Lands Act & Public Land Administration Regulation* (PLAR) issued by the GoA in February 2013 explains the purpose of an HRS:

- *This reservation is placed against public land when an agency is in the process of determining or has determined a specific future land use, but has not put any specific plan in place. It serves to hold the land pending an approved development plan or policy decision.*

The Handbook further states that formal dispositions include leases, licenses, permits, agreements, authorizations and approvals. None of these categories include HRS.

The GoA has argued that the HRS has a restriction that states “No surface disposition” which precludes logging as there is no mention of timber harvesting in the Exemption category. The FMA however, is a disposition, which existed prior to the HRS.

HWP representatives that participated in the Yellowhead Corridor recreation corridor planning indicted that this topic was discussed and the intent on the HRS designation was to identify areas where applications for recreation developments would be accepted and where they would not. The expectation was always that a proponent would apply for a lease on the specific lands required within one of the identified (by a HRS) nodes and the regular consent process would take place.

The existing Holding Reservations also include 904 hectares that have been harvested and reforested by HWP. They overlap parts of the FireSmart Community Zones in or near the Yellowhead Corridor, leading to conflicting provincial policies (i.e. reduce the fire behavior potential, or keep the standing timber intact). As there are significant areas of forested land that is actively growing, HWP proposed that the merchantable forest within the HRS’s not be scheduled for harvest in the spatial harvest sequence; however, the land will continue to be part of the contributing landbase until such time as one or more dispositions are issued that withdraw it from the landbase. The GoA agreed to this proposal. FireSmart projects developed by the GoA within these HRS’s will not be included in this DFMP but will be treated as a variance to the Spatial Harvest Sequence and dealt with on a case-by-case basis.

D. Prime Protection – The GoA asked that HWP remove a small area of “prime protection zone” from the net landbase. These same lands had not been removed in the 1999 DFMP. Nor were they removed in other FMA landbases, such as the Sundre Forest Products and Edson Forest Products. In addition, there was no mention of prime protection zones as being a protected area in the “Parks and Protected Areas” section of the Regional Forest Landscape Assessment Upper Athabasca Region released by the GoA in December 2012.

In addition, of the 468 hectares of prime protection within the contributing landbase, 128 hectares have already been harvested. It was pointed out by the GoA that this harvesting took place before 1990. Table 2 in the Coal Branch Sub-Regional Integrated Resource Plan shows Logging as a “Not-Permitted Use” in the prime protection zone. However, a note on the table states:

> *These activities are only representative of the range of activities that occur in the Eastern Slopes. For these and any other activities, the possibility of whether they should or should not take place in a particular area must always be measured against the fundamental management intentions for that zone. Since economic opportunities are not all known in advance, site-specific developments may be considered in any zone.*

Given that the opportunity exists for site-specific activities to occur within the zone and nearly one third of the area is regenerating cutblocks, HWP proposed that the affected lands remain in the landbase with consultation and detailed planning to take place in the event that harvesting is proposed. The GoA rejected this logic. HWP subsequently removed the prime protection areas from the contributing landbase – it is expected that a decision regarding their ultimate use will be made as part of the Upper Athabasca Land Use Plan process, which should be in place before the next DFMP submission (i.e. within 10 years).

E. Caribou – About 5% of HWP's FMA contains caribou habitat (about 50,000 hectares). This habitat contains parts of the ranges of the Little Smoky and A la Peche caribou herds. Although the provincial government has had an Caribou Recovery Plan in place since 2005 and the Boreal Population Caribou Recovery Strategy has been in place since 2011, there have been no range plans (a requirement coming from both provincial and federal plans) approved as of the submission date of this DFMP. The forests within the caribou area on the Hinton FMA area are generally quite old and very susceptible to MPB attack. HWP has had a voluntary deferral in place within the caribou range on our FMA since 2007; however, this has been a deferral, not a deletion. For this DFMP, HWP will be scheduling some harvest in the caribou area, however; no harvesting will be scheduled in the first five years of this plan, and no harvesting will take place in Zone 1 (see HWP's species conservation strategy for caribou for more information on Zone 1). In addition, any zoning, land use decisions, or other requirements coming out of the Range Plans for the A la Peche and Little Smoky herds or the Land Use Plan for the Upper Athabasca Region will override any planned harvesting in the caribou area.

For more specific information on HWP's harvesting plans within the caribou area on the FMA, please see HWP's Species Conservation Strategy in Appendix 16a.

F. Trumpeter Swans – There are five trumpeter swan lakes on the HWP FMA area, plus two lakes that are within 800 metres of the FMA area. In HWP's Species Conservation Strategy for trumpeter swans (see Appendix 16b), HWP proposed that harvesting mature merchantable timber within the 200 metre buffer surrounding trumpeter swan lakes (i.e. lakes identified by the government as being nesting sites for trumpeter swans) would have a negligible impact to the use of nesting sites, and therefore, proposed that these areas be included in the contributing landbase and available for harvest. This proposal was based on a review of relevant literature by HWP's biologist including the observation that swans commonly successfully nest on lakes in agricultural areas with significant surrounding human disturbances and activities. Any harvesting was to be subject to standard timing restraints (i.e. no harvesting in the nesting season) and approval would be on a case-by-case basis from the GoA. HWP also noted that there was little to no standards, protocols, or documentation for how a lake is identified by the GoA as being a trumpeter swan lake; nor any process to review its classification from time to time. The GoA rejected HWP's proposal with little explanation. HWP disagrees with this and will continue to work toward a solution. The total amount of landbase within the 200 metre buffer surrounding swan lakes that would have been in the contributing landbase was 84.5 hectares.

G. Spatial harvest Sequence Variance –Table 4 on the following page outlines the types and reasons for variance in the Spatial Harvest Sequence associated with the 2010 MPB Plan (technically an amendment to the 1999 DFMP). The table outlines the status of SHS variance as of the end of 2012 – and highlights some of the issues with reporting on variance to the SHS.

Of the total 93,404.4 hectares planned and/or logged, 3,271.6 hectares (3.5%) were deleted, mostly due to operational constraints. Additions included 863.1 hectares of MPB-infested area and 233.3 hectares of structure retention for a total of 5,557.9 hectares (6.0%). In accordance with the Healthy Pine Strategy, 12,299 hectares of non-pine species were deferred for harvest at a later date. These stands will represent mid-term timber supply, should MPB reach outbreak levels.

Table 4 – Spatial Harvest Sequence Variance

Variance Type	Primary Variance Reason	Total Area (Ha)
Additions	1.1 - MPB Infestation	863.1
	1.2 - Non-SHS (in landbase)	3,763.4
	1.3 - Landbase Additions	24.8
	1.4 - Structure Retention	233.3
	1.5 - Sliver	673.4
	Total Additions	5,557.9
Deferrals	2.1 - Non-Pine Overstory	1,454.9
	2.2 - Viable Understory	6,367.9

	2.3 - Low Merch/MPB Risk	4,476.2
	2.4 - Isolated Stands	519.2
	2.5 - Cultural/Heritage	6.9
	2.6 - Sensitive Sites	87.7
	2.7 - Public Concerns	16.2
	2.8 - AVI Errors (age or species)	4,452.4
	2.9 - Structure Retention > 2 Ha	67.5
	2.10 - Other	313.9
	Total Deferrals	17,762.8
Deletions	3.1 - Disposed	150.7
	3.3 - Sensitive Sites	28.1
	3.4 - Steep Slopes	193.8
	3.5 - Public Concerns	5.0
	3.6 - Isolated (Small Areas)	124.0
	3.7 - Riparian Buffer	935.3
	3.8 - AVI Errors (Non-Productive)	526.7
	3.9 - Structure Retention <2 Ha	404.8
	3.10 - Sliver	900.6
	3.11 - Other	2.6
	Total Deletions	3,271.6
No Variance/Unclassified	n/a	40,219.7

4.0 LANDSCAPE ASSESSMENT

This Landscape Assessment has been prepared based on the outline provided in Appendix A of the Alberta Forest Management Planning Standard (Alberta 2006). Unless otherwise noted, the data presented in this assessment is current to May 1, 2012. Some of the data, descriptions, and maps used in this Landscape Assessment have been taken (with permission) from the Regional Forest Landscape Assessment for the Upper Athabasca Region (Alberta, 2012), which was prepared by Forcorp Solutions (Inc.) for the Forest Management Branch of the GoA and approved in 2012.

4.1 Administrative Boundaries

4.1.1 Forest Management Agreement

Hinton Wood Products (a division of West Fraser Mills Ltd) renewed its Forest Management Agreement (FMA) #8800025 effective May 1, 2008 (O.C. 565/2007). There are no embedded quotas associated with this Forest Management Agreement area; however, 10,000 cubic metres of timber (8,500m3 conifer; 1,500m3 deciduous) can be made available annually for harvest by the GoA through the commercial timber permit process.

4.1.2 Defined Forest Area

HWP's Forest Management Agreement applies to Forest Management Unit (FMU) E14 – this FMU boundary is used to define the extent of HWP's landbase. The total area associated with FMU E14 is called the Defined Forest Area (or the FMA area) and is 1,022,465 hectares in size.

4.1.3 Compartments/Subunits

The FMA area (FMU E14) is managed as a single sustained yield unit. For planning purposes, the FMA is divided into five "working circles" – the Athabasca, Berland, Embarras, Marlboro and McLeod Working Circles. These Working Circles are further divided into 134 compartments as follows:

- Athabasca – 32 compartments
- Berland – 30 compartments
- Embarras – 22 compartments
- Marlboro – 25 compartments
- McLeod – 25 compartments

Compartment boundaries are generally defined by geographical or ecological features such as the height of land, wildfire boundaries, or watershed basins, except along the outer edges of the FMA area, where township or section boundaries are often used. Figure 1 shows the location of the 134 compartments.

4.1.4 Natural Sub-Regions

In Alberta, a landscape classification system referred to as the Natural Regions and Subregions of Alberta 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 (Alberta 1994).

HWP developed its own Natural Sub-Region layer in 2004 using the Field Guide to Ecosites of West-Central Alberta (Beckingham et al. 1996). As this layer was developed using data from a larger field sampling program than the government's 1994 program, it will be used instead of the provincial layer. The layer was approved for use in the Terms of Reference for this DFMP. However, for seed inventory planning, seed transfer and forest gene resource conservation work, the Government of Alberta Natural Sub-Regions (1994) layer will still be used. Table 5 describes the size of each of the Natural Sub-Regions based on HWP's 2004 layer. Figure 2 outlines the location of each of four Natural Sub-Regions found within HWP's FMA area.

Table 5 – Natural Disturbance Sub-Regions

Name	Total Area (ha)	Percent of FMU
Not Classified	16,787.4	1.6%
Sub-Alpine	147,089.5	14.4%
Montane	22,379.5	2.2%
Upper Foothills	529,683.3	51.8%
Lower Foothills	306,525.7	30.0%
Total	1,022,465.4	100.0%

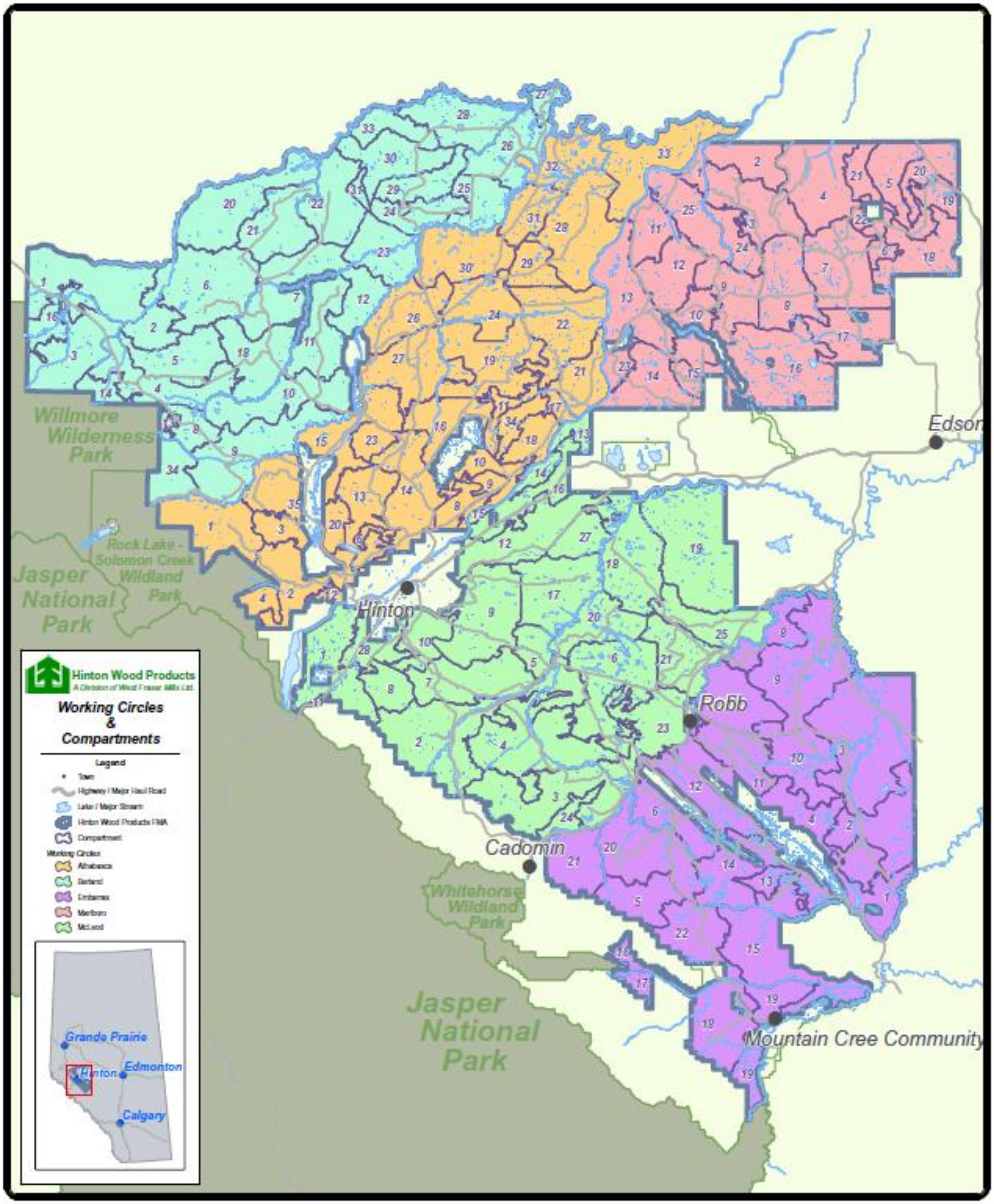


Figure 1 – Compartments on the Hinton FMA Area

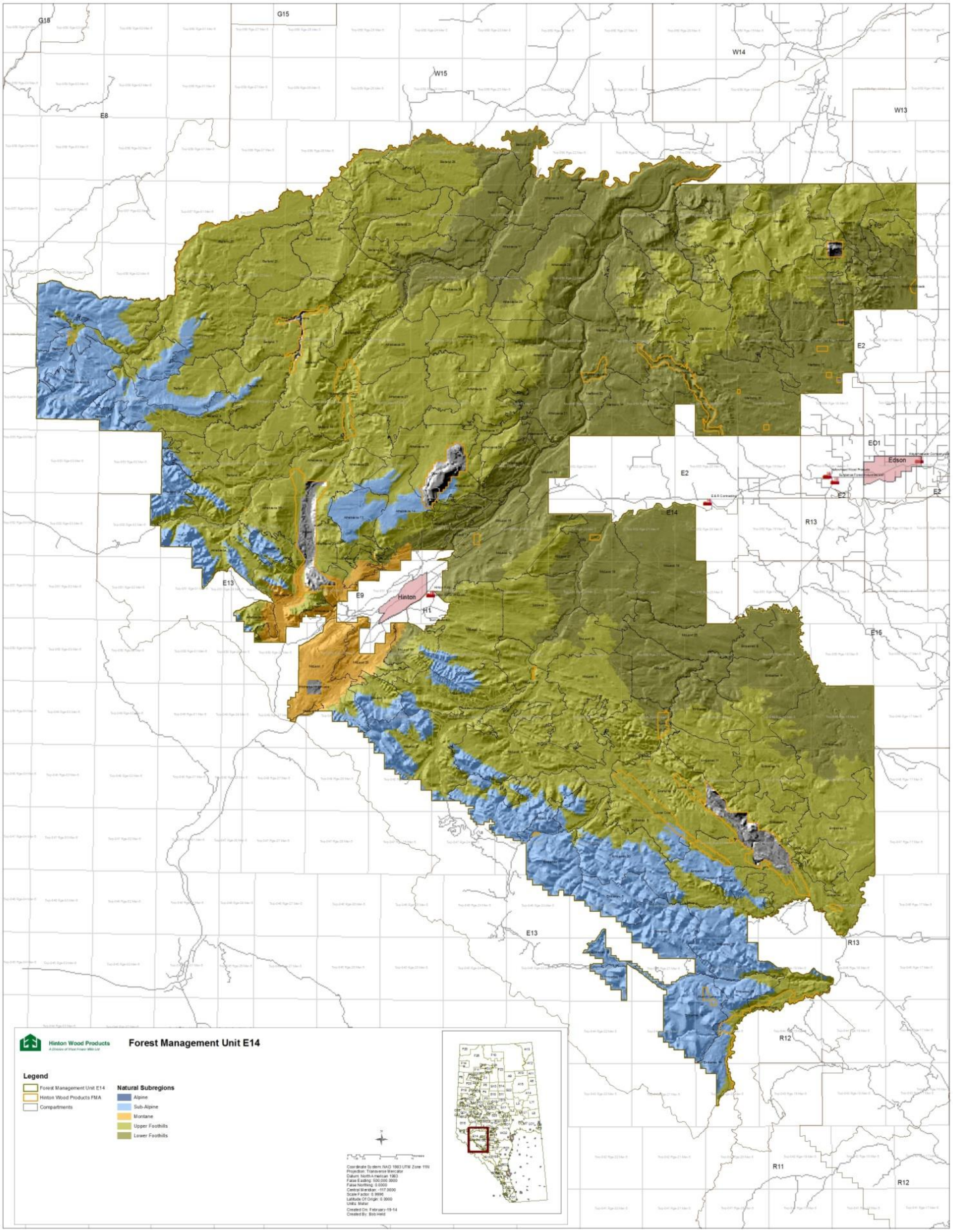


Figure 2 – Natural Sub-Regions on the Hinton FMA

The Upper Foothills Sub-Region accounts for more than half of the FMA area. When the Lower Foothills is combined with the Upper Foothills, together these two Natural Sub-Regions account for 82% of the FMA. The Subalpine Sub-Region is the next most prevalent, accounting for 14% of the FMA. The remaining area lies within the Montane Sub-Region and the Alpine Sub-Region; however, none of the Alpine is within the contributing landbase.

A further definition of each Natural Sub-Region follows:

A. Lower Foothills Natural Sub-Region

The Lower Foothills Natural Sub-Region occurs at lower elevations along the foothills of the Rocky Mountains, with some additional outlying area around Swan Hills as well as the Marten Hills located northeast of the Town of Slave Lake. The typical elevation range is approximately 700-800 metres in the north to approximately 1500 m in the southern and western areas of the sub-region where it borders the Upper Foothills. The rolling, till-covered plateaus consist of closed canopy mixed stands of aspen, lodgepole pine, white spruce and balsam poplar.

The topography of the Lower Foothills consists of undulating to strongly rolling plateaus. Sandstone and siltstone of Tertiary origin underlie the southern part of the sub-region with similar rock of Upper Cretaceous origin occurring in the northern parts of the sub-region. Orthic Gray Luvisolic soils dominate, accompanied by Brunisolic subgroups at higher elevations. Most upland soils are well to imperfectly drained, but there may be imperfectly to poorly drained Gleysolic soils (accompanied by seepage) in lower slope positions.

This Sub-Region is typical of Cordilleran climates, and continental influences are pronounced in the Lower Foothills Sub-Region, resulting in a decrease in both annual and winter precipitation and an increase in growing degree days when compared to conditions in the Upper Foothills Sub-Region. Precipitation is higher than in neighbouring sub-regions to the north and east.

The Lower Foothills Sub-Region has the most diverse forests in the province, in terms of stand types and occurrence of individual tree species. Aspen, balsam poplar, white birch, lodgepole pine, balsam fir and larch (tamarack) grow as pure stands or as mixtures on a wide variety of slopes and aspects. Pure deciduous stands are more common at lower elevations, and coniferous-dominated stands occur at higher elevations.

B. Upper Foothills Natural Sub-Region

The Upper Foothills Natural Sub-Region primarily rests below the Subalpine Sub-Region, but also has pockets in the central and north-western areas of the Upper Athabasca Region. The climate soils and vegetation patterns indicate that this is a transition zone between the drier, somewhat warmer conditions of the Lower Foothills Sub-Region and the cooler, wetter conditions of the Subalpine. Strongly rolling to steep terrain with thin glacial deposits and exposed bedrock are typical.

The bedrock is composed mainly of sandstones and mudstones of Tertiary and Upper Cretaceous origin and coal seams are common in the latter. Surface materials are usually glacial till veneers and blankets over bedrock, with some colluviums and exposed bedrock on the steeper slopes. Well to imperfectly drained Brunisolic Gray Luvisolic soils are typical throughout most of the area. Orthic Gray Luvisols are associated with moderately well drained sites and are usually associated with deciduous vegetation. Wetlands are a complex of Terric and Typic Mesisols along with Peaty and Orthic Gleysols.

Typical climate patterns indicate short wet summers and snowy cold winters. On average the Upper Foothills has a shorter growing season than the Lower Foothills and receives heavier summer and winter precipitation. It has the highest July precipitation of any of the sub-regions. These climatic conditions favour the occurrence of conifers over deciduous species because evergreen needles can begin photosynthesis early in the spring and continue late into the fall. The shorter growing season discourages maturation of twigs and buds of deciduous species.

Forests dominate this Sub-Region and are typically even-aged, wildfire-origin lodgepole pine stands, often with an understory of black spruce. White spruce stands occur along river valleys and on lower slopes. Deciduous and mixedwood stands are restricted to southerly and westerly slopes where growing conditions are similar to lower elevations.

C. Subalpine Natural Sub-Region

The Subalpine Natural Sub-Region lies below the Alpine Sub-Region but above the Montane. Coniferous forests dominate this landscape, with lodgepole pine occurring in the lower elevation zones of the Sub-Region, and Engelmann spruce typically occurring in the upper elevation zones. Growth rates are typically slow as the climate is cool year round.

The substrate of the Subalpine is characterized by shallow morainal and residual materials over bedrock. Soil development has resulted in Eutric and Dystric Brunisols and Regosols. Where wetlands have developed, they are typically over Gleysols. The climate consists of short, cool, wet summers and long cold winters. However topography can play a large role in the creation of micro-climates for the purposes of vegetation growth. In valley bottoms and lower slopes, daytime temperatures in the summer are usually warmer than on upper slopes. However, cold air can pool in these bottom areas reducing the length of the growing season.

D. Montane Natural Subregion

The Montane Sub-Region sits below the Subalpine Sub-Region. Lodgepole pine, Douglas-fir and aspen stands occur on eastern and northern aspects. Grasslands can occur on southern and western aspects at lower elevations. At higher elevations, closed mixedwood and coniferous forests (dominated by lodgepole pine) can be found.

The climate consists of mild summers, high summer precipitation, and frequent Chinook winds. Due to the frequent Chinooks, winters in the Montane are warmer (on average) than almost anywhere else in Alberta. The variable terrain produces dramatic differences in microclimate. North- and east-facing slopes tend to be cooler and moister as they receive less direct sunlight and less precipitation as a result of protection from the prevailing westerly winds.

E. Alpine Natural Subregion

The Alpine Natural Sub-Region consists of lands typically above tree line along the Rocky Mountains and other main ranges. The area typically does not support tree growth with the exception of dwarf conifer species situated either individually or in scatter clumps. These alpine areas are characterized by harsh climates (cold summers, short growing season, persistent snow cover and strong winds), poor soil development and in some cases permanent snowfields and glaciers.

4.1.5 Municipal districts/counties

The entire FMA area falls within the municipal jurisdictions as described in Table 6 below and Figure 3 of the following page.

Table 6 – Summary of Municipal Classifications

Municipal Classification	Name	Population
Municipal District	Yellowhead County	10,045
Municipal District	Greenview County	5,242
Town	Hinton	9,825

There are also a number of other hamlets and/or smaller population centres that are contained within or adjacent to the Hinton FMA area, including: Robb, Mercoal, Brule, Cadomin, Folding Mountain, Carlsdale, Obed, the Gregg Lake subdivision, and the Aboriginal community of the Mountain Cree (located in the south western corner of the FMA). The populations associated with these smaller population centres are included in the Yellowhead County.

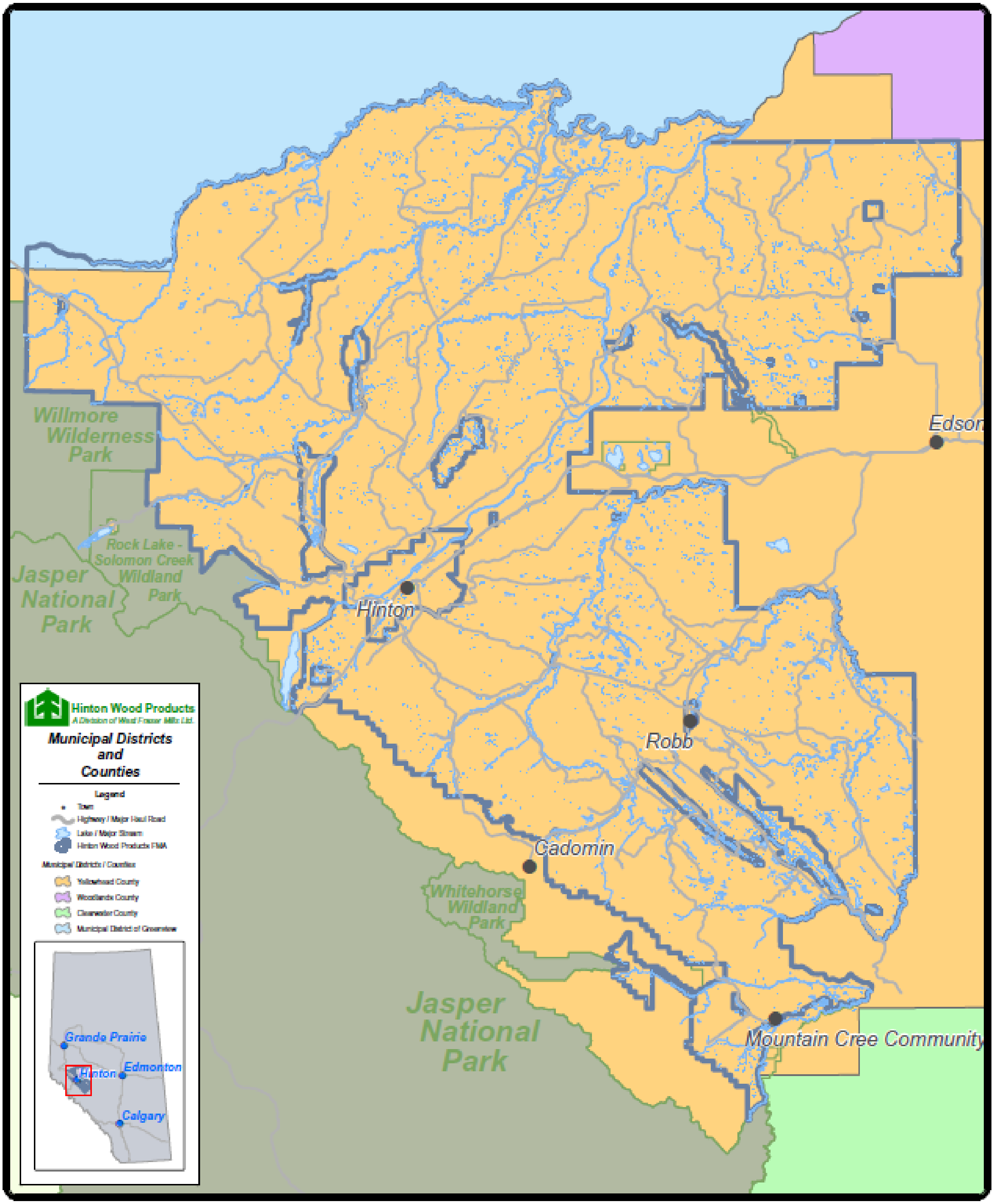


Figure 3 – Map of Municipal Classifications in and adjacent to the Hinton FMA Area

4.1.6 Federal government lands

With the exception of First Nation lands (see section 1.17); there are no federal government lands within the FMA area. Jasper National Park borders or is adjacent to approximately half of the western boundary of the FMA area (see **Error! Reference source not found.**).

4.1.7 Indian reservations

There are no Indian Reservations contained entirely within the FMA area boundary. There is one First Nation, the Alexis Nakota Sioux Nation, which has two parcels of Indian Reserve (IR) land adjacent to the southern boundary of the Hinton FMA area. Table 7 describes the area of these two Indian Reserves, while Figure 4 on the following page shows the location of each IR.

Table 7 – Indian Reserves Adjacent to the Hinton FMA Area

Treaty Number	First Nation	IR Number	IR Name	IR area (ha)
6	Alexis Nakota Sioux Nation	#233	Alexis Elk River	98.0
		#234	Alexis Cardinal River	4,661.0
			Total	4759.0

There are no permanent settlements on either of the above noted Indian Reserves. The Alexis Nakota Sioux Nation have two additional parcels of IR, both located a significant distance for the Hinton FMA. IR#133 is located 70 kilometres northwest of Edmonton and is 6,175.2 hectares in size. The administrative headquarters for the Alexis and the majority of the on-reserve population are located here. IR#232 is located 13 kilometres northwest of Whitecourt and is 3544.9 hectares in size. There is a casino, restaurant, gas station and store development on this IR, but no permanent housing.

As of August, 2014, the total registered population of the Alexis Nakota Sioux Nation (ANSN) was 1,868 persons. Approximately 40% of this population lives off-reserve. Members of the ANSN First Nation are affiliated with the Stoney Tribe. The origin of the Alexis Stoney lies to eastern Canada, where the Assiniboine group detached themselves from the rest of the Siouan family. Sioux is an abbreviation of Nadouessioux, a French corruption of the name (Nadowe-is-iw) given them by the Chippewa; it signifies snake or adder, and metaphorically enemy. The Alexis Nakota Sioux Nation is a signatory to Treaty 6.

Also located adjacent to the southwest corner of the FMA area is the Mountain Cree Community. This small community of approximately 150-200 members is affiliated with the Ermineskin Tribe located in Maskwacis, Alberta (previously known as Hobbema). This small community is not located on Indian Reserve land, but has been permanently living in this area since the late 1960s. It originated when Chief Robert Smallboy from the Ermineskin Reserve became concerned about the corrupting effects of white society on his people. In 1968, with Simon Omeasoo and Lazarus Roan, he led 140 members of his band to establish a traditional Aboriginal community that eventually ended up being located at its present site, in the foothills of the Rocky Mountains.

4.1.8 Protected Areas and Parks

As well as Jasper National Park (a federal protected area), there are also a number of different designations of parks and protected areas in Alberta, most of which are found in or adjacent to the FMA area and are defined as follows:

Provincial Park	A Provincial Park represents areas which preserve natural heritage. They support outdoor recreation, heritage tourism, and natural heritage appreciation activities that depend upon, and are compatible with, environmental protection where natural, historical and cultural landscapes and features are protected under the Provincial Parks Act in Alberta.
Provincial Recreation Area	A Provincial Recreation Area represents the recreation areas in Alberta that support outdoor recreation and tourism and often provide access to lakes, reservoirs and adjacent Crown land. Recreation areas support a range of outdoor activities in natural, modified and man-made settings. They are managed with outdoor recreation as the primary objective.

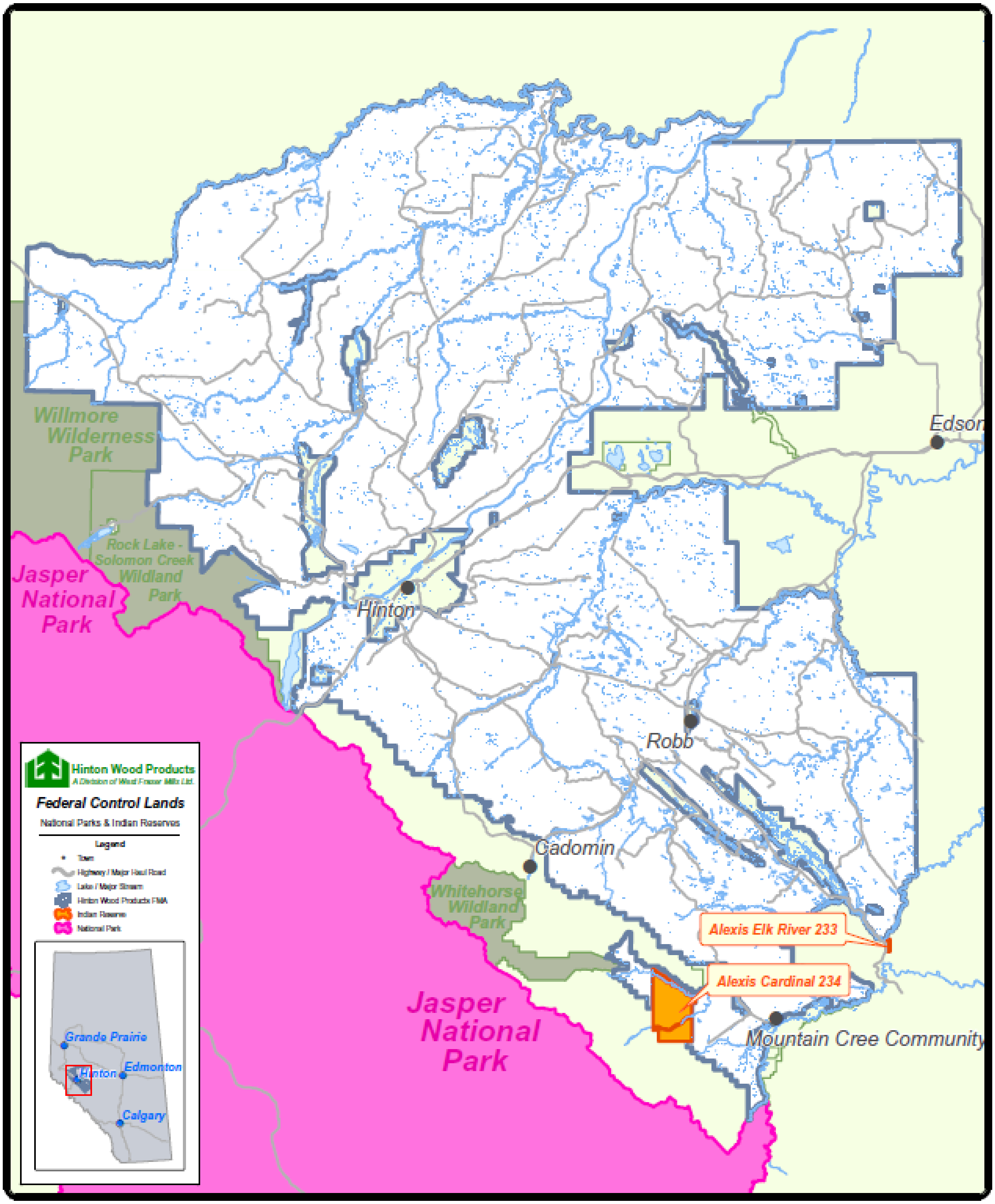


Figure 4 – Federal Controlled Land and Indian Reserves

Wilderness Area Wilderness Areas are for preservation and protection of natural heritage providing opportunities for non-consumptive, nature-based outdoor recreation. No developments of any kind are permitted. Travel in wilderness areas is by foot only. Collection, destruction and removal of plant or animal material, fossils or other object of geological, ethnological, historical or scientific interest, are prohibited. Hunting, fishing and use of horses are not permitted.

Wildland Park Wildland Parks exist to preserve and protect natural heritage and provide opportunities for backcountry recreation. Wildland parks are typically large, undeveloped natural landscapes that retain their primeval character. Trails and primitive backcountry campsites are provided in some wildland parks to minimize visitor impacts. Some wildland parks provide considerable opportunities for eco-tourism and adventure activities such as back packing, backcountry camping, wildlife viewing, mountain climbing and trail riding. Access and use of wilderness and wildland parks is not as restrictive as in wilderness areas.

Wilderness Park Wilderness Parks and Wildland Parks have the same intent: to preserve and protect natural heritage and provide opportunities for backcountry recreation. The sole Wilderness Park in the Province has its own body of legislation ("Willmore Wilderness Park Act" of 1959).

Natural Area A Natural Area represents natural and near-natural landscapes of regional and local importance for nature-based recreation and heritage appreciation. Natural areas are typically quite small; however, larger sites can be included. Most natural areas have no facilities and in those that do, facilities are minimal and consist mainly of parking areas and trails.

The Hinton FMA area is unique in that it has a number of these different types of protected areas within the FMA boundary or attached to the FMA boundary (i.e. adjacent in at least one area). Table 8 shows the types and sizes of the protected areas within or that that are attached to the FMA area. The location of these parks and protected areas are presented in Figure 5 on the following page.

Table 8 – Parks and Protected Areas Within or Attached to the Hinton FMA

Classification	Type of Park or Protected Area	Name	Area within FMA Boundary (ha)	Area that is attached to the FMA Boundary (ha)	Total (ha)
Parks	National Park	Jasper		1,123,183	1,123,183
	Provincial Park	Rock Lake		1,662	1,662
		Sundance	2,766	946	3,712
		William A. Switzer	6,262		6,262
	Wilderness Area	Willmore		459,671	459,671
	Wildland Park	Brazeau Canyon	260	4,779	5,039
		Rock Lake/Solomon Creek		33,153	33,153
		Whitehorse		17,326	17,326
	Provincial Recreation Area	Big Berland	173		173
		Fairfax Lake	130		130
		Little Sundance	24		24
		Lovett River	38		38
		McLeod River	32		32
		Pembina Forks		11	11
		Watson Creek	34		34
		Weald		31	31
		Whitehorse Creek		23	23
		Wildhay	4		4
		Wildhorse Lake	85		85
Protected Area	Natural Area	Pinto Creek Canyon	1,232		1,232
		Wildhay Glacial Cascades	2,474		2,474
		Totals	13,378	1,640,720	1,654,163

The largest protected area (1.1 million ha) that is attached to the FMA border is Jasper National Park (JNP). JNP only touches the FMA border in the very southern portion of the FMA area, but there are numerous other parks and a prime protection zone between the FMA and JNP along the entire western boundary of the FMA area. Willmore Wilderness Area, at 459,671 hectares, is the second largest park bordering the northwest section of the FMA. The three largest parks and/or protected areas entirely within the FMA boundary are William A. Switzer Provincial Park (6,262 ha), Pinto Creek Canyon Natural Area (1,232 ha), and the Wildhay Glacial Cascades Natural Area (2,474 ha).

There also exists a significant area of land in the southwestern area of the FMA that has been classified as a "prime protection zone". This prime protection zone is located between the southwestern border of the

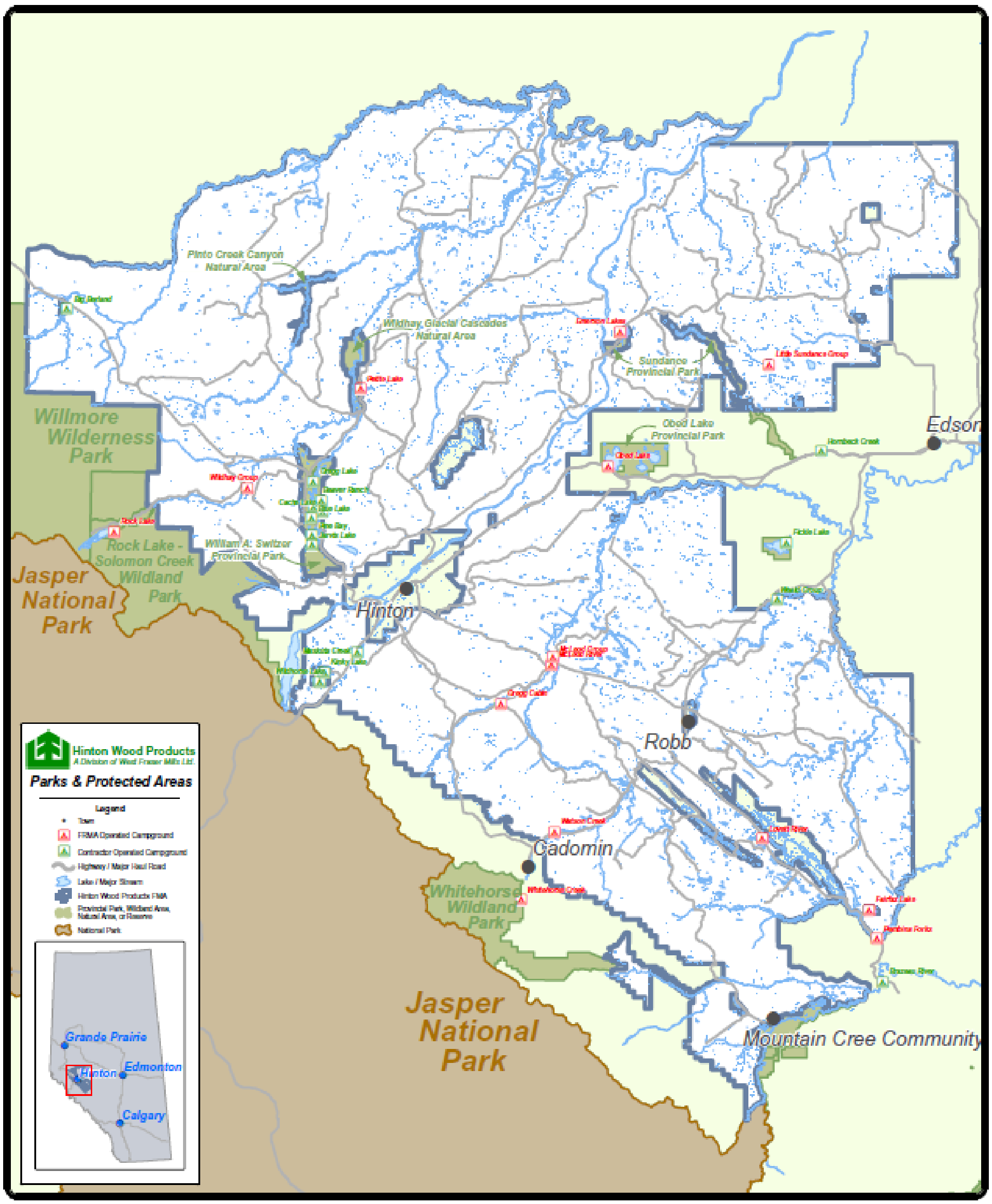


Figure 5 – Federal and Provincial Parks and Protected Areas Within or Attached to the FMA Area Boundary

FMA (i.e. south of Highway #16) and Jasper National Park and the Whitehorse Wildland Park to the west. This classification, or more accurately zoning, originates from Alberta's "Policy for Resource Management of the Eastern Slopes", a document last revised in 1984. The intent of the prime protection zone, as described in the Eastern Slopes Policy, is to preserve environmentally sensitive terrain and valuable ecological and aesthetic resources. This area contains high-elevation forests and steep rocky slopes of the major mountain ranges in the Eastern Slopes. The lower boundary for this zone has been defined by elevation, ecological variables and aesthetic qualities. While not officially designated as a park or protected area under current legislation, at the request of the GoA, this prime protection zone has been removed from the contributing landbase of the FMA. The prime protection area within the FMA area boundary is 962 hectares, of which 468 hectares was within the contributing landbase and 128 hectares of it had already been harvested.

4.1.9 Wildfire Management Areas

Wildfire Management Areas (WMAs) are those areas which define wildfire management responsibilities. The Hinton FMA area is located entirely within the Foothills Wildfire Management Area. The entire Foothills WMA is 3,058,620 hectares in size, while the Hinton FMA area is just over one million hectares, and therefore represents approximately 30% of the WMA.

4.2 Physical conditions

4.2.1 Topography

The FMA area has a wide range of topography as it extends from the Rocky Mountains easterly down to through the foothills onto the boreal plains. Several major river channels (Athabasca, Berland, McLeod and Wildhay) have created deeper valleys where they occur in the foothills, broadening out to more shallow valleys as they flow north and east.

Important elements of topography for natural resource management are slope and aspect and their relationship with forest development. Those aspects are reviewed in the section regarding Natural Sub-Regions (see section 1.14). However, slope is also an important factor in terms of defining machine operability as well as potential for erosion. As part of the Landbase calculation for this DFMP, LiDAR data were used to delineate areas greater than 45% in slope, as slopes over 45% are generally considered too steep to operate on. These areas were then buffered 75 metres to capture areas that were inaccessible. This resulted in 49,299 hectares of inoperable and inaccessible slopes or approximately 5% of the total FMA landbase area (see Figure 6).

This low percentage of inoperable area is characteristic of the Green Area portion of the entire Upper Athabasca Region (which averages less than one percent of slopes greater than 45%). As expected, the majority of steep slopes are found in the western portion of the FMA area, as the land descends off of the Rocky Mountains.

4.2.2 Soils and landforms

A general description of the soil orders present on the Hinton FMA area are described in Table 9. The dominant soil order is Luvisolic, which covers over 75% of the FMA. Brunisols are the second most common soil order on the FMA. Brunisolic soils are typically interpreted as a "transitional" soil between generally un-weathered parent material (common to Regosols) and mature forest soils represented by the Luvisolic orders. Less common soils on the FMA include the Gleysolic, Organic, and Regosolic orders.

Luvisolic soils are dominant in forested landscapes and are generally underlain by loamy tills. Brunisolic soils are primarily found on sand-dominated parent materials throughout the Boreal forest. The presence of

Table 9 – Description of Soil Orders most commonly found on the Hinton FMA Area

Soil Order	Definition
Brunisolic	Very poorly developed soil with a thin topsoil layer. One of three most common soil orders for forested soils in Canada. Typically developed from sandy parent materials and will often have a slightly acidic or basic pH.

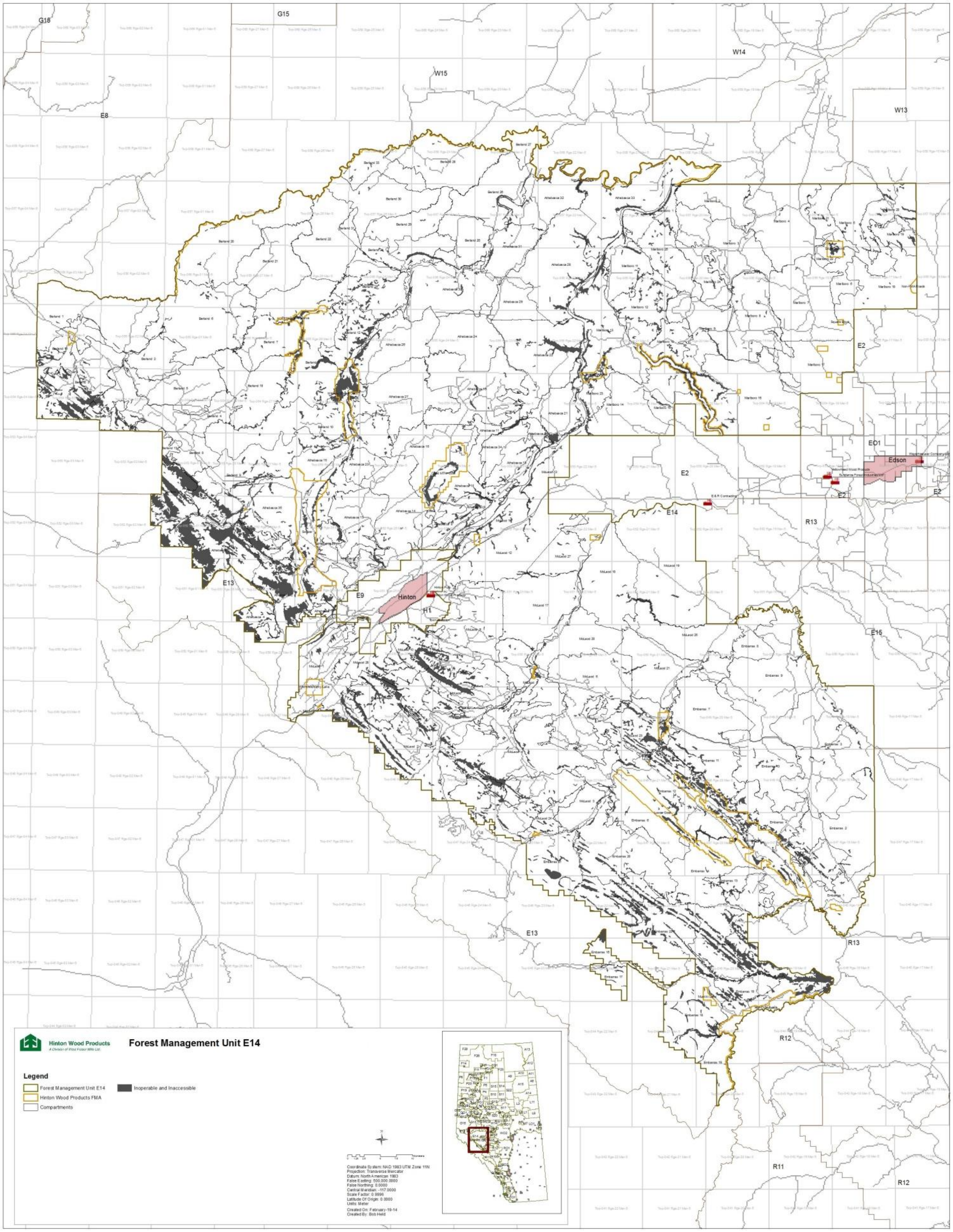


Figure 6 – Inaccessible and Inoperable Areas

Table 9 – *Description of Soil Orders most commonly found on the Hinton FMA Area (cont.)*

Soil Order	Definition
Gleysolic	A distinctive soil that results from being saturated with water for long periods of time. This soil is not productive, and is unable to retain nutrients. The water-saturated conditions also reduce the rate of transformation of organic matter which can lead to the build-up of organic matter of the surface of mineral Gleysolic soils.
Luvisolic	Soil that has large organic but low humus content. Nutrients are easily washed out of the topsoil and therefore this type of soil is not as productive as the Chernozems soils. Parent materials of Luvisolic soils are typically well supplied with base cations and have loamy or clay dominated soil textures.
Organic	A soil that is made up of mostly organic, natural material. Usually refers to peat, bog or fen soils. The wetland variants of Organic soils are associated with landscape positions where water accumulates and saturates the soil. Upland versions of these soils are composed of leaf litter and other woody debris.
Regosolic	Poorly developed soil that has a thin top soil layer. This soil does not retain nutrients well. Commonly associated with landforms where the land surface is (or has recently been) unstable. Because of the instability, the soil has had little time to develop and hence soil horizons are weakly expressed.

many gleyed subgroups indicate that much of the Region is exposed to prolonged or frequent water saturation of the soil profile.

Figure 7 shows the location of the most common soil orders in the Upper Athabasca drainage basis. Notable is the distribution of Brunisolic orders along areas of drainage in addition to the wide distribution of Luvisols as evidenced by their dominance in total area.

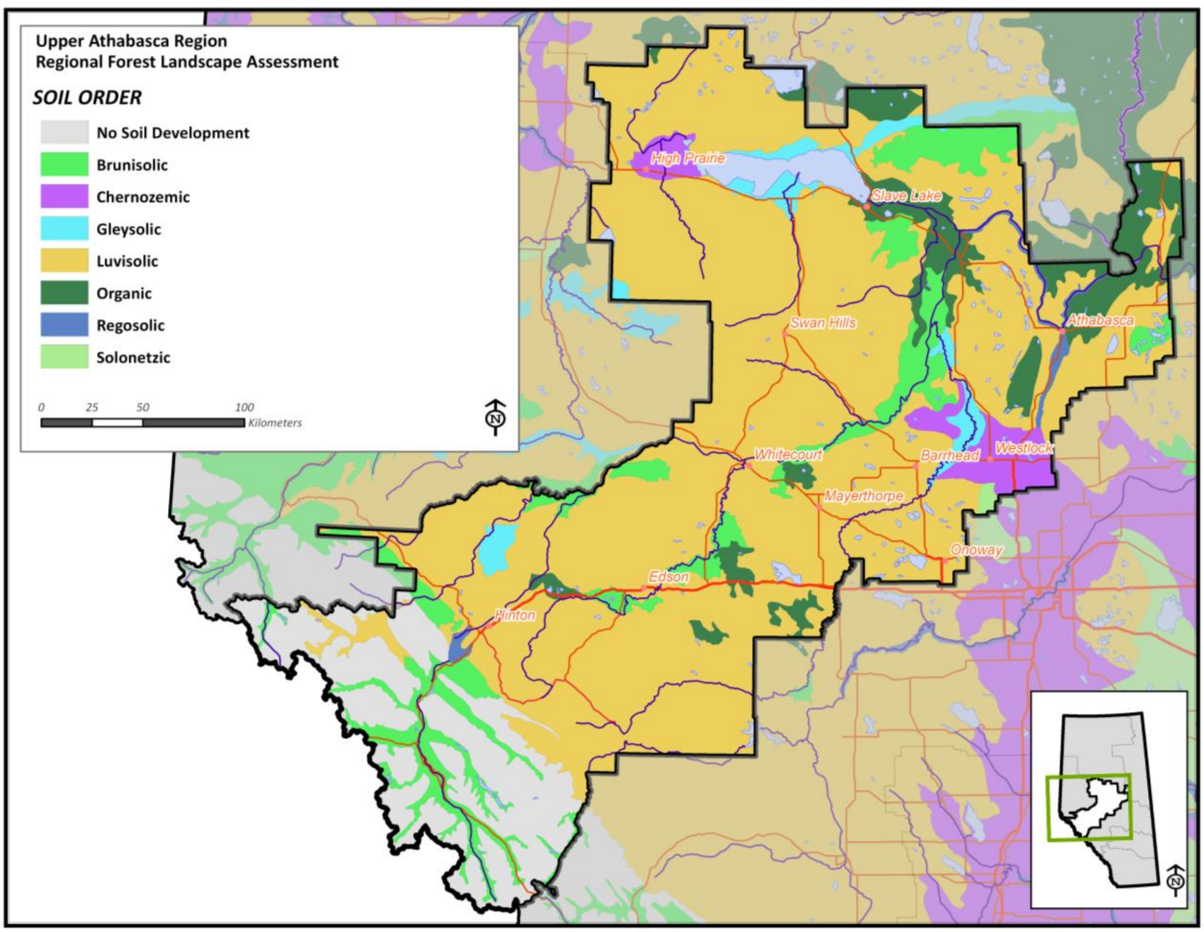


Figure 7 – Soil Orders in the Upper Athabasca Drainage Basin

In addition, to the soil order data, HWP also has data for the entire FMA area that categorizes soil into moisture class (very dry, dry, moist, wet) and soil texture (sandy, coarse sandy, silty loamy, fine loamy clayey, peaty, mineral and organic). This data is more useful than soil order data, as it provides detailed information about operability, tree growth, erodibility, and silvicultural challenges. Figure 8 illustrates the Hinton FMA area by soil moisture class and soil texture.

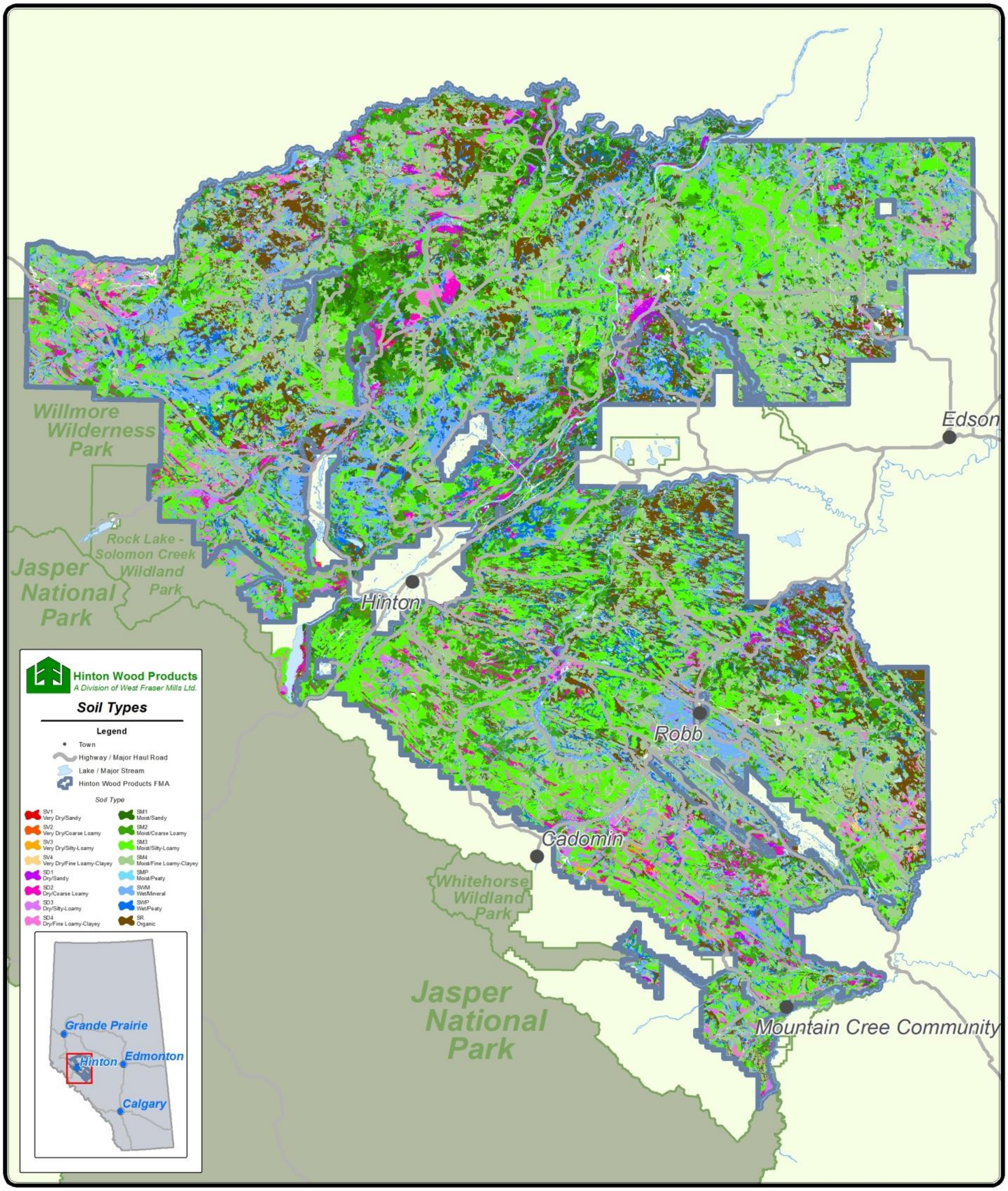


Figure 8 – Soil Moisture Class and Soil Texture for the Hinton FMA Area

4.2.3 Hydrography

Hydrography for the Hinton FMA and surrounding area is described below:

A. Watershed Basins

A new watershed layer was produced by HWP staff in 2010 by referencing watercourse locations, heights of land, and by using local knowledge. The result was 27 watershed basins; the sizes are described in Table 10 and the locations are shown in Figure 9 on the following page.

Table 10 – Area of Large Watershed Basins on Hinton FMA

WS ID#	Name	Area (ha)	Percent of FMU
0	None	4825	0.5
1	Brazeau River	10,189	1.0%
2	Cardinal River	18,593	1.8%
3	Edson River	41,121	4.0%
4	Embarras River	66,506	6.5%
5	Gregg River	23,522	2.3%
6	Little Berland River	9,911	1.0%
7	Lower Athabasca River	62,047	6.1%
8	Lower Berland River	40,155	3.9%
9	Lower Erith River	19,989	2.0%
10	Lower McLeod River	11,015	1.1%
11	Lower Wildhay River	44,616	4.4%
12	Mid Athabasca River	68,196	6.7%
13	Mid Berland River	33,315	3.3%
14	Mid McLeod River	55,451	5.4%
15	Oldman Creek	44,499	4.4%
16	Pembina River	43,172	4.2%
17	Pine Creek	20,569	2.0%
18	Pinto Creek	68,044	6.7%
19	Sundance River	21,197	2.1%
20	Trout Creek	19,056	1.9%
21	Upper Athabasca River	44,795	4.4%
22	Upper Berland River	32,405	3.2%
23	Upper Erith River	53,058	5.2%
24	Upper McLeod River	77,401	7.6%
25	Upper Wildhay River	64,499	6.3%
26	Willow Creek	19,643	1.9%
27	Windfall Creek	4,676	0.5%
	Total	1,022,465	100.0%

These large watershed basins on the FMA area described in Table 10 were also further broken down into smaller watershed groups. As the name suggests, the watershed groups were created by grouping smaller watersheds together with the intent to create units of approximately 10,000 ha in size. Groupings were limited to adjacent units that contained watercourses which flowed to a common outlet. For some watersheds along very large watercourses (e.g. Athabasca River), the groups were simply the smaller watersheds that flowed into the larger watercourse. Table 11 describes the area of each of the 67 watershed groups and Figure 10 shows the location of each watershed group on the FMA.

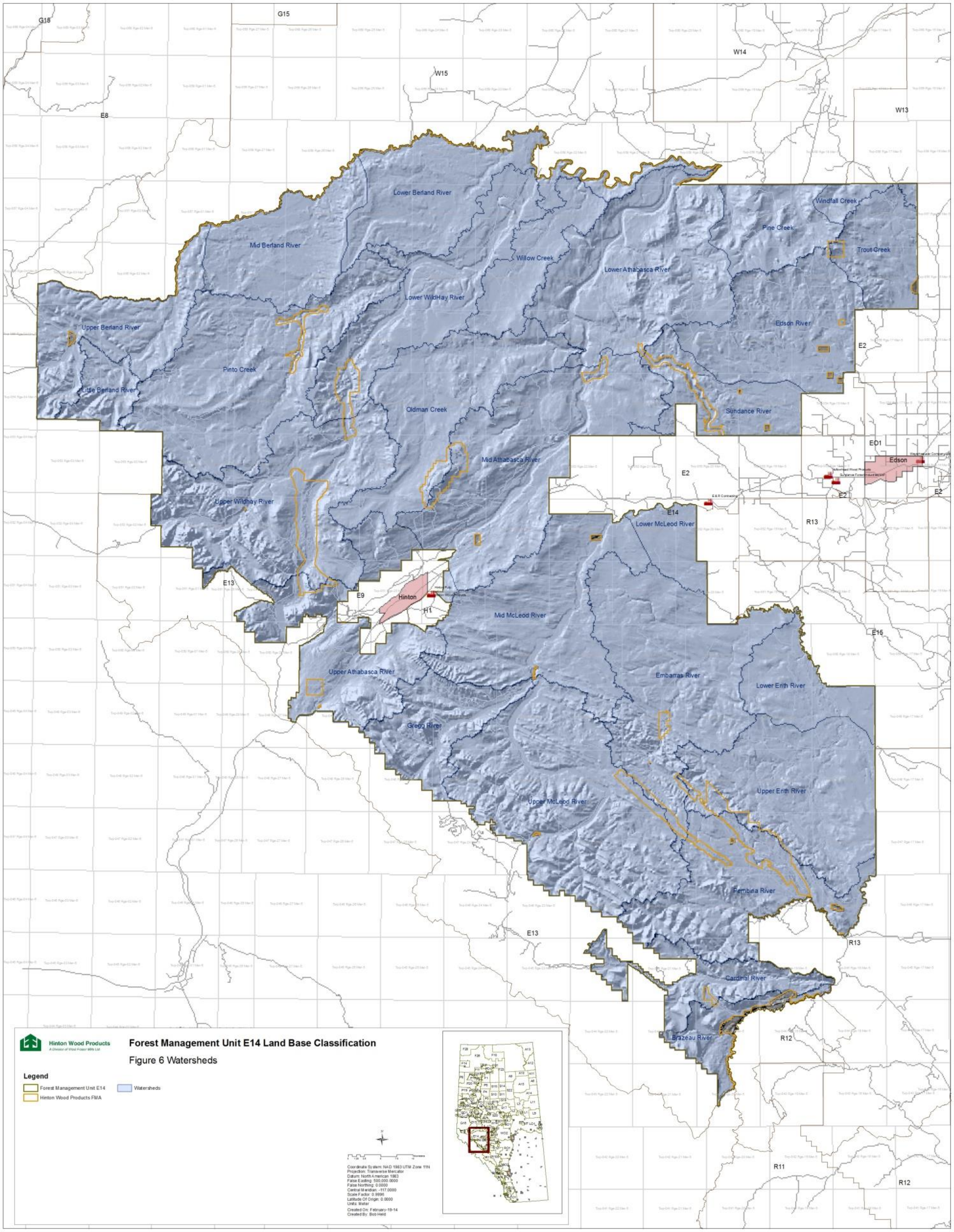


Figure 9 – The Location of the 27 Watershed Basins on the Hinton FMA

Table 11 – Area of Watershed Groups on Hinton FMA

Name	Area (ha)	Percent of FMU
Brazeau River - G1	10,189	1.0%
Cardinal River - G1	18,595	1.8%
Edson River - G1	7,675	0.7%
Edson River - G2	9,820	1.0%
Edson River - G3	14,751	1.4%
Edson River - G4	8,876	0.9%
Embarras River - G1	17,420	1.7%
Embarras River - G2	9,831	1.0%
Embarras River - G3	11,326	1.1%
Embarras River - G4	11,039	1.1%
Embarras River - G5	7,238	0.7%
Embarras River - G6	9,654	0.9%
Gregg River - G1	15,280	1.5%
Gregg River - G2	8,243	0.8%
Little Berland River - G1	9,911	1.0%
Lower Athabasca River - G1	11,357	1.1%
Lower Athabasca River - G2	9,368	0.9%
Lower Athabasca River - G3	10,973	1.1%
Lower Athabasca River - G4	15,792	1.5%
Lower Athabasca River - G5	8,311	0.8%
Lower Athabasca River - G6	6,247	0.6%
Lower Berland River - G1	14,328	1.4%
Lower Berland River - G2	15,313	1.5%
Lower Berland River - G3	10,515	1.0%
Lower Erith River - G1	19,990	1.9%
Lower McLeod River - G1	11,016	1.1%
Lower Wildhay River - G1	22,083	2.1%
Lower Wildhay River - G2	9,754	0.9%
Lower Wildhay River - G3	12,780	1.2%
Mid Athabasca River - G1	10,034	1.0%
Mid Athabasca River - G2	28,468	2.8%
Mid Athabasca River - G3	30,435	2.9%
Mid Berland River - G1	33,316	3.2%
Mid McLeod River - G1	11,557	1.1%
Mid McLeod River - G2	10,988	1.1%
Mid McLeod River - G3	8,148	0.8%
Mid McLeod River - G4	14,934	1.4%
Mid McLeod River - G5	9,909	1.0%
Oldman Creek - G1	13,039	1.3%
Oldman Creek - G2	17,927	1.7%
Oldman Creek - G3	13,533	1.3%
Pembina River - G1	10,483	1.0%
Pembina River - G2	32,690	3.2%
Pine Creek - G1	4,974	0.5%
Pine Creek - G2	15,595	1.5%
Pinto Creek - G1	28,496	2.8%

Name	Area (ha)	Percent of FMU
Pinto Creek - G2	25,545	2.5%
Pinto Creek - G3	14,005	1.4%
Sundance - G1	10,715	1.0%
Sundance - G2	10,483	1.0%
Trout Creek - G1	19,057	1.8%
Upper Athabasca River - G1	28,515	2.8%
Upper Athabasca River - G2	30,893	3.0%
Upper Berland River - G1	32,405	3.1%
Upper Erith River - G1	16,226	1.6%
Upper Erith River - G2	17,301	1.7%
Upper Erith River - G3	19,531	1.9%
Upper McLeod River - G1	16,021	1.6%
Upper McLeod River - G2	12,237	1.2%
Upper McLeod River - G3	22,874	2.2%
Upper McLeod River - G4	6,978	0.7%
Upper McLeod River - G5	19,292	1.9%
Upper Wildhay River - G1	11,977	1.2%
Upper Wildhay River - G2	21,502	2.1%
Upper Wildhay River - G3	31,023	3.0%
Willow Creek - G1	19,644	1.9%
Windfall Creek - G1	4,676	0.5%

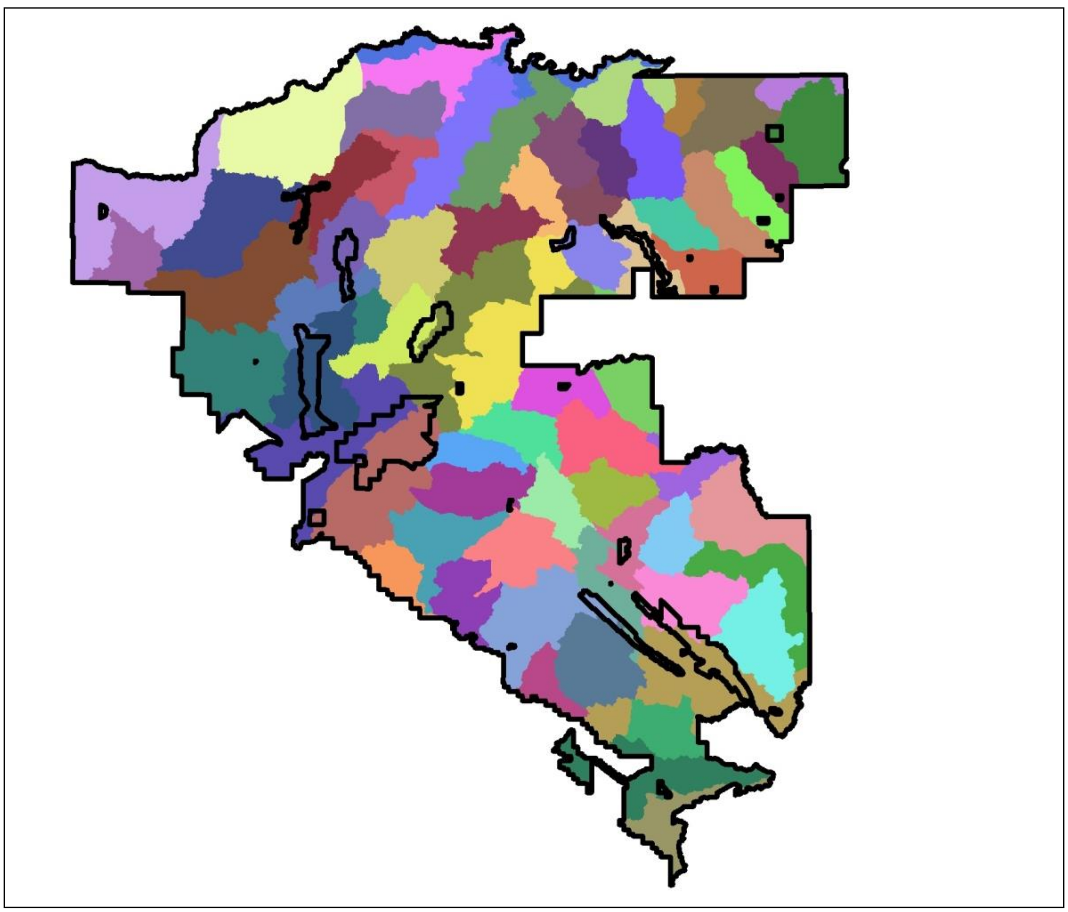


Figure 10 – Watershed Groups on the Hinton FMA

B. Streams Channels and Riparian Areas

Researchers from the Foothills Research Institute developed an Erosion-Based Channel Classification (EBCC) system for the Alberta Foothills, which classifies watercourses into channel classes based on surface erosion processes. HWP adopted the EBCC system for the FMA area because it has several advantages over the Width-based Channel Classification (WBCC) system that is currently used by the Alberta government, including the following:

a. The EBCC system is ecologically based because it reflects erosion processes. An ecological classification system makes it easier to recognize and conserve ecological functions.
b. The EBBC system supports consistent classification of channels in the field when compared to the WBCC system. Channel width variability, especially for smaller channels, makes it hard to consistently classify channels using the WBCC system.
c. The EBCC system was designed to be used with outputs from LiDAR-based watercourse delineation models (like NetMap), which makes it possible to automate watercourse classification for large areas. The WBCC system was not as suitable for automated classification, although it can be done using NetMap.

The EBCC model was calibrated for, and applied to, the FMA area where it classified the landbase into the following four categories:

1. Upland – Drainage features are absent. Surface erosion is driven by overland flow and tree root throw. On LiDAR-generated stream network maps, false channels may appear on uplands.

2. Swale – Historically, channels extended into these areas to remove material and create an obvious depression. Soil is sufficiently wet to support hydrophytic vegetation. These areas are susceptible to compaction and subsequent erosion. The modeled “swale” category also included the discontinuous channel field classification, which is described as a drainage feature that includes alternating sections of channel and vegetated ground.

3. Seepage-fed channel – A channel with a continuous bed but insufficient stream power to transport larger streambed material including gravel and cobbles; hence, these channels typically lack bed features (e.g., regular sequences of pools and riffles) that Foothills fish are adapted to. Sediment is transported as suspended load and bedload; however, only the smaller streambed material is mobile on an annual basis with larger clasts (e.g., cobbles and boulders) remaining stationary for long periods of time.

4. Fluvial channel – A channel with a continuous bed and sufficient power to transport most of the material that it flows through. Sediment transport includes suspended and bed load. Bedload transport is not limited to fine material, and includes larger size materials such as gravel.

Once stream channels were classified on the FMA (i.e. fluvial or seepage-fed), HWP then accurately and precisely mapped the riparian areas within the FMA area into four riparian categories and a fifth non-riparian category (termed “upland”) for the remaining landbase. Specific landforms and ecosites that were indicative of riparian areas were used to map (digitize) the four different riparian categories. Landforms of focus were:

- steep eroded banks caused by water activity and adjacent to water channels
- slumping soils
- flat wetland, fen and bog formations
- lakes and ponds

Ecosites of focus were:

- moisture regimes “7” or greater (Beckingham and Archibald 1996)
- varying nutrient regimes

The top of the contemporary fluvial slope was used for the majority of boundaries. Contemporary fluvial slope was defined by the proximity to the water source as well as the vegetation and ecosite types.

The definitions of the four riparian categories and the fifth non-riparian category are outlined below:

1. Fluvial Riparian – Fluvial riparian areas were defined as the area immediately adjacent to an EBCC-defined fluvial channel. This designation also includes riparian areas surrounding standing bodies of water such as lakes or ponds that have a fluvial channel flowing in or out of them. The top of the contemporary fluvial slope was the main driver in the fluvial boundary; however, ecosite (i.e. ELC) was referenced regularly to ensure consistency and accuracy.

2. Seepage-fed Riparian – Seepage-fed riparian areas were defined as the area immediately adjacent to an EBCC-defined seepage-fed channel. They were often closely associated with discontinuous channels and water source areas in poorly drained areas with minimal erosion potential. Ecosite boundaries, as well as the top of the associated contemporary slope, were used to determine the location and extent of the boundary.

3. Isolated Wetland – Isolated wetland areas were defined as wet areas completely surrounded by upland features. The main difference between seepage-fed and isolated wetland features is that seepage zones eventually flow horizontally into fluvial features, whereas isolated wetlands do not visibly drain over the surface of the landscape. Ecosite boundaries were usually used to determine the location and extent of the boundary.

4. Complex – Complex areas were defined as riparian areas that could not be accurately represented by any other category due to the large upland component mixed in with riparian features, resulting in areas that could not be accurately digitized. The complex classification was only used in a 295 hectare area located in the middle of the Upper Wildhay River drainage basin. The area contained very gentle and hummocky slopes consisting of upland vegetation interspersed with immediately adjacent riparian areas. These areas require additional field investigation to map riparian versus upland and determine any future management objectives. The entirety of the "complex" category is within the Switzer Park boundary and therefore will likely not pose management issues.

5. Upland – Upland areas were defined as all areas that were not classified as riparian. Riparian areas are impacted by natural fluctuations in open water flow volume and are often drastically different from uplands in that they are affected by higher erosion probability, high water table, and the ecological inputs provided by water movement. In contrast, upland areas were well-drained locations largely unaffected by hydrological processes other than surface flow from precipitation.

Table 12 describes the area of each riparian area classification (and Upland) within the FMA and Figure 11 shows the location of classified area.

Table 12 – Riparian Zones (and Upland) on the Hinton FMA

Classification	Area	Percent of FMA
Upland	669,986.4	65.5%
Complex	295.0	0.0%
Fluvial	120,289.4	11.8%
Seepage	225,416.6	22.0%
Isolated Wetland	6,477.9	0.6%
Total	1,022,465.4	

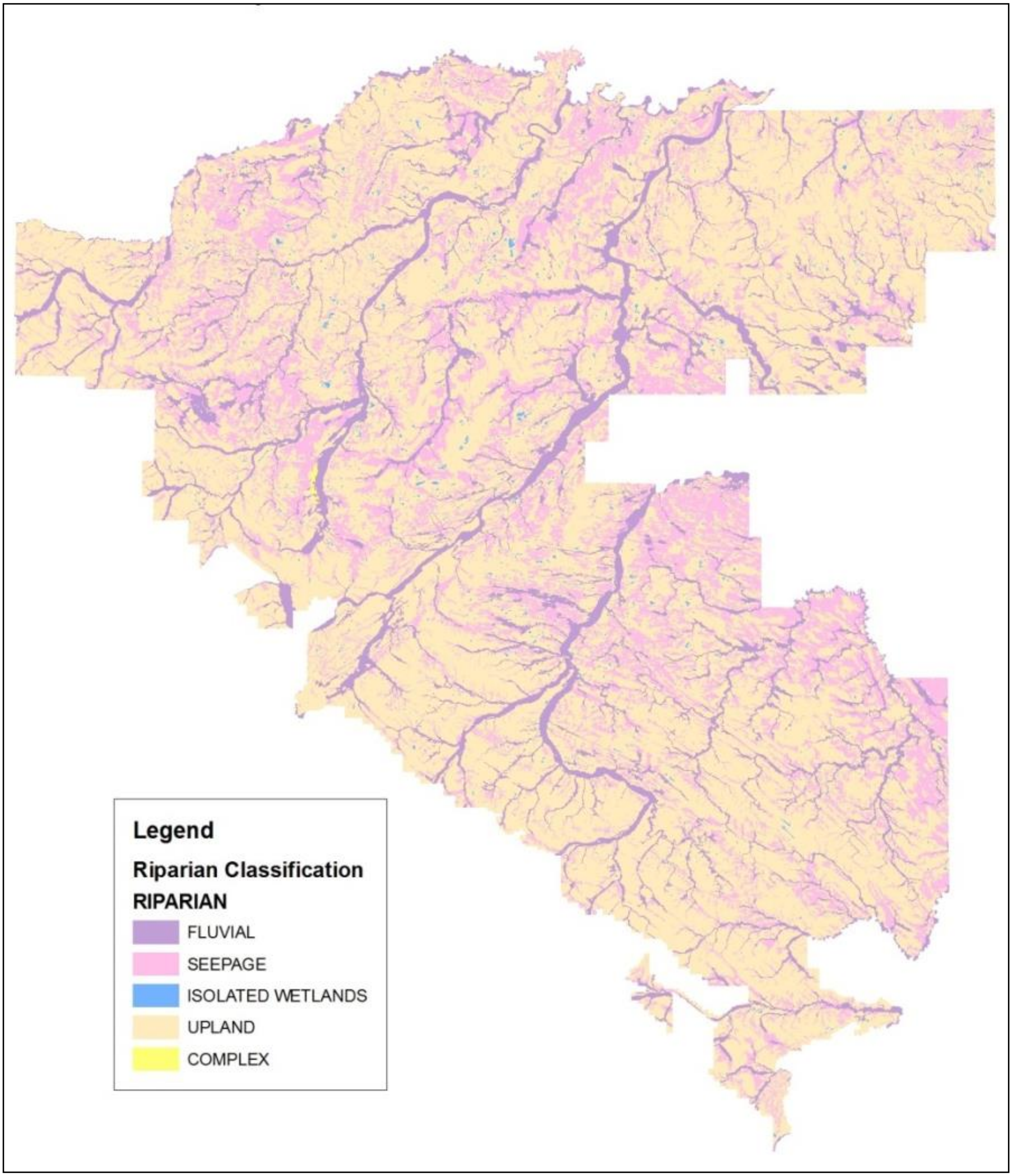


Figure 11 – Riparian classification for the Hinton FMA Area

4.2.4 Climate

Alberta has a continental climate which is characterized by a large variation in temperature between summer and winter. A wide range of climatic conditions are present in the Upper Athabasca Region due to the variety of topography from the Rocky Mountains in the west, to the boreal plains in the north east. The Hinton FMA is located in the southwestern portion of the Upper Athabasca Region. Climatic data from 1971 to 2000 summarized by the GoA and Environment Canada have resulted in the mapping of general climatic trends over the province.

Figures indicating the daily mean January temperature (°C); daily mean July temperature (°C); length of growing season (defined as the number of days where the daily temperature exceeds 5°C); and mean annual precipitation (mm) appear below in Figure 12, Figure 13, Figure 14, and Figure 15 (respectively).

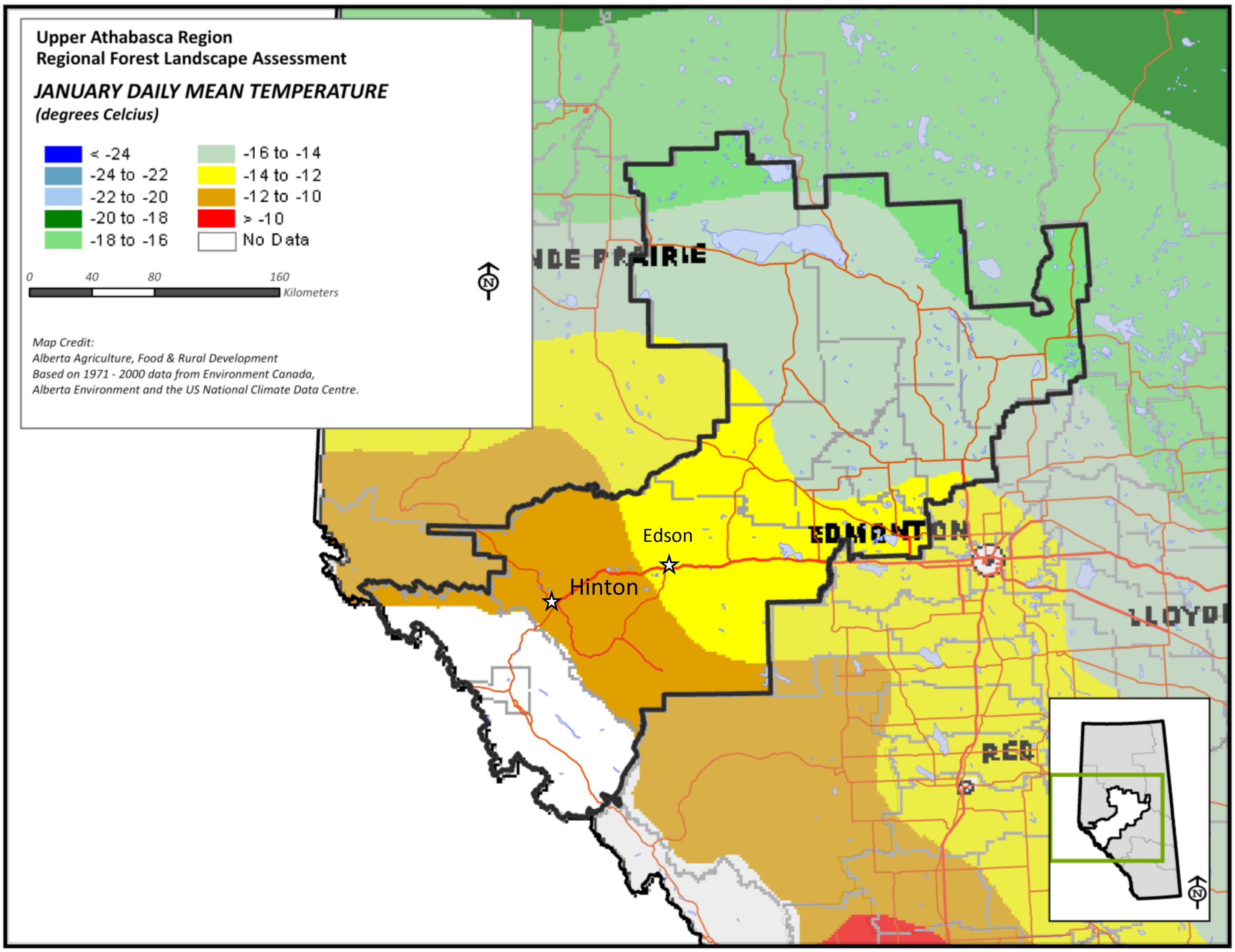


Figure 12 – Daily Mean January Temperature

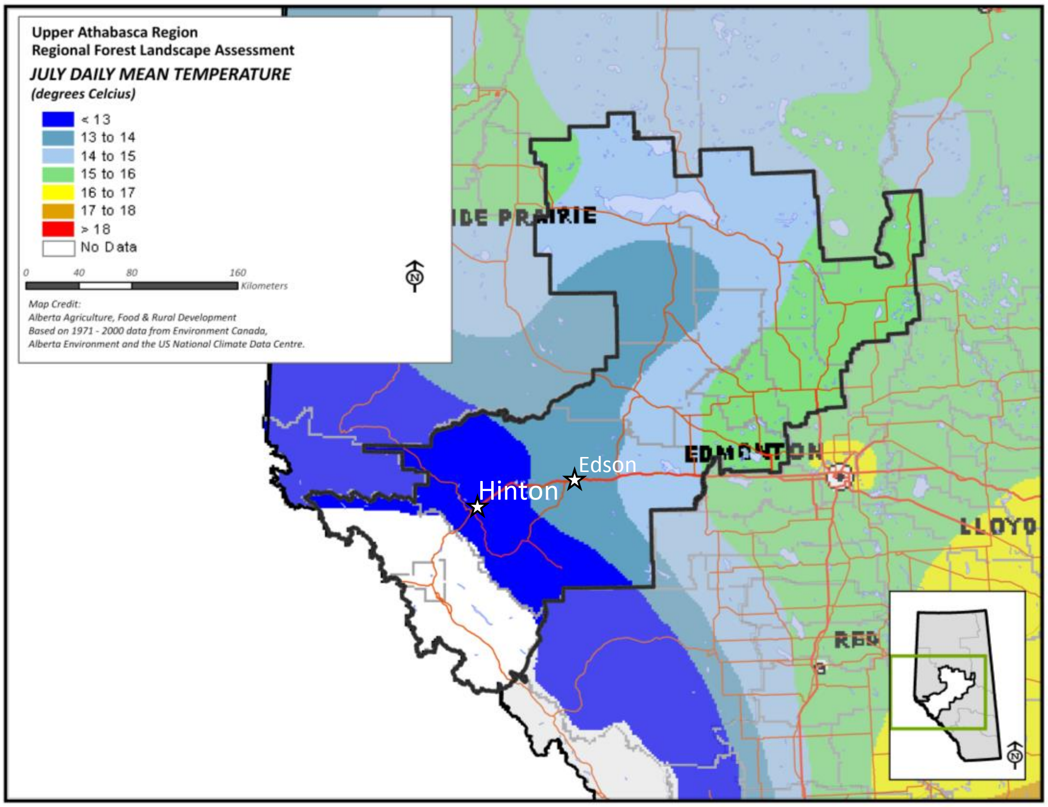


Figure 13 – Daily Mean July Temperature

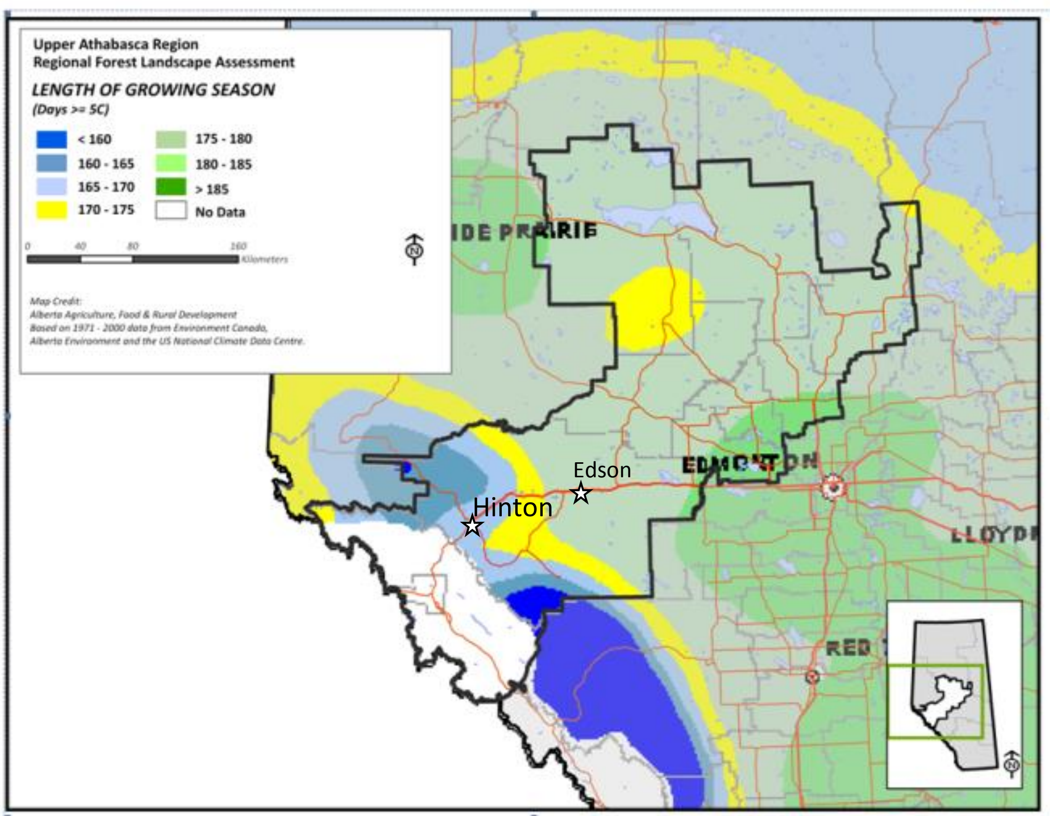


Figure 14 – Length of Growing Season

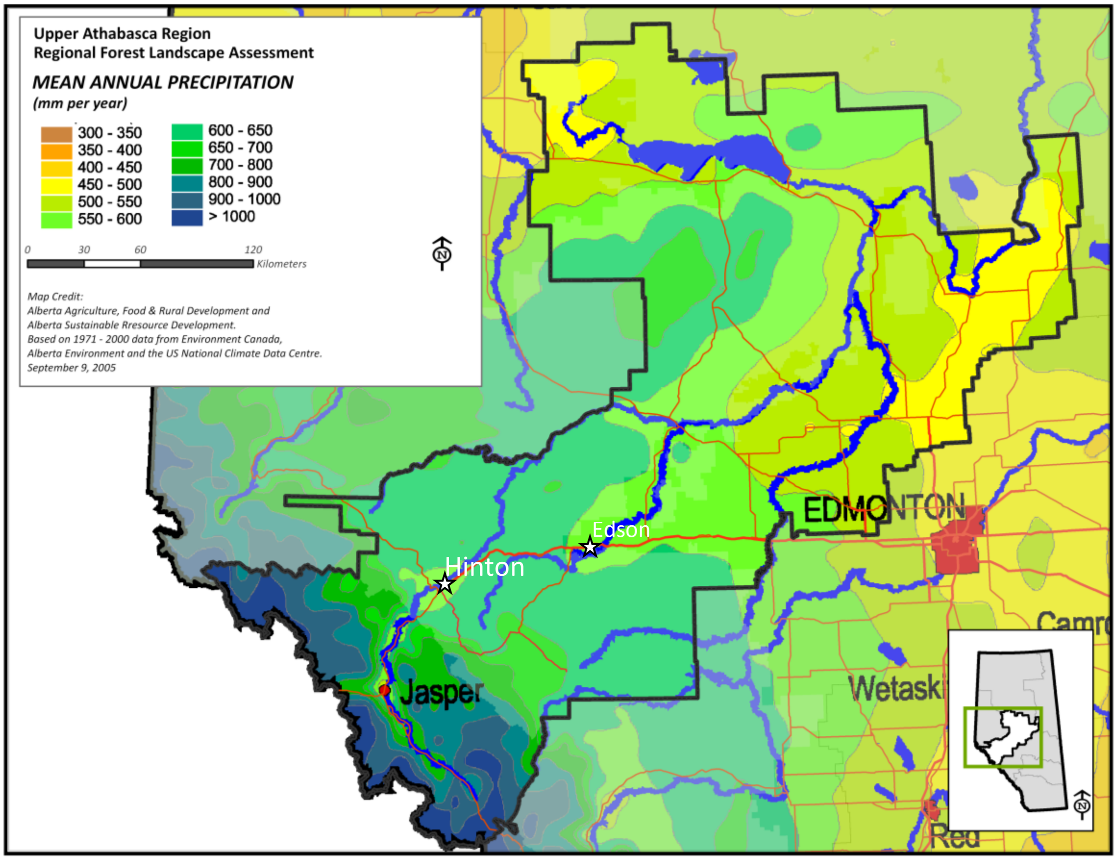


Figure 15 – Mean Annual Precipitation

The provincial ecological classification identifies two eco-climatic provinces present within the Upper Athabasca Region: the Boreal and Cordilleran. The Cordilleran regime is typical in the Alpine, Subalpine and Montane Natural Subregions. The Boreal regime is largely in the north part of the Upper Athabasca Region which is occupied by the Central Mixedwood and Dry Mixedwood Natural Subregions. The Lower Foothills Subregion is considered a transitional zone between Boreal and Cordilleran eco-climates.

In addition to temperature, length of growing season and precipitation shown above, three important factors affecting reforestation success and tree growth have been summarized from the publication Natural Regions and Subregions of Alberta (Natural Regions Committee 2006).

1. <u>Summer Moisture Index</u> – The summer moisture index (SMI) is a measure of precipitation effectiveness during the growing season. It is calculated by dividing the number of growing degree days over 5°C by the amount of precipitation over the growing season (April through August). A high ratio indicates a greater likelihood that evaporation will exceed precipitation at some time during the growing season. For example, an SMI greater than 4 indicates dry to very dry climatic conditions, an SMI less than 3 indicates moist to wet climatic conditions with no moisture deficits during the growing season. An SMI between 3 and 4 indicates the likelihood of only moderate moisture deficits for short periods of the growing season.

2. <u>Frost Free Days</u> – The frost-free period is another indicator of temperature regimes that are favourable or unfavourable to plant growth. Factors contributing to short, erratic, frost-free periods are terrain variability and elevation. Rough terrain and higher elevations tend to reflect shorter and more unpredictable frost-free periods, likely due to variations in aspect and cold air drainage from high to low terrain. While general trends and averages are shown in the

accompanying figure, the calculations of average frost-free periods are highly unreliable because of year-to-year variations in weather patterns and topographic variability.

3. Growing Season Precipitation – Growing season precipitation (GSP) is the portion of mean annual precipitation which falls from April to August. Higher proportions of precipitation during the growing season indicate continental climatic influences (where the bulk of the precipitation falls during the summer).

General patterns of summer moisture index, frost-free days and growing season precipitation are displayed in Figure 16

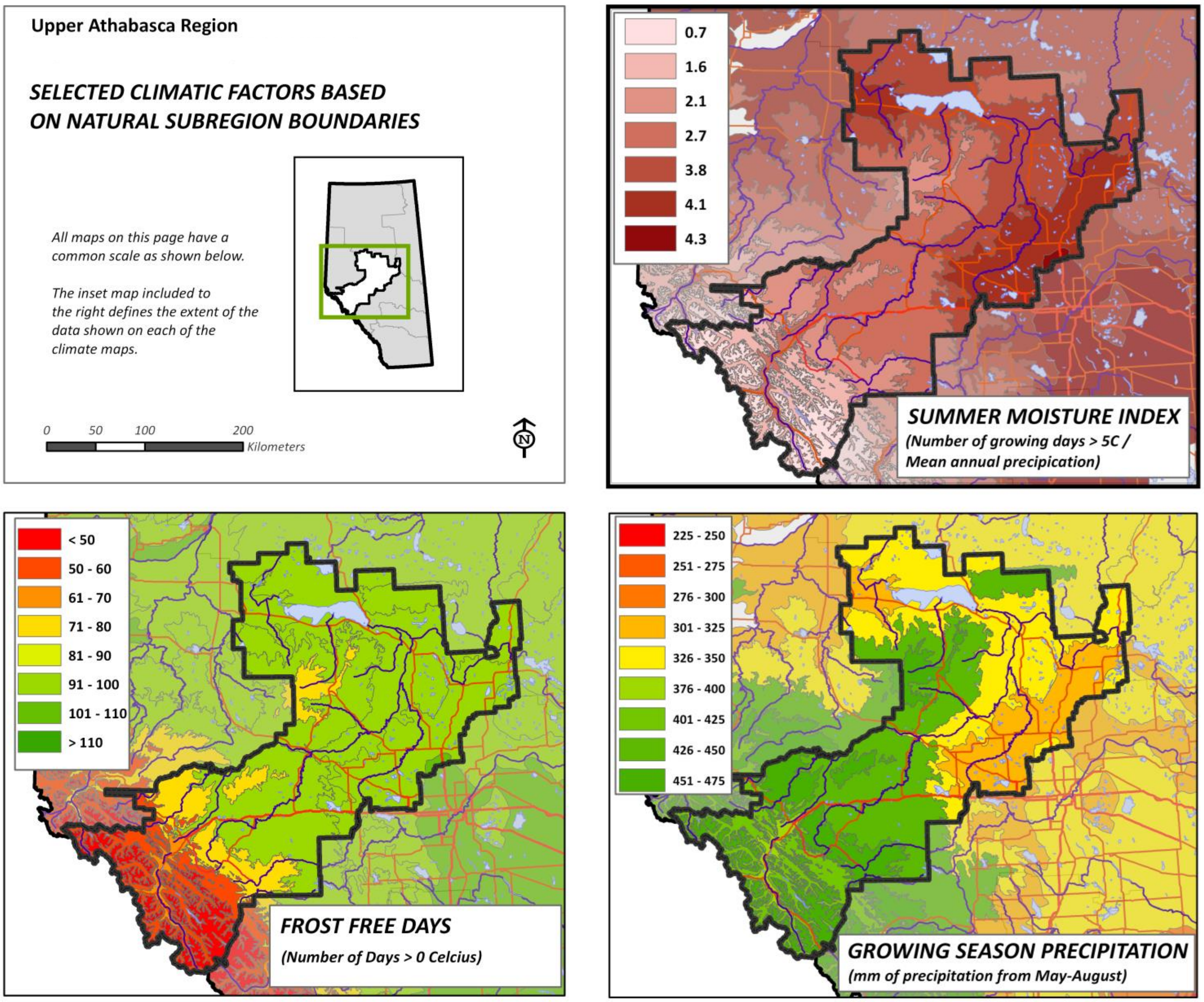


Figure 16 – Climatic Factors Associated with Natural Subregions

4.3 Forest Landscape Pattern and Structure

4.3.1 Forest Species

Forest species refers to the general commercial tree species in Alberta and does not include species such as willow or alder as they are typically more shrub-form in Alberta. In this assessment, described in Table 13, the selected species was the leading overstory tree species as identified in the forest inventory.

Coniferous leading species as a group are more prevalent and most common on the FMA area, while aspen-leading stand types are the least common over the area. Aspen also occurs in mixed-wood stands in the lower elevation areas of the FMA (commonly along major river corridors). Pine is the most prevalent leading coniferous species, forming both pure stands as well as occurring in mixed stands with white spruce and aspen.

White and black spruces occur commonly throughout the Region. White spruce occurs in mixed coniferous, mixed-woods and in pure stands. Black spruce occurs primarily on lowland areas. Note that there may be large areas of sparse black spruce and larch occurring in wetlands. These areas would typically be classified as "Not Forested" due to the wetland being the dominant feature.

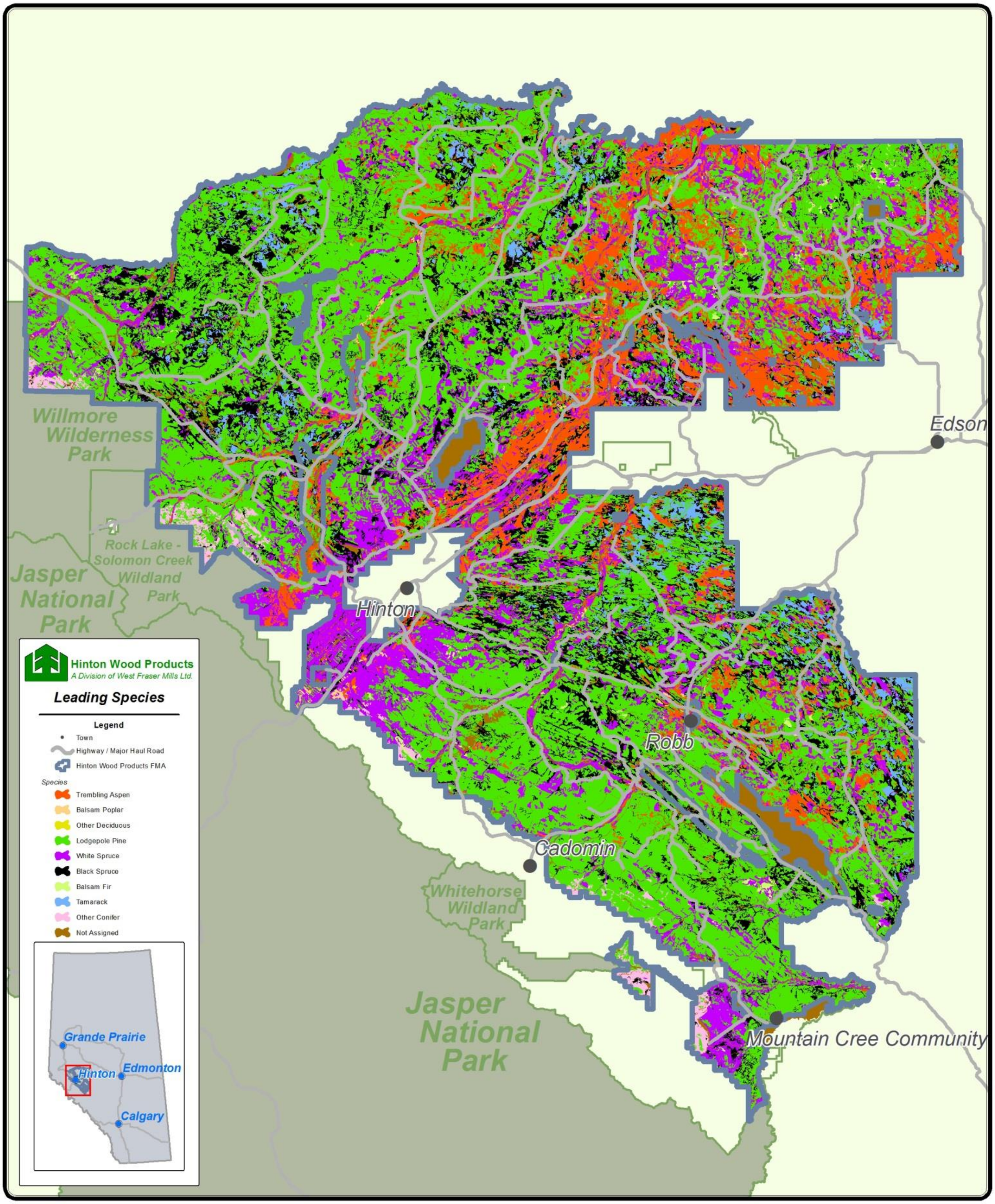
The category "Undeclared species" refers to regenerating wildfires or harvest areas for which a leading tree species has not yet been established or declared.

Table 13 – Leading Species Distribution on the Hinton FMA

Common Name	Latin Name	Area (ha)
Coniferous		
Lodgepole pine	*Pinus contorta*	507,171.02
White Spruce	*Picea glauca*	161,710.28
Black Spruce	*Picea mariana*	126,688.74
Balsam fir	*Abies balsamea*	3,311.45
Tamarack	*Larix laricina*	30,553.67
Engelmann Spruce	*Picea engelmannii*	11,053.02
Subalpine fir	*Abies lasiocarpa*	505.66
	Sub-total coniferous	840,993.84
Deciduous		
Trembling aspen	Populus tremuloides	111,680.56
Balsam popular	Populus balsamifera	3,013.95
Birch	Betula papyrifera	281.13
	Sub-total deciduous	114.975.64
Regeneration		
Undeclared species		
	Sub-total undeclared species	66,495.88
	Sub-total forested land	66,495.88
	Total	1,022,465.36

Figure 17 on the following page outlines the distribution of forest species on the Hinton FMA.

Figure 17 – Distribution of Forest Species on the Hinton FMA



4.3.2 Forest Cover Types

Cover type groupings are based on the provincial strata defined in the yield projection guidelines of the Forest Planning Standard (Alberta 2006). Strata are hierarchical, based first on broad cover group (deciduous, deciduous-coniferous, coniferous-deciduous, coniferous) and then by leading coniferous species (except in the case of pure deciduous). There are 10 primary forest cover types defined in the Planning Standard. The only cover type not represented in the FMA area is the Douglas-fir leading, coniferous stand type.

As outlined in Table 14, the Hinton FMA area is dominated by primarily coniferous stand types, with 69.9% of the inventoried area covered by pine, white spruce, and black spruce forest strata.

The "Regeneration" category includes those harvest areas or wildfires for which an AVI strata has not been assigned.

Table 14 – Forest Cover Type Summary for the Hinton FMA

Description	Code	Yield Class	Area (ha)	% of Gross Landbase
Forested Land				
Pine pure or leading	C-P	8	467,095	45.7%
White spruce pure or leading	C-Sw	7	129,193	12.6%
Black spruce pure or leading	C-Sb	9	118,199	11.6%
Pine/Hardwood	CD-P	5	46,953	4.6%
White spruce/Hardwood	CD-Sw	4	28,044	2.7%
Black spruce/Hardwood	CD-Sb	6	1,180	0.1%
Hardwood/Pine	DC-P	2	27,732	2.7%
Hardwood/Spruce	DC-S	3	29,089	2.8%
Deciduous	D	1	56,303	5.5%
Regeneration (undeclared strata)		0	0	0.0%
Sub-total forested land			903,787	88.4%
Not Forested				
Non-forest (vegetated)	n/a		105,294	10.3%
Non-forest (non-vegetated)			13,384	1.3%
Sub-total not forested land			118,679	11.6%
Total			1,022,465	100.0%

Figure 18 on the following page shows the spatial distribution of cover types across Hinton FMA area.

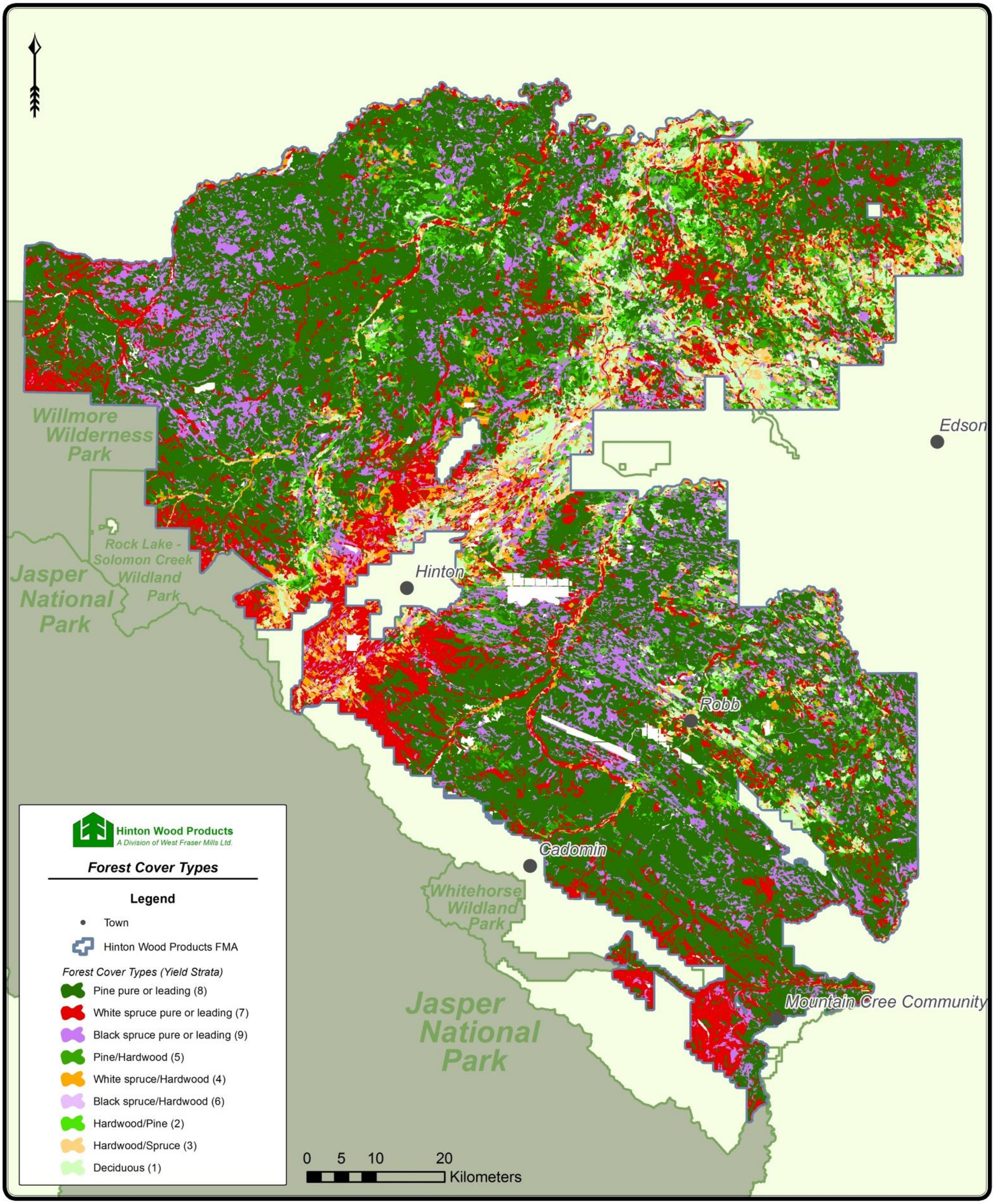


Figure 18 – Spatial Distribution of Cover Types across Hinton FMA area

4.3.3 Forest Age Classes

The age class distribution over the forested landscape of the Hinton FMA area is shown in Table 15 and Figure 19 on the following page. The majority of the forest would be considered mature, with a full 49% of the forested landbase represented by greater than 100 year age classes. Table 15 also categorizes the differences in forest age class based on the contributing and passive landbase. The contributing landbase is that area within the Hinton FMA area that contributes to the Annual Allowable Cut (AAC) and will be harvested in the future or has already been harvested in the past. The passive landbase is that area within the Hinton FMA that does not contribute to the AAC and based on current knowledge and technology, it will not contribute to the AAC in the future.

The largest age class on the FMA area is the 121-130 age class, which represents 19.4 % of the total landbase. The prevalence of this age class is consistent with the wildfire history in the area. A high percentage of the area represented by the age classes between 0 and 50 years is previous harvesting. The 0-50 age class represents 30% of the forested area on the FMA.

Table 15 – Forest Age Class Distribution

Age Class (years)	Area (ha) Contributing	Area (ha) Passive	Area (ha) total	% of Gross Landbase
Non-forested				
Subtotal non-forested		118,679	118,679	
Forested				
0-10	52,140	1,087	53,227	5.2%
11-20	59,305	444	59,749	5.8%
21-30	24,527	1,345	25,872	2.5%
31-40	32,704	3,985	36,689	3.6%
41-50	33,189	4,179	37,368	3.7%
51-60	21,405	6,892	28,297	2.8%
61-70	21,164	11,767	32,931	3.2%
71-80	13,244	9,896	23,139	2.3%
81-90	40,604	26,448	67,053	6.6%
91-100	27,724	23,626	51,351	5.0%
101-110	30,514	11,580	42,094	4.1%
111-120	63,438	20,848	84,286	8.2%
121-130	148,705	49,450	198,156	19.4%
131-140	34,771	13,672	48,443	4.7%
141-150	13,563	12,393	25,956	2.5%
151-160	10,609	9,393	20,002	2.0%
161-170	6,784	7,816	14,600	1.4%
171-180	10,944	6,572	17,516	1.7%
181-190	2,531	1,556	4,087	0.4%
191-200	2,458	1,417	3,875	0.4%
201-210	1,651	984	2,636	0.3%
211-220	590	1,246	1,837	0.2%
221-230	6,522	9,160	15,682	1.5%
231-240	62	84	146	0.0%
241+	3,285	5,511	8,796	0.9%
Subtotal forested	662,434	241,352	903,787	
Grand Total	**662,434**	**360,031**	**1,022,465**	**100.0%**

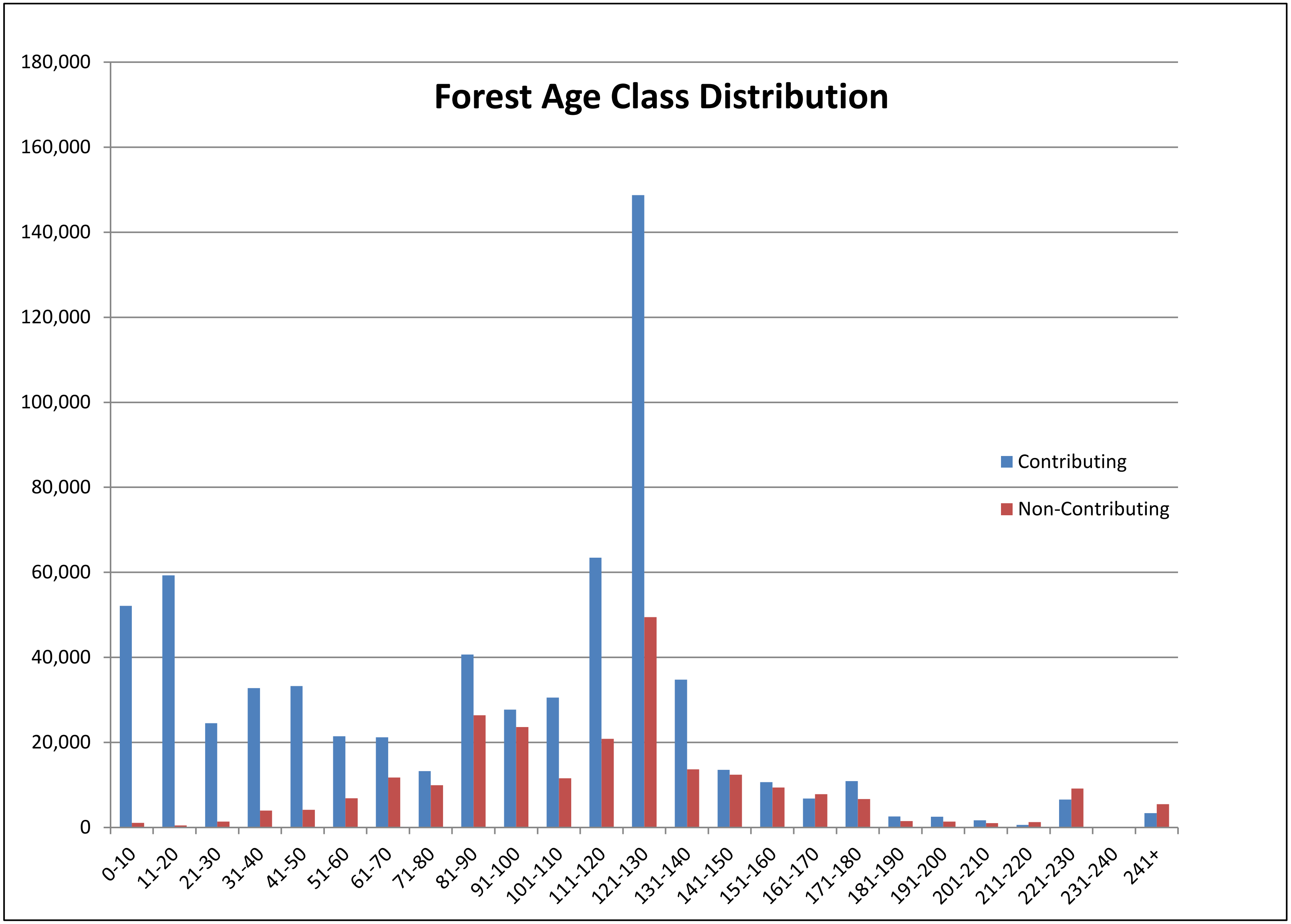


Figure 19 – Forest Age Class Distribution on the Hinton FMA Area

4.3.4 Seral Stages

Seral stages refer to stages in forest succession that are characterized by plant community conditions. For the purposes of the DFMP, seral stages are defined by stand age and by stand origin (i.e. fire or harvest origin). Table 16 outlines the seral stage definitions for the Hinton FMA area. Table 17 describes the distribution in hectares of each seral stage (regardless of stand origin). Not all the landbase is forested or is able to be classified into a seral stage. Figure 20 shows graphically the seral stage distribution of the forested landbase, while the spatial distribution of each seral stage by cover type is shown in Figure 21, Figure 22, Figure 23, Figure 24 and Figure 25 on the following pages. The largest seral stage on the FMA is late mature, while the smallest is old.

Table 16 – Seral Stage definitions for the Hinton FMA Area

Cover Type	Description	Coniferous Composition	Yield Strata	Stand Origin	Seral Stage Definition (years)				
					Young	Pole	Early Mature	Late Mature	Old
Pine Leading	Pl, Pl-Sb, Pl-Fb, Pl-Sw	80% or greater	8	Fire-origin	0-19	20-69	70-119	120-159	160+
				Harvest-origin	0-19	20-49	50-99	100-159	160+
White Spruce Leading	Sw, Sw-Pl, Sw-Fb, Se, Se-Sb, Fb	80% or greater	7	Fire-origin	0-19	20-49	50-99	100-159	160+
				Harvest-origin	0-19	20-49	50-99	100-159	160+
Black Spruce Leading	Sb, Lt, Sb-Lt, Sb-Se	80% or greater	9	Fire-origin	0-29	30-89	90-109	100-189	190+
				Harvest-origin	0-29	30-89	90-109	100-189	190+
Mixed Wood	Aw-Sw, Aw-Pl, Sw-Aw, Pl-Aw	<80% and >20%	2,3,4, 5,6	Fire-origin	0-19	20-59	60-109	110-149	150+
				Harvest-origin	0-19	20-49	50-99	100-149	150+
Deciduous	At, At-Pb, Pb-At, Pb	20% or less	1	Fire-origin	0-19	20-59	60-109	110-149	150+
				Harvest-origin	0-19	20-59	60-109	110-149	150+

Table 17 – Seral Stage Distribution for the Hinton FMA Area

Seral Stage	Contributing Landbase (ha)	Passive Landbase (ha)	Total (ha)
Forested Land			
Young	111,451	1,880	113,331
Pole	123,168	41,246	164,414
Early Mature	154,748	63,575	218,323
Late Mature	237,065	110,761	347,826
Old	36,003	23,890	59,893
Subtotal	662,434	241,352	903,786
Non Forested Land			
Vegetated & non-veg		118,678	
Subtotal			
		Grand Total	1,022,465

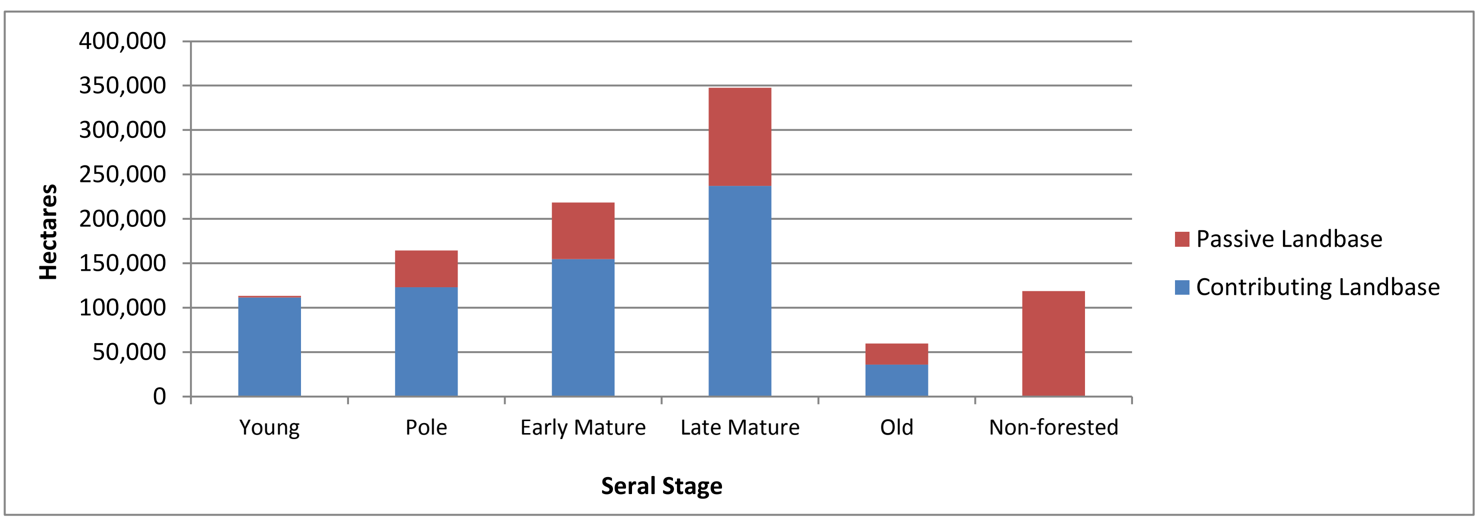


Figure 20 – Seral Stage Distribution on the Hinton FMA Area

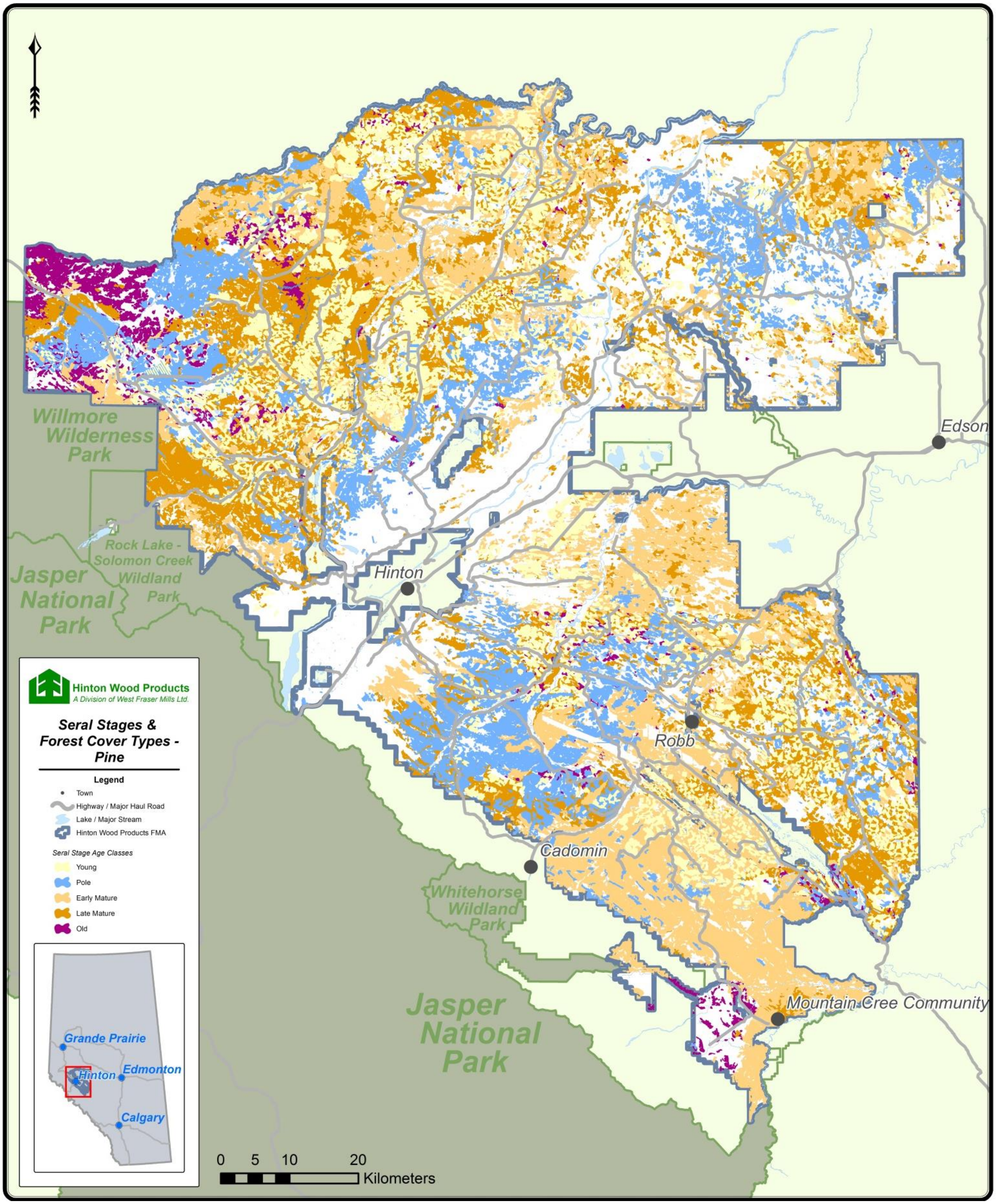


Figure 21 – Seral Stage Spatial Distribution for the Hinton FMA Area for Pine

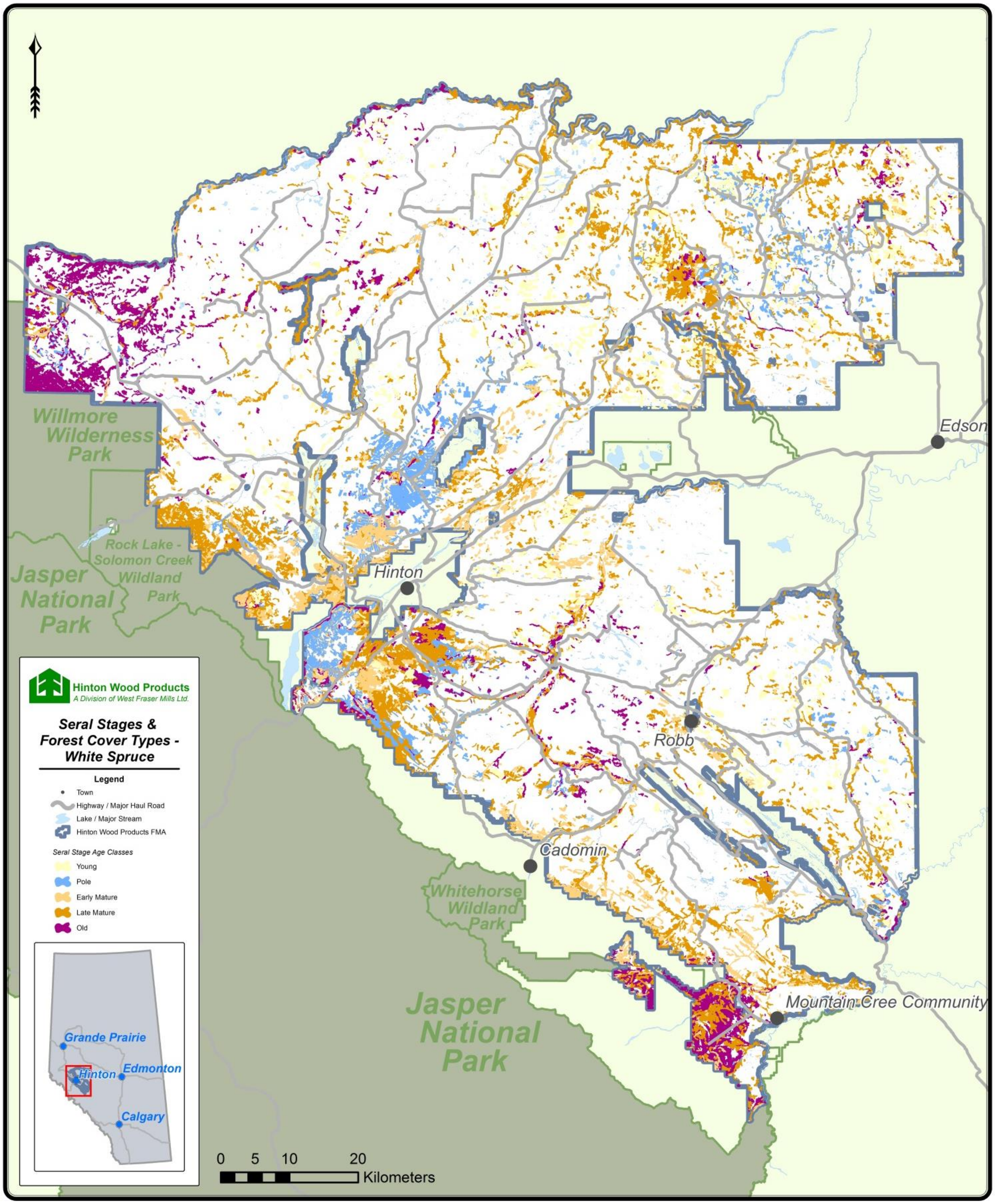


Figure 22 – Seral Stage Spatial Distribution for the Hinton FMA Area for White Spruce

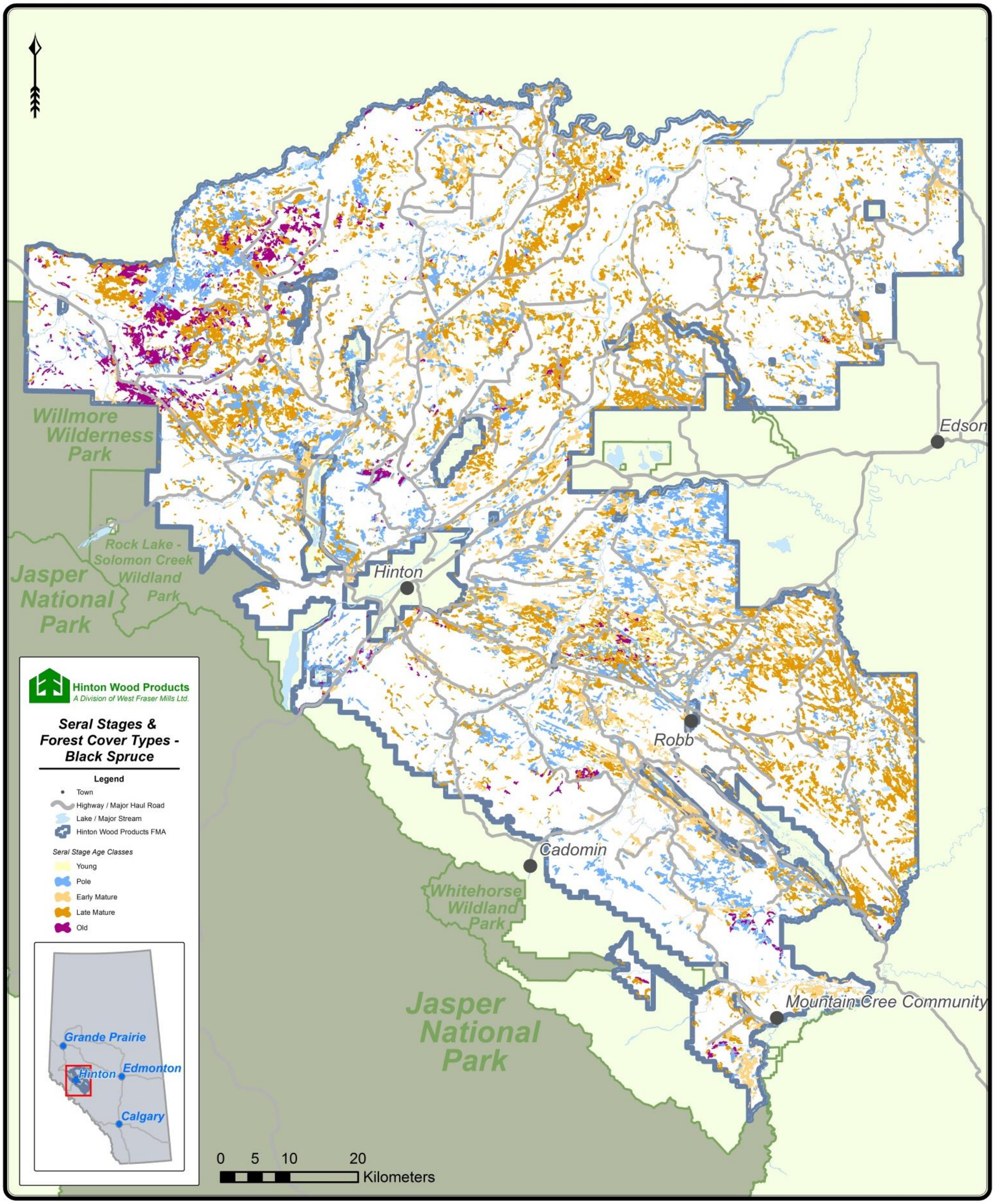


Figure 23 – Seral Stage Spatial Distribution for the Hinton FMA Area for Black Spruce

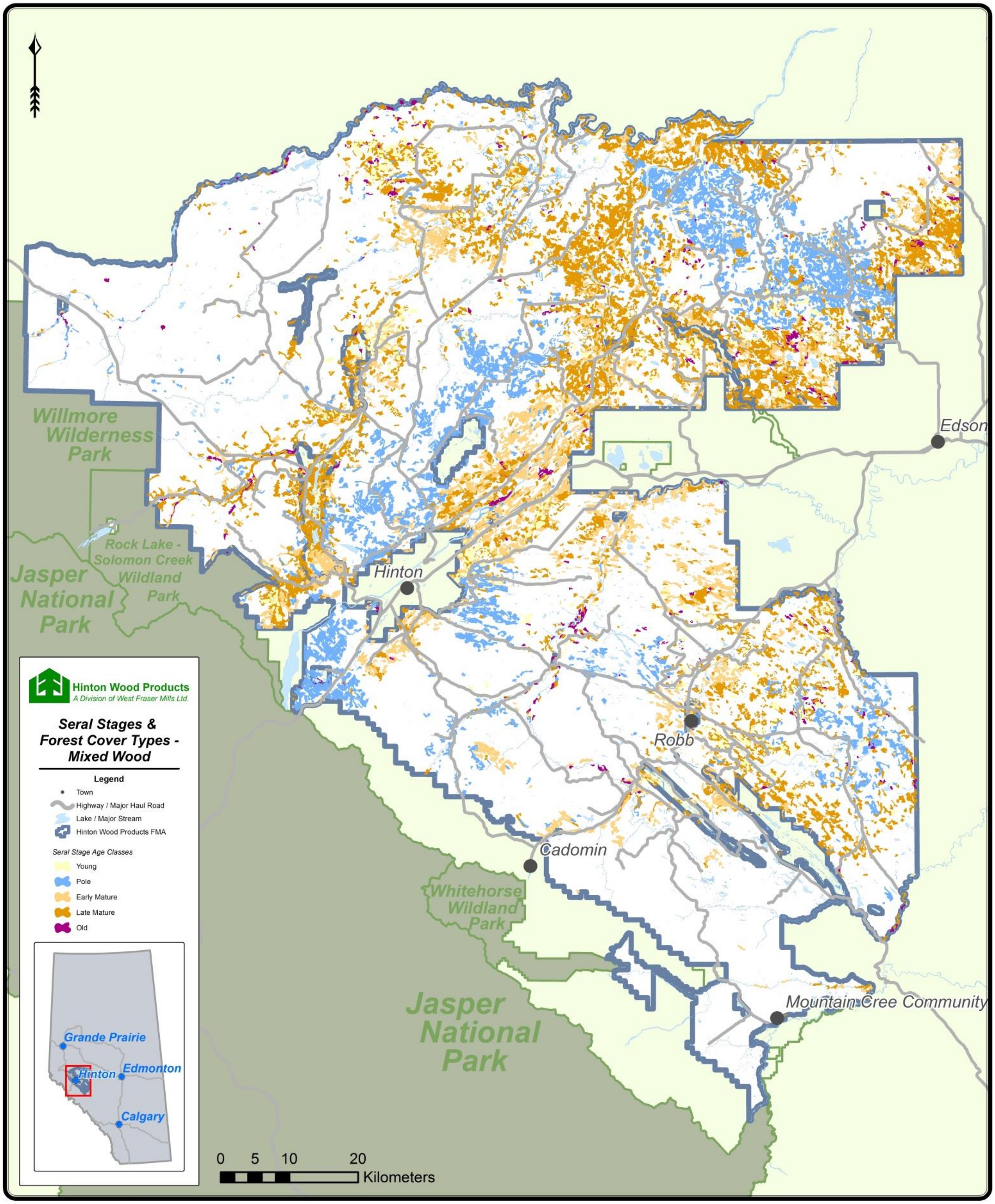


Figure 24 – Seral Stage Spatial Distribution for the Hinton FMA Area for Mixed Wood

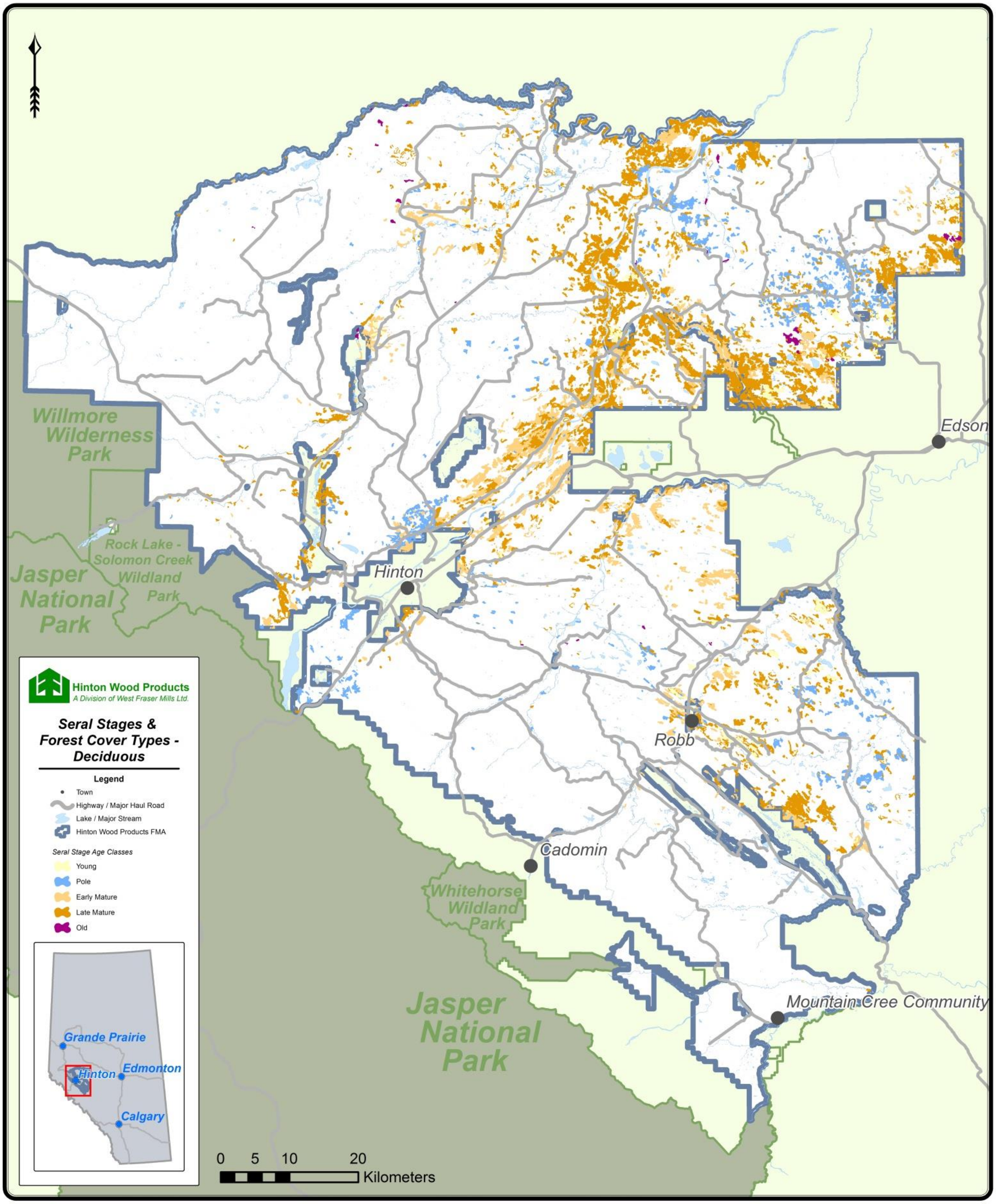


Figure 25 – Seral Stage Spatial Distribution for the Hinton FMA Area for Deciduous

4.3.5 Forest Patches

Forests constantly change in response to disturbances, which vary by type and size. The most common disturbance mechanism on the Hinton FMA area was wildfire, although over the last 50 years fire disturbance has mostly been replaced with harvesting (as fire suppression became much more effective).

Wildfire disturbances are typically made up of patches that range in size from very small patches that effect individual trees to very large patches that may kill many of the trees in very large areas. Patches are usually defined by their size, cover type (e.g. pine, spruce, etc.), age since disturbance, or a combination of these three attributes. In determining patch size, HWP removed all anthropogenic features from the landscape (e.g. roads, seismic lines, etc.). The methodology and the sizes of the patch sizes tracked and reported on were provided by Dr. David Andison, an expert in natural disturbance research, and the program lead of Foothills Research Institute's Healthy Landscapes Program. Table 18 describes the seven patch sizes that HWP is reporting on.

Table 18 – Patch Sizes for Reporting in HWP's 2014 DFMP

Patch Sizes		
• <100 hectares	• 100–500 hectares	• 500–1,000 hectares
• 1,000–2,000 hectares	• 2,000–5,000 hectares	• 5000–10,000 hectares
• 10,000-50,000 hectares	• >50,000 hectares	

Table 19 describes the current (2012) status of patch number and the area in each patch size for the Hinton FMA.

Table 19 – Patch Number and Total Patch Size Area for the Hinton FMA Area

Patch Size Class (ha)	Number of Patches	Area of Patch Size Class (ha)
<100	162,357	666,261
100–500	881	159,496
500–1,000	58	39,424
1,000–2,000	21	28,240
2,000–5,000	3	9,378
5000–10,000	1	7,918
10,000-50,000	1	12,267
50,000+	0	0
Total	163,322	922,983

Figure 26 on the following page shows the current (2012) location and distribution of all patches (regardless of cover type) on the Hinton FMA area.

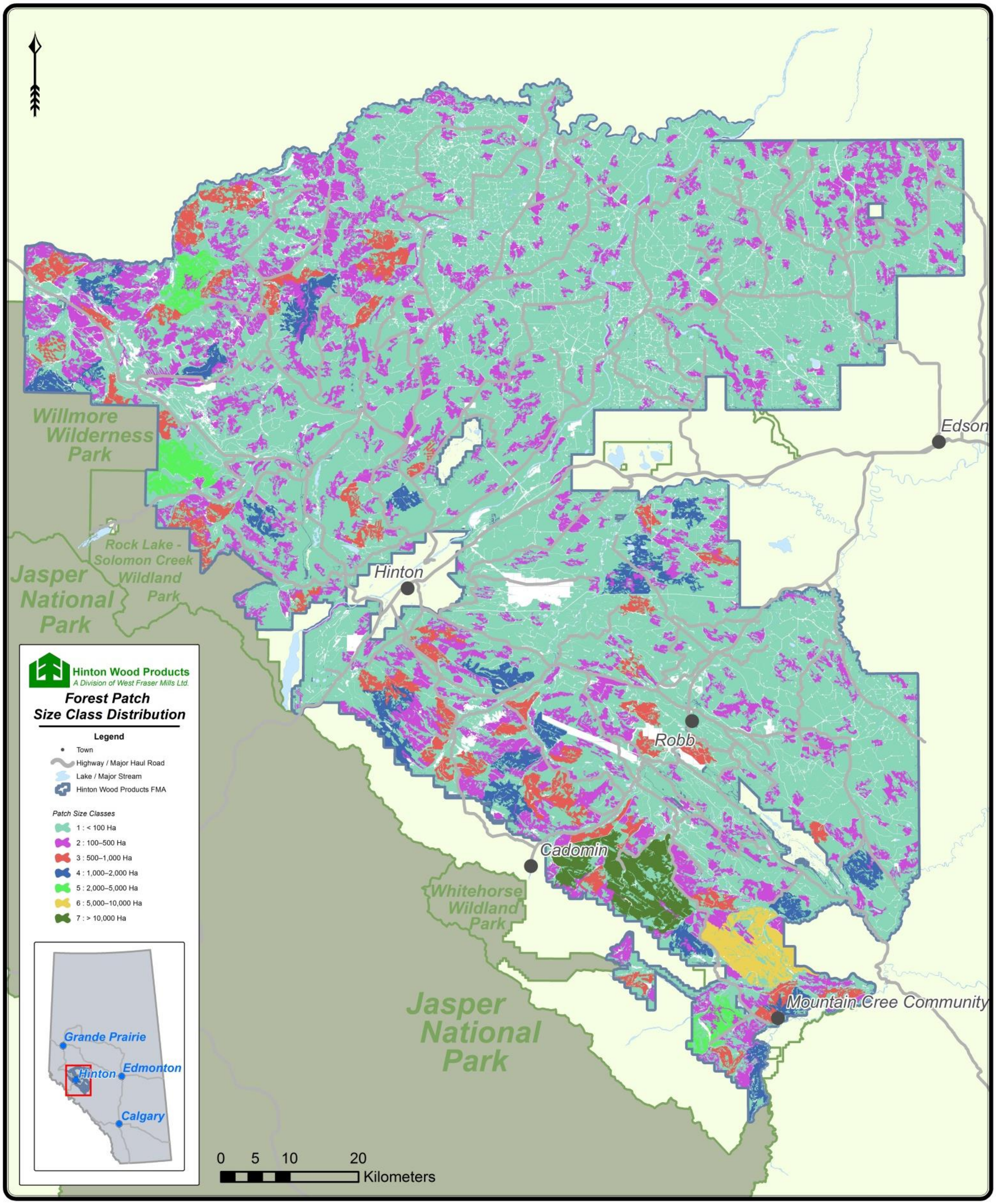


Figure 26 – Distribution of Patches on the Hinton FMA area

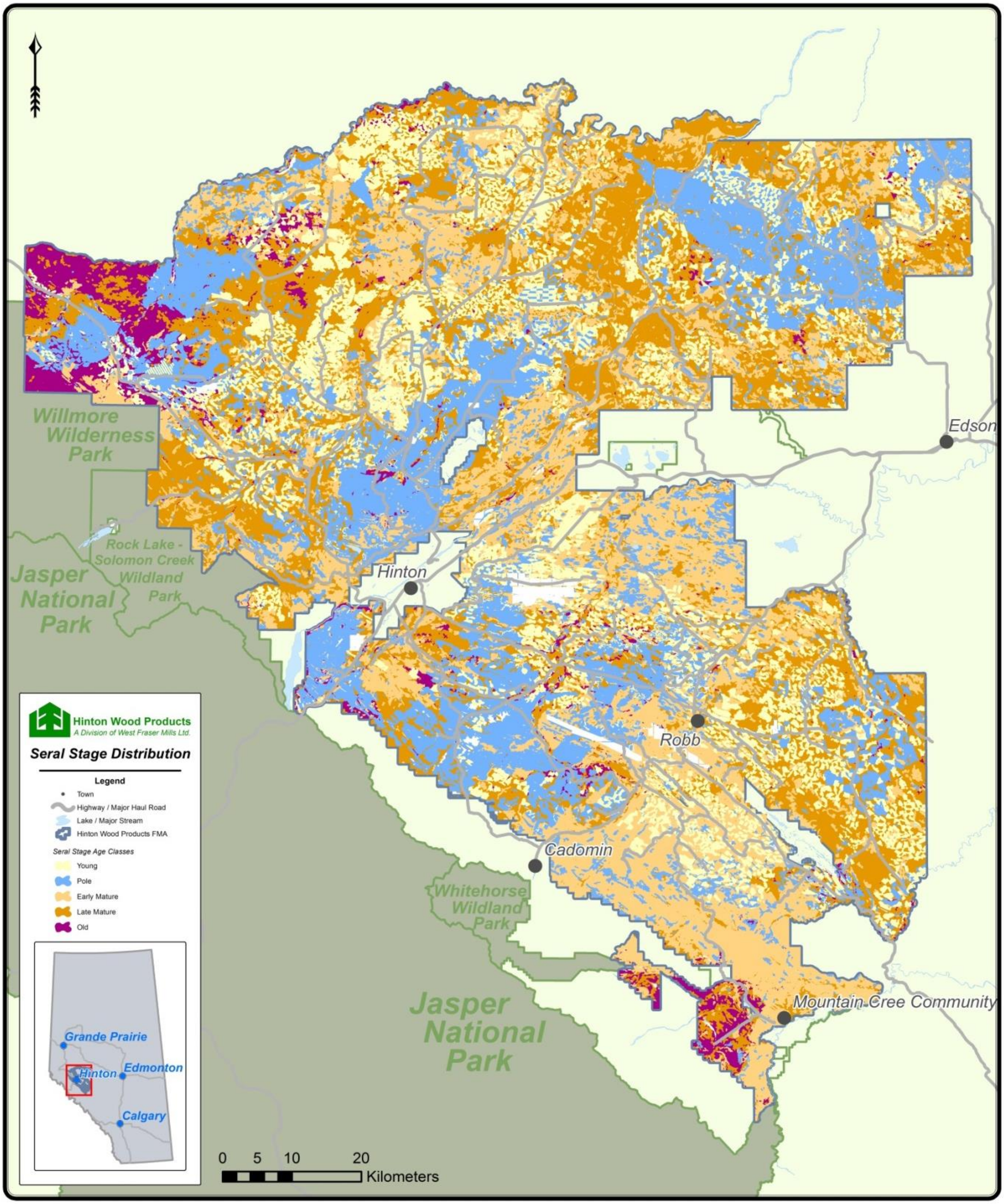
4.3.6 Forest Cover Types and Seral Stages

Table 20 shows the area of each seral stage broken down by cover type for the gross landbase on the Hinton FMA area. Figure 27 also describes the seral stage information for the gross FMA area. The first map in each of Figure 49, Figure 50, Figure 51, Figure 52, and Figure 53 in section 6.0 show each of the five cover types broken down by seral stage (i.e. old pine, young spruce, etc.).

Table 20 – Seral Stage and Cover Type for the Gross Hinton FMA Area

Cover Type	Seral Stage	Status*		
		Year 0 (2012)		
		ha.	% by cover type	% of FMA
Pine	Young	83,876	18.0%	8.2%
	Pole	85,907	18.4%	8.4%
	Early Mature	137,763	29.5%	13.5%
	Late Mature	138,796	29.7%	13.6%
	Old	20,753	4.4%	2.0%
	Total	467,095	100.0%	n/a
White Spruce	Young	17,776	13.8%	1.7%
	Pole	11,770	9.1%	1.2%
	Early Mature	22,060	17.1%	2.2%
	Late Mature	52,042	40.3%	5.1%
	Old	25,545	19.8%	2.5%
	Total	129,193	100.0%	n/a
Black Spruce	Young	739	0.6%	0.1%
	Pole	26,292	22.2%	2.6%
	Early Mature	18,371	15.5%	1.8%
	Late Mature	63,343	53.6%	6.2%
	Old	9,454	8.0%	0.9%
	Total	118,199	100.0%	n/a
Mixed Wood	Young	8,459	6.4%	0.8%
	Pole	33,421	25.1%	3.3%
	Early Mature	26,380	19.8%	2.6%
	Late Mature	61,055	45.9%	6.0%
	Old	3,682	2.8%	0.4%
	Total	132,997	100.0%	n/a
Deciduous	Young	2,481	4.4%	0.2%
	Pole	7,023	12.5%	0.7%
	Early Mature	13,749	24.4%	1.3%
	Late Mature	32,590	57.9%	3.2%
	Old	460	0.8%	0.0%
	Total	56,303	100.0%	n/a
Non-forest (vegetated)		105,294	n/a	10.3%
Non-forest (not vegetated)		13,384	n/a	1.3%
	Grand Total	1,022,465	n/a	100.0%

Figure 27 – Seral Stage and Cover Type for the Hinton FMA Area



4.4 Forest Landscape Disturbance and Succession

4.4.1 Inherent Disturbance Regime

The natural disturbance regime in the Hinton FMA and surrounding landscape consists of wildfire and natural pests, with wildfire being the dominant natural factor shaping the composition and distribution of species (Rowe et al. 1973). Wildfire disturbance is the primary process introducing variability in the forest mosaic (Andison 1999).

The dominant landscape disturbances on the Hinton FMA are now through anthropogenic, or man-caused, events such as the harvesting associated with the forest industry, well-sites, pipelines, and roads associated with the energy sector, as well as the large footprint associated with open pit coal mining. In addition, regulation and policy to limit the impact of natural disturbances (for example: wildfire control, wildfire prevention and insect suppression programs) have contributed to a landscape shaped primarily by man's activities.

4.4.2 Insects and Diseases

Insect surveys conducted by the GoA indicate that the most prevalent insect pests in the Upper Athabasca Region (and in the Hinton FMA) are:

A. Mountain pine beetle (*Dendroctonus ponderosae*);
B. Hardwood defoliators:
  - Large aspen tortrix (*Choristoneura conflicta*);
  - Bruce spanworm (*Operophtera bruceata*);
  - Tent caterpillar (*Malacosoma disstria*);
C. Spruce budworm (*Choristoneura fumiferana*).

The following sections provide information on each of these pests, as well as other forest health issues found in and around the Hinton FMA area:

A. Mountain pine beetle

The mountain pine beetle (MPB) is the most destructive pest of mature pine forests in North America. Mature and over-mature pine under some sort of stress are the preferred host, but as populations increase, smaller-sized and healthy trees can all be attacked. Outbreaks continue as long as a food source is available and the climate is favourable (i.e. warm winters). The beetle kills trees by clogging and destroying the conductive tissue of the tree. Its larvae feed in the phloem of the tree, disrupting the flow of water and nutrients. In addition, the larvae introduce a blue-stain fungus which prevents the tree from using its pitch to repel attacking beetles.

The first relatively large (about 11,000 trees) outbreak of MPB near the FMA area was discovered in the Wilmore Wilderness Area in 2005. The Wilmore Wilderness Area is adjacent to the northwest corner of the FMA area. At that time, the GoA mobilized over 100 personnel onto this outbreak – all located green-attacked MPB trees were cut and burned. Pheromones were also located adjacent to infested areas in order to capture those beetles missed in the falling and burning efforts

MPB was not detected on the Hinton FMA area until 2006 (nor were there any known historic MPB outbreaks on the FMA). The 2006 MPB primarily originated from British Columbia – the result of high winds blowing the beetles in from BC in a southeasterly direction from Grand Prairie down through to Whitecourt and Drayton Valley.

In 2006, HWP (80 sites) and the GoA (5 sites) placed 85 pheromone bait sites on and near the FMA area in a grid pattern (one site per Township) to detect new MPB attacks. Trees at 12 HWP and three GoA pheromone bait sites on or near the FMA were attacked by low numbers of MPB in the summer of 2006 (Table 21). Also in 2006, HWP placed 11 Lindgren funnel traps in the mill's logyard to capture MPB emerging from logs or through local flights. In 2006, HWP captured no MPB in its funnel traps (Table 21).

In 2007 and 2008, MPB detection on the FMA through GoA flights, FMA wide pheromone trap sites, and logyard funnel traps, remained low – cold snaps in 2007 and 2008 were thought to be the cause of low beetle reproductive success; that, and the fact that there had been no subsequent beetle in-flights from BC.

That all changed in the summer of 2009, when Alberta and the Hinton FMA saw another more extensive in-flight of MPB, again being brought in from BC on high winds. This resulted in extensive MPB activity at HWP's pheromone bait sites and a substantial amount of natural green-attack along the north boundary of the FMA. Of 92 bait sites, 74 were hit, with an estimated number of individual beetle hits of 8760; the highest to date (Table 21). In the fall of 2009, the GoA conducted aerial surveys to identify 5,219 faders from the 2009 attack, mostly in the Marlboro Working Circle concentrated near the north boundary of the FMA in compartments Marlboro 2, 4, and 21. This led to a GoA winter program that controlled all (3,063 trees) of the faders that had been mass-attacked.

In 2010, there was no large in-flight of beetles from BC. HWP also reduced the number of pheromone bait sites to 63 because some sites were now in areas within known local MPB populations. Of these 63 bait sites, 34 sites had MPB hits. Overall, MPB activity at bait sites was considerably lower in 2010 compared to the same sites in 2009 (Table 21). Also in 2010, HWP changed the logyard program to a mass trapping system with 72 sites; each with three Lindgren funnel traps. A total of 1,539 MPB were captured in the funnel traps; the largest number to date.

The GoA also conducted aerial surveys in fall 2010 to identify clusters of 3 or more red trees (attacked by MPB in 2009). A total of 5,608 clusters representing approximately 26,350 red-attack trees were identified in the north and east portions of the FMA. The GoA also sampled to determine green-to-red ratios, which were quite low, averaging about one green attack tree for every 5 red-attack trees. Applying the ratios to the red-attack clusters yielded an estimate of approximately 5,200 green-attacked trees on the FMA. Of these, the GoA controlled approximately 3,200 high priority green attack trees in winter 2010-2011. In addition, HWP harvested cut blocks containing about 75 green-attacked trees. The GoA predicted that most of the green attack trees not identified as high priority would not survive into 2011.

In the spring of 2011, HWP again revised the number of pheromone bait sites to 68 to reflect the change in known MPB dispersal across the FMA. Of these 68 sites, 21 sites had MPB hits. Overall, MPB activity at bait sites was considerably lower compared to previous years (see Table 21). In 2011, the logyard program had 65 sites with 3 Lindgren funnel traps at each site. A total of 978 MPB were captured in the funnel traps, which was down from the previous year. There were no large in-flights from BC. During the winter 2011-2012, the GoA controlled (through cutting and burning) another 3000 trees (approximately).

In 2012, there was an increase in MPB activities; mainly the result of a milder winter, resulting in high beetle survival. Of the 69 pheromone bait sites HWP set up, 51 of them were attacked. The funnel traps in the logyard caught 2206 beetles, the highest number to date. During the winter of 2012-2013, the GoA surveyed 952 beetle sites (sites where there we more than 3 red-attacked trees) and controlled a total of 3,860 green-attacked trees in the Foothills Region.

Table 21 – Summary of MPB pheromone bait hits and trap captures on Hinton FMA area from 2006-2012

Year	Sites	Sites hit by MPB	Stations	Stations hit by MPB	Total MPB hits	Logyard funnel traps	Logyard MPB captures
2006	85	12	255	15	91	11	0
2007	92	19	276	28	143	13	14
2008	93	6	279	8	48	24	1
2009	92	74	276	147	8,760	24	13
2010	63	34	189	57	2,145	216	1,539
2011	68	21	204	31	981	195	978
2012	69	51	207	110	4368	195	2206

The collection of provincial MPB aerial survey and green-to-red attack ratio data will continue to be led by the GoA – all data is entered into a provincial decision support system (DSS) to generate a control priority for each site. Not all collected points are controlled – the decision is made based on the number of trees attacked, the stand structure, and the surrounding forest. Data and priority for Level 2 control (harvesting) is sent to forest companies in the fall for planning of harvest.

Table 22 describes the number of red-attacked sites (3 or more red trees) found in aerial surveys conducted by the GoA in the winters of 2009/2010 to 2012/2013 for the Hinton FMA area, and the green-to-red attack (G:R) ratios for the same timeframes. G:R ratios of less than one indicate a decreasing MPG populations, while G:R rations over one indicate an increasing MPB population.

Table 22 – Number of Red-Attack Sites and Green-to-Rations for the Hinton FMA Area

Geographic area on the Hinton FMA	# of red-attack sites				green-to-red ratios*			
	2009-10	2010-11	2011-12	2012-13	2009-10	2010-11	2011-12	2012-13
E1	148	81	41	115	0.10	0.25	1.09	0.29
E3	1896	663	252	316	0.34	0.56	1.29	0.79
E4	10	14	11	41	-	0.29	0.63	0.31
E6	560	77	13	52	0.04	0.17	0.42	0.63
E7	827	165	34	30	0.16	0.16	0.17	0.17
Totals	5451	3011	2363	2567				

*G:R ratios <1 indicates a decreasing MPB population, while G:R ratios >1 means an increasing MPB population.

Figure 28 on the following page highlights the spread of MPB across Alberta since 2005. The figure shows red-attacked trees as identified in the GoA's annual aerial survey. The Foothills area remains a high priority for control work because it contains a large volume of pine and there is potential for infestations to spread.

B. Hardwood Defoliators

Table 23 summarizes the total area of hardwood defoliation as surveyed by the GoA between 1998 and 2011 (inclusive) in the Upper Athabasca Region. The hardwood defoliator agent causing the most damage in this Region (and the Hinton FMA) is large aspen tortrix, which accounts for 65% of the total area impacted by hardwood defoliators. The majority of the historical infestations are of moderate severity. Of the three main defoliator agents, typically only one of the species is the dominant defoliator at a given time.

Gypsy moth has been detected, but has not become established in the province. Satin Moth is currently an urban pest in Edmonton and Calgary. There are other species like the Aspen Two Leaf Tier and the Black Army Cutworm that are either currently causing a lot of defoliation or have been a problem in the past in the Hinton FMA.

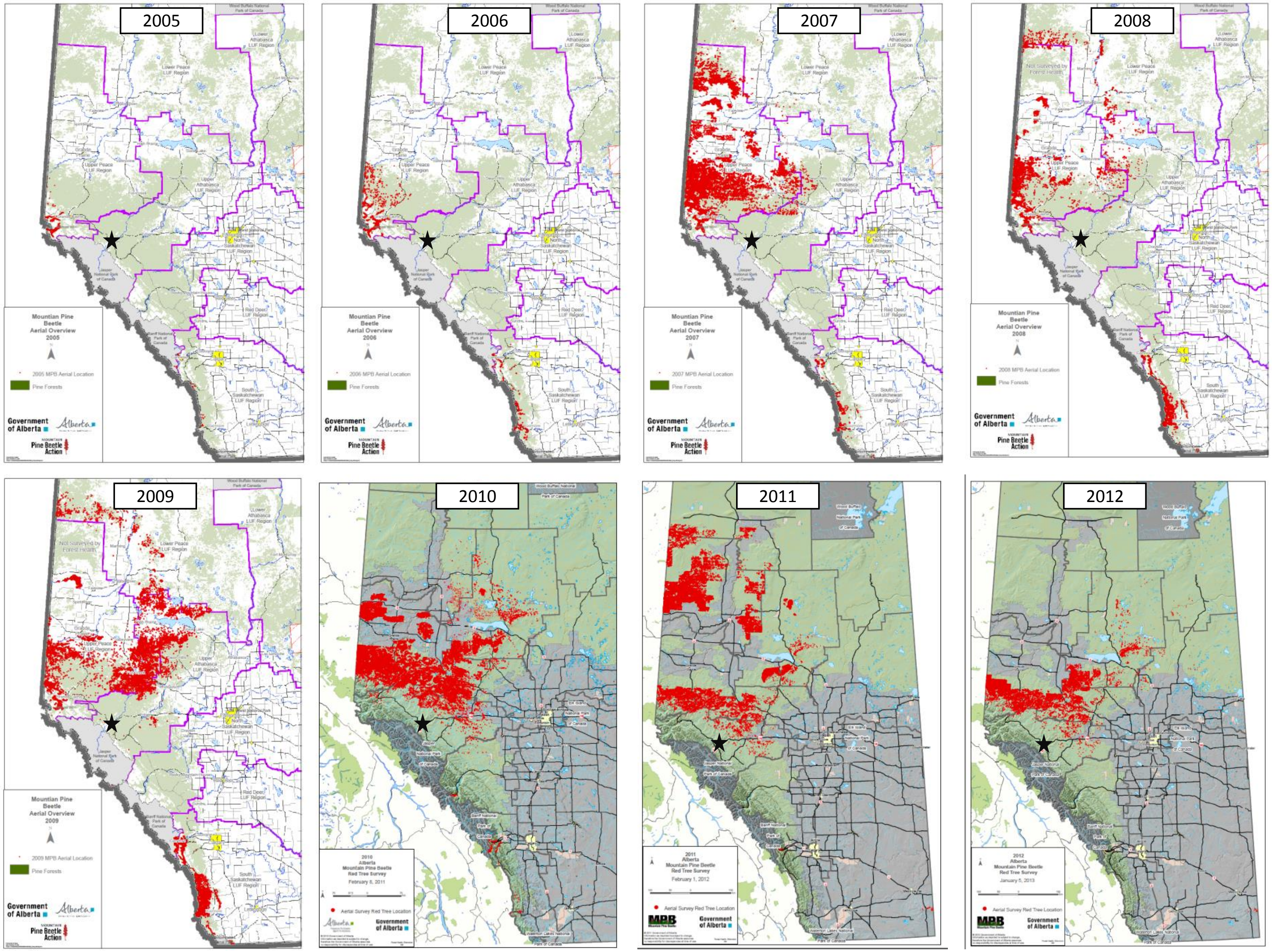
Table 23 – Summary of Hardwood Defoliation Agents in the Upper Athabasca Region

Insect Pest – Defoliators		Severity of Impact						Total	
Common Name	Latin Name	Light		Moderate		Severe			
		Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Large aspen tortrix	Choristoneura conflictana	379,237	16	979,237	40	235,571	10	1,594,626	65
Bruce spanworm	Operophtera bruceata	301,744	12	267,229	11	45,779	2	614,752	25
Aspen leaf-roller	Epinotia soandriana			186,630	8			186,630	8
Forest tent caterpillar	Malacosoma disstria	1,586	0	16,021	1	11,953	0	29,561	1
Aspen defoliators	n/a	16,334	1					16,344	1
Other	n/a			60	0	129	0	189	0
*Totals**		669,482	29	1,449,177	59	293,433	12	2,442,091	100

- Sum of infestation survey records 1999 to 2011 inclusive

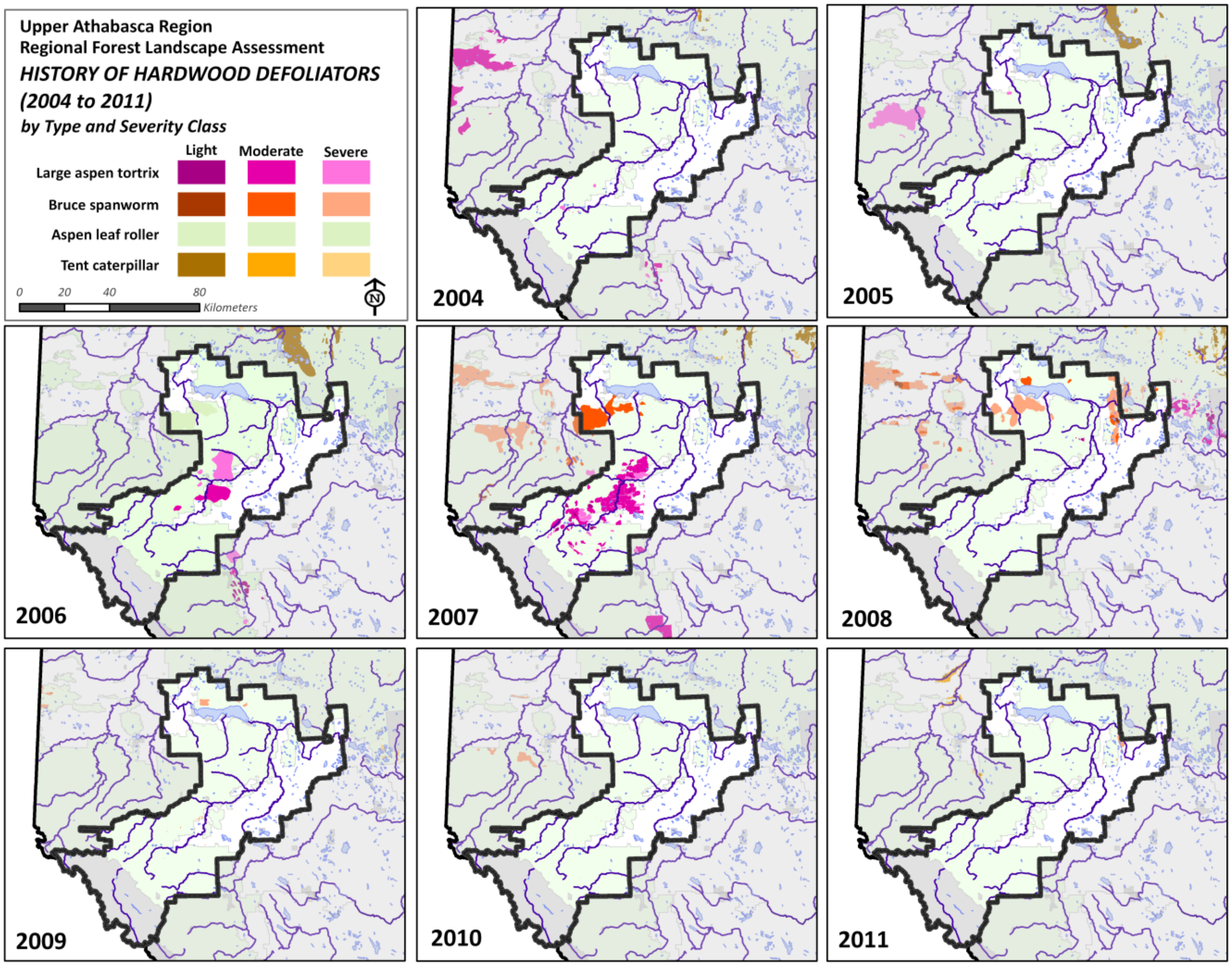
Figure 29 provides an overview of the history of the presence of hardwood defoliator outbreaks impacting forests in the Upper Athabasca Region. As these defoliators tend to occur in cycles, only the last 8 years of infestation are mapped.

Figure 28 – A series of maps showing red-attacked pine trees; based on GoA aerial surveys from 2005 to 2012



NOTE: (Hinton is indicated by a black star)

Figure 29 – History of Hardwood Defoliation Outbreaks (2004-2011)



A detail summary of the most important of these insect species (large aspen tortrix, Bruce spanworm and tent caterpillar) is presented in following sections.

Large Aspen Tortrix

The large aspen tortrix occurs across Canada and is one of the most serious pests of trembling aspen. Aspen is the preferred host, but the tortrix will also feed on willow, balsam poplar and white birch. Outbreaks 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.

Frequently, infestations of large aspen tortrix in the Upper Athabasca can account for over half of the overall provincial infestation.

Bruce Spanworm

Bruce spanworm also occurs widely across Canada. Aspen is the principle host, but the spanworm will also feed on willow, balsam poplar, white birch and shrubs such as Saskatoon, currants and wild rose. Historically, outbreaks have not lasted more than two years and typically decline very quickly. Hence there seems to be little value in adopting control measures for this pest.

Infestations of Bruce spanworm are sporadic in nature. The most recent infestation occurred over 2007 and 2008 but quickly collapsed. While the overall provincial incidence of Bruce spanworm is relatively low, it's prevalence in the Upper Athabasca Region is important. Even in periods of low infestation, the proportion of infected forests located in the Upper Athabasca Region is typically greater than 50%.

Tent Caterpillar

The tent caterpillar occurs across Canada and is considered the most serious defoliator of hardwoods. While aspen is the preferred host, the tent caterpillar will attack almost any hardwood species during outbreaks. Outbreaks generally last 2-4 years and may reoccur every 8-10 years. Infestation cause branch dieback and reduce growth increment. Several years of severe defoliation may cause mortality, particularly where trees may have additional stress factors.

There has been no significant tent caterpillar outbreak since the last major infestation which ran from 2005 to 2008. Incidence of tent caterpillar outbreaks in the Upper Athabasca Region would be considered low, relative to the impact of other hardwood defoliators.

Given the potential greater damage to forest growth caused by tent caterpillar, there have been trials to assess bacterial control mechanisms. No such mechanism has been implemented in an operational setting.

C. Spruce Budworm

The spruce budworm is the most important defoliator pest of spruce-fir forests in North America. In Alberta, white spruce is the preferred host, but black spruce, tamarack and balsam fir can also be attacked. While attacks are more visible in pure host stands, mixedwood stands are also prone to attack once an infestation is underway. Re-occurrence and length of infestations vary widely. Damage to trees is considerable, as the budworms attack new needle growth as well as buds. After 4-5 years of defoliation, dead tops can appear on trees. Additional years of infestation may result in mortality.

The budworm is not a serious pest in this Region or on the Hinton FMA. The budworm only appears in significant numbers in the north east area of the Upper Athabasca Region, usually as an extension of infestations occurring farther to the north. There have been small but isolated incidents of budworm attacks on the Hinton FMA area. The most recent infestation noted was in 2010-2011.

D. Other Forest Health Agents

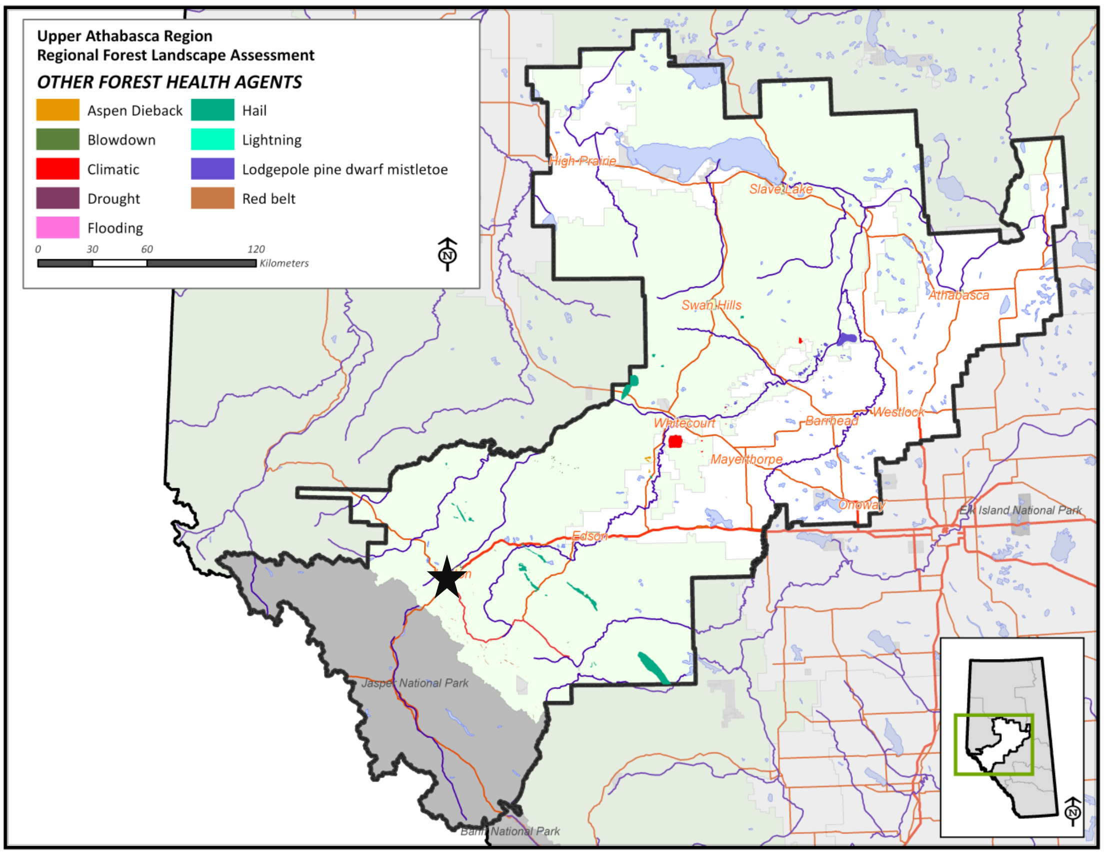
Surveys of the Upper Athabasca Region in 2010 and 2011 indicate that there are other forest health agents present which impacted forest growth. Table 24 summaries the other agents that were found in the Upper Athabasca Region and their level of severity – the surveys for these agents were done independently of each other. Because these agents are sometimes unrelated to each other, the percentage calculated reflects the percentage area of each agent across the levels of severity. Locations of the surveyed agents are shown in Figure 30.

As can be seen in Figure 30, only hail and blowdown have occurred on the Hinton FMA area in any significant amounts. Aspen dieback occurs, but there has been no significant mortality.

From 1997 to 2012 there was 2,819.7 hectares of blowdown and 7,629.4 hectares of hail damage on the Hinton FMA. The blowdown and hail damage areas reported here are approximate and include the entire extent of known events. Within the events there were portion that were not stand-replacing. The total areas associated with these events may be revised after more detailed analysis is completed and as we become aware of other disturbed areas.

Table 24 – Other Forest Health Agents (Upper Athabasca Region)

Other Health Agents	Severity of Impact						Total	
Common Name	Light		Moderate		Severe			
	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Aspen dieback	465	77	139	23			604	100
Blowdown	125	22	423	75	13	2	562	100
Climatic factors	5,683	99	77	1			5,760	100
Drought	446	100					446	100
Flooding	37	100					37	100
Hail	3,525	14	20,298	82	986	4	24,808	100
Lightening					3	100	3	100
Dwarf mistletoe	7,544	100					7,544	100
Red belt	126	15	624	76	72	9	822	100
Totals	17,949	44	21,562	53	1,075	3	40,586	100



NOTE: Hinton is indicated by the black star. Hail and blowdown are the main "other" forest health agents of any significance on the Hinton FMA area.)

Figure 30 – Other Forest Health Agents

4.4.3 Invasive Plant Species

An invasive species has been defined as "a species, subspecies or lower taxon, introduced outside its natural past or present distribution ... whose introduction and/or spread threaten biological diversity" (United Nations Environment Program 1992). Invasive plant species are monitored by the GoA. Alberta classifies invasive plants into two categories (Alberta 2008a):

1. Prohibited Noxious – A prohibited noxious plant is a plant (including seeds) that must be destroyed by the landowner or person who occupies the land. Destroy means to kill all growing parts or to render reproductive mechanisms non-viable.

2. Noxious – A noxious plant is a plant (including seeds) that must be controlled by the landowner or person who occupies the land. Control means that the action may destroy the plant, but at best, must inhibit its growth or spread.

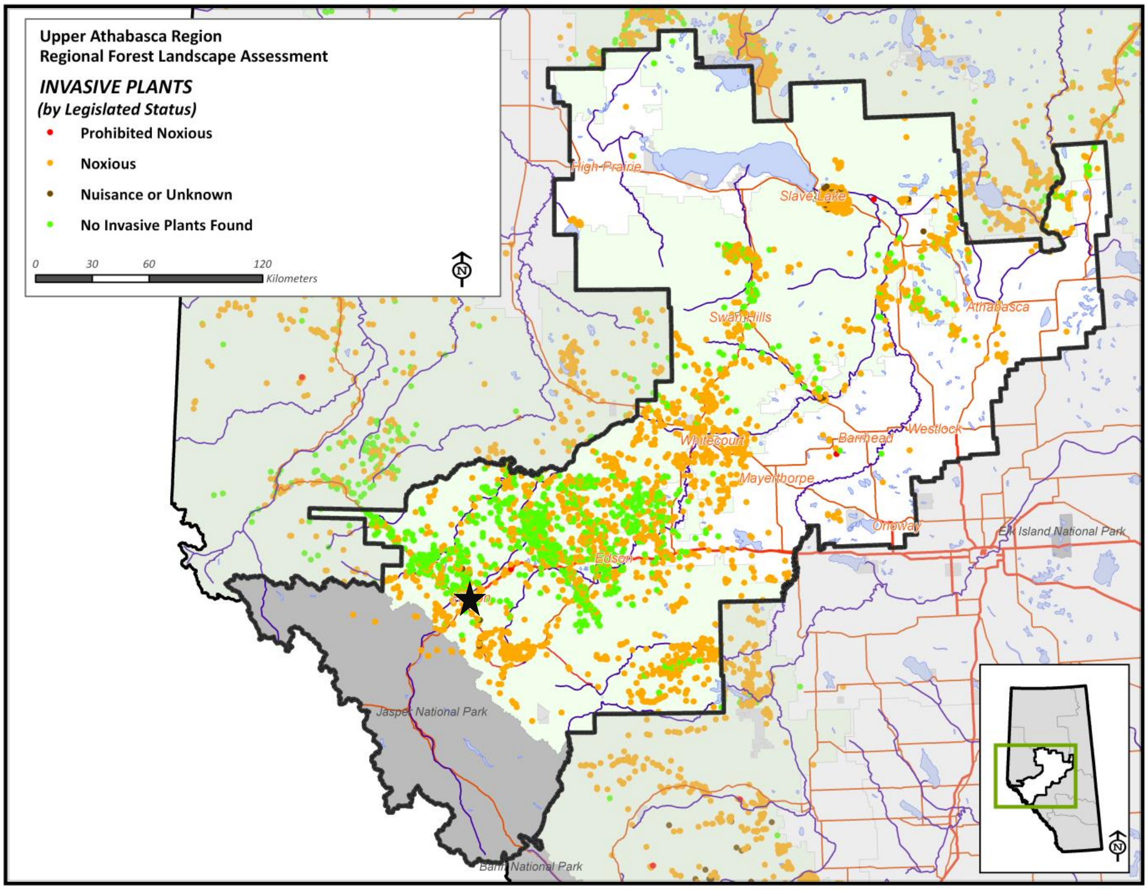
Additionally, plants can be identified as "Nuisance". These have no legislative controls but are identified as potential problem species. The Weed Control Regulations of 2010 also allow municipalities to declare additional plant species as prohibited or noxious and impose the current regulations on those species. Any areas that receive reclamation activities are potential problem sites for invasive species as commercial seed mixes can contain seeds from noxious plants. There are 5,688 sites of observed invasive species in the Upper Athabasca region. At each site, it is possible that multiple invasive species are present. Sample sites are visited by municipal and provincial inspectors on a regular basis. Table 25 shows the invasive plants status for the Region, by class (prohibited, noxious, nuisance).

No problem weeds were observed on 25% of the sites visited. Fortunately, the occurrences of prohibited noxious plants are very low; the 10 occurrences account for less than one half of one percent of all observations. Incidences of noxious plants are the highest category at 74% of all observed invasive plants, with the most common problem species being Canada thistle and oxeye daisy.

Table 25 – Status of Invasive Plants for the Upper Athabasca Region

Classification	Plant Name	Incidence of Observed Weeds	Percentage of all Observations (%)
No Weeds Found	None	1,653	25
	Subtotal	1,653	25
Prohibited Noxious Weeds	Hawkweed	3	0
	Meadow hawkweed	2	0
	Nodding thistle	2	0
	Orange hawkweed	1	0
	Purple loosestrife	1	0
	Spotted knapweed	1	0
	Subtotal	10	0
Noxious	Annual sow thistle	4	0
	Blueweed	1	0
	Canada thistle	1,326	20
	Common tansy	286	4
	Common toadflax	8	0
	Leafy spurge	2	0
	Oxeye daisy	906	13
	Perennial sow thistle	829	12
	Scentless chamomile	726	11
	Sow thistle	5	0
	Tall buttercup	825	12
	Toadflax	26	0
	White cockle	11	0
	Yellow hawkweed	1	0
	Yellow toadflax	1	0
	Subtotal	4,957	74
Nuisance/Unknown Status	Bladder Campion	1	0
	Bull thistle	2	0
	Cleavers	5	0
	Dog mustard	9	0
	False cleavers	25	0
	Foxtail barley	1	0
	Stock's bill	18	0
	Tall hawkweed	2	0
	Tall larkspur	1	0
	Wild caraway	34	1
	Subtotal	98	1
	Totals	6,718	100

Figure 31 shows the distribution of invasive plants in the Upper Athabasca Region. The majority of occurrences are in the Green Area, likely as a result of tighter controls on seed spread in the agricultural areas of the White Area. The most common invasive plants found in the Upper Athabasca Region are also the most common found on the Hinton FMA area.



NOTE: Hinton is indicated by the black star.

Figure 31 – Invasive Plant Distribution in the Upper Athabasca Region

4.4.4 Forest Succession

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 can 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) and 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. Wherever 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).

4.4.5 Wildfire History

Disturbances by wildfire have been tracked and recorded by the GoA since the responsibility of natural resource management was moved from the federal government to Alberta in the 1930s. The wildfire records summarized in the following tables and figures represent all wildfires, regardless of their origin (lightning or man-caused) in the Upper Athabasca Region.

Summary statistics of the Region's wildfire history are reported in Table 26. The areas reported in Table 26 include only burned area and do not include residual islands that may not have burned during a wildfire event. The reporting period is by decade with the labelled wildfire date representing the start of the decadal period (i.e.: period '1930' represents 1930-1939 inclusive). The number of wildfires by decade is highly variable, as are the total area burned, average wildfire size and size of largest wildfire (Table 26, Figure 32). However, the median wildfire size is on a clear trend downwards (Figure 33). This is likely the result of substantial efforts in the areas of proactive wildfire prevention activities, faster wildfire response and improved wildfire control practices. These factors are also reflected in the drop in percent of the Region burned each decade (Table 26).

Table 26 – Wildfire Statistics by Decade for the Upper Athabasca Region

Fire Period	Number of Wildfires	Total Wildfire Area (ha)	Wildfire Area in Upper Athabasca (ha)	Average Wildfire Size (ha)	Median Wildfire Size (ha)	Size of Maximum Wildfire (ha)	Area Burned as a percentage of the Region (%)*
1930	3	21,633	2,245	7,211	893	20,011	0
1940	232	709,475	568,570	2,087	493	133,681	8
1950	132	287,461	269,616	971	100	48,281	4
1960	70	373,161	339,738	1,117	31	151,422	5
1970	20	61,932	60,203	439	26	22,332	1
1980	54	96,570	63,401	773	37	36,989	1
1990	51	293,722	197,107	639	21	147,439	3
2000	226	165,765	164,051	334	5	83,322	2
2010**	95	35,543	35,535	57	7	12,505	0

* Note that the area used for percent calculation is only the Region's Green and White Areas
** The 2010 decade only includes two years of data

Figure 32 shows the wildfire size by decade, while Figure 33 shows the average and median fire size by decade.

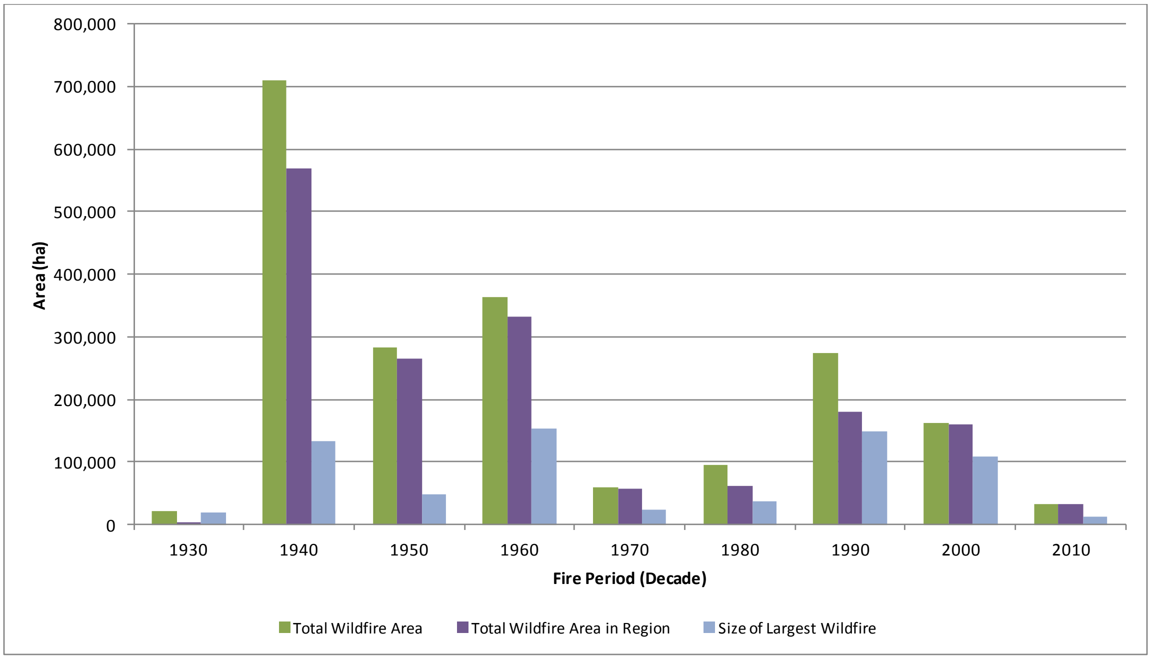


Figure 32 – Wildfire Size Statistics by Decade for the Upper Athabasca Region

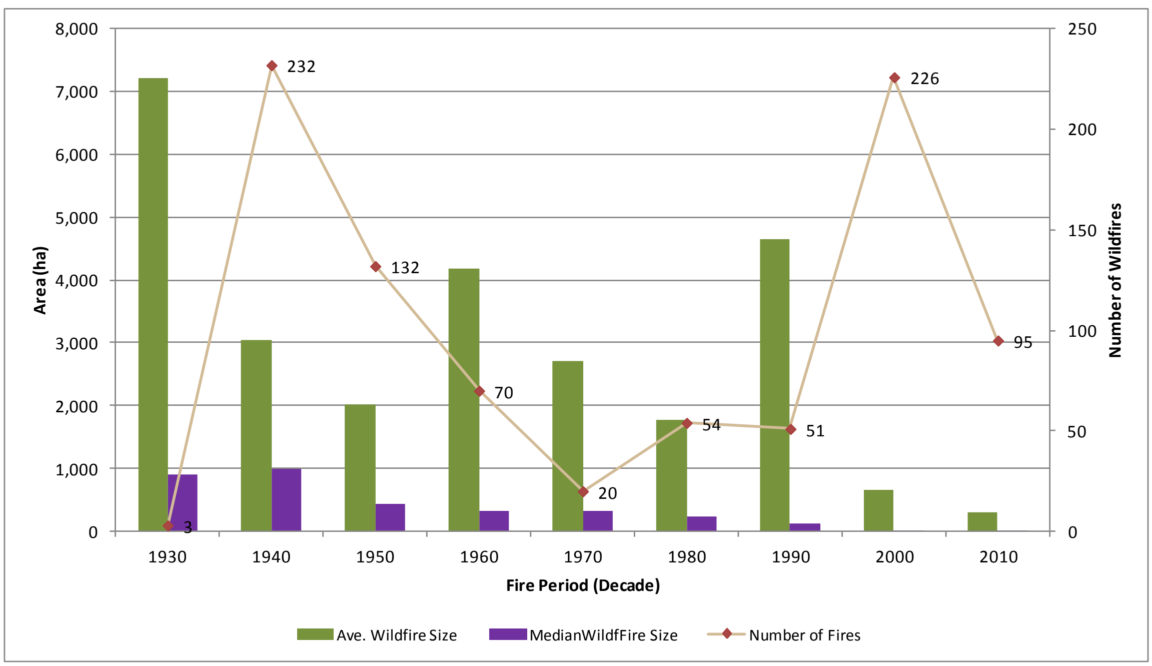


Figure 33 – Average and Median Fire Size by Decade for the Upper Athabasca Region

Figure 34 on the following page shows the location of large wildfire in the Upper Athabasca Region. As can be seen clearly in Figure 34, most large wildfires have occurred to the east of the Hinton

FMA. Since the Hinton FMA was signed in the 1955, there have only been four fires larger than 1,000 hectares on the FMA. These fires are described in Table 27.

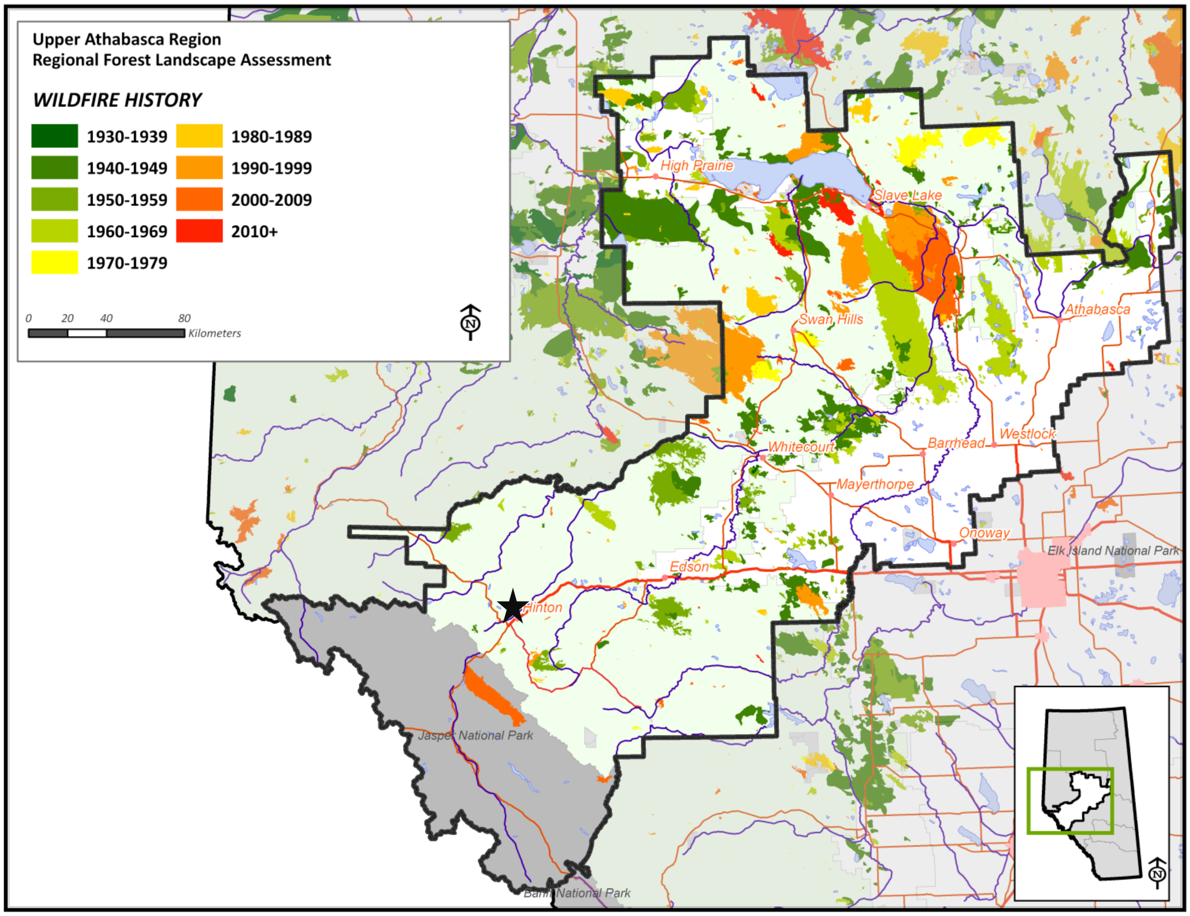


Figure 34 – Wildfire Distribution by Decade in the Upper Athabasca Region

Table 27 – Large Wildfires on the Hinton FMA Area (1950-2012)

Fire Name	Year of Fire	Size (ha)	General Location of Fire
Gregg Fire	1956	9,325	Gregg River, McLeod 4
Smith Creek	1956	3,424	Pine Creek, Berland 20 and 21
Pine Creek	1956	6,060	Pine Creek, Marlboro 24 and 25
Fire 37 (Christmas fire)	1997	2,900	Gregg River, McLeod 2
Total		21,709	

4.4.6 Timber Harvesting

Timber harvesting has been a component of anthropogenic disturbances in the Hinton area since the beginning of the province. From the time of the transfer of resource management from the federal government to the provincial government in 1930 (Alberta 1930) until approximately the mid-1950's, forest harvesting was generally for local or regional use (e.g. railway ties, mining uses, housing, etc.). Larger scale commercial harvesting began in 1955 with the establishment of the first Forest Management Agreement with (the former) Northwest Pulp and Power company – this Forest Management Agreement is now owned by West Fraser and the area associated with this FMA is commonly referred to as the Hinton or Hinton Wood Products' FMA area. A summary of the timber harvest area and number of harvest areas by decade for the Hinton FMA area is displayed in Table 28.

Table 28 – Harvesting on the Hinton FMA Area from 1950 to 2012

Decade of Harvest	Total Harvested Area		Number of Harvest Areas		Average Area/Year
	(ha)	%	(ha)	%	(ha)
1950-1959	7,869.9	3.0%	526	3.9%	1,967.5
1960-1969	33,621.6	13.0%	2,825	21.1%	3,362.2
1970-1979	39,184.2	15.1%	2,094	15.7%	3,918.4
1980-1989	26,706.2	10.3%	1,307	9.8%	2,670.6
1990-1999	54,145.7	20.9%	2,518	18.8%	5,414.6
2000-2009	59,925.1	23.2%	2,634	19.7%	5,992.5
2010-2012	12,531.7	4.8%	521	3.9%	4,177.2
Unclassified	24,657.3	9.5%	952	7.1%	n/a
Total	258,641.7	100.0%	13,377	100.0%	4,618.6

4.4.7 Access

There is a well-developed network of roads within and adjacent to the Hinton FMA area. Cultural expansion (e.g. towns, villages), resource exploration, and resource extraction (e.g.: forestry, oil and gas, coal) have been the main drivers of road development. Figure 35, on the following page, shows the major transportation routes in and adjacent to the Hinton FMA area. In this map, note that only paved and all-season major gravel roads are displayed. The main transportation corridors are:

- Highway 16 – The Yellowhead Highway (Highway 16) runs east-west through the middle of the FMA area. The Yellowhead Highway is part of the Trans-Canada Highway system and is a major corridor for truck transport of goods.
- Highway 40 – Also known as the Forestry Trunk Road, this highway runs north-south near the western edge of the FMA area. Portions of this highway are paved, while other portions are gravel.
- Highway 47 – This highway runs between the Hamlet of Robb and the Town of Edson; it is paved.
- Willow Road (W) – The “W” road is the main graveled haul road that is used to transport logs from the central portion of the northern half of the FMA to the mills in Hinton.
- Emerson Creek Road (A) – The “A” road is the main graveled road that is used to transport logs from the eastern portion of the northern half of the FMA to the mills in Hinton.
- Polecat Road (P) – The “P” road is the main graveled road that is used to transport logs from the western portion of the northern half of the FMA to the mills in Hinton.
- Robb Road (R) – The “R” road is the main graveled road that is used to transport logs from the eastern and central portion of the southern half of the FMA to the mills in Hinton.
- Pembina River Road (PR) – The “PR” road is the main graveled road that is used to transport logs from the western portion of the southern half of the FMA to the mills in Hinton.

Table 29 summarizes the length of road by road type within the Hinton FMA area. This table includes roads that are both HWP-owned and non HWP-owned roads.

Table 29 – Length of Road by Classification

Road Type	Length of Roads (km)		Total (km)	Comments
	HWP-owned	Non HWP-owned		
Major Highway		35.6	35.6	Highway 16
Secondary Paved or Unpaved Highways		118.5	118.5	Highway 40 & 47, Brule Rd., Jarvis Lake Rd.
Open All-Weather Gravel Roads	2280.6	2569.9	4850.5	
Open Temporary Gravel Roads	232.3		232.3	Data doesn’t exist for non-HWP open temp. roads
Total	2512.9	2724.0	5236.9	
Railways		203.5	203.5	

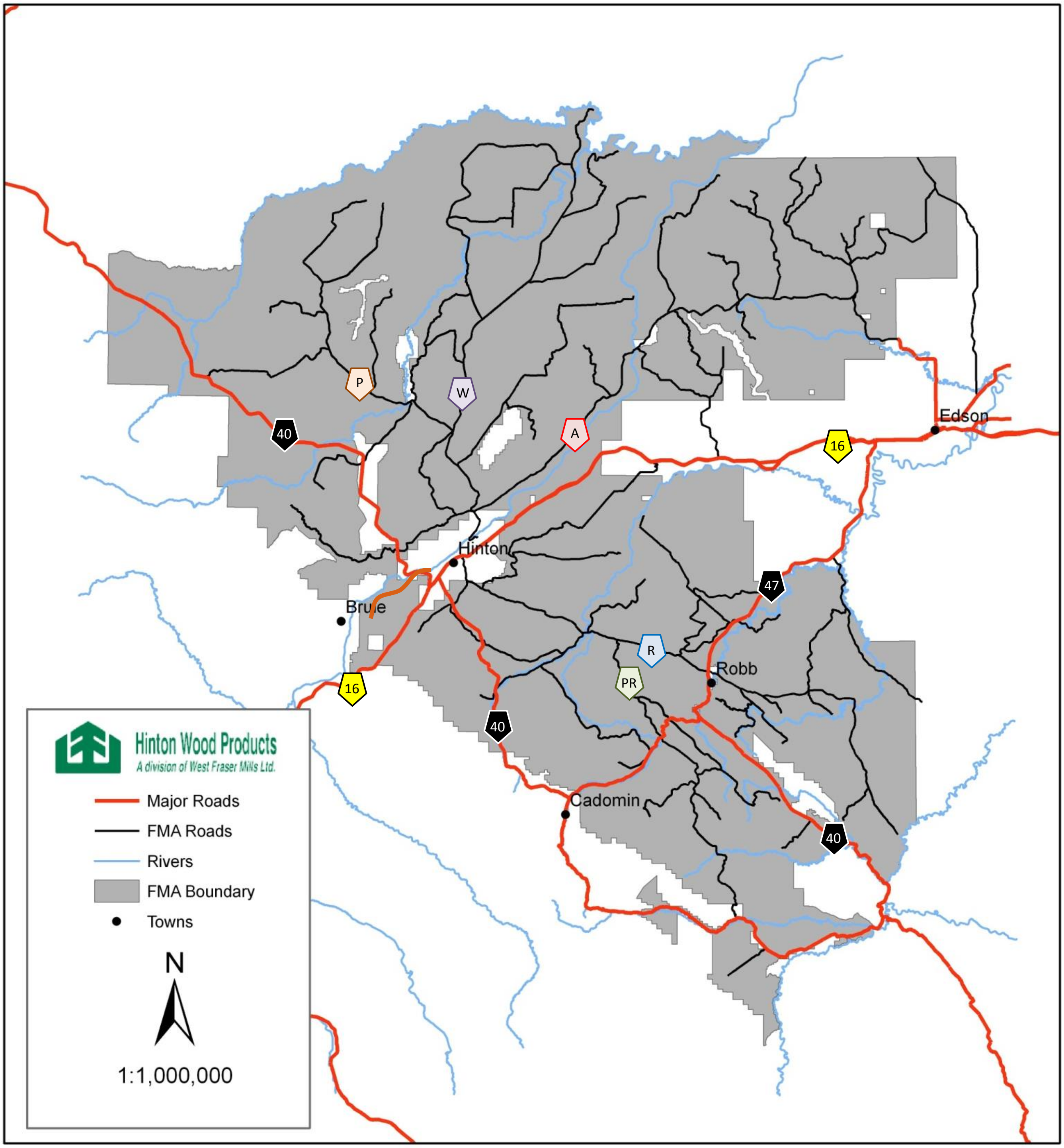


Figure 35 – Major Roads on the Hinton FMA Area

4.4.8 Industrial Development

The energy sector accounts for a large portion of the dispositions issued on the Hinton FMA area. Table 30 shows the type and area of dispositions issued on the Hinton FMA as of May 1, 2012. As indicated in Table 30, the highest percentages of dispositions have been issued to License of Occupations, Mineral Surface Leases, and Pipeline Agreements. A License of Occupation typically is for all season road access to specific areas. A Mineral Surface Lease (MSL) can be issued for a number of energy industry facilities, but with the exception of coal mines, the most common feature on the Hinton FMA are oil or gas well sites. MSLs associated with coal mining are tracked separately in Table 30 and tend to be sporadic in nature (i.e. a number of years will go by with no mining related MSLs and then there will be one large MSL issued as a result of a mine expansion or a new mine). Pipelines connect well sites, so naturally there are a high proportion of pipeline dispositions located in the FMA as well.

Table 30 – Industrial Dispositions on the Hinton FMA Area (as of 2012)

Disposition Type	Code	Area (ha)	Percentage of all Dispositions
Government PSP	DRS	1,473	0.14%
Powerlines	EZE	923	0.09%
Forestry Trunk Road	FRD	155	0.02%
Roads	LOC	17,190	1.68%
Miscellaneous	MLL	1,340	0.13%
Miscellaneous	MLP	61	0.01%
Mining	MSL	22,568	2.21%
Pipeline Installation Lease	PIL	127	0.01%
Pipelines	PLA	10,630	1.04%
Government Road	RDS	785	0.08%
Recreation	REC	49	0.00%
Right of Entry	ROE	186	0.02%
Registered Roadway	RRD	1,458	0.14%
Gravel Pits	SMC	54	0.01%
Gravel Pits	SML	3,013	0.29%
Vegetation Control Easement	VCE	174	0.02%
Grand Total		60,183	5.89%

The total area occupied by industrial dispositions is 60,183 hectares or approximately 5.9% of the Hinton FMA's area for which dispositions are allocated.

Of note in the Hinton FMA area is the number of operating coal mines. Of the 60,183 hectares of dispositions within the FMA area, 37.5% or 22,568 hectares are occupied by coal mines. These mines are located within or adjacent to the FMA – see Figure 36.

Other coal-bearing formations can be found in the area, but no mine development permits have been issued as of December 31, 2012 to access these formations. A new mine is being proposed less than 10 kilometres east of Hinton, but that MSL has not yet been issued.

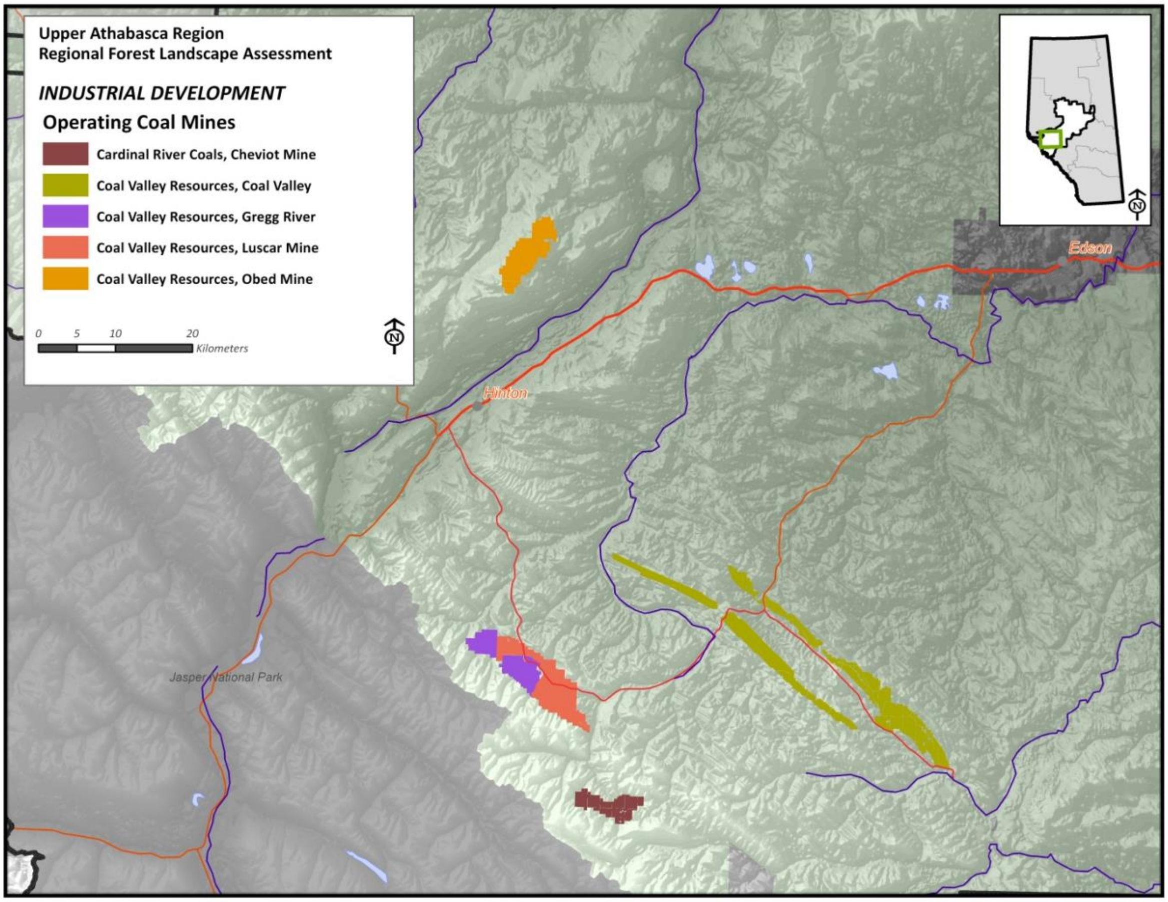


Figure 36 – Coal Mines on or adjacent to the Hinton FMA Area (2012)

4.4.9 Monitoring Sites

Permanent monitoring plots have been established throughout the Hinton FMA area and the Upper Athabasca Region under a variety of programs. For the purposes of this discussion, 'monitoring programs' are those for which a commitment has been made for ongoing, repeated measurements over time, on a series of established plots.

A. HWP Permanent Sample Plots

HWP has established permanent sample plots (PSP) on the Hinton FMA area and monitors them on an ongoing basis. The PSPs were established from 1955 to 1961. There were 3000 plots established that were 0.08 hectares and 0.04 hectares in size. Some have been measured six times – not all still exist. PSP information is used to develop tables of volumes and log profiles as well as to model growth of stands and individual trees (i.e. yield curves). HWP maintains its PSP program in addition to participating in other forest growth and yield cooperatives. Re-measurement schedules depend on the purpose of the monitoring plot and its location.

Locations of most permanent sample plots established by HWP, or other cooperatives HWP is involved in, are registered with the Public Lands, Land Status Automated System as Industrial Sample Plots (ISPs). This designation is similar to the Protective or Consultative Notation for GoA plots, but applies to non-government holdings. ISP registration alerts other land users that monitoring plots are in place and if disturbed without permission of the owner, compensation may be required.

All of the ISP dispositions within the outer boundary of the FMA were determined using Alberta's Digital Integrated Dispositions (DIDs) system. All of the ISP's on the FMA are registered to West Fraser, but many are registered to West Fraser on behalf of other organizations (e.g. Canadian Forest Service, Foothills Growth & Yield Association, Western Boreal Growth and Yield Cooperative, etc.).

The DIDs data contained 2652 ISP shapes within the outer FMA boundary; however, there are some caveats when using DIDs data:

- Errors are possible.
- Some plots overlap more than one research program.
- Some installations have numerous plots contained within them.
- PGS installation/plot counts are just calculated by number of "squares" making up groups with the same ISP number (it is possible more than one installation is under one ISP, or more than one measurement plot is contained within one "square").

A description of the main types of monitoring plots is presented in Table 31 and Figure 37. Note that Table 31 has values for both the number of installations and the number of plots. A single installation can be comprised of many plots, or it can be a single plot, depending on the type of program under which the plots were established.

Table 31 – West Fraser Owned Monitoring Plots on the Hinton FMA Area

Monitor Plot Classification	Number of Installations	Number of Plots
Permanent Growth Sample (PGS) Plots	990	2,554
Breeding / Tree Improvement Programs	12	12
Caribou Lichen Monitoring Plots	2	2
Canadian Forest Service (CFS) plots monitoring productivity in the Gregg Burn	4	4
Foothills Growth & Yield Association (FGYA)	66	66
Foothills Research Institute (FRI) / University of Alberta MPB	4	4
Western Boreal Growth & Yield (WESBOGY)	5	5
Unknown Research Plots	4	4
Totals	1,087	2,651

B. GoA Permanent Sample Plots

The GoA has been actively managing a variety of programs which involve the use of permanent sample plots (PSP) since the early 1960's. Locations of all installations are registered with the Public Lands, Land Status Automated System (LSAS). Most registrations are designated as Protective Notation (PNT), Consultative Notation (CNT) or Disposition Reservation (DRS). In these cases, any proponent of industrial activity near a PSP must consult with the Department prior to any development to assess potential impact to the sample plot. The Department may give permission for the activity to proceed, but in return it may request compensation to re-establish the plot, post-disturbance. A description of permanent monitoring programs managed by the GoA is as follows:

Permanent Sample Plots Permanent sample plots have been established since 1960, primarily in mature stand types representative of the most common forests in Alberta. Initially, their purpose was to provide volume estimates for the purpose of yield curve construction. Two sample designs are in place. The initial design involves an installation comprised of four plots. A later design (approximately 1980) revised the PSP installation to be a single plot. The re-measurement cycle for an installation is either 5 or 10 years, depending on stand age.

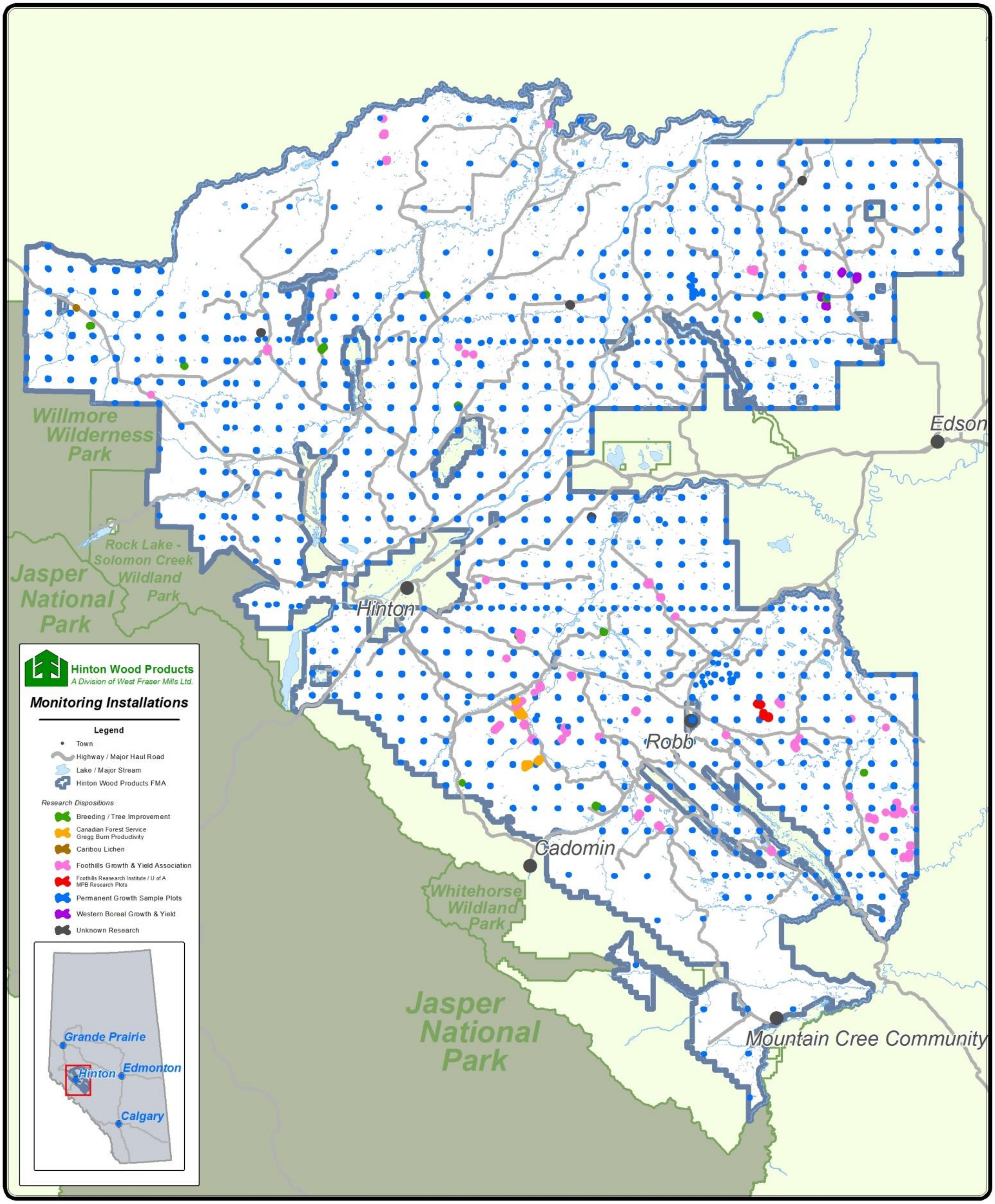


Figure 37 – The distribution of West Fraser owned monitoring sites across the Hinton FMA Area

Reforestation Monitor Plots	Reforestation monitor plots were first established in the early 1980s for the purpose of monitoring the initial stand development (from initial planting to approximately 8-10 years old). An installation is typically made up of 40 plots, distributed over a grid on newly reforested cutblocks. The measurement cycle is annual or bi-annual.
Western Boreal Growth and Yield Cooperative	The Western Boreal Growth and Yield Cooperative was started in 1985 with the purpose of conducting research projects that contribute to the development of growth and yield information and modeling for both natural and regenerated stands in the boreal mixedwood region. Members of the Cooperative consist of industrial forest managers, provincial/territorial forest managers and academia. Sample design is a randomized block experiment. The re-measurement schedule is complex and depends on age and season of planting stock and reforestation activities occurring on the block.
Stand Dynamics Plots	Stand Dynamics plots are similar in nature to the Reforestation Monitor Plots, however their target dynamic is the stand age after the successful establishment of a new forest to the juvenile stand development stage. Re-measurement schedule is approximately 2 years.
Other PSP (Special Projects)	There are a variety of special projects for which additional PSPs have been installed. Some examples are to monitor stand development: (a) in response to mountain pine beetle infestation; (b) following specific wildfire events, or (c) in response to a local or regional forest growth issue (e.g.: spruce budworm, blowdown event).

Table 32 below describes the GoA monitoring plots within the Upper Athabasca Region.

Table 32 – GoA Monitoring Plots in the Upper Athabasca Region

Monitor Plot Classification	Number of Installations	Number of Plots
GoA Permanent Sample Plots		
Permanent Sample Plots	156	330
Reforestation Monitoring Plots	120	5020
Western Boreal Growth and Yield Cooperative	30	30
Stand Dynamics Plots	90	90
Other PSPs (Special Projects)	73	217
Totals		

C. Alberta Biodiversity Monitoring Institute

The Alberta Biodiversity Monitoring Institute (ABMI) conducts monitoring of more than 2,000 species and habitats to support decision making about biodiversity in the province. The network of plots is based on a 20km by 20km grid, following the protocol for the Canadian National Forest Inventory (NFI) (Canada 2004).

The locations of all installations are predetermined as per the protocol for the NFI. However, the exact plot locations on the ground are not publicly accessible to maintain an unbiased measure of biodiversity and the human footprint across the province (map locations are within 5.5 km of the actual survey location). Locations are not registered with the Public Lands LSAS system as these points do not require protection of any kind.

There are a total of 1,656 plots located across the province, of which 210 fall within the Upper Athabasca Region. Each location is re-visited every 5 years, at which time a variety of terrestrial and aquatic surveys are completed.

4.5 Landscape Fire Assessment

The following landscape fire assessment was prepared by the GoA's Forestry and Emergency Response Division (Wildfire Management Branch) and was provided to HWP at the May 30, 2014 Plan Development Team Meeting:

4.5.1 Fire Regime Analysis

The HWP FMA is comprised of five Natural Subregions (NSR). These include the Alpine, Lower Foothills, Montane, Subalpine and Upper Foothills Natural Subregions (Figure 38).

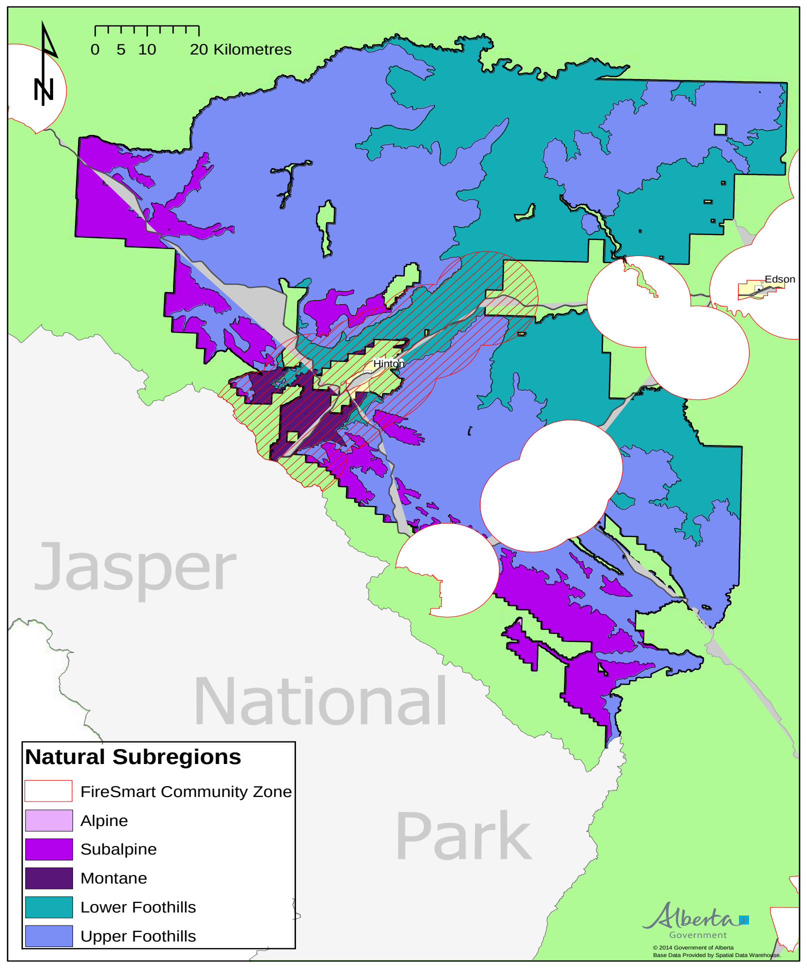


Figure 38 – Natural Subregions and FireSmart Community Zones

The combined Lower Foothills NSR and the Upper Foothills NSR cover most of the FMA. The Lower Foothills and the Upper Foothills are characterized by the following attributes (Tymstra, Wang and Rogeau, 2005):

1. Human-caused spring fires (Lower Foothills).
2. Lightning-caused wildfires (more frequent in the Upper Foothills compared to the Lower Foothills).
3. Discontinuous fuels which help restrict fire growth during summer months.
4. Frequent, medium sized wildfires.

The Subalpine NSR also covers a significant portion of the HWP FMA area. The Subalpine NSR is dominated by coniferous vegetation and the number of wildfires peaks in August (Tymstra, Wang and Rogeau, 2005). In general, this area has an infrequent small wildfire regime with the odd large, high intensity wildfire (Tymstra, Wang and Rogeau, 2005).

The Alpine NSR portion of the HWP FMA is very small and this NSR is associated with few wildfires due to the terrain and scattered vegetation.

The Montane NSR has a general fire regime of frequent, small human-caused fires. The wildfires in this NSR peak in spring—likely due to the pine, leafless aspen and grass fuels.

The two most common Canadian Forest Fire Behaviour Prediction (FBP) fuel types occurring in the FMA are C2 – Boreal Spruce (283,326 hectares) and C3 – Mature Lodgepole Pine (173,217 hectares). There is also a large portion of mixedwood stands (M1/M2) with 25 percent to 80 percent conifer (154,073 hectares) and a significant area of O1-grass fuels (148,205 hectares) and C4-immature Lodgepole Pine. See Figure 39.

Based on recommendations contained in the Flat Top Complex Wildfire Review Committee Final Report (2012), the following (Recommendation 4) should be considered on HWP FMA lands adjacent to communities:

> "*Accelerate fuel management treatments near communities in forested areas that are at risk from wildfires. Priority should be given to thinning or conversion of coniferous stands, particularly black spruce, which threaten community developments*."

There are four FireSmart Community Zones which have portions occurring on the HWP FMA. These zones include (Figure 39):

1. Hinton/Carldale FireSmart Community Zone
2. Marlboro/Wapiti Ridge FireSmart Community Zone
3. Robb/Mercoal FireSmart Community Zone
4. Cadomin FireSmart Community Zone

HWP should consider the harvest of coniferous stands early in the spatial harvest sequence which are located in FireSmart Community Zones or which are located adjacent to communities where there may not be formal FireSmart Community Zones.

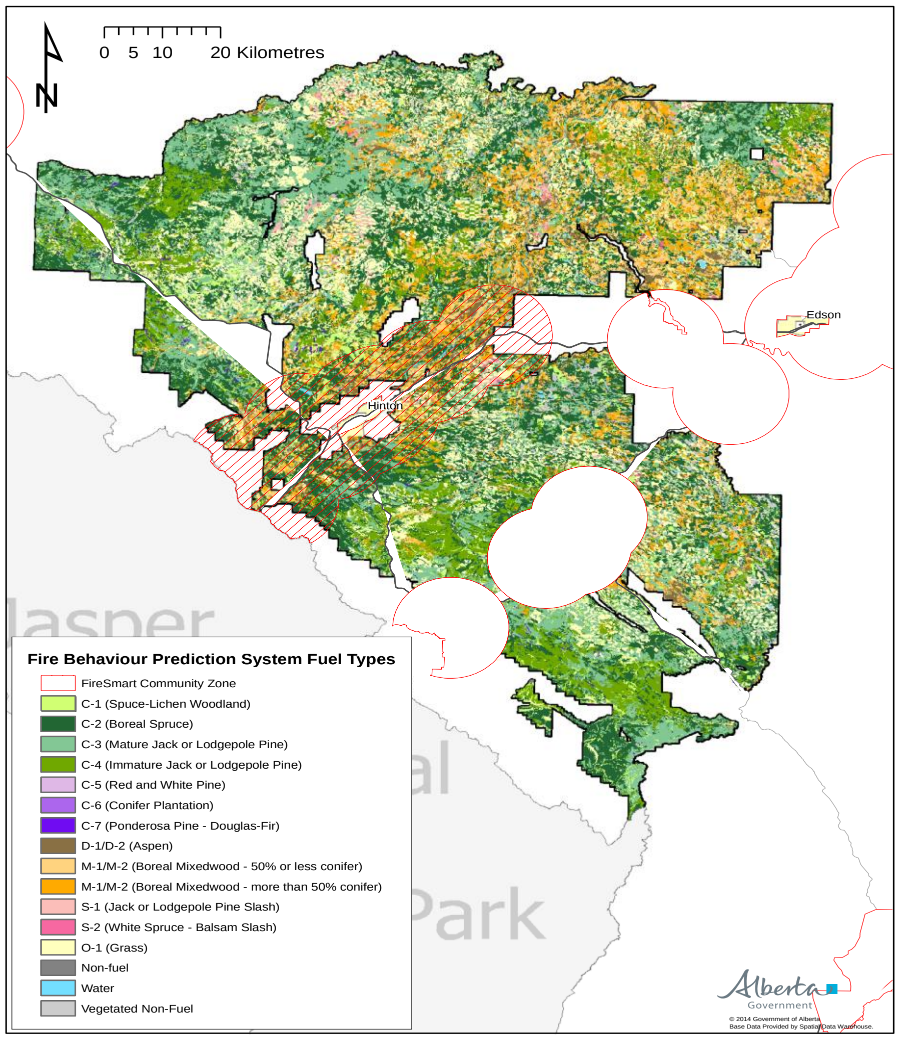


Figure 39 – Canadian Forest Fire Behaviour Prediction System (FBP) Fuel Types and FireSmart Community Zones

4.5.2 Wildfire Threat Assessment

The Wildfire Threat Assessment Model (WTA Model) allows 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.

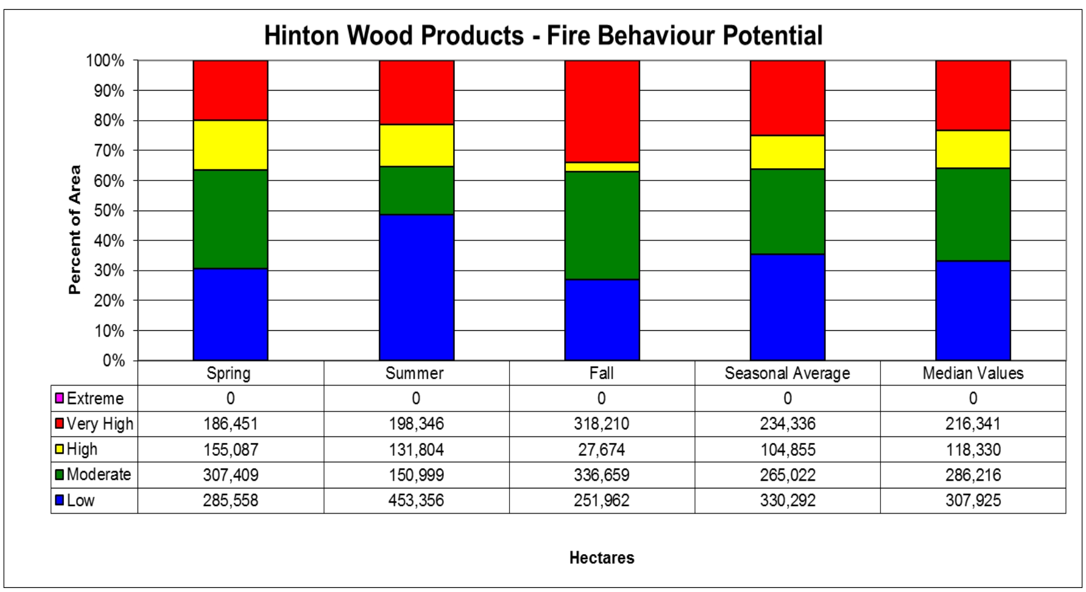
The FireSmart objective for the preferred forest management strategy is to reduce the overall wildfire threat potential in the HWP FMA through:

- Reducing the fire behaviour potential
- Reducing the exposure of values at risk to fire
- Targeting harvest to locations with problematic forest fuel types
- The consideration of species conversion reduced stand stocking densities and reduced coarse woody debris retention in locations harvested near communities.
- Ensuring linkages to other Fire Smart plans and strategies—such as Community Wildfire Mitigation Strategies

A. Wildfire Threat Analysis – Fire Behaviour Potential and Community Zone Detailed Fuels Analysis

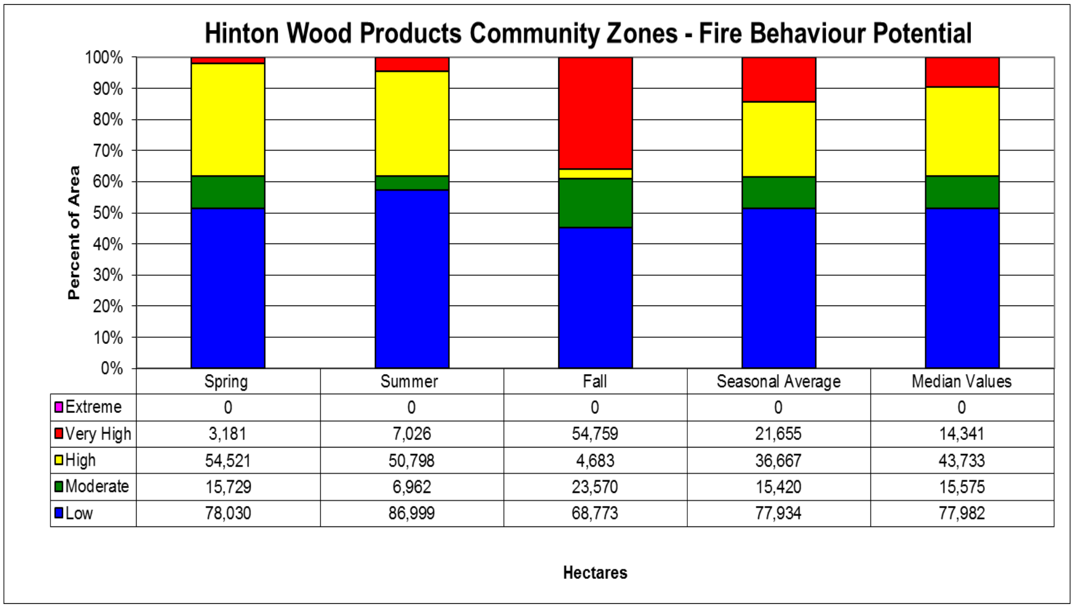
The wildfire threat analysis for the Hinton Wood Products FMA focused on the fall season as it is the season in which the greatest area of high to very high fire behaviour potential occurs and. The analysis was done both for the entire FMA (Figure 40) and for the FireSmart Community Zones occurring on the FMA (Figure 41).

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.



	Spring	Summer	Fall	Seasonal Average	Median Values
Extreme	0	0	0	0	0
Very High	186,451	198,346	318,210	234,336	216,341
High	155,087	131,804	27,674	104,855	118,330
Moderate	307,409	150,999	336,659	265,022	286,216
Low	285,558	453,356	251,962	330,292	307,925

Figure 40 – HWP FMA Base Fire Behaviour Potential for the entire FMA



	Spring	Summer	Fall	Seasonal Average	Median Values
Extreme	0	0	0	0	0
Very High	3,181	7,026	54,759	21,655	14,341
High	54,521	50,798	4,683	36,667	43,733
Moderate	15,729	6,962	23,570	15,420	15,575
Low	78,030	86,999	68,773	77,934	77,982

Figure 41 – HWP FMA FireSmart Community Zones Base Fire Behaviour Potential for the Community Zones clipped out of the FMA

B. Hazardous Fuels Assessment – FireSmart Community Zones – Conifer Stands

Two assessments using the current FBP layer were completed for the HWP FMA. The first focused on all of the coniferous stands located in the FireSmart Community Zones. The second analysis consisted of isolating the C1, C2, C3 and M1/2 > 50 % conifer composition located in the FireSmart Community Zones. See Figure 40 and Figure 41.

4.6 Landuse

4.6.1 Timber

Large scale commercial timber harvest began in the Hinton area in the mid-1950s concurrent with the signing of Alberta's first Forest Management Agreement (with West Fraser's predecessor company "North West Pulp and Power") and the construction of the Hinton pulpmill. Since that time, timber harvesting and the associated economic benefits, have continued non-stop to present day.

Annual allowable cut (AAC) levels are calculated by FMU and are set or approved by Alberta. The FMU associated with HWP's Forest Management Agreement #8800025 is E14. The approved AAC as of January 1, 2012 is 1,766,576m3 of coniferous and 249,832m3 of deciduous. There are no other embedded timber quotas within the Hinton FMA area. A new AAC has been proposed as part of this DFMP (see section 7.74).

4.6.2 Trapping

The Hinton FMA area contains all or part of 60 Registered Fur Management Areas (RFMA). The locations of these RFMAs are shown in Figure 42. Within the RFMA, trappers have the right to establish and maintain traplines and any necessary supporting structures (e.g., cabins). Trappers rely on populations of fur bearing wildlife species such as beaver, marten, fisher, fox, wolf, coyote, lynx, weasel, muskrat, mink, wolverine and red squirrel.

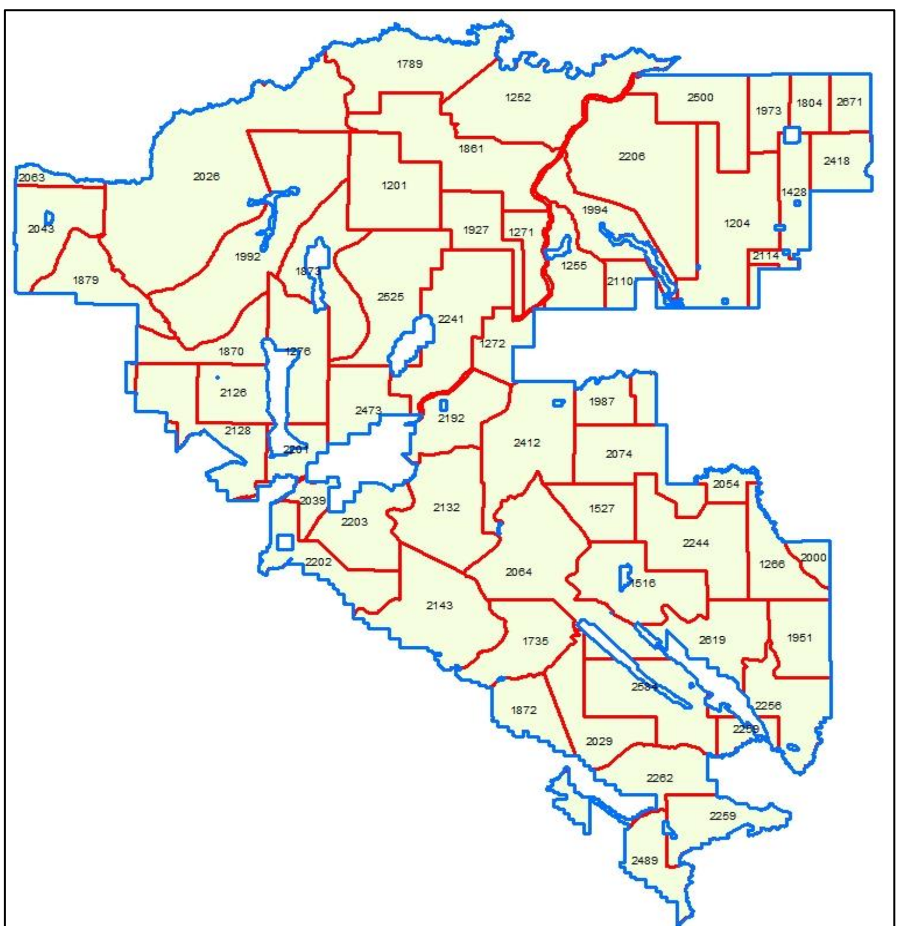


Figure 42 – The Location of the 60 RFMA on the Hinton FMA Area

4.6.3 Grazing

Grazing dispositions within the FMA are issued by Alberta as the need arises. Company policy has been to support these permit applications in those areas where regenerating stands are not threatened, and where no harvesting is scheduled in the short term. There are three types grazing dispositions found within or adjacent to the Hinton FMA area:

Forest Grazing Licence	Long term license (up to 10 years). Renewable. Licensee cannot control public access. Predominantly issued in forested areas where access for other activities (e.g.: recreation, forest harvesting) need to be accommodated.
Grazing Lease	A long term (up to 20 years) authorization to individuals, corporations or associations. Renewable. Access can be controlled with the exception for timber harvesting.
Grazing Permit	Short term permits issued on an annual basis and often on land that is fragmented and perhaps periodically wet.

There are a small number of grazing dispositions on the Hinton FMA area (see Figure 43). There are currently 20 Forest Grazing Licenses within or immediately adjacent to the FMA area. There are also a number of small grazing leases and permits within or adjacent to the FMA landbase.

4.6.4 Energy

The energy and mining industries are very active in the Hinton FMA area and have had a significant impact on the landbase and on forest management planning and operations. All Working Circles in the FMA area have been subject to exploration, drilling, pipeline, powerline and facility development.

HWP receives disposition applications directly from companies proposing oil, natural gas, and coal developments. Over the past eight years, an average of just over 1200 applications, were received annually by HWP. In the period from 1990 to 2000, the average number of dispositions applications was about 200 per year, so disposition applications have increased substantially over the last 25 years. Table 33 shows the number of disposition applications received by HWP since 2005. What is immediately apparent from looking at Table 33 is the drop in disposition applications during the worldwide recession that started around 2008 and from which we have only just recently seen a recovery. It is likely that with the recovery of the economy, disposition applications will continue to rise.

Table 33 – Energy Disposition Applications on the Hinton FMA Area from 2005 to 2012

	2005	2006	2007	2008	2009	2010	2011	2012
Non-forestry Disposition Type	**Number of Disposition Applications**							
Pipelines (PLA)	703	596	450	293	246	138	239	184
Pipeline Installation Lease (PIL)		199	189	129	135	87	103	57
Seismic Lines	15	17	5	3	4	0	0	0
Roads (LOC)	453	500	306	201	201	136	156	176
Well Sites (MSL)	640	683	415	278	259	203	95	140
Mining (MSL)	1	1		0	1	2	0	0
Powerlines (EZE)	9	5	7	4	7	4	9	2
Vegetation Control Easement (VSE)			10	4	0	0	3	0
Miscellaneous (MLL/MLP)	31	23	8	17	15	8	13	16
Other (DRS/PLS)		3	5	0	0	0	181	3
Gravel Pits (SML/SMC)		14	9	17	12	10	5	574
Total	1,851	2041	1404	946	880	588	804	1,152

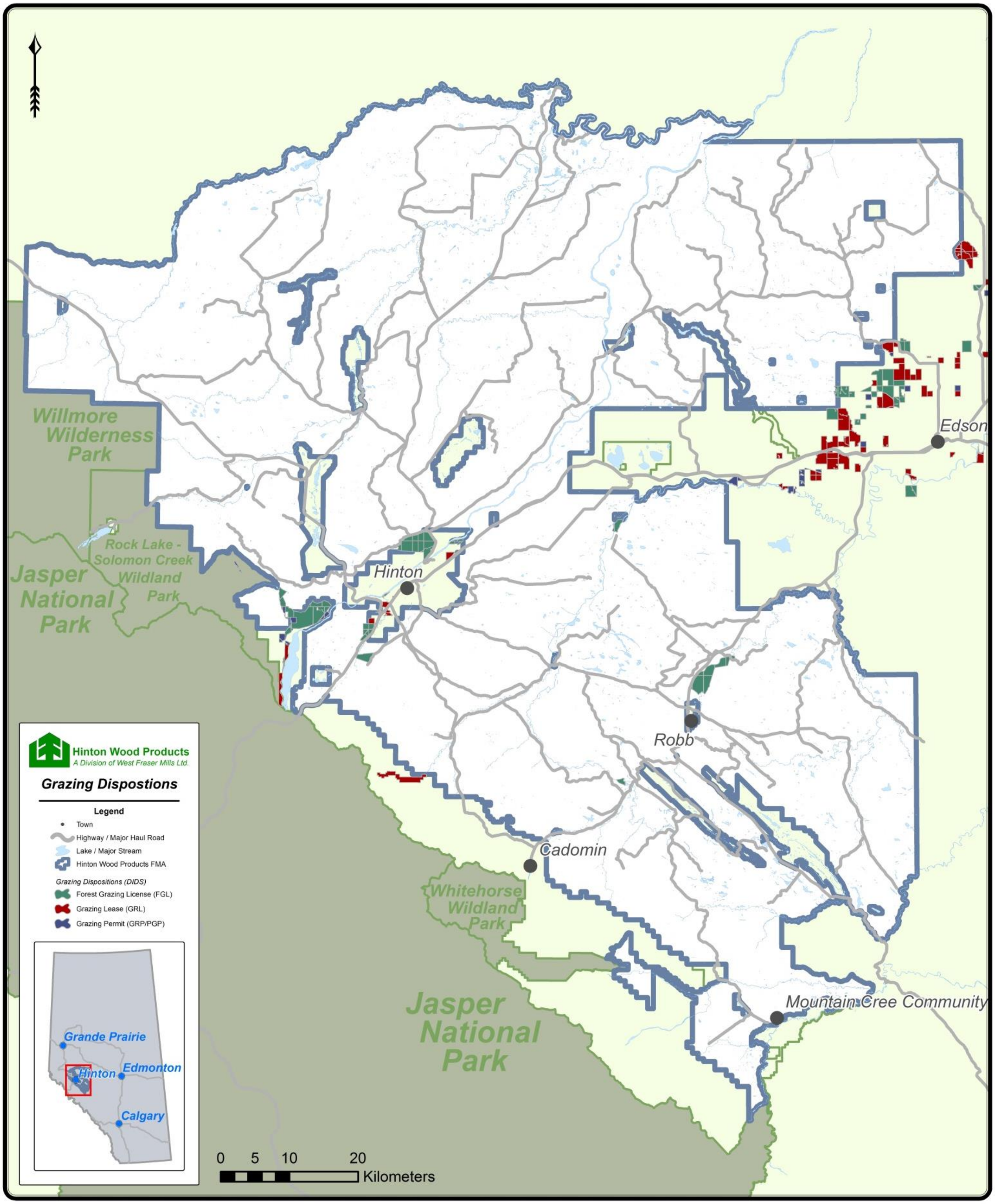


Figure 43 – The location of Grazing Dispositions on or near the Hinton FMA Area

Three major coal mining operations exist on or adjacent to the FMA area: Teck Coal (Cardinal River Operations) and Westmoreland Coal (previously Sherritt) with its Coal Valley Resources and Obed Mountain Coal operations. The Obed Mountain Coal operation was closed in 2013. Teck's current operations (the Cheviot pit) are located outside of the FMA area. Westmoreland's Coal Valley Resources operation continues to expand northwest, with the recent approval of the Robb Trend pit.

In addition to these existing mining operations, Coalspur Mines recently announced that the Alberta Energy Regulator (AER) had approved its Vista coal project. The AER approval is a significant milestone in the regulatory process for the approval of the Vista project and places Coalspur in a position to work with the regulators to finalize detailed licences and permits. Coalspur is a coal development company with approximately 55,000 hectares of coal leases located within the Hinton area. Coalspur's flagship project is the Vista project, which covers approximately 10,000 hectares of HWP's FMA and provides a large scale, surface mineable, thermal coal development. Coalspur is currently looking for start-up capital.

Significant areas are disturbed annually by the energy and mining industries, resulting in substantial timber and productive land losses. HWP employs numerous strategies to address these impacts. The underlying intent of all strategies is to work cooperatively with the energy and mining industries to minimize the extent of disturbance, and to salvage as much damaged timber as possible and return removed land back to the FMA as soon as possible.

4.6.5 Recreation and Tourism

Non-commercial recreation use on the FMA area is high and increasing steadily, partly due to restrictions on activities in the Provincial and National Parks adjacent to the FMA area. Popular recreational activities include fishing, hunting, hiking, camping, mountain biking, canoeing, ATV riding, horse-back riding, skiing, snowmobiling, wildlife viewing, and swimming. Refer back to Figure 5 for the location of most recreation sites on the Hinton FMA area.

Since 2000, HWP has been using FRIAA (Forest Resources Improvement Association of Alberta) funding, combined with revenue collected through camping fees, to run a large recreation program on and adjacent to the Hinton FMA area. In the fall of 2010, HWP started looking at different options for continuing to fund the Recreation Program. It was at this time that HWP started to explore the idea of bringing on additional partners to help fund the program.

In December 2010 and early January 2011, HWP approached the three coal companies that work within or adjacent to the Hinton FMA. These were:

1. Teck Coal – Cardinal River operations
2. Sherritt (now Westmoreland Coal) – Coal Valley and Obed operations
3. Coalspur – No active coal mine – operations tentatively scheduled to start in 2015

HWP asked each company if they would be interested in partnering in the recreation program HWP has been running for the past decade. The response for each company was overwhelmingly positive. HWP also approached the Town of Hinton and Yellowhead County. Both these organizations also agree to partner. The result was a new group with six partners called the Foothills Recreation Management Association (FRMA). The mandate of FRMA is to provide safe and affordable outdoor recreation opportunities to the public in the area surrounding Hinton and Edson.

The Foothills Recreation Management Association (FRMA) manages 24 recreation sites that are either within HWP's Forest Management Area or adjacent to it. The list below summarizes the 24 campgrounds and trail systems that are currently being managed and maintained by FRMA:

- Emerson Lakes Campground
- Obed Lake Campground
- Lovett River Campground
- Little Sundance Group
- Whitehorse Campground
- Fairfax Lake Campground
- Rock Lake Campground
- Wildhorse/Kinky Lake Campgrounds
- Wildhay Group Campground

- Pembina Forks Campground
- Petite Lake Campground
- Emerson Lakes Trail
- Pine Management Trails
- Happy Creek Trail
- McLeod Group Campground
- Watson Creek Campground
- Wild Sculpture Trail
- Spruce Management Trails
- Bighorn Trail
- Gregg Cabin Recreation Area
- McLeod River (North) Campground
- McLeod River (South) Campground
- Canyon Creek Trail
- McLeod River Silviculture Interpretive Trail

Of these 24 recreation sites, HWP currently has a five year operating contract for all of the Alberta Tourism, Parks, and Recreation campgrounds as well as for the Wild Sculpture Trail and Emerson Lake Trail. The remaining campgrounds and hiking trails are privately managed by FRMA.

In addition to the sites that HWP operates directly through the FRMA partnership, there are also a number of other recreation sites within or adjacent to the FMA area boundary. This includes the campgrounds and day-use areas associated with Switzer Provincial Park, the Big Berland campground in the northwest corner of the FMA, and a number of other privately run campgrounds such as the Maskuta Creek, Hinton/Jasper KOA, and Hinton Centre campgrounds.

Jasper National Park, which is close proximity to the southwestern border of the FMA, is also a primary recreation and tourism destination in the region. Virtually all recreation opportunities except off-highway vehicles (OHV), hunting and snowmobiling can be found there. Willmore Wilderness Park is adjacent to the northwest portion of the FMA and is a popular place for horseback riding, backpacking, and hunting. Outfitters and other tourism-based businesses operate out of the Willmore and the adjacent Rock Lake Provincial Park.

There are also three public land use zones (PLUZs) within or adjacent to the FMA area. These were created to potentially avoid land use conflicts, often between human and wildlife but also between different user groups. Table 34describes these three PLUZs.

Table 34 – Public Land Use Zone in and Adjacent to the Hinton FMA area

PLUZ Name	Area	Camping	Hiking	OHV	Snowmobile	Equestrian	Cross-Country Skiing	Fishing	Hunting	Purpose of PLUZ
Brule Lake	1,479	X	X	X	X	X	X	X	X	Maintain or increase elk populations in the area and minimize conflicts between OHV users and elk
Coal Branch	57,449	X	X	X	X	X	X	X	X	Mitigate environmental impacts on sensitive areas. Protect and properly manage reclaimed mine sites.
Athabasca Ranch	4,132	X	X	X	X	X		X	X	Minimize conflicts between motorized access and elk breeding season.

4.6.6 Guiding and Outfitting

Guides and outfitters are licensed in the province of Alberta and pay annual user fees for their allocations. The Professional Outfitters Association of Alberta (POAA) was established in the late 1980's to encourage unity and consensus within the industry. Prior to this a number of organizations had existed. Since 1997, the Alberta Professional Outfitters Society (APOS) has been responsible for managing the outfitting industry on behalf of the government of Alberta. While guiding and outfitting does take place within and adjacent to the FMA area, HWP has no formal mechanism to consult or notify guides and outfitters regarding planned operations, other than through our annual public open houses.

4.6.7 Cultural and Historical Resources

The Alberta Culture "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 (see Figure 44). The listing provides companies with advance notification of possible historic resource concerns. The listing is constantly being updated as new resources are found and updates are published semi-annually.

Each land parcel in the listing is assigned a Historic Resource Value (HRV) ranging from 1 to 5, reflecting their relative importance:

- HRV 1: includes lands designated as Provincial Historic Resources under the Alberta Historical Resources Act, and may identify World Heritage Sites.
- HRV 2: designated as a Municipal or Registered Historic Resource
- HRV 3: contains a significant historic resource that will likely require avoidance
- HRV 4: contains a historic resource that may require avoidance
- HRV 5: believed to contain a historic resource

Table 35 outlines the area covered as well as percent area of the historical resources in the Upper Athabasca Region (in which the HWP FMA is located). A total of 212 hectares are listed as HRV 1 (Historical), with locations near Athabasca, Mayerthorpe, High Prairie and Onoway (none in the Hinton FMA area). A 32 hectare parcel categorized as HRV-1 (Geological) is located southeast of Whitecourt (a meteorite impact crater found in 2007 and outside the Hinton FMA). Archaeological and Paleontological sites are the most plentiful, occupying 50% and 33% respectively of the Listing's total area in the Upper Athabasca Region, and being the most common listing found on the Hinton FMA area.

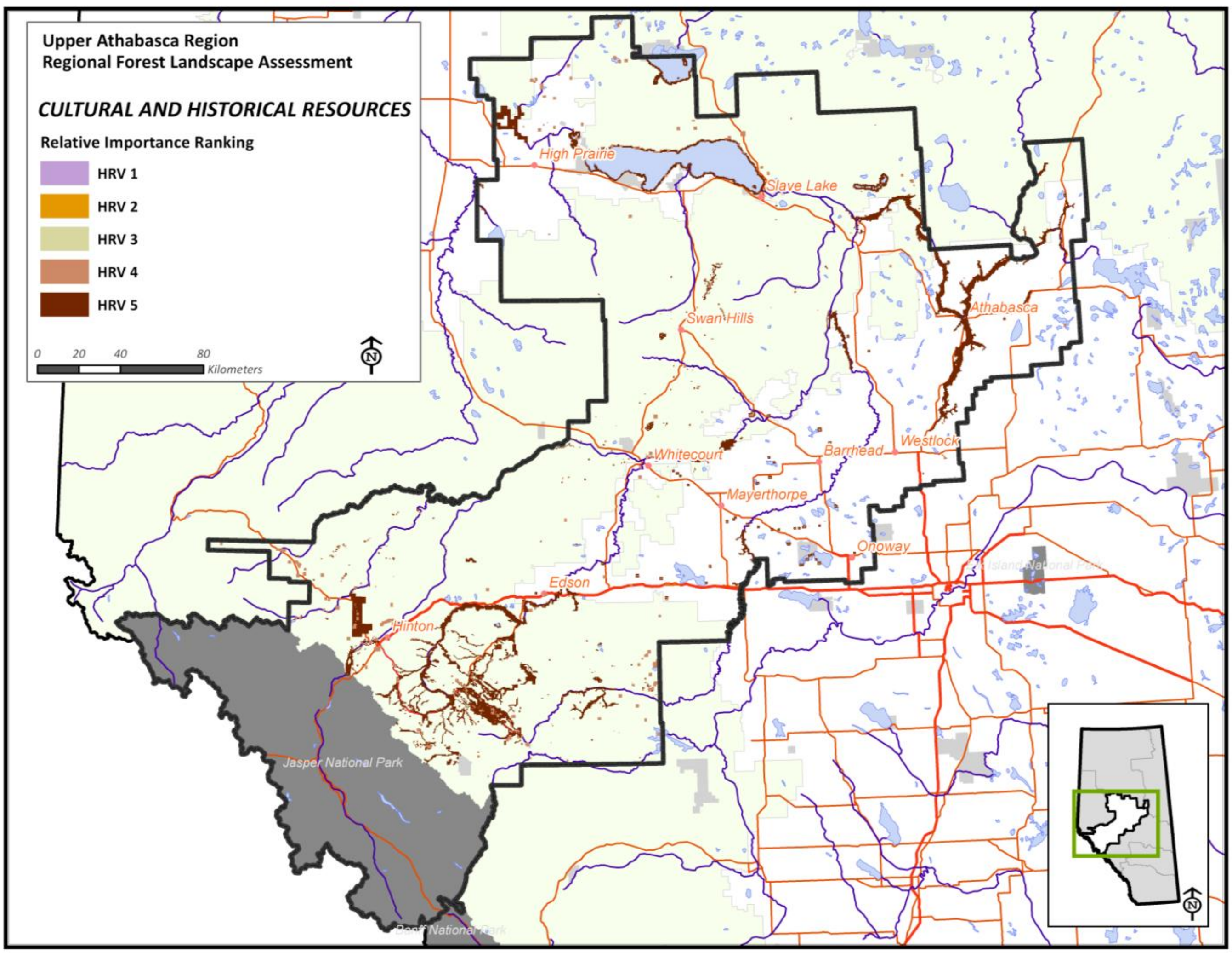


Figure 44 – Areas of Historic Resource Value

Table 35 – Categories and Relative Importance Value (HRV)

Category	Relative Importance Ranking (HRV)											
	1		2		3		4		5		total	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Archaeological	-	-	-	-	510	0	19,587	6	139,912	42	160,009	48
Archaeological, Historical	-	-	-	-	-	-	16	0	-	-	16	0
Archaeological, Natural	-	-	-	-	-	-	-	-	23,846	7	23,846	7
Cultural	-	-	-	-	-	-	33,160	10	-	-	33,16	10
Cultural, Historical	-	-	-	-	-	-	276	0	-	-	276	010
Geological	32	-	-	-	-	-	-		-	-	32	0
Historical	212	-	84	0	175	0	933	0	-	-	1,404	0
Natural	-	-	-	-	145	0	-	-	-	-	145	0
Paleontological	-	-	-	-	99	0	1,932	1	111,019	33	113,051	34
Total	245	0	84	0	929	0	55,906	17	274,777	83	331,940	100

4.6.8 Visual Resources

In 1997, a visual landscape inventory of the portions of FMA area visible from numbered highways and major river corridors was conducted by Industrial Forest Service for HWP using British Columbia Ministry of Forests standards. In this inventory, two levels of viewing intensity were acknowledged:

- Level 1 – Significant recreational traffic and a high number of viewers (e.g. Highway 16, which receives over 2 million visitors and major river corridors)
- Level 2 – Less recreational traffic and fewer viewers (e.g. Highways 40 and 47 and watercourses)

The inventory stratified visible areas into one of five “Visual Quality Classes” (VQC), which defined the broad management intent with respect to aesthetics (VQC 1 correlates to high aesthetic values). Table 36 defines each VQC broad recommendation.

Table 36 – General Intent for Managing Alterations within Visual Quality Classes

VQC	VQC Code Broad Recommendation
1	No visible alterations.
2	Alterations not to be visually apparent within the characteristic landscape.
3	Alterations are to remain subordinate to the characteristic landscape.
4	Alterations may dominate the original characteristic landscape, but must compare to natural occurrences.
5	Alterations may dominate the original characteristic, and may not compare to natural occurrences.

A matrix of potential effects was developed from the inventory classification. Acceptable levels of alteration were identified for combinations of VQC, Visual Sensitivity Rating (the relative prominence or importance of an area, based on physical characteristics, viewing conditions and social concerns, ranked as High, Medium or Low) and the Visual Absorption Capacity (the natural capacity of the area to accept alteration, ranked as High, Medium or Low). This matrix was developed for both Level 1 and Level 2 areas.

Since 1997, visual assessments have been initiated or completed on all compartments identified as having high visual sensitivity in the visual landscape inventory. A visual impact assessment is an assessment of the impact of proposed operations on visual resource values (aesthetics). Assessments based on the viewscape (what can be seen) from specific viewpoints subjectively evaluated and either accepted or revised based on a new operations scenario. The Forest Harvest Plan describes the assessment and the operations plan proposed to minimize aesthetic impact.

4.6.9 Fish and Wildlife Resources

A. Management Zones

Fish and Wildlife management and regulation is divided into zones (or districts) across the province. Table 37 outlines the size of each Management zone within the Upper Athabasca region (in which the Hinton FMA area is located). The Hinton FMA lies primarily within the Hinton Fish and Wildlife district, but portions of the FMA area are also included in the Edson and Grande Cache districts. Figure 45 shows the distribution of those districts.

Table 37 – Fish and Wildlife Districts

Fish and Wildlife District Name	Entire District	Portion of District in Upper Athabasca		Proportion of Upper Athabasca occupied by District
	Area (ha)	Area (ha)	%	%
Athabasca	1,504,338	949,971	63	11
Barrhead	656,891	652,849	99	8
Drayton Valley	279,737	4,627	2	0
Edson	1,023,570	1,014,425	99	12
Evansburg	666,861	576,738	86	7
Grande Cache	795,252	42,351	5	1
High Prairie	1,254,130	1,167,843	93	14
Hinton	740,273	674,537	91	8
Lack La Biche	1,328,292	174,000	13	2
Nordegg	843,691	38,873	5	0
Peace River	1,707,905	37,270	2	0
Rocky Mountain House	802,822	4,903	1	0
Slave lake	1,749,981	997,793	57	12
Stony Plain	341,176	19,038	6	0
Swan Hills	469,345	415,188	88	5
Valleyview	1,392,872	12,552	1	0
Whitecourt	439,416	391,925	89	5
Subtotal	15,996,553	7,174,883		86
No Fish & Wildlife District		1,123,185		14
Total		8,298,067		100

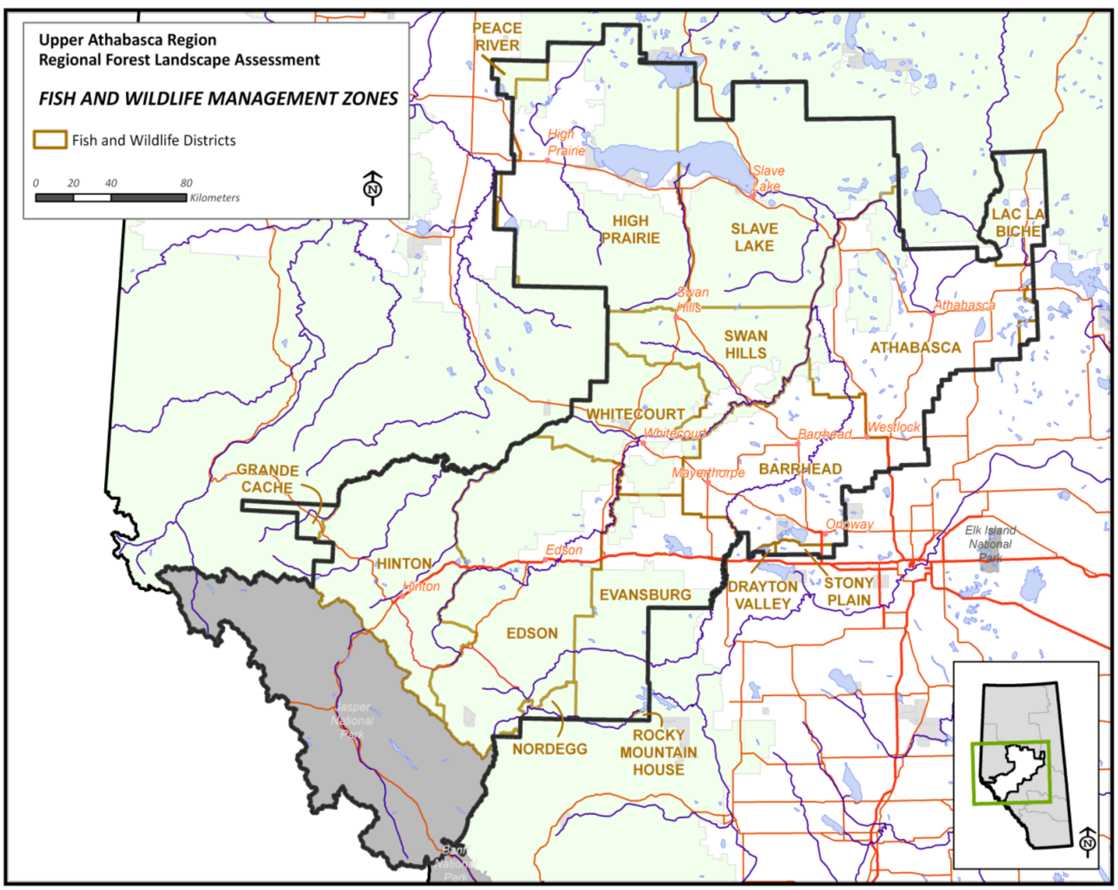


Figure 45 – Fish and Wildlife Districts

B. Fisheries

Fish Management Zones are used to determine fisheries health, regulate sport and commercial fishing, and determine fish stocking. Fish Management Zones are further subdivided into Fish Watershed Units which are based on specific river basins. Sport fishing regulations apply at the Watershed Unit level, or in some cases regulations are site specific to locations (lakes, streams) within a Watershed Unit. The Hinton FMA area is situated in Eastern Slopes Fish Management Zone. Table 38 and Figure 46 describe the area and location of Fish Management Zones in the Upper Athabasca Region.

Table 38 – Fish Management Zones

Fish Management Zone	Entire Zone	Portion of Zone in Upper Athabasca		Proportion of Upper Athabasca occupied by Zone
	Area (ha)	Area (ha)	%	%
Northern Boreal Zone	32,972,500	4,388,873	13	53
Eastern Slopes Zone	12,264,460	2,678,291	22	32
Parkland-Prairie Zone	15,539,920	107,721	1	1
Sub-total	60,776,880	7,174,885		86
No Fish Management Zone		1,123,182		14
Total		8,298,067		100

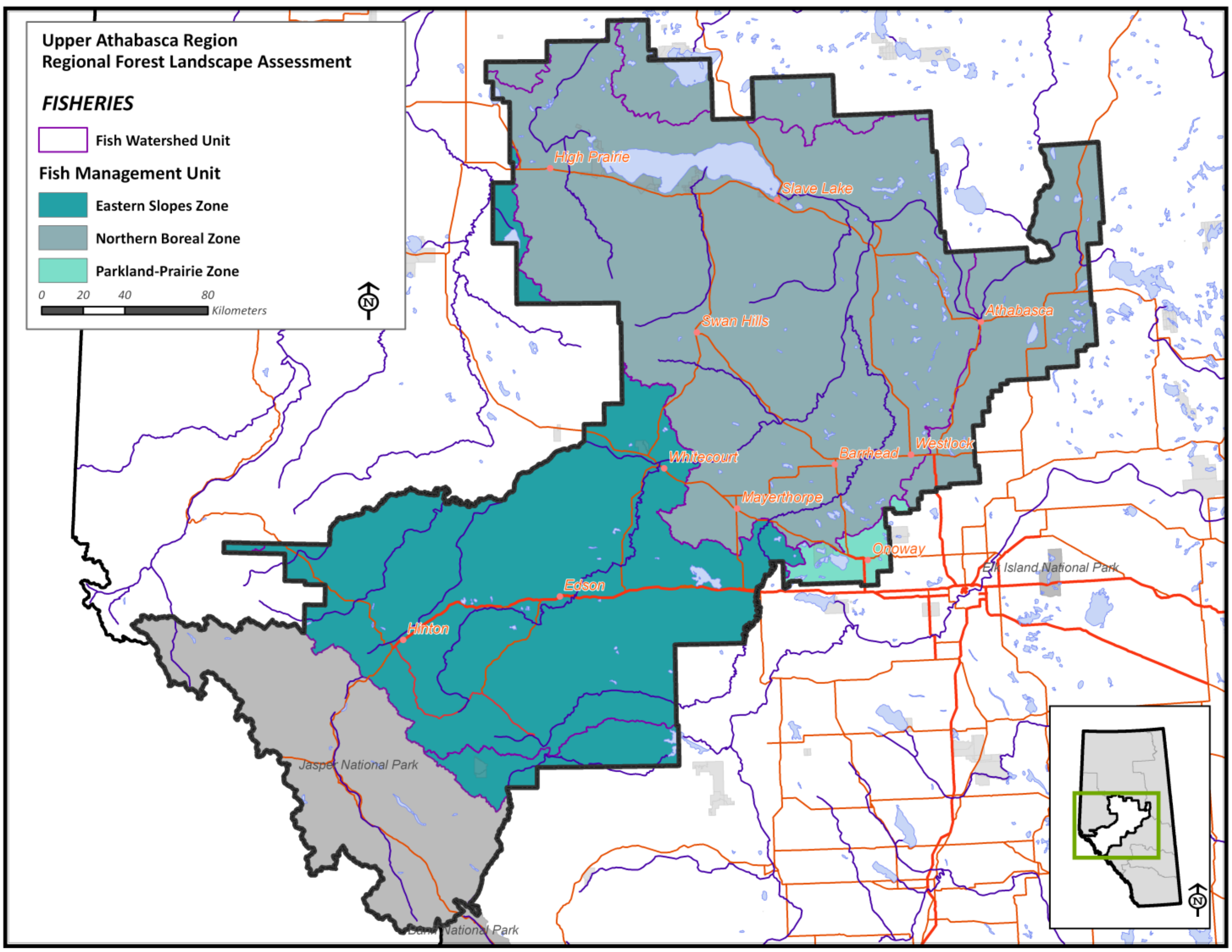


Figure 46 – Fish Management Units and Fish Watershed Units

C. Wildlife

Government wildlife sensitivity zones (Table 39 and Figure 47) are derived from aerial surveys, historical information, movements of collared animals and specific habitat type requirements. They are used by companies and government departments in operational decision making on Crown land. The list of species is not exhaustive for the region but identifies species that the GoA has listed as a concern related to the development of industrial activities.

Table 39 – Wildlife Sensitivity Zones

Wildlife Species	Sensitivity Zone within Alberta	Proportion of Sensitivity Zone in Upper Athabasca		Proportion of Upper Athabasca occupied by Sensitivity Zone
	Area (ha)	Area (ha)*	%	%
Caribou	9,749,350	306,623	4	3
Grizzly Bear				
- Core Habitat	3,726,439	1,065,472	13	29
- Secondary Habitat	2,476,588	1,214,582	15	49
Mountain Goat and Mountain Sheep	1,246,003	102,944	1	8
Sharp Tailed Grouse	15,810,566	68,452	1	0
Trumpeter Swan	538,615	43,154	1	8
Colonial Nesting Birds	46,319	6,078	0	13
- American White Pelican	14,911	1,269	0	9
- Great Blue Heron	31,408	4,809	0	15
Sensitive Raptor Range	33,006,540	31,739	0	0
- Bald Eagle	4,382,724	31,710	0	1
- Peregrine Falcon	13,246	29	0	0
Key Wildlife Biodiversity Zone	4,689,713	508,249	6	11
Special Access Zone	1,763,820	494,249	6	28
Total Area of Upper Athabasca		8,298,067		

*Zones overlap each other (see Figure 47), so the areas are not additive.

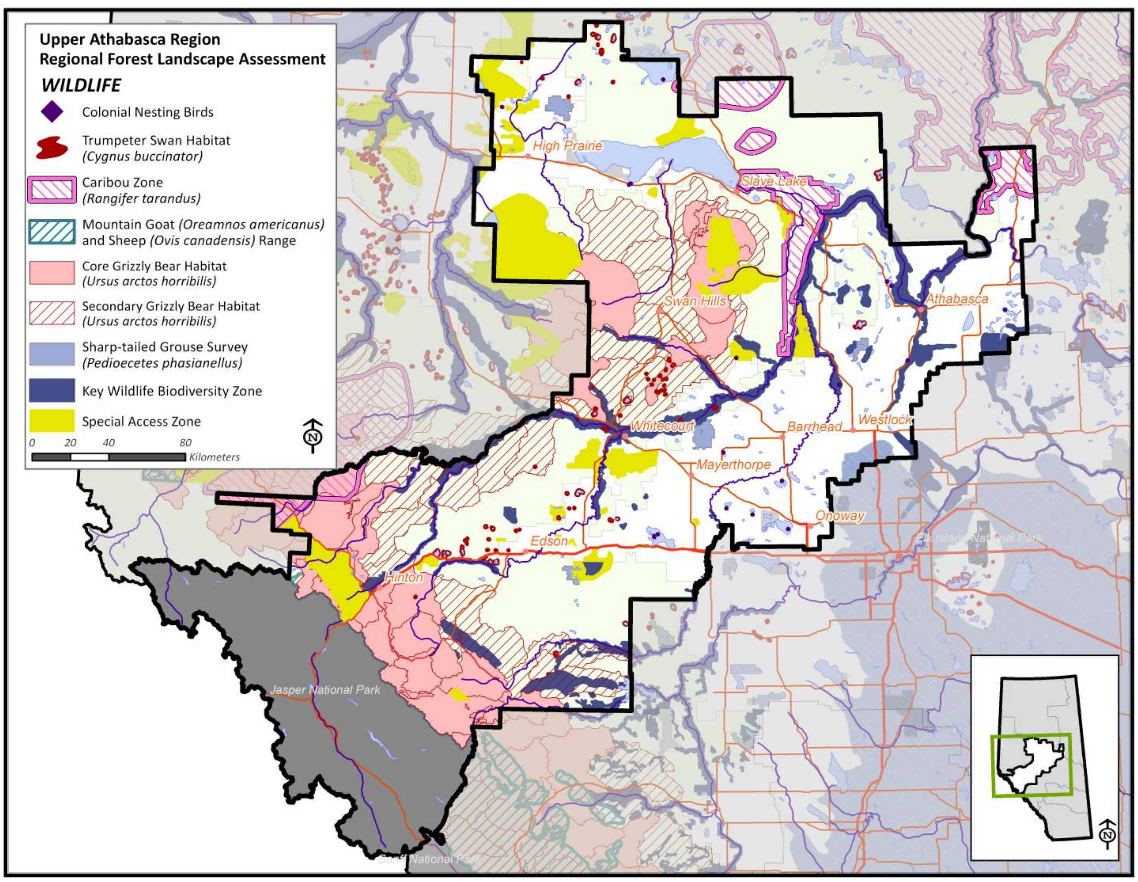


Figure 47 – GoA Wildlife Sensitivity Zones

HWP also has a five Special Management Areas (SMAs); a number of which overlap with the GoA's Wildlife Sensitivity Zones (see Table 40 and Figure 48). HWP uses these SMAs to identify areas of wildlife concern and the SMAs are used as a constraint in the timber supply schedule. Boundaries for these areas are those that were effective as of the landbase date (2012) with the exception of the caribou ranges which were updated to include amendments made by the GoA in 2013. Five separate areas resulted in six unique identifiers as the Little Smoky Caribou Range and the Pinto Creek Mountain Goat Special Management Area have 87.4 hectares of overlap.

Table 40 – HWP Special Management Areas for Wildlife

Special Management Area	Total Area (ha)	Percent of FMA Area
A la Peche Caribou Range	24,035	2.35%
Little Smoky Caribou Range	39,069	3.82%
Trumpeter Swan	538	0.05%
High Elevation Sheep and Goat SMA	1,301	0.13%
Pinto Creek Mountain Goat SMA	3,019	0.30%
Little Smoky Caribou Range and Pinto Creek Mountain Goat SMA (overlap)	87	0.01%
Total	68,048	6.66%

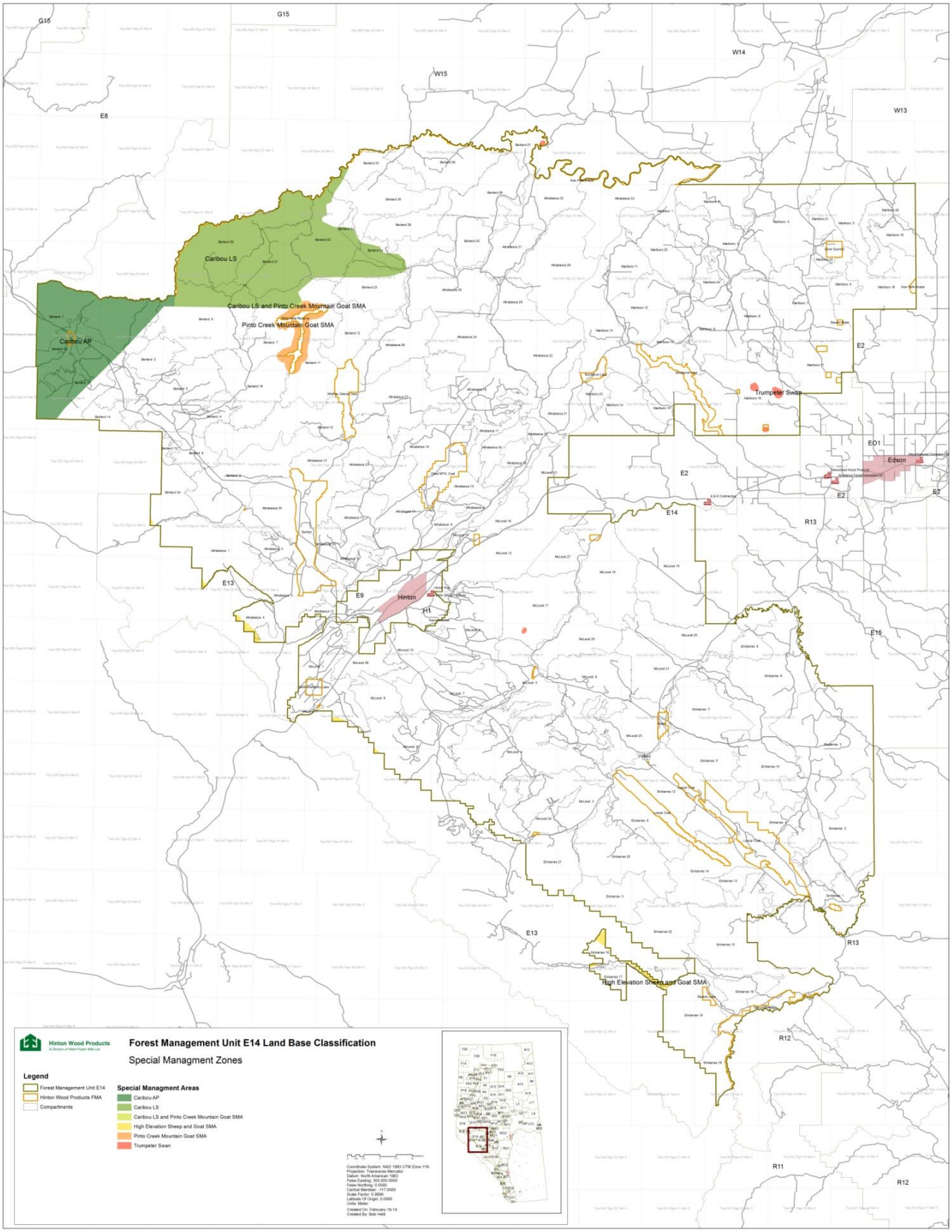


Figure 48 – HWP Special Management Areas for Wildlife on the Hinton FMA area

4.7 Landscape Assessment References

Alberta. Alberta Natural Resources Act. 1930. S.C. 1930. C.3

Alberta. Wildlife Act. Revised Statutes of Alberta, (2000). Chapter W-10.

Alberta. Environmental Protection. 1994. Natural Regions and Subregions of Alberta: Summary. Alberta Environmental Protection. Pub. No. I/531.

Alberta. Sustainable Resource Development. Resource Information Management Branch. (2005). Alberta Vegetation Inventory Interpretation Standards. Chapter 3 – Vegetation Inventory Standards and Data Model Documents. 99 pp.

Alberta. Sustainable Resource Development. Forest Management Branch. (2006). Alberta Forest Management Planning Standard Version 4.1. 114 pp.

Alberta. Sustainable Resource Development. Resource Information Management Branch. (2006b). Base Features Hydrography Update Specification V. 1.4 October 16, 2006.. 64 pp.

Alberta Sustainable Resource Development, Public Lands and Forests Division, Forest Management Branch. Alberta Forest Management Planning, Standard. Version 4.1 - April 2006

Alberta. Sustainable Resource Development. (2008). Land-use Framework. 58 pp.

Alberta. Weed Control Act. Statutes of Alberta, (2008a). Chapter W-5.1.

Alberta. Municipal Affairs. Municipal Services Branch (2010). 2010 Official Population List. 12pp.

Alberta. Environment and Sustainable Resource Development. Forest Management Branch. (2011). Retrieved from: http://srd.alberta.ca/LandsForests/ForestManagement/ForestManagementFactsStatistics/documents/AAC-CurrentFactsAndStatistics-2011.pdf

Alberta. Forest Management Branch, Alberta Environment and Sustainable Resource Development. Regional Forest Landscape Assessment for the Upper Athabasca Region. Forcorp Solutions Inc. December 2012

Andison, D.W. 1999. Assessing forest age data in foothills and mountain landscapes of Alberta. Alberta Foothills Disturbance Ecology Research Series Report No. 1. 24 pp.

Boreal Centre. 2002. The Natural Disturbance Model. Alberta Environmental Centre, Vegreville, AB. Retrieved from: http:// http://www.borealcentre.ca/reports/reports.html

Canada. Statistics Canada. (n.d.) Population and dwelling counts. Retrieved from: http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/hlt-fst/pd-pl/Table-Tableau.cfm?LANG=Eng&TABID=3&T=302&SR=1&RPP=9999&S=51&O=A&CMA=0&PR=48#C3

Canada. Natural Resources Canada. 2004. Canada's National Forest Inventory Design Overview. 13 pp.

Daishowa-Marubeni. 1999. A Physical, Biological and Land Use Synopsis of the Boreal Forest's Natural Regions of Northwest Albert. In: DMI Pulp River Pulp Division, Detailed Forest Management Plan – 2008. Retrieved from: http://www.dmi.ca/about_dmi/dmi_in_alberta/prpd/detailed_forest_management_plans/landscape_assessment.html

Foster, John E.. 2007 "Fur Trade. The Challenge of Settlement" The Canadian Encyclopedia. Historical Foundation, 2007. Retrieved from: http://www.thecanadianencyclopedia.com/articles/fur-trade

Johnson, E.A. 1992. Fire and vegetation dynamics: Studies from the North American boreal forest. Cambridge University Press, Great Britain.

McGarigal, K., S.A. Cushman, and E Ene. 2012. FRAGSTATS v4: Spatial Pattern Analysis Program for Categorical and Continuous Maps. Computer software program produced by the authors at the University of Massachusetts, Amherst. Retrieved from: http://www.umass.edu/landeco/research/fragstats/fragstats.html

Natural Regions Committee. 2006. Natural Regions and Subregions of Alberta. Compiled by D.J. Downing and W.W. Pettapiece. Government of Alberta. Pub. No. T/852.

Ranney, J.W., M.C. Bruner, and J.B. Levenson. 1981. The importance of edge in the structure and dynamics of forest islands. Pages 67-94 in R.I. Burgess and D.M. Sharpe, eds. Forest Island Dynamics in Man-Dominated Landscapes. Springer-Vergad, New York.

Rowe, J.S. and G.W. Scotter. 1973. Fire in the boreal forest. Quantitative Research 3(3): 444-464.

Song, S.J. (editor) 2002. Ecological basis for stand management: A synthesis of ecological responses to wildfire and harvesting. Alberta Research Council Inc., Vegreville, AB.

Stelfox, J.B. 1995. Relationships between stand age, stand structure, and biodiversity in aspen mixedwood forests in Alberta. Alberta Environmental Centre, Vegreville, AB. Retrieved from: http:// http://www.borealcentre.ca/reports/reports.html

Strong, W.L. and K.R. Leggat. 1992. Ecoregions of Alberta. Publication No. T/245. Alberta Forestry Lands and Wildlife, Land Information Services Division, Resource Information Branch, Edmonton, Alberta Canada. xii + 59 pp.

United Nations Environment Program. 1992. Convention on Biological Diversity, Rio de Janero. 1992.

5.0 PUBLIC INVOLVEMENT AND ABORIGINAL INVOLVEMENT

Hinton Wood Products is committed to sustainable forest management (SFM) and responsible stewardship. A key component of SFM is public involvement. The public is ultimately the owner of the forest and therefore must be given the opportunity to participate in its management.

The Company operates on a public resource under a contract (licensed tenure) with the provincial government. Our ability to maintain this social license is directly related to the public's belief that we are doing a good job of sustainable forest management. In order for the public to be able to develop an opinion on our performance, they need information about what the Company is doing and opportunities to provide feedback. For this reason, HWP developed (in consultation with our local public advisory group) a document titled, "Basic Operating Rules for the DFMP Public Participation Process", which outlines all the components of our Public Involvement Program, the different avenues for public feedback, as well as other related topics, such as: a dispute mechanism, a decision make process and timelines. HWP's Public Involvement Program is described in more detail in section 5.1 below and in Appendix 3a.

The Crown's duty to carry out Aboriginal consultation is rooted in the protection afforded to Aboriginal and Treaty rights under Section 35 of the Constitution Act, 1982. Consultation is a process intended to help parties understand and consider the potential adverse impacts of anticipated Crown decisions on the exercise of Treaty rights and traditional uses.

The legal responsibility for fulfilling Alberta's duty to consult with First Nations rests with the provincial government. Alberta undertakes substantive aspects of consultation, including determining if the duty to consult is triggered, assessing which First Nations to consult and at what level, ensuring that First Nations are provided with sufficient information to describe the proposed decision or activity, gathering information on First Nations concerns, and determining what, if any, accommodation is required.

Alberta may delegate procedural aspects of Aboriginal consultation to a third party, such as a project proponent like Hinton Wood Products. In the case of this DFMP, Alberta has delegated some responsibility for consultation of this proposed DFMP to HWP. As a result, HWP developed, and Alberta approved, an Aboriginal Consultation Plan for this DFMP. HWP's approved Aboriginal Consultation Program for this DFMP can be found in Appendix 4a. Further more specific information about HWP's Aboriginal consultation activities is described in section 5.2 and in Appendix 4b.

5.1 Public Involvement

HWP's Public Involvement Program for the development of this DFMP is described in HWP's approved Terms of Reference (Appendix 1), the document titled "*Basic Operating Rules for the DFMP Public Participation Process*" (Appendix 3a), and is also described briefly here below:

The goals of HWP's Public Involvement Program are to:

1. Give the public an opportunity to become proactively involved in the management of the Forest Management Area;
2. Use a public participation process to help improve the Hinton Wood Products' Sustainable Forest Management System (SFM) for our Forest Management Area;
3. Provide awareness of the opportunity for interested parties to participate through a local public advisory group (FRAG) member or by direct communication with Hinton Wood Products;
4. Collect, consider and respond to all input provided by interested parties;
5. Establish a list of interested parties to participate in continual improvement of the Hinton Wood Products SFM System; and
6. Increase the general awareness and understanding of sustainable forest management.

The major strategy used in seeking involvement from the public in the development of the DFMP was through the use of a public advisory group. This group, called the Forest Resources Advisory Group (FRAG), was first established in 1989. FRAG provides organized and regular public input to Hinton Wood Products, including feedback, comment, and input into development of the values, goals, objectives, and targets (VOITs) that form a key component of this DFMP.

FRAG was also established to select or identify and respond to issues, and consider and recommend actions and policies to Hinton Wood Products. FRAG is not a decision making body and Hinton Wood Products is not required to accept FRAG recommendations, but is committed to providing a rationale for decisions made. Currently FRAG has representation from the following interested parties:

- Hinton & District Chamber of Commerce
- United Steelworkers
- Hinton Ministerial Association
- Coal Association of Canada
- Town of Hinton
- Hinton Good Companions
- Alberta Teachers Association
- UNIFOR
- Yellowhead County
- Alberta Sustainable Resource Development (advisory)
- Hinton Fish & Game Association
- Jasper National Park
- Hinton All-Terrain Vehicle Society
- Alberta Trappers Association
- Friends of Switzer Park
- Hinton Neighbour Link
- Whisky Jack Club
- Fox Creek Development Association (Aboriginal non-profit business)
- Foothills Research Institute (advisory)
- Coalspur Mines (advisory)

In addition, each year, starting in 2012 (and ending in 2014), HWP produced a DFMP Summary Document. This Summary Document provided an easy to understand overview of the DFMP. Its other purpose was to provide an opportunity for the public, Aboriginal communities and other stakeholders to give feedback to HWP before the DFMP was submitted to the government for approval.

This Summary Document outlined important information contained within the DFMP, such as:

- An overview of the DFMP and the planning process in general.
- A summary of the main components of DFMP, such as the landbase determination, the Annual Allowable Cut (AAC) calculation, the 20-Year Spatial Harvest Sequence, VOITs, and strategies for major non-timber values on the FMA.
- A description of the numerous ways that the public can have direct input into HWP's operations.

Each spring, starting in 2012 (and ending in 2014), HWP hosted an open house in Edson and Hinton – advertisements were placed in local newspapers notifying the public of the time and location of these open houses, and specifically noted that HWP was in the process of developing a DFMP and was seeking input.

As part of the notification process for the above noted open houses, HWP also sent letters to over a 100 stakeholders (e.g. trappers, municipal government representatives, contractors, FRAG, local ENGOs, etc.) advising them of these open houses and their intent.

In the summer of 2014, after the VOIT table had been given "approval-in-principle" by the GoA and a Spatial Harvest Sequence (SHS) map had been created, HWP once again sent another letter to over 100 stakeholders (e.g. all trappers, FRAG members, local media, local government, local ENGOs, and local logging contractors) informing them of about the imminent submission of the 2014 DFMP and providing them with an attached DFMP Summary Document, which outlined all the important components of the DFMP and included a copy of the VOIT table and a copy of the SHS map.

After the DFMP has been approved, an "Approved" DFMP Summary Document will be developed by HWP. This document will describe in layperson's terms the highlights and important components of the DFMP. This document will be provided to all stakeholders (i.e. FRAG, trappers, local government, etc.) and any other interested parties.

In addition to all of the above noted methods and opportunities for public involvement, West Fraser also has a website in which we will annually post the previously discussed Summary Documents. This website contains a number of different ways for the public to contact HWP with questions, concerns, and/or input into the DFMP, including: email, regular mail, and a 1-800 phone number. Once the final DFMP is approved, it will also be posted on the West Fraser's website in its entirety.

Table 41 summarizes HWP public involvement process for the 2014 DFMP submission.

Table 41 – Public Participation Opportunities in the DFMP Development Process

Public participation opportunity	2012	2013	2014	2015 or 2016 (depending of date of approval)
FRAG Members	Review VOITs	Review VOITs	Review VOITs	Review Approved DFMP Summary Document
Open Houses	March 21st and 22nd in Edson and Hinton	March 27th and 28th in Edson and Hinton	March 26th and March 27th Edson and Hinton	Approved DFMP Summary Doc available at 2015 or 2016 Open House
2012, 2013, & 2014 DFMP Summary Document	2012 Summary Doc. available at March open houses	2013 Summary Doc. available at March open houses	2014 DFMP Summary Document sent out to 115 stakeholders	n/a
Letters to Stakeholders (e.g. trappers, FRAG members, municipal government, etc.)	Invitation to open houses, with attached 2012 Summary Doc.	Invitation to open houses, with attached 2013 Summary Doc.	• March - Invitation to open houses. • August – Invitation for feedback with attached 2014 DFMP Summary Document.	Invitation to open houses, with attached Approved Summary Document
Newspaper Advertisements (local Edson and Hinton newspapers)	Invitation to open houses specifically noting DFMP development	Invitation to open houses specifically noting DFMP development	Invitation to open houses specifically noting DFMP development	Invitation to open houses – noting an Approved DFMP Summary Document is available
Approved DFMP Summary Document	n/a	n/a	n/a	Available at open houses, mailed to stakeholder list.

The GoA's Planning Standard, through its adoption of the CSA Z809 SFM Standard, requires companies to seek comprehensive, continuing public participation and to work with Aboriginal peoples at the local community level. The public is to help identify forest values of specific importance to environmental, social, and economic concerns and needs. The public also takes part in the forest planning process and works with the organization to identify and select SFM objectives, indicators, and targets to ensure that these values are addressed.

All of the VOITs (see section 6.0) found within this 2014 DFMP have been discussed and vetted through HWP's Forest Resources Advisory Group (FRAG). This involved HWP staff members going through each VOIT and describing what the VOIT meant and how HWP was proposing to meet its intent through the establishment of indicators and targets. After each VOIT was discussed, FRAG members were asked if they had any issues, questions, concerns, or suggested changes to what was being proposed. Detailed minutes were kept of all these meetings. FRAG members were also asked to provide input into the final draft of the DFMP. In addition, HWP has made the commitment to annually report on the VOITs found within this DFMP, so that the public will continue to be involved and up-to-date on HWP's forest management practices. Significant effort was also made to provide opportunities for other "non-FRAG members" to participate, such as letters to a stakeholder list that included all trappers on the FMA area, local media, local government, ENGOs and contractors.

A record of all the public consultation associated with the development of this DFMP is found in Appendix 3b.

5.2 Aboriginal consultation

First Nation consultation regarding this DFMP is the responsibility of the Alberta Government, but portions of it can be delegated to the proponent (i.e. HWP). Under direction from the Government, potentially affected First

Nations were identified and contacted. Alberta required HWP to conduct extensive consultation with the following four First Nations (or equivalent):

1. Aseniwuche Winewak Nation of Canada
2. Alexis Nakota Sioux Nation
3. Ermineskin Tribe
4. O'Chiese First Nation

During 2012, an Aboriginal Consultation Plan was developed by the GoA/HWP DFMP Planning Team and approved by the GoA in February of 2013 (Appendix 4a). The Consultation Plan outlined four main consultation contact points over a three year period (once in 2012, once in 2013, and twice in 2014), with opportunities for follow-up meetings and/or field trips on request. A DFMP Summary Document was developed each year, which explained in plain language, the main components of the DFMP, including: VOITs, the Landbase, Yield Curves, Annual Allowable Cut, and the Spatial Harvest Sequence. As the development of the DFMP progressed from 2012 onward, more detailed information was supplied as part of the consultation package each year, culminating in the fall of 2014 with a full digital copy of the entire DFMP that was being submitted to the GoA for approval.

Table 42 below summarizes the main components of the approved Consultation Plan and when each component was consulted.

Table 42 – Summary of First Nation Consultation 2012-2014

Consultation Component	2012	2013	2014 (summer)	2014 (fall)
Consultation letter, explaining the main components of the DFMP, with an invitation to meet and discuss further.	Yes	Yes	Yes	Yes
Two follow up reminders regarding the consultation letter*	Yes	Yes	Yes	Yes
DFMP Summary Document – A document explaining in plain language the major components of the DFMP such as VOITs, Landbase, AAC, and the Spatial Harvest Sequence.	Yes	Yes	Yes	No
Terms of Reference for DFMP Development	n/a	Yes	No	Yes
Completed VOIT Table	n/a	n/a	Yes	Yes
Spatial Harvest Sequence map	n/a	n/a	Yes	Yes
Summary of Consultation given to the GoA	Yes	Yes	Yes	n/a
Complete digital copy of the final DFMP submission to the GoA	n/a	n/a	n/a	Yes
Summary of consultation log (RoC) from 2012 to 2014	n/a	n/a	n/a	Yes

*Reminders were only sent when required.

A complete copy of all the correspondence records between HWP and the four First Nations previously noted can be found in Appendix 4b. Please note that the documentation in Appendix 4b is broken into two separate documents – the first summarizes all of the consultation and associated documentation between the beginning of the DFMP consultation process (2012) to the submission of the DFMP on October 31, 2014; the second document summarizes consultation after the DFMP was submitted on October 31, 2014 and covers the periods of November and December 2014. These two documents (found in Appendix 4b) constitute the full consultation record for the First Nations consultation of this DFMP.

6.0 RESOURCE MANAGEMENT GOALS & VOITS

6.1 Resource Management Goals

Sustainable Forest Management (SFM) is defined in the Alberta Forest Management Planning Manual as "Management to maintain and enhance the long-term health of the forest ecosystems, while providing ecological, economic, social and cultural opportunities for the benefit of present and future generations." HWP is committed to managing to this philosophy of SFM.

At the beginning of this DFMP development process, HWP and the GoA agreed to five major goals for the DFMP. Goals can be thought of as broad statements of intent or direction relative to an aim, end or state of being used to achieve the desired future forest necessary to attain the balance of ecological, social and economic values. These five goals developed by HWP are listed, and their intent is described, below in Table 43:

Table 43 – Resource Management Goals

Goal	Intent
1. Maximize the conifer Annual Allowable Cut (AAC) from the contributing landbase.	To ensure that the maximum sustainable conifer harvest level is determined. The proposed coniferous utilization standard is 15/11/15 Tree Length (3.76 metre minimum log length), while the proposed deciduous utilization standard is 15/10/30 Tree Length (3. 66 metre minimum log length).
2. Follow Sustainable Forest Management principles to address a mix of both timber and non-timber values.	To ensure the management and consideration of all values the FMA landscape provides (not just timber).
3. Adapt and incorporate natural disturbance research into stand and landscape level harvesting strategies, including strategies for both the riparian and upland areas of the FMA.	To ensure the FMA is being managed using the best available scientific research on natural disturbance; acknowledging that both upland and riparian areas are adapted to periodic natural disturbance and should managed accordingly.
4. Include pine management strategies intended to reduce the amount of MPB susceptible lodgepole pine stands on the FMA.	To lower the risk of MPB spread within the FMA by concentrating timber harvest in mature pine stands in accordance with Alberta's pine management directive.
5. Develop and implement strategies to mitigate potential mid-term timber supply downfalls.	The primary emphasis will be to mitigate downfalls associated with a potential MPB epidemic outbreak. Key strategies will include delaying the harvest of pine stands with spruce/fir overstory or understory, mixed-wood stands, and pure spruce stands.

Achieving these five major goals are accomplished through the development of a hierarchy of Criterion, SFM Elements, Values, Objectives, Indicators, and Targets; as well as having strategies to implement them and methods to monitor and report on them. This hierarchy is based on the framework developed at part of the CSZ Z809 Standard for SFM, and is described in more detail in the following sections.

6.2 Background

The Canadian Standards Association (CSA) is a not-for-profit, independent standards writing organization. The CSA Sustainable Forest Management (SFM) Project was initiated in 1994, through funding and support of the Canadian forest industry. The purpose of the CSA Sustainable Forestry Management system was to provide a credible and recognized process for certifying sustainable forestry in Canada. The CSA system is based on the definition of SFM developed by the Council of Canadian Forest Ministers and implemented through a hierarchy of Criteria, SFM Elements, Values, Objectives, Indicators and Targets. The Criteria, which are also set by the Canadian Council of Forest Ministers, represent a broad and internationally accepted measure of sustainable forest management. The six Criteria are:

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 Contributions to Global Ecological Cycles*
5. *Multiple Benefits to Society*
6. *Accepting Society's Responsibility for Sustainable Development*

Although no single criterion is a measure of sustainability on its own, together they represent a measurable definition of sustainable forest management. In addition to the Criteria noted above, the Canadian Standards Association has further divided each of the Criteria into a total of 17 SFM Elements, which provide more clarity around each of the six Criteria.

As part of the CSA requirements, organizations need to develop, with significant input from the public, a set of Values, Objectives, Indicators, and Targets, commonly referred to as VOITs, which address each of the six criteria and 17 Elements.

This CSA-based framework of sustainable forest management was subsequently adopted by Alberta in 2004 as a key component of the Alberta Forest Management Planning Standard. Annex 4 of the Planning Standard outlines a minimum number of VOITs that must be addressed by all companies developing a Detailed Forest Management Plan in Alberta.

While Annex 4 does provide significant detail when describing the required Values and Objectives that must be addressed, the details around the specific Indicators and Targets are purposely less precise to allow each FMA holder the opportunity to develop Indicators and Targets specific to their particular circumstances. As part of the DFMP development process, a Plan Development Team (PDT), made up of representatives from Alberta and HWP, met regularly in the years leading up to the submission of this DFMP. A major function of the PDT, through negotiation and input from its members, was the development of customized VOITs for the Hinton FMA. This sometimes resulted in changes to the Annex 4 VOITs, due to improvements in science, better clarity in the wording, more measurable targets, changing policy, and other similar reasons. Each change to a VOIT in Annex 4 was vetted through the PDT and approved in that process by Alberta.

In addition to the input gathered through the Plan Development Team process, HWP also has given our Forest Resources Advisory Group (FRAG) the opportunity to provide significant input and feedback regarding the development of all the VOITs found in this DFMP. Because HWP was certified to the CSA Z809 Sustainable Forest Management Standard from 2000 to 2010, FRAG members were very familiar with the VOIT process. Many of the VOITs found within this plan were already discussed and vetted through FRAG as part of HWP's CSA certification process. Those VOITs that were not vetted through FRAG as part of the CSA process were subsequently discussed in detail with FRAG as part of this DFMP development.

As part of HWP's government approved Aboriginal Consultation Plan for this DFMP, Aboriginal communities were also given the opportunity to provide input in the development of the VOITs found in this plan. While provided the opportunity, there was limited uptake and feedback regarding VOITs from the First Nations and other non-status Aboriginal communities HWP consulted with.

From the six CSA Criteria and 17 SFM Elements, in conjunction with the Plan Development Team and our Forest Resources Advisory Group (representing various public stakeholders) and after consultation with First Nations, Aboriginal communities, and other public stakeholders or interested parties, HWP has developed Values, Objectives, Indicators and Targets, which help to assess our performance in meeting the five goals and six Criteria, as well as set out the work that needs to be done over the term of this DFMP. Together these VOITs form the basis, and key performance measurements, of this Detailed Forest Management Plan and the implementation of a Sustainable Forest Management system.

6.3 Definitions

This DFMP follows the definitions described in the Canadian Council of Forest Ministers (1995) and the CAN/CSA Z809:02 SFM Standard document. As previously noted, there are six SFM Criteria and 17 SFM Elements. Under each Criterion and SFM Element, Values and Objectives have been identified. To meet the Values and Objectives, a series of Indicators and Targets have been defined. Definitions are as follows:

- **Criterion** – A distinguishable characteristic of sustainable forest management; a value that must be considered in setting objectives and in assessing performance.
- **SFM Element** – A more specific component of the criterion. Each SFM Element relates to one Criterion; a Value, Objective, Indicator, and Target must be set for each SFM Element.
- **Value** – A DFA-specific characteristic or quality considered by an interested party to be important (e.g. ecosystem diversity, timber, etc.).
- **Objective** – a broad statement that describes a desired future state or condition for a DFA-specific value (e.g. maintain current levels of types of ecosystem diversity).
- **Indicator** – A variable that measures the state or condition of a DFA-specific value and for which one or more targets are set (e.g. age-class structure or the forest's stands).
- **Target** – A specific statement describing a desired future state of condition of an indicator (e.g. maintain forest age class within range of natural variability). A Target is commonly stated as a desired level of an indicator

6.4 Formatting and Presentation of Each VOIT

All of the above noted information is summarized in the Table 44's VOIT Performance Matrix. Within this table, each individual Target is numbered. Following Table 44, each numbered Target is discussed in detail, which includes further information regarding the VOIT, including the following:

- **Means to Identify Target** – The basis behind the target (i.e. how was it identified).
- **Legal/Policy Requirements** – Listing of the legal requirements associated with the target.
- **Means of Achieving Objective and Target** – The forest management strategies and actions utilized to achieve the target.
- **Monitoring and Measurement** – A description of HWP will monitor and measure the performance on achieving the target
- **Reporting Commitments** – A description of the commitments HWP has made for reporting on the status of the indicator and target.
- **Acceptable Variance** – The identification of the level of acceptable deviation from the target.
- **Response** – If the target is not met or is outside its acceptable variance, the response identifies what will have to change in regards to management, monitoring, or information collection in order to better address the target.
- **HWP Strategy** – A discussion about how HWP is planning to meet the target.
- **DFMP Reporting** – A report describing the current and future status of the indicator including other information pertinent to the Target such as definitions, spatial reporting scales, temporal reporting scales, graphs, charts, tables, and maps.

6.5 VOIT Performance Matrix

Table 44 on the following pages summaries each Value, Objective, Indicator, and Target included in this DFMP. Within Table 44, the Criterion, Elements, Values, and Objectives that are the same as the Annex 4 Criterions, Elements, Values, or Objectives are given the same corresponding number in Table 44 as in Annex 4. If there is no number assigned to the Value or Objective in Table 44; this is because it is a new Value or Objective developed by the PDT. Following Table 44, each of the 45 Targets are discussed in detail.

Table 44 – VOIT Performance Matrix

Criterion	SFM Element	Value	Objective	Indicator	#	Target
1. Biological Diversity	(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.	(1.1.1) Landscape scale biodiversity	(1.1.1.1) Maintain biodiversity by retaining the full range of cover types and seral stages	Area by seral stage	1	Over the 200 year planning horizon, the area in the following four seral stages: • Young, Pole, Early Mature, Late Mature, and Old and the following five vegetation types: • Pine (pine leading), white Spruce (white spruce leading), black spruce (black spruce or larch leading), mixedwood, and deciduous will be maintained between the 12.5 percentile and the 87.5 percentile of the NRV for the gross and contributing FMA landbase as described in Table 47, Table 48, Table 50, and Table 51 and the graphs found in Appendices 5 and 7. These ranges are based on the Natural Range of Variation for each seral stage as determined by the Andison LANDMINE model. A more detailed description of the NRV calculations and how they were used to inform each target is described in the HWP Natural Disturbance Strategy found in Appendix 2.
			(1.1.1.2) Maintain biodiversity by avoiding landscape fragmentation	Range of patch sizes by subunit and entire FMA	2	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
				Area of old interior forest of each cover class by subunit and entire DFA	3	Area of old interior forest will not be less than 10% of each cover class over the next 200 years
			(1.1.1.3) Maintain biodiversity by minimizing access	Open all-weather forestry road density by subunit	4	In core grizzly bear habitat units the target will be to have less 0.6 km/km2 of open all-weather forestry road.
					5	In secondary grizzly bear habitat units the target will be to have less than 1.2 km/km2 of open all-weather forestry roads.
					6	Incorporate access density targets as in approved caribou range plans.
				Open seasonal / temporary forestry road length by FMA	7	Less than 250 km of open temporary road for the FMA.
			(1.1.1.4) Maintain plant communities uncommon in FMA or province	Area or occurrence of each uncommon plant community within DFA	8	Apply a Standard Operating Procedure to conserve uncommon plant communities for 100% of known and encountered occurrences (plant communities are listed in the Stewardship Report table and this DFMP text under Target #8).
			(1.1.1.5) Maintain unique habitats provided by wildfire	Unsalvaged natural stand replacing disturbances	9	The cumulative total area of unsalvaged natural stand replacing disturbances will be at least 25% of area disturbed based on a 20 year rolling average.

Criterion	SFM Element	Value	Objective	Indicator	#	Target
			and blowdown events		10	Apply operational procedures to address unsalvaged trees and patches at salvage planning stage.
			(1.1.1.6) Retain ecological values and functions associated with riparian zones	Compliance with the riparian-related sections of the Operating Ground Rules	11	100% consistent and compliant with the DFMP's Riparian Management Strategy
					12	Zero non-compliance incidents on an annual basis.
		(1.1.2) Local/stand scale biodiversity	(1.1.2.1) Retain stand level structure	The percentage area of residual structure (both living and dead), within an event, which is representative of the status (live/dead), sizes, and species of the forest by Natural Subregion and FMA.	13	HWP will maintain its current target of retaining 1% of the harvest area within harvest openings on an FMA-wide basis, as described and prioritized in the current version of the Company's Operating Ground Rules.
				Coarse Woody Debris levels by harvest area.	14	100% of harvest areas retain Coarse Woody Debris (CWD)
			(1.1.2.2) Protect and maintain the integrity of rare ecological sites, sensitive sites, and special landscape features.	Special Features	15	Identify and document any special features found through HWP's Standard Operating Procedures (Special Features SOP & Form – EM-0054) and Special Places in the Forest Program - develop a management strategy for each identified site within 12 months.
			(1.1.2.3) Maintain aquatic biodiversity by minimizing impacts of water crossings	New Company water crossings in compliance with Code of Practice for Water Course Crossings within each subunit	16	New crossing designs meet standards of the Code of Practice for Water Course Crossings
				Non-HWP water course crossings	17	Participate in the Foothills Stream Crossing Partnership.
			Maintain aquatic biodiversity by minimizing impacts of water crossing and protecting water quality	Company watercourse crossings inspection and remediation program	18	HWP will continue to implement its Stream Crossing Inspection Program and maintain an inventory of all HWP watercourse crossings on the Hinton FMA.
					19	HWP will remediate Company stream crossings (old and new) not meeting current standards on watercourses according to an annual action plan. The annual action plan will be updated throughout the course of the year to address unforeseen crossing issues.
	(1.2) Species Diversity –	(1.2.1) Viable	(1.2.1.1) Maintain	Species Conservation	20	SHS maintains suitable habitat supply (area) within 10% for selected

Criterion	SFM Element	Value	Objective	Indicator	#	Target
	Conserve species diversity by ensuring that habitats for the native species found in the FMA are maintained throughout time.	populations of identified plant and animal species	habitat for identified high value species (i.e., economically valuable, socially valuable, species at risk, species of management concern)	Strategies inclusive of area (ha) of suitable habitat within the DFA or subunit for American Marten, Barred Owl, Trumpeter Swan, Grizzly Bear and Woodland Caribou		species (American marten, barred owl, trumpeter swan, grizzly bear and woodland caribou) as determined by habitat supply analysis or as set in Recovery Plans.
					21	Complete species conservation strategies for all species at risk (SARA and Alberta designations) within 6 months of designation, update strategies at least every 2 years and report on results of strategies annually.
	(1.3) Genetic Diversity – Conserve genetic diversity by maintaining the variation of genes within species.	(1.3.1) Genetic integrity of natural tree populations	(1.3.1.1) Retain "wild forest populations" - for each tree species in each seed zone through genetic conservation areas established by the company or in cooperation with Alberta.	Number and area (ha) of in situ genetic conservation areas	22	Each seed zone that occurs in the Hinton FMA area, that requires a conservation area, will have one or more genetic conservation areas established, but those areas may not necessary be on the Hinton FMA.
			(1.3.1.2) Conserve wild forest genetic resources through gene archiving.	Provenances and genetic lines in gene banks and trials	23	Active conservation program for all species on the FMA that have a tree improvement program.
	(1.4) Protected Areas and Sites of Special Biological Significance – Respect protected areas identified through government processes. Identify sites of special biological significance within the DFA and implement management strategies appropriate to their long-term maintenance	(1.4.1) Areas with minimal human disturbances within managed landscapes	(1.4.1.1) Integrate trans-boundary values and objectives into forest management	HWP participation in consultative and integrative processes	24	Follow existing consultative and integrative processes: a. HWP's Forest Resources Advisory Group (FRAG) b. HWP's Forest Harvest Plan process c. HWP's (and FRMA's) Recreation Program d. West Yellowhead Mountain Pine Beetle Coordinating Committee e. FireSmart f. HWP Long Term Access Plans
		Sites of special biological significance	Protect and maintain the integrity of rare ecological sites, sensitive sites, and special landscape features.	Special Features	n/a	Same as Target #15
2. Maintenance and Enhancement of Forest Ecosystem Condition and Productivity	(2.1) Forest Ecosystem Resilience – Conserve ecosystem resilience by maintaining both ecosystem processes and ecosystem conditions.	(2.1.1) Reforested harvest areas	(2.1.1.1) Meet reforestation targets on all harvested areas	Annual % of SR establishment surveys	25	90% of blocks surveyed (establishment surveys) will be Satisfactorily Restocked (SR) on the first survey.
				Cumulative percentage of reforested areas that meet reforestation target	26	90% of post-91 blocks surveyed (establishment surveys) will be Satisfactorily Restocked (SR).

Criterion	SFM Element	Value	Objective	Indicator	#	Target
		(2.1.2) Maintenance of forest landbase	(2.1.2.1) Limit conversion of productive forest landbase to other uses	Amount of change in the forest landbase	27	Maintain or minimize the loss of forest landbase by: a. Participate in the FLMF/GoA regional access plan process (e.g. TFA administration process) b. Track the net FMA landbase withdrawals for use by Crown to be < 1% of total FMA landbase as of May 1, 2008 c. Measure and track the industrial footprint by disposition type.
			(2.1.2.2) Recognize lands affected by insects, disease or natural calamities	Amount of area disturbed	28	Report on area (ha) affected by natural disturbances such as insect, diseases, fire, wind, hail etc.
		(2.1.3) Control invasive species	(2.1.3.1) Control non-native plant species (weeds)	Noxious weed program	29	Continue to implement the Company's noxious weed program.
3. Conservation of Soil and Water Resources	(3.1) Soil Quality and Quantity - Conserve soil resources by maintaining soil quality and quantity.	(3.1.1) Soil productivity	(3.1.1.1) Maintain soil productivity	% Compliance with Company OGR	30	Complete compliance with Company Operating Ground Rules
			(3.1.1.2) Minimize incidence of soil erosion and slumping	Incidence of soil erosion and slumping	31	Complete compliance with Forest Soil Conservation Guidelines and Stream Crossing Guidelines.
	(3.2) Water Quality and Quantity – Conserve water resources by maintaining water quality and quantity	(3.2.1) Water quantity	(3.2.1.1) Limit impact of timber harvesting on water yield	Compliance with the Water Act and the DFMP	32	Zero Water Act penalties and complete compliance with DFMP
			Evaluate impact of timber harvesting on water yield	Maximum percent increase in annual water yield	33	All identified watershed basins within the FMA will undergo an Alberta "Equivalent Clear-cut Area" (ECA) analysis. For each watershed, HWP will report on the maximum annual water yield increases projected by the Alberta ECA model.
		(3.2.2) Effective riparian habitats	Retain ecological values and functions associated with riparian zones	Compliance with the riparian-related sections of the Operating Ground Rules.	34	100% consistent and compliant with the DFMP's Riparian Management Strategy and associated OGRs.
4. Forest Ecosystem Contributions to Global Ecological Cycles	(4.1) Carbon Uptake and Storage – Maintain the processes that take carbon from the atmosphere and store it in forest ecosystems	Ecological processes	Maintain the ecological processes that are responsible for recycling water, carbon, nitrogen and other life sustaining elements	Reforestation Delay	35	Commence reforestation on 80% of Hinton Wood Products harvested area within 1 year of harvest, and 100% of harvested area within 2 years of harvest
	(4.2) Forest Land Conversion – Protect forestlands from deforestation or conversion to non-forests.	Maintenance of forest landbase (same as 2.1.2).	Limit conversion of productive forest landbase to other uses (same as 2.1.2.1).	Amount of change in the forest landbase (same as Target #27).	n/a	Same as Target #27.

Criterion	SFM Element	Value	Objective	Indicator	#	Target
5. Multiple Benefits to Society	(5.1) Timber and Non-Timber Benefits – Manage the forest sustainably to produce an acceptable and feasible mix of both timber and non-timber benefits.	(5.1.1) Sustainable timber supplies	Maintain the sustainable productive capacity of ecosystems	Annual Timber Harvest (m3)	36	Establish appropriate AAC using the process and standards described in Annex 1 & 2 of the GoA Planning Standard and comply with cut control requirements specified in the Forest Management Agreement.
	(5.2) Communities and Sustainability – Contribute to the sustainability of communities by providing diverse opportunities to derive benefits from forests and to participate in their use and management	(5.2.1) Risk to communities and landscape values from wildfire is low.	(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	FireSmart cooperative initiatives	37	Cooperate with all GoA FireSmart initiatives around communities within or bordering the FMA
				Percentage reduction in Fire Behaviour Potential area (ha) across the DFA now and over the planning horizon	38	Reduce the area (ha) in the extreme and high Fire Behaviour Potential rating categories by 5% across the DFA
		(5.2.2) Provide opportunities to derive benefits and participate in use and management	Ensure land use management and planning processes include timely, fair, open and equitable public involvement	Activities that allow interested parties to participate in the decision making process	39	Conduct three open houses annually to provide opportunities for the public to review plans, provide feedback, and ask questions about Hinton Wood Products' sustainable forest management practices.
					40	Annually, report publicly on FRAG's activities.
					41	Annually publicly solicit new membership groups/organizations not already represented.
		(5.2.3) Forest Productivity	(5.2.3.1) Maintain Long Run Sustained Yield Average	Regenerated stand yield compared to natural stand yield	42	Average regenerated stand yield is greater than or equal to average natural stand yield.
6. Accepting society's responsibility for sustainable development	(6.1) Aboriginal and Treaty Rights – Recognize and respect Aboriginal and treaty rights. (6.2) Respect for Aboriginal Forest Values, Knowledge and Uses – Respect traditional Aboriginal forest values and uses identified through the Aboriginal input process	Respect for Aboriginal and treaty rights & Aboriginal consultation	Respect and accommodate the special and unique rights and needs of aboriginal peoples in forest management decisions.	Aboriginal Consultative Activities	43	Annually conduct consultative activities as required under Alberta's "First Nations Consultation Guidelines on Land Management and Resource Development" and as directed by Alberta annually as part of the HWP's GDP submission and as outlined in approved HWP Aboriginal Consultation Plans.
					44	Hinton Wood Products may also conduct consultative activities voluntarily with other local Aboriginal communities.
	(6.3) Public Participation –	(6.2.1) Meaningful public	Implement public involvement program	Consultation Opportunity and	45	Develop, implement, monitor, and report on a public participation process that meets the requirements of CSA Z809-02 Standard

Criterion	SFM Element	Value	Objective	Indicator	#	Target
	Demonstrate that the SFM public participation process is designed and functioning to the satisfaction of the participants.	involvement is achieved	ensuring broad participation of interested parties in forest management decision-making processes.	Participation	39	Conduct three open houses annually to provide opportunities for the public to review plans, provide feedback, and ask questions about Hinton Wood Products' sustainable forest management practises.
					40	Annually, report publicly on FRAG's activities.
					41	Annually publicly solicit new membership groups/organizations not already represented.

6.6 Target Detail

Each of the 45 Targets from the VOIT Performance Matrix (Table 44) is discussed in detail in the following sections.

TARGET #1 – Seral Stage

Value	Landscape scale biodiversity
Objective	Maintain biodiversity by retaining the full range of cover types and seral stages
Indicator	Area by seral stage
TARGET #1	Over the 200 year planning horizon, the area in the following four seral stages: • "Young", "Pole", "Early Mature", and "Late Mature plus Old" and the following five vegetation types: • Pine (pine leading), white Spruce (white spruce leading), black spruce (black spruce or larch leading), mixed wood, and deciduous will be maintained between the 12.5 percentile and the 87.5 percentile of the NRV for the gross and contributing FMA landbase as described in Table 47, Table 48, Table 50, and Table 51 and the graphs found in Appendices 5 and 7. These ranges are based on the Natural Range of Variation for each seral stage as determined by the Andison LANDMINE model. A more detailed description of the NRV calculations and how they were used to inform each target is described in the HWP Natural Disturbance Strategy found in Appendix 2 and in Bandaloop's final NRV report found in Appendix 24.
Means to Identify Target	Targets and seral stage definitions are based on sound science (e.g. LANDMINE model), ecological considerations, wildlife zones, and disturbance regimes. The targets will ensure representation of natural range of ecosystem attributes (e.g., productivity class)
Legal/Policy Requirements	Planning Standard
Means of Achieving Objective and Target	Spatial temporal harvest planning
Monitoring and Measurement	Regular updates to inventory
Reporting Commitments	• DFMP: Tables of indicators (values and targets) at 0, 10, 50, 100, and 200 years. Maps of indicators at 0, 10 years, 50 years for the gross and contributing landbases • Performance: 5-Year DFMP Stewardship Report
Acceptable Variance	It will be an acceptable variance if the cover type and seral stage is outside the 12.5 and the 87.5 percentiles (i.e. the middle 75%) of the NRV but within the overall Natural Range of Variation. In all cases where the middle 75% target has not been met, HWP will describe the primary driver/rationale on why the scenario is beyond the 12.5 and 87.5 quartiles and any applicable "response" strategies.
Response	Adjust strategies in subsequent DFMP
HWP Strategy	See section 3.31 in HWP's Natural Disturbance Strategy found in Appendix 2.

1.0 Target #1

Definitions

A. Seral Stage – The definitions for the five seral stages chosen are discussed in detail in HWP's Natural Disturbance Strategy found in Appendix 2. A summary of how each seral stage was demarcated is outlined in Table 45 below:

Table 45 – Seral Stage Definitions

Seral Stage definition	General Description of Seral Stage	
	Fire-origin	Harvest-origin*
Young	Starts with a major disturbance and continues until regenerated trees have dominated the site and crown	Starts with harvest and continues until regenerated trees have dominated the site and crown closure

Seral Stage definition	General Description of Seral Stage	
	Fire-origin	Harvest-origin*
	closure occurs. This usually occurs around 20-30 years of age post disturbance.	occurs. This usually occurs around 20-30 years of age post disturbance.
Pole	Young crown closure to when stand volume is equal to 100 m3/ha	Young crown closure to when stand volume is equal to 100 m3/ha
Early Mature	Volume/ha > 100m3/ha	Volume/ha > 100m3/ha
Late Mature	10 years post peak Mean Annual Increment (MAI)	10 years post peak Mean Annual Increment (MAI)
Old	10 years post peak highest vol/ha	Old fire-origin equals old harvest-origin

*If harvest-origin age is slightly older than fire-origin – default to fire-origin age.

After the NRV analysis for this VOIT was completed and after the DFMP was first submitted to the GoA for approval (Oct 2014), GoA staff asked that HWP combine the older two seral stages (i.e. late mature and old) into one seral stage called, "late mature + old". In this revised DFMP submission, the two older seral stages have been combined into one for the purposes of this VOIT.

B. Cover Types – The descriptions for each of the seven cover types and age classifications for each seral stage (depending on whether or not the stand is fire-origin or harvest origin) are outlined in Table 46 below:

Table 46 – Cover Type Descriptions and Seral Stage Age Thresholds

Cover Type	Description	Coniferous Composition	Stand Origin	Seral Stage					Late Mature + Old
				Young	Pole	Early Mature	Late Mature	Old	
Pine Leading	Pl, Pl-Sb, Pl-Fb, Pl-Sw	80% or greater	Fire-origin	0-19	20-69	70-119	120-159	160+	120+
			Harvest-origin	0-19	20-49	50-99	100-159	160+	100+
White Spruce	Sw, Sw-Pl, Sw-Fb, Se, Se-Sb, Fb	80% or greater	Fire-origin	0-19	20-49	50-99	100-159	160+	100+
			Harvest-origin	0-19	20-49	50-99	100-159	160+	100+
Black Spruce	Sb, Lt, Sb-Lt, Sb-Se	80% or greater	Fire-origin	0-29	30-89	90-109	110-189	190+	110+
			Harvest-origin	0-29	30-89	90-109	110-189	190+	110+
Mixed Wood	Aw-Sw, Aw-Pl, Sw-Aw, Pl-Aw	<80% and >20%	Fire-origin	0-19	20-59	60-109	110-149	150+	110+
			Harvest-origin	0-19	20-49	50-99	100-149	150+	100+
Deciduous	At, At-Pb, Pb-At, Pb	20% or less	Fire-origin	0-19	20-59	60-109	110-149	150+	110+
			Harvest-origin	0-19	20-59	60-109	110-149	150+	110+
Vegetated non-forested	n/a	Meadows, etc.	n/a	n/a	n/a	n/a	n/a	n/a	
Non-vegetated, non-forest	n/a	Lakes, rock, etc.	n/a	n/a	n/a	n/a	n/a	n/a	

Overview and Analysis

Tables, graphs, and maps in the following sections describe the status of this Target and where it lies with respect to its Natural Range of Variation (NRV) at a number of different points in time (e.g. Year 0 (2012), Year 10 (SHS), Year 50, Year 100, and Year 200), and at the following spatial scales:

- Gross FMA – All area within the outside perimeter of the FMA boundary, not including non-FMA land (e.g. Obed Mine, Switzer Park, Town of Hinton, etc.).
- Contributing landbase – All areas within the outside FMA perimeter that actively contribute to the Annual Allowable Cut (i.e. operable land with no deletions)

In addition, HWP has also voluntarily reported on the status of this seral stage indicator at a number of additional spatial scales. This has been done to provide additional information around what is happening to the NRV for each seral stage and cover type within riparian, wetland, and upland areas (on the gross, contributing, and passive landbases) and on the passive landbase. This will help inform future management decisions by HWP and the GoA. These additional spatial scales are described below.

- Riparian, Wetland, and Upland – In 2013, a project was completed that digitally mapped all the riparian areas on the Hinton FMA (Green-Link - Kristoff and Paranich 2013) based on ecological and morphological characteristics of the riparian areas. Details of the methodology used in this digitizing project can be found in Appendix 2 (Appendix 2). Further details about why HWP chose to delineate riparian areas based on ecological and morphological characteristics (rather than stream-wide, which is the current status quo in Alberta) are discussed in HWP's Riparian Management Strategy found in Appendix 2 (Appendix 2). This digitizing project resulted in three types of area within the FMA

A. *Riparian* – A riparian area associated with either a fluvial or seepage-fed water channel as defined by the Erosion Based Channel Classification (McCleary 2013), found in Appendix 2 (Appendix 2). In addition, a third category of riparian area called "complex" was also classified by Green-Link (Kristoff and Paranich 2013) – this was riparian that was too complex to classify as being associated with either seepage-fed, fluvial or wetland. This "complex" classification represents a very low percentage of all the riparian area classified and was only found in one protected area.
B. *Wetland* – HWP possesses an FMA-wide ecosite inventory call the Ecosite Land Classification (ELC) (Downing, 2004). To assist with the Green-Link riparian delineation project, wet sites were provided as a guide to the interpreters of the riparian project. Any isolated wet sites which were not associated with a riparian area were given a wetland call.
C. *Upland* - Neither riparian nor wetland.

Following each report on the gross, contributing, and passive landbase, there are sections that describe the NRV for the riparian, wetland, and upland for each of these landbase designations, including forecasts for the landscape condition in the riparian, wetland, and upland for Year 0, Year 10, Year 50, and Year 100.

- Passive landbase – All areas within the outside perimeter of the FMA that are not available for harvest due to numerous factors such as steep slopes, wet soils, other tenures, etc.

2.0 Report –Target #1 (Gross FMA Landbase NRV by Seral Stage and Cover Type)

Table 47 and Table 48 outline the Natural Range of Variability (NRV) for each seral stage and cover type for the gross FMA landbase. NRV is presented in these tables as a range from the lowest number of hectares of a cover type and seral stage to the highest number of hectares of the same seral stage and cover type (and their corresponding percentages). In addition, the table shows where the 12.5 percentile and 87.5 percentile of these data lie – in other words, these percentiles bracket where the data falls 75% of the time. These tables also describe what the current status of the indicator is at Year 0 (2012), Year 10, Year 50, Year 100, and Year 200 for the gross landbase.

Graphs

Appendix 5 provides NRV graphs for the gross FMA landbase for each of the cover types and seral stages on the gross FMA area. In each graph, NRV is defined and the landscape condition in Year 0 (2012), Year 10 (SHS), Year 50, Year 100 and Year 200 is noted. The graphs describe the relative frequency distribution of the amount of forest in the specified forest type and seral-stage for the gross FMA landbase as noted based on 100 LANDMINE consecutive model runs captured in ten year increments.

On each graph the median of the 100 samples is shown as a vertical solid line. The median is the mid-point of the sample data; 50% of the samples are greater than the median and 50% are less. Also shown on each graph is the range from the 12.5 to the 87.5 percentile (green shaded box). This box captures the middle 75% of the data.

Relative frequency describes the percent chance that a particular seral stage (e.g. young) will account for a particular percentage of a cover type (e.g. pine). For example, a graph found in Appendix 5 shows that 26% of the time, pine-leading forests on the gross FMA landbase will consist of 10-20% young forest.

Maps

Figure 49, Figure 50, Figure 51, Figure 52, and Figure 53 are five maps of the gross FMA landbase showing the spatial location of the five forested cover types at Year 0 (2012), Year 10, and Year 50.

Figure 54 contains three maps of the gross FMA landbase showing the spatial distribution of the four seral stages (regardless of cover type), also at Year 0 (2012), Year 10, and Year 50.

Discussion

The gross landbase is the best scale to look at the success of any NRV based plan – as all of the hectares (except protected areas, towns, and mines) within the landscape contribute and influence the patterns created on the landscape through harvesting.

Looking at the entire FMA gross landbase, regardless of cover type (Table 47), the current and future condition of each of the four seral stages, remains within NRV over the entire 200 year forecast. There is only one seral stage ("early mature") that is forecasted to be within NRV but outside of the middle 75% of the data (shaded yellow in Table 47). This occurs at Year 50, Year 100 and Year 200 and in each situation there are only slightly too many hectares of early mature. Because we are only very minimally over the 87.5 percentile, HWP will have many opportunities over the next five decades to make adjustments to slightly lower the amount of early mature on the gross landbase (through additional harvesting).

When the gross landbase is further broken down by cover type (Table 48), all of the pine, white spruce, mixed wood and deciduous cover types and seral stages remain within NRV over the 200 year forecast. The only cover type that has any seral stage outside of NRV is the black spruce cover type (too much old and not enough young). This certainly makes sense as HWP is not targeting black spruce cover types as they tend to be unmerchantable (and make up the majority of the passive landbase), so the longer these types remain unharvested (or unburned), the older they become, resulting in too much hectares of older seral stages and not enough hectares of the younger ones.

The following is a discussion regarding the status of NRV in each of the five cover types as described in Table 48:

Pine

The pine cover type (pine leading) makes up 51.7% of the forested gross landbase; making it the largest cover type within the FMA area. Within this cover type, all seral stages were within NRV over the 200 year planning horizon. There was only one seral stage; "early mature" (70-119 years), which was not between the 12.5 and 87.5 percentile (i.e. where it is 75% of the time) – this occurred in the Year 50 and Year 200 forecasts. In both cases there was too much early mature, because harvesting of the pine has not kept up with what natural disturbance would have created. Because there is too much of this older seral stage, there will be opportunities to create less "early mature" (by harvesting slightly more) in future plans.

White spruce

The white spruce cover type (white spruce leading) makes up 14.3% of the forested gross landbase; making it the third largest cover type within the FMA area. Within this cover type, all seral stages were within NRV over the 200 year planning horizon. There were two seral stages; "late mature plus old" (100+ years) and "pole" (20-49 years), which were not between the 12.5 and 87.5 percentile in three instances. For "pole", we are slightly below the 12.5 percentile in Year 0 (2012) and therefore cannot do anything to change this (i.e. as this is not a forecast, it's the current condition). For "late mature plus old", we are above the 87.5 percentile and thus there is too much of this seral stage in Year 0 and Year 10 – in fact, having this much older white spruce on the landscape only natural occurs approximately 3% of the time. Essentially there is a little too much older white spruce on the landscape and not enough of the younger pole seral stage – this is likely the result of the amount of white spruce that is not logged due to it being located in riparian buffers (almost 25% of all the white spruce cover type is in the passive landbase). If 25% of this cover type is not harvested, the overall cover type begins to get older as no new disturbances are being created. By implementing the SHS found in this plan, HWP has been be able to move this cover type back into the middle 75% of NRV by year 50; where it remains for the rest of the planning horizon.

Black Spruce

The black spruce cover type makes up 13.1% of the forested gross landbase; making it the fourth largest cover type within the FMA area; however, 97% of this cover type is within the passive landbase, which makes it impossible for HWP to have any significant impact on the seral stage distribution (because we don't harvest on the passive landbase). Within this cover type, three out of the four seral stages ("young", "pole", and "late mature plus old") were outside of NRV at eight different time periods over the 200 year planning horizon and three out of four seral stages ("pole", "early mature", and "late mature plus old") were either above or below the 12.5 and 87.5 percentiles in five different time periods. In general, there is too much older forest seral stages (i.e. "early mature" and "late mature plus old") and too little younger forest seral stages (i.e. "young" and "pole"). The only way this can be effectively changed is either to introduce some type of disturbance (e.g. prescribed fire, harvesting, etc.) into this cover type or stop supressing forest fires here (not a palatable option). While there are a number of times when this seral stage is outside NRV or outside of the middle 75%, HWP has no plans to address this as we do not operate on the passive landbase; however, HWP would suggest that the issue of having too much old and not enough young black spruce is something that the GoA should further investigate to determine if there are other options to address this issue.

Mixed Wood

The mixed wood cover type makes up 14.7% of the forested gross landbase; making it the second largest cover type within the FMA area. Within this cover type, all seral stages were within NRV over the 200 year planning horizon. There were two seral stages; "early mature" (60-109 years) and "late mature plus old" (110+ years), which were not between the 12.5 and 87.5 percentile in six cases. This would be because over the last 60 years harvesting has not disturbed as many mixed wood hectares as natural disturbance would have.

The "early mature" seral stage was over the 87.5 percentile in Year 50, 100, and 200; in other words, there was too much "early mature" – this can be addressed in future FMPs through additional harvesting. The "late mature plus old" seral stage was just over the 87.5 percentile in Year 0 (2012) and Year 10 (i.e. too much old), but through the implementation of the SHS, it was brought back into the middle 75% by Year 50, where it stays until Year 200 where it falls 0.1% below the 12.5 percentile. As this is only very slightly below the 12.5 percentile and this occurs in Year 200, HWP will have numerous opportunities to address this in future FMPs.

Deciduous

The deciduous cover type makes up 6.2% of the forested gross landbase; making it the smallest cover type within the FMA area. Within this cover type, all seral stages were within NRV over the 200 year planning horizon. There were two seral stages; "late mature plus old" (110+ years) and "pole" (20-59 years), which were not between the 12.5 and 87.5 percentile in three cases. For "pole", we are slightly below the 12.5 percentile in Year 10, however, through the implantation of the SHS this seral stage moves back into the middle 75% by Year 50 where it stays for the remainder of the planning horizon. For "late mature plus old", we are above the 87.7th percentile and thus there is too much of this seral stage in Year 0 and Year 10 – in fact, having this much older deciduous on the landscape only natural occurs approximately 3% of the time. By implementing the SHS found in this plan, HWP will be able to move this cover type back into the middle 75% of NRV by year 50; where it remains for the rest of the planning horizon.

Table 47 – Summary of NRV and Current Condition for all forest on the Gross FMF area

Seral Stage	NRV						Status*									
	Low Range		12.5 %	87.5 %	High Range		Year 0 (2012)		Year 10		Year 50		Year 100		Year 200	
	ha	%	%	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Young	24,676	2.6	6.0	49.5	692,752	72.1	125,196	13.9	180,872	20.0	128,813	14.3	160,741	17.8	184,654	20.4
Pole	55,560	5.8	12.5	51.9	701,744	73.1	147,746	16.3	137,807	15.2	161,121	17.8	159,683	17.7	182,856	20.2
Early Mature	17,304	1.8	4.6	33.9	504,944	52.6	222,656	24.6	200,653	22.2	333,071	36.9	306,857	34.0	328,012	36.3
Late Mature + Old	56,276	5.9	10.1	45.2	703,696	73.3	408,189	45.2	384,454	42.5	280,782	31.1	276,508	30.6	208,267	23.0
Total	903,786															

Table 48 – NRV by Seral Stage and Cover Type for the Gross FMA Over 200 Years

Cover Type	Seral Stage	NRV						Status*									
		Low Range		12.5 %	87.5 %	High Range		Year 0 (2012)		Year 10		Year 50		Year 100		Year 200	
		ha	%	%	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Pine	Young	10,383	2.2	4.4	46.4	329,186	70.5	93,305	20.0	123,826	26.5	63,751	13.6	98,757	21.1	79,924	17.1
	Pole	36,788	7.9	14.0	53.5	355,059	76.0	76,429	16.4	88,823	19.0	83,748	17.9	98,886	21.2	101,907	21.8
	Early Mature	8,037	1.7	5.2	36.7	254,730	54.5	137,476	29.4	107,685	23.1	228,714	49.0	170,054	36.4	195,451	41.8
	Late Mature + Old	28,503	6.1	10.4	46.8	338,421	72.5	159,884	34.2	146,762	31.4	90,882	19.5	99,399	21.3	89,812	19.2
	Total	467,095															
White Spruce	Young	3,241	2.5	5.1	46.8	89,460	69.2	18,335	14.2	18,321	14.2	23,063	17.9	16,030	12.4	41,278	32.0
	Pole	3,591	2.8	6.9	41.0	84,118	65.1	8,186	6.3	10,881	8.4	30,254	23.4	22,865	17.7	12,941	10.0
	Early Mature	5,051	3.9	6.7	39.0	81,168	62.8	25,060	19.4	25,121	19.4	33,825	26.2	55,551	43.0	46,966	36.4
	Late Mature + Old	9,472	7.3	12.6	46.1	93,501	72.4	77,611	60.1	74,871	58.0	42,051	32.5	34,747	26.9	28,008	21.7
	Total	129,192															
Black Spruce	Young	5,057	4.3	12.2	59.0	99,618	84.3	1,146	1.0	1,253	1.1	1,182	1.0	2,148	1.8	21,207	17.9
	Pole	6,252	5.3	15.7	58.4	85,943	72.7	25,880	21.9	12,870	10.9	3,148	2.7	2,778	2.4	13,656	11.6
	Early Mature	31	0.0	0.8	16.0	38,387	32.5	18,370	15.5	27,762	23.5	3,615	3.1	1,256	1.1	7,533	6.4
	Late Mature + Old	4,593	3.9	8.4	41.4	83,671	70.8	72,803	61.6	76,314	64.6	110,254	93.3	112,017	94.8	75,804	64.1
	Total	118,199															
Mixed Wood	Young	2,954	2.2	4.5	52.1	89,338	67.2	9,743	7.3	25,707	19.3	28,008	21.1	30,008	22.6	30,426	22.9
	Pole	4,880	3.7	11.2	49.5	94,801	71.3	30,609	23.0	20,996	15.8	22,620	17.0	16,480	12.4	27,602	20.8
	Early Mature	2,901	2.2	5.3	41.2	78,972	59.4	27,861	20.9	29,577	22.2	57,767	43.4	65,235	49.1	63,943	48.1
	Late Mature + Old	7,650	5.8	8.4	42.4	100,994	75.9	64,784	48.7	56,716	42.6	24,603	18.5	21,274	16.0	11,026	8.3
	Total	132,997															
Deciduous	Young	689	1.2	4.1	47.6	39,366	64.9	2,666	4.7	11,765	20.9	12,810	22.8	13,799	24.5	11,819	21.0
	Pole	1,555	2.8	8.3	49.6	41,071	72.9	6,642	11.8	4,238	7.5	21,351	37.9	18,674	33.2	26,750	47.5
	Early Mature	1,246	2.2	5.2	41.7	34,593	61.4	13,888	24.7	10,508	18.7	9,149	16.2	14,761	26.2	14,119	25.1
	Late Mature + Old	3,666	6.4	9.9	45.8	46,010	81.7	33,107	58.8	29,792	52.9	12,994	23.1	9,070	16.1	3,616	6.4
	Total	56,303															
Non-forest (non-veg.)		105,294															
Non-forest (vegetated)		13,384															
Total gross area		1,022,464															

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

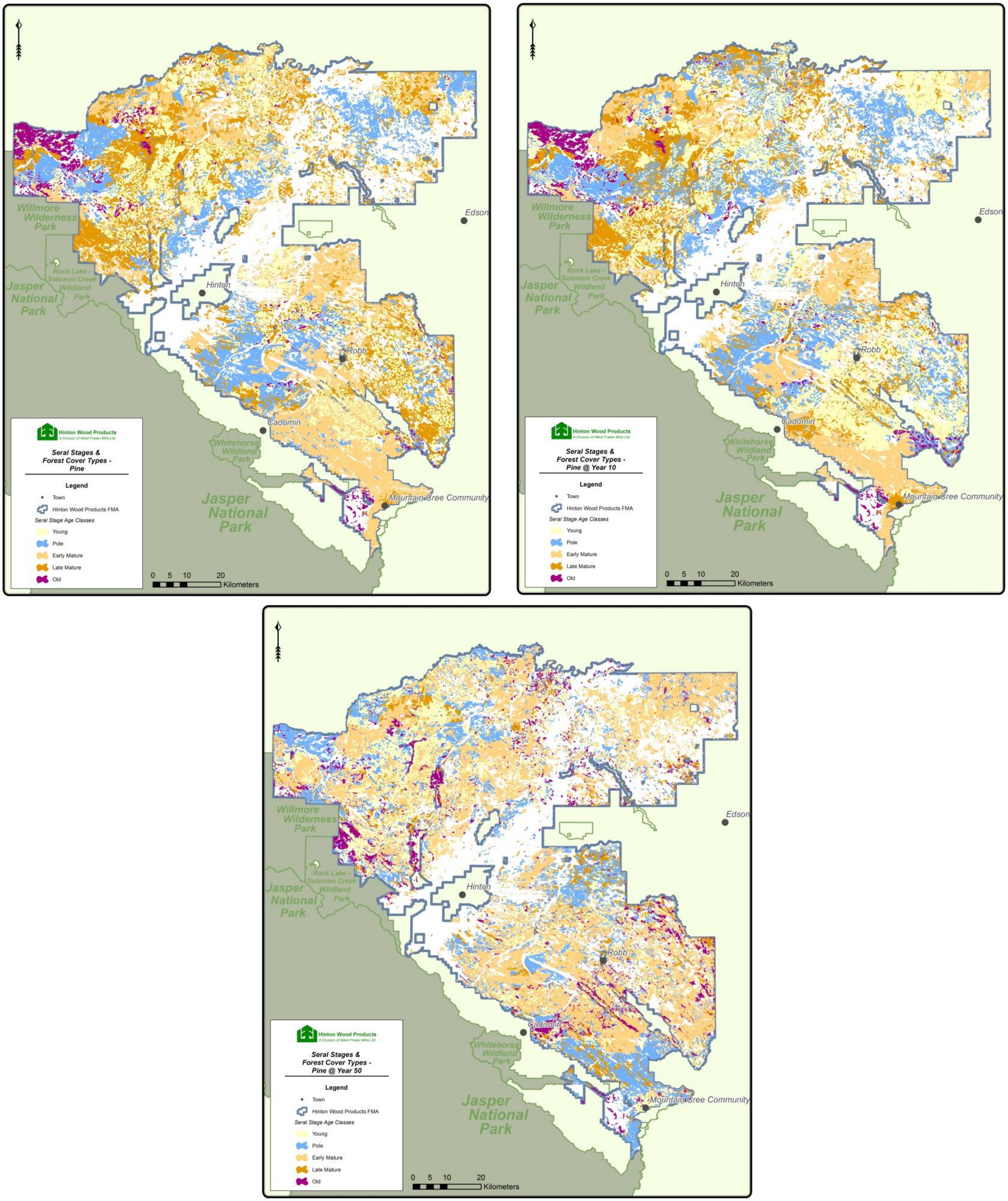


Figure 49 – Pine seral stage locations in Year 0, 10, and 50 on the gross FMA landbase

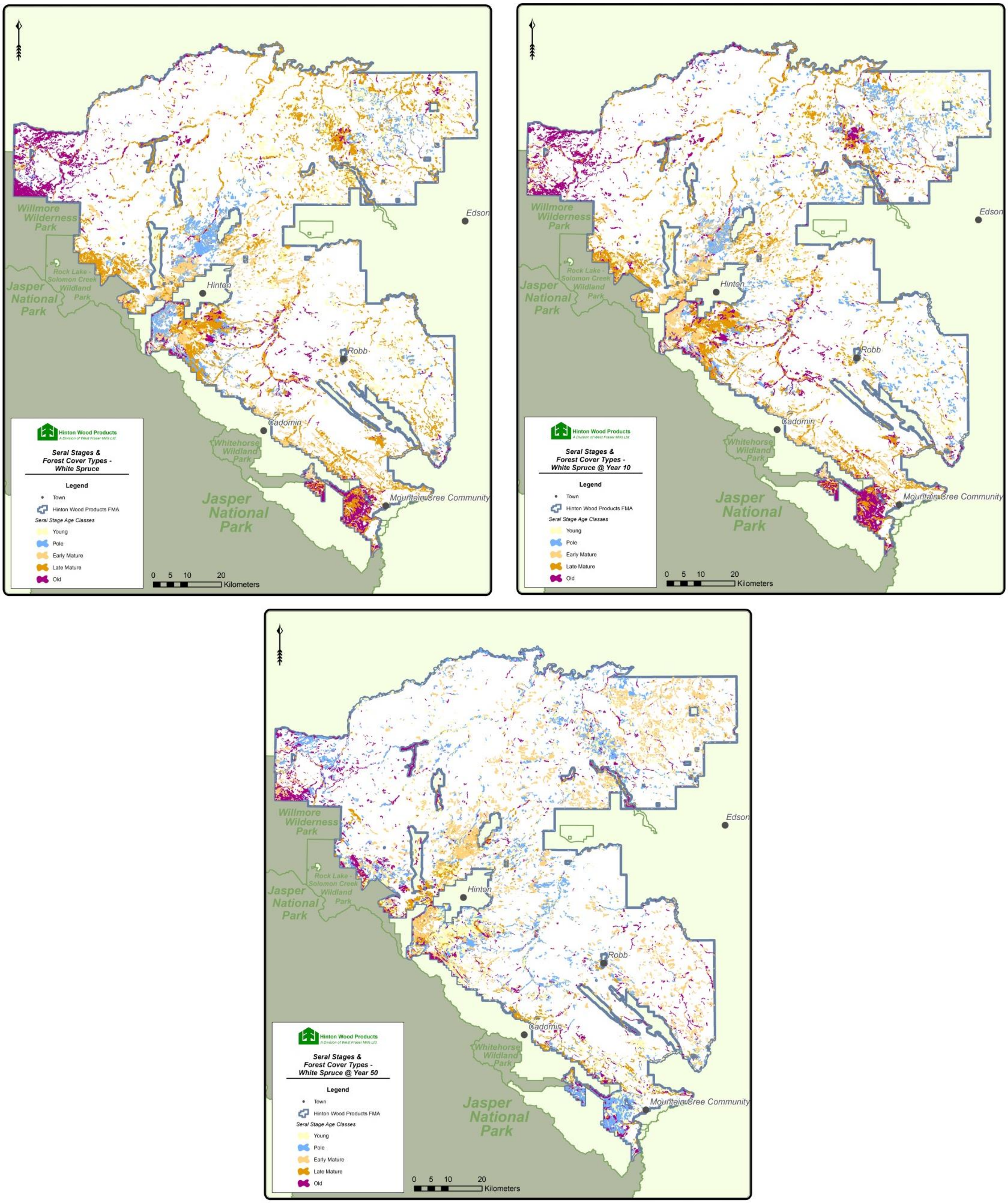
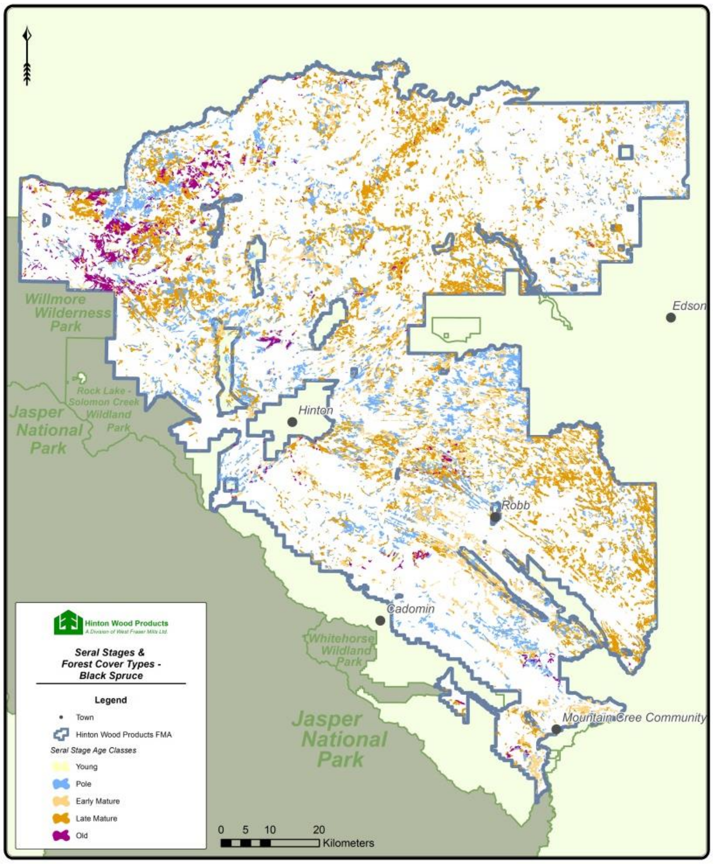
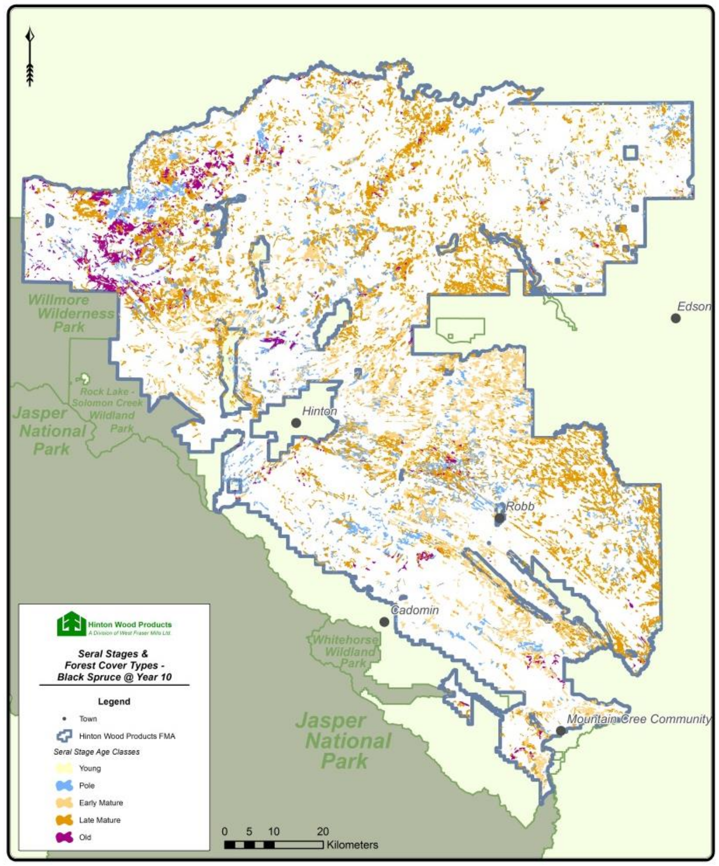


Figure 50 – White spruce seral stage locations in Year 0, 10, and 50 on gross FMA landbase





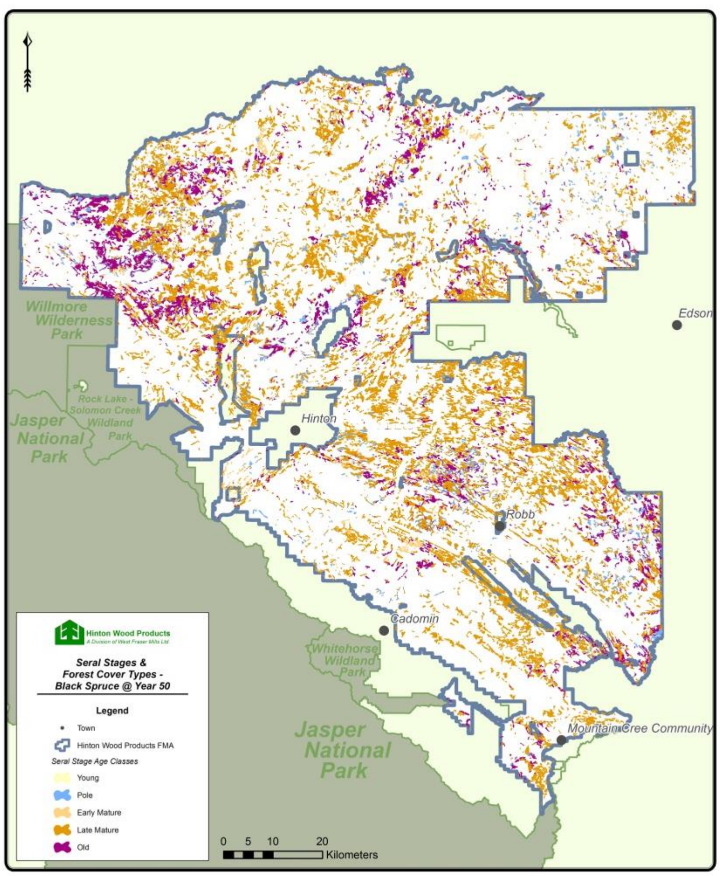


Figure 51 – Black spruce seral stage locations in Year 0, 10, and 50 on the gross FMA landbase

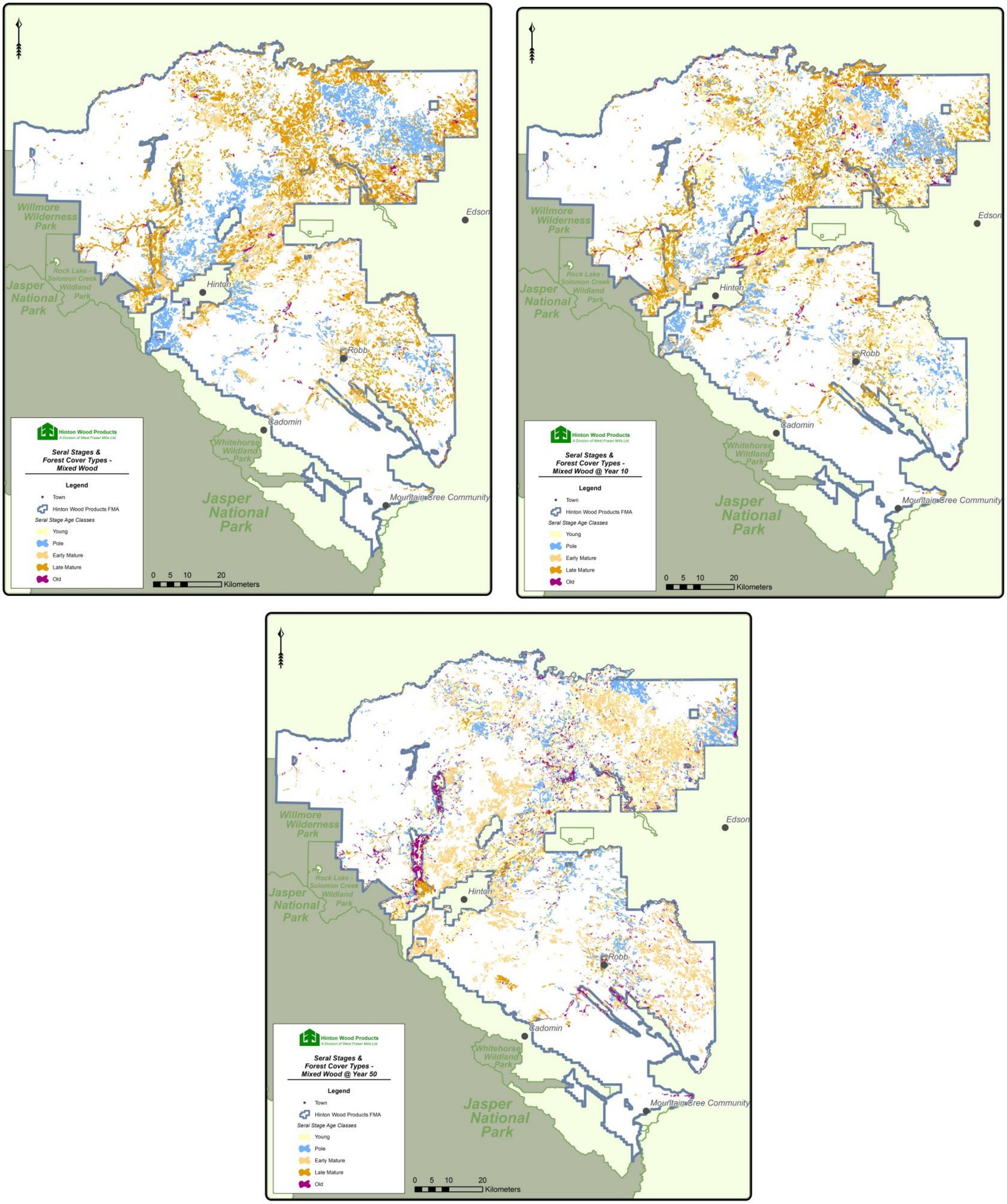
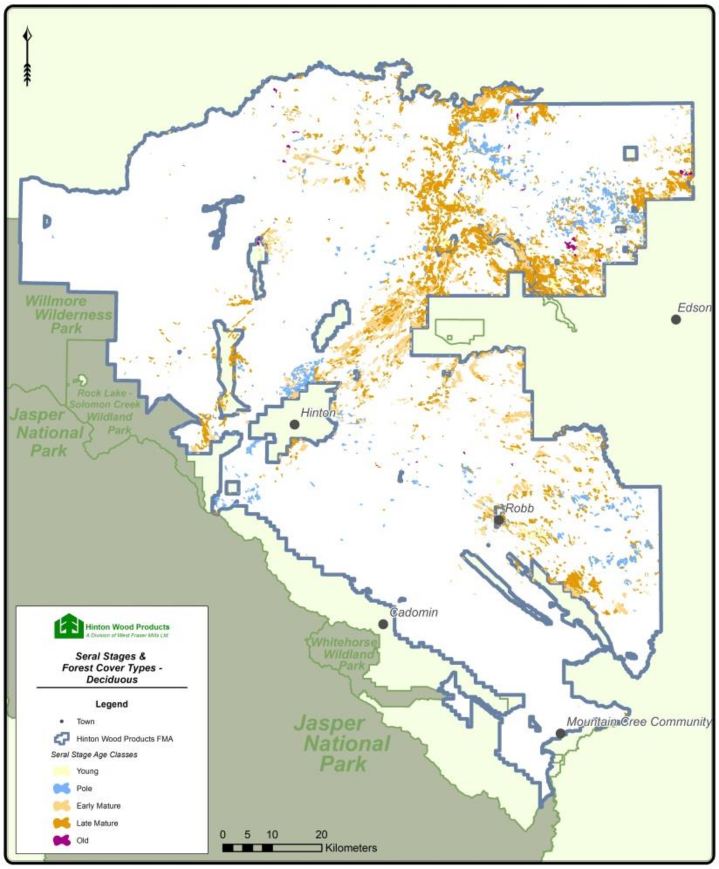
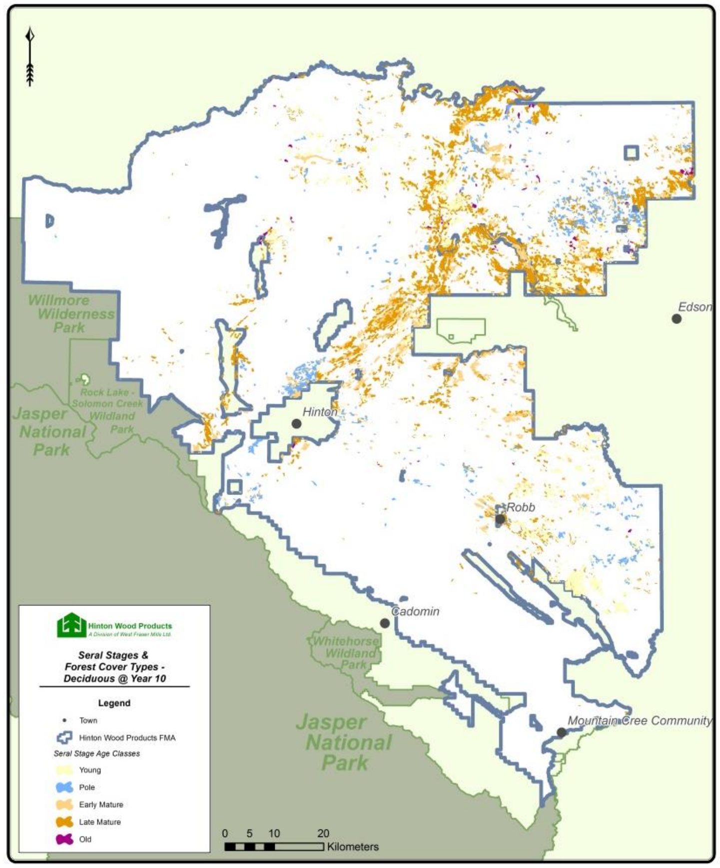


Figure 52 – Mixed wood seral stage locations in Year 0, 10, and 50 on the gross FMA landbase





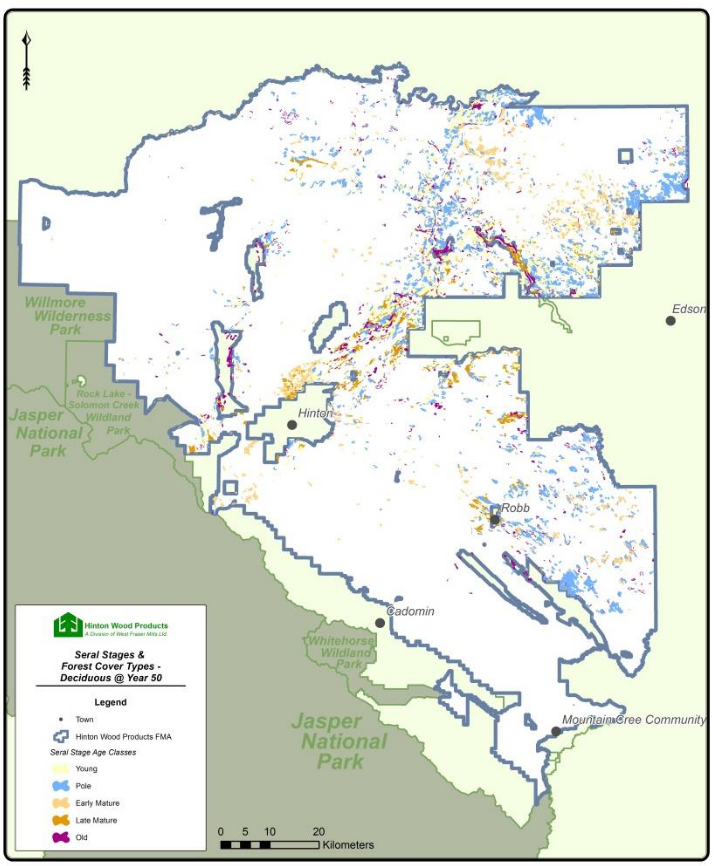


Figure 53 – Deciduous seral stage locations in Year 0, 10, and 50 on the gross FMA landbase

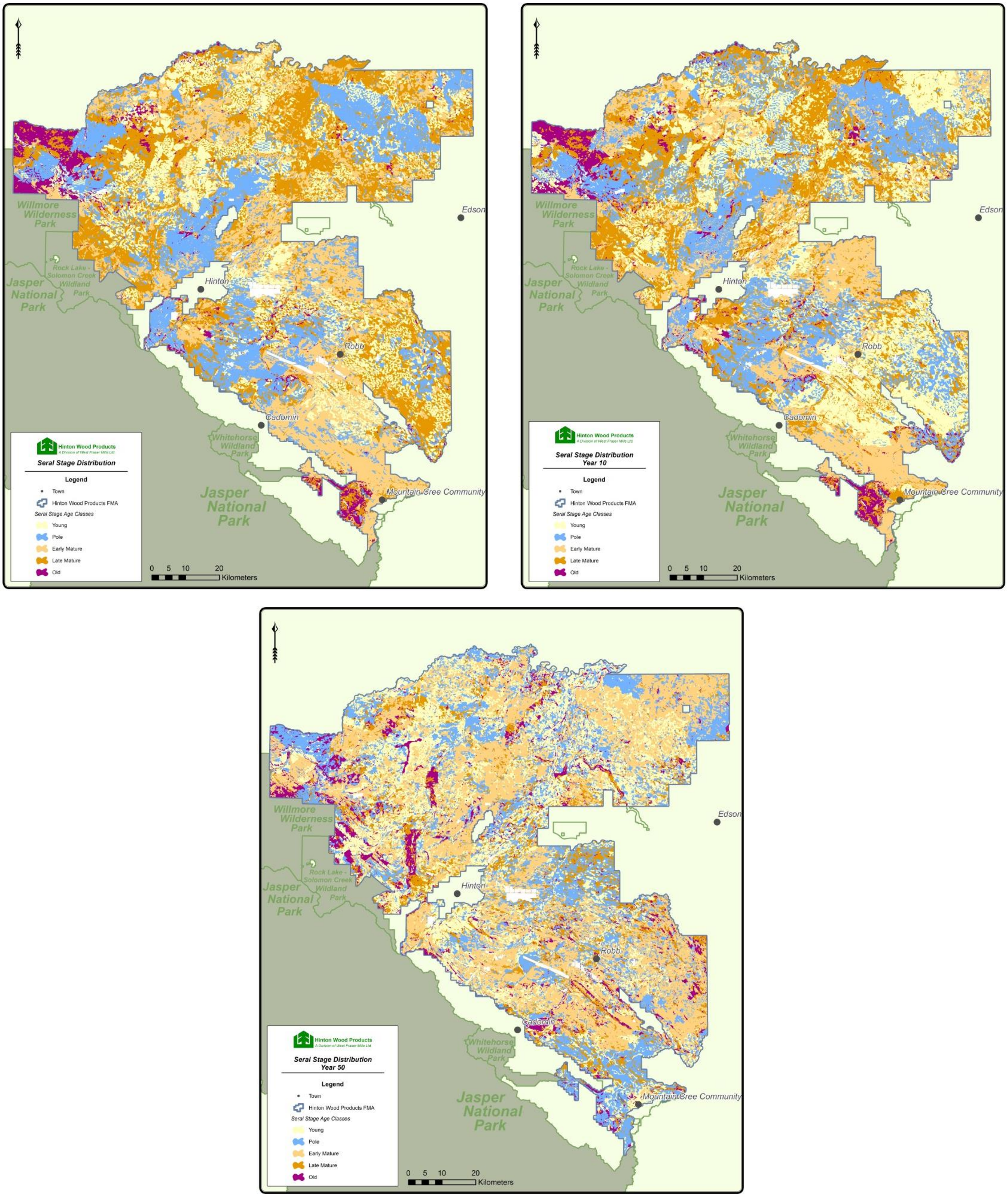


Figure 54 – Seral stage distribution in Year 0, 10, and 50 for the gross FMA landbase

3.0 Gross FMA Landbase by Upland, Riparian, and Wetland

Table 49 on the following pages outline the NRV for each seral stage and cover type broken down by upland, riparian, and wetland for the gross Hinton FMA landbase. This data is being presented as information – which will help inform future management decisions around topics such as riparian management. The table also notes the current status of the upland, riparian, and wetland compared to NRV at Year 0 (2012), Year 10, Year 50, and Year 100 for the gross landbase.

Graphs

Graphs in Appendix 6 include the relative frequency distribution of the amount of forest in the specified forest cover type and seral-stage for the gross FMA landbase by upland, riparian, and wetland, based on 100 LANDMINE consecutive model runs captured in ten year increments. In each graph, NRV is compared to the landscape condition in Year 0 (2012), Year 10 (SHS), Year 50, Year 100, and Year 200. There all also graphs in this appendix that show the relative frequency distribution of the upland, riparian and wetland by seral stage (e.g. all of the young riparian, regardless of cover type, etc.).

On each graph the median of the 100 samples is shown as a vertical solid line. The median is the mid-point of the sample data; 50% of the samples are greater than the median and 50% are less. Also shown on each graph is the range from the 12.5 to the 87.5 percentile (green shaded box). This box captures the middle 75% of the data.

Relative frequency describes the percent chance that a particular seral stage (e.g. old) will account for a particular percentage of a cover type (e.g. spruce). For example, 28% of the time, spruce-leading forests in riparian areas (gross landbase) will consist of 20-30% of the “late mature plus old” seral stage.

Maps

Figure 55 is a map of the gross FMA landbase showing the spatial location of the riparian area, as well as the location of each of the five forested cover types within the riparian area.

Discussion

Determining NRV for the gross riparian areas on the FMA and then tracking the status of each seral stage within the riparian area is a central tenant of HWP’s Riparian Management Strategy (RMS) as discussed in Appendix 2. The primary objective of the RMS was to ensure riparian areas on the FMA area remain with their NRV over time.

Looking at Table 49, in general, the trend from Year 0 (2012) to Year 100, is one where there are fewer seral stages and cover types outside of NRV as we move forward in time. However, there is one exception; black spruce. In Year 0 and Year 10 (SHS) there is a trend where the “early mature” black spruce seral stage is at the high side of NRV; however, as the landbase ages, these trees get older (as they are not being harvested and are not being burned), and move into the “late mature plus old” category; resulting in this category being outside NRV in Year 50 and Year 100. This problem will continue to propagate until disturbance is introduced back into this cover type because this cover type is mostly in the passive landbase, and at this time it is not being disturbed by harvesting to any significant degree.

Looking at the other four cover types in the riparian area, the number of seral stage cover types that are near the edge of NRV (yellow shaded boxes in Table 49) or outside NRV (red shaded boxes) changes from 14 in Year 0, to 11 in Year 10, to two in Year 50, and then back up to eight in Year 100; however, in Year 100 and Year 50, none of the riparian seral stage cover types are outside of NRV. Also, when the “late mature plus old” seral stage is outside the middle 75% of the data, it is because there is too much old (i.e. it’s over the 87.5 percentile) and not enough young (meaning more disturbance is still need). This is a result of the implementation of HWP’s riparian Management Strategy (i.e. the seral stages are moving back in or slight above NRV over time).

Table 49 – The Upland, Riparian, and Wetland NRV for the Gross FMA Landbase Compared to the Status of Each at Year 0 and Year 10

Cover Type	Seral Stage	NRV - Upland				NRV - Riparian				NRV - Wetland				Status* Year 0 (2012)						Status* Year 10					
		Low Range		High Range		Low Range		High Range		Low Range		High Range		Upland		Riparian		Wetland		Upland		Riparian		Wetland	
		ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Pine	Young	8,096	2.2	254,648	70.3	2,245	2.2	73,410	71.7	22	0.9	1,533	65.2	86,510	23.9	6,522	6.4	274	11.6	110,640	30.5	12,733	12.4	452	19.2
	Pole	28,717	7.9	274,468	75.8	7,735	7.6	79,255	77.4	182	7.8	1,731	73.6	63,255	17.5	12,838	12.5	337	14.3	77,990	21.5	10,547	10.3	286	12.2
	Early Mature	6,344	1.8	196,658	54.3	1,562	1.5	57,168	55.8	41	1.7	1,273	54.1	96,243	26.6	40,542	39.6	691	29.4	73,411	20.3	33,699	32.9	574	24.4
	Late Mature + Old	22,910	6.3	262,420	72.4	5,093	5.0	74,575	72.8	123	5.2	1,533	65.2	116,318	32.1	42,516	41.5	1,050	44.6	100,284	27.7	45,438	44.4	1,039	44.2
	Total (ha)	362,325				102,418				2,352															
White Spruce	Young	1,768	2.2	56,339	69.0	1,191	2.5	32,729	69.6	4	0.6	407	68.8	16,806	20.6	1,477	3.1	52	8.8	14,708	18.0	3,550	7.6	63	10.6
	Pole	2,035	2.5	52,902	64.8	1,112	2.4	30,866	65.7	0	0.0	353	59.7	5,457	6.7	2,641	5.6	88	15.0	9,159	11.2	1,673	3.6	48	8.1
	Early Mature	3,214	3.9	51,555	63.2	1,377	2.9	29,269	62.3	15	2.6	361	61.0	15,438	18.9	9,413	20.0	209	35.4	15,670	19.2	9,234	19.6	217	36.8
	Late Mature + Old	6,164	7.6	58,898	72.2	3,281	7.0	34,822	74.1	23	3.9	456	77.3	43,893	53.8	33,477	71.2	241	40.9	42,057	51.5	32,551	69.2	262	44.4
	Total (ha)	81,593				47,008				591															
Black Spruce	Young	590	4.4	11,072	83.3	4,403	4.3	87,388	84.6	41	2.6	1,264	81.5	550	4.1%	587	0.6%	9	0.6	529	4.0	705	0.7	19	1.2
	Pole	632	4.8	9,596	72.2	5,590	5.4	75,586	73.1	62	4.0	1,236	79.7	2,782	20.9	22,625	21.9	473	30.5	2,152	16.2	10,500	10.2	218	14.1
	Early Mature	2	0.0	3,827	28.8	25	0.0	34,518	33.4	0	0.0	452	29.1	1,618	12.2	16,528	16.0	224	14.4	2,119	15.9	25,196	24.4	447	28.8
	Late Mature + Old	435	3.3	9338	70.2	4,171	4.0	73,345	71.0	55	3.5	1041	67.1	8,344	62.8	63,614	61.6	845	54.5	8,495	63.9	66,952	64.8	867	55.9
	Total (ha)	13,294				103,353				1,551															
Mixed Wood	Young	2,002	2.0	66,068	67.4	604	1.8	22,999	67.3	0	0.0	654	75.4	9,087	9.3	619	1.8	37	4.3	20,684	21.1	4,905	14.4	118	13.6
	Pole	2,991	3.1	70,228	71.7	1,451	4.2	24,566	71.9	21	2.5	697	80.3	25,280	25.8	5,119	15.0	210	24.2	17,742	18.1	3,115	9.1	140	16.1
	Early Mature	2,129	2.2	57,383	58.6	764	2.2	21,240	62.2	7	0.8	498	57.4	19,455	19.9	8,177	23.9	229	26.4	21,907	22.4	7,427	21.7	243	28.0
	Late Mature + Old	5,589	5.7	75,082	76.6	39	0.1	16,668	48.8	14	1.6	626	72.1	44,142	45.1	20,250	59.3	392	45.1	37,632	38.4	18,718	54.8	367	42.2
	Total (ha)	97,964				34,165				868															
Deciduous	Young	577	1.3	29,443	65.9	107	0.9	7,429	65.5	0	0.0	171	64.4	2,560	5.7	101	0.9	6	2.1	10,400	23.3	1,325	11.7	40	15.2
	Pole	1,088	2.4	32,576	72.9	229	2.0	8,514	75.1	6	2.2	200	75.6	5,682	12.7	925	8.2	34	12.9	3,576	8.0	641	5.7	21	8.0
	Early Mature	927	2.1	27,356	61.2	261	2.3	7,234	63.8	0	0.0	174	65.6	10,564	23.6	3,243	28.6	81	30.6	8,020	17.9	2,422	21.4	67	25.2
	Late Mature + Old	2,727	6.1	36,402	81.4	832	7.3	9,395	82.8	15	5.6	230	86.7	25,890	57.9	7,073	62.4	144	54.4	22,701	50.8	6,955	61.3	137	51.7
	Total (ha)	44,696				11,342				265															
Non-forest (non-veg.)		58,286				46,262				746															
Non-forest (vegetated)		11,832				1,448				104															
Total area		669,992				345,995				6,478															

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

Table 49 (cont.) – The Upland, Riparian, and Wetland NRV for the Gross FMA Landbase Compared to the Status of Each at Year 50 and Year 100

Cover Type	Seral Stage	NRV - Upland				NRV - Riparian				NRV - Wetland				Status* Year 50						Status* Year 100					
		Low Range		High Range		Low Range		High Range		Low Range		High Range		Upland		Riparian		Wetland		Upland		Riparian		Wetland	
		ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Pine	Young	8,096	2.2	254,648	70.3	2,245	2.2	73,410	71.7	22	0.9	1,533	65.2	48,733	13.4	14,550	14.2	468	19.9	83,949	23.2	14,394	14.1	413	17.6
	Pole	28,717	7.9	274,468	75.8	7,735	7.6	79,255	77.4	182	7.8	1,731	73.6	66,906	18.5	16,349	16.0	494	21.0	88,817	24.5	9,593	9.4	477	20.3
	Early Mature	6,344	1.8	196,658	54.3	1,562	1.5	57,168	55.8	41	1.7	1,273	54.1	200,387	55.3	27,456	26.8	871	37.0	136,976	37.8	32,022	31.3	1,055	44.9
	Late Mature + Old	22,910	6.3	262,420	72.4	5,093	5.0	74,575	72.8	123	5.2	1,533	65.2	46,299	12.8	44,064	43.0	519	22.1	52,583	14.5	46,409	45.3	407	17.3
	Total (ha)	362,325				102,418				2,352															
White Spruce	Young	1,768	2.2	56,339	69.0	1,191	2.5	32,729	69.6	4	0.6	407	68.8	13,236	16.2	9,686	20.6	141	23.9	10,151	12.4	5,803	12.3	75	12.8
	Pole	2,035	2.5	52,902	64.8	1,112	2.4	30,866	65.7	0	0.0	353	59.7	18,427	22.6	11,706	24.9	121	20.5	19,753	24.2	3,013	6.4	99	16.7
	Early Mature	3,214	3.9	51,555	63.2	1,377	2.9	29,269	62.3	15	2.6	361	61.0	26,844	32.9	6,808	14.5	172	29.2	33,529	41.1	21,741	46.2	281	47.6
	Late Mature + Old	6,164	7.6	58,898	72.2	3,281	7.0	34,822	74.1	23	3.9	456	77.3	23,087	28.3	18,808	40.0	156	26.4	18,160	22.3	16,452	35.0	136	23.0
	Total (ha)	81,593				47,008				591															
Black Spruce	Young	590	4.4	11,072	83.3	4,403	4.3	87,388	84.6	41	2.6	1,264	81.5	525	4.0	639	0.6%	18	1.1	730	5.5	1,396	1.4	22	1.4
	Pole	632	4.8	9,596	72.2	5,590	5.4	75,586	73.1	62	4.0	1,236	79.7	1,402	10.5	1,716	1.7%	30	1.9	1,197	9.0	1,544	1.5	36	2.4
	Early Mature	2	0.0	3,827	28.8	25	0.0	34,518	33.4	0	0.0	452	29.1	732	5.5	2,823	2.7%	60	3.9	626	4.7	622	0.6	7	0.5
	Late Mature + Old	435	3.3	9338	70.2	4,171	4.0	73,345	71.0	55	3.5	1041	67.1	10,635	80.0	98,174	95.0	1,444	93.1	10,741	80.8	99,791	96.6	1,486	95.8
	Total (ha)	13,294				103,353				1,551															
Mixed Wood	Young	2,002	2.0	66,068	67.4	604	1.8	22,999	67.3	0	0.0	654	75.4	19,762	20.2	8,060	23.6	186	21.4	24,080	24.6	5,777	16.9	151	17.4
	Pole	2,991	3.1	70,228	71.7	1,451	4.2	24,566	71.9	21	2.5	697	80.3	16,626	17.0	5,869	17.2	125	14.4	13,297	13.6	3,009	8.8	174	20.1
	Early Mature	2,129	2.2	57,383	58.6	764	2.2	21,240	62.2	7	0.8	498	57.4	47,546	48.5	9,895	29.0	325	37.5	49,076	50.1	15,749	46.1	411	47.3
	Late Mature + Old	5,589	5.7	75,082	76.6	39	0.1	16,668	48.8	14	1.6	626	72.1	14,030	14.3	10,341	30.3	232	26.7	11,512	11.8	9,631	28.2	132	15.2
	Total (ha)	97,964				34,165				868															
Deciduous	Young	577	1.3	29,443	65.9	107	0.9	7,429	65.5	0	0.0	171	64.4	10,083	22.6	2,656	23.4	71	26.7	11,263	25.2	2,466	21.7	70	26.6
	Pole	1,088	2.4	32,576	72.9	229	2.0	8,514	75.1	6	2.2	200	75.6	18,128	40.6	3,140	27.7	84	31.5	16,207	36.3	2,378	21.0	88	33.3
	Early Mature	927	2.1	27,356	61.2	261	2.3	7,234	63.8	0	0.0	174	65.6	8,096	18.1	1,014	8.9	39	14.9	11,913	26.7	2,776	24.5	72	27.1
	Late Mature + Old	2,727	6.1	36,402	81.4	832	7.3	9,395	82.8	15	5.6	230	86.7	8,390	18.8	4,532	40.0	71	26.9	5,314	11.9	3,722	32.8	35	13.0
	Total (ha)	44,696				11,342				265															
Non-forest (non-veg.)		58,286				46,262				746															
Non-forest (vegetated)		11,832				1,448				104															
Total area		669,992				345,995				6,478															

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

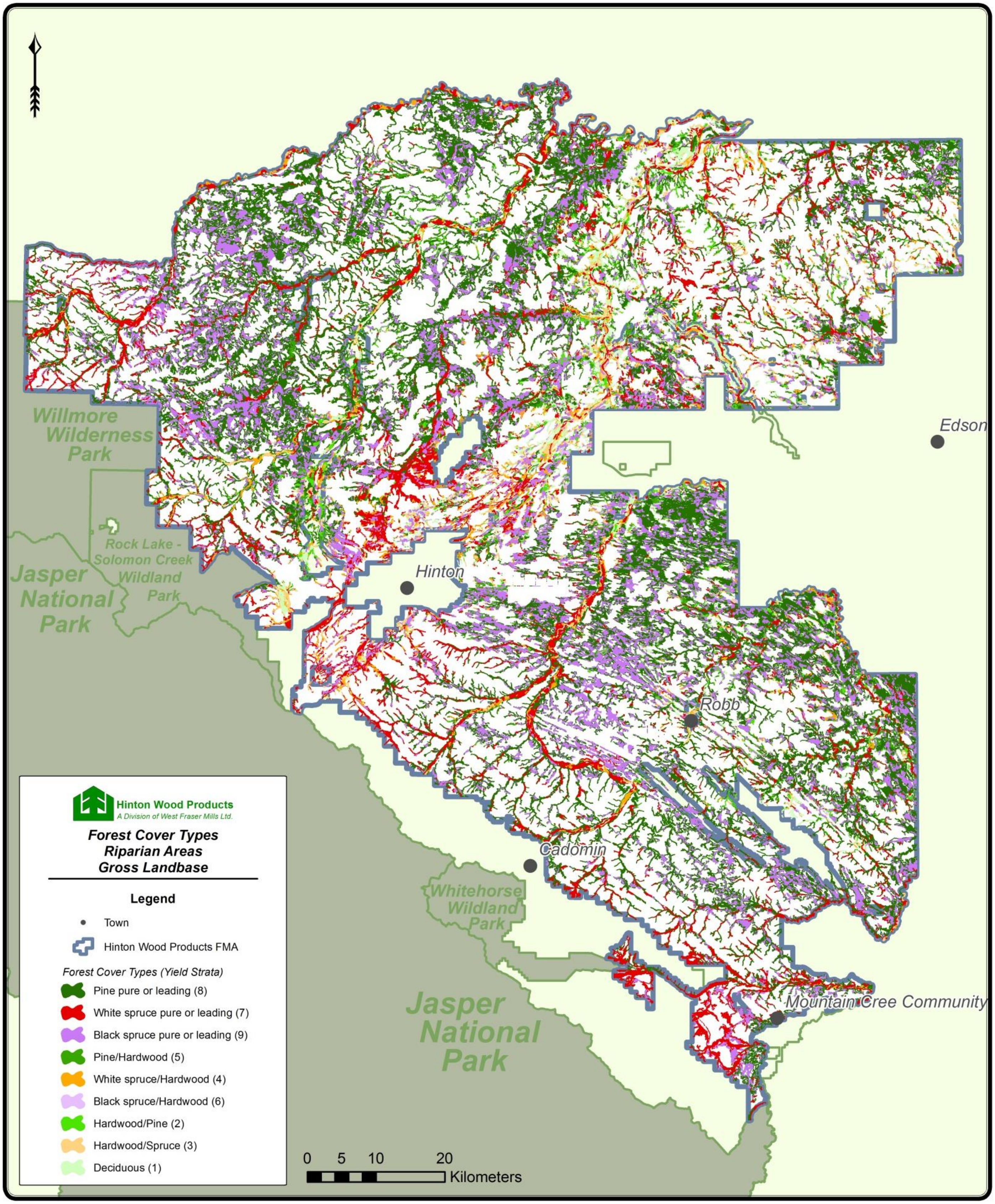


Figure 55 – The location of riparian area by cover type for the gross FMA

4.0 Report –Target #1 (Contributing FMA Landbase)

Table 50 and Table 51 on the following page outline the Natural Range of Variability (NRV) for each seral stage and cover type for the contributing FMA landbase. NRV is presented in the table as a range from the lowest number of hectares of a cover type and seral stage to the highest number of hectares of the same seral stage and cover type. In addition, the table shows where the 12.5 percentile and 87.5 percentile of the data lie – in other words, these percentiles bracket where the data falls 75% of the time. The tables also describe what the current status of the indicator is at Year 0 (2012), Year 10, Year 50, Year 100, and Year 200 for the contributing landbase.

Graphs

Appendix 7 provides NRV graphs for the contributing FMA landbase for each of the cover types and seral stages on the contributing FMA area. In each graph, NRV is defined and the landscape condition in Year 0 (2012), Year 10 (SHS), Year 50, Year 100 and Year 200 is noted. The graphs describe the relative frequency distribution of the amount of forest in the specified forest type and seral-stage for the contributing FMA landbase based on 100 LANDMINE consecutive model runs captured in ten year increments.

On each graph the median of the 100 samples is shown as a vertical solid line. The median is the mid-point of the sample data; 50% of the samples are greater than the median and 50% are less. Also shown on each graph is the range from the 12.5 to the 87.5 percentile (green shaded box). This box captures the middle 75% of the data.

Maps

Figure 56, Figure 57, Figure 58, Figure 59, and Figure 60 contain maps of the contributing FMA landbase showing the spatial location of each of the five forested cover types at Year 0 (2012), Year 10, and Year 50.

Figure 61 contains three maps of the contributing FMA landbase showing the spatial distribution of the five seral stages (regardless of cover type), also at Year 0 (2012), Year 10, and Year 50.

Discussion

The contributing landbase is the landbase on which HWP can grow and harvest trees over the entire planning horizon. It can be thought of as the gross landbase minus deletions due to factors such as steep slopes, protected areas, wet areas (e.g. black spruce and/or tamarack fens), riparian buffers, wildlife constraints, roads, and powerlines.

Looking at the entire FMA contributing landbase, regardless of cover type (Table 50), the current and future condition of each of the four seral stages, remains within NRV over the entire 200 year forecast. However, there are three instances (Year 50, Year 100, Year 200) where the “early mature” seral stage ranges above the 87.5 percentile, and three instances (Year 50, Year 100, Year 200) where the “late mature plus old” seral stage fall below the 12.5 percentile.

Although in three cases the amount of “late mature plus old” is below the 12.5% percentile, this is still within NRV and this amount (5-10%) of “late mature plus old” on the contributing landbase would occur approximately 8% of the time. The “late mature plus old” seral stage is at the bottom end of NRV on the contributing landbase because it is this age class that is targeted for harvesting; more specifically, it is old mountain pine beetle (MPB) susceptible pine trees that are primarily being targeted. A main focus of this DFMP is to follow a MPB-related mandate from the GoA, which was to have companies reduce MPB susceptible trees (i.e. primarily old pine trees) by 75% in 20 years. Addressing this mandate results in trade-offs; one such trade-off is that the amount of “late mature plus old” will be on the bottom end of NRV. HWP has no plan to move “late mature plus old” back above the 12.5 percentile on the contributing landbase, but will ensure that is stays within NRV.

The three cases where the “early mature” seral stage is above the 87.5 percentile occur in Year 50, Year 100, and Year 200. Being above the 87.5 percentile means there is too much “early mature” and is the result of not enough harvesting or natural disturbance 50 to 120 years ago. Small adjustments in future spatial harvest sequences can regulate this number back below the 87.5 percentile.

When the contributing landbase is further broken down by cover type (Table 51), all of the pine, white spruce, mixed wood and deciduous cover types and seral stages remain within NRV over the 200 year forecast. The only cover type that has any seral stage outside of NRV is the black spruce cover type and this occurs at only one time period (Year 200) and there is too much “early mature” (which can be addressed by increasing harvesting slightly in a future decade).

The following is a discussion regarding the status of NRV in each of the five cover types as described in Table 51:

Pine
The pine cover type (pine leading) makes up 59.0% of the contributing landbase; making it the largest cover type within the contributing landbase. Within this cover type, all seral stages were within NRV over the 200 year planning horizon. There was only one seral stage; “late mature plus old” (120+ years), which was not between the 12.5 and 87.5 percentile (i.e. where it is 75% of the time) – this occurred in three instances; at Year 50, Year 100, and Year 200. In each case the forecast fell below the 12.5 percentile; meaning there was not enough “late mature plus old” pine. As previously discussed, this is because HWP is addressing the GoA’s mandate to reduce MPB susceptible pine on the contributing landbase by 75% over 20 years. In order to accomplish this directive, significant areas of “late mature plus old” pine (which is the most susceptible to MPB) must be harvested in the first 20 years of this plan; this in turn, results in a lower number of hectares of this seral stage as you move further out into time (as it takes time for these harvest areas to grow back into this seral stage). At this time, HWP has no plans to change future FMPs to move this seral stage back above the 12.5 percentile, as doing this would be in conflict with the goal of reducing the overall amount of MPB susceptible pine on the contributing landbase.

White Spruce
The white spruce cover type (white spruce leading) makes up 15.0% of the contributing landbase; making it the third largest cover type within the contributing landbase. Within this cover type, all seral stages were within NRV over the 200 year planning horizon. There were two seral stages; “early mature” (50-99 years) and “late mature plus old” (120+ years), which were not between the 12.5 and 87.5 percentile.

The “early mature” seral stage ranged above the 87.5 percentile at Year 100 and Year 200. This is because not enough “late mature plus old” spruce was logged during the first 20 years, and then a lot will be logged in the next 50 years (as mature merchantable pine has been significantly reduced), resulting in a bump of “early mature” around Year 100. Deferring white spruce stands in the first 20 years and harvesting more heavily in the next 50 years, means there will be too much “early mature “stands in Year 100.

The “late mature plus old” seral stage was above the 87.5 percentile at Year 0 (2012) and remained above the 87.5 percentile at Year 10. This is because older spruce stands are not being targeted for harvesting; as previously discussed, HWP is focusing on harvesting older pine stand thereby reducing the risk and impact of MPB. This results in a reduction of available pine in the third to seventh decade meaning that HWP must shift harvest into mature spruce in order to maintain the AAC. The shift to mature white spruce means that the “late mature plus old” seral stage falls below the 12.5 percentile in Year 100 and 200. At this time, HWP has no plans to change future FMPs to move this seral stage back above the 12.5 percentile.

Black Spruce
The black spruce cover type makes up only 0.6% of the contributing landbase; making it by far the smallest cover type of the contributing landbase. There are numerous instances where the seral stages fall below the 12.5 percentile or ranges above the 87.5 percentile; however, given the small overall area within this cover type, it becomes very difficult to maintain a balance of all the seral stages through time (i.e. harvesting black spruce in one compartment might mean 25% of all the black spruce in the

contributing landbase becomes young at once). In addition, the validity of managing to be within NRV for such a small area of cover type that is widely distributed across the FMA is questionable.

There is only one instance when a seral stage fall outside NRV; this occurs at Year 200 for the "early mature" seral stage. In this case there is too much early mature black spruce.

Due to the small area of this cover type on the contributing landbase, HWP does not plan to try to maintain each seral stage between the 12.5 and 87.5 percentile over the planning horizon, but has committed to maintaining the "late mature plus old" seral stage within NRV.

Mixed Wood

The mixed wood cover type makes up 17.8% of the contributing landbase; making it the second largest cover type within the contributing landbase. Within this cover type, all seral stages were within NRV over the 200 year planning horizon. There were two seral stages; "early mature" (60-109 years) and "late mature plus old" (110+ years), that were not between the 12.5 and 87.5 percentile.

The "early mature" seral stage ranged above the 87.5 percentile at Year 50, Year 100 and Year 200 – meaning there was too much "early mature". This is because not enough "late mature plus old" mixed wood is currently being logged but will be harvested more heavily in the following decades. This is because HWP is strategically not targeting mixed wood stands for harvest in the first 20 years of this plan (unless they contain MPB) in order to be able to meet the GoA mandate of reducing MPB susceptible pine stands by 75% in 20 years. Deferring mixed wood stands in the first 20 years, and then harvesting more heavily in the next 50 years, means there will be too much "early mature "stands later in the planning horizon.

The "late mature plus old" seral stage was above the 87.5 percentile at Year 0 (2012). This is because mixed wood stands have not been targeted for harvesting at rate equal to natural disturbance. As HWP shifts harvest out of MPB susceptible pine stands into mixed wood stands in order to maintain the AAC more mixed wood stands will be harvested later in the planning horizon. By Year 100, the "late mature plus old" seral stage for mixed wood falls below the 12.5 percentile. At this time, HWP has no plans to change future FMPs to move this seral stage back above the 12.5 percentile.

Deciduous

The deciduous cover type makes up 7.6% of the contributing landbase; making it the fourth largest (or second smallest) cover type within the contributing landbase. Within this cover type, all seral stages were within NRV over the 200 year planning horizon. There were two seral stages; "pole" (60-109 years) and "late mature plus old" (110+ years), that were not between the 12.5 and 87.5 percentile.

The "pole" seral stage fell below the 12.5 percentile at Year 10 – meaning there was not enough "pole" deciduous. This is because not enough "late mature plus old" has been harvested (or naturally disturbed) in the past. By Year 50, the "pole" seral stage moves back in between the 12.5 and 87.5 percentile where it remains for the rest of the planning horizon.

The "late mature plus old" seral stage was above the 87.5 percentile at Year 0 (2012) and Year 10. This is because deciduous stands have not been targeted for harvesting at rate equal to natural disturbance. As harvesting increases throughout the term of this plan, the "late mature plus old" seral stage for deciduous falls below the 12.5 percentile by Year 100 and remains there at Year 200. HWP will have numerous opportunities to change future FMPs to move deciduous back above the 12.5 percentile and will plan to do so.

Table 50 – Summary of NRV and Current Condition for all forest on the Contributing FMF area

Seral Stage	NRV						Status*									
	Low Range		12.5 %	87.5 %	High Range		Year 0 (2012)		Year 10		Year 50		Year 100		Year 200	
	ha	%	%	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Young	14,444	2.1	4.8	47.9	471,060	69.8	122,539	18.5	179,600	27.1	128,482	19.4	158,625	23.9	152,732	23.1
Pole	39,808	5.9	11.8	50.5	495,940	73.5	107,788	16.3	116,326	17.6	159,931	24.1	156,480	23.6	160,023	24.2
Early Mature	14,208	2.1	5.4	37.0	378,564	56.1	158,597	23.9	130,070	19.6	313,316	47.3	306,314	46.2	308,665	46.6
Late Mature + Old	41,244	6.1	10.4	46.4	500,244	74.1	273,510	41.3	236,439	35.7	60,706	9.2	41,017	6.2	41,017	6.2
Total	662,434															

Table 51 – NRV by Seral Stage and Cover Type for the Contributing FMA Landbase Over 200 Years

Cover Type	Seral Stage	NRV						Status*									
		Low Range		12.5 %	87.5 %	High Range		Year 0 (2012)		Year 10		Year 50		Year 100		Year 200	
		ha	%	%	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Pine	Young	8,179	2.1	4.3	46.2	273,685	70.0	91,709	23.5	122,879	31.4	63,733	16.3	98,472	25.2	74,031	18.9
	Pole	31,348	8.0	13.7	52.9	296,687	75.9	65,356	16.7	81,581	20.9	83,601	21.4	97,885	25.1	98,468	25.2
	Early Mature	6,811	1.7	5.5	36.5	214,153	54.8	104,438	26.7	76,826	19.7	216,191	55.3	169,893	43.5	193,751	49.6
	Late Mature + Old	24,471	6.3	10.6	47.7	285,087	73.0	129,218	33.1	109,434	28.0	27,196	7.0	24,471	6.3	24,471	6.3
	Total	390,720															
White Spruce	Young	2,516	2.1	5.2	47.3	68,783	69.3	18,194	18.3	18,245	18.4	22,921	23.1	15,456	15.6	37,663	38.0
	Pole	2,633	2.7	7.0	41.1	65,919	66.4	7,359	7.4	10,558	10.6	30,254	30.5	21,636	21.8	11,666	11.8
	Early Mature	4,001	4.0	6.8	39.1	62,993	63.5	18,392	18.5	19,097	19.2	32,858	33.1	55,399	55.8	43,162	43.5
	Late Mature + Old	6,736	6.8	12.2	45.6	71,962	72.5	55,282	55.7	51,328	51.7	13,194	13.3	6,736	6.8	6,736	6.8
	Total	99,227															
Black Spruce	Young	209	5.1	13.0	60.7	3,493	84.8	331	8.0	1,047	25.4	1,013	24.6	1,037	25.2	746	18.1
	Pole	185	4.5	16.2	59.2	3,006	72.9	598	14.5	428	10.4	2,124	51.5	1,913	46.4	1,245	30.2
	Early Mature	0	0.0	0.8	16.1	1,207	29.3	356	8.6	399	9.7	232	5.6	1,047	25.4	2,005	48.7
	Late Mature + Old	125	3.0	8.4	43.7	2,896	70.3	2,836	68.8	2,247	54.5	753	18.3	125	3.0	125	3.0
	Total	4,121															
Mixed Wood	Young	2,549	2.2	4.6	52.4	79,291	67.2	9,670	8.2	25,667	21.8	28,005	23.7	29,874	25.3	29,023	24.6
	Pole	3,930	3.3	11.1	49.2	84,325	71.5	28,257	23.9	19,792	16.8	22,601	19.2	16,379	13.9	23,430	19.9
	Early Mature	2,505	2.1	5.3	41.1	69,146	58.6	23,609	20.0	24,967	21.2	55,341	46.9	65,214	55.3	59,015	50.0
	Late Mature + Old	6,542	5.5	8.2	42.4	89,978	76.2	56,473	47.9	47,582	40.3	12,062	10.2	6,542	5.5	6,542	5.5
	Total	118,009															
Deciduous	Young	595	1.2	4.0	48.1	32,811	65.2	2,635	5.2	11,761	23.4	12,810	25.4	13,786	27.4	11,268	22.4
	Pole	1,417	2.8	8.2	49.6	36,857	73.2	6,219	12.3	3,967	7.9	21,351	42.4	18,667	37.1	25,215	50.1
	Early Mature	1,044	2.1	5.2	41.7	30,734	61.0	11,803	23.4	8,781	17.4	8,695	17.3	14,761	29.3	10,732	21.3
	Late Mature + Old	3,143	6.2	9.8	45.9	41,203	81.8	29,701	59.0	25,848	51.3	7,502	14.9	3,143	6.2	3,143	6.2
	Total	50,357															
Non-forest (non-veg.)		0															
Non-forest (vegetated)		0															
Total gross area		662,434															

* Yellow boxes denote a seral stage and cover type within NRV but either below the 12.5 quartile or over the 87.5 quartile, while red boxes denotes a seral stage and cover type outside of NRV.

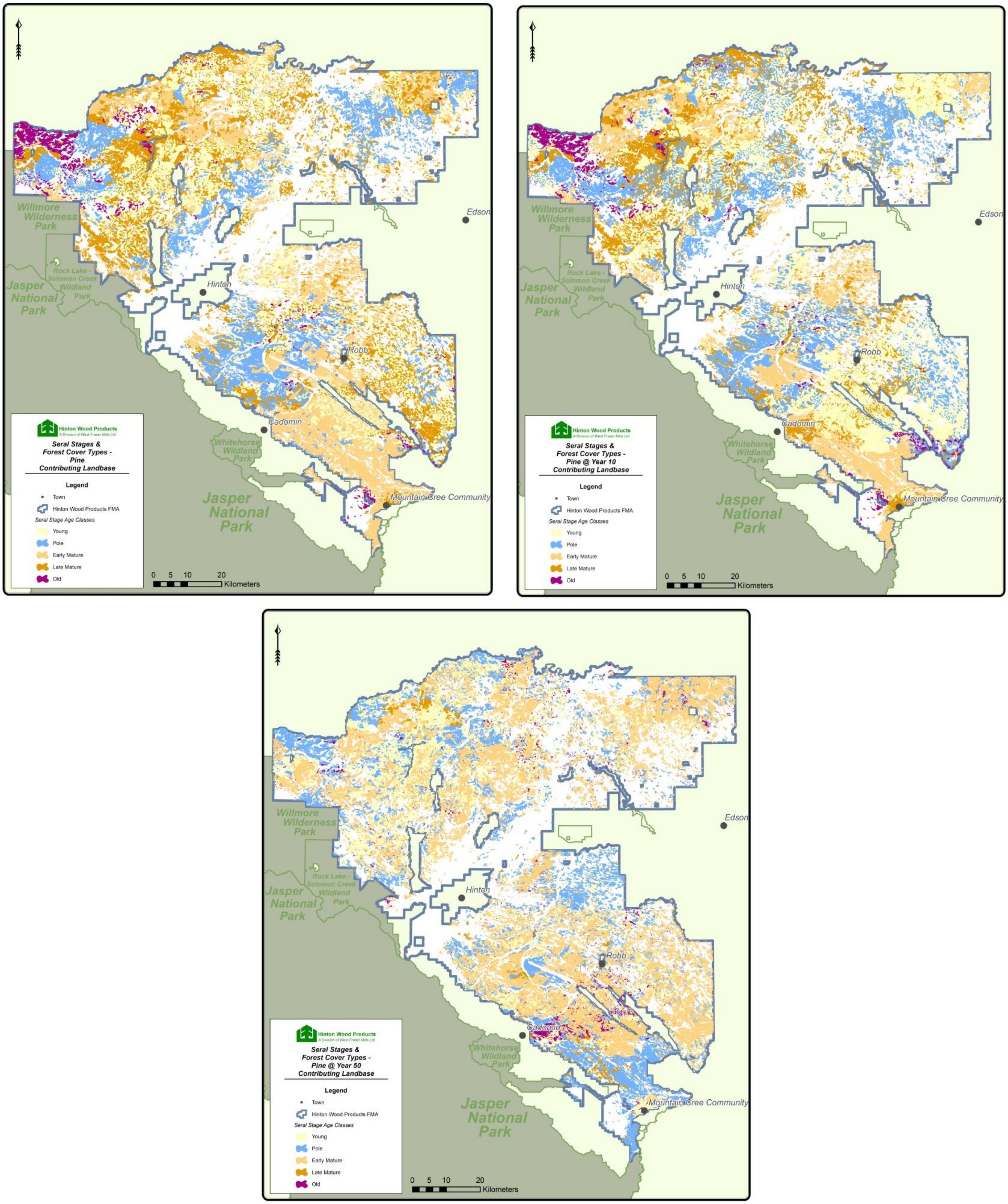
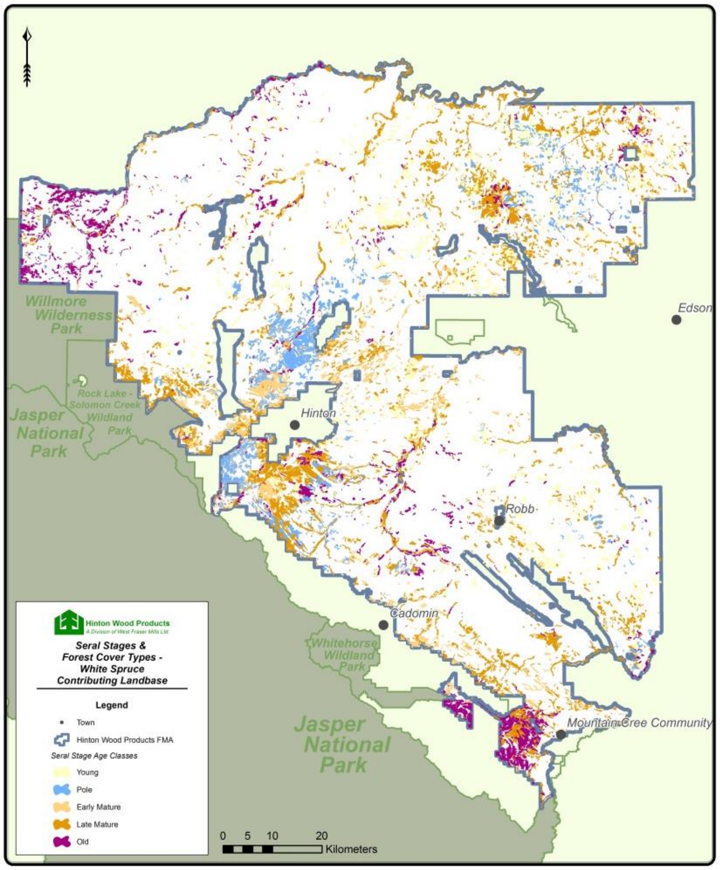
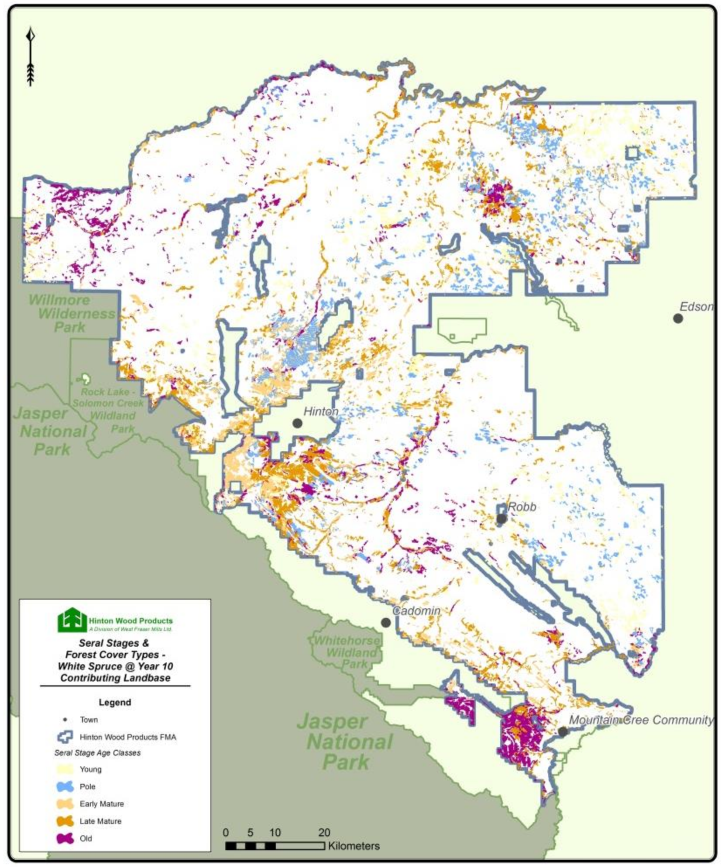


Figure 56 – Pine seral stage locations in Year 0, 10, and 50 on the contributing FMA landbase





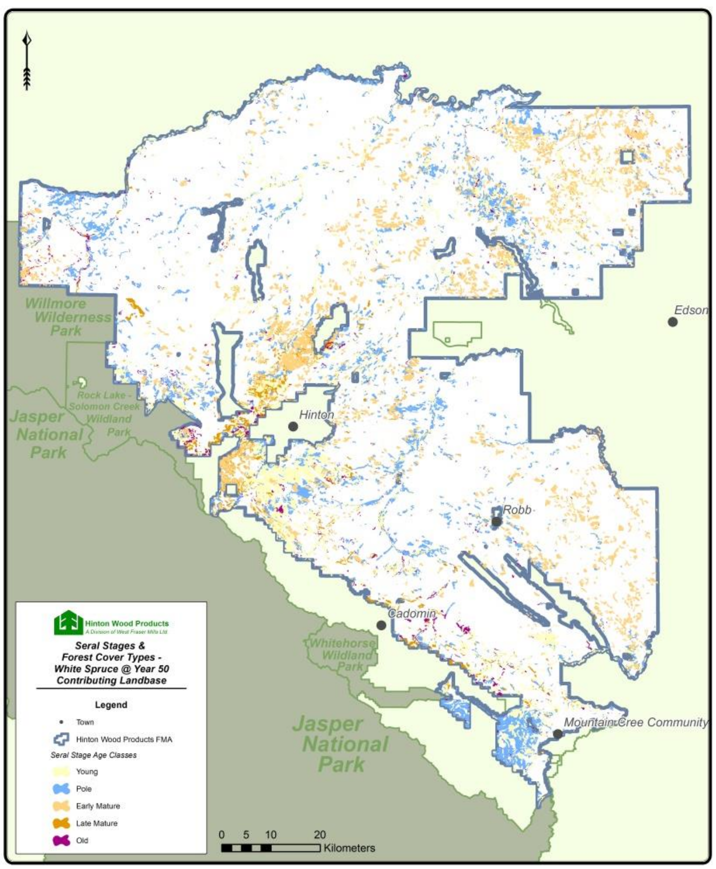
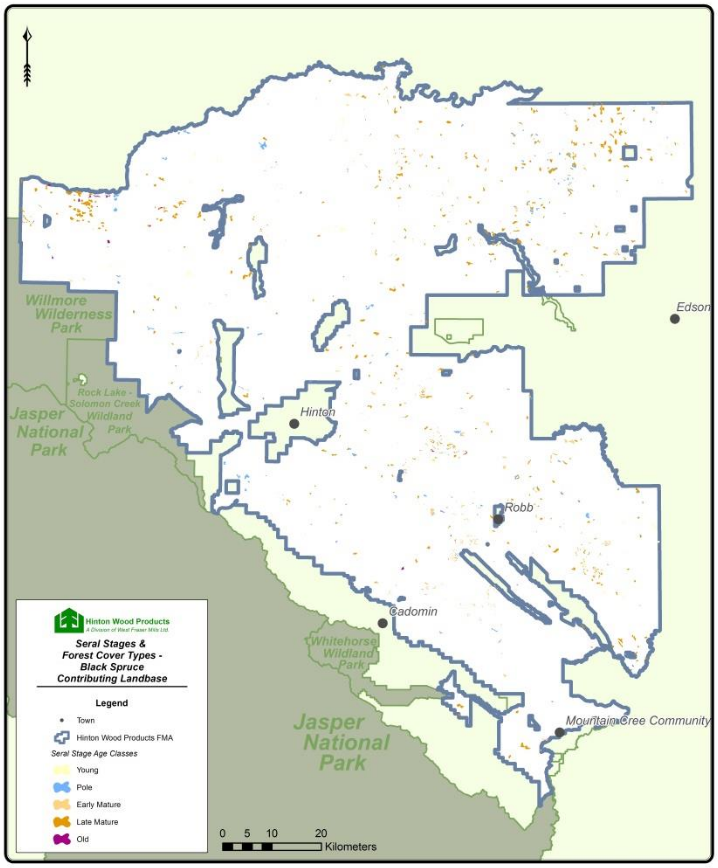
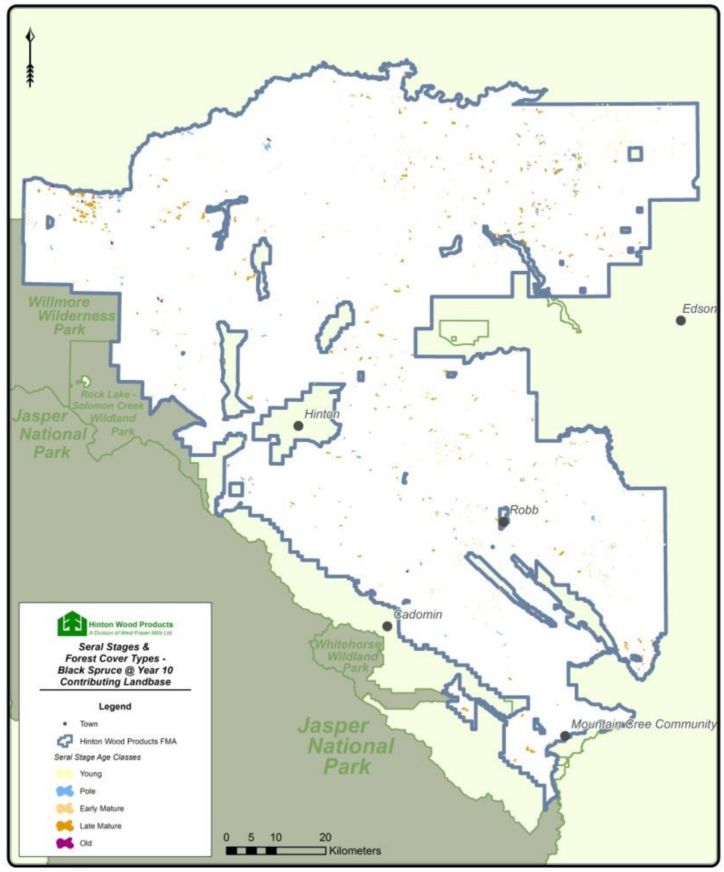


Figure 57 – White spruce seral stage locations in Year 0, 10, and 50 on the contributing FMA landbase





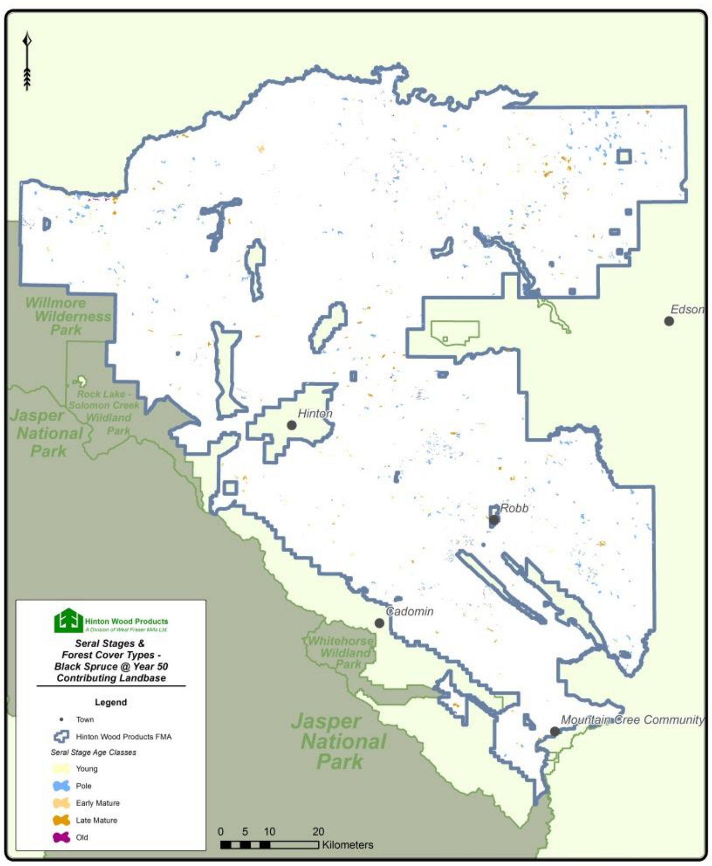


Figure 58 – Black spruce seral stage locations in Year 0, 10, and 50 on the contributing FMA landbase

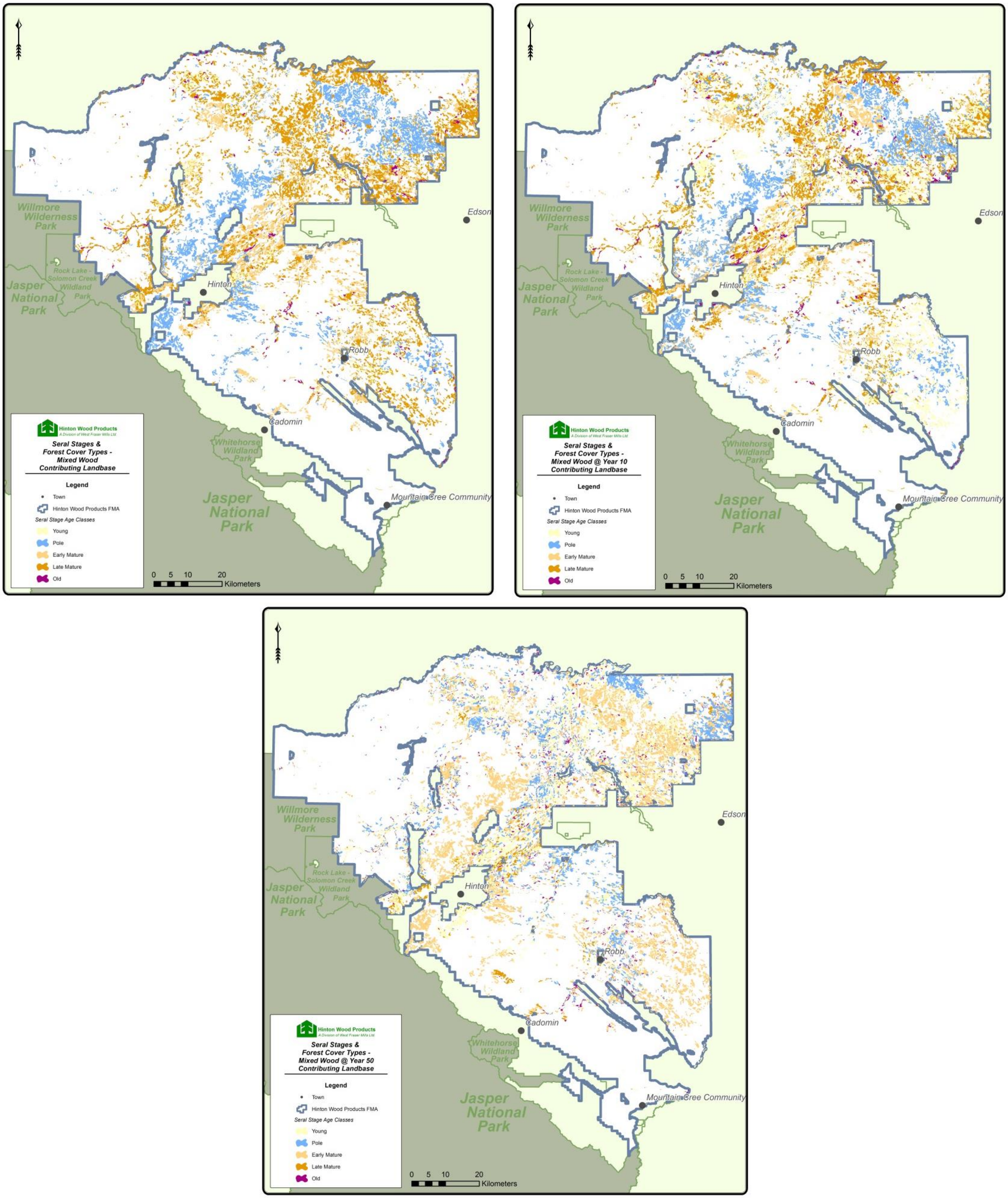


Figure 59 – Mixed wood seral stage locations in Year 0, 10, and 50 on the contributing FMA landbase

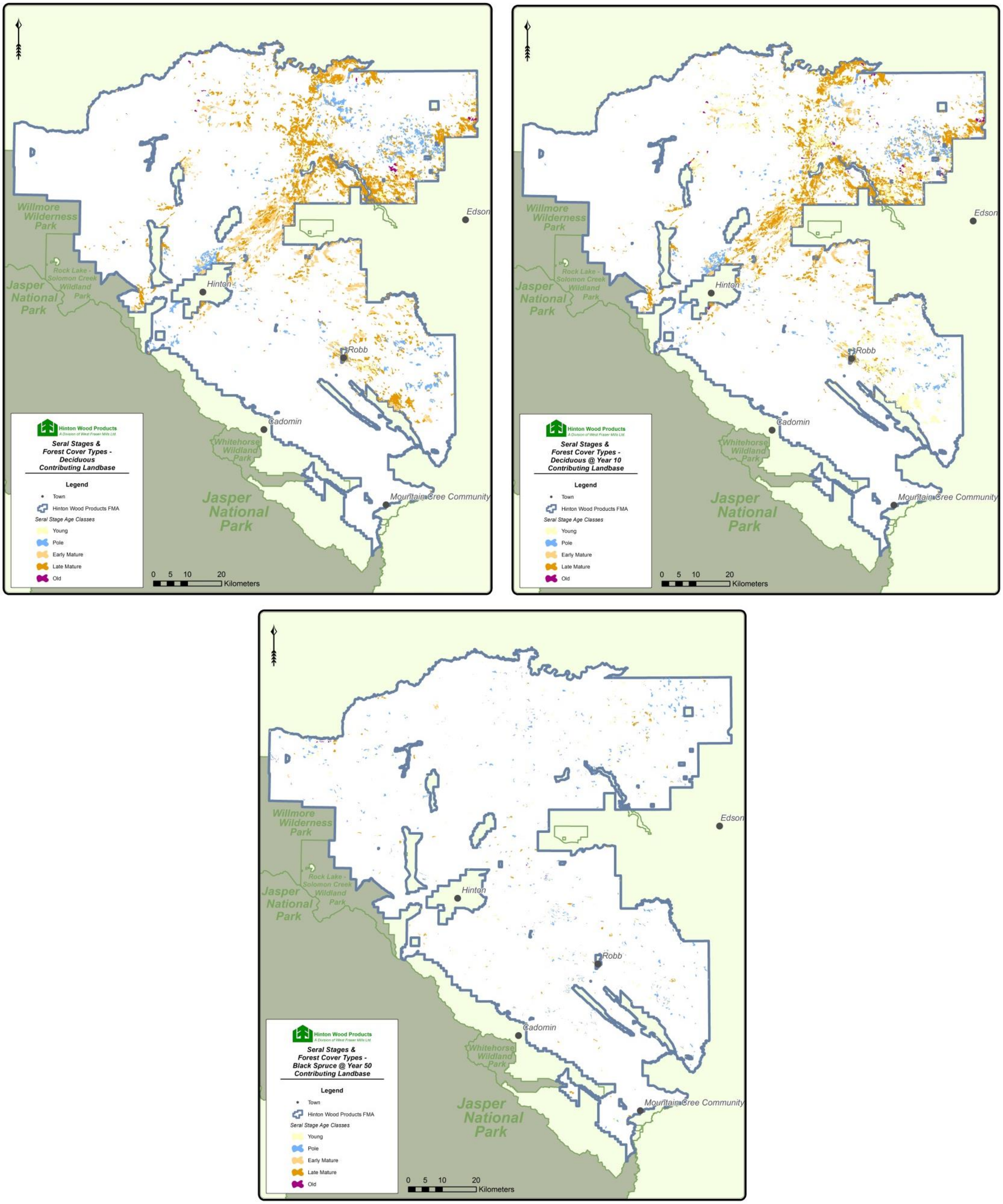


Figure 60 – Deciduous seral stage locations in Year 0, 10, and 50 on the contributing FMA landbase

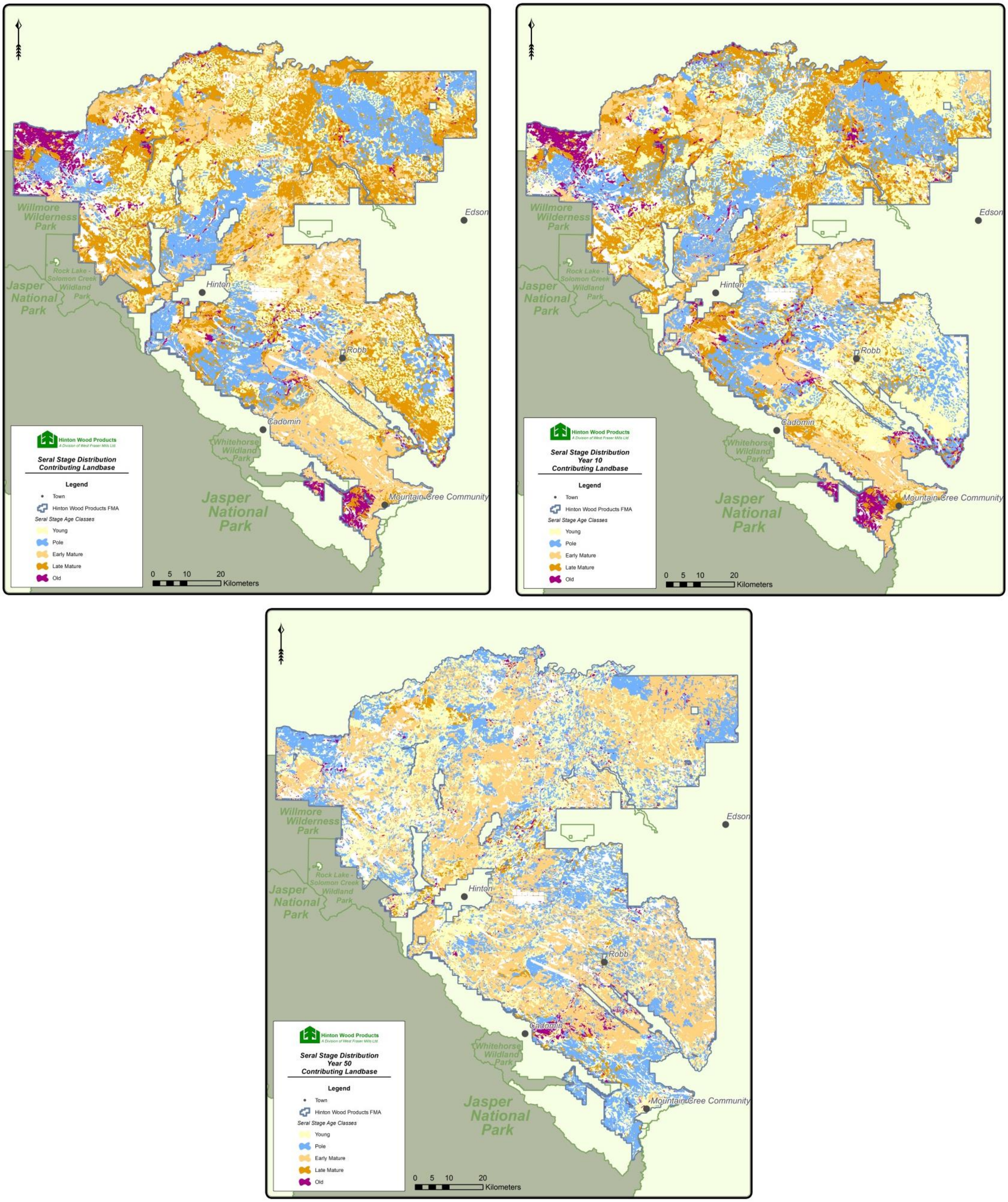


Figure 61 – Seral stage distribution in Year 0, 10, and 50 for the contributing FMA landbase

5.0 Contributing FMA Landbase by Upland, Riparian, and Wetland

Table 52 on the following pages outline the NRV for each seral stage and cover type broken down by upland, riparian, and wetland for the contributing Hinton FMA landbase. This data is being presented as information, which will help inform future management decisions around topics such as riparian management. The table also notes the current status of the upland, riparian, and wetland compared to NRV at Year 0 (2012), Year 10, Year 50, and Year 100 for the contributing landbase.

Graphs

Graphs in Appendix 8 include the relative frequency distribution of the amount of forest in the specified forest cover type and seral-stage for the contributing FMA landbase by upland, riparian, and wetland, based on 100 LANDMINE consecutive model runs captured in ten year increments. On each graph the median of the 100 samples is shown as a vertical solid line. In each graph, NRV is compared to the landscape condition in Year 0 (2012), Year 10 (SHS), Year 50, Year 100, and Year 200.

The median is the mid-point of the sample data; 50% of the samples are greater than the median and 50% are less. Also shown on each graph is the range from the 12.5 to the 87.5 percentile (green shaded box). This box captures the middle 75% of the data.

Maps

Figure 62 is a map of the contributing FMA landbase showing the spatial location of the riparian area, as well as the location of each of the five forested cover types within the riparian area.

Discussion

Determining NRV for the riparian areas on the contributing FMA landbase and then tracking the status of each seral stage within the riparian area is an important component of HWP's Riparian Management Strategy (RMS) as discussed in Appendix 2. The primary objective of the RMS is to ensure riparian areas on the FMA area remain with their NRV over time.

In the contributing riparian landbase, in general, there is too much of the "late mature and old" seral stage, particularly in the white spruce, black spruce, mixed wood, and deciduous cover types, for the first 10 years of the plan. However, at Year 50, all seral stages and cover types are between the 12.5 and 87.5 percentiles except for one; "early mature" pine, which is slightly over the 87.5 percentile, meaning there is a little too much "early mature".

At Year 100, the "late mature plus old" seral stage on the contributing riparian landbase either falls out of NRV or below the 12.5 percentile for each of five cover types, although when the passive landbase is added to the contributing (i.e. the gross riparian landbase – Table 49), all cover types for the "late mature plus old" seral stage are either between the 12.5 and 87.5 percentiles or are above them (meaning too much old). Depending on how HWP's RMS gets implemented over the subsequent years, changes may be made to future FMPs to bring the "late mature plus old" seral stage in the contributing riparian landbase back above the 12.5 percentile for Year 100.

Table 52 – The Upland, Riparian, and Wetland NRV for the Contributing FMA Landbase Compared to the Status of Each at Year 0 and Year 10

Cover Type	Seral Stage	NRV - Upland				NRV - Riparian				NRV - Wetland				Status* Year 0 (2012)						Status* Year 10					
		Low Range		High Range		Low Range		High Range		Low Range		High Range		Upland		Riparian		Wetland		Upland		Riparian		Wetland	
		ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%
Pine	Young	6,799	2.1	231,150	69.9	1,065	1.8	41,378	71.4	16	0.8	1,323	66.3	85,230	25.8	6,207	10.7	272	13.6	109,877	33.2	12,551	21.7	451	22.6
	Pole	26,876	8.1	250,341	75.7	4,203	7.3	45,021	77.7	157	7.9	1,468	73.6	58,376	17.6	6,721	11.6	259	13.0	74,497	22.5	6,841	11.8	242	12.2
	Early Mature	5,793	1.8	180,465	54.6	930	1.6	32,703	56.4	40	2.0	1,118	56.0	84,618	25.6	19,235	33.2	585	29.3	63,001	19.0	13,351	23.0	474	23.8
	Late Mature + Old	977	0.3	138,116	41.8	83	0.1	25,394	43.8	0	0.0	744	37.3	102,544	31.0	25,796	44.5	878	44.0	83,393	25.2	25,215	43.5	826	41.4
	Total	330,768				57,959				1,994															
White Spruce	Young	1,216	1.8	45,943	68.7	782	2.5	22,514	70.8	4	0.8	365	71.0	16,720	25.0	1,424	4.5	51	9.9	14,673	21.9	3,509	11.0	63	12.2
	Pole	1,688	2.5	44,248	66.1	759	2.4	21,368	67.2	0	0.0	318	61.8	5,122	7.7	2,155	6.8	82	16.0	9,008	13.5	1,507	4.7	43	8.3
	Early Mature	2,714	4.1	42,164	63.0	906	2.8	20,559	64.6	12	2.3	322	62.6	12,278	18.4	5,929	18.6	185	35.9	12,770	19.1	6,133	19.3	194	37.6
	Late Mature + Old	1,094	1.6	35,709	53.4	499	1.6	16,859	53.0	4	0.8	279	54.2	32,789	49.0	22,296	70.1	197	38.3	30,458	45.5	20,654	64.9	216	41.9
	Total	66,909				31,803				515															
Black Spruce	Young	97	4.8	1,692	83.8	115	5.6	1,783	87.0	1	1.5	44	84.8	258	12.8	72	3.5	1	2.1	460	22.8	573	27.9	14	27.8
	Pole	89	4.4	1,479	73.2	87	4.3	1,480	72.2	1	1.5	44	86.4	299	14.8	272	13.3	27	53.0	245	12.1	183	8.9	0	0.1
	Early Mature	0	0.0	608	30.1	0	0.0	563	27.4	0	0.0	16	30.3	198	9.8	156	7.6	2	2.9	196	9.7	175	8.5	28	54.8
	Late Mature + Old	31	1.5	1,273	63.0	36	1.8	1,307	63.7	1	1.5	34	66.7	1,265	62.6	1,550	75.6	22	42.0	1,117	55.3	1,121	54.7	9	17.3
	Total	2,019				2,051				51															
Mixed Wood	Young	1,811	2.0	61,543	67.4	442	1.7	17,933	69.0	0	0.0	559	74.2	9,046	9.9	587	2.3	37	4.9	20,654	22.6	4,895	18.8	118	15.7
	Pole	2,690	2.9	65,568	71.9	1,147	4.4	18,503	71.2	16	2.2	624	82.8	24,035	26.3	4,029	15.5	192	25.5	17,114	18.8	2,547	9.8	131	17.4
	Early Mature	1,946	2.1	53,566	58.7	549	2.1	15,753	60.6	0	0.0	430	57.0	17,373	19.0	6,050	23.3	186	24.7	19,582	21.5	5,192	20.0	193	25.6
	Late Mature + Old	140	0.2	43,106	47.2	36	0.1	12,304	47.3	0	0.0	332	44.1	40,796	44.7	15,338	59.0	339	44.9	33,899	37.1	13,372	51.4	312	41.3
	Total	91,250				26,005				754															
Deciduous	Young	513	1.2	27,937	66.1	81	1.0	5,134	65.4	0	0.0	145	61.5	2,542	6.0	88	1.1	6	2.4	10,396	24.6	1,325	16.9	40	17.1
	Pole	1,039	2.5	30,952	73.2	180	2.3	5,979	76.2	6	2.6	172	73.1	5,453	12.9	735	9.4	30	12.9	3,430	8.1	518	6.6	19	8.2
	Early Mature	854	2.0	25,939	61.4	149	1.9	4,991	63.6	0	0.0	154	65.4	9,696	22.9	2,033	25.9	73	31.2	7,268	17.2	1,456	18.5	57	24.3
	Late Mature + Old	70	0.2	21,290	50.4	17	0.2	4,214	53.7	0	0.0	124	52.4	24,582	58.2	4,993	63.6	126	53.5	21,179	50.1	4,551	58.0	119	50.4
	Total	42,273				7,849				236				42,274		7,849		236							
Non-forest		0				0				0				0		0		0							
	Total area	533,219				125,666				3,550				533,219		125,666		3,550		533,219		125,666		3,550	

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

Table 52 (cont.) –The Upland, Riparian, and Wetland NRV for the Contributing FMA Landbase Compared to the Status of Each at Year 50 and Year 100

Cover Type	Seral Stage	NRV - Upland				NRV - Riparian				NRV - Wetland				Status* Year 50						Status* Year 100					
		Low Range		High Range		Low Range		High Range		Low Range		High Range		Upland		Riparian		Wetland		Upland		Riparian		Wetland	
		ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%
Pine	Young	6,799	2.1	231,150	69.9	1,065	1.8	41,378	71.4	16	0.8	1,323	66.3	48,729	14.7	14,538	25.1	466	23.4	83,762	25.3	14,297	24.7	413	20.7
	Pole	26,876	8.1	250,341	75.7	4,203	7.3	45,021	77.7	157	7.9	1,468	73.6	66,862	20.2	16,247	28.0	493	24.7	87,946	26.6	9,471	16.3	468	23.5
	Early Mature	5,793	1.8	180,465	54.6	930	1.6	32,703	56.4	40	2.0	1,118	56.0	194,273	58.7	21,126	36.4	793	39.7	136,932	41.4	31,908	55.1	1,052	52.8
	Late Mature + Old	977	0.3	138,116	41.8	83	0.1	25,394	43.8	0	0.0	744	37.3	20,905	6.3	6,048	10.4	243	12.2	22,127	6.7	2,283	3.9	61	3.0
	Total	330,768				57,959				1,994															
White Spruce	Young	1,216	1.8	45,943	68.7	782	2.5	22,514	70.8	4	0.8	365	71.0	13,134	19.6	9,646	30.3	141	27.4	9,837	14.7	5,544	17.4	75	14.6
	Pole	1,688	2.5	44,248	66.1	759	2.4	21,368	67.2	0	0.0	318	61.8	18,427	27.5	11,706	36.8	121	23.5	18,867	28.2	2,675	8.4	93	18.0
	Early Mature	2,714	4.1	42,164	63.0	906	2.8	20,559	64.6	12	2.3	322	62.6	26,424	39.5	6,268	19.7	165	32.1	33,419	49.9	21,700	68.2	281	54.6
	Late Mature + Old	1,094	1.6	35,709	53.4	499	1.6	16,859	53.0	4	0.8	279	54.2	8,924	13.3	4,182	13.2	88	17.0	4,786	7.2	1,884	5.9	66	12.8
	Total	66,909				31,803				515															
Black Spruce	Young	97	4.8	1,692	83.8	115	5.6	1,783	87.0	1	1.5	44	84.8	505	25.0	490	23.9	18	34.2	442	21.9	580	28.3	14	28.1
	Pole	89	4.4	1,479	73.2	87	4.3	1,480	72.2	1	1.5	44	86.4	998	49.4	1,105	53.9	22	42.0	1,015	50.3	868	42.3	30	57.6
	Early Mature	0	0.0	608	30.1	0	0.0	563	27.4	0	0.0	16	30.3	114	5.6	118	5.7	0	0.0	515	25.5	525	25.6	7	14.2
	Late Mature + Old	31	1.5	1,273	63.0	36	1.8	1,307	63.7	1	1.5	34	66.7	403	19.9	338	16.5	12	23.8	47	2.3	78	3.8	0	0.0
	Total	2,019				2,051				51															
Mixed Wood	Young	1,811	2.0	61,543	67.4	442	1.7	17,933	69.0	0	0.0	559	74.2	19,762	21.7	8,058	31.0	186	24.6	24,046	26.4	5,679	21.8	149	19.8
	Pole	2,690	2.9	65,568	71.9	1,147	4.4	18,503	71.2	16	2.2	624	82.8	16,610	18.2	5,867	22.6	125	16.6	13,232	14.5	2,973	11.4	174	23.1
	Early Mature	1,946	2.1	53,566	58.7	549	2.1	15,753	60.6	0	0.0	430	57.0	46,260	50.7	8,774	33.7	307	40.8	49,059	53.8	15,744	60.5	411	54.5
	Late Mature + Old	140	0.2	43,106	47.2	36	0.1	12,304	47.3	0	0.0	332	44.1	8,619	9.4	3,307	12.7	136	18.0	4,914	5.4	1,609	6.2	20	2.6
	Total	91,250				26,005				754															
Deciduous	Young	513	1.2	27,937	66.1	81	1.0	5,134	65.4	0	0.0	145	61.5	10,083	23.9	2,656	33.8	71	30.0	11,260	26.6	2,456	31.3	70	29.9
	Pole	1,039	2.5	30,952	73.2	180	2.3	5,979	76.2	6	2.6	172	73.1	18,128	42.9	3,140	40.0	84	35.5	16,201	38.3	2,378	30.3	88	37.3
	Early Mature	854	2.0	25,939	61.4	149	1.9	4,991	63.6	0	0.0	154	65.4	7,849	18.6	810	10.3	35	15.1	11,913	28.2	2,776	35.4	72	30.5
	Late Mature + Old	70	0.2	21,290	50.4	17	0.2	4,214	53.7	0	0.0	124	52.4	6,214	14.7	1,243	15.8	46	19.4	2,899	6.9	238	3.0	5	2.2
	Total	42,273				7,849				236															
Non-forest		0				0				0															
	Total area	533,219				125,666				3,550															

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

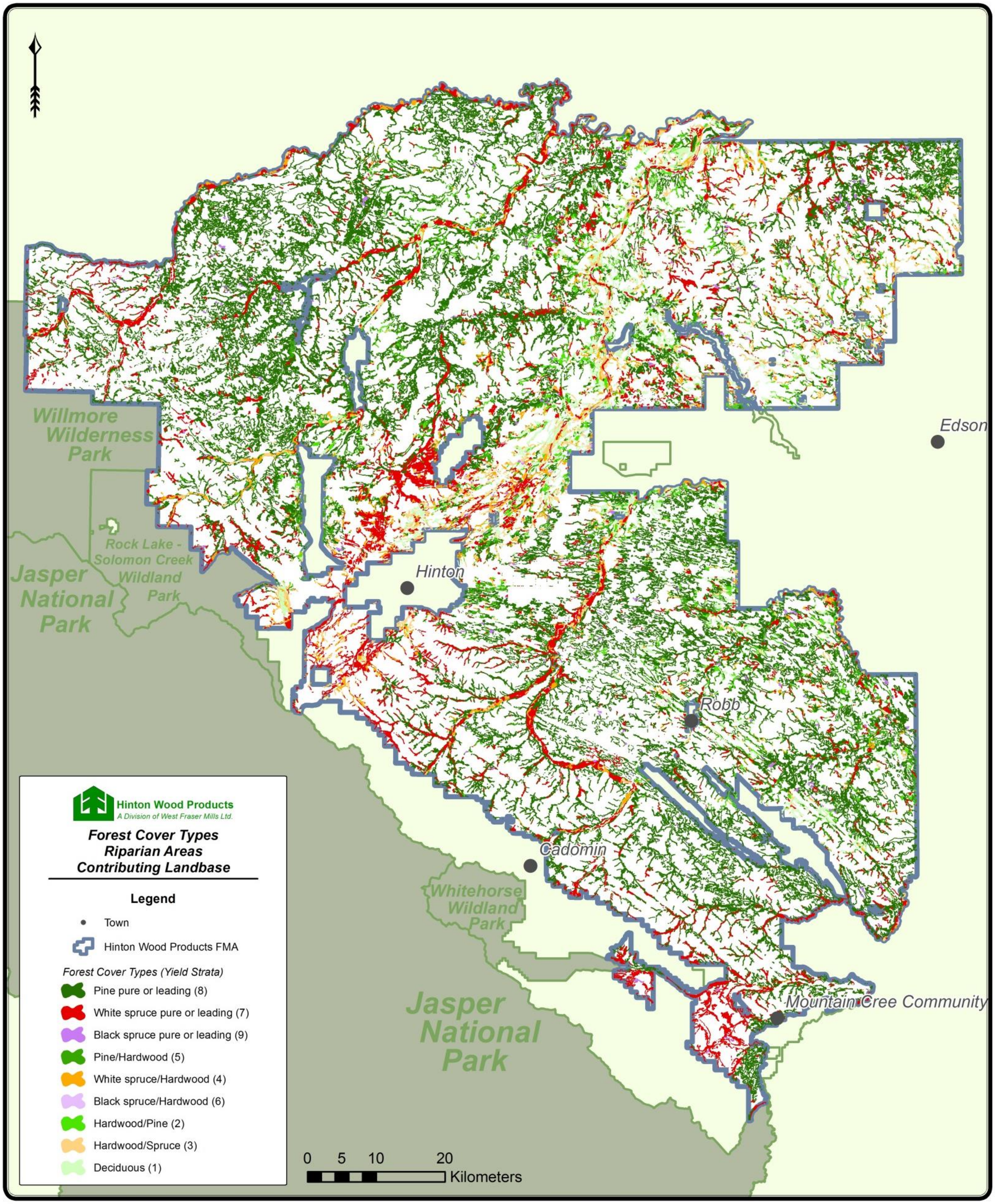


Figure 62 – The location of riparian area by cover type for the contributing FMA landbase

6.0 Passive FMA Landbase

Table 53 and Table 54 on the following page outline the Natural Range of Variability (NRV) for each seral stage and cover type for the passive FMA landbase – this is the portion of the landbase that isn't harvested due to a number of factors such as steep slopes, riparian buffers, and wildlife constraints. This data is being presented as information – which will help inform future management decisions around topics such as how to introduce disturbance back into the passive landbase. NRV is presented in the table as a range from the lowest number of hectares of a cover type and seral stage to the highest number of hectares of the same seral stage and cover type. The tables also describe what the current status of the indicator is at Year 0 (2012), Year 10, Year 50, Year 100, and Year 200 for the passive landbase.

Graphs

Appendix 9 provides NRV graphs for the passive FMA landbase for each of the five cover types and four seral stages. In each graph, NRV is defined and the landscape condition in Year 10 (SHS), Year 50, Year 100 and Year 200 is noted. The graphs describe the relative frequency distribution of the amount of forest in the specified forest type and seral-stage for the passive FMA landbase as noted based on 100 LANDMINE consecutive model runs captured in ten year increments.

On each graph the median of the 100 samples is shown as a vertical solid line. The median is the mid-point of the sample data; 50% of the samples are greater than the median and 50% are less. Also shown on each graph is the range from the 12.5 to the 87.5 percentile (green shaded box). This box captures the middle 75% of the data.

Discussion

There is a definite pattern when looking at the forecasts compared to the NRV for the passive landbase – there is too many hectares of the older seral stages and not enough hectares of the younger seral stages. This makes sense, as the passive landbase is not being disturbed, so it is difficult to recruit younger seral stages, as the two major mechanisms for converting older forests to younger ones are fire and harvesting; both of which are removed from the passive landbase. Over time, old stands will die off and be converted back to young stands, but this will take much longer to happen then it normally would through fire. As this plan is implemented in the long term, the government will have to decide on whether or not to continue to let the passive landbase grow old or to intervene is some manner (e.g. prescribed fire) to reset old seral stages to younger ones.

Table 53 – Summary of NRV and Current Condition for all forest on the Passive FMF area

Seral Stage	NRV						Status*									
	Low Range		12.5 %	87.5 %	High Range		Year 0 (2012)		Year 10		Year 50		Year 100		Year 200	
	ha	%	%	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Young	8,054	3.3	9.0	52.3	186,036	77.1	2,657	1.1	1,273	0.5	331	0.1	2,115	0.9	31,922	13.2
Pole	14,188	5.9	15.3	52.8	161,185	66.8	39,958	16.6	21,481	8.9	1,190	0.5	3,203	1.3	22,833	9.5
Early Mature	4,262	1.8	4.0	23.9	88,272	36.6	64,059	26.5	70,583	29.2	19,755	8.2	543	0.2	19,347	8.0
Late Mature + Old	5,301	2.2	9.9	41.5	117,000	48.5	134,679	55.8	148,015	61.3	220,076	91.2	235,491	97.6	167,250	69.3
Total	241,352															

Table 54 – NRV by Seral Stage and Cover Type for the Passive FMA Landbase Over 200 Years

Cover Type	Seral Stage	NRV						Status*									
		Low Range		12.5 %	87.5 %	High Range		Year 0 (2012)		Year 10		Year 50		Year 100		Year 200	
		ha	%			ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Pine	Young	1,744	2.3	4.9	47.1	55,476	72.6	1,597	2.1	946	1.2	18	0.0	285	0.4	5,893	4.1
	Pole	5,256	6.9	15.5	55.1	58,444	76.5	11,074	14.5	7,241	9.5	147	0.2	1,001	1.3	3,440	2.3
	Early Mature	1,228	1.6	4.4	36.0	40,590	53.1	33,039	43.3	30,859	40.4	12,524	16.4	161	0.2	1,700	3.7
	Late Mature + Old	4,037	5.3	9.9	41.5	53,330	69.8	30,666	40.2	37,327	48.9	63,686	83.4	74,928	98.1	65,341	89.9
	Total	76,375															
White Spruce	Young	699	2.3	5.2	45.1	20,671	69.0	141	0.5	76	0.3	142	0.5	573	1.9	3,614	9.9
	Pole	741	2.5	7.3	39.8	18,173	60.6	827	2.8	323	1.1	0	0.0	1,230	4.1	1,275	4.9
	Early Mature	988	3.3	6.9	39.0	18,169	60.6	6,669	22.3	6,024	20.1	968	3.2	151	0.5	3,804	17.0
	Late Mature + Old	2,750	9.2	13.9	47.2	21,828	72.8	22,329	74.5	23,543	78.6	28,856	96.3	28,011	93.5	21,272	68.3
	Total	29,966															
Black Spruce	Young	4,689	4.1	12.0	58.5	96,025	84.2	815	0.7	206	0.2	169	0.1	1,111	1.0	20,461	11.0
	Pole	6,230	5.5	15.6	58.1	83,253	73.0	25,282	22.2	12,442	10.9	1,024	0.9	865	0.8	12,411	13.7
	Early Mature	27	0.0	0.7	16.1	37,823	33.2	18,014	15.8	27,363	24.0	3,384	3.0	209	0.2	5,527	13.3
	Late Mature + Old	4,641	4.1	8.5	41.9	80,881	70.9	69,967	61.3	74,067	64.9	109,501	96.0	111,892	98.1	75,679	62.0
	Total	114,078															
Mixed Wood	Young	314	2.1	4.6	52.1	10,136	67.6	74	0.5	40	0.3	2	0.0	134	0.9	1,404	9.0
	Pole	653	4.4	11.6	50.6	10,757	71.8	2,352	15.7	1,204	8.0	19	0.1	101	0.7	4,172	23.3
	Early Mature	372	2.5	5.4	41.4	9,499	63.4	4,252	28.4	4,610	30.8	2,426	16.2	21	0.1	4,928	32.2
	Late Mature + Old	996	6.6	8.7	42.7	11,145	74.4	8,311	55.4	9,134	60.9	12,541	83.7	14,732	98.3	4,484	35.5
	Total	14,988															
Deciduous	Young	89	1.5	4.1	48.7	3,861	64.9	31	0.5	4	0.1	0	0.0	12	0.2	550	9.8
	Pole	144	2.4	9.8	50.1	4,243	71.4	423	7.1	271	4.6	0	0.0	6	0.1	1,535	26.1
	Early Mature	186	3.1	5.2	43.4	3,810	64.1	2,086	35.1	1,727	29.0	454	7.6	0	0.0	3,387	53.6
	Late Mature + Old	431	7.3	10.3	45.7	4,819	81.0	3,406	57.3	3,944	66.3	5,492	92.4	5,927	99.7	473	10.5
	Total	5,946															
Non-forest (non-veg.)		105,294															
Non-forest (vegetated)		13,384															
Total gross area		360,031															

* Yellow boxes denote a seral stage and cover type within NRV but either below the 12.5 quartile or over the 87.5 quartile, while red boxes denotes a seral stage and cover type outside of NRV.

7.0 Passive FMA Landbase by Upland, Riparian, and Wetland

Table 55 on the following pages outline the NRV for each seral stage and cover type broken down by upland, riparian, and wetland for the passive Hinton FMA landbase. This data is being presented as information, which will help inform future management decisions around topics such as riparian management. The tables also note the current status of the upland, riparian, and wetland compared to NRV at Year 0 (2012), Year 10, Year 50, and Year 100 for the contributing landbase.

Graphs

Graphs in Appendix 10 include the relative frequency distribution of the amount of forest in the specified forest cover type and seral stage for the passive FMA landbase by upland, riparian, and wetland, based on 100 LANDMINE consecutive model runs captured in ten year increments. On each graph the median of the 100 samples is shown as a vertical solid line. In each graph, NRV is compared to the landscape condition in Year 0 (2012), Year 10 (SHS), Year 50, and Year 100.

The median is the mid-point of the sample data; 50% of the samples are greater than the median and 50% are less. Also shown on each graph is the range from the 12.5 to the 87.5 percentile (green shaded box). This box captures the middle 75% of the data. .

Discussion

There is a very obvious pattern when looking Table 55 and the graphs found in Appendix 10 – the majority of the seral stages and their accompanying cover types in the passive landbase are either trending out of NRV or are out of NRV. For example, in the riparian areas within the passive landbase in Year 0 and Year 10 there are 14 seral stage/cover type combinations that are out of NRV; in Year 50 there are 15 seral stage/cover type combinations that are out of NRV; and in Year 100 there are 18 (out of 25) seral stage/cover type combinations that are outside of NRV. This is a direct result of there being no significant disturbance (harvesting or fire) in the passive landbase since 1950 – nor is there any planned disturbance in this passive landbase. This is not necessarily an issue, as this passive landbase is only 35% of the gross FMA landbase, and this passive landbase contributes older seral stages to the overall gross landbase. However, black spruce makes up a significant portion (32%) of this passive landbase and therefore, the lack of young black spruce types may have ecological consequences over time. HWP see this as an issue that the government will need address over the long run through practises such as prescribed fire.

Table 55 – The Upland, Riparian, and Wetland NRV for the Passive FMA Landbase Compared to the Status of Each at Year 0 and Year 10

Cover Type	Seral Stage	NRV - Upland				NRV - Riparian				NRV - Wetland				Status* Year 0 (2012)						Status* Year 10					
		Low Range		High Range		Low Range		High Range		Low Range		High Range		Upland		Riparian		Wetland		Upland		Riparian		Wetland	
		ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%				
Pine	Young	586	1.9	23,055	73.1	1,129	2.5	32,078	72.2	0	0.0	218	61.0	1,280	4.1	315	0.7	2	0.5	763	2.4	182	0.4	1	0.3
	Pole	2,060	6.5	24,076	76.3	3,270	7.4	34,226	77.0	24	6.6	263	73.5	4,879	15.5	6,117	13.8	78	21.7	3,492	11.1	3,705	8.3	44	12.2
	Early Mature	552	1.7	16,501	52.3	614	1.4	24,344	54.8	3	0.7	190	52.9	11,625	36.8	21,308	47.9	107	29.8	10,411	33.0	20,349	45.8	100	27.9
	Late Mature + Old	1,932	6.1	21,808	69.1	1,716	3.9	31,634	71.2	13	3.7	237	66.2	13,774	43.6	16,720	37.6	172	48.1	16,891	53.5	20,223	45.5	213	59.5
	Total	31,557				44,459				358															
White Spruce	Young	283	1.9	10,434	71.1	323	2.1	10,248	67.4	0	0.0	56	73.9	86	0.6	54	0.4	1	1.3	34	0.2	41	0.3	0	0.0
	Pole	283	1.9	8,526	58.1	330	2.2	9,553	62.8	0	0.0	53	69.6	334	2.3	486	3.2	6	8.2	151	1.0	167	1.1	5	6.9
	Early Mature	447	3.0	9,408	64.1	469	3.1	8,795	57.8	0	0.0	50	65.2	3,160	21.5	3,485	22.9	24	32.1	2,899	19.7	3,101	20.4	24	31.4
	Late Mature + Old	1,420	9.7	10,315	70.2	1,338	8.8	11,437	75.2	0	0.0	56	73.9	11,104	75.6	11,181	73.5	44	58.3	11,600	79.0	11,896	78.2	47	61.7
	Total	14,684				15,206				76															
Black Spruce	Young	426	3.8	9,292	82.4	4,216	4.2	85,477	84.4	35	2.3	1,213	80.9	293	2.6	514	0.5	8	0.5	69	0.6	132	0.1	5	0.3
	Pole	580	5.1	8,038	71.3	5,530	5.5	74,419	73.5	62	4.1	1,178	78.6	2,483	22.0	22,353	22.1	446	29.7	1,907	16.9	10,317	10.2	218	14.5
	Early Mature	3	0.0	2,986	26.5	21	0.0	34,270	33.8	0	0.0	473	31.5	1,420	12.6	16,371	16.2	222	14.8	1,922	17.0	25,021	24.7	419	27.9
	Late Mature + Old	436	3.9	7,867	69.8	4,145	4.1	71,981	71.1	54	3.6	988	65.9	7,079	62.8	62,064	61.3	824	54.9	7,378	65.4	65,831	65.0	858	57.2
	Total	11,276				101,302				1,500															
Mixed Wood	Young	116	1.7	4,543	67.7	156	1.9	5,513	67.6	0	0.0	94	82.8	42	0.6	32	0.4	0	0.0	30	0.4	10	0.1	0	0.0
	Pole	259	3.9	4,727	70.4	317	3.9	6,079	74.5	0	0.0	86	75.9	1,245	18.5	1,089	13.3	18	15.6	628	9.3	568	7.0	9	7.6
	Early Mature	167	2.5	4,134	61.6	205	2.5	5,357	65.6	0	0.0	82	72.4	2,082	31.0	2,127	26.1	43	38.0	2,324	34.6	2,235	27.4	50	44.0
	Late Mature + Old	409	6.1	4,990	74.3	464	5.7	6,079	74.5	0	0.0	79	69.0	3,346	49.8	4,911	60.2	53	46.5	3,733	55.6	5,346	65.5	55	48.3
	Total	6,715				8,160				114															
Deciduous	Young	41	1.7	1,560	64.4	25	0.7	2,295	65.7	0	0.0	27	91.7	18	0.7	13	0.4	0	0.0	4	0.2	0	0.0	0	0.0
	Pole	54	2.2	1,712	70.7	47	1.3	2,524	72.3	0	0.0	27	91.7	229	9.4	190	5.4	4	13.4	145	6.0	123	3.5	2	6.1
	Early Mature	62	2.6	1,549	63.9	110	3.1	2,245	64.3	0	0.0	22	75.0	868	35.8	1,210	34.6	8	25.6	752	31.0	966	27.6	9	31.8
	Late Mature + Old	175	7.2	1,959	80.9	251	7.2	2,844	81.4	2	8.3	22	75.0	1,308	54.0	2,080	59.5	18	61.0	1,522	62.8	2,404	68.8	18	62.1
	Total	2,423				3,493				30															
Non-forest (non-veg.)		58,286				46,262				746															
Non-forest (vegetated)		11,832				1,448				104															
Total area		136,774				220,329				2,928															

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

Table 55 (cont.) – The Upland, Riparian, and Wetland NRV for the Passive FMA Landbase Compared to the Status of Each at Year 50 and Year 100

Cover Type	Seral Stage	NRV - Upland				NRV - Riparian				NRV - Wetland				Status* Year 50						Status* Year 100					
		Low Range		High Range		Low Range		High Range		Low Range		High Range		Upland		Riparian		Wetland		Upland		Riparian		Wetland	
		ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%	ha.	%				
Pine	Young	586	1.9	23,055	73.1	1,129	2.5	32,078	72.2	0	0.0	218	61.0	4	0.0	12	0.0	2	0.7	187	0.6	98	0.2	17	4.7
	Pole	2,060	6.5	24,076	76.3	3,270	7.4	34,226	77.0	24	6.6	263	73.5	44	0.1	102	0.2	1	0.2	871	2.8	122	0.3	2	0.6
	Early Mature	552	1.7	16,501	52.3	614	1.4	24,344	54.8	3	0.7	190	52.9	6,115	19.4	6,330	14.2	79	22.0	44	0.1	114	0.3	8	2.3
	Late Mature + Old	1,932	6.1	21,808	69.1	1,716	3.9	31,634	71.2	13	3.7	237	66.2	25,395	80.5	38,015	85.5	276	77.2	30,456	96.5	44,126	99.2	331	92.4
	Total	31,557				44,459				358															
White Spruce	Young	283	1.9	10,434	71.1	323	2.1	10,248	67.4	0	0.0	56	73.9	0	0.0	40	0.3	0	0.0	314	2.1	260	1.7	8	10.4
	Pole	283	1.9	8,526	58.1	330	2.2	9,553	62.8	0	0.0	53	69.6	17	0.3	0	0.0	0	0.0	886	6.0	338	2.2	0	0.2
	Early Mature	447	3.0	9,408	64.1	469	3.1	8,795	57.8	0	0.0	50	65.2	1,287	19.2	540	3.6	7	9.6	111	0.8	41	0.3	1	0.7
	Late Mature + Old	1,420	9.7	10,315	70.2	1,338	8.8	11,437	75.2	0	0.0	56	73.9	5,411	80.6	14,625	96.2	69	90.4	13,374	91.1	14,567	95.8	67	88.8
	Total	14,684				15,206				76															
Black Spruce	Young	426	3.8	9,292	82.4	4,216	4.2	85,477	84.4	35	2.3	1,213	80.9	21	0.2	149	0.1	0	0.0	288	2.6	816	0.8	250	16.6
	Pole	580	5.1	8,038	71.3	5,530	5.5	74,419	73.5	62	4.1	1,178	78.6	404	3.6	612	0.6	8	0.5	182	1.6	676	0.7	94	6.3
	Early Mature	3	0.0	2,986	26.5	21	0.0	34,270	33.8	0	0.0	473	31.5	618	5.5	2,705	2.7	60	4.0	112	1.0	97	0.1	20	1.3
	Late Mature + Old	436	3.9	7,867	69.8	4,145	4.1	71,981	71.1	54	3.6	988	65.9	10,233	90.8	97,836	96.6	1,432	95.5	10,694	94.8	99,712	98.4	1,136	75.8
	Total	11,276				101,302				1,500															
Mixed Wood	Young	116	1.7	4,543	67.7	156	1.9	5,513	67.6	0	0.0	94	82.8	0	0.0	2	0.0	0	0.0	35	0.5	97	1.2	5	4.5
	Pole	259	3.9	4,727	70.4	317	3.9	6,079	74.5	0	0.0	86	75.9	17	0.3	2	0.0	0	0.0	65	1.0	36	0.4	33	28.6
	Early Mature	167	2.5	4,134	61.6	205	2.5	5,357	65.6	0	0.0	82	72.4	1,287	19.2	1,121	13.7	18	15.6	17	0.3	4	0.1	41	36.4
	Late Mature + Old	409	6.1	4,990	74.3	464	5.7	6,079	74.5	0	0.0	79	69.0	5,411	80.6	7,034	86.2	96	84.4	6,598	98.3	8,022	98.3	35	30.5
	Total	6,715				8,160				114															
Deciduous	Young	41	1.7	1,560	64.4	25	0.7	2,295	65.7	0	0.0	27	91.7	0	0.0	0	0.0	0	0.0	3	0.1	10	0.3	3	11.2
	Pole	54	2.2	1,712	70.7	47	1.3	2,524	72.3	0	0.0	27	91.7	0	0.0	0	0.0	0	0.0	6	0.2	0	0.0	4	14.4
	Early Mature	62	2.6	1,549	63.9	110	3.1	2,245	64.3	0	0.0	22	75.0	247	10.2	203	5.8	4	13.4	0	0.0	0	0.0	18	59.3
	Late Mature + Old	175	7.2	1,959	80.9	251	7.2	2,844	81.4	2	8.3	22	75.0	2,176	89.8	3,290	94.2	26	86.6	2,415	99.7	3,483	99.7	5	15.1
	Total	2,423				3,493				30															
Non-forest (non-veg.)		58,286				46,262				746															
Non-forest (vegetated)		11,832				1,448				104															
Total area		136,774				220,329				2,928															

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

TARGET #2 – Patch Size

Value	Landscape scale biodiversity
Objective	Maintain biodiversity by retaining the full range of cover types and seral stages
Indicator	Range of patch sizes by subunit and entire FMA
TARGET #2	A distribution of harvest area sizes that will result in a patch size pattern over the 200 year planning horizon approximating patterns (i.e. NRV) created by natural disturbances.
Means to Identify Target	Natural disturbance patch size patterns will be established through LANDMINE modeling informed through FRI research
Legal/Policy Requirements	Alberta Forest Management Planning Standard
Means of Achieving Objective and Target	Spatial and temporal harvest planning.
Monitoring and Measurement	• Regular updates to forest inventory • The SHS will be compared to the NRV for patch sizes as determined by LANDMINE modeling.
Reporting Commitments	• DFMP: Tables of area of forest in each patch size class by subunit at 0, 10, and 50 years (or end of first rotation). Maps of patch size classes at 0, 10, and 50 years, (or end of first rotation). • Performance: 5-Year DFMP Stewardship Report
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 DFMP
HWP Strategy	See section 3.32 in HWP's Natural Disturbance Strategy found in Appendix 2.

1.0 Target #2

Definitions

A. Patch Size – HWP used eight size classes for measuring patch size. The eight patch sizes were as follows:

- <100 hectares
- 100–500 hectares
- 500–1,000 hectares
- 1,000–2,000 hectares
- 2,000–5,000 hectares
- 5000–10,000 hectares
- 10,000-50,000 hectares
- 50,000+ hectares

Overview and Analysis

Tables, graphs, and maps in this section describe, for the gross FMA landbase, the status of this indicator (Patch Size) and where it lies with respect to its Natural Range of Variation (NRV) at the following three points in time: Year 0 (2012), Year 10 (SHS), and Year 50, and for the following five seral stages: young, pole, early mature, late mature, and old (described in Table 45). Please note that although Target #1 reports on four seral stages (adding "late mature" and "old" into one seral stage called "late mature plus old" at the request of the GoA after the DFMP was originally submitted in October 2014), this was not possible for this indicator, as the NRV calculation had already been completed, and because it is a spatial calculation, HWP could not post-hoc add the "late mature" and "old" patches into one larger patch.

2.0 Report – Target #2 (Patch Size and Patch Number by Seral Stage)

Table 56 on the following pages outlines the Natural Range of Variation (NRV) for the patch sizes of each of the five seral stages for the gross FMA landbase, regardless of cover type (i.e. old patches can be made up of one or more cover types). Patch Size NRV is represented in the table as the range between the lowest total area of patches and the highest total area of patches, for each of the eight patch size classes. Patch number NRV is represented in the table as the range between the lowest total number of patches and the highest total number of patches, for each of the eight patch size classes. In addition, the table shows where the 12.5 percentile and 87.5 percentile of these data lie – in other words, these percentiles bracket where the data falls 75% of the time.

Table 56 – Patch size and density NRV by seral stage compared to landscape conditions at Year 0, 10, and 50 (gross FMA)

Seral Stage	Patch Size Class	Natural Range of Variation								Year 0 (2012)		Year 10		Year 50	
		Patch Density (#)				Patch Area (ha)				Patches (#)	Area (ha)	Patches (#)	Area (ha)	Patches (#)	Area (ha)
		Min. #	12.5%	87.5%	Max #	Min	12.5%	87.5%	Max						
Young	<100	78	163	1,211	2,331	390	815	6,055	11,655	13,473	100,703	35,456	134,549	55,653	122,502
	100–500	12	27	70	109	2,796	6,291	16,310	25,397	77	12,634	114	18,739	35	5,970
	500–1,000	3	7	17	25	2,001	4,669	11,339	16,675	-	-	1	664	-	-
	1–2,000	2	4	15	19	2,666	5,332	19,995	25,327	-	-	-	-	-	-
	2–5,000	0	3	11	17	0	9,000	31,875	51,000	-	-	-	-	-	-
	5–10,000	0	0	5	8	0	0	30,835	53,336	-	-	-	-	-	-
	10-50,000	0	0	5	7	0	0	116,665	163,331	-	-	-	-	-	-
	50,000+	0	0	2	4	0	0	323,782	654,824	-	-	-	-	-	-
Pole	<100	493	882	1,938	2,454	2,465	4,411	9,689	12,270	50,402	118,496	53,401	140,238	67,957	153,974
	100–500	26	52	98	113	6,058	12,116	22,834	26,329	175	33,003	145	26,982	58	9,533
	500–1,000	3	8	21	25	2,001	5,586	14,007	16,675	14	9,239	10	6,622	-	-
	1–2,000	1	6	14	20	1,333	7,998	18,662	26,660	4	5,288	2	3,151	-	-
	2–5,000	0	4	11	14	0	12,000	31,875	42,000	1	3,098	-	-	-	-
	5–10,000	0	1	5	7	0	6,667	33,335	46,669	-	-	-	-	-	-
	10-50,000	0	1	7	9	0	23,333	154,581	209,997	-	-	-	-	-	-
	50,000+	0	0	2	3	0	0	318,094	583,048	-	-	-	-	-	-
Early Mature	<100	664	1,124	2,401	3,121	3,320	5,619	12,006	15,605	33,224	138,837	40,227	121,885	71,917	245,637
	100–500	32	53	115	166	7,456	12,349	26,708	38,678	211	37,645	192	34,883	380	66,713
	500–1,000	3	8	23	29	2,001	5,336	15,091	19,343	26	17,713	19	12,221	27	17,998
	1–2,000	1	4	15	19	1,333	5,332	19,995	25,327	7	9,162	7	9,107	5	5,739
	2–5,000	0	2	11	16	0	6,000	33,000	48,000	-	-	2	5,557	1	3,171
	5–10,000	0	0	6	10	0	0	40,002	66,670	1	7,918	2	13,461	-	-
	10-50,000	0	0	5	9	0	0	116,665	209,997	1	12,267	-	-	-	-
	50,000+	0	0	1	2	0	0	82,093	288,721	-	-	-	-	-	-
Late Mature	<100	608	989	2,118	3,019	3,040	4,944	10,590	15,095	58,616	267,866	96,408	248,686	58,351	121,314
	100–500	16	39	97	126	3,728	9,087	22,514	29,358	355	64,319	299	52,739	150	25,973
	500–1,000	0	5	19	26	0	3,585	12,673	17,342	13	9,018	17	11,482	3	1,870
	1–2,000	1	2	12	16	1,333	3,166	15,996	21,328	8	10,714	4	5,493	1	1,025
	2–5,000	0	1	10	14	0	3,000	30,000	42,000	1	4,154	2	6,348	-	-
	5–10,000	0	0	4	7	0	0	26,668	46,669	-	-	-	-	-	-
	10-50,000	0	0	2	6	0	0	46,666	139,998	-	-	-	-	-	-
	50,000+	0	0	0	2	0	0	0	253,404	-	-	-	-	-	-
Old	<100	768	1,036	1,872	2,215	3,840	5,179	9,358	11,075	6,642	40,360	12,116	49,556	155,838	119,223
	100–500	33	46	77	85	7,689	10,718	17,941	19,805	63	11,895	65	11,938	96	16,019
	500–1,000	3	7	14	23	2,001	4,669	9,338	15,341	5	3,453	4	2,784	3	2,106
	1–2,000	2	4	11	16	2,666	5,332	14,663	21,328	2	3,076	2	2,816	3	4,206
	2–5,000	0	2	9	15	0	7,125	27,000	45,000	1	2,126	1	3,074	-	-
	5–10,000	0	0	3	5	0	0	20,001	33,335	-	-	-	-	-	-
	10-50,000	0	0	5	8	0	0	116,665	186,664	-	-	-	-	-	-
	50,000+	0	0	2	3	0	0	122,069	264,994	-	-	-	-	-	-

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

For the patch size calculation, HWP excluded areas under disposition, and non-forested areas, including watercourses (i.e. rivers, streams and lakes are excluded). Linear disturbances greater than 8 metres split patches, while linear disturbance less than 8 metres (i.e. seismic lines) did not.

Graphs

Appendix 11 provides NRV graphs for the gross FMA landbase for each of the above noted patch sizes and seral stages. In each graph, NRV is defined and the landscape condition in Year 0 (2012 - current), Year 10 (SHS) and Year 50 is noted. The median and where NRV falls 75% of the time is also shown.

Maps

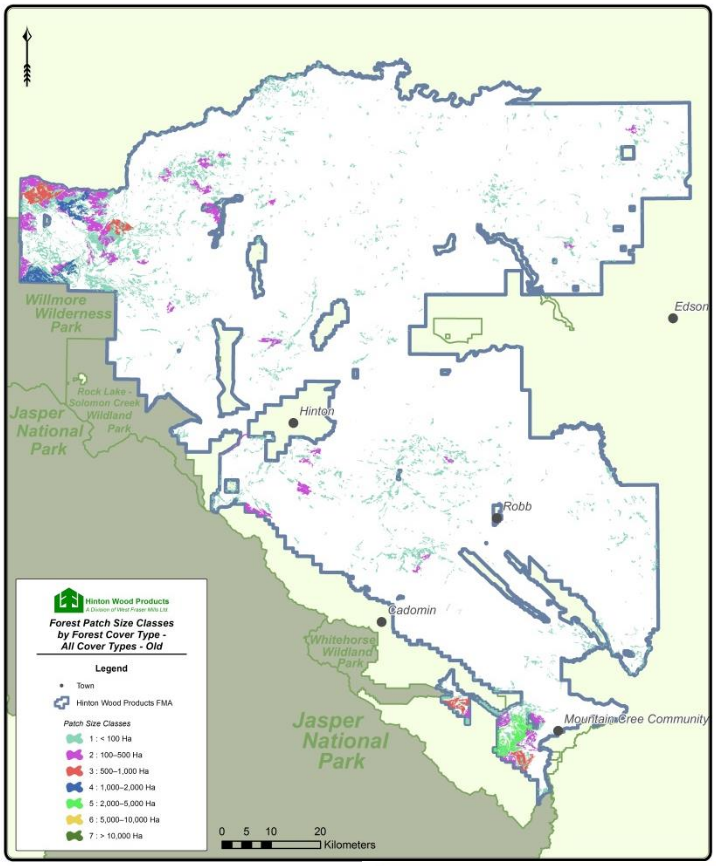
Figure 63, Figure 64, Figure 65, Figure 66 and Figure 67 contain maps of the gross FMA landbase showing the spatial location of the eight patch classes for the five seral stages (regardless of cover type) at Year 0 (2012), Year 10, and Year 50. Please note that there were no patches over 50,000 hectares in size, so the largest patch size shown in the map's legend is patches greater than 10,000 hectares.

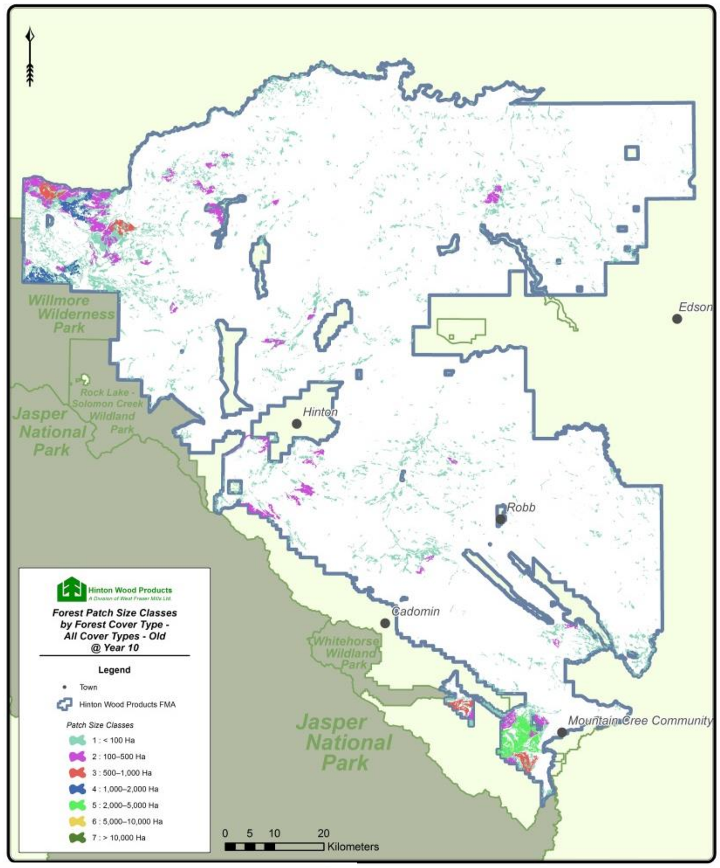
Discussion

A readily apparent trend when looking at Table 56 is the high patch area (as compared to NRV) and patch numbers (as compared to NRV) in the two smallest patch size classes, resulting in these two patch size classes (<100 and 100-500) being outside of NRV or outside of the 12.5 and 87.5 percentiles in most of the forecasts. This most likely the result of anthropogenic changes on the landbase over the last 60 years (and effective fire control); primarily from harvesting (small cutblocks) and road development (forestry and energy) that fragments patches. This pattern on the landscape will be difficult to remove in the shorter term as it is the result of years of planning and harvesting small cutblocks. In compartments or geographic areas where first pass has already been harvested (and second pass hasn't), it will take at least a rotation to remove the pattern of small patches on the landscape. The roads associated these smaller more numerous cutblocks (and energy development) also fragment patches. Part of the answer may also lie with creating larger cutblocks, but large cutblocks can be problematic due to the public's dislike of the aesthetics associated with large cutblocks. Having said that, if we want to be closer to NRV over time, HWP will need to plan and harvest larger cutblocks as we move forward.

In future DFMPs, HWP will also attempt to quantify the difference between patch size distribution with roads (which fragment patches) and without roads (i.e. allowing two patches split by a road to become one patch). Removing the roads (i.e. not allowing the fragmentation of a patch due to a road) may allow a better "apples to apples" comparison between NRV and the current and future landscape condition.

Another option is to measure this VOIT differently. In Andison's fire terminology (Andison D.W. November 2003), patches and events have different meanings. Events are areas within or between landscapes that at some point in time are commonly affected by a single disturbance such as a forest fire. Events include one or more disturbance patches. They may also include both forested and non-forested patches. In the future, this VOIT could be changed to keep track of event size rather than patch size; in this way, cutblocks that have been logged within a certain time period of one another (e.g. <20 years) and within a certain distance of one another (e.g. 500 metres) would be grouped together into one cultural event. Cultural events could then be tracked against the NRV of natural events (which Andison has also measured).





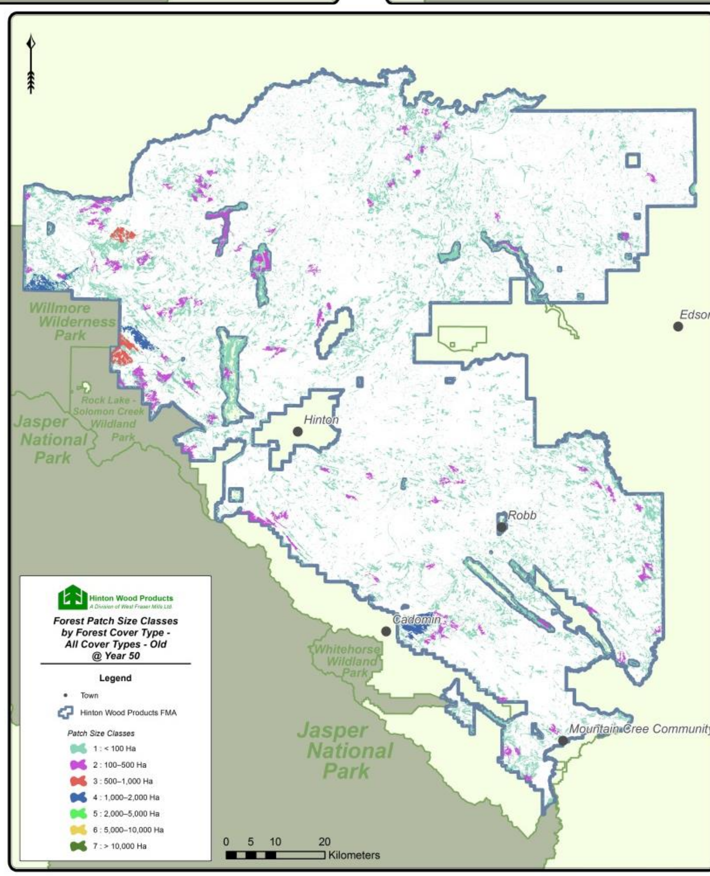


Figure 63 – Eight patch classes for the old seral stages at Year 0 (2012), Year 10, and Year 50 (Gross FMA)

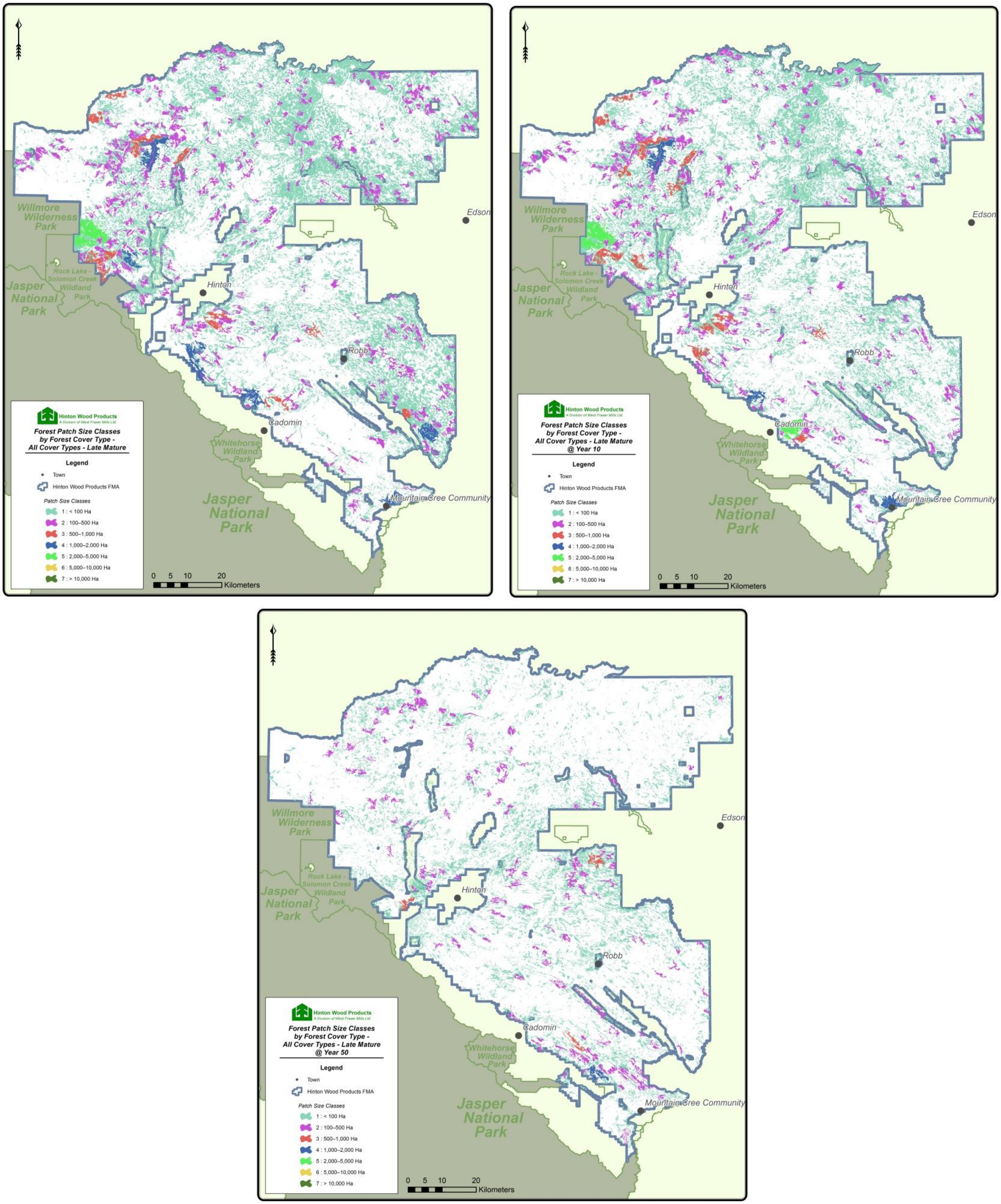


Figure 64 – Eight patch classes for the late mature seral stages at Year 0 (2012), Year 10, and Year 50 (Gross FMA)

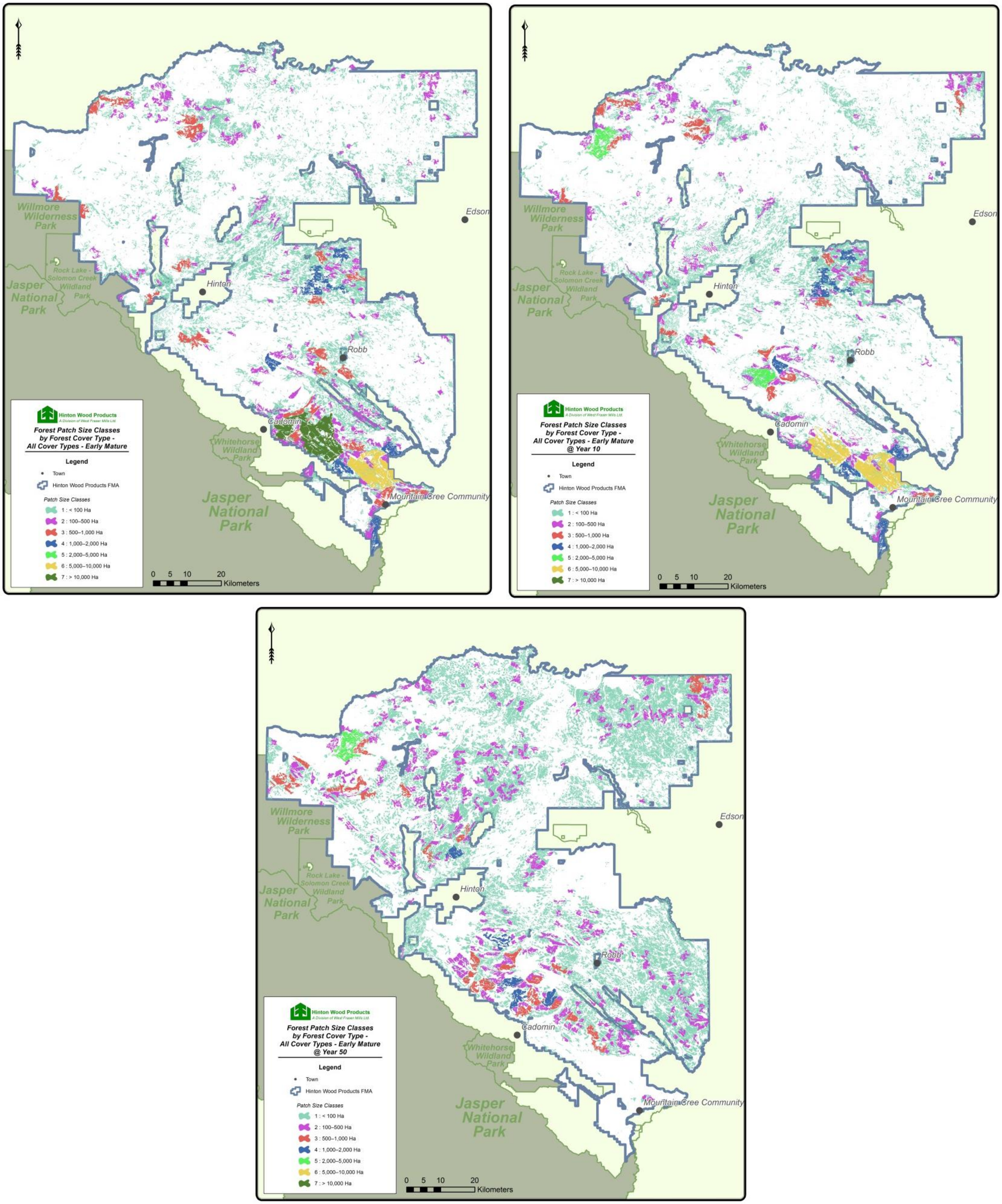


Figure 65 – Eight patch classes for the early mature seral stages at Year 0 (2012), Year 10, and Year 50 (Gross FMA)

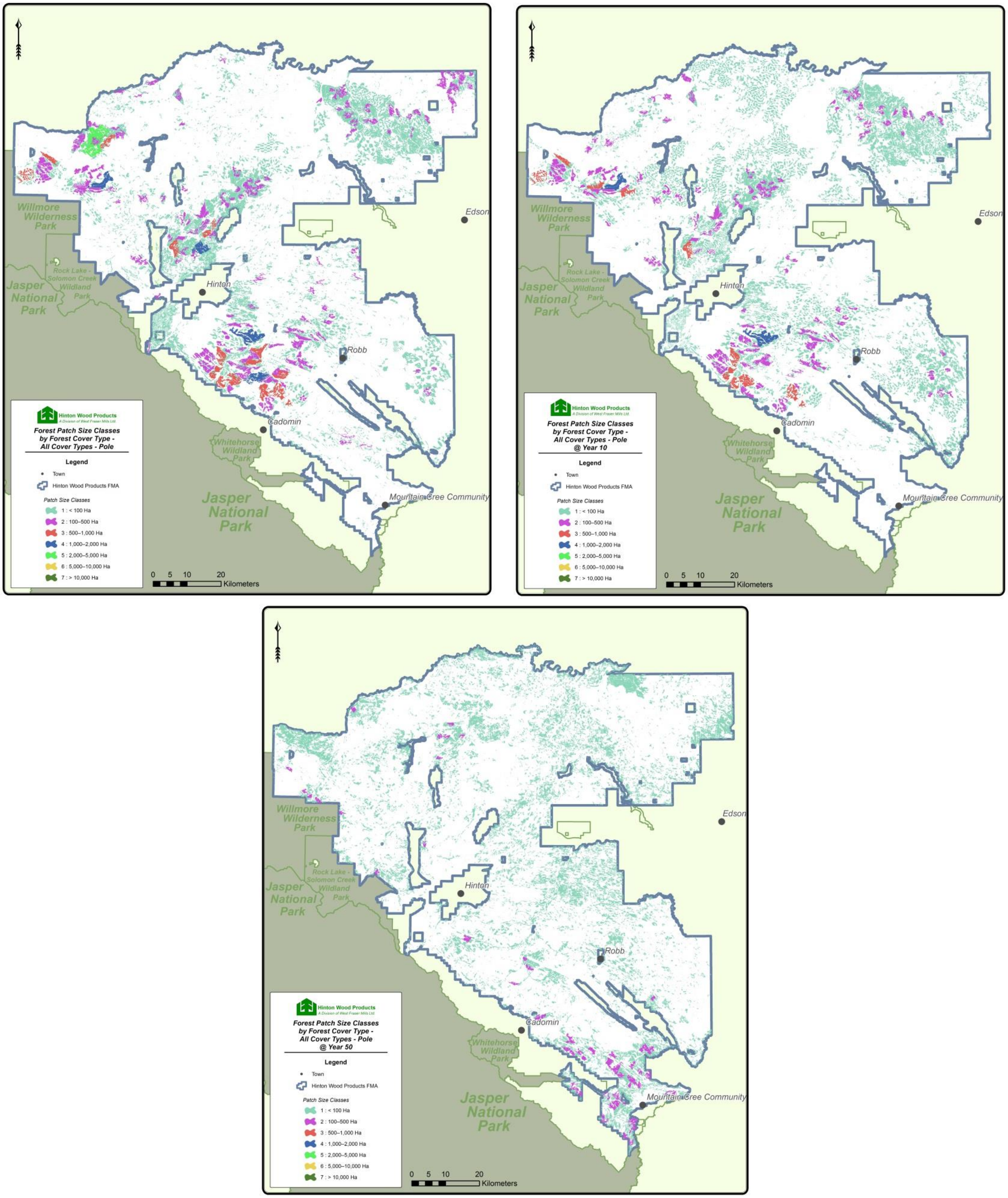


Figure 66 – Eight patch classes for the pole seral stages at Year 0 (2012), Year 10, and Year 50 (Gross FMA)

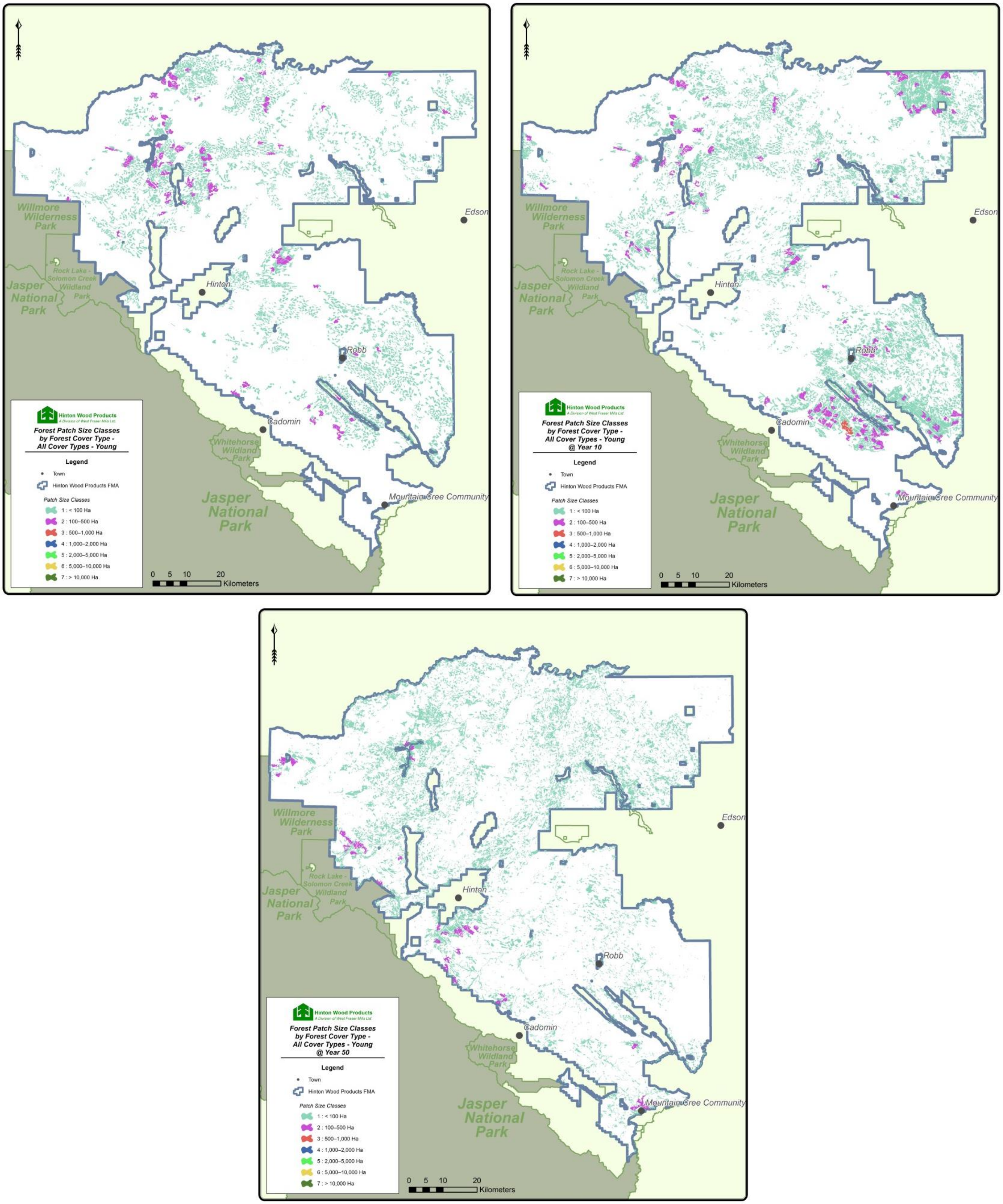


Figure 67 – Eight patch classes for the young seral stages at Year 0 (2012), Year 10, and Year 50 (Gross FMA)

3.0 Report – Target #2 (Patch Size by Cover Type and Seral Stage)

Table 57, Table 58, Table 59, Table 60, and Table 61 on the following pages outlines the Natural Range of Variation (NRV) for the patch sizes of each of the five seral stages by cover type for the gross FMA landbase. Patch Size NRV is represented in the table as the range between the lowest total area of patches and the highest total area of patches, for each of the eight patch size classes. Patch number NRV is represented in the table as the range between the lowest total number of patches and the highest total number of patches, for each of the eight patch size classes.

Graphs

Appendix 12 contains graphs that show the full range of NRV for each patch size class for every seral stage by cover type, for the gross FMA landbase. Each chart also shows: where NRV falls 75% of the time; the median (the numerical value separating the higher half of the probability distribution, from the lower half); ; Year 0 (2012 – current condition); and Year 10 (after implementation of the Spatial Harvest Sequence associated with this DFMP).

These graphs describe the NRV for various seral stages combined with cover types, allowing the reader to see, for example, what the Natural Range of Variability is for the size (hectares) of old pine patches on the FMA, and how this compares to past, current, and future landscape conditions.

Maps

Figure 68,

Figure 69, Figure 70, Figure 71, and Figure 72 contains maps of the gross FMA landbase showing the spatial location of old, late mature, early mature, pole, and young lodgepole pine for the eight patch classes for Year 0 (2012), Year 10, and Year 50. Please note that there are no patches larger than 50,000 hectares, so only seven patch sizes are shown in the map's legend.

Figure 73, Figure 74, Figure 75, Figure 76, and Figure 77 contains maps of the gross FMA landbase showing the spatial location of old, late mature, early mature, pole, and young white spruce for the eight patch classes for Year 0 (2012), Year 10, and Year 50.

Figure 78, Figure 79, Figure 80, Figure 81, and Figure 82 contains maps of the gross FMA landbase showing the spatial location of old, late mature, early mature, pole, and young black spruce for the eight patch classes for Year 0 (2012), Year 10, and Year 50.

Figure 83, Figure 84, Figure 85, Figure 86 and Figure 87 contains maps of the gross FMA landbase showing the spatial location of old, late mature, early mature, pole, and young mixed wood for the eight patch classes for Year 0 (2012), Year 10, and Year 50.

Figure 88, Figure 89, Figure 90, Figure 91, and Figure 92 contains maps of the gross FMA landbase showing the spatial location of old, late mature, early mature, pole, and young deciduous for the eight patch classes for Year 0 (2012), Year 10, and Year 50.

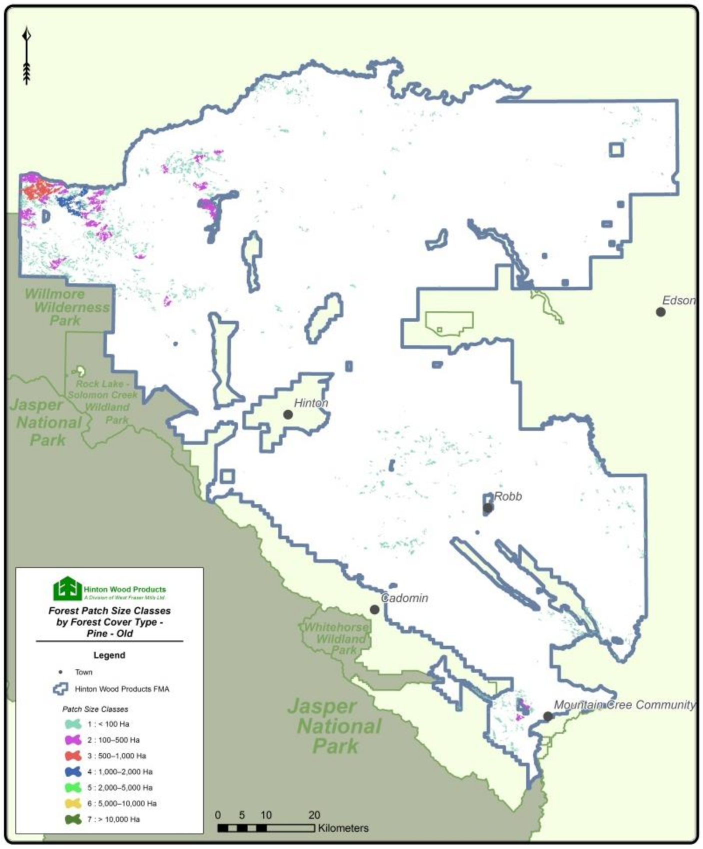
Table 57 – Patch size summary by area and density for pine forest on the HWP Gross FMA area

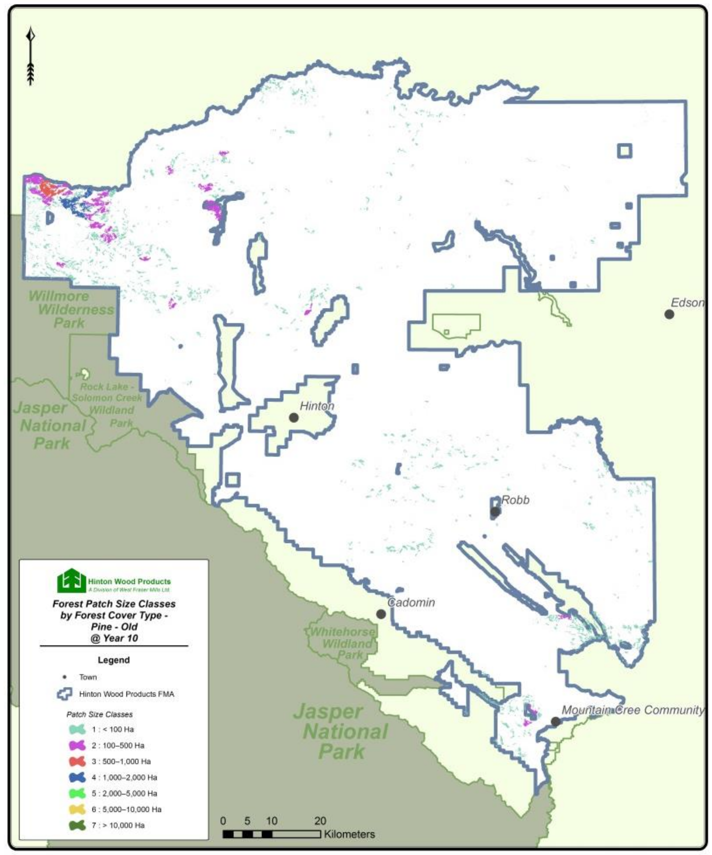
Seral Stage	Patch Size Class	Natural Range of Variation								Year 0 (2012)		Year 10		Year 50	
		Patch Density (#)				Patch Area (ha)				Patches (#)	Area (ha)	Patches (#)	Area (ha)	Patches (#)	Area (ha)
		Min. #	12.5%	87.5%	Max #	Min	12.5%	87.5%	Max						
Young	<100	179	356	1,979	2,403	895	1,781	9,894	12,015	6,313	71,951	15,409	85,560	23,580	60,032
	100–500	9	24	124	150	2,097	5,621	28,892	34,950	71	11,930	108	18,010	22	3,701
	500–1,000	0	3	23	30	0	2,251	15,091	20,010	-	-	1	664	-	-
	1–2,000	0	2	14	23	0	2,666	18,662	30,659	-	-	-	-	-	-
	2–5,000	0	1	11	15	0	3,000	31,875	45,000	-	-	-	-	-	-
	5–10,000	0	0	4	6	0	0	26,668	40,002	-	-	-	-	-	-
	10-50,000	0	0	3	8	0	0	69,999	186,664	-	-	-	-	-	-
	50,000+	0	0	0	1	0	0	0	78,597	-	-	-	-	-	-
Pole	<100	777	1,092	2,481	2,931	3,885	5,461	12,403	14,655	14,643	44,821	13,469	77,199	27,590	76,436
	100–500	42	67	135	161	9,786	15,495	31,368	37,513	136	27,472	127	24,421	46	7,428
	500–1,000	4	9	26	32	2,668	6,253	17,092	21,344	13	8,700	10	6,622	-	-
	1–2,000	1	4	14	20	1,333	5,332	18,662	26,660	3	4,286	2	3,151	-	-
	2–5,000	0	3	11	16	0	9,000	33,000	48,000	1	3,098	-	-	-	-
	5–10,000	0	0	6	8	0	0	40,002	53,336	-	-	-	-	-	-
	10-50,000	0	0	4	7	0	0	93,332	163,331	-	-	-	-	-	-
	50,000+	0	0	0	1	0	0	0	135,927	-	-	-	-	-	-
Early Mature	<100	374	771	2,322	2,637	1,870	3,854	11,609	13,185	12,772	64,279	10,999	43,735	26,078	143,832
	100–500	16	31	114	149	3,728	7,310	26,562	34,717	168	31,209	141	26,451	343	61,903
	500–1,000	1	3	22	31	667	2,001	14,674	20,677	23	15,841	17	11,057	26	17,459
	1–2,000	0	2	12	19	0	2,666	15,996	25,327	7	9,162	7	9,107	4	4,737
	2–5,000	0	1	10	18	0	3,000	30,000	54,000	-	-	2	5,557	1	3,171
	5–10,000	0	0	3	9	0	0	20,001	60,003	1	7,918	2	13,461	-	-
	10-50,000	0	0	2	5	0	0	46,666	116,665	1	12,267	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0						
Late Mature	<100	51	403	1,790	2,500	255	2,014	8,948	12,500	22,384	88,584	46,400	83,806	21,743	26,462
	100–500	3	14	79	133	699	3,349	18,465	30,989	180	35,243	140	26,355	55	10,591
	500–1,000	0	1	13	26	0	667	8,421	17,342	8	5,636	11	7,495	2	1,359
	1–2,000	0	0	8	14	0	0	10,664	18,662	6	8,146	4	5,493	1	1,025
	2–5,000	0	0	5	12	0	0	15,000	36,000	1	4,154	2	6,348	-	-
	5–10,000	0	0	1	7	0	0	6,667	46,669	-	-	-	-	-	-
	10-50,000	0	0	0	2	0	0	0	46,666	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Old	<100	584	797	2,192	2,398	2,920	3,984	10,961	11,990	2,231	13,209	4,213	14,363	76,470	46,637
	100–500	14	30	85	102	3,262	7,077	19,718	23,766	26	5,059	25	4,788	41	6,695
	500–1,000	1	4	15	19	667	2,668	10,005	12,673	2	1,530	1	832	2	1,381
	1–2,000	0	1	10	15	0	1,333	13,330	19,995	1	1,307	1	1,321	2	2,951
	2–5,000	0	2	9	11	0	6,000	27,000	33,000	-	-	-	-	-	-
	5–10,000	0	0	4	8	0	0	26,668	53,336	-	-	-	-	-	-
	10-50,000	0	0	3	6	0	0	61,249	139,998	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

Discussion:

Pine is most commonly out of NRV in the first and second smallest patch size class. As previously noted, this is due to the large number of small cutblocks harvested over the last 60 years, as well as the number of roads on the landscape, which split patches up. In order to reduce this trend, HWP will have to lay out larger harvesting areas (something that HWP is doing now where possible); however, because this pattern is on the landscape it will take many years (i.e. probably at least a rotation) to shift the landscape condition backed into NRV. There are also additional social (aesthetics) and environmental (ECA) issues with creating larger opening, which may also slow down the shift of patch size back into NRV.





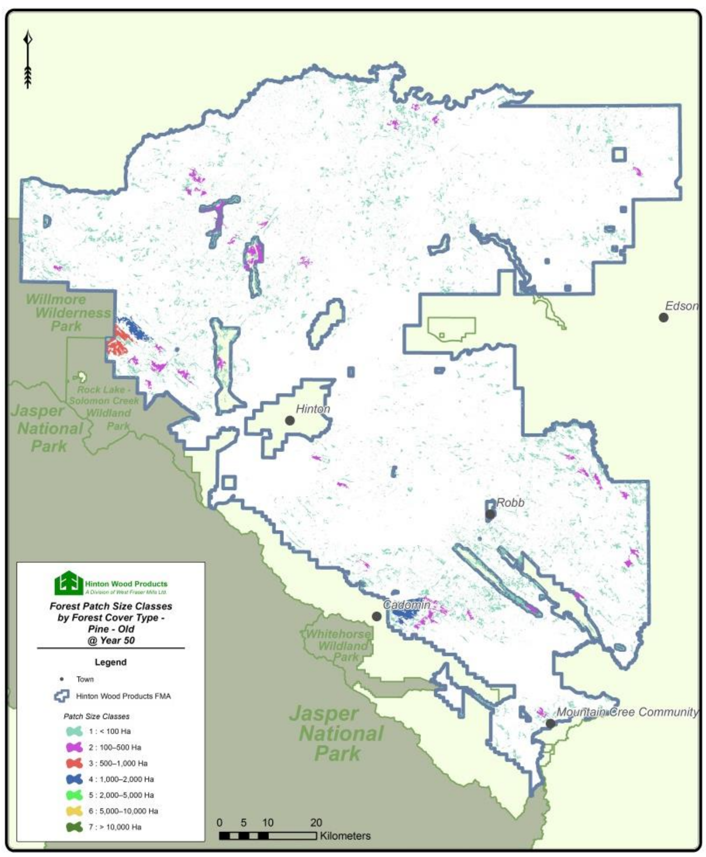


Figure 68 – Patch size classes for old pine for Year 0, Year 10 and Year 50 gross FMA

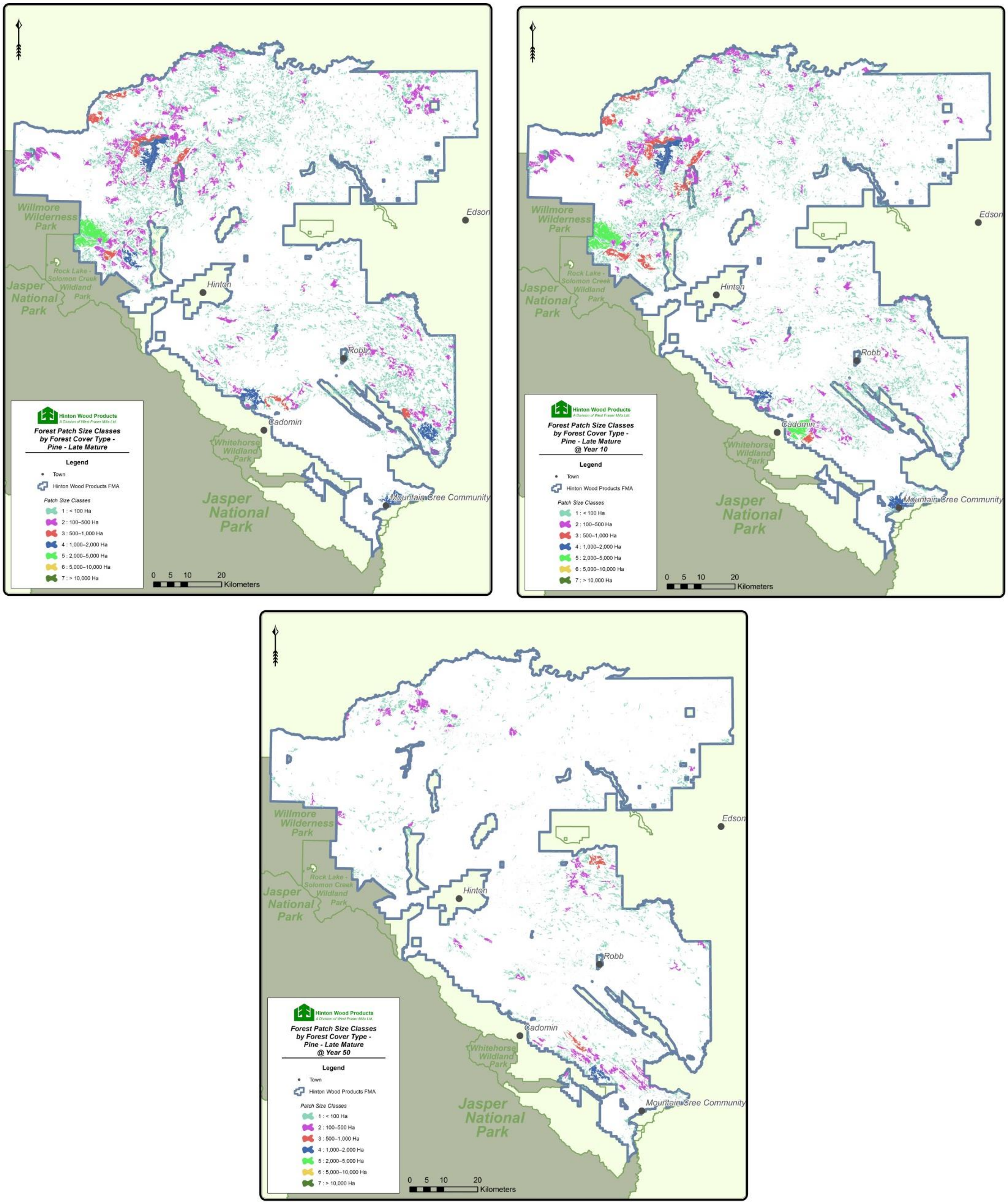


Figure 69 – Patch size classes for late mature pine for Year 0, Year 10 and Year 50 gross FMA

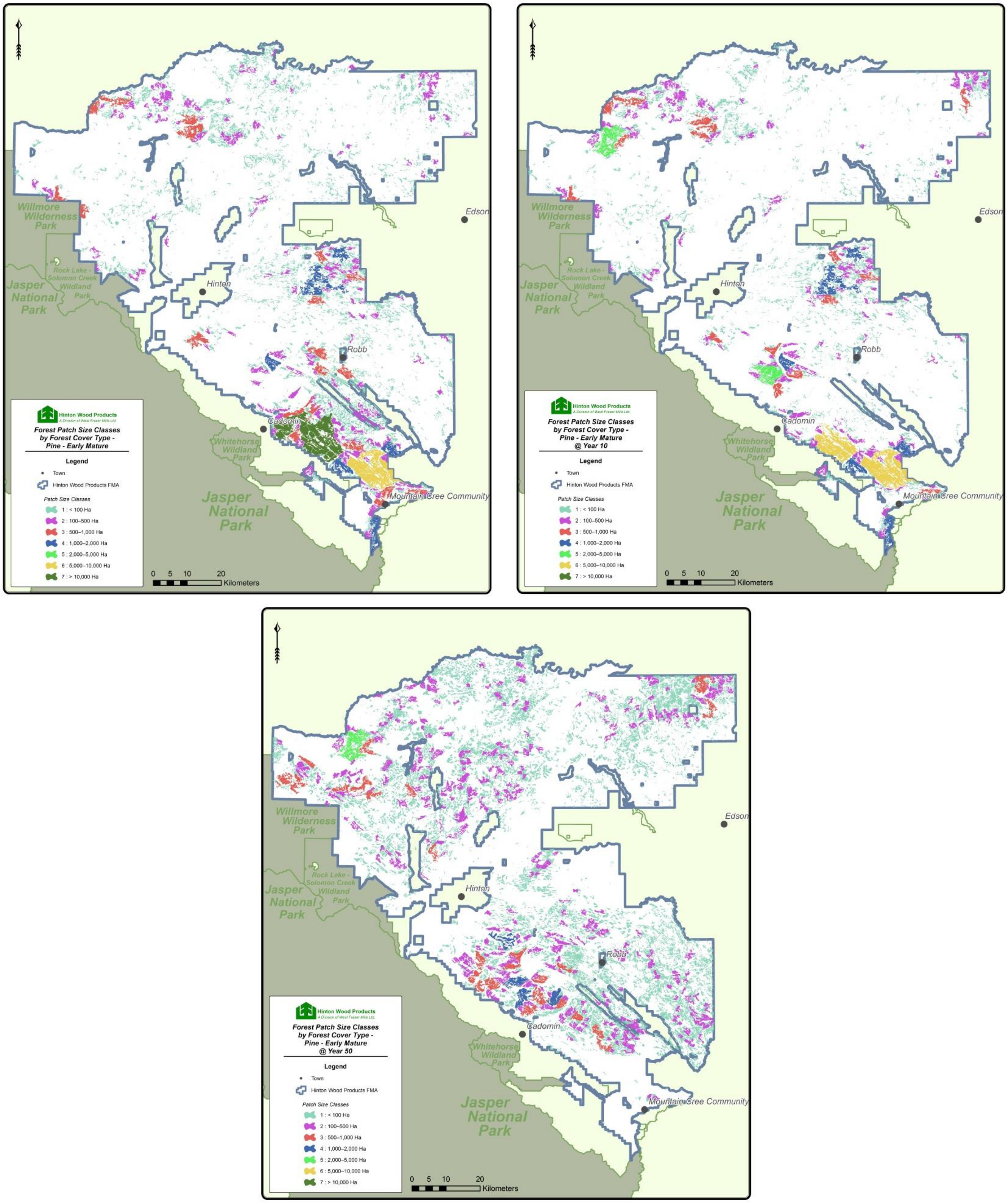


Figure 70 – Patch size classes for early mature pine for Year 0, Year 10 and Year 50 gross FMA

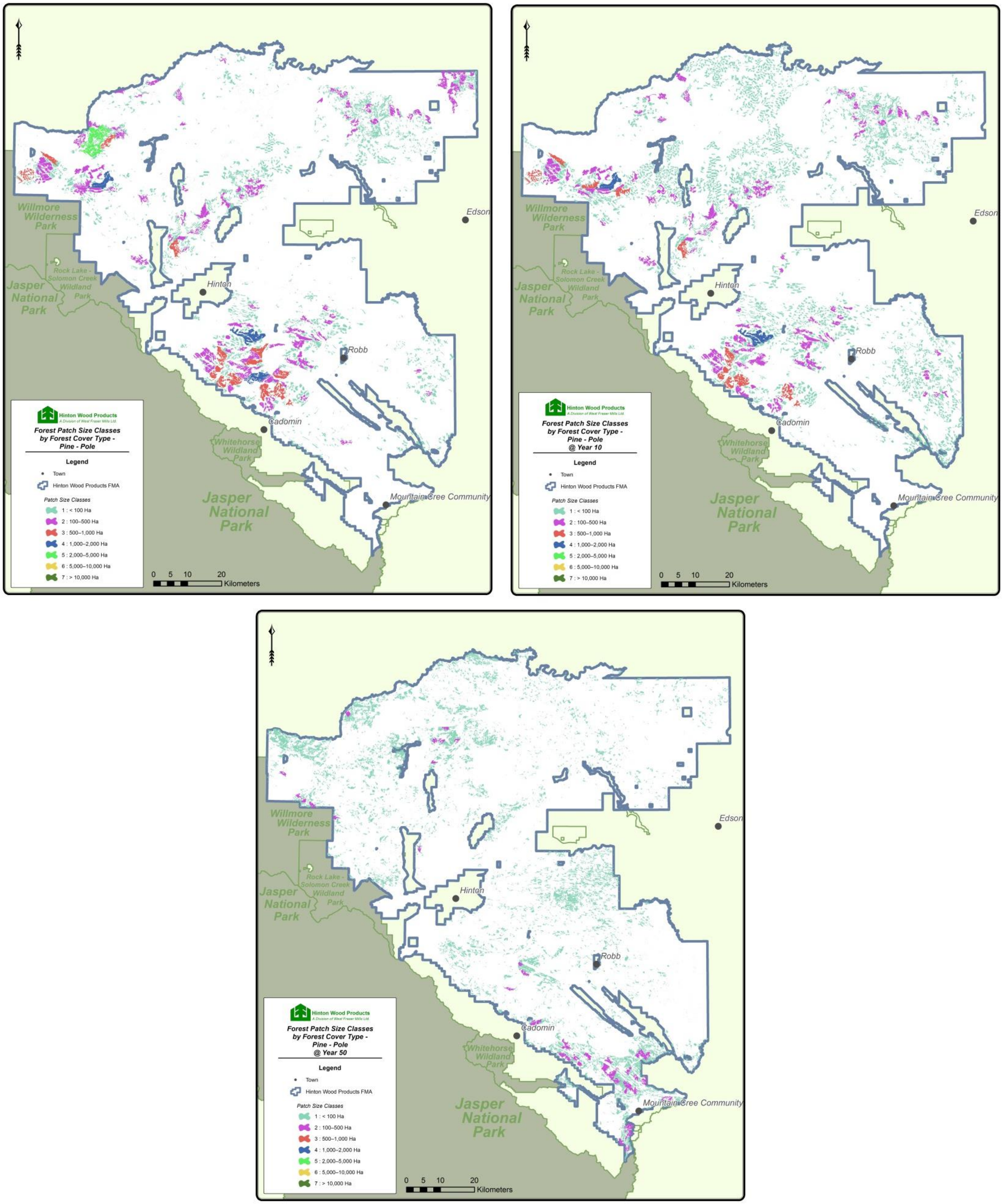
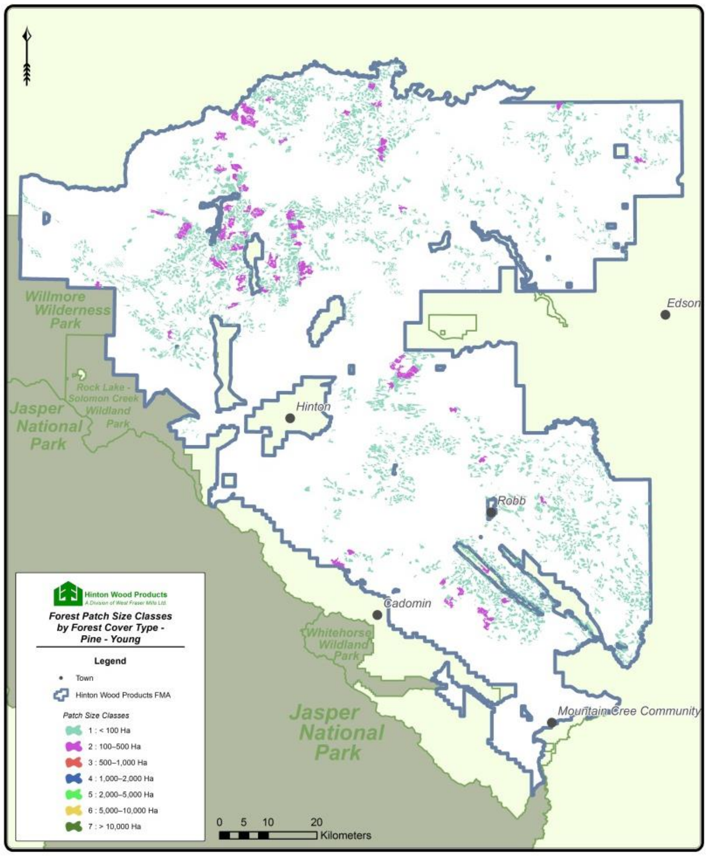
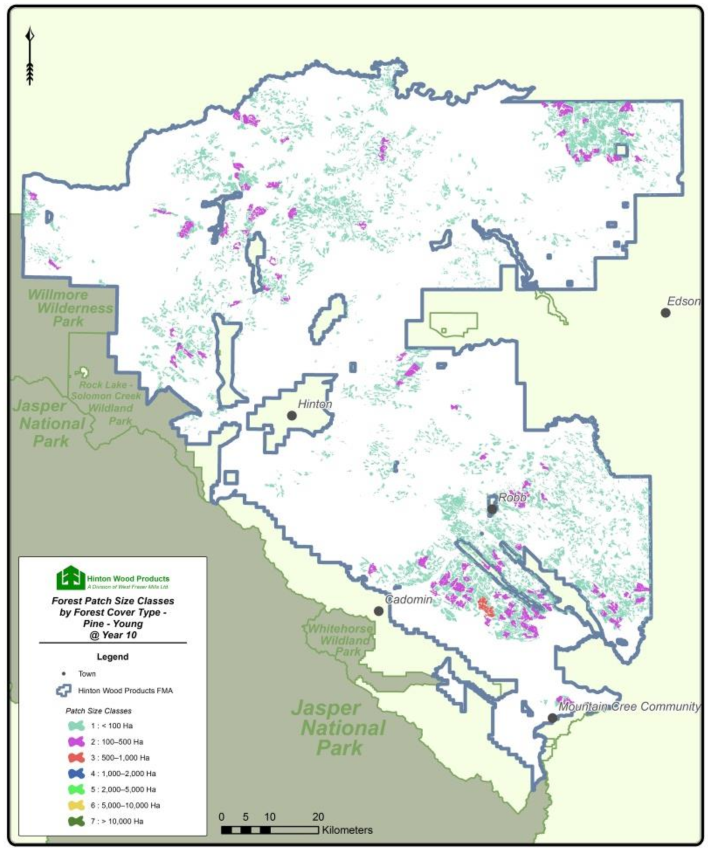


Figure 71 – Patch size classes for pole pine for Year 0, Year 10 and Year 50 gross FMA





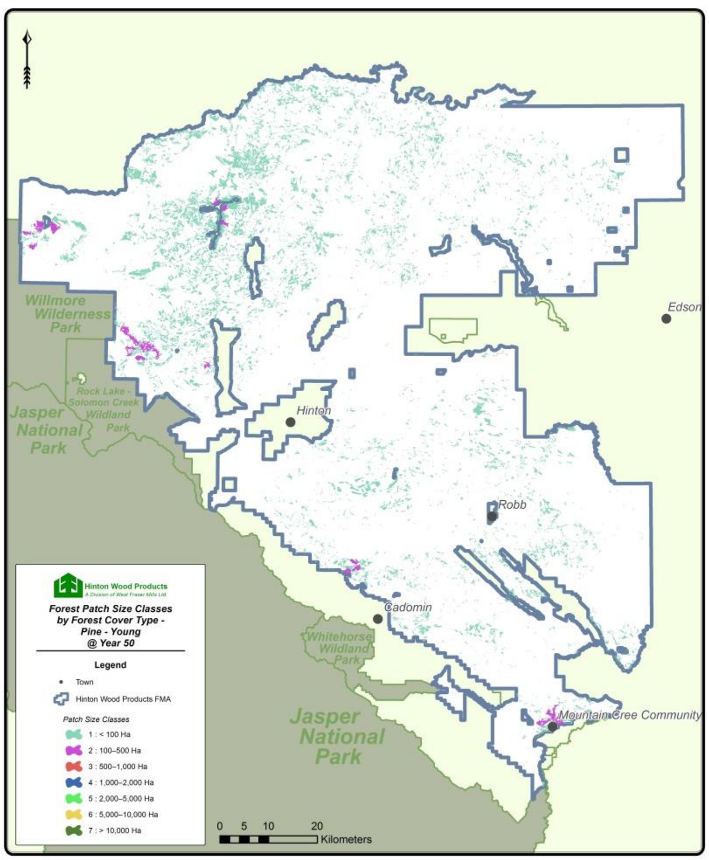


Figure 72 – Patch size classes for young pine for Year 0, Year 10 and Year 50 gross FMA

Table 58 – Patch size summary by area and density for white spruce forest on the HWP Gross FMA area

Seral Stage	Patch Size Class	Natural Range of Variation								Year 0 (2012)		Year 10		Year 50	
		Patch Density (#)				Patch Area (ha)				Patches (#)	Area (ha)	Patches (#)	Area (ha)	Patches (#)	Area (ha)
		Min. #	12.5%	87.5%	Max #	Min	12.5%	87.5%	Max						
Young	<100	126	251	2,233	2,897	630	1,253	11,166	14,485	1,742	17,072	3,903	13,147	8,722	20,643
	100–500	2	9	78	105	466	2,184	18,058	24,465	6	704	3	369	13	2,269
	500–1,000	0	0	8	11	0	0	5,336	7,337	-	-	-	-	-	-
	1–2,000	0	0	4	9	0	0	5,332	11,997	-	-	-	-	-	-
	2–5,000	0	0	2	6	0	0	6,000	18,000	-	-	-	-	-	-
	5–10,000	0	0	0	2	0	0	0	13,334	-	-	-	-	-	-
	10-50,000	0	0	0	1	0	0	0	23,333	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Pole	<100	169	418	2,070	2,974	845	2,088	10,351	14,870	9,732	9,648	7,841	17,215	9,860	28,256
	100–500	3	11	63	103	699	2,563	14,679	23,999	6	829	5	631	11	1,991
	500–1,000	0	0	7	12	0	250	4,669	8,004	1	539	-	-	-	-
	1–2,000	0	0	4	9	0	0	5,332	11,997	1	1,002	-	-	-	-
	2–5,000	0	0	2	4	0	0	6,000	12,000	-	-	-	-	-	-
	5–10,000	0	0	1	2	0	0	6,667	13,334	-	-	-	-	-	-
	10-50,000	0	0	0	1	0	0	0	23,333	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Early Mature	<100	341	524	2,158	2,786	1,705	2,621	10,789	13,930	8,004	18,875	9,251	18,188	13,927	33,015
	100–500	5	10	63	97	1,165	2,330	14,592	22,601	12	1,947	22	4,406	18	2,288
	500–1,000	0	0	7	10	0	0	4,669	6,670	3	1,871	2	1,164	1	539
	1–2,000	0	0	4	6	0	0	5,332	7,998	-	-	-	-	1	1,002
	2–5,000	0	0	3	4	0	0	9,000	12,000	-	-	-	-	-	-
	5–10,000	0	0	1	1	0	0	4,167	6,667	-	-	-	-	-	-
	10-50,000	0	0	0	1	0	0	0	23,333	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Late Mature	<100	176	364	1,630	2,528	880	1,818	8,149	12,640	6,831	38,716	8,864	33,752	12,423	13,554
	100–500	1	5	42	87	233	1,165	9,699	20,271	47	8,805	39	7,370	11	1,526
	500–1,000	0	0	5	8	0	0	3,335	5,336	4	2,868	5	3,473	1	511
	1–2,000	0	0	2	4	0	0	2,666	5,332	2	2,568	-	-	-	-
	2–5,000	0	0	1	3	0	0	3,000	9,000	-	-	-	-	-	-
	5–10,000	0	0	0	2	0	0	0	13,334	-	-	-	-	-	-
	10-50,000	0	0	0	1	0	0	0	23,333	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Old	<100	344	453	1,672	2,257	1,720	2,263	8,358	11,285	2,388	15,604	4,143	20,199	23,181	20,769
	100–500	5	10	50	70	1,165	2,417	11,563	16,310	27	5,128	31	5,562	20	3,708
	500–1,000	0	1	6	9	0	667	4,002	6,003	2	1,255	2	1,283	-	-
	1–2,000	0	0	1	3	0	0	1,333	3,999	1	1,769	1	1,495	1	1,255
	2–5,000	0	0	1	4	0	0	3,000	12,000	1	2,126	1	3,074	-	-
	5–10,000	0	0	0	1	0	0	0	6,667	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

Discussion:

There is slightly better white spruce patch size distribution as compared to lodgepole pine (Table 57) – this may be due to there being more white spruce in the passive landbase (23% of all white spruce is in the passive landbase, while only 16% of pine is); meaning a slightly less chance of white spruce being fragmented into smaller patches due to harvesting or roads.

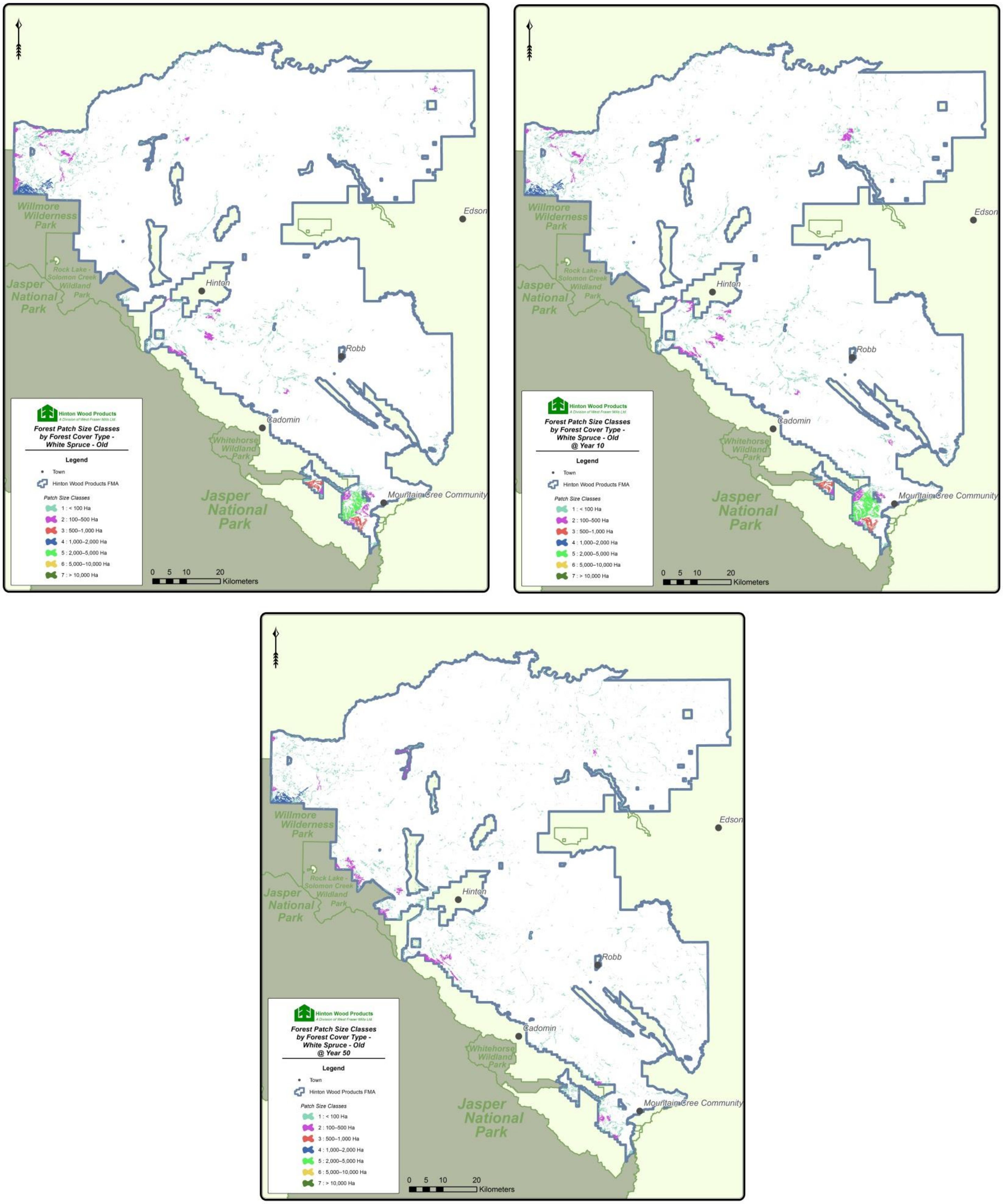


Figure 73 – Patch size classes for old white spruce for Year 0, Year 10 and Year 50 gross FMA

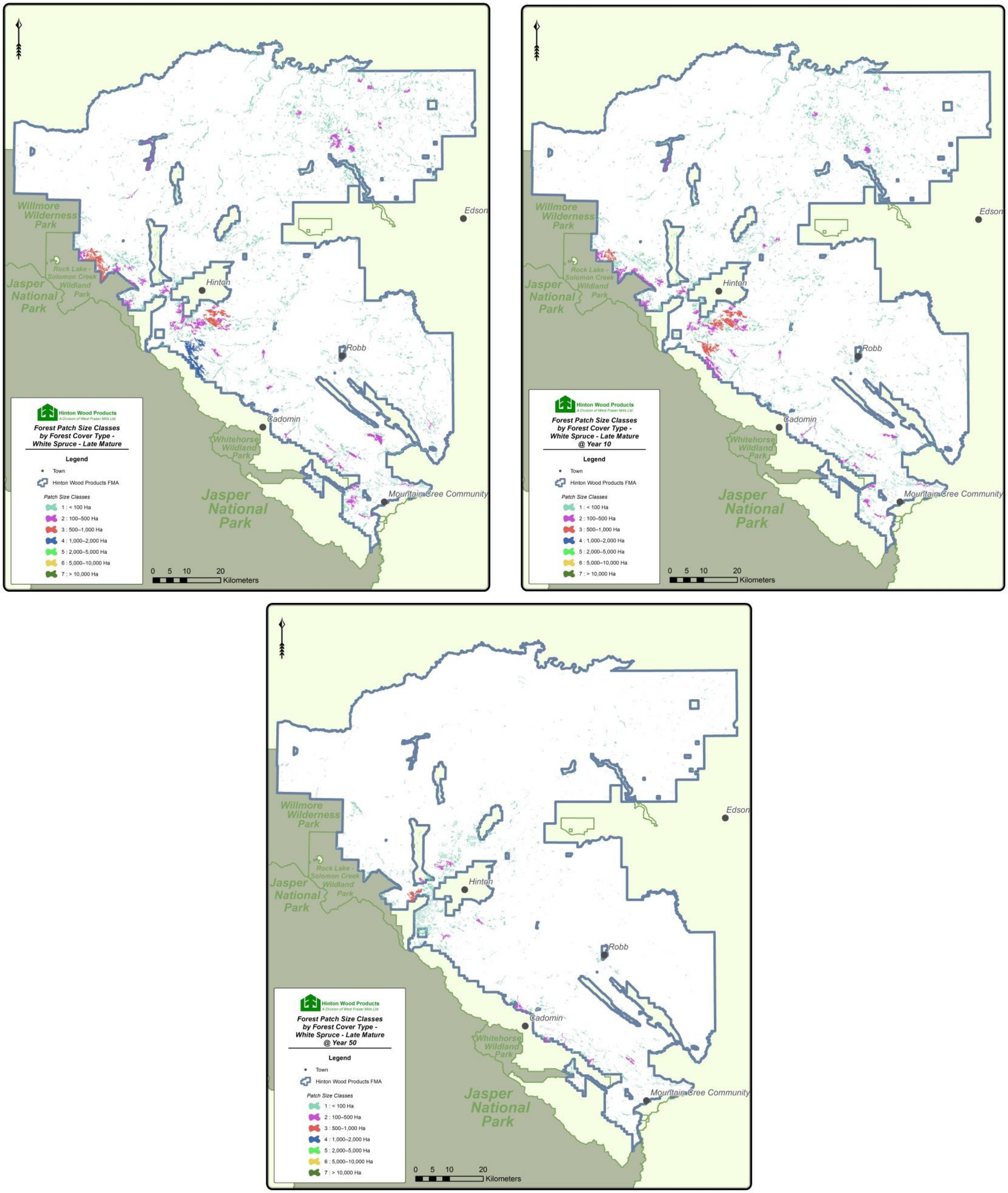


Figure 74 – Patch size classes for late mature white spruce for Year 0, Year 10 and Year 50 gross FMA

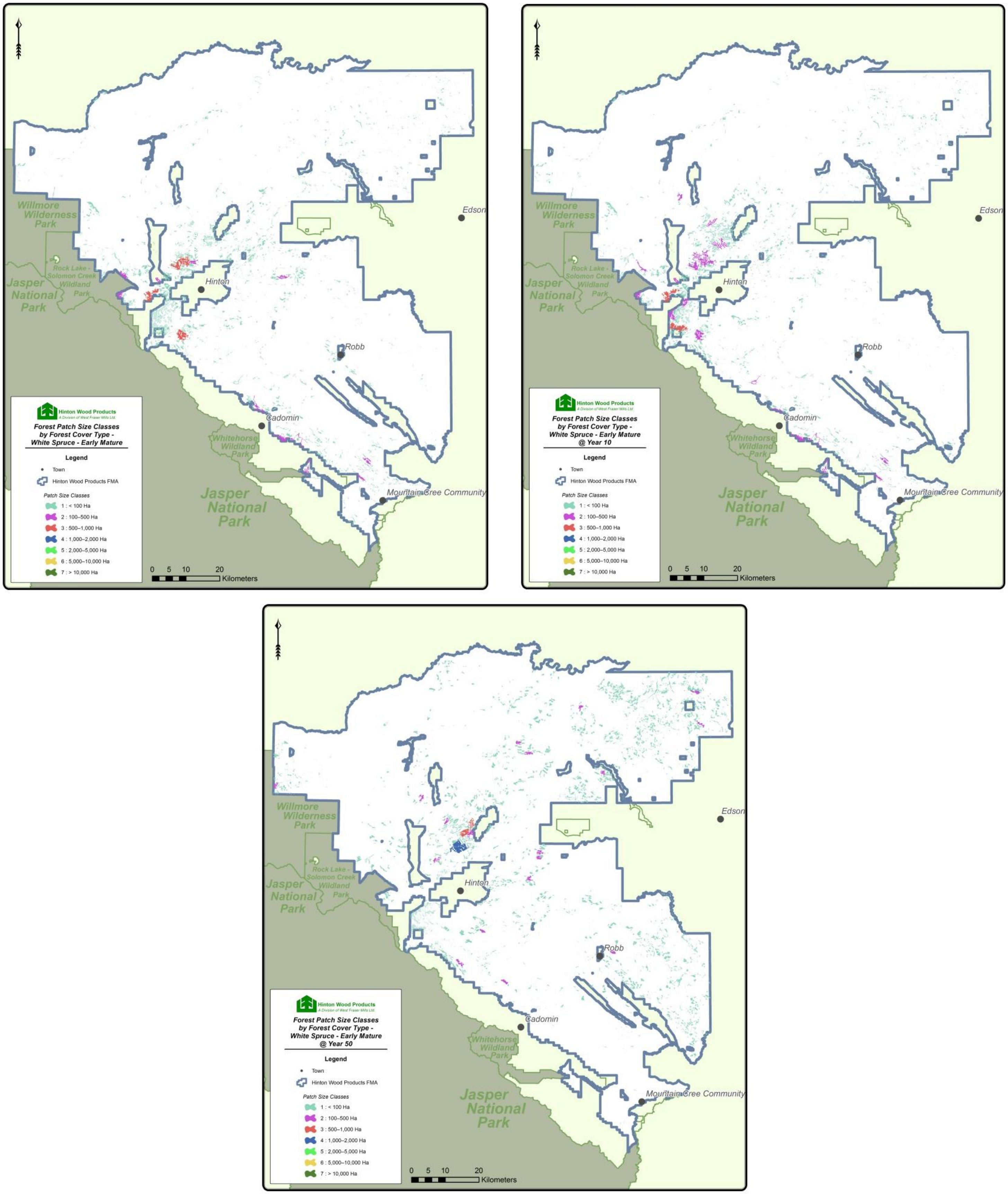


Figure 75 – Patch size classes for early mature white spruce for Year 0, Year 10 and Year 50 gross FMA

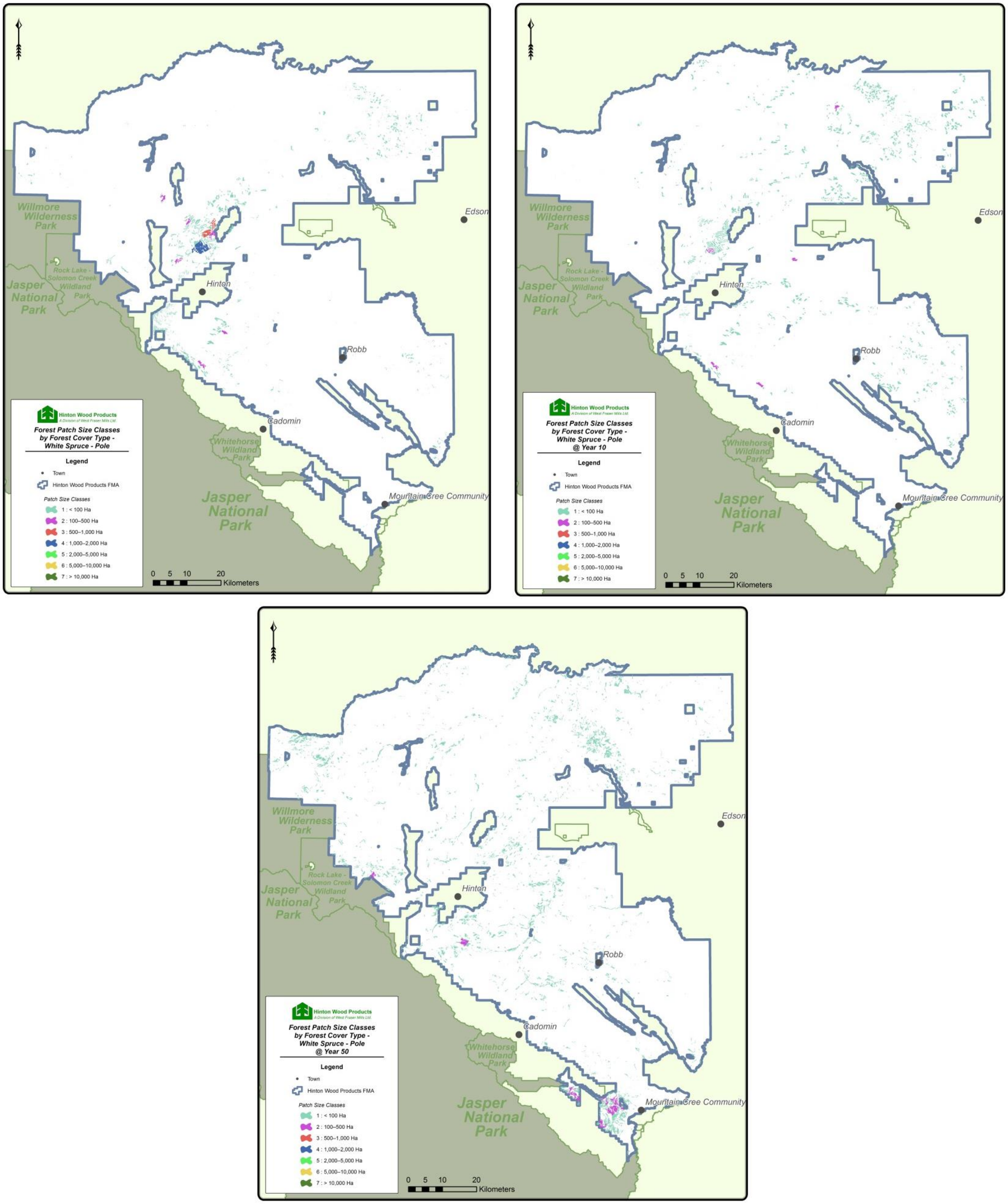


Figure 76 – Patch size classes for pole white spruce for Year 0, Year 10 and Year 50 gross FMA

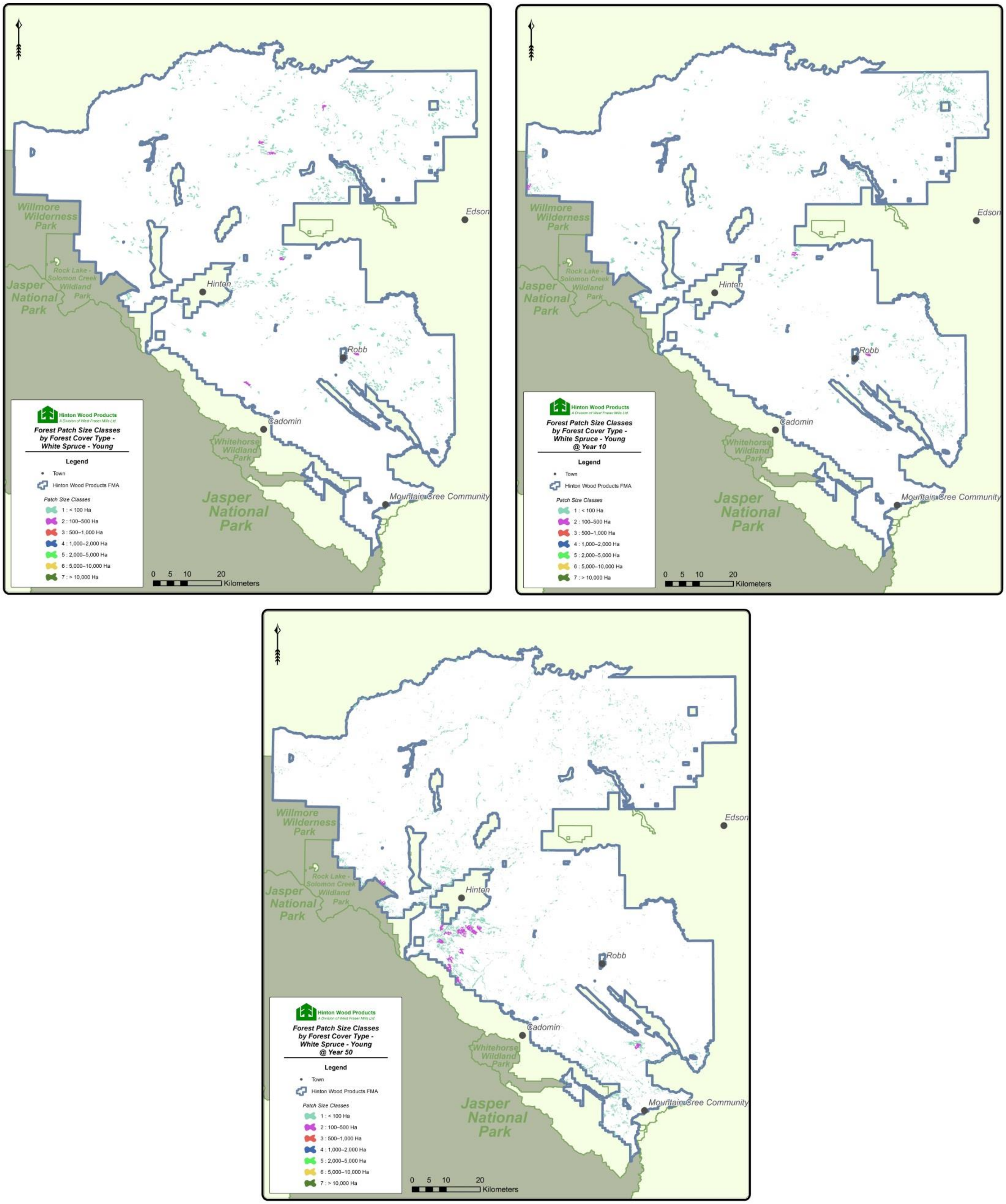


Figure 77 – Patch size classes for young white spruce for Year 0, Year 10 and Year 50 gross FMA

Table 59 – Patch size summary by area and density for black spruce forest on the HWP Gross FMA area

Seral Stage	Patch Size Class	Natural Range of Variation								Year 0 (2012)		Year 10		Year 50	
		Patch Density (#)				Patch Area (ha)				Patches (#)	Area (ha)	Patches (#)	Area (ha)	Patches (#)	Area (ha)
		Min. #	12.5%	87.5%	Max #	Min	12.5%	87.5%	Max						
Young	<100	271	659	2,834	3,687	1,355	3,296	14,168	18,435	3,816	739	1,592	1,124	738	1,013
	100–500	13	28	115	149	3,029	6,611	26,766	34,717	-	-	-	-	-	-
	500–1,000	0	3	18	25	0	2,001	12,006	16,675	-	-	-	-	-	-
	1–2,000	0	1	9	13	0	1,833	11,997	17,329	-	-	-	-	-	-
	2–5,000	0	0	6	11	0	0	18,000	33,000	-	-	-	-	-	-
	5–10,000	0	0	1	3	0	0	6,667	20,001	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Pole	<100	621	1,092	2,998	3,665	3,105	5,461	14,990	18,325	11,529	24,713	13,788	12,454	10,125	3,398
	100–500	12	41	113	155	2,796	9,640	26,213	36,115	14	2,226	4	836	-	-
	500–1,000	0	4	17	25	0	2,668	11,339	16,675	-	-	-	-	-	-
	1–2,000	0	1	9	14	0	1,333	11,997	18,662	-	-	-	-	-	-
	2–5,000	0	0	5	8	0	0	15,000	24,000	-	-	-	-	-	-
	5–10,000	0	0	1	3	0	0	6,667	20,001	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Early Mature	<100	5	92	1,368	1,975	25	462	6,840	9,875	2,687	17,165	4,091	25,632	5,656	3,282
	100–500	0	1	44	78	0	233	10,165	18,174	11	1,667	20	2,846	1	196
	500–1,000	0	0	4	12	0	0	2,668	8,004	-	-	-	-	-	-
	1–2,000	0	0	1	8	0	0	1,333	10,664	-	-	-	-	-	-
	2–5,000	0	0	0	2	0	0	0	6,000	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Late Mature	<100	350	536	2,174	3,347	1,750	2,679	10,868	16,735	9,021	54,198	10,558	57,237	12,322	65,791
	100–500	4	9	61	120	932	2,184	14,213	27,960	64	10,460	65	10,004	80	13,293
	500–1,000	0	0	8	22	0	0	5,336	14,674	1	514	1	514	-	-
	1–2,000	0	0	3	10	0	0	3,999	13,330	-	-	-	-	-	-
	2–5,000	0	0	1	5	0	0	3,000	15,000	-	-	-	-	-	-
	5–10,000	0	0	0	2	0	0	0	13,334	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Old	<100	97	333	1,618	2,316	485	1,663	8,089	11,580	1,128	7,404	1,404	8,448	5,229	28,203
	100–500	0	3	44	75	0	699	10,310	17,475	9	1,599	9	1,588	34	5,452
	500–1,000	0	0	5	10	0	0	3,335	6,670	1	669	1	669	1	725
	1–2,000	0	0	2	4	0	0	2,666	5,332	-	-	-	-	-	-
	2–5,000	0	0	1	2	0	0	1,875	6,000	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

Discussion:

The youngest seral stages of black spruce has the opposite issue of pine and white spruce – in most cases there is not enough numbers or area of the smallest patch size classes (<100). This is likely because black spruce has not been a primarily species that is targeted for harvesting – over time because of the lack of harvesting and fires, these small sized young patch sizes start to become fewer and fewer in number as they age into the other older seral stages.

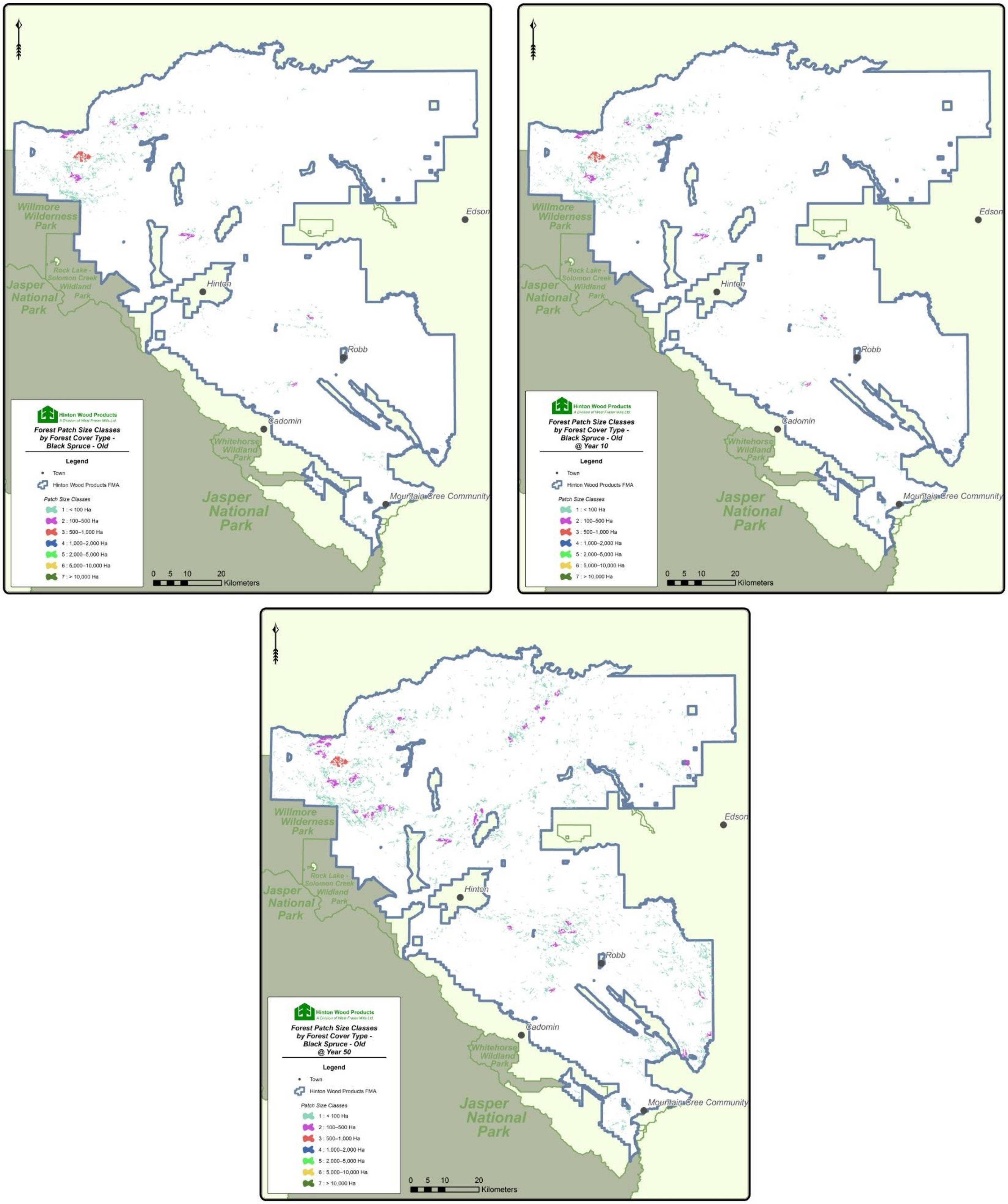


Figure 78 – Patch size classes for old black spruce for Year 0, Year 10 and Year 50 gross FMA

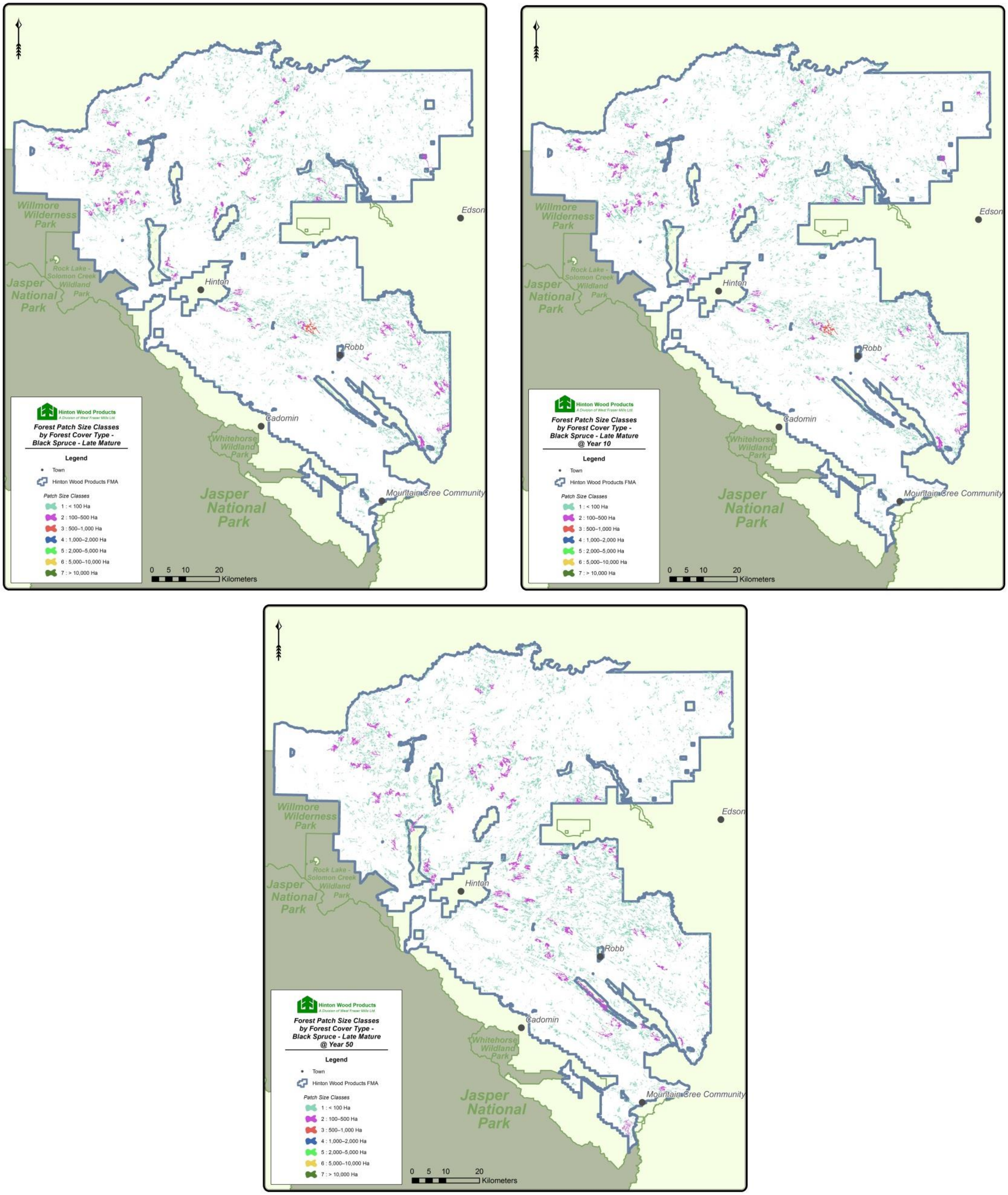


Figure 79 – Patch size classes for late mature black spruce for Year 0, Year 10 and Year 50 gross FMA

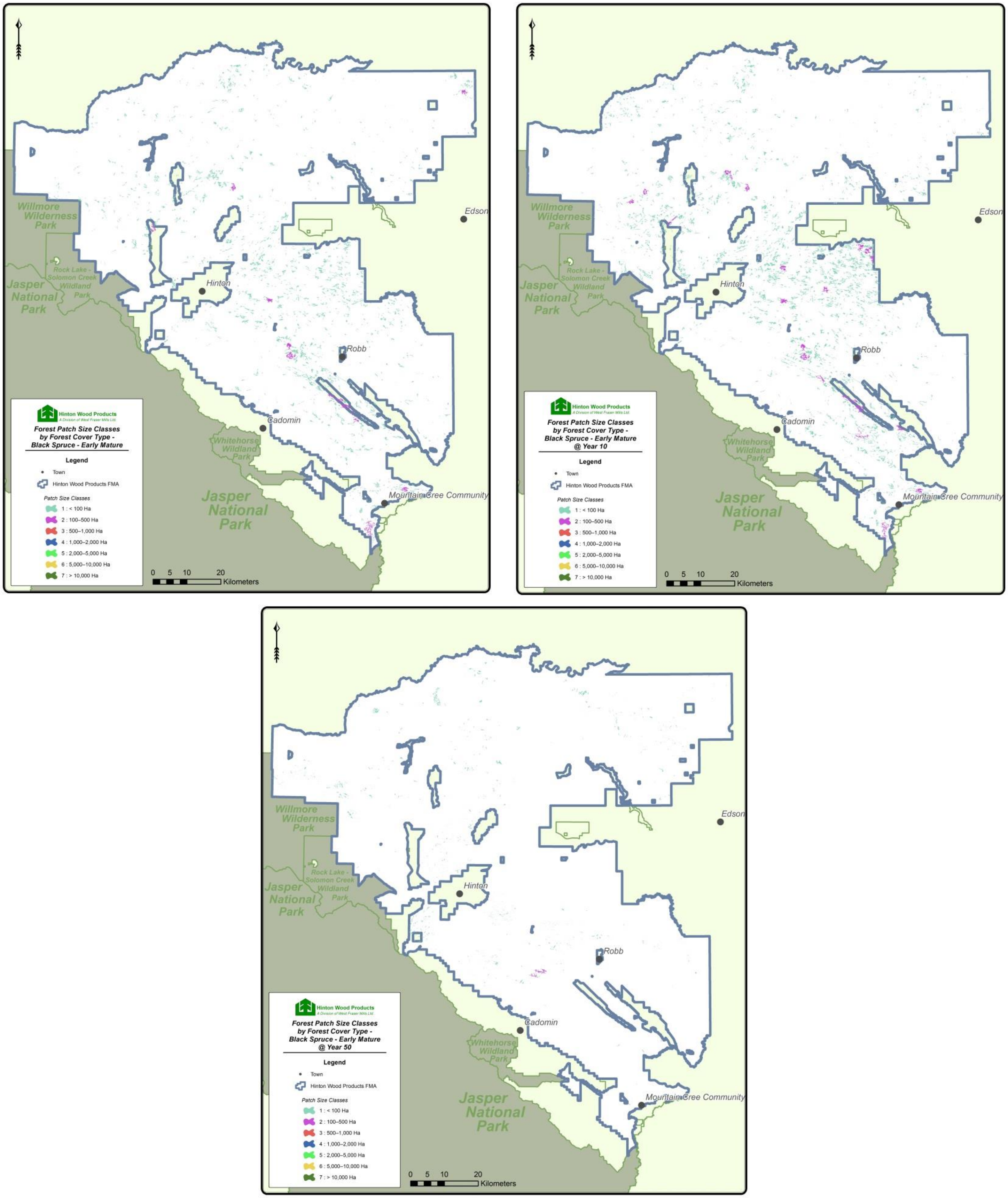


Figure 80 – Patch size classes for early mature black spruce for Year 0, Year 10 and Year 50 gross FMA

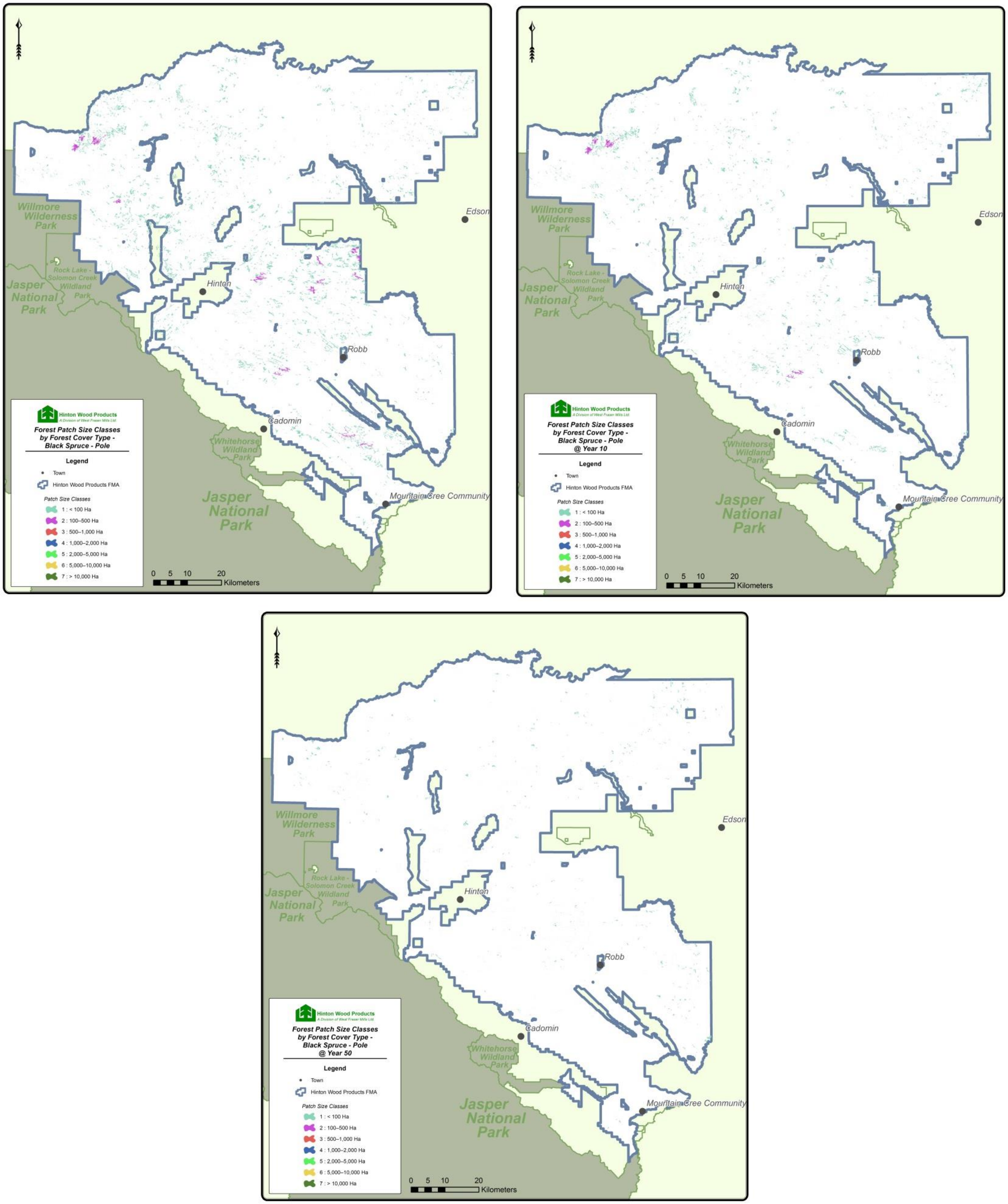
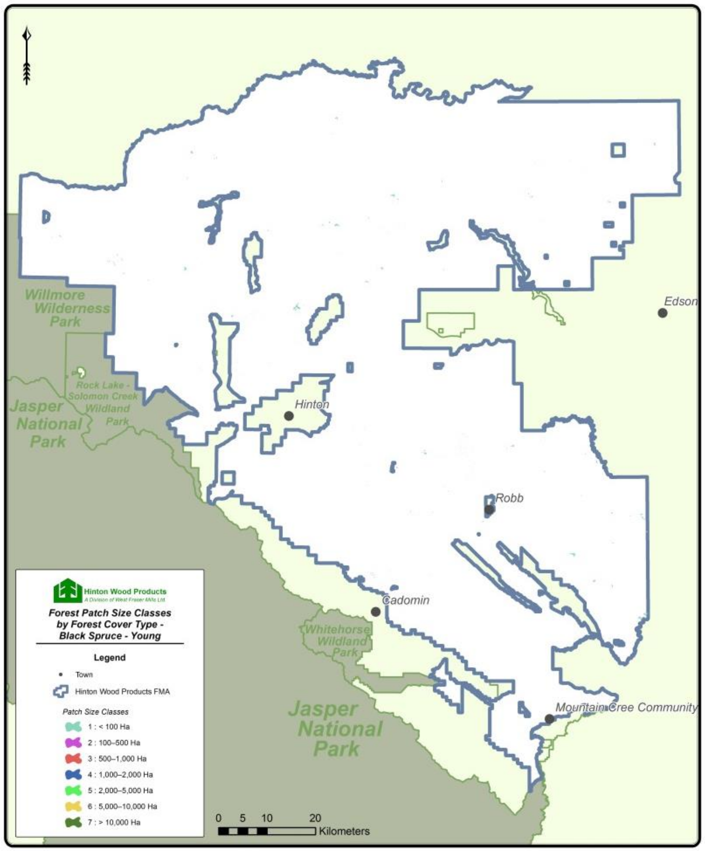
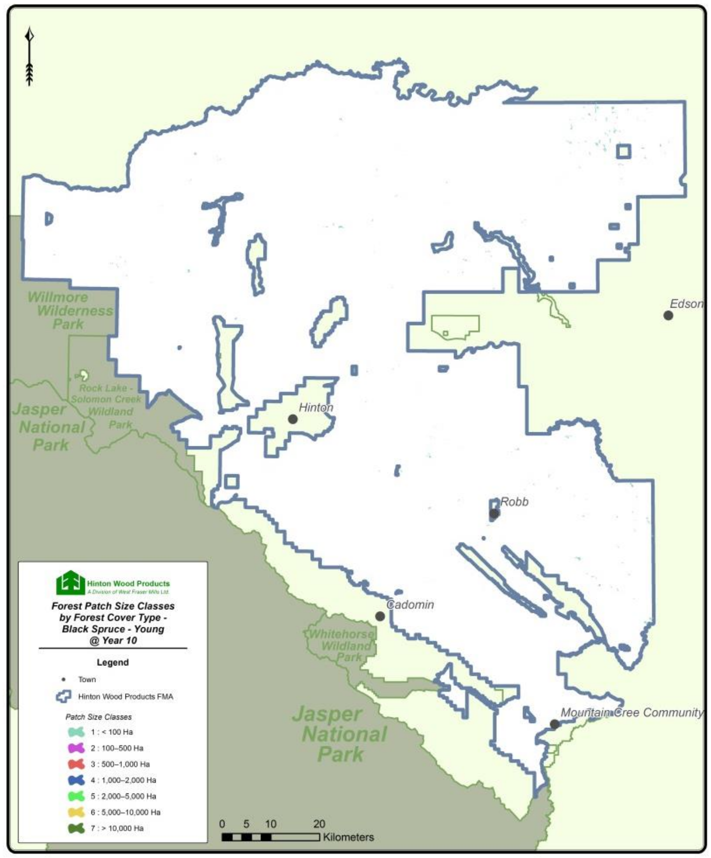


Figure 81 – Patch size classes for pole black spruce for Year 0, Year 10 and Year 50 gross FMA





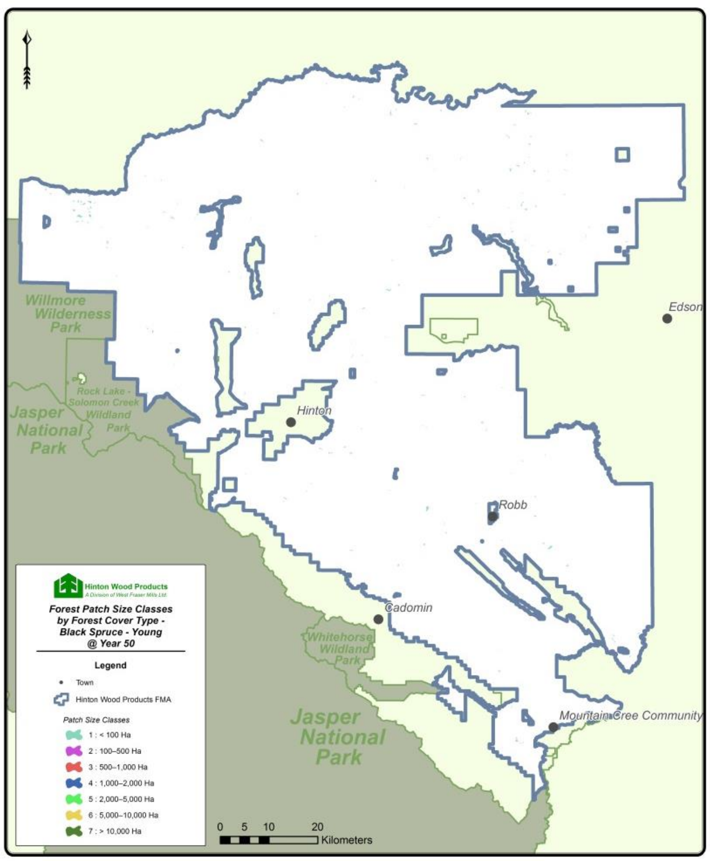


Figure 82 – Patch size classes for young black spruce for Year 0, Year 10 and Year 50 gross FMA

Table 60 – Patch size summary by area and density for mixedwood forest on the HWP Gross FMA area

Seral Stage	Patch Size Class	Natural Range of Variation								Year 0 (2012)		Year 10		Year 50	
		Patch Density (#)				Patch Area (ha)				Patches (#)	Area (ha)	Patches (#)	Area (ha)	Patches (#)	Area (ha)
		Min. #	12.5%	87.5%	Max #	Min	12.5%	87.5%	Max						
Young	<100	139	249	2,333	2,820	695	1,245	11,164	14,100	1,344	8,460	10,617	23,330	15,658	28,005
	100–500	0	3	64	86	0	699	14,941	20,038	-	-	2	244	-	-
	500–1,000	0	0	2	6	0	0	1,334	4,002	-	-	-	-	-	-
	1–2,000	0	0	0	1	0	0	0	1,333	-	-	-	-	-	-
	2–5,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Pole	<100	303	623	2,261	2,982	1,515	3,113	11,304	14,910	10,607	32,229	14,317	27,782	11,810	22,622
	100–500	0	9	60	97	0	2,184	14,038	22,601	18	2,373	9	1,094	-	-
	500–1,000	0	0	2	6	0	0	1,334	4,002	-	-	-	-	-	-
	1–2,000	0	0	1	1	0	0	1,333	1,333	-	-	-	-	-	-
	2–5,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Early Mature	<100	197	396	2,024	2,599	985	1,981	10,121	12,995	6,949	26,916	12,612	25,085	22,131	58,068
	100–500	0	3	48	88	0	699	11,155	20,504	2	259	5	573	18	2,326
	500–1,000	0	0	1	4	0	0	667	2,668	-	-	-	-	-	-
	1–2,000	0	0	0	1	0	0	0	1,333	-	-	-	-	-	-
	2–5,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Late Mature	<100	19	163	1,126	2,218	95	816	5,631	11,090	13,514	59,501	20,235	50,173	9,062	9,714
	100–500	0	0	19	60	0	0	4,427	13,980	23	3,143	18	2,624	-	-
	500–1,000	0	0	0	1	0	0	0	667	-	-	-	-	-	-
	1–2,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	2–5,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Old	<100	291	375	1,626	2,408	1,455	1,877	8,129	12,040	789	3,774	1,961	5,747	34,872	15,916
	100–500	1	3	31	72	233	699	7,223	16,776	-	-	-	-	-	-
	500–1,000	0	0	2	3	0	0	1,334	2,001	-	-	-	-	-	-
	1–2,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	2–5,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

Discussion:

The smallest patches size (<100) is over represented on the landbase.

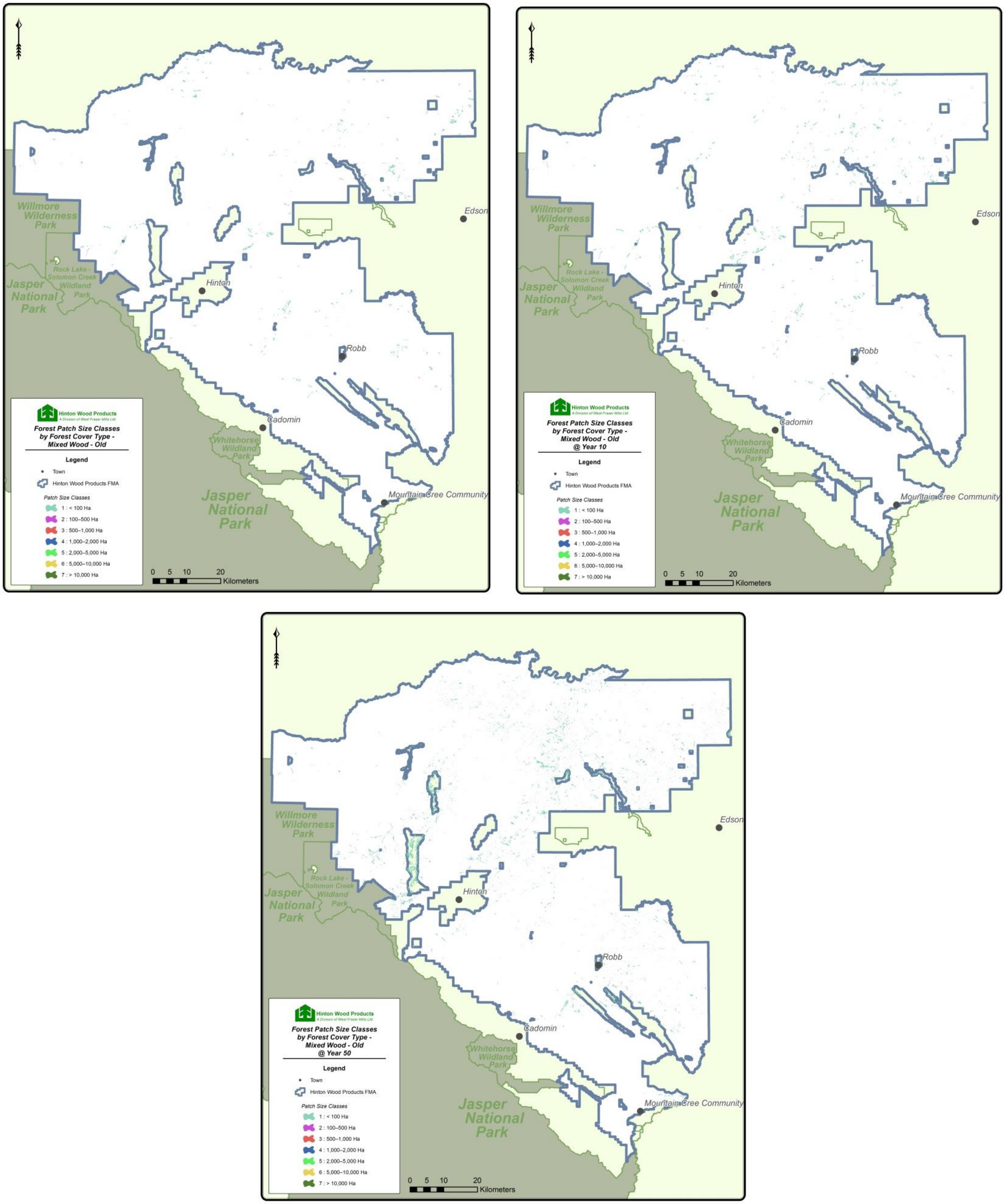


Figure 83 – Patch size classes for old mixed wood for Year 0, Year 10 and Year 50 gross FMA

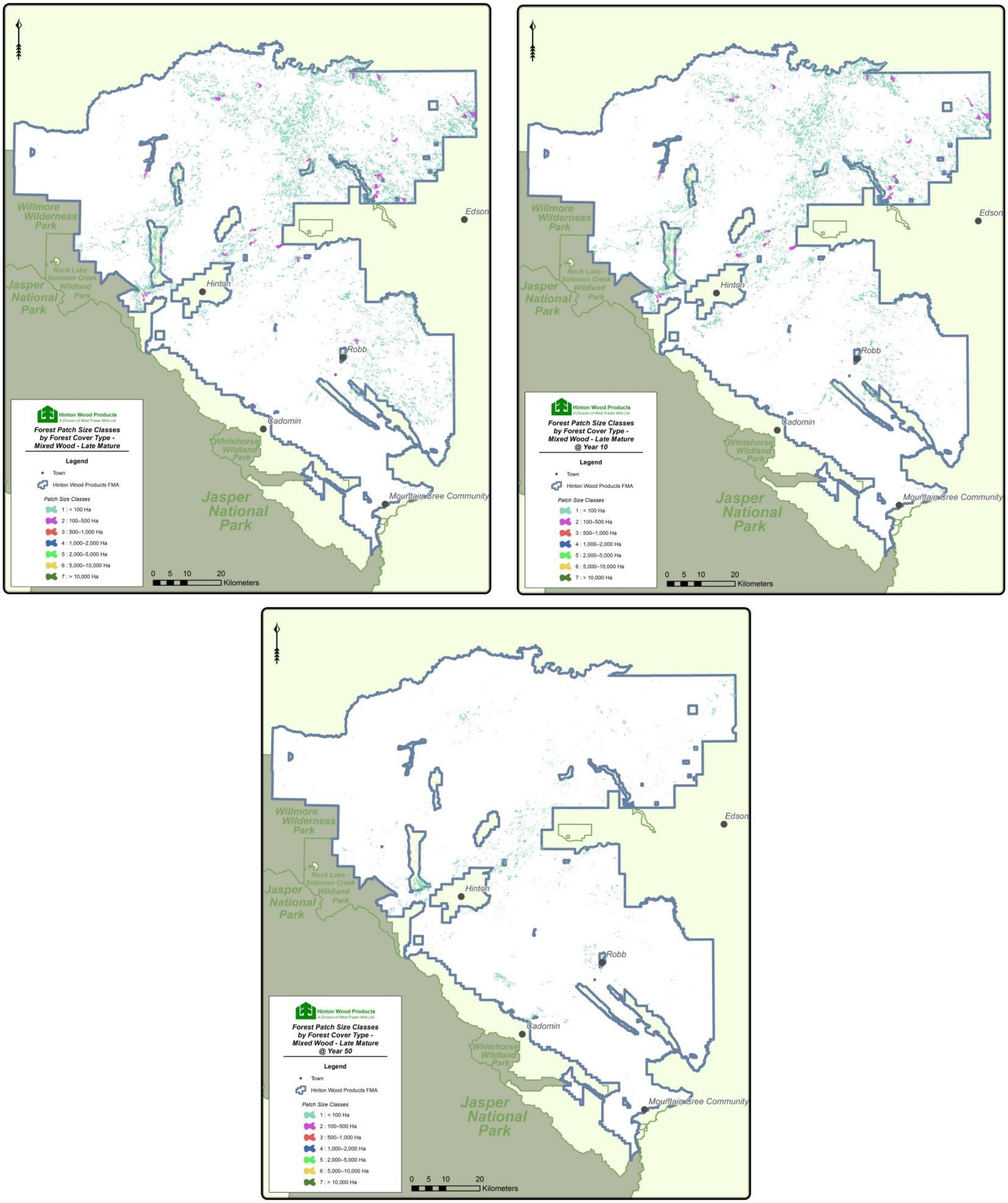


Figure 84 – Patch size classes for late mature mixed wood for Year 0, Year 10 and Year 50 gross FMA

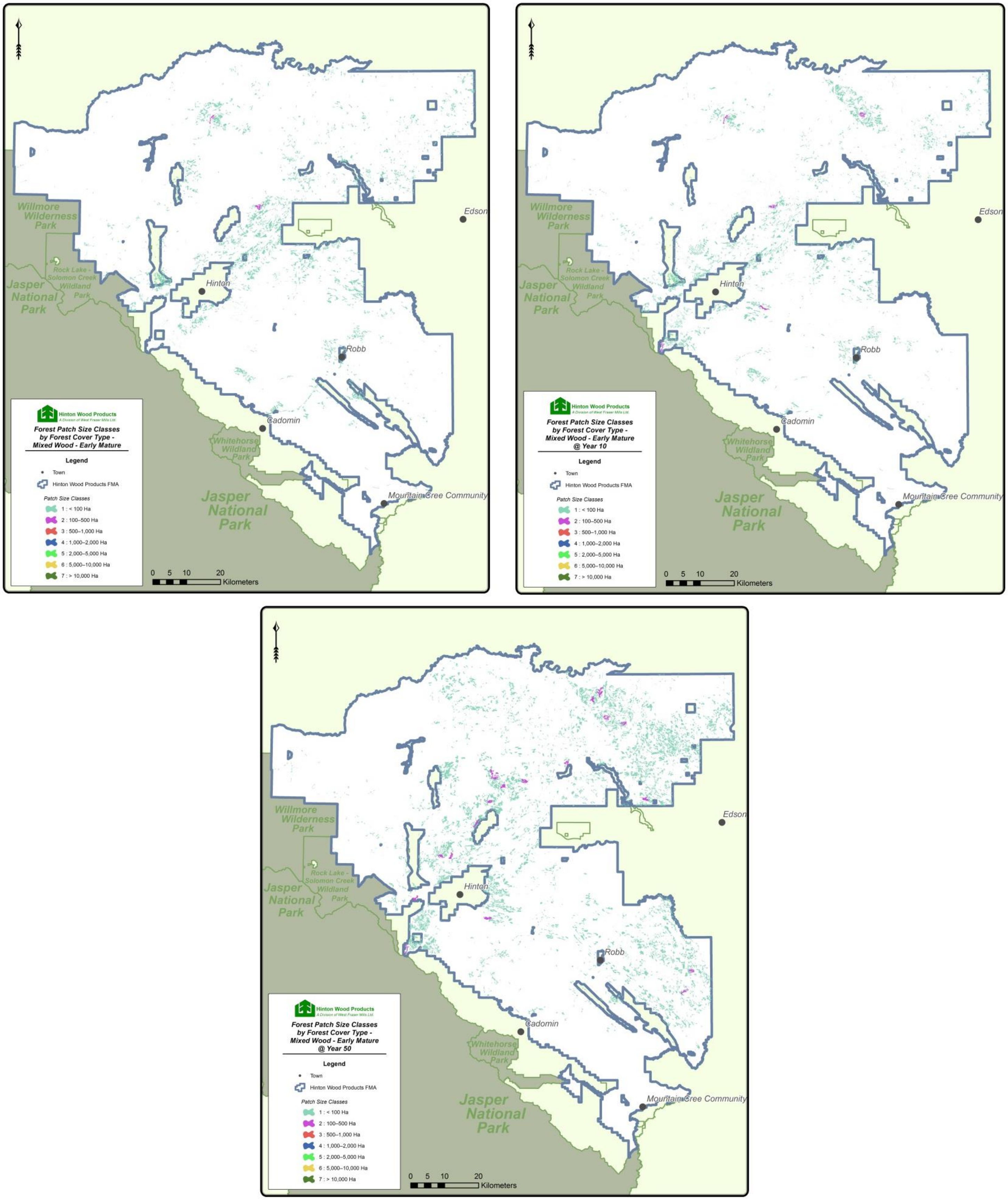


Figure 85 – Patch size classes for early mature mixed wood for Year 0, Year 10 and Year 50 gross FMA

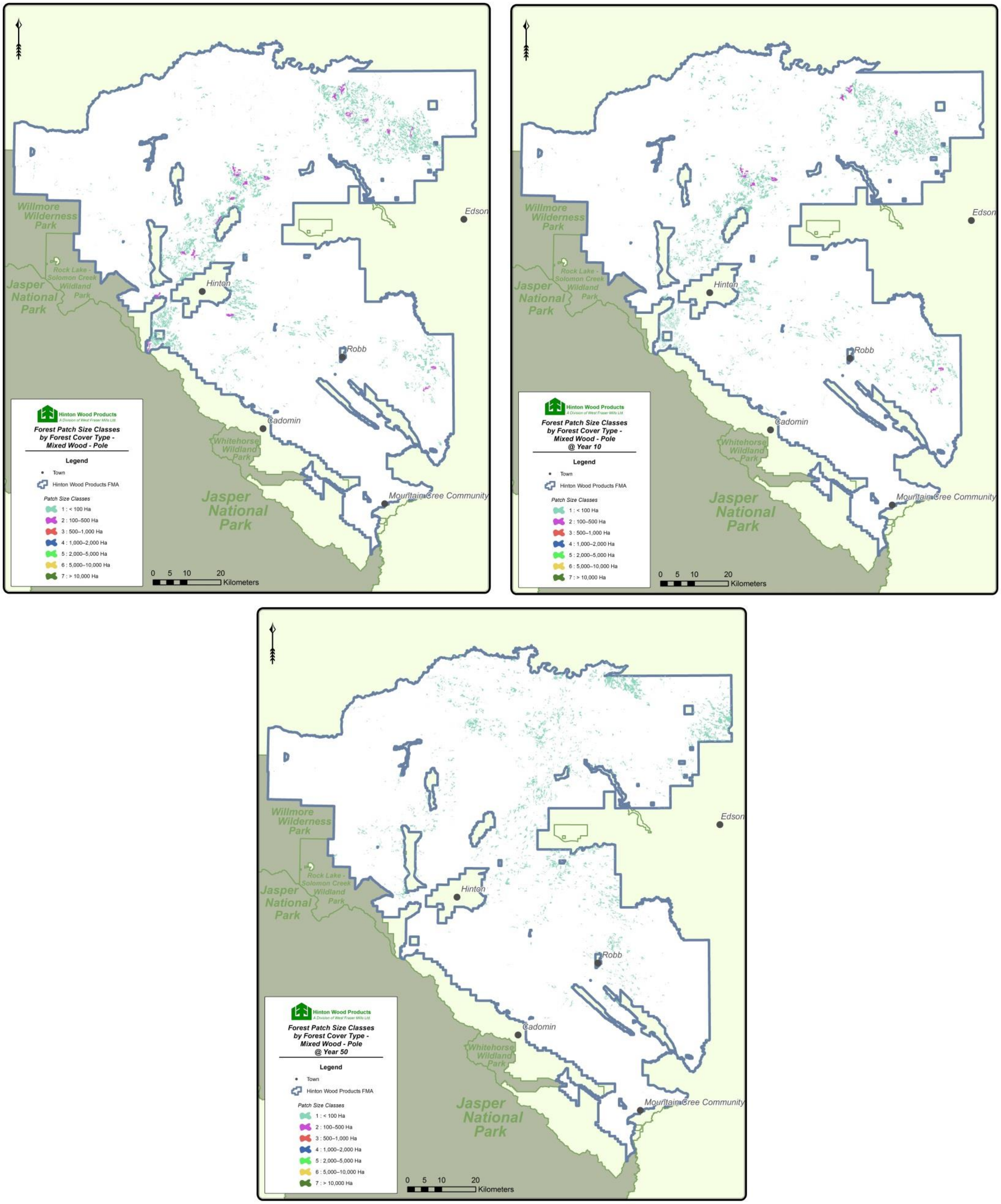


Figure 86 – Patch size classes for pole mixed wood for Year 0, Year 10 and Year 50 gross FMA

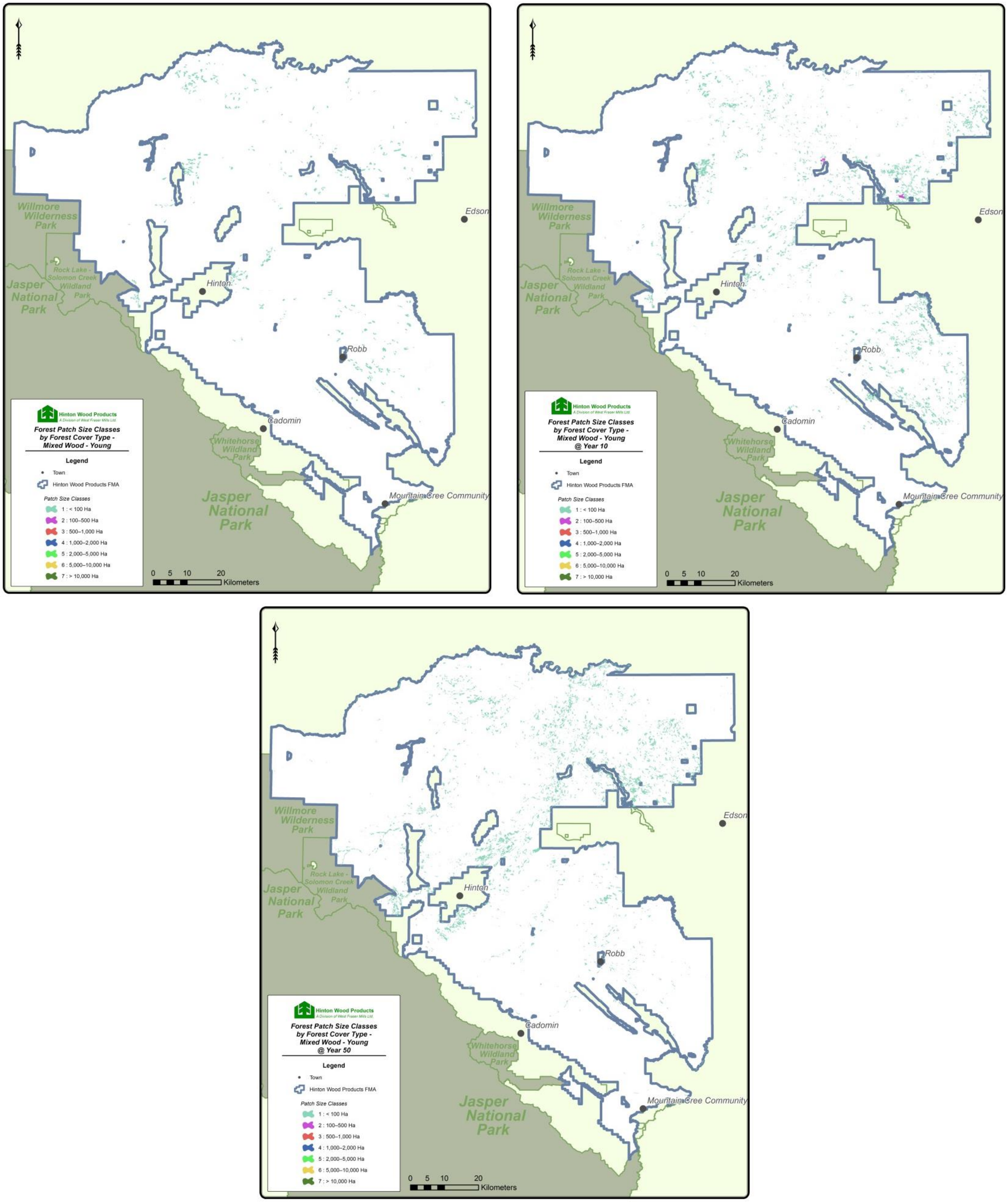


Figure 87 – Patch size classes for young mixed wood for Year 0, Year 10 and Year 50 gross FMA

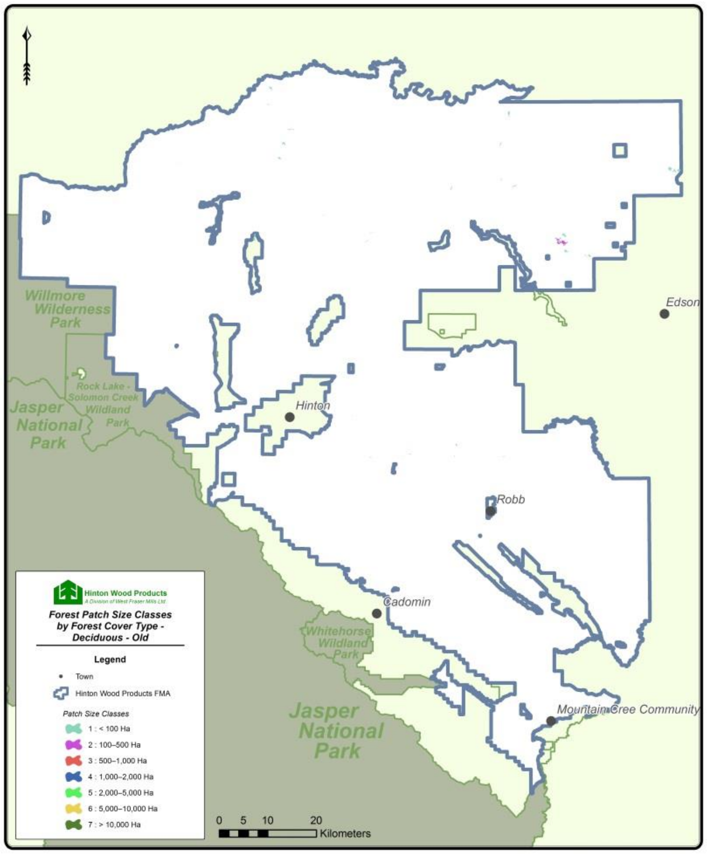
Table 61 – Patch size summary by area and density for deciduous forest on the HWP Gross FMA area

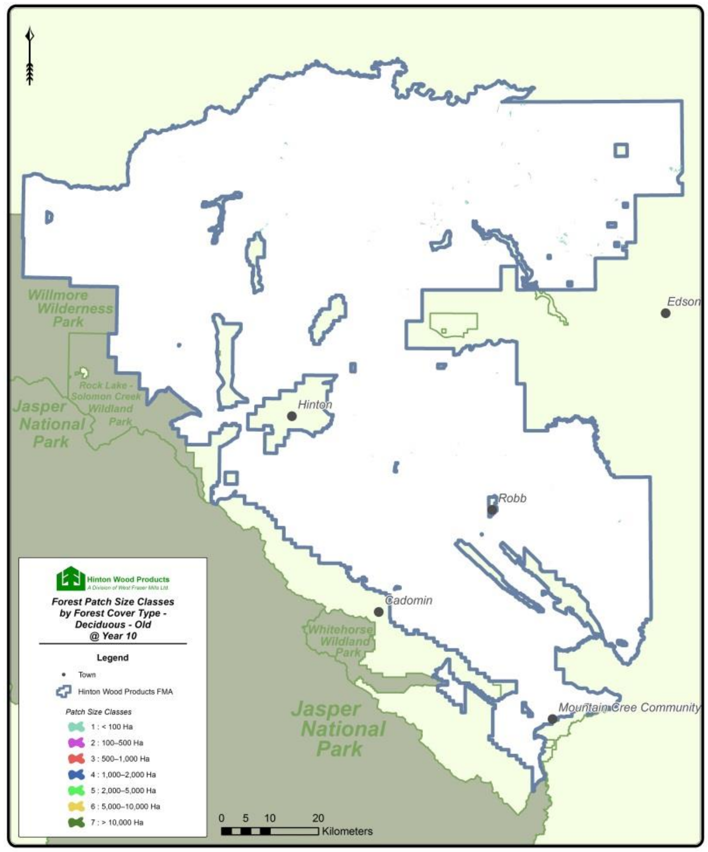
Seral Stage	Patch Size Class	Natural Range of Variation								Year 0 (2012)		Year 10		Year 50	
		Patch Density (#)				Patch Area (ha)				Patches (#)	Area (ha)	Patches (#)	Area (ha)	Patches (#)	Area (ha)
		Min. #	12.5%	87.5%	Max #	Min	12.5%	87.5%	Max						
Young	<100	69	170	1,362	1,764	345	851	6,808	8,820	258	2,481	3,935	11,388	6,955	12,810
	100–500	1	4	64	95	233	932	14,970	22,135	-	-	1	115	-	-
	500–1,000	0	0	8	17	0	0	5,086	11,339	-	-	-	-	-	-
	1–2,000	0	0	2	4	0	0	2,666	5,332	-	-	-	-	-	-
	2–5,000	0	0	1	2	0	0	3,000	6,000	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Pole	<100	196	438	1,454	1,775	980	2,189	7,269	8,875	3,891	7,085	3,986	5,588	8,572	23,262
	100–500	2	9	67	93	466	2,097	15,640	21,669	1	103	-	-	1	115
	500–1,000	0	0	11	17	0	0	7,337	11,339	-	-	-	-	-	-
	1–2,000	0	0	2	4	0	0	2,666	5,332	-	-	-	-	-	-
	2–5,000	0	0	1	2	0	0	3,000	6,000	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Early Mature	<100	163	312	1,375	1,694	815	1,559	6,875	8,470	2,812	11,602	3,274	9,245	4,125	7,440
	100–500	0	5	55	86	0	1,252	12,728	20,038	18	2,563	4	607	-	-
	500–1,000	0	0	6	12	0	0	4,002	8,004	-	-	-	-	-	-
	1–2,000	0	0	2	3	0	0	2,666	3,999	-	-	-	-	-	-
	2–5,000	0	0	0	1	0	0	0	3,000	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Late Mature	<100	28	141	888	1,495	140	704	4,441	7,475	6,866	26,867	10,351	23,718	2,801	5,793
	100–500	0	0	27	69	0	0	6,204	16,077	41	6,669	37	6,386	4	563
	500–1,000	0	0	2	9	0	0	1,334	6,003	-	-	-	-	-	-
	1–2,000	0	0	1	2	0	0	1,333	2,666	-	-	-	-	-	-
	2–5,000	0	0	0	1	0	0	0	3,000	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-
Old	<100	236	361	1,206	1,562	1,180	1,806	6,028	7,810	106	367	395	798	16,086	7,698
	100–500	1	5	41	65	233	1,165	9,466	15,145	1	108	-	-	1	164
	500–1,000	0	0	5	12	0	0	3,335	8,004	-	-	-	-	-	-
	1–2,000	0	0	1	5	0	0	1,333	6,665	-	-	-	-	-	-
	2–5,000	0	0	1	4	0	0	3,000	12,000	-	-	-	-	-	-
	5–10,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	10-50,000	0	0	0	0	0	0	0	0	-	-	-	-	-	-
	50,000+	0	0	0	0	0	0	0	0	-	-	-	-	-	-

* Yellow boxes denote a seral stage and/or cover type within NRV but below the 12.5 quartile or over the 87.5 quartile, while red boxes denote a seral stage and/or cover type outside of NRV.

Discussion:

The smallest size class is over represented for all seral stages except old, where it is under represented. As there is only 460 hectares of old deciduous on the entire gross landbase, it is hard to draw any inferences about its patch size distribution.





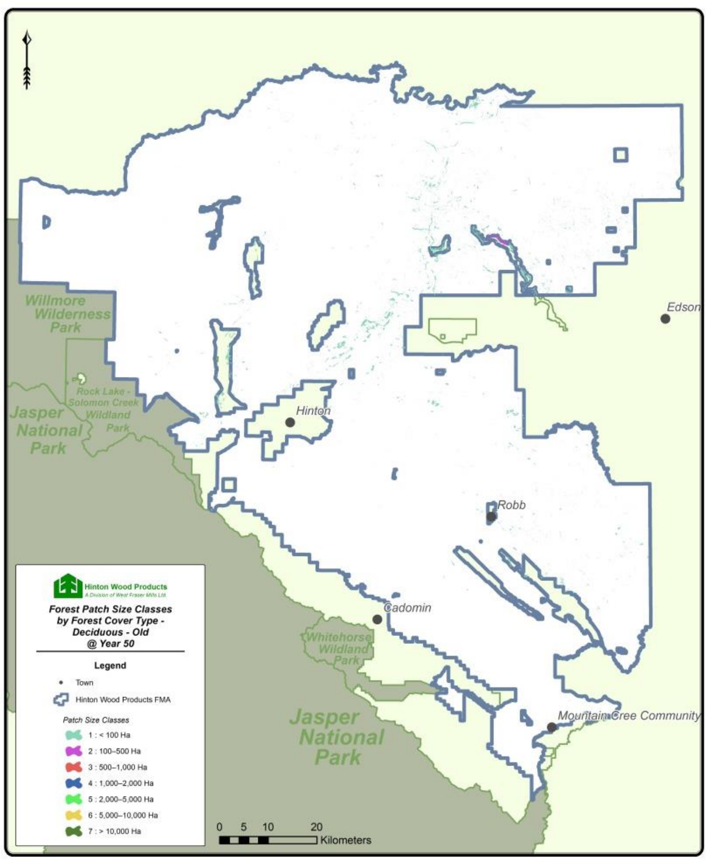


Figure 88 – Patch size classes for old deciduous for Year 0, Year 10 and Year 50 gross FMA

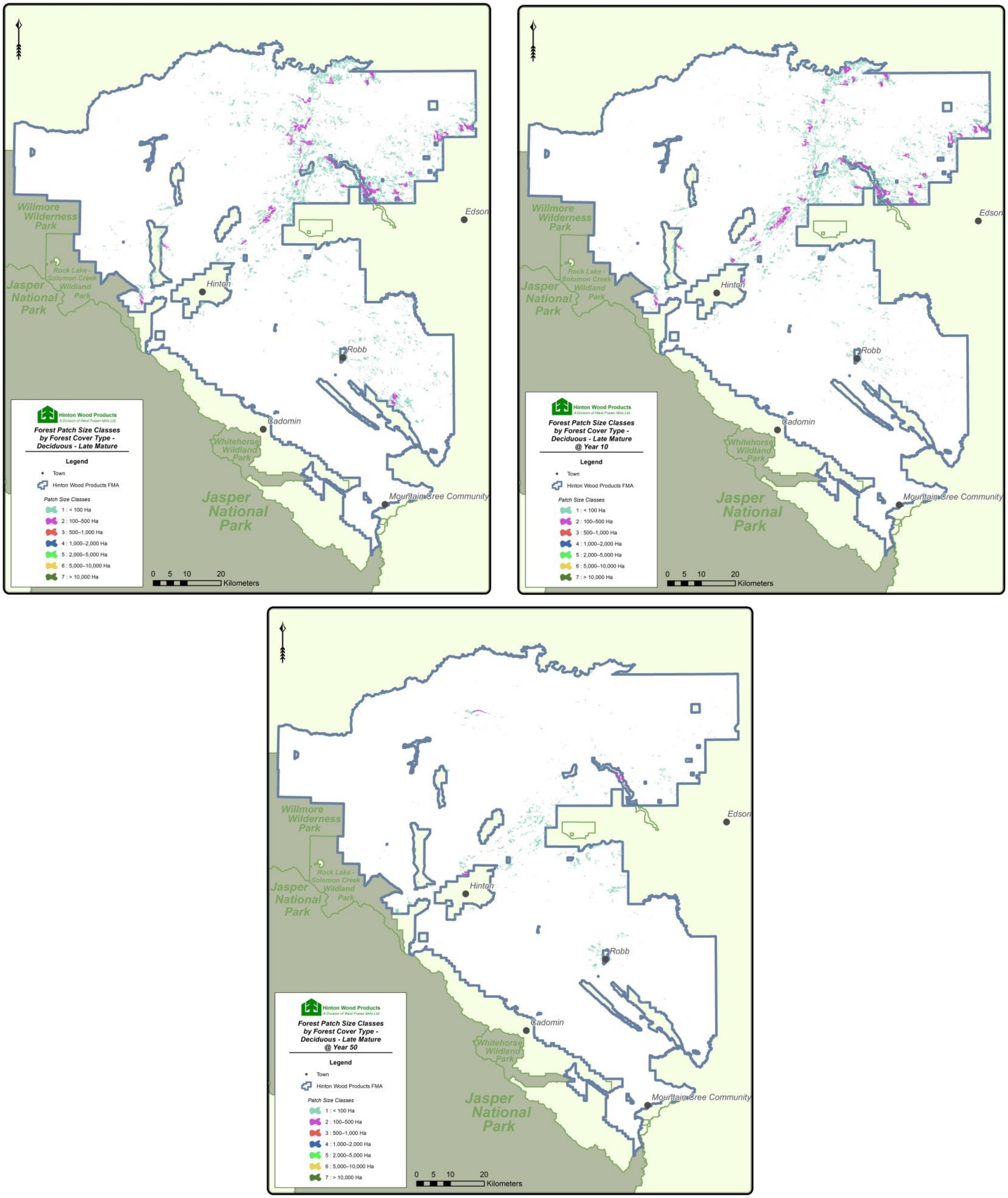


Figure 89 – Patch size classes for late mature deciduous for Year 0, Year 10 and Year 50 gross FMA

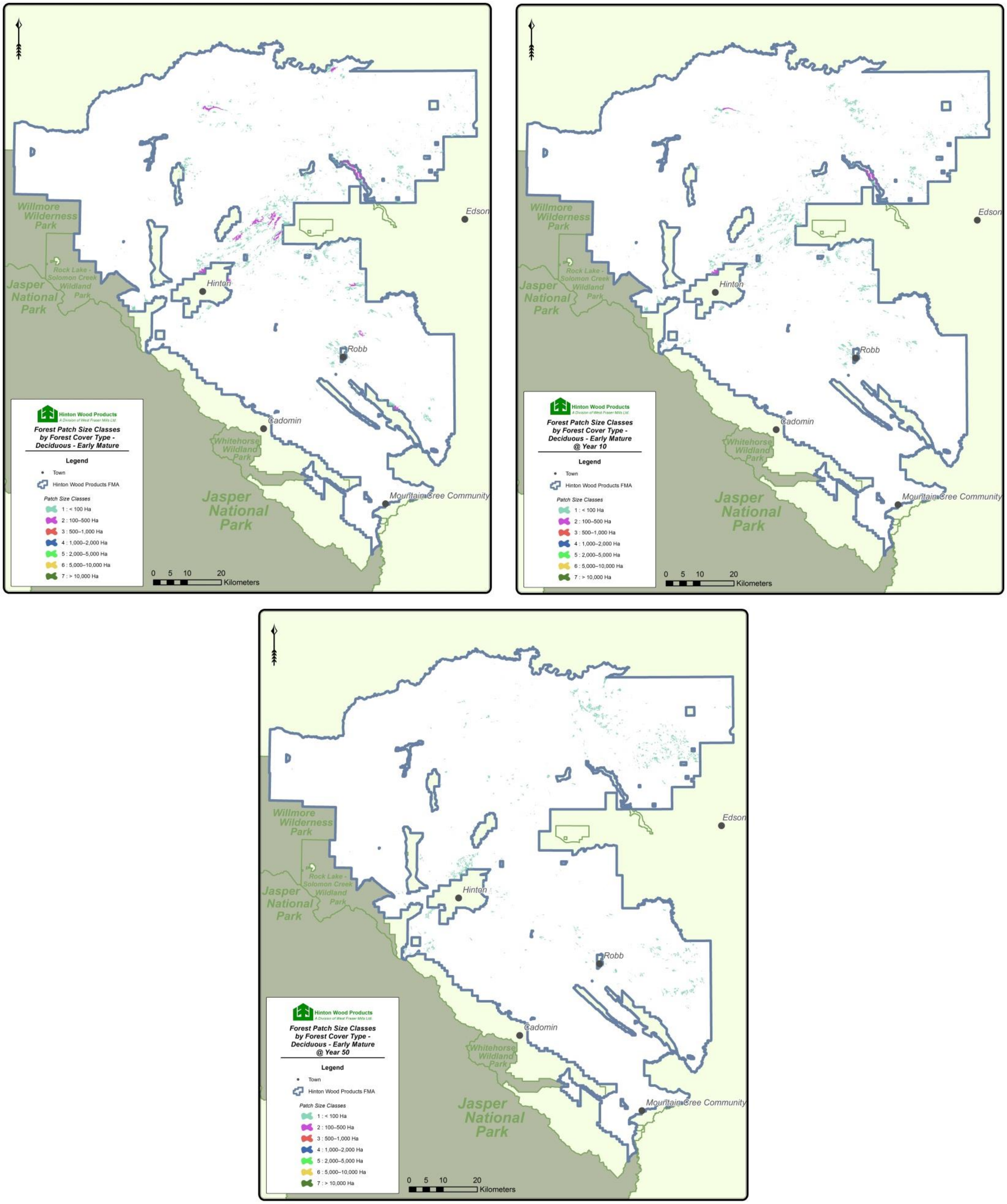


Figure 90 – Patch size classes for early mature deciduous for Year 0, Year 10 and Year 50 gross FMA

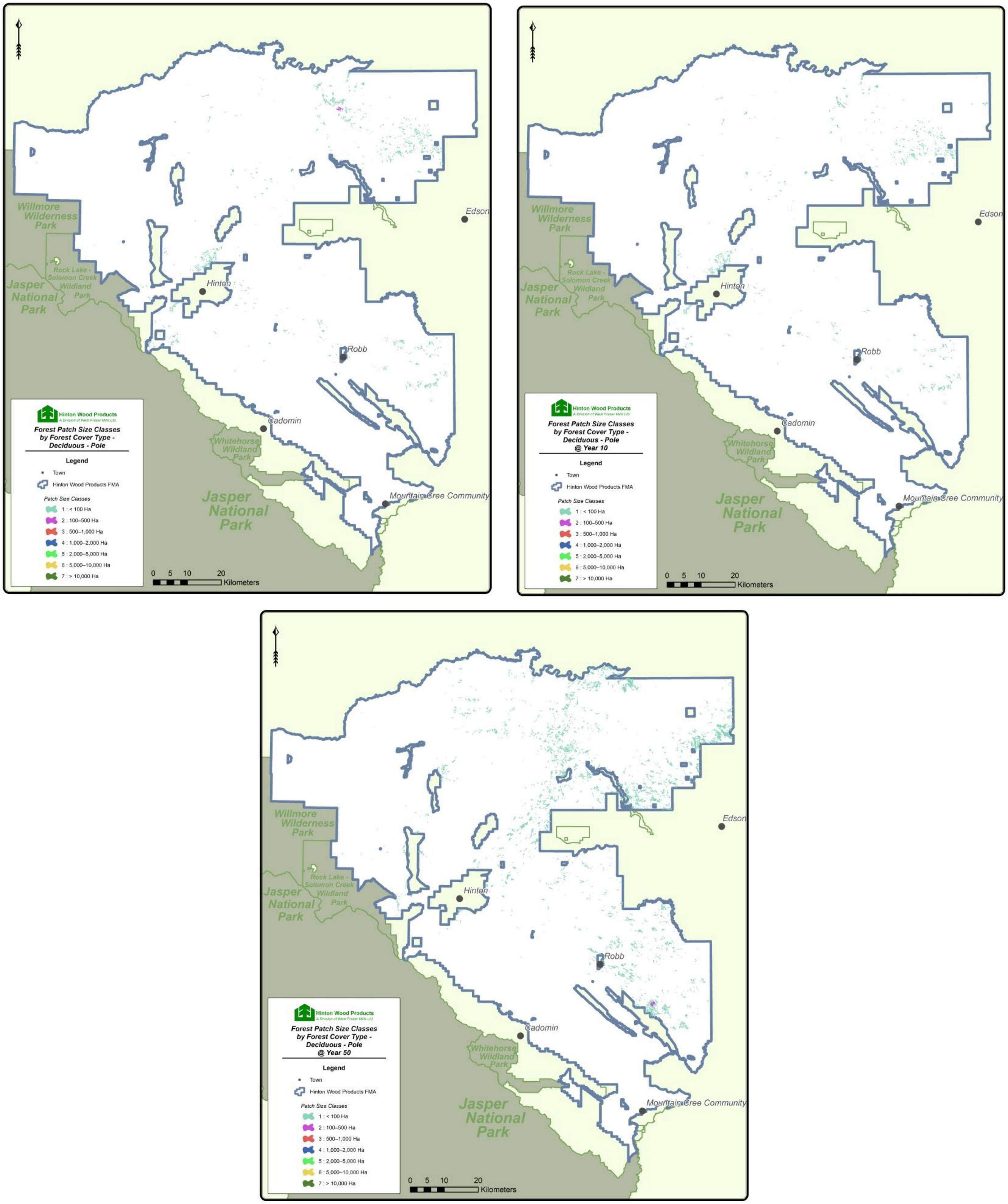


Figure 91 – Patch size classes for pole deciduous for Year 0, Year 10 and Year 50 gross FMA

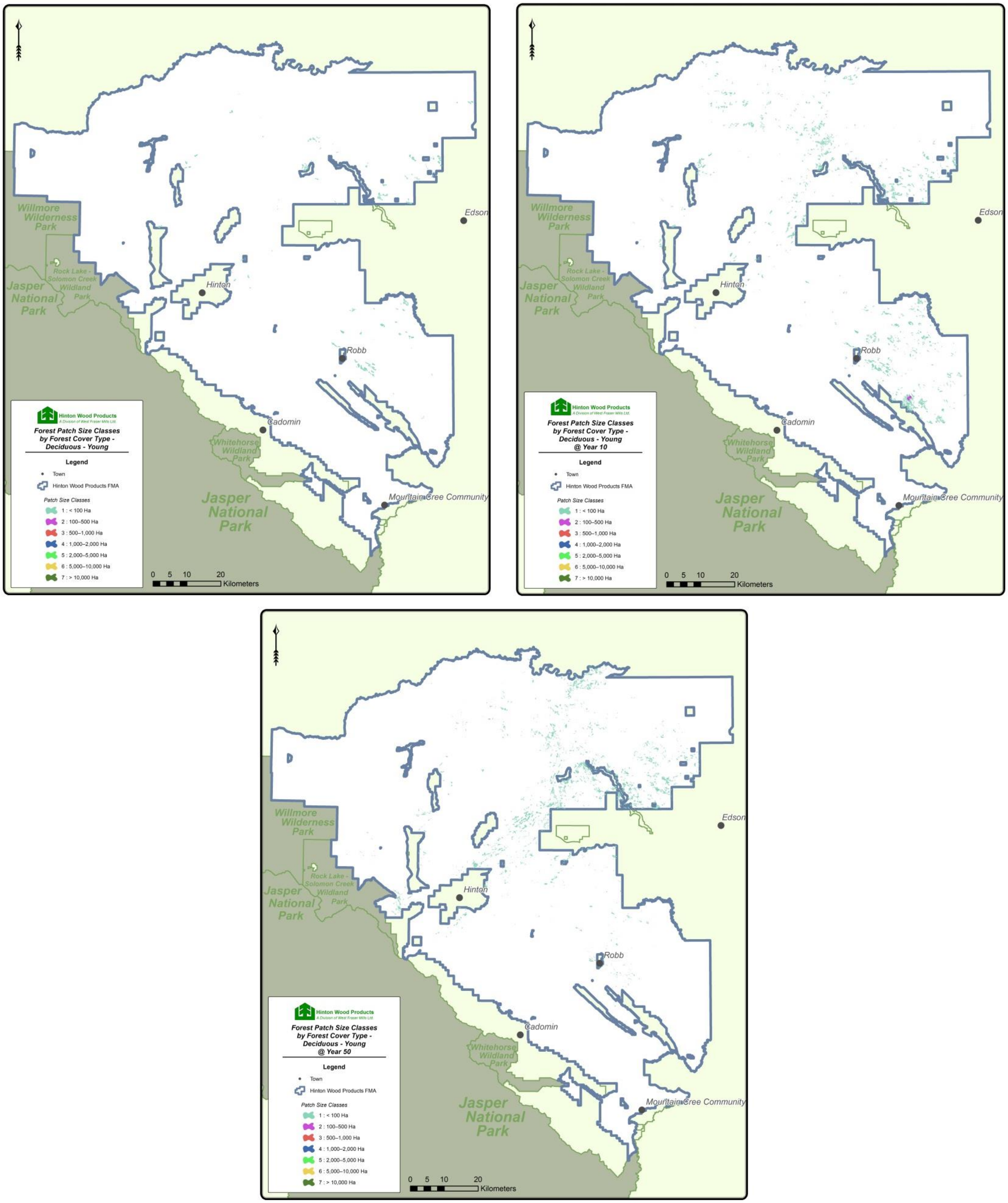


Figure 92 – Patch size classes for young deciduous for Year 0, Year 10 and Year 50 gross FMA

TARGET #3 – Old Interior Forest

Value	Landscape scale biodiversity
Objective	Maintain biodiversity by avoiding landscape fragmentation
Indicator	Area of old interior forest of each cover class by subunit and entire DFA
TARGET #3	Area of old interior forest will not be less than 10% of each cover class over the next 200 years
Means to Identify Target	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)
Legal/Policy Requirements	Planning Standard
Means of Achieving Objective and Target	Spatial and temporal harvest planning
Monitoring and Measurement	Regular updates to forest inventory
Reporting Commitments	• DFMP: Maps and Tables of indicator at 0 and 20 years • Performance: 5-Year DFMP Stewardship Report
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 DFMP
HWP Strategy	See section 3.33 in HWP's Natural Disturbance Strategy found in Appendix 2.

1.0 Target #3

Definitions

A. Old Interior Forest (OIF) – Old Interior Forest is defined in the Alberta Forest Management Planning Standard, as follows:

- "A forested area >100 hectares in size located beyond edge effect buffer zone along the forest edge".

The Standard suggests using, "a common age definitions for all cover classes to prevent breaking up forest patches that have a common origin date". The Standard further defines edge effect, required buffer zones, and forest edge, as follows:

- Edge effect buffer zone: 60 m where adjacent area is non-forested or less than 40 years old; 30 m where adjacent forest stand is >= 40 years and less than mature forest; and 0 m where adjacent stand is mature forest.
- 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.

It should be noted that only the area within the FMA was included in the OIF analysis and neighbouring provincial and federal protected areas were not considered.

Overview and Analysis

Tables, graphs, and maps in this section describe, for the gross FMA landbase, the status of Old Interior Forest at the following two points in time: Year 0 (2012) and Year 20 (SHS).

2.0 Report – Target #3 (Old Interior Forest)

Table 62 on the following page provides an overview of the status of Old Interior Forest by cover type at Year 0 (2012) and Year 20 (after the implementation of the first two decades of the October 2014 version of the Spatial Harvest Sequence associated with this DFMP). This calculation and its associated data were provided to HWP by the GoA.

Table 62 – Old Interior Forest (OIF) Overview Summary

Cover Type	Gross Forested Area	Year 0 (2012)		Year 20	
		Area of OIF (ha)	% of gross forest area in OIF	Area of OIF (ha)	% of gross forest area in OIF
Pine	467,095	103,126	22.1%	63,753	13.6%
Spruce	129,193	19,208	14.9%	14,141	10.9%
Black Spruce	118,199	13,495	11.4%	13,308	11.3%
Mixedwood	132,997	21,383	16.1%	14,343	10.8%
Deciduous	56,303	13,568	24.1%	9,081	16.1%
Non-forest	118678		n/a		n/a
total	1,022,465	170,780	16.7%	114,626	11.2%

Maps

Figure 93 and Figure 94 on the following pages show for the gross FMA landbase the location of Old Interior Forest for the five forested cover types at Year 0 (2012), and Year 20. Data used to derive these maps were provided to HWP by the GoA.

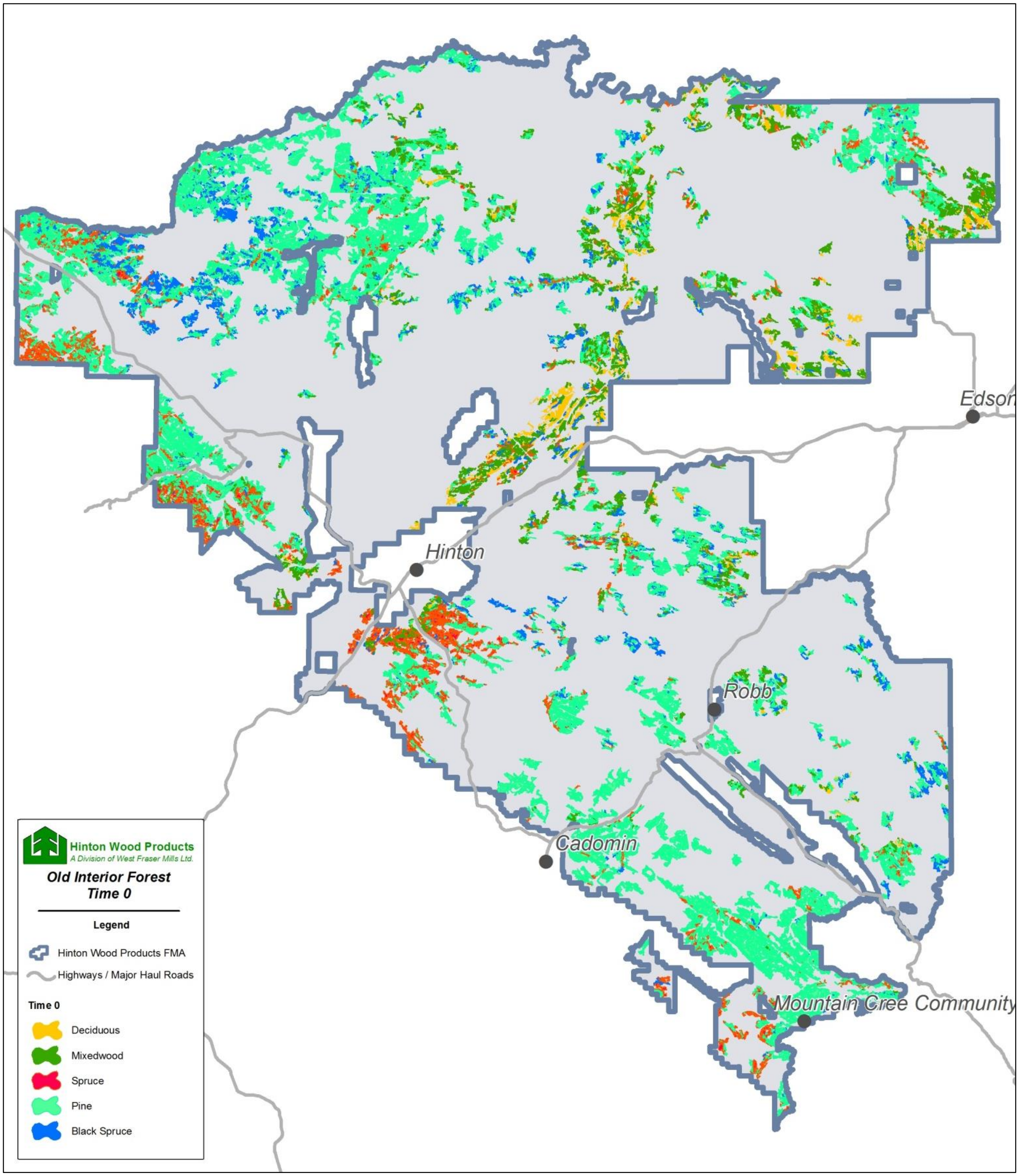


Figure 93 – Old Interior Forest for the five forested cover types at Year 0 (2012) (Gross FMA)

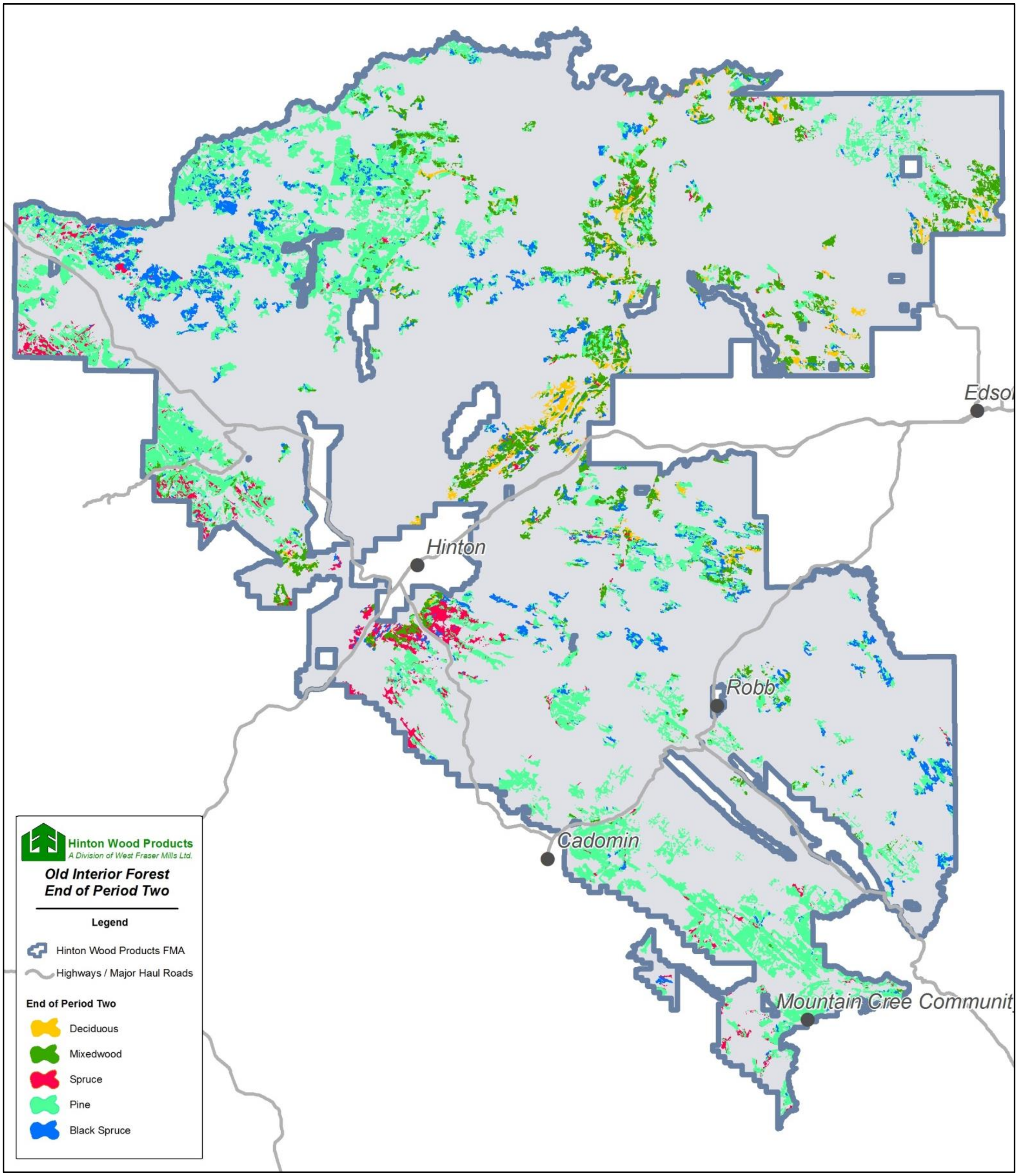


Figure 94 – Old Interior Forest for the five forested cover types at end of period 2 (Gross FMA)

TARGET #4 and #5 – Open All-Weather Roads (grizzly bears)

Value	Landscape scale biodiversity
Objective	Maintain biodiversity by minimizing access
Indicator	Open all-weather forestry road density by subunit
TARGET #4	In core grizzly bear habitat units the target will be to have less 0.6 km/km2 of open all-weather forestry road.
TARGET #5	In secondary grizzly bear habitat units the target will be to have less than 1.2 km/km2 of open all-weather forestry roads.
Means to Identify Target	The Alberta Grizzly Bear Recovery Plan calls for 0.6 km/km² in core grizzly bear watershed units and 1.2 km/km² in secondary grizzly bear watershed units
Legal/Policy Requirements	GoA Planning Standard
Means of Achieving Objective and Target	Develop a strategy that coordinates access with other resource users, spatial/temporal sequencing of harvest, road closures and decommissioning. • Utilize existing access roads and rights-of-way wherever possible. • Cooperate with other companies to develop and maintain shared roadways. • Maintain contact with representatives of companies using and building roads within the Hinton FMA area.
Monitoring and Measurement	• Regular updates to forest inventory. • Changes in road density will be reported in the Stewardship Report.
Reporting Commitments	• DFMP: Table of road density by subunit at 0 year. Map of existing and proposed open all weather roads. Report forestry roads and total (all users) roads. • Performance: 5-Year DFMP Stewardship Report • HWP Stewardship Report: Annual voluntary Stewardship Report
Acceptable Variance	A variance not exceeding +/-20% must be achieved.
Response	Adjust strategies in subsequent DFMP
HWP Strategy	• HWP will work cooperatively with other resource sectors operating in the FMA to minimize permanent road construction • HWP will continue with the implementation of Long Term Access Plans (Appendix 13) to help coordinate access development and reclamation on the FMA. • HWP is committed to working with Alberta on the development and implementation of practical, cost-effective grizzly bear recovery strategies

1.0 Target #4

2.0 Target #5

Research conducted in both Alberta and many other parts of grizzly bear range in North America, have found that the key to maintaining grizzly bear populations is to keep human-caused grizzly bear mortality rates low. Regulating human use of access (specifically motorised vehicle routes) in grizzly bear range reduces the risk of human-caused mortality. Because human use of access is difficult to measure, the Recovery Plan recommends using Open Route Densities as a surrogate for the amount of human use. The GoA's open route density objectives are:

- In Core GBWUs the open route density threshold is 0.6 km/km2.
- The open route density threshold in Secondary GBWUs is 1.2 km/km2.

In both Core and Secondary GBWUs, the government's objective is to maintain or reduce current levels of open road route density below the above target densities. However, HWP can only plan and control its own road building activities; therefore, Target #4 and Target #5 relate only to HWP open forestry roads, not to all other non-HWP roads on the FMA. It is recognized that these other non-forestry roads also contribute to access density, so HWP has also reported the total of non-forestry roads as well as HWP forestry roads in the tables found in this section; however, the actual targets relate only to HWP's "forestry" open all-weather roads.

Definitions

A. Open all-weather forestry roads – These are roads owned (i.e. DLO) by HWP. These are class 2, 3, and 4 roads as defined in HWP's Operating Ground Rules.

B. Core and Secondary Grizzly Bear Habitat – In Alberta, six Grizzly Bear Population Units have been identified. Grizzly Bear Population Units are management units based on genetic distinctions within the Alberta grizzly bear population. These population units are generally separated by major highway corridors. There are two Grizzly Bear Population Units found in the Hinton FMA – the Grande Cache Grizzly Bear Population Unit and the Yellowhead Grizzly Bear Population Unit. The population units are further subdivided into Grizzly Bear Watershed Units (GBWU); a management unit based on major watersheds subdivided along heights of land and occasionally along watercourses, to approximate the size of an adult female grizzly bear home range (~700 km2). Each GBWU is characterized as being either Core or Secondary grizzly bear habitat based on current landscape conditions. Definitions are as follows:

- Core Areas – These are areas of high habitat value and generally low mortality risk currently measured through Open Route Densities.
- Secondary Areas – These are areas of good habitat, reflecting the broader range of grizzly bears.

The gross Hinton FMA landbase is comprised of approximately the following Core and Secondary grizzly bear habitat areas (see Figure 95):

- Core area: 48%
- Secondary area: 37%
- Not classified grizzly bear habitat: 15%

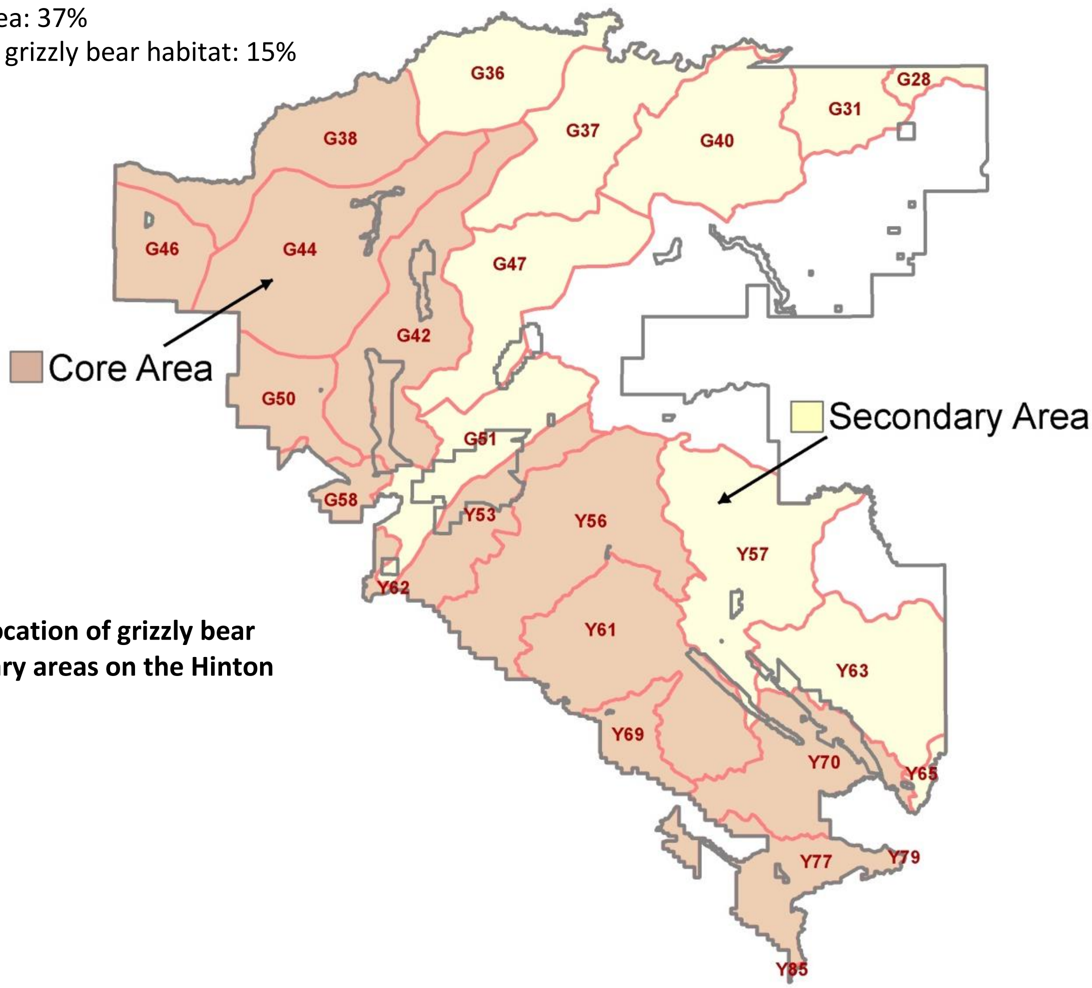


Figure 95 – The location of grizzly bear core and secondary areas on the Hinton FMA

Overview

Tables and maps in this section describe, for the gross FMA landbase, the road density status (km/km2) of all HWP-owned "open all-weather forestry roads" in Core and Secondary grizzly bear habitat at Year 0 (2012), as well as the road density status of non-HWP open roads for Year 0 (2012). There is no Year 10 forecast for HWP or non-HWP open roads, due to our inability to forecast road construction from other users and due to unknown circumstances (e.g. caribou range plan, MPB outbreaks, etc.).

Target's #4 and #5 in this DFMP relate only to HWP-owned open all-weather forestry roads. Non-HWP open roads have been reported for informational purposes only.

3.0 Report – Target #4 (Core GBWU Road Densities)

4.0 Report – Target #5 (Secondary GBWU Road Densities)

Table 63 on the following page shows the results of a route density analysis of HPW and non-HWP open all-weather roads in the Core and Secondary Grizzly Bear Watershed Units for the Grande Cache and the Yellowhead Grizzly Bear populations at Year 0 (2012). There is no forecast at Year 10 for HWP or non-HWP roads, as we do not know exactly which roads we will need to build at this point (e.g. will proposed logging in the caribou area go ahead or not?). HWP will update this table in the each Performance Stewardship Report (compiled every five years)

Maps

Figure 96 shows the location of all existing open all weather roads for Year 0 (2012) on the Hinton FMA. This map delineates the difference between HWP owned roads and roads owned by other users. Figure 97 shows the location of all existing and HWP planned open all weather roads for entire Hinton FMA for the term of this plan.

Notes

HWP has developed a Road Corridor Plan (see Figure 97) that indicates the location of future HWP-required permanent roads across the FMA over time. HWP has also developed Long Term Access Plans (LTAPs) that detail HWP's plans for existing and future roads – in these LTAPs, HWP has determined whether we want to maintain, deactivate or reclaim a given existing road. By doing this, HWP is able to address identified access concerns and coordinate access development and management between HWP and other industrial users of the landbase such as the oil and gas industry, and ensure road density values are managed. LTAPs for the Athabasca, Marlboro, Embarras, McLeod, and Berland working circles can be found in Appendix 13.

Table 63 – Road Densities in Core and Secondary Grizzly Bear Watershed Units – Gross FMA Landbase

Grizzly Bear Population Unit	Grizzly Bear Watershed Unit	Habitat Type	HWP Open All-Weather Forestry Roads Year 0 (2012) Road Length	Area (km sq)	Rd. Density (km/km sq)	All Other Open All-Weather Non-HWP Roads Year 0 (2012) Road Length	Area (km sq)	Rd. Density (km/km sq)	Total Road Density all open roads Year 0 (2012)
Grande Cache	G38	Core	84.95	454.1	0.187	35.19	454.1	0.077	0.265
	G42	Core	222.95	537.6	0.415	112.93	537.6	0.210	0.625
	G44	Core	216.42	728.6	0.297	98.7	728.6	0.135	0.433
	G46	Core	18.37	229.1	0.080	44.28	229.1	0.193	0.273
	G50	Core	80.06	232.2	0.345	49.6	232.2	0.214	0.558
	G58	Core	29.64	107.1	0.277	10.57	107.1	0.099	0.375
		Core Totals	652.39	2288.7	***0.285***	351.28	2288.7	***0.153***	***0.439***
	G28	Secondary	3.03	58.0	0.052	24.3	58.0	0.418	0.471
	G31	Secondary	40.01	204.2	0.196	147.2	204.2	0.721	0.917
	G36	Secondary	175.69	376.7	0.466	218.1	376.7	0.579	1.045
	G37	Secondary	159.61	477.8	0.334	413.3	477.8	0.865	1.199
	G40	Secondary	132.36	540.0	0.245	360.7	540.0	0.668	0.913
	G47	Secondary	210.31	475.7	0.442	118.0	475.7	0.248	0.690
	G51	Secondary	92.30	289.7	0.319	91.0	289.7	0.314	0.633
		Secondary Totals	813.31	2422.1	***0.336***	1372.7	2422.1	***0.567***	***0.903***
Yellowhead	Y53	Core	61.62	230.6	0.267	50.2	230.6	0.218	0.485
	Y56	Core	292.29	691.7	0.423	95.6	691.7	0.138	0.561
	Y61	Core	180.53	624.5	0.289	70.5	624.5	0.113	0.402
	Y69	Core	14.44	138.2	0.104	18.4	138.2	0.133	0.238
	Y70	Core	88.16	343.5	0.257	99.3	343.5	0.289	0.546
	Y77	Core	35.89	283.2	0.127	48.8	283.2	0.172	0.299
		Core Totals	372.93	2311.6	***0.291***	682.7	2311.6	***0.295***	***0.457***
	Y57	Secondary	214.35	641.6	0.334	184.5	641.6	0.288	0.622
	Y63	Secondary	218.12	495.0	0.441	123.4	495	0.249	0.690
	Y65	Secondary	9.48	28.2	0.336	9.6	28.2	0.339	0.676
		Secondary Totals	441.97	1164.9	***0.379***	317.4	1164.9	***0.273***	***0.652***

*Road density could not be forecast for Year 10 for non-HWP owned roads, due to HWP's inability to forecast road construction from other users

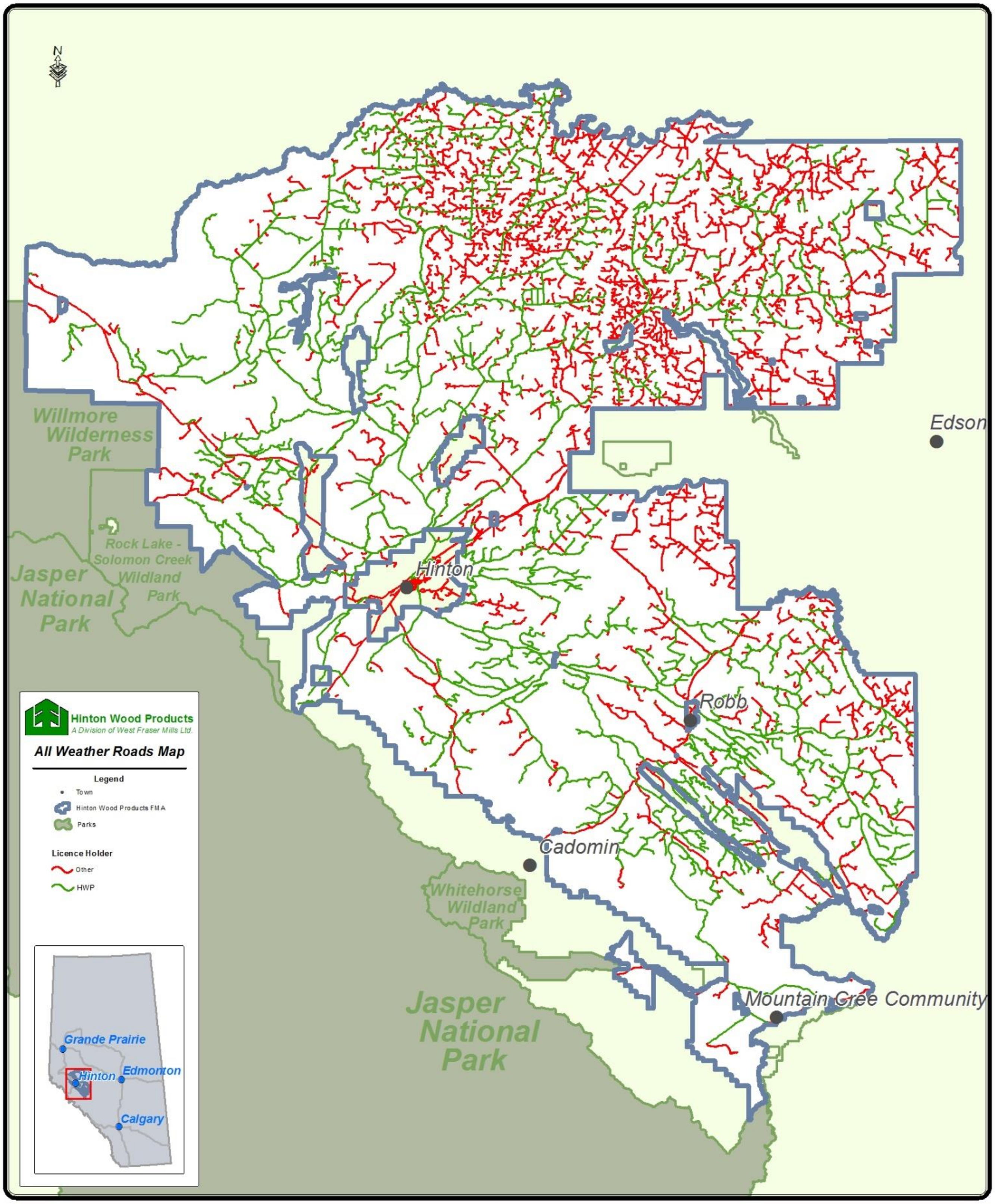


Figure 96 – All existing open all weather roads for Year 0 (2012) on the Hinton FMA

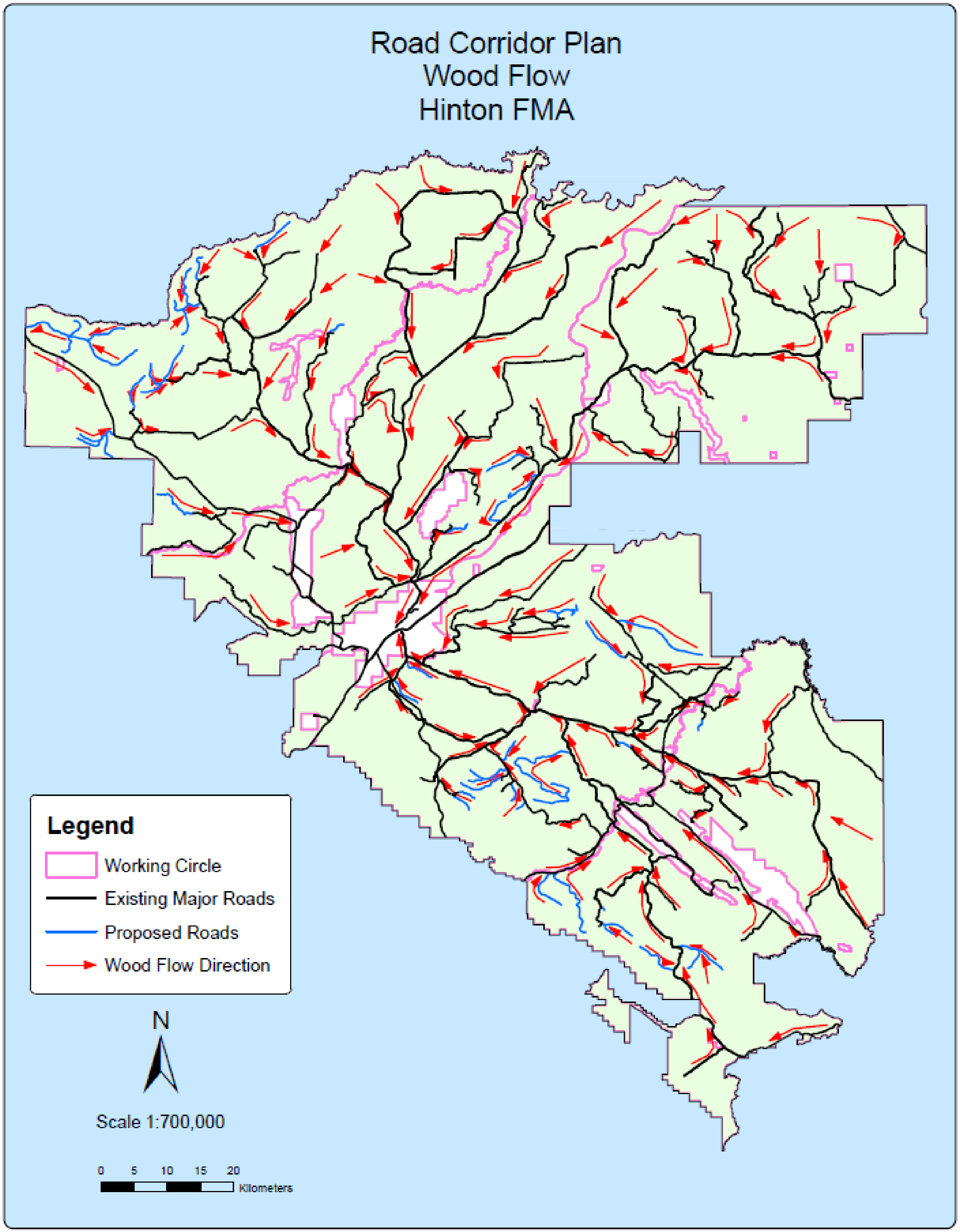


Figure 97 – Road Corridor Plan for the Hinton FMA

TARGET #6 – Open All-Weather Roads (caribou)

Value	Landscape scale biodiversity
Objective	Maintain biodiversity by minimizing access
Indicator	Open all-weather forestry road density by subunit
TARGET #6	Incorporate access density targets as in approved caribou range plans.
Means to Identify Target	Future approved caribou range plans
Legal/Policy Requirements	GoA Planning Standard. Other relevant Acts, Regulations, approved plans, and policy
Means of Achieving Objective and Target	Develop a strategy that coordinates access with other resource users, spatial/temporal sequencing of harvest, road closures and decommissioning. • Utilize existing access roads and rights-of-way wherever possible. • Cooperate with other companies to develop and maintain shared roadways. • Maintain contact with representatives of companies using and building roads within the Hinton FMA area.
Monitoring and Measurement	• Regular updates to forest inventory. • Changes in road density will be reported in the Stewardship Report.
Reporting Commitments	• As required by the GoA and directed by approved caribou range plans. • Performance: 5-Year DFMP Stewardship Report • HWP Stewardship Report: Annual voluntary Stewardship Report
Acceptable Variance	• As required by GoA and directed by approved caribou range plans.
Response	Adjust strategies in subsequent DFMP
HWP Strategy	• Foothills Landscape Management Forum – HWP is a founding member of this voluntary multi-stakeholder organization committed to integrated resource management in the range of the Little Smoky and A La Peche caribou herds (see http://flmf.foothillsri.ca/). • Keep informed with respect to the Alberta Caribou Action and Range Planning Project, through West Fraser's representation in the Alberta Forests Products Association.

1.0 Target #6

The Alberta Caribou Action and Range Planning Project is a government led project that will develop range plans for Alberta's caribou ranges and one action plan to meet the requirements of the Government of Canada's Recovery Strategy for the Woodland Caribou (*Rangifer tarandus* caribou), Boreal population in Canada. In Alberta, caribou conservation and recovery are also guided by the Alberta Woodland Caribou Recovery Plan (2005) and A Woodland Caribou Policy for Alberta (2011).

As part of this Range Planning Project, Advisory Groups were formed to advise the government in the development of these Range Plans. The Little Smoky and A La Peche Multi-Stakeholder Advisory Group (Advisory Group) is one of four Advisory Groups supporting the Government of Alberta's Caribou Action and Range Planning Project. The Hinton FMA contains a portion of both the Little Smoky and A La Peche caribou herds (see Figure 98 on the following page). The Alberta Forest Products Association has a representative on this Advisory Group representing the forest industry.

The Government of Alberta holds responsibility for writing the action and range plans. The Advisory Group, operating within the scope and purpose of the Alberta Caribou Action and Range Planning Project Charter provides advice for the Government of Alberta's consideration in writing the plans. At this time (2014), the Range Plan for the Little Smoky and A La Peche caribou herds is not completed. Once the plan is completed, there may, or may not, be access density targets applied to all or a portion of range of the Little Smoky and A La Peche herds. This Target commits HWP to incorporate access density targets as required in a future government approved range plan for the Little Smoky and A La Peche caribou herds.

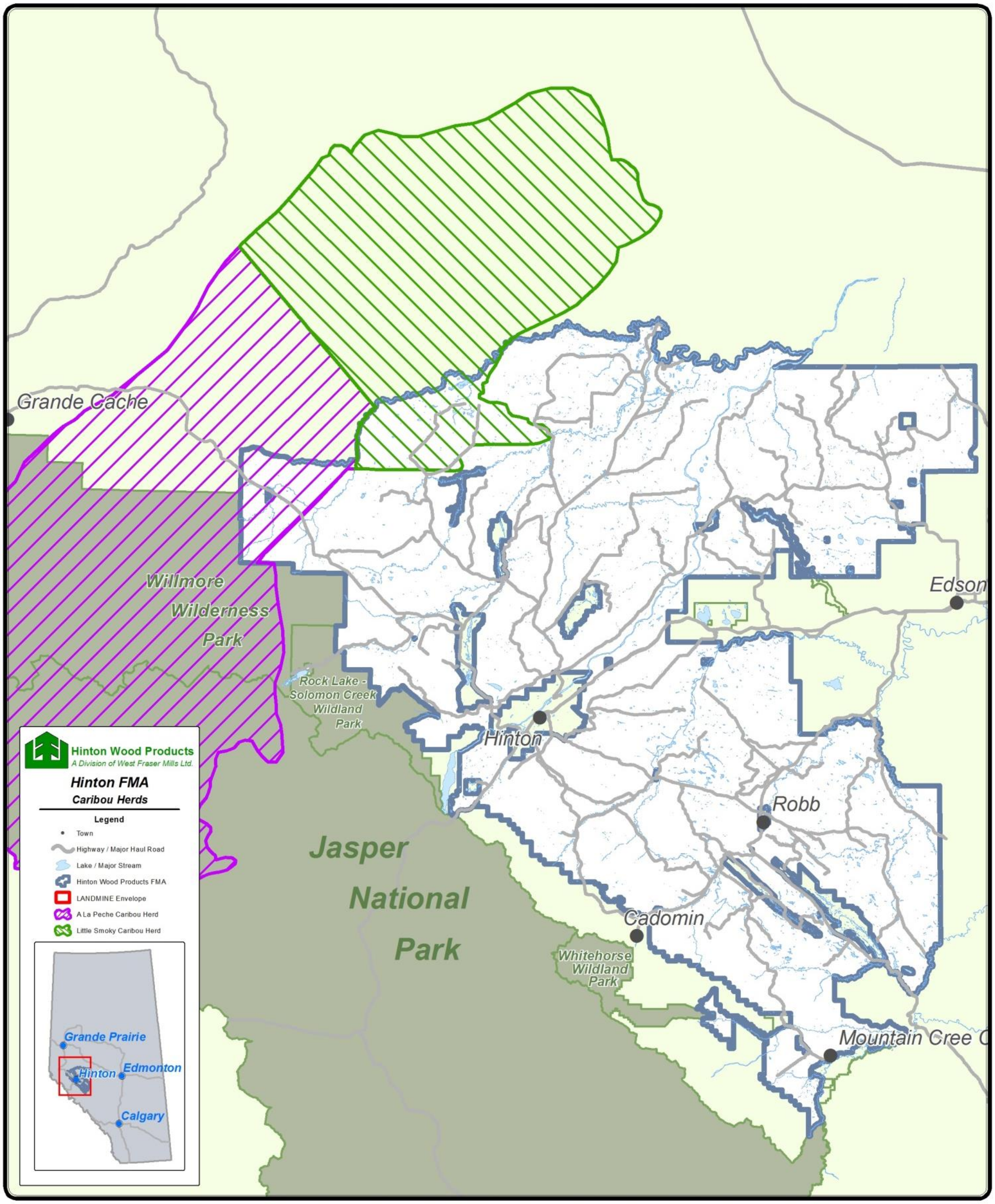


Figure 98 – The Range of the Little Smoky and A La Peche Caribou Herds With Respect to the Hinton FMA

TARGET #7 – Temporary Roads

Value	Landscape scale biodiversity
Objective	Maintain biodiversity by minimizing access
Indicator	Open seasonal / temporary forestry road length by FMA
TARGET #7	Less than 250 km of open temporary road for the FMA
Means to Identify Target	Target is based on open temporary roads from previous and current timber years.
Legal/Policy Requirements	GoA Planning Standard
Means of Achieving Objective and Target	Road construction, deactivation, and reclamation activities
Monitoring and Measurement	Road plan OGR 11.2
Reporting Commitments	AOP, 5-Year DFMP Stewardship Report, Annual HWP Stewardship Report
Acceptable Variance	A variance not exceeding +/- 20% must be achieved
Response	Adjust strategies in subsequent AOPs
HWP Strategy	Continue with the implementation of HWP's system for tracking the status at any given point in time of open class-5 roads.

1.0 Target #7

This Target limits the number of kilometres of open temporary roads, as limiting access can be beneficial to wildlife, reduces habitat fragmentation, and minimizes the amount of unproductive land taken up by roads.

Definitions

A. Open Temporary Roads – HWP builds two types of temporary roads; class 5 roads, which go between blocks and can be open up to five years; and class 6 roads, which are in-block roads and only open for a short period of time and reclaimed after logging in the block is complete. This target only addresses class 5 temporary roads, as all class 6 roads are reclaimed immediately following harvesting, and if they are not, compliance issues arise.

B. Methodology for Determining the Status of Open Temporary Road – In order to determine the status of all roads falling under the current definition of an open temporary road, HWP reviewed all roads on the FMA classified as either Class 4b (old Operating Ground Rules definition of an open temporary road) or Class 5 (current OGR definition) and placed them into one of the following four categories:

1. Planned – No disturbance created but required or possibly required at a later date
2. Existing Open – Road was drivable with a pick-up truck. Note: some of these were actually accessed by quad due to large mud holes, downed trees, etc.. If it was felt that under frozen conditions, or very dry conditions, the road could be accessed by a pick-up it was still deemed existing.
3. Reclaimed – Road was well vegetated. Vegetation could be trees, shrubs or grass. No evidence of quad access. Recent roads that had been rolled back but may not actually have had much, or any, vegetation on them were included here.
4. Deactivated – Road not drivable by pickup, but accessible by quad. This could be due to berming, pulling of culverts/bridges, or just narrowness of road (in-growth). If a road was behind a locked gate, it was deemed deactivated. Secondary roads off of the main road that had a pulled bridge were also included here.

There was an office component and a field component used in the methodology for determining the amount of existing open temporary roads.

In the office (summer 2013), HWP's GIS department provided a spreadsheet identifying all of the Class 4b and Class 5 roads identified in TFM (database management software). There were a total of 503 Class 4b roads and 1,863 Class 5 roads; for a total of 2366 temporary roads. GIS then provided a spatial layer identifying all the previously approved blocks that had been deleted from the system when HWP stopped logging pulp blocks (this was approximately 1,500 blocks). GIS also provided a spatial layer identifying all the second and third pass blocks (approximately 5,800 blocks). NOTE: When doing Block Layout Reports (BLR's), HWP was required to identify all second and third pass blocks and associated access to them. The access was not laid out, but had to be identified within the BLR.

All the 2,366 temporary roads noted above were looked at on screen with the aid of the 2012 orthography (ortho) photos.

- If the roads were not at all evident and were deemed to access either of the pulp block category or the second and third pass category (discussed above), those roads were deleted from TFM.
- If the roads were designated as "Planned" and accessed blocks that had "expired" or have been identified "deferred", they were kept in the system but identified as "Planned" until a decision is made as to whether those blocks will be re-planned in the future.
- Temporary roads that were now under a pipeline were deleted from TFM, unless there were other roads coming off from said road. When this was the case, the road which was now a pipeline, was kept so routing of the connecting roads could be determined.
- If a temporary road was now entirely under an LOC, the road was deleted. If only part of the temporary road was now under an LOC, the temporary road was shortened to reflect that and tied into the new LOC.
- If a temporary road now lay within a mine disposition, it was deleted from the system.
- For all roads not deleted, they were examined on the ortho photos to see evidence of them being open or not. If the road had originally been classed as "reclaimed" and there was no evidence otherwise, it was kept as reclaimed. For evidence, HWP looked for things such as an obvious corridor in place with "whiteness" along the road indicating mineral soil exposure. If there was some evidence indicating the road might still be open, it was field checked.
- Almost all of the temporary roads classified as "deactivated" were field checked as it was impossible to tell from the ortho photos as to whether deactivation methods had actually been used (i.e. berms). It was discovered that on numerous roads, although culverts had been pulled, they were still accessible by truck and therefore were classified as existing.
- Most roads that had an original status of "Existing" were field checked. In a few cases, it was very obvious that they were still open and field checking was not done.
- For recently harvested areas that were not captured by the 2012 ortho images, the corresponding HWP Operations Supervisor was contacted to determine the current road status. If they were unaware of the status, these newer roads were field checked.

Upon completion of the office component, there were a total of 463 of the 2,366 temporary roads to field check to confirm their status (180 Class 4b's and 283 Class 5's). All of these remaining roads were then site visited and classified/reclassified as either planned, existing temporary, reclaimed, or deactivated. Some issues that arose out of the field checking that had to be addressed included the following:

- If a road which led to another road (or more than one other) was either reclaimed or deactivated, the roads off of it were not field checked but classified as deactivated (although they could have actually be reclaimed or existing).
- If there were roads off of a road that had a pulled bridge, or had a berm constructed restricting access, once that bridge is re-installed, or berm removed, they may all become "existing" again (i.e. taking one bridge or berm out, may open up numerous roads).
- Numerous roads were totally vegetated with grass and had no evidence of quad usage and were called reclaimed. However, quads can access almost anywhere, so they could have been classified as deactivated. This could apply to just about any temporary road.

Based on the above methodology, in the summer of 2013, there were 232.3 km of open class 5 roads. HWP set the target at 250. HWP has implemented a system to keep track of open temporary roads – updates on the status of open temporary roads will be calculated annually.

Although the acceptable variance specified in the Planning Standard places bounds on both the minimum and maximum number of kilometers of open temporary roads (i.e. + 20%), HWP will minimize the kilometres of open temporary class 5 roads, regardless of the acceptable variance criteria.

2.0 Report – Target #7 (Kilometres of Open Temporary Road)

The kilometres of HWP-owned temporary open class 5 roads on the Hinton FMA will be reported annually in the Annual Operating Plan (AOP) and summarized by year every five years in the Stewardship Report.

TARGET #8 – Uncommon Plant Communities

Value	Landscape scale biodiversity
Objective	Maintain plant communities uncommon in FMA or province
Indicator	Area or occurrence of each uncommon plant community within DFA
TARGET #8	Apply a Standard Operating Procedure to conserve uncommon plant communities for 100% of known and encountered occurrences (listed in Stewardship Report table and DFMP text).
Means to Identify Target	GIS analysis of ELC coverage, review of ACIMS tracking list
Legal/Policy Requirements	Planning Standard and Company Policy
Means of Achieving Objective and Target	Mapped occurrences protected or conserved according to community type. Field guide for identifying additional occurrences.
Monitoring and Measurement	Update occurrences for new finds and report them to ACIMS
Reporting Commitments	New occurrences will be reported annually in HWP's Stewardship Report and every 5 years in the 5-Year DFMP Stewardship Report.
Acceptable Variance	+/- 5% from target in the first 10 years of the FMP.
Response	Review and revise operational procedures and controls to ensure conformance.
HWP Strategy	HWP developed a Standard Operating Procedure for Uncommon Plant Communities (see Appendix 14)

1.0 Target #8

Biodiversity conservation includes special attention to ecosystems, species, and genes that are uncommon. Uncommon plant communities should be conserved to maintain ecosystem diversity and the individual species (species diversity) and genes (genetic diversity) found within the communities. Uncommon plant communities usually occur on special physical environments at the scale of the FMA, region, or province. These sites are likely to contain species and genes that are also uncommon because the environmental conditions they need are in short supply. Most uncommon plant communities on the FMA do not support merchantable forests and will not be altered by HWP activities.

Conservation of both non-forested and forested uncommon plant communities will be through application of a Standard Operating Procedure (SOP). The entire SOP is located in Appendix 14.

Definitions

A. Plant community – A plant community is as a distinct assemblage of plant species that can often be associated with particular environmental conditions and, given the right conditions, reoccurs predictably. Plant communities can be separated into three major types: terrestrial, wetland and aquatic. Aquatic plant communities should not be affected by HWP and are not considered in this indicator.

B. Uncommon Plant Community – There is little guidance in the Planning Standard to define the word 'uncommon' in relation to this VOIT. The definition for the NatureServe global conservation status rank "Apparently Secure" (G4) is: "Uncommon but not rare; some cause for long-term concern due to declines or other factors." (NatureServe Explorer 2007). Therefore, under the NatureServe system, uncommon plant communities are not the same as at risk plant communities, which NatureServe classifies as "Critically Imperilled" (G1), "Imperilled" (G2), and "Vulnerable" (G3). The NatureServe system applies to global distributions.

   The Nature Conservancy plant community type classification is also used by the Alberta Conservation Information Management System (ACIMS). Element occurrences are tracked as point data that can be searched online using NatureServe Explorer or the online ACIMS data map tool. Occurrences of tracking and watch list plant communities in Alberta are poorly known and generally are not mapped. For this reason, HWP chose a different methodology to define and map uncommon plant communities – the methodology HWP has chosen to use is based on the West-Central Alberta ecosite classification

(Beckingham et al. 1996), which uses "Natural Subregions", "Ecosites", "Ecosite Phases", and "Plant Community Types".

Using the West-Central Alberta ecosite classification system, ecological landscape classification (ELC) and mapping for the FMA was completed to the Ecosite Phase level in 2004. The ELC for the Hinton FMA has portions of four Natural Subregions, 14 Ecosites, and 43 Ecosite Phases, for a total of 103 Natural Subregion/Ecosite/Ecosite Phase combinations. There is a very small amount of the Alpine Natural Subregion in the FMA that will not be affected by HWP and was not included in this analysis.

For this VOIT, a plant community is a unique combination of "Natural Subregion", "Ecosite", and "Ecosite Phase" as described in the Field Guide to Ecosites of West-Central Alberta (Beckingham et al. 1996). The maximum resolution of the FMA's ELC inventory is to the ecosite phase.

Unless further detail (i.e. specific locations) is developed by ACIMS through the NatureServe system, HWP will use area (hectares) to define uncommon plant communities on the FMA. Therefore, an "uncommon plant community" for the purposes of this VOIT is a Natural Subregion/Ecosite/Ecosite Phase that occurs on the FMA, and:

1. For the Lower Foothills, Upper Foothills, and Subalpine Natural Subregions, has a total area of less than 1,000 hectares (approximately 0.1% of the FMA).
2. For the Montane Natural Subregion, has a total area of less than 225 ha (approximately 1.0% of the FMA Montane area).

Natural Subregions, Ecosites and Ecosite Phases are defined in the Field Guide to Ecosites of West-central Alberta and mapped through the ELC inventory for the FMA.

2.0 Report – Target #8 (Uncommon Plant Communities)

Based on the ELC, 28 Ecosite Phases have a total area extent that is less than 1,000 hectares in the Upper Foothills and Subalpine Natural Subregions or less than 225 hectares in the Montane Natural Subregion. The total area occupied by uncommon plant communities, as defined above, on the Hinton FMA is 6,686.8 hectares as described in Table 64. There is no forecast for this indicator.

Table 64 – Uncommon plant communities on the Forest Management Area (Jan 1, 2013)

Plant Community*	Ecosite	Ecosite Phase	Area (ha)
Montane-A-1	grassland	shrubby grassland	122.6
Montane-A-2	grassland	graminoid grassland	148.2
Montane-B-1	bearberry	bearberry Fd	0.3
Montane-B-2	bearberry	bearberry Pl	91.9
Montane-C-1	hairy wild rye	hairy wild rye Fd	4.3
Montane-E-1	meadow	shrubby meadow	72.4
Montane-E-2	meadow	forb meadow	33.1
Montane-F-1	horsetail	horsetail Pb-Aw	181.0
Montane-G-2	fen	shrubby fen	141.7
Montane-G-3	fen	graminoid fen	216.5
Montane-H-1	marsh	marsh	2.9
Montane Natural Subregion Total			**1014.8**
Lower Foothills-A-1	grassland	shrubby grassland	113.7
Lower Foothills-B-1	bearberry lichen	bearberry/lichen Pl	185.9
Lower Foothills-C-4	hairy wild rye	hairy wild rye Sw	826.4
Lower Foothills-G-2	meadow	forb meadow	599.3
Lower Foothills-K-2	bog	shrubby bog	248.1

Plant Community*	Ecosite	Ecosite Phase	Area (ha)
Lower Foothills-N-1	marsh	marsh	114.3
Lower Foothills Natural Subregion Total			**2087.8**
Upper Foothills-A-1	grassland	shrubby grassland	252.9
Upper Foothills-B-1	bearberry lichen	bearberry/lichen Pl	870.7
Upper Foothills-K-2	bog	shrubby bog	203.0
Upper Foothills Natural Subregion Total			**1326.6**
Subalpine-A-1	grassland	shrubby grassland	242.9
Subalpine-A-2	grassland	graminoid grassland	109.9
Subalpine-C-2	hairy wild rye	hairy wild rye Pl-Aw	358.5
Subalpine-E-2	meadow	forb meadow	265.2
Subalpine-H-1	bog	treed bog	588.8
Subalpine-H-2	bog	shrubby bog	2.9
Subalpine-I-3	fen	graminoid fen	689.4
Subalpine Natural Subregion Total			**2257.7**
Forest Management Area Total			**6686.8**

* Format: Text-Character-Number: Natural Subregion-Ecosite-Ecosite Phase

HWP will update the status of uncommon plant communities on the FMA annually in HWP's Stewardship Report and summarize UPC status every five years in the DFMP Performance Stewardship Report.

Notes

Plant communities on the ACIMS Element Tracking List (Allen 2013) that might occur or do occur on the FMA will be considered for addition to the uncommon plant community list as more knowledge is obtained. HWP will check ACIMS's Tracking List annually for the addition of uncommon plant communities, or additional information about the location of previously identified uncommon plant communities, and report results in annual Stewardship Report.

The Target of this VOIT was to develop a Standard Operating Procedure (SOP) to conserve uncommon plant communities for 100% of known and encountered occurrences. The SOP includes two documents:

1. Uncommon Plant Community Guidebook – This guidebook provides detailed information on each of the identified and know uncommon plant communities on the FMA, including information on how to identify them (Appendix 15).
2. UPC Standard Operating Procedure – This document outlines the procedures to follow during field layout to ensure uncommon plant communities are identified before harvesting begins (i.e. during layout) and what to do when an uncommon plant community (UPC) is encountered during forest planning (Appendix 14).

These documents are tools that are intended to assist forest managers in the recognition and understanding of uncommon plant communities in the FMA and the procedures to take should UPCs be encountered during planning.

TARGET #9 and #10 – Unsalvaged Natural Disturbances

Value	Landscape scale biodiversity
Objective	Maintain unique habitats provided by wildfire and blowdown events
Indicator	Unsalvaged natural stand replacing disturbances
TARGET #9	The cumulative total area of unsalvaged natural stand replacing disturbances will be at least 25% of area disturbed based on a 20 year rolling average.
TARGET #10	Apply operational procedures to address unsalvaged trees and patches at salvage planning stage.
Means to Identify Target	Research into natural disturbance on the HWP FMA by the Foothills Research Institute
Legal/Policy Requirements	GoA Planning Standard
Means of Achieving Objective and Target	Timber Salvage Planning / Timber salvage Standard Operating Procedures
Monitoring and Measurement	"Endangered" timber is identified through ongoing inventory and survey programs. Significant occurrences are mapped and incorporated into the inventory program, and timber salvage is planned and approved through the planning and approval process
Reporting Commitments	This will be tracked and reported annually in HWP' Stewardship Report and every 5 years in the 5-Year DFMP Stewardship Report.
Acceptable Variance	Target #9 – 5% Target #10 – No variance; apply operational procedures
Response	Adjust strategies in subsequent AOPs
HWP Strategy	HWP will leave unsalvaged at least 25% (based on a rolling 20 year average) of the area affected by stand-replacing natural disturbances. A salvage plan will be determined for each new natural stand replacing disturbance event targeting the timber that is least damaged and most accessible (in terms of sensitive ground, steep slopes, habitat issues, etc.), and the unsalvaged area will be added to the rolling ledger, with the goal of having at least 25% of natural disturbances remaining un-salvaged. The Company has developed an operational procedure for timber salvage and will apply it to all natural disturbance events. The operational procedure can be found Appendix 2 (Appendix 3). For a more detailed discussion of HWP's strategy around unsalvaged natural disturbances, see section 3.37 in HWP's Natural Disturbance Strategy found in Appendix 2.

1.0 Target #9

2.0 Target #10

The HWP goal is to conserve some representation of ecosystems originating from natural disturbances on the FMA over the 200 year planning horizon as represented by unsalvaged natural disturbances on the FMA.

Eventually the majority of FMA ecosystems (almost all of the contributing landbase) will originate from harvest disturbances instead of natural disturbances. Natural disturbances will continue to occur, and a proportion of natural disturbances will not be salvage harvested to ensure representation of natural-origin stands. Conservation of unsalvaged natural disturbances for the FMA landbase (contributing and non-contributing) is through the application of a Standard Operating Procedure (SOP) developed and applied as part of this DFMP.

Definitions

A. Natural disturbances – Natural disturbances are agents that cause the death of most trees in an area. They include fire, wind (blowdown), floods, insects, disease, etc. Disturbances that damage most of the trees in a stand are called stand-replacing disturbances. HWP defines a natural disturbance that kills ≥ 50% of the trees in an area ≥ two hectares in size as a stand-replacing disturbance
B. Timber salvage – Timber salvage is the recovery and use of merchantable timber that is damaged (killed or injured) by stand-replacing fire, insects, disease, or blowdown. Timber salvage also refers to timber that is cut on the FMA for non-Company dispositions (roads, well-sites, pipelines, mines, powerlines, etc.).

C. Endangered timber – Timber that has been damaged but not salvaged is called endangered timber because it must be salvaged before decay makes it unsuitable for forest products. The window from death to salvage to meet quality specifications is usually < 3 years.

3.0 Report – Target 9 (Cumulative total area of unsalvaged natural stand replacing disturbances)

HWP tracks occurrences of natural disturbances on the FMA through several processes. Area burned is tracked in the Annual Fire Statistic Summary Report prepared by the government and this summary information is included in HWP's Annual Stewardship Report. At present insects, disease, blowdown hail, and other disturbances are monitored and are reported on by the GoA through an informal basis (e.g. through MPB reconnaissance flights). The GoA has provided this information to HWP in the last couple of years – HWP also records natural disturbances such as blowdown and hail damage through field observations. There have been no significant timber losses to insects and disease on the FMA since records started in 1954.

Significant occurrences of endangered timber are mapped and incorporated into the inventory program, and salvage is planned and approved through the planning and approval process. Harvested (salvaged) areas are reforested and tracked through the history and silviculture records system. The status of the FMA landbase is inventoried every 10 years. There is no historical data to calculate a 20 year rolling average for the first target, so the rolling average was commenced starting in 1997. The cumulative percentage of unsalvaged natural disturbances as of December 31, 2012 is 86.9% (Table 65). The calculation is based only on those natural disturbance events that have some level of salvage – every year, there are numerous small fires and areas of blowdown that are not salvaged (or in some cases, even tracked spatially); thus, the actual cumulative unsalvaged percent will be greater than the reported number.

Table 65 – Cumulative area of unsalvaged natural stand replacing disturbances on the HWP FMA 1997-2012

Event	Year	Area disturbed (ha)	Area unsalvaged (ha)	Cumulative % unsalvaged
Fire 37	1997	1,603	1,310	81.7
1997 blowdown (multiple events)[1]	1997	400	200	75.4
Fire 61	2003	459	13	61.9
2005 blowdown (multiple events)[1]	2005	150	125	63.1
Fire EWF-059-2006	2006	163	148	64.7
Fire EWF-080-2006	2006	95	95	65.9
Fire EWF-138-2006	2006	240	240	68.5
McLeod 25 blowdown	2008	11.7	1.7	68.3
McLeod 12 blowdown	2009	54	1.5	67.2
2009 blowdown (multiple events)[1]	2009	181.6	181.6	69.0
2009 hail damage (multiple events)[1]	2009	1,714	1286.1	71.0
2011 hail damage (multiple events)	2011	5,450.4	5,450.4	86.0
2011 Blowdown[2]	2011	669.9	669.9	86.9
No major events	2012	0.0	0.0	0.0
	Total	11,191.6	9,722.2	86.9%

[1] The blowdown and hail damage areas reported here are approximate and include the entire extent of known events. Within the events there were portion that were not stand-replacing. The total areas associated with these events may be revised after more detailed analysis is completed and as we become aware of other disturbed areas associated with the 2009 wind and hail events.
[2] The blowdown areas reported here are approximate and include the entire extent of known events. Within the events there were portion that were not stand-replacing. The total areas associated with these events may be revised after more detailed analysis is completed and as we become aware of other disturbed areas associated with the 2011 wind and hail events. Some salvage has occurred of these events in 2011; however, a final accounting of these areas was not available at the time of this report.

4.0 Report – Target #10 (Operational Procedures)

Operational procedures developed by HWP for timber salvage of natural disturbances can be found in Appendix 2 (Appendix 3).

TARGET #11 and #12 – Conserving Riparian Areas

Value	Landscape scale biodiversity
Objective	Retain ecological values and functions associated with riparian zones
Indicator	Compliance with the riparian-related sections of the Operating Ground Rules.
TARGET #11	100% consistent and compliant with the DFMP's new Riparian Management Strategy (RMS), where the RMS is applicable
TARGET #12	Zero non-compliance incidents on an annual basis.
Means to Identify Target	Target #11 – Research into natural disturbance on the HWP FMA by the Foothills Research Institute. (http://foothillsresearchinstitute.ca/pages/ProgramsNatural_Disturbance/default.aspx). Target #12 – Operating Ground Rules (OGRs)
Legal/Policy Requirements	Operating Ground Rules / Federal Fisheries Act / Water Act
Means of Achieving Objective and Target	Target #11 – Initiate and implement a program for introducing disturbance into riparian areas / Air photo interpretation / Field work / Field trips Target #12 – Regular training of contractors and staff, third-party audits (e.g. SFI, ISO, FOMP), HWP logging inspections, HWP SFI/ISO compliance audits, West Fraser internal SFI/ISO divisional audits.
Monitoring and Measurement	Target #11: • The SHS will be implemented - riparian disturbance will be measured and compared to targeted NRV riparian disturbance in the SHS. • HWP is developing a Monitoring and Measuring Program to measure and monitor any negative environmental impacts from the implementation of its Riparian Management Strategy. Target #12 – Monitoring will occur through on-site inspections, internal and external auditing, and incident reporting. Environmental incidents and follow up action items are tracked on a database.
Reporting Commitments	Target #11: • Report variances with the targeted riparian disturbance (based on the approved SHS) with each FHP submission. • Annually and cumulatively summarize variances and report in the HWP's annual Stewardship Report and every five years in the DFMP Stewardship Report. Target #12 – All incidents that are reportable to the government will be reported immediately and then summarized annually in HWP's Stewardship Report and every five years in the DFMP Stewardship Report.
Acceptable Variance	Target #11 – 0% positive variance in meeting the five-year SHS target for riparian disturbance (up to 20% negative variance is acceptable) Target #12 – No variance
Response	Target #11 – Adjust strategies in subsequent DFMP Target #12 – Internal investigation, and if required, timely remedial actions
HWP Strategy	• On a portion of the FMA area, HWP will implement its Riparian Management Strategy (RMS). A full copy of HWP's RMS can be found in Appendix 2 (Appendix 2). A briefer overview of HWP's RMS can be found in section 3.35 in HWP's Natural Disturbance Strategy found in Appendix 2. • On the remaining portion of the FMA area, HWP will continue to implement the current riparian management practises (fixed-width buffers) as described in the provincial OGRs. • HWP has also developed a monitoring and measuring program to evaluate the effectiveness of the HWP's Riparian Management Strategy. All the protocols and a full description of this program, called the, "Properly Functioning Condition Assessment for Streams and Riparian Areas in the West Central Foothills of Alberta" can be found in Appendix 2 (Appendix 2).

During the development of this DFMP (particularly between the October 2014 submission and the revised December 2015 submission) there was an agreement between the GoA and HWP that a roll-out of HWP's Riparian Management Strategy on 100% of the FMA landbase wouldn't be appropriate given the substantial difference between the existing riparian standards in the provincial OGRs (fixed-width buffers based on stream width) and HWP's Riparian Management Strategy (streams classified by erosion processes with careful disturbance prescribed based on NRV). The exact scope of HWP’s Riparian Management Strategy roll-out will be determined in the future based on a number of different factors such as any associated negative impacts to riparian areas significantly outside of NRV, an agreement on parameters for measuring impacts (i.e. a Monitoring and Measuring Program), and the setting up and measuring of “reference streams”.

For the purposes of Targets #11 and Target #12, it should be assumed that Target #11 refers to the implementation of HWP’s new Riparian Management Strategy, which may take place on some portion of the FMA; while Target #12 refers to the existing fixed-width buffer riparian management practises as currently described in the provincial Operating Ground Rules, which will take place on the remaining area of the FMA.

1.0 Target #11

This Target is centred on implementing and monitoring HWP’s Riparian Management Strategy. The underlying principle of this Strategy is that some level of disturbance within riparian areas is required to maintain ecological function. Unfortunately, over the last 50+ years, government regulation and policy, along with very effective fire control, has effectively removed fire as a natural disturbance agent in riparian areas in the Foothills of Alberta. Research is starting to show that removing all disturbances from riparian areas will have ecological consequences over time.

Overview and Analysis

HWP’s entire Riparian Management Strategy can be found in Appendix 2, but its implementation is summarized in the following nine steps:

1. Channel Classification – HWP has identified the type of watercourse/waterbody (at the DFMP level using remote sensing technology) using a new watercourse classification system developed at the Foothills Research Institute (McCleary, R.J. 2011.) (McCleary, R.J, Haslett S. and Christie, K. Nov 2012). The current government system to identify watercourse channels is based primarily on channel width and permanence. Depending on the channel width, there will be a buffer of a certain width where no tree removal is allowed. HWP’s proposed classification system is a surface erosion process-based system (i.e. channels are defined based on what they do). Using this system, five erosion process categories were defined, resulting in four types of channels.

   Table 66 highlights the difference in the government’s classification system and the new process-based channel classification system HWP is implementing in our Riparian Management Strategy.

Table 66 – HWP’s Process Channel Classification versus Existing Provincial OGR Classification

<table>
<tr><th colspan="2">HWP’s Process- Based Classification</th><th colspan="2">OGR Width-Based Classification</th></tr>
<tr><th>Terminology</th><th>Definition</th><th>Terminology</th><th>Definition</th></tr>
<tr><td>Upland</td><td>Carved by water in the past; no current water flow; no hydrophytic plants</td><td>Upland</td><td>All other area not classified as riparian.</td></tr>
<tr><td>Swale</td><td>Carved by water in the past or depression; no channel; current flow is by seepage; hydrophytic plants</td><td>Ephemeral or water source areas</td><td>Little or no channel, no riparian buffer required. Can be treated the same as upland.</td></tr>
<tr><td rowspan="2">Discontinuous channel</td><td rowspan="2">Water at surface; no continuous channel; flow by seepage; water does not shape channel</td><td>Intermittent</td><td><0.4 m in width. Distinct channel development; Channel usually has no terrestrial vegetation.</td></tr>
<tr><td rowspan="2">Transitional</td><td rowspan="2">Channel widths are between 0.4 and 0.7 metres. Flows all year but may freeze completely in the winter or dry up during periods of drought.</td></tr>
<tr><td rowspan="2">Seepage-fed channel</td><td rowspan="2">Continuous channel highly variable width; organic bridges and undercut banks; bed is soft unconsolidated and in-situ material; water does not move bed material or shape channel</td></tr>
<tr><td rowspan="2">Small Permanent</td><td rowspan="2">Banks and channel well defined. Channel width from ≥ 0.7 metres to 5 metres.</td></tr>
<tr><td rowspan="2">Fluvial</td><td rowspan="2">Continuous channel and flow; bed is fluvial materials; water shapes channel; typical pool/riffle structure</td></tr>
<tr><td>Large Permanent</td><td>Non-vegetated channel width exceeds 5 meters. Flows all year.</td></tr>
</table>

2. Identify Riparian Areas – In the government's OGR riparian area classification system, the riparian areas are designated based on a set width rather than ecological or morphological features (as outlined Table 66). The actual ecological and morphological riparian area and the prescribed buffer-width riparian area often bear no similarity. Under HWP's Riparian Management Strategy, the Company identified and mapped the riparian areas based on ecological and morphological features. Figure 99 illustrates a common difference found between fixed-width riparian zones (as required by the government) versus riparian zones defined by ecological and/or morphological features, such as the top of a slope break.

   As part of HWP's Riparian Management Strategy, ecological/morphological riparian area classification was carried out for the entire FMA by Green-Link Forestry Inc. using a combination of LiDAR data and 3D soft copy colour photo imagery as well as other inventories such as Wet Areas Mapping and HWP's Ecological Land Classification (see Appendix 2 (Appendix 2).

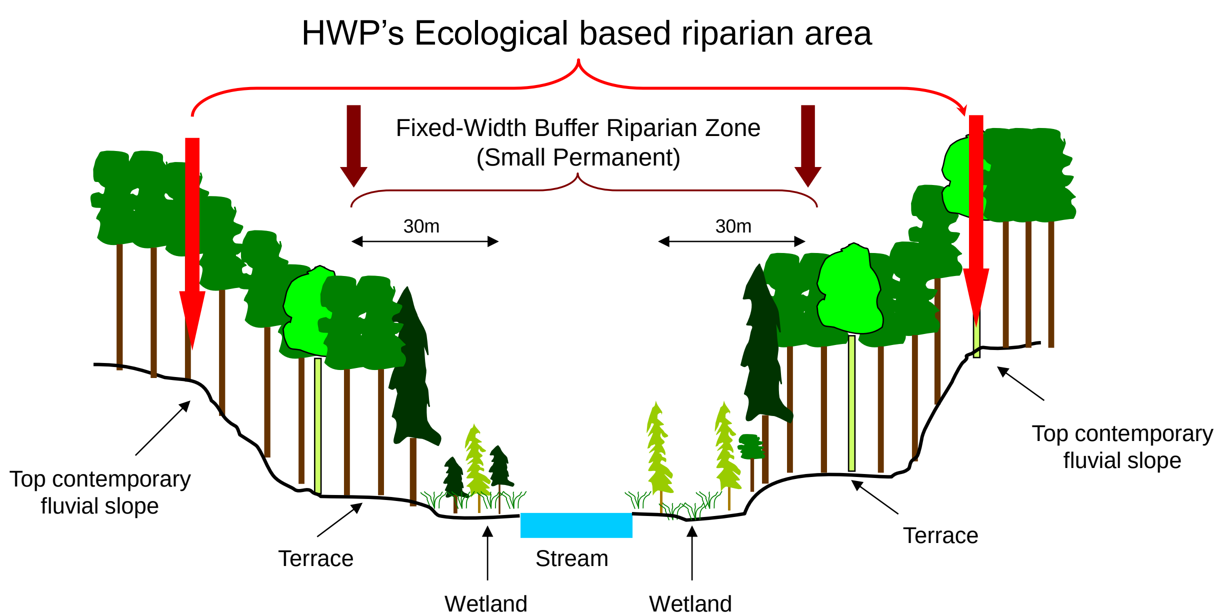


Figure 99 – An illustration of the difference between identifying a riparian zone based on stream channel width versus identifying a riparian zone based on ecological and morphological characteristics

3. Classify Riparian Areas into Vegetation and Operability Classes – After all watercourse channels were identified and all riparian areas were designated, then it was determined for all of the riparian zones what land was designated as passive (i.e. no timber harvest) and what land was designated as active (i.e. some form of timber harvest may be proposed at some time in the future). After the area that is unavailable for harvesting disturbance has been identified and netted out of the riparian area, the next step was to identify the vegetation classes and age of the remaining area available for disturbance.

4. Determine the Natural Range of Variation (NRV) – NRV was calculated by the LANDMINE model (Andison D.W. 1996.) for all riparian areas and broken down by cover type, seral stage, and Natural Subregion. Based on this data, targets (in hectares) were developed to keep riparian areas within their NRV or move them back into NRV over time.

5. Develop Stand-Level Riparian Disturbance Treatment Options – A silviculture strategy (see section 7.3.12) has been developed by HWP silviculturalists that provides a range of acceptable treatments that will depend on the vegetation type, the ecological classification of the area (nutrient and moisture class) and the morphological characteristics (e.g. flood plain, terrace, etc.), as well as other factors. The flow chart in Figure 107 will be used to help determine the type of harvesting prescribed.

6. Spatial Harvest Sequence – HWP used timber modelling (Woodstock) to create a Spatial Harvest Sequence (SHS). The SHS is for a 20 year period and is recalculated every 10 years as part of the DFMP. The SHS set targets (hectares) for disturbance (based on LANDMINE modelling for NRV) within the ecologically defined riparian areas. Harvesting treatments were based on the silviculture matrix.

7. Field Checking– As part of the Forest Harvest Plan (FHP) development, each riparian area and stream classification will be field verified and adjusted as required. In addition, modelled block spatial locations are field checked and adjusted as required.

8. Careful Harvesting – Based on meeting NRV targets, careful harvesting will take place within HWP identified riparian areas, where ecological and morphological conditions are appropriate. A 10-metre channel function zone will be placed on all fluvial and seepage-fed channels. Within the 10-metre channel function zone, the following strategies will be employed:

   - For fluvial channels, all trees, vegetation, and regeneration will be protected that are currently, or may in the future (e.g. leaning trees), interact with the channel. Up to 50% of the trees that are not interacting with the channel can be removed from this zone. Proper watercourse crossing must be installed.
   - For seepage-fed channels, protect the watercourse (i.e. proper crossings) and also protect the vegetation, trees, and regeneration that are currently interacting with the channel. All remaining trees may be taken.

9. Monitoring, Measuring, and Reporting – The total hectares of riparian disturbance (i.e. through harvesting) as compared to the NRV targets will be reported in each FHP. HWP has also developed a monitoring and measuring program to evaluate the effectiveness of the RMS. All the protocols and a full description of this program, called the, "Properly Functioning Condition Assessment for Streams and Riparian Areas in the West Central Foothills of Alberta" can be found in Appendix 2 (Appendix 2).

2.0 Target #12

Target #12 is for HWP to have zero non-compliance incidents on an annual basis. For this VOIT, this means no contraventions of the riparian related sections of HWP's Operating Ground Rules. For example, all required riparian management zones and associated practises must be adhered to.

3.0 Report – Target #11 (Implement the Riparian Management Strategy)

Table 49, Table 52, and Table 55 found in Target #1 report on the Natural Range of Variation for riparian areas for the gross, contributing, and passive landbase, for each cover type, by each seral stage. Each table also describes the current (2012) status of the number of riparian hectares by cover type and seral stage and forecasts the status for Year 10, 50, and 100.

4.0 Report – Target #12 (Non-compliance incidents)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast.

All incidents that are reportable to the government will be reported immediately and then summarized annually in HWP's annual Stewardship Report and every five years in the DFMP Stewardship Report. A brief summary of each incident and the action items taken to prevent similar incidents from reoccurring will be included in HWP's annual Stewardship Report.

TARGET #13 – Stand Level Structure (islands within cutblocks)

Value	Local/stand scale biodiversity
Objective	Retain stand level structure
Indicator	The percentage area of residual structure (both living and dead), within an event that is representative of the status (live/dead), sizes, and species of the forest by Natural Subregion and FMA.
TARGET #13	Retain 1% of the merchantable harvest volume within harvest openings on an FMA-wide basis, as described and prioritized in the current version of the Company's Operating Ground Rules.
Means to Identify Target	This target was identified through negotiation with the GoA.
Legal/Policy Requirements	Occupational Health and Safety Act; Forest and Prairie Protection Act; Planning Standard
Means of Achieving Objective and Target	Implement residual structure retention strategies, as documented in the DFMP and Operating Ground Rules. Implement the OGRs.
Monitoring and Measurement	Compliance with the 1% target is monitored with each FHP submission.
Reporting Commitments	Performance: 5-Year DFMP Stewardship Report
Acceptable Variance	Will not be below 30% of percent area of target. Exceeding the 1% target is allowed.
Response	Adjust strategies in subsequent FMP
HWP Strategy	Described below

1.0 Target #13

For this Target, HWP's strategy is to apply specific stand structure guidelines to minimize mountain pine beetle (MPB) risk when planning and harvesting on the Hinton FMA. The intent is to retain merchantable non-pine species and low-risk/low-value merchantable pine as the first and second priority respectively. The target is to retain 1% of the merchantable harvest volume within openings on an FMA-wide basis.

On the FMA, there is some risk of MPB attack of, and dispersal from, green pine retained in blocks for stand structure. However, the risk can be somewhat mitigated if the residual pine being retained is low risk (small diameter, very open or dense, young or old), or if it is high risk pine and it should be positioned so it can be easily harvested if infested, or alternatively positioned away from block edges to reduce risk of infestation.

Operations planners will identify retention patches according to the following priority list:

- Priority 1 – Retain merchantable non-pine species (no MPB risk) such as aspen and spruce.
- Priority 2 – Retain merchantable sawlog pine (moderate MPB risk).

It will also be important to retain other structure such as large snags (no MPB risk) and immature or non-merchantable forest within the block opening; however, this retention will not count toward the 1% merchantable target for this indicator.

Definitions

Guidance on the selection of the location of retention patches includes the following:

- Planned retention patches should be >2 tree lengths apart and >2 tree lengths away from the block boundary. If narrower gaps are necessary, there must be room between patches for site preparation equipment to operate between patches.
- Planned large retention patches (≥ 1 ha) will be removed from the block at the planning stage.
- Forest planners will design the shape of large patches to help minimize blow down.

Overview and Analysis

Harvest operations will be conducted as per the directions provided in the harvest plan. Single trees and clumps will be added operationally around specific features. Patches will be created if required to achieve retention targets. Upon completion of harvest operations, retention patches will be mapped using GPS or aerial photography. All patches 0.04 ha and greater will be mapped and attributed with one of the following:

- Type: Retention or Partial Harvest
- Contains merchantable volume: Yes or No

Area of merchantable retention patches (≥ 0.04 ha) will be summarized at the end of the year after the year of harvest (i.e. same timing as ARIS update area reporting). Total harvest area and retention area will be summarized in HWP's annual stewardship report.

Retention patches will be overlaid with the forest inventory. HWP volume tables will be applied to the retention patches, by stratum, to calculate merchantable volume. These volumes will be manually reported to Alberta's Timber Production and Revenue System (TPRS) at the end of the year after the year of harvest.

Single tree and clumps will, by design, contain little merchantable volume; hence they will not be assessed or reported for structure retention under this program.

2.0 Report – Target #13 (island within cutblocks)

Table 67 below describes the current (2012) status of stand structure for islands within cutblocks on the FMA.

Table 67 – Stand Structure Retention (Islands within Cutblocks) - 2012

Timber Harvest Year - 2012			
Number of blocks harvested	**Hectares logged**	**Hectares in- block retention**	**% in-block retention**
202	4,805.9	146.4	3.0%

TARGET #14 – Coarse Woody Debris

Value	Local/stand scale biodiversity
Objective	Retain stand level structure
Indicator	Coarse Woody Debris levels by harvest area.
TARGET #14	100% of harvest areas retain Coarse Woody Debris (CWD)
Means to Identify Target	Sound ecological considerations, based on a literature and Best Management Practices review
Legal/Policy Requirements	Planning Standard
Means of Achieving Objective and Target	HWP developed standards/procedures.
Monitoring and Measurement	Carried out during undocumented and documented logging inspections by HWP Operations Supervisors.
Reporting Commitments	The percentage of blocks harvested that meet CWD objectives will be reported annually in HWP's Stewardship Report and every 5 years in the DFMP Stewardship Report.
Acceptable Variance	-10%
Response	Adjust strategies in subsequent DFMP
HWP Strategy	Implement HWP's CWD strategy (see below)

1.0 Target #14

Long-term success for managing coarse wood debris (CWD) means retaining enough dead wood to sustain deadwood-dependent organisms (e.g. many fungi and invertebrates) and maintain ecological function driven by the input of dead wood. In developing a strategy for CWD, HWP used the following guiding principles (Lofroth. 1998) (BC Chief Forester CWD Guidance. 2010):

- Larger pieces of CWD provide ecological functions that differ from smaller pieces. Large logs (length and diameter) last longer, hold more moisture, contribute more organic material to the soil, and provide habitat for a greater number of species.
- Recruitment of CWD during the mid to later stages of a rotation is important to maintain continuous levels of CWD. Mid to later stage CWD can be managed with retention patches (island and matrix remnants) and other constrained or reserve areas. Individual standing live and dead trees and/or stubs retained on cutblocks also represent important sources of CWD recruitment.
- Variability in the amount of CWD is important at both the site level and landscape level. Ecologically, it is advantageous to maintain the full range of decay and diameter classes of CWD on every site — different functions and ecosystem processes require CWD in different stages of decay
- Silviculture requirements, such as plantable spots, are considered along with CWD management
- HWP's intent is not to cut and leave merchantable stems as CWD – in general, logs left on site for CWD will come from the unmerchantable component of the stand.
- CWD has additional value in riparian areas, which are a valuable habitat resource for many species of wildlife. CWD entering or falling across a stream produces habitat for fish, invertebrates and vegetation. Most importantly, it contributes to stream geomorphology. Excessive amounts of fine woody debris can have negative effects on stream biology and will be avoided. The management of CWD in riparian areas (where it is called Large Woody Debris or LWD) is addressed in detail in HWP's Riparian Management Strategy, which can be found in Appendix 2 in HWPs Natural Disturbance Strategy (Appendix 2).
- Maintain variability in the levels of CWD at the landscape level. The natural distribution and amounts of CWD will vary according to natural subregions, stand types, and stand development history. Although the natural distributions of CWD cannot be mimicked exactly it is important that CWD management captures landscape variation and site-specific variations

HWP's Coarse Woody Debris management strategy will consist of four major parts and is described below:

1. Manage existing CWD - In most cases, logs already lying on the forest floor are left after harvesting. This constitutes an obvious source of CWD. In addition, all other uneconomic wood resulting from harvesting

(such as breakages, short pieces, tops, and dead and dry logs) also provides existing sources of CWD. The intent is to leave these behind after harvest as CWD.

2. Recruit CWD – HWP's focus will be on non-merchantable readily available sources of CWD recruitment. CWD recruitment will be addressed in a number of different ways, which include the following:

    - Leave stand structure retention in island and matrix remnants.
    - Provide direction to HWP's harvesting contractors to either, leave standing, or fall and leave on site, trees (live or dead) that have obvious defects (e.g. multiple tops, forks, various scars, etc.). These types of trees are often referred to as cull trees and will usually produce low-grade lumber. Identifying cull trees during operations as sources of future CWD recruitment is a good example of improving CWD management.
    - Stubbing - leaving high stumps, often several metres in height, to create standing dead wood.

3. Block inspections – HWP's Operations Supervisors conduct documented and undocumented logging inspections regularly. As part of these logging inspections, HWP supervisors will specifically check to see that CWD objectives are being met. At the time of the final documented logging inspection, CWD objectives will be deemed to have been met if three of the following four conditions are observed:

    - Island and matrix remnants identified in approved or amended FHP's are all retained.
    - There is evidence of cull trees (live or dead) being left standing or evidence they have been fallen and left in the block.
    - There is evidence of stubbing or additional stand structure retention patches left in or adjacent to the block that were not identified in the FHP.
    - Pieces larger than 11 centimeters in diameter on the butt and longer than 10 metres should make up less than 30% by volume of the cull piles based on an ocular estimation.

4. Silviculture Practices – Post harvest silviculture operations such as site preparation and stand tending will ensure CWD objectives for the block continue to be met. While CWD may be moved around on the block as a result of some silviculture practices, the goal will be to not remove any CWD from the block.

Definitions

A. Coarse Woody Debris (CWD) – CWD consists of fallen trees and other woody material on the forest floor. It is generally considered to be sound and rotting logs, stumps and branches greater than 10 cm in diameter, which provide, among other things, habitat for plants, animals and insects, and a source of nutrients for soil development. Maintaining CWD after harvesting is an important element of managing for biodiversity. In most cases, non-merchantable logs, breakages, short pieces, stumps, tops and branches left on the forest floor after harvesting provide the major source of CWD in managed stands. Ensuring that large pieces of CWD are recruited throughout the rotation is also a significant component of managing for CWD. (BC Ministry of Forest. March 2002).

Overview and Analysis

Block inspections by HWP Operations Supervisors are carried out regularly – at least one final logging inspection per cutblock is carried out after harvesting is complete, and if harvesting of the block is likely to take more than one month, an interim documented inspection may also be made. HWP will monitor cutblocks with both documented and undocumented inspections to ensure CWD objectives are being met. For the purposes of reporting, each block will undergo a final harvesting inspection, at which time the Operations Supervisor will decide if the CWD objectives have or have not been met, based on the criteria outlined in HWP's CWD strategy (noted above).

2.0 Report – Target #14 (coarse woody debris)

The percentage of "haul-cleared" cutblocks that meet CWD objectives will be reported annually in HWP's Stewardship Report and summarized and reported every five years in the DFMP Stewardship Report. There is no forecast for this indicator.

TARGET #15 – Special Features

Value	Local/stand scale biodiversity
Objective	Protect and maintain the integrity of rare ecological sites, sensitive sites, and special landscape features.
Indicator	Special Features
TARGET #15	• Identify and document any special features found through HWP's Standard Operating Procedures (Special Features SOP & Form – EM-0054) and Special Places in the Forest Program • Develop a management strategy for each identified site within 12 months.
Means to Identify Target	Local staff knowledge, public participation process, field work, ACIMS, HWP rare species database
Legal/Policy Requirements	Planning Standard
Means of Achieving Objective and Target	HWP has a SOP that has an objective of identifying special features/sensitive sites (e.g. mineral licks, tufa springs, hoodoo formations, etc.). For any feature that is found a management strategy is documented within 12 months. HWP also has a similar process through its Special Places in the Forest Program. Sites that are of regional or provincial significance are also documented and management strategies developed within 12 months.
Monitoring and Measurement	Special features or sensitive sites are normally found during field work - HWP staff are aware of the special feature SOP and report finds. The number of special features and SPIF features are shown annually in the Stewardship Report. There is a cumulative total and annual report. All special features are entered into a GIS layer.
Reporting Commitments	Report annually in the HWP's Stewardship Report and every 5 years in the DFMP Stewardship Report.
Acceptable Variance	None - all special features/sensitive will be reported through HWP special features SOP.
Response	Adjust strategies in subsequent AOPs. The Special Features SOP is reviewed, annually and updated as required.
HWP Strategy	The primary strategy to implement this target is to ensure HWP staff are aware of the procedures to take when a special feature of any kind is discovered. The management strategies employed to address the special feature may range from, "business as usual", to special management, or to complete protection.

1.0 Target #15

The objective is to protect and maintain the integrity of rare ecological sites, sensitive sites, and special landscape features. The HWP Standard Operating Procedures for identifying special features and the Company's Special Places in the Forest Program address this objective.

Definitions

A. Special Feature – A special feature is any rare or unusual natural feature (usually small in area) on the FMA, such as a rare ecological site, a sensitive site or a special landscape feature. Some examples of special features are tufa springs, waterfalls, caves, mineral licks, stick nests, den sites, rock outcrops/talus slopes, and unique landforms, such as glacial erratics. These sites should be protected or carefully managed because they are rare and difficult to replace. Below is a more detailed explanation of the most common types of special features found on the Hinton FMA:

- Tufa spring – Tufa springs are most often found around hot-springs. Tufa deposits are lumpy, spongy-looking masses of a chemical sedimentary rock composed of calcite. When the water from the spring reaches the surface, dissolved carbon dioxide escapes, reducing the water's capacity to hold calcium carbonate in solution, so tiny crystals form. These accumulate as the tufa deposit.
- Glacial erratic – An erratic is a piece of rock carried by glacial ice some distance from the rock outcrop from which it came. Erratics can range in size from pebbles to massive pieces such as the Okotoks and Airdrie erratics. The Foothills Erratics Train is a long series of erratics, of many sizes, stretching in a narrow belt for about 400 miles from the Athabasca River Valley to south-western Alberta. The rock type of the erratics is different to the underlying bedrock in the places where they are now found and

indicates that they were probably derived from a rock outcrop in the Mount Edith Cavell area of Jasper National Park.

- Hoodoo formation – These unique columns and outcrops are created when strong winds attack the face of sandstone bluffs, eroding away the softer layers, leaving larger caps of harder stone atop narrow columns of softer substrate or protruding from the side of the hill.
- Mineral Lick – This is a mineral deposit or spring that animals regularly lick or drink. In an ecosystem, salt/mineral licks sometimes occur naturally, providing the sodium, calcium, iron, phosphorus and zinc required in the springtime for bone, muscle and other growth in deer and other wildlife. Mineral licks can draw animals from miles away for a taste of needed nutrients.

B. Special Places in the Forest Program – The Special Places in the Forest (SPIF) program recognizes that there are unique sites within our working forest and that these areas need to be managed in a special way. Some of these areas are protected, while others are specially managed for such values as wildlife, watersheds, aesthetics, recreation, education, geology, timber and cultural or historical significance. The four components of the Special Places in the Forest program are: protected areas, educational areas, cultural and historical areas, and special management areas and special features. Some of these components are further subdivided (see Figure 100). Part of the SPIF program is the identification of "special features", which are defined as any rare or unusual natural feature (usually small in area) on the FMA.

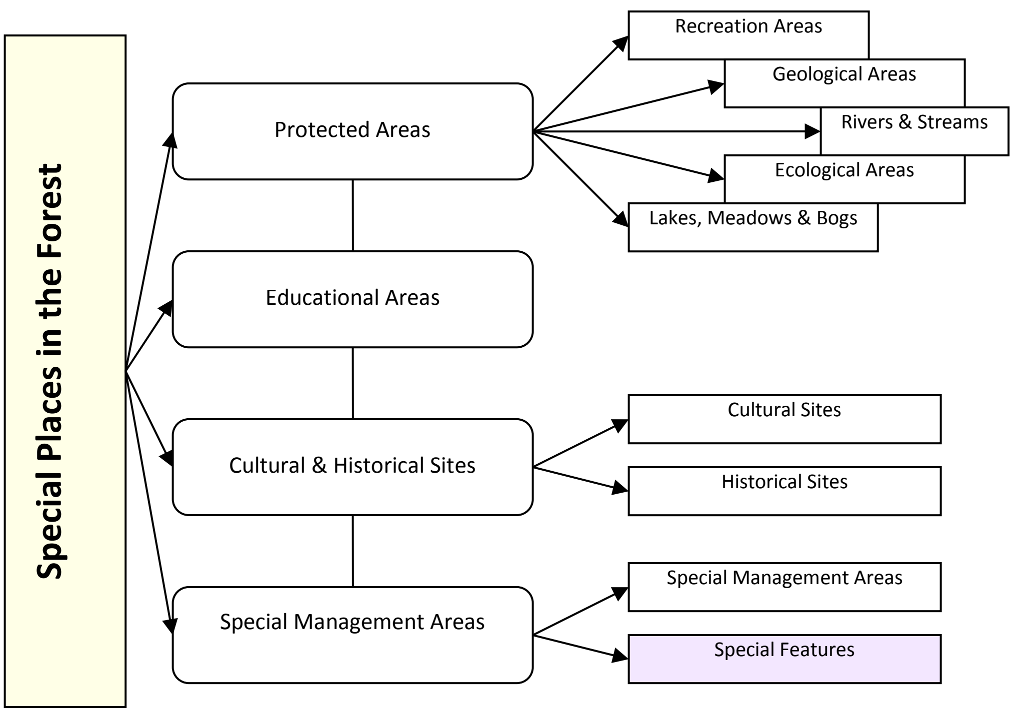


Figure 100 – An outline of the main components of HWP's Special Places in the Forest Program

Overview and Analysis

When a special feature is discovered, the Company follows an internal Standard Operation Procedure (SOP) to describe the feature and develop a conservation or special management strategy/prescription. This management strategy for each identified site will be completed within 12 months of the site being identified. The intent of this SOP is to ensure that special features identified during Company activities (such as planning, operations, silviculture, etc.) are reported and appropriate actions are taken to record and conserve the feature where required. Depending on how unique the special feature is, it may also be incorporated into the Company's Special Places in the Forest Program.

As this is a management activity indicator, there is no forecast for this Target.

2.0 Report – Target #15 (Special Features)

As this is a management activity indicator, there is no forecast for this Target. Table 68 outlines the current status (2012) of special features found on Hinton Wood Product's FMA.

Table 68 – Summary of known Special Features as of December 31, 2012

Site ID Number	Description of Special Feature	Special Places in the Forest (Yes/No)
GESF0063	Large glacial erratic	Yes
GESF0068	Glacial erratic	Yes
GESF0069	Glacial erratic	Yes
GESF0098	Glacial erratic	No
HFSF0060	Sandstone hoodoo formation	Yes
HFSF0061	Sandstone hoodoo formation	No
HFSF0099	Hoodoo Formation	Yes
MLSF0117	Large Mineral Lick	Yes
OTCA0119	Cave	No
SFWF0096	Waterfall/Hoodoo in steep canyon draw	No
TSSF0061	Tufa spring	Yes
TSSF0062	Tufa spring	Yes
TSSF0065	Tufa spring	Yes
TSSF0066	Tufa spring	Yes
TSSF0067	Tufa spring	Yes
TSSF0097	Tufa spring – not extensive	No
TSSF0098	Very large tufa spring	No
TSSF0112	Tufa Spring	Yes
TSSF0113	Tufa Spring	Yes
TSSF0114	3 Tufa Springs	Yes
TSSF0118	Tufa Spring	No

Inventory and status of legislated protected areas and some policy-protected areas is available from Alberta government land disposition records. These areas have been removed from the FMA landbase (e.g. Provincial Parks, Provincial Recreation Areas, etc.) or recognized through other processes (e.g. Operating Ground Rules). In addition, within this DFMP, HWP has identified all lands within the FMA landbase that would be designated as passive (no timber management) or special management areas (e.g. applicable water buffers).

TARGET #16 – Watercourse Crossings (HWP owned)

Value	Local/stand scale biodiversity
Objective	Maintain aquatic biodiversity by minimizing impacts of water crossings
Indicator	New Company water crossings in compliance with Code of Practice for Water Course Crossings within each subunit
TARGET #16	New crossing designs meet standards of the Code of Practice for Watercourse Crossings
Means to Identify Target	Code of Practice for Watercourse Crossings: Sections 7 - 9 and Schedule 2
Legal/Policy Requirements	Code of Practice for Watercourse Crossings
Means of Achieving Objective and Target	Road construction, maintenance and reclamation activities
Monitoring and Measurement	Road plan in Operating Ground Rules
Reporting Commitments	Performance: 5-Year DFMP Stewardship Report and HWP's annual Stewardship Report
Acceptable Variance	None
Response	Act immediately to eliminate problems and adjust strategies in subsequent AOPs
HWP Strategy	HWP will install all new (2012) watercourse crossing structures that are appropriate for the watercourse, the season of use, and in compliance with the Provincial and Federal Legislation, including Alberta's Code of Practice for Water Course Crossings.

1.0 Target #16

On HWP's nearly one million hectare FMA there are thousands of watercourse crossings; some owned by HWP and others owned by various other companies (e.g. oil & gas, mining, etc.). The standard to which crossings have been built also varies depending on when it was installed. Due to the potential impacts of roads and their associated watercourse crossings on water quality and fish habitat, all new crossings of a certain size and type must be installed to standards outlined in Alberta's Code of Practice for Watercourse Crossings.

Definitions

A. Code of Practice for Watercourse Crossings – The Code of Practice for Watercourse Crossings establishes the objectives, standards and conditions to be met when undertaking the activity of constructing or removing certain watercourse crossing. An owner/proponent of a watercourse crossing is responsible for meeting all requirements set out in the Code of Practice, and bears responsibility for obtaining appropriate information and advice from appropriate professionals to meet the objectives, standards and conditions of the Code of Practice. This Code applies to the following types of watercourse crossings on HWP's FMA:

- Culvert crossings where the culvert size is greater than 1.5m in diameter.
- Bridge crossings greater than one span

Overview and Analysis

This target applies to all new (i.e. 2012 and forward) crossings that are owned by HWP. It does not apply to crossings built before 2012 or crossings that are not HWP-owned.

As this is a management activity indicator, there is no forecast for this Target.

2.0 Report – Target #16 (HWP owned crossings)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. HWP will report annually in the AOP and in the 5-year DFMP Stewardship Report the compliance status on all the new watercourse crossings that fall under the scope of the Code of Practice for Watercourse Crossings.

TARGET #17 – Watercourse Crossings (non-HWP owned)

Value	Local/stand scale biodiversity
Objective	Maintain aquatic biodiversity by minimizing impacts of water crossing
Indicator	Non-HWP water course crossings
TARGET #17	Participate in the Foothills Stream Crossing Partnership.
Means to Identify Target	Stream crossing database / Strategy to integrate other industrial users into long term planning – overall results in less road/crossings being built. / Strategy to remediate old crossings that are not up to current standards (primarily other users).
Legal/Policy Requirements	• Code of Practice for Water Course Crossings • GoA Planning Standard • The Roadway Watercourse Crossings Remediation Directive
Means of Achieving Objective and Target	• Participate in the Foothills Stream Crossing Partnership (FSCP) • Complete Long Term Access Plans for FMA (see Appendix 13).
Monitoring and Measurement	Stream inspection protocols have been developed by the FSCP. Partners in the FSCP annually develop a stream inspection plan based on partner input and results from previous inspections (i.e. previously inspected streams that may need to be re-inspected). The implementation of this inspection plan begins each spring.
Reporting Commitments	HWP will provide a summary of FSCP initiatives and accomplishments each year in HWP's annual Stewardship Report and all the activities for the previous five years will be summarized every five years in the DFMP Performance Stewardship Report.
Acceptable Variance	The Company will continue to participate in the Foothills Stream Crossing Partnership
Response	HWP will continue to support recruitment of new membership in the FSCP.
HWP Strategy	Participate in the Foothills Stream Crossing Partnership

1.0 Target #17

Roads and stream crossings play a critical role in allowing road access into areas for resource management activities. If installed to older standards or not properly maintained, stream crossings can impact fish habitat and movement through crossings, or can become safety issues.

A large network of permanent roads exist on the Hinton FMA that are not owned by HWP, but instead are owned by various other companies and organizations including oil and gas, railways, mining, Alberta Transportation, county, and local municipalities. Because aquatic systems such as streams and rivers are interconnected, the activities (e.g. watercourse crossing structures) influencing a watercourse in one area can impact other areas within the watershed. For example, an improperly installed culvert blocking fish passage will affect all the stream above that crossing regardless of whether or not the upstream crossings are installed properly – in other words, one improperly installed crossing, regardless of who owns it, will render useless all properly installed crossings above it, as fish cannot proceed past the improperly installed structure.

For this reason HWP participates in the Foothills Stream Crossing Partnership (FSCP) – a group of organizations with responsibilities for stream crossings on the Hinton FMA. The FSCP members have a common purpose of repairing and re-mediating all stream crossings (for which they have responsibility) to current standards. This organization is coordinated through the Foothills Research Institute.

Definitions

A. The Foothills Stream Crossing Partnership – The FSCP is an independent, industry driven program focused primarily on improving the management of stream crossings. The Foothills Research Institute (www.foothillsresearchinstitute.ca), the coordinating agency for the program, has established a close working relationship with the FSCP since its inception in 2004.

   Since 2005 the FSCP has focused on inspections to evaluate public safety, sedimentation and fish passage concerns. As of 2012, the group has inspected over 1,800 pipeline and road crossings. Many local and regional issues linked to sedimentation, public safety and fish movement barriers have been documented and remediated.

Multi stakeholder remediation plans are the culmination of stream crossing inspections and a watershed prioritization system aimed towards maximizing ecological benefits. This collaborative approach facilitates interagency and intercompany cooperation and enables companies to set aside the normal confidentiality which surrounds their liabilities on the landscape. Many stream crossings and watersheds have been remediated and remediation plans are continuing to be developed.

B. Watercourse crossing – A watercourse crossing is any structure such as a culvert, bridge, etc. used to provide access across a water body.

Overview and Analysis
This target applies as long as the FSCP exists. As this is a management activity indicator, there is no forecast for this Target.

2.0 Report – Target #17 (non-HWP owned crossings)

HWP will not provide any reporting. The FSCP provides an annual report that can be received on request.

TARGET #18 & #19 – Water Crossings (inspection & remediation programs)

Value	Local/stand scale biodiversity
Objective	Maintain aquatic biodiversity by minimizing impacts of water crossing and protecting water quality
Indicator	Company watercourse crossings inspection and remediation program
TARGET #18	HWP will continue to implement its Stream Crossing Inspection Program and maintain an inventory of all HWP watercourse crossings on the Hinton FMA.
TARGET #19	HWP will remediate Company stream crossings (old and new) not meeting current standards on watercourses according to an annual action plan. The annual action plan will be updated throughout the course of the year to address unforeseen crossing issues.
Means to Identify Target	HWP's Company Stream Crossing Inspection Program will identify crossings with maintenance issues. HWP's strategy will be to remediate crossings that are not up to current standards, with a priority as follows - Safety, Fish Passage (on fish streams), Erosion, and Functionality
Legal/Policy Requirements	• Code of Practice for Water Course Crossings • Fisheries Act (Federal) • The Roadway Watercourse Crossings Remediation Directive
Means of Achieving Objective and Target	HWP will prepare an annual stream remediation action plan. The action plan will be implemented based on a priority system (safety, fish passage, erosion, and functionality). It is expected that the action plan will be updated throughout the year as priorities can change due to unforeseen circumstances (e.g. heavy rain, new inspections, culvert blockages, road washouts, etc.).
Monitoring and Measurement	Measured using existing monitoring programs (streams crossings program, block inspection program, roads maintenance program, roads monitoring program).
Reporting Commitments	Target 18 – A summary of the number of stream inspections completed will be reported on annually in HWP's Stewardship Report and every 5 years in the DFMP Stewardship Report. Target 19 – A summary of the number and type of streams/crossings remediated will be completed annually and reported on in HWP's Stewardship Report and every 5 years in the DFMP Stewardship Report.
Acceptable Variance	0%.
Response	Projects not completed will be re-evaluated for timing and completion.
HWP Strategy	Implement the targets.

1.0 Target #18

2.0 Target #19

Roads and stream crossings play a critical role in allowing road access into areas for resource management activities. Older crossings installed to different standards or not properly maintained stream crossings can impact fish habitat and movement through crossings and can become safety issues.

HWP currently owns approximately 1,878 existing crossings on channelled watercourses and approximately 2882 cross-drains. There are also numerous other crossings owned by non-HWP companies that are stored in the database but are not an active part of the crossing inspection program.

HWP initiated a stream crossing inspection program in 1995. Data for the large number of crossings are housed in the West Fraser Mills GIS system called "The Forest Manager" (TFM) and are monitored through the TFM database based on a risk assessment protocol. Significant repair actions for each crossing are also recorded digitally and tracked in the database. Information from the inspections is used to develop the annual repair plan and long-term capital plans. Additional data from the Foothills Research Institute's fish and aquatic program such as basin reports as well as data collected as part of the Foothills Stream Crossing Program are also used in the planning process.

Definitions

A. Watercourse crossing – A watercourse crossing is any structure such as a culvert, bridge, etc. used to provide access across a water body. As part of HWP's Stream Crossing Inspection Program, crossings of watercourses with a channel and sandy/rocky bottom (i.e. permanent creeks) are assessed and rated according to the following categories:

- Satisfactory – Safety, fish passage, erosion and functionality all meet the current standard for watercourse crossings
- Non-Satisfactory – One or more of the above stated factors fails to meet the current standard for watercourse crossings

Crossings assessed as being Non-Satisfactory are given a High, Medium, or Low priority of repair based on a risk assessment comparing frequency of occurrence versus severity of occurrence. High and Medium priority issues will be dealt with more promptly, while low priority issues will be monitored for status changes and repaired as resources permit.

B. Fish passage – This refers to the ability of any fish that frequent a waterbody to pass through the crossing structure both upstream and downstream under all baseline flow conditions.

Overview and Analysis

HWP will inspect stream crossings annually as part of the Stream Crossing Inspection Program based on a risk assessment protocol; that is, crossings with higher risks are inspected more often. Based on the results of the current and previous inspections, an annual action plan is developed. Each year, HWP will remediate Company stream crossings (old and new) not meeting current standards on watercourses according based on this annual action plan. The annual action plan will normally be updated throughout the course of the year to address unforeseen crossing issues.

As this is a management activity indicator, there is no forecast for this Target.

3.0 Report – Target #18 (Stream Crossing Inspection Program)

4.0 Report – Target #19 (Annual Action Plan)

There is no DFMP report for Targets #18 and #19 and because it is a management activity target, there is also no forecast. Each year, in HWP's annual Stewardship Report, the Company will report on the number of inspections carried out, and provide a summary of the remediation activities undertaken by HWP in that same year.

TARGET #20 & #21 – Species Conservation Strategies & Habitat

Value	Viable populations of identified plant and animal species
Objective	Maintain habitat for identified high value species (i.e., economically valuable, socially valuable, species at risk, species of management concern)
Indicator	Species Conservation Strategies inclusive of area (ha) of suitable habitat within the DFA or subunit for American Marten, Barred Owl, Trumpeter Swan, Grizzly Bear and Woodland Caribou.
TARGET #20	The Spatial Harvest Sequence maintains suitable habitat supply (area) within 10% for selected species (American marten, barred owl, trumpeter swan, grizzly bear and woodland caribou) as determined by habitat supply analysis or as set in Recovery Plans.
TARGET #21	Complete species conservation strategies for all species at risk (SARA and Alberta designations) within 6 months of designation, update strategies at least every 2 years and report on results of strategies annually.
Means to Identify Target	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.
Legal/Policy Requirements	Species at Risk Act (federal) / Alberta Wildlife Act / Recovery Plans
Means of Achieving Objective and Target	Species conservation strategies will be developed and reviewed as a cooperative program between Hinton Wood Products and the GoA. Means of achieving Target #21 will be through appropriate harvesting plans, road construction, OGR, planning and implementation, and adherence to provincial wildlife guidelines.
Monitoring and Measurement	Review and revision of species conservation strategies, including suitable habitat assessment mapping, will be reported on an annual calendar year basis. Direction from the strategies will be incorporated into a new forecast prepared every 10 years as part of the DFMP revision.
Reporting Commitments	Target #20 – DFMP: For species with a suitable habitat target provide tables of area (ha) of suitable habitat at 0, 10, 50, 100, and 200 years and maps of suitable habitat at 0, 10, and 50 years. Report every five years in the DFMP Performance Stewardship Report. Target #21 – Report on results of Species Conservation Strategies annually in HWP's Stewardship Report.
Acceptable Variance	Target #20 – At the end of the 10-year FMP term the target is achieved plus or minus 10%. Target #21 – 0%
Response	Adjust strategies in subsequent FMP
HWP Strategy	Implement the SHS. Adhere to strategies and guidelines outlined in the Species Conservation Strategies.

1.0 Target #20

HWP Species Conservation Strategies, which include a component of habitat modelling, were completed for grizzly bears (Appendix 16c), trumpeter swans (Appendix 16b), and woodland caribou (Appendix 16a). In addition, habitat modeling for grizzly bears, barred owl, and American marten was also completed by the GoA. The methodology and results of this GoA modelling can be found in Appendix 16c for grizzly bear, Appendix 17 for barred owl, and Appendix 18 for American marten.

2.0 Target #21

Species conservation is a cornerstone of biodiversity conservation. If species are conserved, genetic diversity and the ecosystem diversity that is needed to conserve species are also likely to be conserved. Prosperity of all native species is part of a "fine filter" biodiversity conservation strategy.

The coarse filter component of Hinton Wood Products' biodiversity conservation strategy is based on maintaining seral stages and habitat supply within the Natural Range of Variation, as described in detail in HWP's Natural Disturbance Strategy (Appendix 2). However, sometimes additional management emphasis is needed for species that have been designated as being a species at risk, to ensure that their needs are met by implementation of the coarse filter component.

The Company addresses species at risk by developing a Species Conservation Strategy for each species at risk as designated by legislation, plus additional species voluntarily selected by the Company. Each Species Conservation Strategy document describes how the Company will act alone and in cooperation with others to conserve the species. Table 69 describes each of the species at risk currently designated by legislation and that occur on the Forest Management Area, as well as describing each of the species that HWP has additionally voluntarily selected to develop Species Conservation Strategies for.

Where available FMA habitat appears to be, or is thought to be, a contributing factor to a species being at risk, then a habitat analysis will be part of the Species Conservation Strategy.

Definitions

A. Species at risk – A species at risk is defined as a species designated as threatened or endangered in Canada (Canada Species at Risk Act designation) or Alberta (Alberta Wildlife Act designation). Species at risk do not include species identified as potentially threatened or potentially endangered until they have been designated under the relevant legislation. For the purposes of this indicator, species at risk do not include species identified as special concern, vulnerable, lower risk, or sensitive by any other process, including federal or Alberta processes, IUCN rankings, ANHIC rankings, and as a result of a local species status evaluation. However, the Company may choose to develop species conservation strategies for species in this group (e.g. Pinto Creek mountain goat herd) and the target will apply to these species as long as they remain on the species conservation strategy list.
B. Species Conservation Strategy – A species conservation strategy is a document that provides information on the status and conservation of a species at risk that occurs on the Forest Management Area (FMA) landbase, in relation to Company responsibilities and commitments. These strategies extend to habitat conservation, Company activities, and co-operation with accountable government agencies to address actions of others and population management issues.
C. Endangered Species – A species facing imminent extirpation or extinction.
D. Threatened Species – A species likely to become endangered if limiting factors are not reversed.
E. Species of Special Concern – A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.

Overview and Analysis

HWP has completed Species Conservation Strategies for each of the nine species highlighted in Table 69 below. If additional species at risk are identified through SARA and/or Alberta legislative designations, HWP will complete a risk assessment within a year of the designation and, if required, a new Species Conservation Strategy within 6 months of the designation. HWP will update all strategies at least every 2 years. Species Conservation Strategies for all species in Table 69 are found in Appendices 16a to 16g.

Table 69 – Species conservation strategies for Hinton Wood Products FMA

Species	SARA[1] designation	Alberta Wildlife Act designation	Appendices
Species at Risk:			
Woodland caribou[2]	Threatened[3]	Threatened	Appendix 16a
Trumpeter swan	Not at risk	Threatened	Appendix 16b
Grizzly bear[4]	Special concern	Threatened	Appendix 16c
Common nighthawk	Threatened[5]	Not designated	Appendix 16d
Olive-sided flycatcher	Threatened[5]	Not designated	Appendix 16e
Athabasca rainbow trout	Not designated	Threatened	Appendix 16f
Bull trout	Not designated	Threatened	Appendix 16f
Species of special concern:			
Arctic grayling	Not designated	Special concern	Appendix 16f
Additional species:			
Pinto Creek mountain goats	Not designated	Not designated	Appendix 16g

[1] Canada Species at Risk Act, Schedule 1
[2] The West Central Alberta Caribou Landscape Plan was submitted in May 2008 for Alberta government approval. West Fraser participated in the development of the WCACLP. As of December 31, 2012 the government approval had not been granted. The HCS Revision will be deferred until the WCACLP is approved or replaced. However, HWP has already started to implement some of the recommendations in the WCACLP.

[3] Threatened: A species likely to become endangered if limiting factors are not reversed.
[4] The strategy was reviewed in 2007 but not updated from the March 9, 2004 version. The Alberta Endangered Species Conservation Committee recommended in 2002 that the Alberta status of the grizzly bear should be "threatened". The Alberta government did not make a listing decision then but did commission a Recovery Team to prepare an Alberta Grizzly Bear Recovery Plan. The Recovery Team submitted a draft Recovery Plan to the Minister of Sustainable Resource Development in 2006 and the Recovery Plan was approved in 2008. The Alberta government designated grizzly bear as Threatened in 2010. The Hinton Wood Products grizzly bear species conservation strategy was reviewed in 2006, 2007, 2008, and 2009. Now that the listing designation has been made the HCS revision will be completed in 2013.
[5] Common nighthawk and olive-sided flycatcher were designated as Threatened under SARA in 2010. HWP will develop species conservation strategies for these species in 2013.

In addition, HWP will also complete species conservation strategies for wolverine, the black-throated green warbler, the Columbia spotted frog and the northern long-eared bat, within the next five years.

3.0 Report – Target #20 (Habitat Modelling)

Habitat modeling and associated results for caribou, grizzly bear and trumpeter swan are found within the Species Conservation Strategies for those species (see Appendices 16a to 16g). Habitat modeling and associated results for the barred owl is found in Appendix 17, while habitat modeling and associated results for American martin is found in Appendix 18.

4.0 Report – Target #21 (Species Conservation Strategies)

There is no DFMP report for these targets, and because it is a management activity target, there is also no forecast.

TARGET #22 – In Situ Genetic Conservation Areas

Value	Genetic integrity of natural tree populations
Objective	Retain "wild forest populations" - for each tree species in each seed zone through genetic conservation areas established by the company or in cooperation with Alberta.
Indicator	Number and area (ha) of in situ genetic conservation areas
TARGET #22	Each seed zone that occurs in the Hinton FMA area, that requires a conservation area, will have one or more genetic conservation areas established, but those areas may not necessary be on the Hinton FMA.
Means to Identify Target	Cooperate with Alberta in the establishment of the required number of genetic conservation areas determined in accordance with Gene Conservation Plan for Native Trees of Alberta
Legal/Policy Requirements	Timber Management Regulation 144.2
Means of Achieving Objective and Target	Conservation areas are designated by a notation (e.g. PNT, CNT)
Monitoring and Measurement	New dispositions are issued by Alberta and shown on the provincial database.
Reporting Commitments	DFMP: Table showing number of genetic conservation areas required in each seed zone and number provided in FMA. Map showing locations of genetic conservation areas. Performance: 5-Year DFMP Stewardship Report
Acceptable Variance	At the end of the 10-year FMP term the target is achieved or exceeded
Response	Adjust strategies in subsequent FMP
HWP Strategy	Implement the target.

1.0 Target #22

Definitions

As described in the Gene Conservation Plan for Native Trees of Alberta (ASRD. 2009b), In situ gene conservation is the maintenance of wild tree populations in their natural habitats with natural processes maintained.

Overview and Analysis

All of the tree species harvested by Hinton Wood Products (balsam fir, white spruce, black spruce, lodgepole pine, balsam poplar and aspen) have been ranked provincially and globally as “demonstrably secure under present conditions, >100 occurrences, may be rare in parts of its range, especially peripherally” (ASRD. 2009b). Where reforestation is achieved by using on-site materials (roots or seeds) or by planting seedlings grown from local seed, *in situ* conservation areas are not required.

When the GoA completes an assessment of conservation areas existing as required, it is anticipated that the network of provincial parks and protected areas will contribute to the *in situ* gene conservation objectives. HWP will cooperate in the identification and selection of appropriate areas in the HWP FMA area.

Participants in tree improvement projects operating under Controlled Parentage Program (CPP) plans are responsible for adequate protection of the target species within the deployment area. The Alberta Forest Genetic Resource Management Conservation Standards (ASRD. 2009a) requires that between two and four areas of wild forest populations be designated for gene conservation for each species and seed zone combination included in a CPP plan. Areas may be chosen from the active or passive landbase as long as planting is conducted with seed specifically from the site. Table 70 on the following page shows the area of controlled parentage program of each region on the Hinton FMA area.

Table 70 – Area of Controlled Parentage Program Regions

Region	Area (ha)
A	594,862
B1	335,592
B2	488,107
K1	162
I	483,572
L1	483,572

2.0 Report – Target #22 (In situ Genetic Conservation Areas)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. Figure 101 on the following page shows the location of the Controlled Parentage Regions on the FMA area. HWP will cooperate with Alberta in the establishment of the required number of genetic conservation areas determined in accordance with Gene Conservation Plan for Native Trees of Alberta

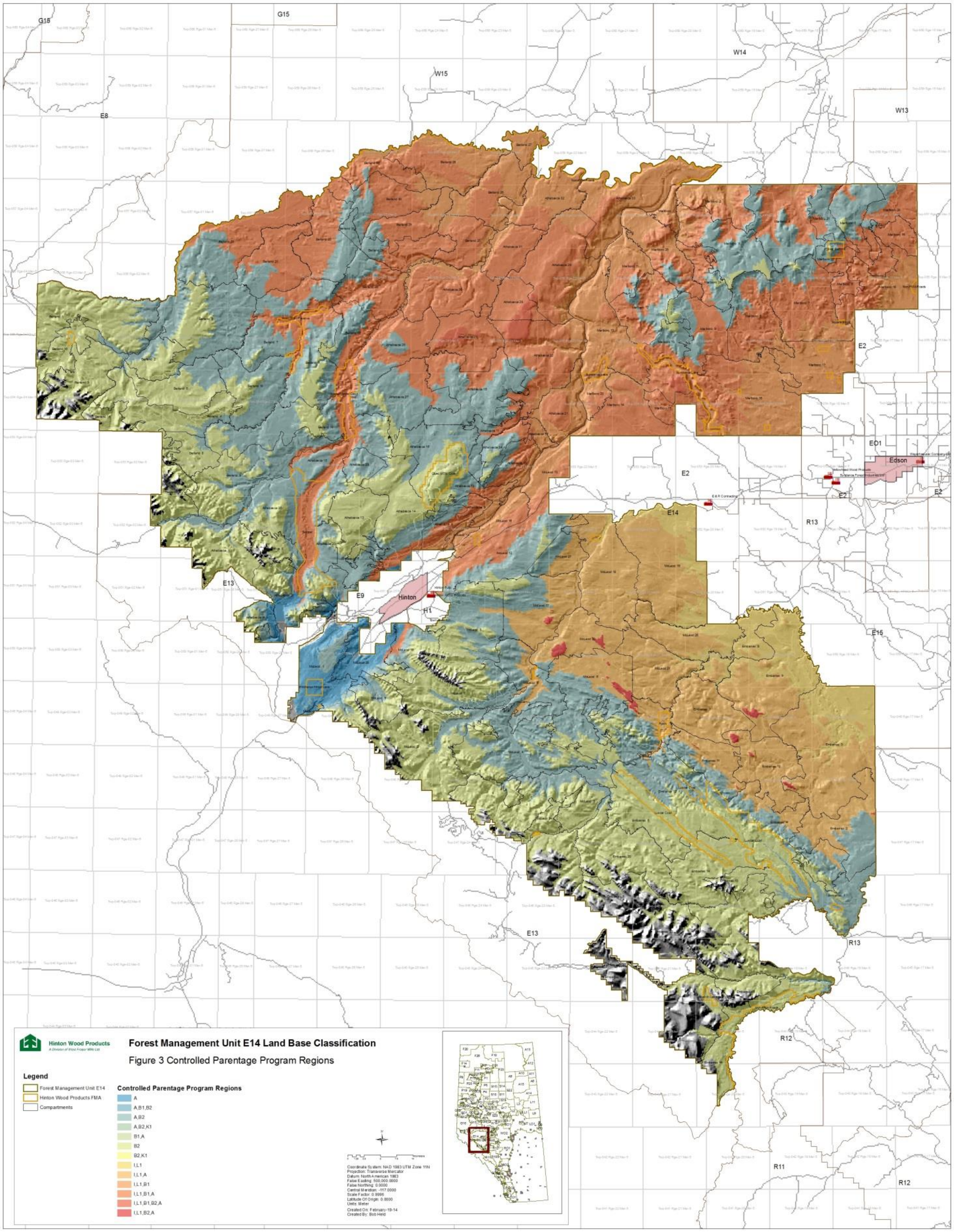


Figure 101 – Controlled Parentage Regions on the FMA Area

TARGET #23 - Conserving Wild Forest Genetic Resources

Value	Genetic integrity of natural tree populations
Objective	Conserve wild forest genetic resources through gene archiving.
Indicator	Provenances and genetic lines in gene banks and trials
TARGET #23	Active conservation program for all species on the FMA that have a tree improvement program.
Means to Identify Target	In cooperation with Alberta and in accordance with the Alberta Forest Genetic Resource Management and Conservation Standards (Sections 17 & 29)
Legal/Policy Requirements	Timber Management Regulation 144.2
Means of Achieving Objective and Target	Alberta Forest Genetic Resource Management and Conservation Standards and government / industry genetic cooperatives
Monitoring and Measurement	Conservation activities related to the FMA are carried out by Alberta and Companies involved in Controlled Parentage Plans
Reporting Commitments	DFMP: Planned Conservation activities specific to Controlled Parentage Plan (CPP) Region Performance: 5-Year DFMP Stewardship Report : Five year reporting in cooperation with Alberta on activities and amounts for each CPP Region required under section 17 and 29 of the Alberta Forest Genetic Resource Management and Conservation Standards
Acceptable Variance	None
Response	Adjust strategies in future FMPs.
HWP Strategy	Implement target.

1.0 Target #23

Definitions

As described in the Gene Conservation Plan for Native Trees of Alberta (ASRD. 2009), *ex situ* gene conservation is the conservation of representative samples of wild tree populations away from their original location and usually away from their natural habitats.

Overview and Analysis

As of September 2013, 53,000 kg of tree, shrub and grass seed, 32,000 kg of which belongs to industry, was stored at -18°C in a bunker near Smoky Lake (GoA. 2013).

In February 2014, HWP had a seed inventory as outlined in Table 71 below:

Table 71 – HWP Seed Inventory (February 2014)

Species	Seedlots	Kg of seed	No. of seeds (millions)
Lodgepole Pine	98	1,397.5	336.3
Black Spruce	15	5.3	4.3
White Spruce	47	1,035.0	469.4
White Spruce/ Engelmann Spruce	7	344.9	142.7

While this number of seeds might seem excessive – in fact, this high-tech security is protecting a serious asset. Almost 32,000 kilograms of the seed housed in the bunker belongs to logging, oil sands, and mining companies – and will ultimately be used to turn public land impacted by industry back into lush, green forest.

2.0 Report – Target #23 (Conserving Wild Forest Genetic Resources)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast.

TARGET #24 – Consultation and Integrative Processes

Value	Areas with minimal human disturbances within managed landscapes
Objective	Integrate trans-boundary values and objectives into forest management
Indicator	HWP participation in consultative and integrative processes
TARGET #24	Follow existing consultative and integrative processes: a. HWP's Forest Resources Advisory Group (FRAG) b. HWP's Forest Harvest Plan process c. HWP's (and FRMA's) Recreation Program d. West Yellowhead Mountain Pine Beetle Coordinating Committee e. FireSmart f. HWP Long Term Access Plans
Means to Identify Target	A link to consultation objective in the GoA Planning Standard.
Legal/Policy Requirements	GoA Planning Standard
Means of Achieving Objective and Target	• Implement HWP's public participation process. • Active participant on joint government-industry trans-boundary initiatives.
Monitoring and Measurement	Documentation of participation processes
Reporting Commitments	Annually in HWP's Stewardship Report and every five years in the DFMP Stewardship Report.
Acceptable Variance	0%
Response	Adjust strategies in subsequent FMP
HWP Strategy	a. Continue with FRAG meetings and field trips. b. Implement the Forest Harvest Plan process. Annually produce a General Development Plan Summary Document. c. Continue to manage and maintain FRMA's Recreation Program and look for opportunities to expand recreational opportunities where possible. d. Continue to actively participate on the West Yellowhead Mountain Pine Beetle Coordinating Committee. e. Continue to actively participate on Foothills FireSmart Coordinating Committee. f. Develop Long Term Access Plans for the entire FMA.

1.0 Target #24

The objective of this Indicator is to integrate trans-FMA boundary values and objectives into forest management planning. The Hinton Forest Management Area (FMA) sits adjacent to two large protected areas – Jasper National Park and the Willmore Wilderness Area. Smaller protected areas within and adjacent to the FMA include Switzer Provincial Park, Sundance Provincial Park, Wildhay Glacial Cascades Natural Area, Pinto Creek Natural Area, the Brazeau Canyon Wildland Park and the Rock Lake/Solomon Creek Wildland Park.

To address the issue of integrating trans-boundary values and objectives, Hinton Wood Products (HWP) has developed a number of separate processes, and also participates in a number of different committees or projects, that integrate the values and objectives of those landbases that border our FMA. These processes, committees, and projects are all described in more detail below in the "Definitions" section.

Definitions

A. Forest Resources Advisory Group (FRAG) – HWP's Forest Resources Advisory Group was established to select or respond to issues, consider and recommend actions and policies to Hinton Wood Products. FRAG is the main avenue for public participation as required and outlined in the CAN/CSA Z809-02 standard (which is referenced in the GoA's Planning Standard). FRAG is made up of various stakeholders including those that represent landbases that are adjacent to or within our FMA. For example, "Friends of Switzer Provincial Park" and the "Robb Preservation Society" have voting members on FRAG. Part of these members' mandate is to ensure the interests of their constituents are represented at FRAG and are incorporated into Company planning and operations.

B. Forest Harvest Plan Process (FHP) – The Company's FMA is divided into 140 compartments that vary in size from just over 100 hectares to over 22,000 hectares. HWP develops a FHP for each of these compartments (or a portion thereof) approximately 1-3 years before harvesting is planned. As part of this FHP process, the Company places advertisements in the local community papers looking for input into the development of values and objectives for the compartment. In addition, as part of the FHP process, the Company's Operating Ground Rules (OGRs) must be adhered to. These Rules address a number of trans-boundary issues – for example, the OGRs contain Special Management Areas (SMAs), which are areas that have unique or special values that need to be managed in a special way.

C. Recreation Program – Hinton Wood Products (HWP) has been using funding from the Forest Resources Improvement Association of Alberta (FRIAA), combined with revenue collected through camping fees, to run a large recreation program for the last 13 years. In 2011, HWP spearheaded the formation of the Foothills Recreation Management Association (FRMA), a group of companies and organizations committed to providing safe and affordable outdoor recreation opportunities. The partnership, which includes West Fraser, Teck, Sherritt, Coalspur, Yellowhead County, and the Town of Hinton, currently manages 17 campgrounds and eight trail systems in the foothills area near the communities of Hinton, Edson, Robb, Cadomin, and Brule. HWP is the managing partner.

   FRMA's Recreation Program addresses trans-boundary values and objectives by directly managing the recreation facilities within the protected areas, such as the trails and campgrounds HWP manages within Sundance Provincial Park, Obed Provincial Park, Rock Lake/Solomon Creek Provincial Park, and Whitehorse Creek Wildland Park and working with organizations that have differing values and objectives (e.g. coal, tourism, etc.). The Company has also conducted recreation surveys from time to time of the users of our campgrounds. Recreation surveys were conducted in 2002, 2006, and 2013. Results from these surveys are also used to determine future improvements to the Recreation Program.

D. West Yellowhead Mountain Pine Beetle Coordinating Committee – The expansion of the mountain pine beetle population in Alberta is of enormous concern due to the potential for major economic impacts on the forest industry and potential adverse effects on recreation, wildlife and forest health in general. Because of the numerous trans-boundary values and objectives that vary significantly from HWP's (e.g. Jasper National Park and Willmore Wilderness Area), a multi-agency West Yellowhead Coordinating Committee was formed in 2004 to deal with the emerging issue of MPB. The federal and Alberta governments and other land management partners have formed this Committee in order to work collaboratively with respect to forest management and to protect the economic value of the provincial forest and achieve ecological integrity objectives of the national and provincial parks and protected areas. Actions to date have included an aggressive short term approach to control MPB in areas of high risk and the development of an effective long term strategy to create better vegetation diversity across the landscape.

E. FireSmart – FireSmart is a provincial government initiative whose goal is to make communities more fire aware and fire proof. HWP sits on the Foothills FireSmart Coordinating Committee, a local committee made up of representatives from various provincial and municipal governments that have together developed a Yellowhead Corridor Community Protection Plan. This Plan identifies both man-made and natural landscape features which, through recommended enhancement programs, will serve as firebreaks or buffers. This proactive strategy will help minimize the wildfire threat, and help mitigate catastrophic fires. A pre-attack plan has also been developed to outline current landscape features that could be utilized to assist fire suppression activities. Throughout the development of the Yellowhead Corridor Community Protection Plan, Project Management Teams reviewed and referred all pertinent data to interest groups both within and outside the provincial government, to ensure that the data necessary to successfully engineer the project was accessed. HWP also participated in similar processes for the Hinton, Robb, and Carldale Community Protection Plans.

F. Long Term Access Plans – A Long Term Access Plan (LTAP) is a plan showing the current permanent and temporary access roads or access corridors for an identified area on the FMA (e.g. a working circle). For each geographical area, HWP has determined whether we want to maintain, deactivate or reclaim a given road (see Appendix 13). By doing this, HWP is able to address identified access concerns and coordinate access development and management between HWP and other industrial users of the landbase such as the oil and gas industry. LTAP's will not be provided to the government for approval, but will be an internal HWP document. As part of this DFMP, HWP has submitted a Road Corridor Plan (Figure 97), which describes where future HWP permanent roads are located. Longer Term Access Plans (Appendix 13) also show future roads locations at higher map resolution.

Overview and Analysis

a. Forest Resources Advisory Group – FRAG meets approximately 5-10 times per year with one field trip (if interest permits).
b. Forest Harvest Plan Process – As this is associated with a management activity indicator, there is no forecast.
c. Recreation Program – Detailed information on FRMA's Recreation Program can also be found on West Fraser's website (www.westfraser.com/responsibility/recreation/foothills-recreation-management-association). FRMA's Recreation Program is ongoing assuming appropriate funding.
d. West Yellowhead Mountain Pine Beetle Coordinating Committee – The West Yellowhead Mountain Pine Beetle Coordinating Committee normally meets 1-2 time per year. As this is associated with a management activity indicator, there is forecast.
e. FireSmart – HWP staff will continue to participate in the Foothills FireSmart Coordinating Committee. The Committee meets as required and normally at least once per year.
f. Long Term Access Plans – LTAPs are developed for each of the five Working Circles on the FMA. LTAP describe HWP's plans for all existing roads (i.e. they will be maintained, deactivated or reclaimed) and future roads (based on best available information at the time). This is an internal document.

2.0 Report – Target #24 (Consultative and Integrative Processes)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. The above noted processes will be reported on annually in HWP's annual Stewardship Report and summarized every five years in the DFMP Stewardship Report.

TARGET #25 – Establishment Surveys (annual % SR)

Value	Reforested harvest areas
Objective	Meet reforestation targets on all harvested areas
Indicator	Annual % of SR establishment surveys
TARGET #25	90% of blocks surveyed (establishment surveys) will be Satisfactorily Restocked (SR) on the first survey.
Means to Identify Target	Historical establishment survey information / ARIS
Legal/Policy Requirements	Timber Management Regulation / Regeneration Standard of Alberta / GoA Planning Standard
Means of Achieving Objective and Target	Implement silviculture program
Monitoring and Measurement	Regeneration surveys
Reporting Commitments	Results of establishment surveys will be reported annually to ARIS and in the AOP and HWP's Stewardship Report, and summarized every five years in the DFMP Stewardship Report.
Acceptable Variance	10%
Response	Review specific variances that led to outages and address accordingly
HWP Strategy	The primary strategy for meeting this target is to implement HWP's current silviculture procedures for each block being logged. After logging, a Management Opportunity Survey (MOS) is also conducted. The block is then site prepared, and either left for natural regeneration or planted at the nearest window of opportunity. The block is then surveyed at the appropriate time

1.0 Target #25

The objective of this indicator is to ensure ecosystem resilience by maintaining ecosystem processes and conditions. Prompt reforestation after harvest ensures that forest ecosystems are maintained after disturbance. Establishment surveys provide a means to measure the success of reforestation efforts. The target is that 90% of blocks will be surveyed to be satisfactorily restocked on the first legislated survey.

The Regeneration Survey of Alberta Manual sets standards for "conifer" (C), "conifer leading mixedwood" (CD), "deciduous leading mixedwood" (DC) and "deciduous" (D). Currently there is a requirement to balance the regeneration these four strata.

Definitions

A. Establishment survey – A legislated survey to be completed in Alberta at 5 to 8 years after harvesting in coniferous (C), deciduous (D), coniferous/deciduous (CD), and deciduous/coniferous (DC) cutblocks or strata. At the establishment survey, the stocking of a block can be SR (satisfactorily restocked), CSR (aspen blocks that are conditionally restocked), RTD (re-treated after an NSR survey or declaration) or NSR (not satisfactorily restocked). An establishment survey will show stocking amount (%), density (stems/ha) and height of regenerated trees; this survey will also show the approximate locations of plots by status and NSR areas larger than four hectares.

B. Satisfactorily Restocked (SR) – This means "satisfactorily restocked" according to the definitions described in the current survey manual for the type of survey, species, height, etc. This term only applies to establishment surveys. The term may refer to an individual plot, a portion of a cut block, or an entire cut block. In general, "satisfactorily restocked" means that a particular site is stocked with trees of a suitable species that meet specific criteria as set out by the government. Currently establishment survey standards are set out in RSA-ReforestationStandardAlberta-2010.pdf available on the Province's website.

C. ARIS - ARIS is an acronym for the Alberta Reforestation Information System; a provincial database that monitors reforestation obligations of the Alberta forest industry.

D. Regeneration Survey – A general term used to describe an activity where HWP monitors the performance of a regenerated stand. Some surveys are legislated, while others are meant as an intermediate check to monitor performance or assess the need for management intervention.

Overview and Analysis

The target was chosen based on past performance and reasonable expectations for success. It would not be possible to have a target of 100% SR on the first establishment survey, because this has never happened in the past. There are too many variables that can effect successful restocking that HWP would have difficulty controlling, such as weather, seed crop, seed viability, and planting stock. Historically, a target of 90% of first time blocks being surveyed as SR is aggressive, but reasonable.

Establishment surveys will be conducted five to eight years after harvesting. Block survey results are maintained in the HWP's silviculture record keeping system (TFM) and are reported to the Province and tracked by the government in the Alberta Reforestation Information System (ARIS).

2.0 Report – Target #25 (Establishment Surveys – Annual %)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. The results of establishment surveys will be reported annually to ARIS, in the Annual Operating Plan, and HWP's Stewardship Report. Results will also be summarized every five years in the DFMP Stewardship Report.

TARGET #26 – Establishment Surveys (cumulative % SR)

Value	Reforested harvest areas
Objective	Meet reforestation targets on all harvested areas
Indicator	Cumulative percentage of reforested areas that meet reforestation target
TARGET #26	90% of post-91 blocks surveyed (establishment surveys) will be Satisfactorily Restocked (SR).
Means to Identify Target	A link to consultation objective in planning standard. / Consultation requirement of CSA Z809:02 Standard
Legal/Policy Requirements	GoA Planning Standard
Means of Achieving Objective and Target	Silviculture program
Monitoring and Measurement	Regeneration surveys
Reporting Commitments	Cumulative reforestation status of post-91 blocks establishment surveys will be reported on annually in HWP's Stewardship Report and AOP, and summarized every five years in the DFMP Stewardship Report.
Acceptable Variance	10%
Response	Review specific variances that led to outages and address accordingly
HWP Strategy	Same as Target #25.

1.0 Target #26

As with Target #25, reforestation success is a measure of ecosystem resilience. This indicator addresses the long-term cumulative performance of reforestation efforts. This indicator only applies to blocks harvested since March 1, 1991. In any one year it may be acceptable for a block not to meet survey standards, but blocks that do not meet the standards on the first survey are retreated until they meet the survey standards up until the fourteenth year after the block was harvested (skid cleared).

Definitions

A. Establishment survey – See definitions in Target #25.
B. Performance Survey – A legislated survey to be completed 12 to 14 years after harvesting in broad strata grouping as C, D, CD and DC cutblocks. As of June, 2010, the Provincial Alternative Regeneration Standards have been replaced with the Regenerated Standards of Alberta. As of May 1, 2009, the Performance Survey measures different variables from the establishment survey. The regenerated stands are stratified from aerial photos based on the Provincial Planning Manual Standards of 10 strata. A sample of the strata is measured on the ground and an average "mean annual increment" (MAI) for coniferous and deciduous species is calculated. That average MAI is applied to each block in the survey population (in proportion to the actual strata represented in each block). The average MAI for conifer and deciduous by broad strata group (C, CD, DC and D) are compared to target MAI stated in the Forest Management Plan. After the refinement period is completed in 2012, a cut adjustment may be made depending on regenerated stand performance. A block will no longer be called FTG (Free to Grow) or NSR after a performance survey.
C. Satisfactorily Restocked (SR) – See definitions in Target #25.
D. Regeneration Survey – See definitions in Target #25.

Overview and Analysis

The target was chosen based on past performance and reasonable expectations for success. It is a cumulative target; meaning that on a running total (from 1991) 90% of our blocks will be surveyed to be SR. A target of 100% was unrealistic as historically HWP has always a few blocks that prove to be challenging to reforest the first time. The target was chosen based on past performance and reasonable expectations for success.

Block level treatments and survey results are maintained in the silviculture record keeping system. The first legislatively required performance surveys were due by April, 2005. Currently, there is a requirement to balance regeneration strata for “conifer” (C), “conifer leading mixedwood” (CD), “deciduous leading mixedwood” (DC) and “deciduous” (D).

The first time a block is required to meet establishment survey for all blocks (including deciduous blocks as of May 1, 2008) is 8 years after harvest. The stocking status of block now can be either: CSR (after a deciduous Establishment Survey), SR, NSR, RTD (Retreated after an NSR survey), FTG or PSC (Performance Survey Completed after May 1, 2009). For the calculation of this indicator the areas of PSC, FTG, CSR, RTD and SR blocks are added together to come up with the percentage cumulative SR.

2.0 Report – Target #26 (Establishment Surveys – Cumulative %)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. Cumulative reforestation status of post-91 blocks establishment surveys will be reported on annually in HWP’s Stewardship Report and AOP, and summarized every five years in the DFMP Stewardship Report.

TARGET #27 – Amount of Change in Forest Landbase

Value	Maintenance of forest landbase
Objective	Limit conversion of productive forest landbase to other uses
Indicator	Amount of change in the forest landbase
TARGET #27	Maintain or minimize the loss of forest landbase by: a. Participate in the FLMF b. Track the net FMA landbase withdrawals for use by Crown to be < 1% of total FMA landbase as of May 1, 2008 c. Measure and track the industrial footprint by disposition type.
Means to Identify Target	• Direct input from public participation process (concern about cumulative impacts) • Forest Management Plan landbase inventory
Legal/Policy Requirements	GoA Planning Standard
Means of Achieving Objective and Target	Implement the strategies associated with each of the targets (see section 4 for more detail).
Monitoring and Measurement	Each target will be reported on in the annual HWP Stewardship Report.
Reporting Commitments	Annually in HWP's Stewardship Report and every five years in Performance Stewardship Report
Acceptable Variance	a. Report annually b. Report annually c. Report annually
Response	Adjust net landbase in next TSA
HWP Strategy	Implement the target.

1.0 Target #27

This overall objective of this indicator is to limit the conversion of HWP's forest landbase to other uses that are not compatible to growing trees. Industrial activities of HWP and other commercial users can often reduce the productive landbase, through such activities as road building, oil and gas exploration, pipeline construction, and well-site development. When these industrial dispositions are no longer required it is desired to have them reforested where appropriate and returned to a productive forest state as quickly as possible. However, not all returned industrial lands are appropriate for reforestation; nor does HWP have the ability to reforest tenures that are not HWP-owned (e.g. pipelines, well-sites, mines, etc.).

This indicator measures the changes in the total FMA landbase and the extent of the contributing landbase available for timber production. It is a measure of the sustainability of our harvest levels and other resource values. This indicator also contains a commitment to participate in the Foothills Landscape Management Forum (see definitions), a multi-stakeholder group developing and coordinating access and development in the range of the Little Smoky and A Le Peche caribou herds.

Definitions

A. Foothills Landscape Management Forum (FLMF) – The FLMF is a group of stakeholders practicing advanced integrated landscape management in a geographic area of the province that is particularly sensitive due to the presence of two caribou herds – the Little Smoky and the A Le Peche herds. The FLMF members include five forest companies, 10 energy companies and one Aboriginal community. One of the goals of the FLMF is to grow the area of influence in the upcoming years.

Overview and Analysis

a. The FLMF has been in existence since 2005. Current projects include:

- Regional Access Development (RAD) plan – The integration of access plan can reduce access needs at the front end. The FLMF is working to identify "Access Corridor Routing" over the next 30 years and develop plan amendment processes, metrics for reporting, and next steps to address reclamation/remediation.

- Reclamation planning – Remove access no longer needed or redundant.
- Innovative strategies – Develop a new approach to cumulative effects management. The government would be responsible for population management and human use, while the FLMF would manage Industrial footprint and vegetation (habitat).

b. HWP's new FMA Agreement was effective May 1, 2008. This FMA Agreement contains assurances from the province that any land taken out of the FMA's net landbase in excess of 1% (over the term of the Agreement) for purposes of the Crown (e.g. protected areas, townsites, etc.) will result in compensation to the Company.

c. HWP will measure and track industrial footprint (including our own) by disposition type.

2.0 Report – Target #27 (Change in Forest Landbase)

- **Target 27a** – There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. HWP will report on initiatives undertaken by the FLMF annually in HWP's Stewardship Report and every five years in Performance Stewardship Report.

- **Target 27b** – Table 72below describes the status of land base withdrawals from May 1, 2008 to May 1, 2012. The total landbase withdrawal for Crown uses is 0.12% from May1, 2008 to May 1, 2012.

Table 72 – Landbase Withdrawals (shown in brackets) and Additions (ha) to the HWP FMA Landbase

	Industrial (hectares)			Crown Uses (hectares)						
Year	Oil & Gas	Mining	Sub-Total	Special Places	Indian Reserve	Other	Sub-Total	Total Change (hectares)	Total FMA Landbase (hectares)	Change (hectares)
2008	FMA Landbase as of May 1, 2008								958,161	
2008*	(1275)	(1155)	(2429)	0	0	0	0	(2429)	955,732	(2429)
	381	0	381	0	0	50	50	431	956,163	(1998)
	(1008)	(4)	(1013)	0	0	0	0	(1013)	955,150	(3011)
2009	327	0	327	0	0	0	0	327	955,477	(2684)
	(1527)	0	(1527)	0	0	(733)	(733)	(2260)	953,217	(4944)
2010	481	3254	3735	0	0	6	6	3741	956,958	(1203)
	(2421)	(118)	(2539)	0	0	(462)	(462)	(3001)	953,957	(4204)
2011	113	0	113	0	0	0	0	113	954,070	(4091)
	(1536)	(32)	(1568)	0	0	(42)	(42)	(1610)	952,460	(5701)
2012	59	0	59	0	0	0	0	59	952,519	(5642)
Total Net Change (ha.)	(6406)	1945	(4461)	0	0	(1181)	(1181)	(5642)		
% Net Change	(0.67%)	(0.20%)	(0.47%)	0.00	0.00	(0.12%)	(0.12%)	(0.59%)		

* New reporting period May 1, 2008 - April 30, 2009 effective with the new FMA Agreement May 1, 2008, reset net billing area 958,561ha

- **Target 27c** – Table 30 describes the status of the industrial footprint by disposition type as of 2012.

TARGET #28 – Amount of Area Disturbed

Value	Maintenance of forest landbase
Objective	Recognize lands affected by insects, disease or natural calamities
Indicator	Amount of area disturbed
TARGET #28	Report on area (ha) affected by natural disturbances such as insect, diseases, fire, wind, hail etc.
Means to Identify Target	Natural disturbance reports are normally provided to HWP by the GoA
Legal/Policy Requirements	GoA Planning Standard
Means of Achieving Objective and Target	Maintain up-to-date information
Monitoring and Measurement	This will be tracked and reported annually in the Stewardship Report
Reporting Commitments	AOP, HWP's Stewardship Report and the 5-Year DFMP Stewardship Report
Acceptable Variance	Report actuals
Response	Event specific
HWP Strategy	Report on areas affected by natural disturbance based on records provided to HWP by the GoA and through field observations.

1.0 Target #28

Natural disturbances are part of, and support, ecological function and forest dynamics. However, uncontrolled occurrences of natural disturbances are not desirable in a managed forest, where harvesting in a controlled manner is intended to largely replace uncontrolled natural disturbances.

On the HWP FMA, forest fire, blowdown, and insects and disease (e.g. mountain pine beetle) represent the largest risk to landbase in terms of natural disturbances. While the target is to simply report on the area affected by natural disturbance, HWP also actively manages the FMA landbase to limit the amount of natural disturbance through such strategies as aggressive fire control and targeted harvesting to reduce mountain pine beetle risk.

Definitions

A. Natural disturbances – Natural disturbances are agents that cause the death of most trees in an area. They include fire, wind (blowdown), floods, insects, disease, etc. Disturbances that damage most of the trees in a stand are called stand-replacing disturbances.

Overview and Analysis

HWP tracks occurrences of natural disturbances on the FMA through several processes. Area burned is tracked in the Annual Fire Statistic Summary Report prepared by the government. At present insects, disease, blowdown hail, and other disturbances are monitored and are reported on by the GoA through an informal basis (e.g. through MPB reconnaissance flights). The GoA has provided this information to HWP in the last couple of years – HWP also records natural disturbances such as blowdown and hail damage through field observations.

While there are many types of natural disturbances, such as fire, blowdown, hail, floods, insects, and disease, HWP will only report on stand-replacing disturbances in this indicator. This will normally include fire, blowdown, and severe hail. The areas of other natural disturbances that don't tend to replace a stand, such as aspen defoliation, aspen dieback, floods, redbelt, spruce budworm, and root rots, will not be reported on. Mountain pine beetle will be reported on based on aerial and ground survey information provided to HWP by the GoA annually. The GoA reports aerial survey information (red attacked tree sites from aerial surveys) with green-to-red ratios (i.e. the amount of newly attacked trees compared to the amount of previously attacked trees). The GoA also provides HWP with the priority sites generated from the GoA's Decision Support System (DSS), so that HWP will know which sites will be surveyed by the GoA for green attack (which then provides information on which sites will be controlled).

2.0 Report – Target #28 (Amount of Area Disturbed)

Table 73 outlines the natural disturbances that were recorded on the FMA in 2012 and 2013. There is no forecast for this indicator.

Table 73 – Natural Disturbances on the Hinton FMA – 2012 and 2013

Year	Type of Natural Disturbance						
	Wildfire		Blowdown (ha)	Severe hail damage (ha)	Mountain Pine Beetle		
	# of fires	Area burned (ha)			Geographic area	# of MPB aerial red attack survey sites	green-to-red ratios*
2012	12	1.56	695.0	465.0	E1	41	1.09
					E3	252	1.29
					E4	11	0.63
					E6	13	0.42
					E7	34	0.17
2013	28	3.84	1327.4	-	E1	115	0.29
					E3	316	0.79
					E4	41	0.31
					E6	52	0.63
					E7	30	0.17

*G:R ratios <1 indicates a decreasing MPB population, while G:R ratios >1 means an increasing MPB population.

TARGET #29 – Noxious Weeds

Value	Control invasive species
Objective	Control non-native plant species (weeds)
Indicator	Noxious weed program
TARGET #29	Continue to implement the Company's noxious weed program.
Means to Identify Target	Field reports
Legal/Policy Requirements	• Public Lands Act • Weed Control Act • FMD Directive 2000-06 • GoA Planning Standard
Means of Achieving Objective and Target	Implement the Company's noxious weed program outlined in EM-0058.
Monitoring and Measurement	This will be tracked and reported annually in the SFM Stewardship Report
Reporting Commitments	Annually in HWP's Stewardship Report and summarized every 5 years in DFMP Stewardship Report.
Acceptable Variance	None - report annually.
Response	Improve the Noxious Weed Program as required.
HWP Strategy	Implement the Company's noxious weed program.

1.0 Target #29

Prohibited noxious weeds and noxious weeds are aggressive, difficult to manage, and invasive plant species. These weeds may displace or significantly alter native plant communities and may also cause economic damage to private and public lands. Legislation in Alberta, specifically the Alberta Weed Control Act, recognizes these two classes of weeds and is in place to keep these problem weeds from being introduced to Alberta or from spreading if they are already present. Each class of weeds is treated differently. Invasive non-native plant species compete with naturally occurring species, which can potentially have negative effects for biodiversity conservation on the FMA. The main objective of this VOIT is to ensure that invasive non-native plants species are controlled or destroyed.

The Company's Noxious Weed Program contains a number of different elements. This includes:

1. Yellowhead Invasive Plants Initiative – Since 2000/01, Hinton Wood Products has been involved with the "Northern East Slopes Regional Weed Control Program". In 2009 this working group was renamed the "Yellowhead Invasive Plants Initiative". The GoA and Yellowhead County provide the direction and prioritize the areas of focus for control of invasive non-native plant species (weeds). They also conduct some inventory work.

2. A Company Weed Control Procedure (EM-0058) – The purpose of this procedure is to eradicate all prohibited noxious weeds and to control noxious weeds within the Hinton FMA as directed by the Weed Control Act. The procedure includes the following:

   - An annual plan is created that identifies priorities for inventory, control and prevention of weed spread on the FMA.
   - A yearly report is created summarizing control measures.
   - Co-operating with the GoA and Yellowhead County to identify yearly priorities for inventory and control measures.
   - Coordinating control and inventory measures with ERSD and Yellowhead County.
   - Setting up training and education opportunities for staff and contractors as required.
   - Any employee, contractor, or consultant that spots a weed infestation on the FMA completes the Weed Awareness Report Form and submits it to HWP's assigned Area Silviculturalist.

Definitions

A. Noxious weed – Is a plant that is designated under the Alberta Weed Control Regulations as a noxious weed and includes noxious weed seeds. It is required to be controlled. There are 29 noxious weeds listed in the Regulation.
B. Prohibited noxious weed – Is a plant that is designated under the Alberta Weed Control Regulations as a prohibited noxious weed and includes prohibited noxious weed seeds. It is required to be destroyed. There are 46 prohibited noxious weeds listed in the Regulation.

Overview and Analysis

The Company's Noxious Weed Plan is carried out annually as follows:

- April – GoA/Yellowhead County organizes workshop to identify priorities.
- May – Hinton Wood Products identifies main roads within priority area and contracts out the weed control.
- June – A contractor carries out weed control.
- December – Weed control summary is completed and filed internally (on S: drive) .

The vast majority of weed control undertaken by HWP occurs along right-of-ways, as road sides are the most common starting point of weeds and the represent the most likely way weeds spread. The kilometres of road treated, and the location of those roads, is reported each year in HWP's annual Stewardship Report. A summary will be reported every five years in the DFMP Stewardship Report.

2.0 Report – Target #29 (Noxious Weeds)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. As previously noted, the kilometres of road treated, and the location of those roads, is reported each year in HWP's annual Stewardship Report and a summary will be reported every five years in the DFMP Stewardship Report.

TARGET #30 – Compliance with Company OGRs

Value	Soil productivity
Objective	Maintain soil productivity
Indicator	Percentage Compliance with Company OGRs
TARGET #30	Complete compliance with Company Operating Ground Rules
Means to Identify Target	Company Environmental Incident Database
Legal/Policy Requirements	• HWP Operating Ground Rules • Forest Soils Conservation Guidelines
Means of Achieving Objective and Target	Implement, monitor and continually improve HWP's Environmental Management System.
Monitoring and Measurement	• Internal compliance auditing. • Block inspection reports. • External and internal ISO and SFI certification audits
Reporting Commitments	Annually in HWP's Stewardship Report and in the 5-Year DFMP Stewardship Report
Acceptable Variance	+1 incident
Response	Develop and implement an action plan to correct the incident or practise ASAP
HWP Strategy	• The Company maintains and implements its own cutblock inspection system (100% of blocks and roads are inspected). • HWP has its own compliance auditing program – these are internal audits completed at regular intervals. • An ongoing training program for HWP workers and supervisors. • Investigating any non-conformance of HWP OGRs and developing and implementing action plans to address each non-conformance.

1.0 Target #30

The objective underlying this target is to maintain soil productivity. Soil productivity conservation is critical to sustainable forest management because soils provide the medium to support plant growth and other biological processes. Damage to soils is therefore of great concern. Application of Best Management Practices through the Operating Ground Rules (OGRs) to prevent soil damage is an indicator of effective management activities.

With respect to soil conservation, the Company's OGRs requires that HWP be in compliance the Forest Soil Conservation Guidelines. There are also other sections in the Company's OGRs, that when followed correctly, minimize or eliminate damage to soil productivity. This includes rules around contingency planning, pre-harvest silvicultural planning, site preparation, access planning, road construction, drainage & erosion control, deactivation and reclamation of roads and watercourse crossings, and gravel pits.

Definitions

A. Forest Soil Conservation Guidelines – These guidelines were developed by a joint task force of the Alberta Forest Products Association and the GoA. The Guidelines are applicable to temporary roads and decking areas, harvesting/skidding, and reforestation. They were adopted as standard in the 2002 Harvest Planning and Operating Ground Rules. The Alberta Soil Conservation Guidelines came into effect in 1996. One of the major objectives of the Guidelines is to keep rutting to less than 2% of the block areas as measured by linear transects.

Overview and Analysis

All blocks are regularly inspected by HWP's Operations Supervisors as part of the block inspection process. These inspection reports involve systematically working through a checklist to ensure various aspects of the logging operations are taking place according to the plan and in compliance with Company procedure, the Operating Ground Rules, and government regulations

Any major non-conformance or non-compliance with the Company's Operating Ground Rules is reported to the GoA. All non-conformances/non-compliances are addressed through the HWP environmental incident reporting procedure, where each incident is investigated and action plans are developed to reduce the likelihood of the incident reoccurring.

2.0 Report – Target #30 (Compliance with OGRs)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. HWP will report on non-conformance or GoA non-compliance with the Company's OGRs annually in HWP's Stewardship Report.

TARGET #31 – Incidence of Soil Erosion and Slumping

Value	Soil productivity
Objective	Minimize incidence of soil erosion and slumping
Indicator	Incidence of soil erosion and slumping
TARGET #31	Complete compliance with Forest Soil Conservation Guidelines and Stream Crossing Guidelines.
Means to Identify Target	Company Environmental Incident Database Company Environmental Incident Database
Legal/Policy Requirements	• HWP Operating Ground Rules • Forest Soils Conservation Guidelines (FSCG) • Stream Crossing Guidelines (SCG)
Means of Achieving Objective and Target	Implement, monitor and continually improve HWP's Environmental Management System.
Monitoring and Measurement	• Internal compliance auditing. • Block inspection reports. • External and internal ISO and SFI certification audits
Reporting Commitments	Annually in HWP's Stewardship Report and in the 5-Year DFMP Stewardship Report
Acceptable Variance	0%
Response	Develop and implement an action plan to correct the incident or practise ASAP
HWP Strategy	HWP strategy to ensure compliance with the FSCG and the SCG are as follows: • HWP maintains and implements its own cutblock inspection system (100% of blocks and roads are inspected). • Internal and external ISO/SFI audits are completed at regular intervals. • A spring training program for HWP workers and supervisors is conducted annually. • Each logged block has an ocular estimate of soil disturbance – only those that appear to have soil disturbance greater than 2% are ground surveyed. • HWP will investigate any non-conformance of HWP OGR and will develop and implement action plans to address each non-conformance.

1.0 Target #31

Soil productivity conservation is critical to sustainable forest management because soils provide the medium to support plant growth and other biological processes. Soil erosion affects soil productivity and is therefore of great concern. Slumping is a form of soil erosion from slope failures that result in soil and parent material moving downhill from an original location. Slumping occurs naturally but also when roads cut across a slope, especially if there are springs near the surface. The objective of this VOIT is to apply best management practices to minimize or eliminate slumping and soil entry into water bodies.

Definitions

A. Forest Soil Conservation Guidelines – see definitions in Target #30.
B. Soil erosion – Soil erosion is the wearing away of the land surface by wind or water. Erosion occurs naturally from weather or runoff, but can be intensified by land-clearing practices related to road building or timber cutting.
C. Slumping – Slumping is a form of soil erosion related to slope failures that result in soil and parent material moving downhill from an original location
D. Stream Crossing Guidelines – The Alberta Stream Crossing Guidelines were developed in 1989 and are still the guidance document for the Operating Ground Rules. Other relevant documents include the Fish Habitat Protection Guidelines for Stream Crossings (1995) and the Code of Practice for Watercourse Crossings (2000). The Code of Practice is part of the Alberta Water Act.

Overview and Analysis

Incidents of slumping and sediment entry into watercourses are detected by several programs:

- The cutblock inspection system (100% of new blocks and roads are inspected).

- The compliance auditing program, which includes both internal and external ISO and SFI audits.
- The annual road and stream crossings inspection program
- Incidents noticed by HWP staff and contractors during the course of normal work in the forest.
- Incidents documented by GoA inspections and audits (Forest Operations Monitoring Program and Silviculture ARIS Monitoring: FOMP/SAM).

Any non-conformance with the Forest Soil Conservation Guidelines or Stream Crossing Guidelines is reported to the GoA. All non-conformances are addressed through the HWP environmental incident reporting procedure, where each incident is investigated and action plans are developed to reduce the likelihood of the incident reoccurring.

Slumping associated with roads is relatively uncommon and usually fairly small in extent and impact. Slumping incidents are noted and repaired through the HWP's Road Maintenance Program as they occur.

2.0 Report – Target #31 (Compliance with FSCG and SCG)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. HWP will report on compliance with the Forest Soil Conservation Guidelines and the Stream Crossing Guidelines annually in HWP's Stewardship Report.

TARGET #32 – Compliance with the Water Act and the DFMP

Value	Water quantity
Objective	Limit impact of timber harvesting on water yield
Indicator	Compliance with the Water Act and the DFMP
TARGET #32	Zero Water Act penalties and complete compliance with DFMP
Means to Identify Target	Water Strategy and local needs
Legal/Policy Requirements	Water Act, Planning Standard
Means of Achieving Objective and Target	Adherence to Water Act and relevant water-related OGRs
Monitoring and Measurement	Block inspections, HWP internal and external ISO/SFI audits, GoA monitoring (e.g. FOMP), etc.
Reporting Commitments	Annually in HWP's Stewardship Report and in the 5-Year DFMP Stewardship Report
Acceptable Variance	Report actuals
Response	Adjust harvest pattern if problems arise
HWP Strategy	HWP strategy to ensure compliance with the Water Act and DFMP/OGRs are as follows: • HWP maintains and implements its own cutblock inspection system (100% of blocks and roads are inspected). • Internal and external ISO/SFI audits are completed at regular intervals. • The annual road and stream crossings inspection program • A spring training program for HWP workers and supervisors is conducted annually. • HWP will investigate any non-conformance of HWP the Water Act or OGRs and will develop and implement action plans to address each non-conformance.

1.0 Target #32

The Alberta Water Act is legislation designed to manage and protect Alberta's water. Under the Act, penalties and enforcement orders can be levied where contraventions have been discovered. This DFMP also contains strategies and commitments around water management, which are then translated into Operating Ground Rules (OGRs).

The intent of this indicator is to limit the impact of timber harvesting on water yield, by complying with the Water Act and by complying with the strategies and commitments described in the DFMP (which are translated into OGRs).

Definitions

A. ISO/SFI internal and external audits – West Fraser is registered to the ISO 14001 Environmental Management System Standard and to the Sustainable Forestry Initiative (SFI) Standard. Both of these standards have requirements to comply with existing legislation and to conduct regular internal audits (conducted in-house) and regular external audits (conducted by a certified third-party).

B. FOMP – The Forest Operations Monitoring Program (FOMP) is Alberta's compliance monitoring program. Provincial employees monitor, through random checking, the forest operations of HWP.

Overview and Analysis

Adherence to the Water Act and the Operating Ground Rules are ensured through a number of programs:

- HWP's cutblock inspection system (100% of new blocks and roads are inspected).
- HWP's compliance auditing program, which includes both internal and external ISO and SFI audits.
- HWP's annual road and stream crossings inspection program
- Incidents noticed by HWP staff and contractors during the course of normal work in the forest.
- Incidents documented by GoA inspections and audits (Forest Operations Monitoring Program and Silviculture ARIS Monitoring: FOMP/SAM).

Any non-conformances with the Water Act or OGRs discovered by HWP are reported to Alberta. All non-conformances are addressed through the HWP environmental incident reporting procedure, where each incident is investigated and action plans are developed to reduce the likelihood of the incident reoccurring. Non-conformances discovered by Alberta are addressed through penalties, enforcement orders, warning letters, and other various enforcement options.

2.0 Report – Target #32 (Compliance with Water Act and DFMP/OGRs)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. HWP will report on compliance with the Water Act and relevant water-related OGRs annually in HWP's Stewardship Report.

TARGET #33 – Maximum % increase in annual water yield

Value	Water quantity
Objective	Evaluate impact of timber harvesting on water yield
Indicator	Maximum percent increase in annual water yield
TARGET #33	All identified watershed basins within the FMA will undergo an Alberta "Equivalent Clear-cut Area" (ECA) analysis. For each watershed, HWP will report on the maximum annual water yield increases projected by the Alberta ECA model.
Means to Identify Target	The Alberta ECA model (based on research carried out by Uldus Silins - professor of forest hydrology and watershed management, University of Alberta)
Legal/Policy Requirements	Water Act, GoA Planning Standard
Means of Achieving Objective and Target	Adherence to forecast harvest sequence and relevant OGRs.
Monitoring and Measurement	The model evaluates the effect of disturbances on stream flow in a watershed, and projects the cumulative effect of past and future harvesting on stream flow. The projected annual maximum water yield will be monitored and measured using the Alberta ECA model.
Reporting Commitments	5-Year DFMP Stewardship Report
Acceptable Variance	If the ECA model predicts a maximum annual water yield increase of more than 15% in a watershed basin, then HWP will review these basins to determine the reasons why, and if required, adjust the harvest schedule accordingly. Note - there may be situations where having a higher than 15% increase in water yield would be acceptable (e.g. in situations where only a small portion of a watershed basin is within HWP's FMA; to address MPB related issues; to address NRV issues, etc.).
Response	Adjust harvest pattern if problems arise
HWP Strategy	Conduct an Alberta ECA analysis on 67 watershed groups on the FMA.

1.0 Target #33

Forest management activities have both direct and indirect impacts on hydrology and aquatic ecosystems. Impacts increase with the amount of disturbance in a watershed basin and the effects are most pronounced for smaller basins. Impacts occur in response to natural disturbances (e.g. forest fires) and management activities (e.g. harvesting, roads). This VOIT addresses the cumulative effect of disturbances on fish habitat, stream geomorphology, and human infrastructure. The VOIT also indirectly addresses the issue of water quality.

Definitions

A. Alberta ECA Model – This model provides a relatively simple framework for the evaluation of hydrologic effects of forest practices with modest input data requirements. The main application of this model is to evaluate the effect of past disturbances on streamflow in a watershed, and to project the cumulative effect (net combined effect) of both past and future forest harvesting and/or natural disturbances on streamflow. ECA or "Equivalent Clearcut Area" describes a recovering disturbance in terms of what it would currently represent as an equivalent area of new disturbance. (Silnis. 2003)

Overview and Analysis

Water yield impacts of timber harvesting were modelled using the Alberta ECA model for the period between 2012 and 2032. Projected water yield changes were looked at using three different sizes of watersheds:

- 27 major basins (average: 38,361 ha - maximum: 77,360 ha - minimum: 4,676 ha)
- 67 watershed groups (average: 15,419 ha - maximum: 33,315 ha - minimum: 4,676 ha)
- 222 watersheds (average: 4,653 ha - maximum: 11,977 ha - minimum: 5 ha)

HWP decided that the 67 watershed groups are the most appropriate size of watershed basin for the purposes of this DFMP water yield assessment. The major basins were too large and the watersheds tended to be too small for the scale of assessment completed. As the name suggests, the watershed groups were created by grouping smaller watersheds together with the intent of creating units between approximately 10,000 hectares and 30,000 hectares in size. Groupings were limited to adjacent units that contained watercourses which flowed to a common outlet. For some watersheds along very large watercourses (e.g. Athabasca River), the groups were simply the smaller watersheds that flowed into the larger watercourse. The watershed group ECA results are presented in the following section. Figure 102 illustrates the geographic extent of the 67 watershed groups within the Hinton FMA.

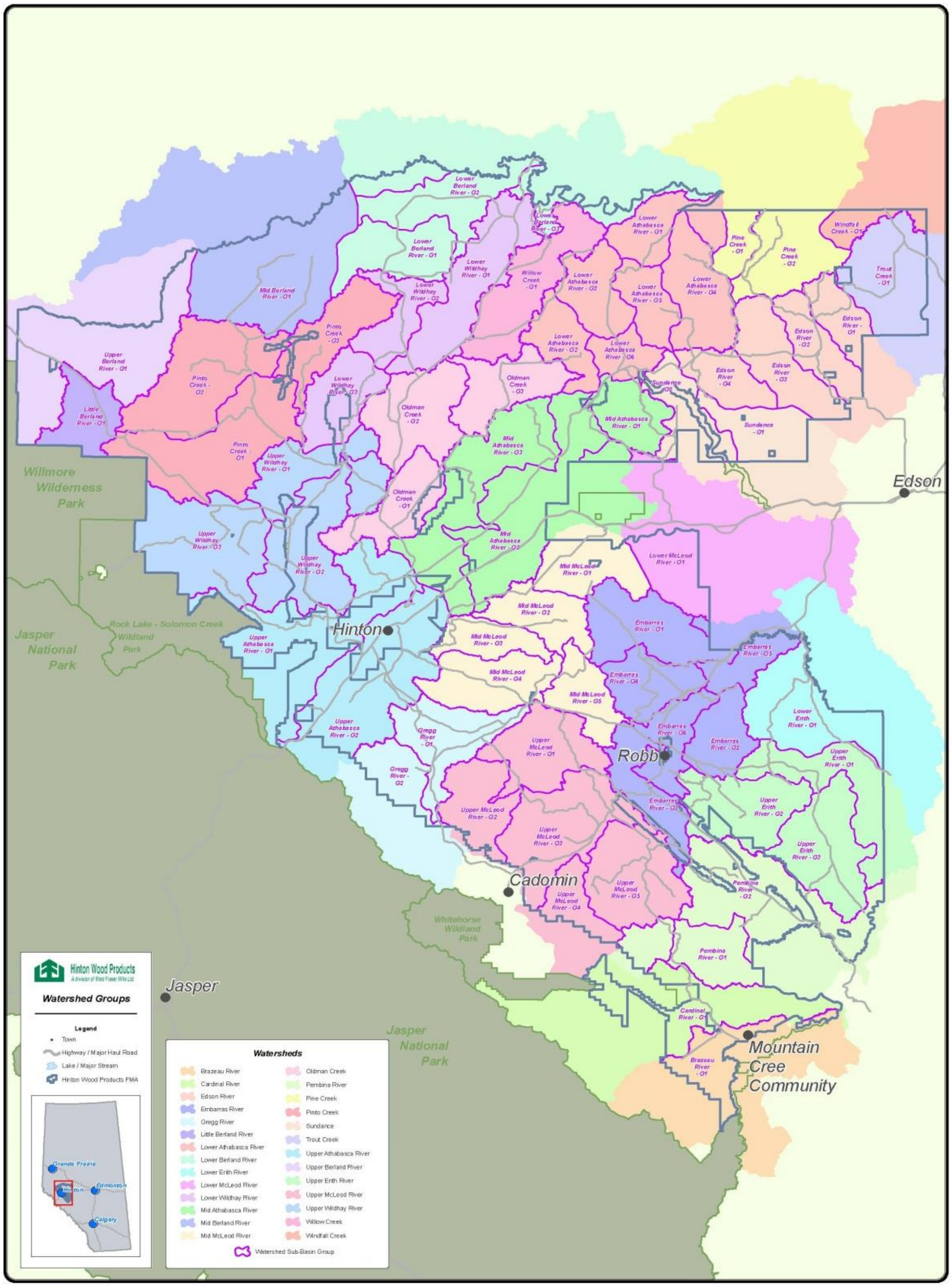


Figure 102 – The 67 watershed groups on the Hinton FMA

2.0 <u>Report – Target #33 (ECA Analysis)</u>

The Alberta ECA model was used to evaluate potential impacts of the spatial harvest sequence (Year 10 of the October 2014 version of the SHS) on water yield. Base precipitation and base yield estimates were obtained from a report completed for the Hinton FMA area (Strategic Planning Tools for Hydrologic Resources Phase 2 Study, Golder Associates Ltd. 1999.) Base yield estimates were provided for three hydrologic zones, which covered the extent of the FMA:

- Front Range: 279 mm
- Upper Foothills: 267 mm
- Lower Foothills: 112 monitoring and measuring program

Base precipitation estimates were provided for ten selected basins. These estimates were extended to all the watersheds in this assessment, based on the relative proximity of each watershed to the original ten (from the Golder study). See Figure 103 and Figure 104 for an illustration of the assignments of yield and precipitation to the individual watersheds.

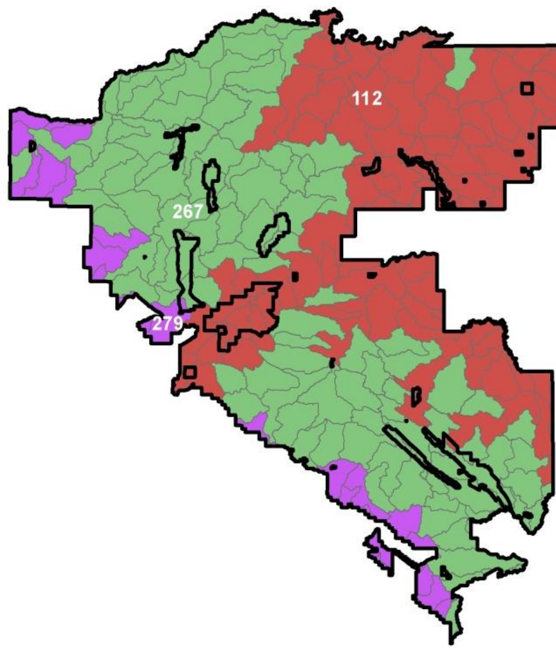


Figure 103 – Base yield estimates. Regions where base yield estimates were applied are identified by colour

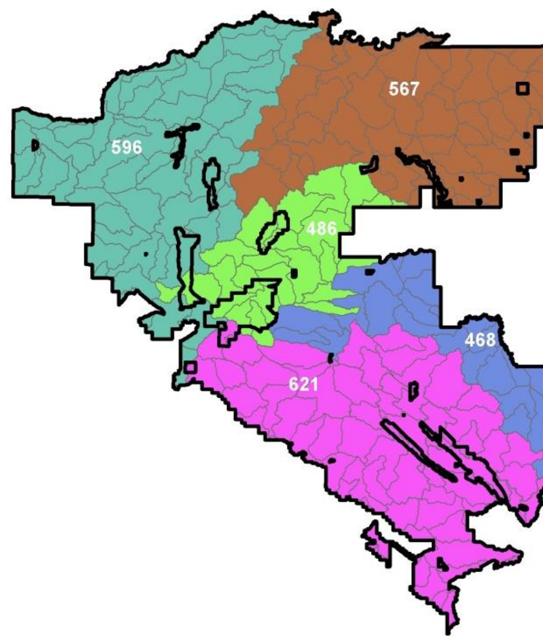


Figure 104 – Base Precipitation Estimates. Regions where base precipitation estimates were applied are identified by colour

A summary of the Alberta ECA results for the watershed groups is provided in Table 74. The maximum water yield increase has been calculated using the first 10 years of harvest. "Pine Creek – G2" and "Windfall Creek – G1" are the only watershed groups that show projected yield increases above 15%. These watersheds are on the edge of the FMA; hence the analysis does not include the entire watershed area Figure 105 shows the location of these two watershed groups. These areas were attacked by MPB in 2009.

Table 74 – Water Flow Assessment: Watershed Groups using 10-year Spatial Harvest

Watershed	Base Precipitation (mm)	Base Water Yield (mm)	Total Area (ha)	Total Harvest (ha)	Percent Harvest	Maximum Water Yield Increase	
						Amount (%)	Year
Brazeau River - G1	621	273	10,189	1,682	17%	3.6%	2031
Cardinal River - G1	621	272	18,595	2,524	14%	2.2%	2031
Edson River - G1	567	112	7,675	2,343	31%	10.9%	2021
Edson River - G2	567	112	9,820	503	5%	1.9%	2028
Edson River - G3	567	112	14,751	1,593	11%	3.9%	2022
Edson River - G4	567	112	8,876	2,163	24%	9.0%	2031

Watershed	Base Precipitation (mm)	Base Water Yield (mm)	Total Area (ha)	Total Harvest (ha)	Percent Harvest	Maximum Water Yield Increase	
						Amount (%)	Year
Embarras River - G1	468	112	17,420	4,815	28%	11.8%	2031
Embarras River - G2	621	267	9,831	2,947	30%	4.0%	2021
Embarras River - G3	621	267	11,326	3,170	28%	4.4%	2021
Embarras River - G4	621	267	11,039	660	6%	0.7%	2031
Embarras River - G5	468	112	7,238	1,308	18%	5.0%	2030
Embarras River - G6	621	112	9,654	2,343	24%	9.9%	2021
Gregg River - G1	621	267	15,280	2,076	14%	3.3%	2031
Gregg River - G2	621	271	8,243	62	1%	0.2%	2027
Little Berland River - G1	596	279	9,911	1,771	18%	3.0%	2031
Lower Athabasca River - G1	567	112	11,357	2,242	20%	8.7%	2031
Lower Athabasca River - G2	567	112	9,368	2,066	22%	6.2%	2031
Lower Athabasca River - G3	567	112	10,973	2,259	21%	8.5%	2031
Lower Athabasca River - G4	567	112	15,792	557	4%	2.5%	2030
Lower Athabasca River - G5	567	112	8,311	934	11%	8.5%	2031
Lower Athabasca River - G6	567	112	6,247	1,149	18%	5.1%	2021
Lower Berland River - G1	596	267	14,328	2,411	17%	1.6%	2019
Lower Berland River - G2	594	254	15,313	2,284	15%	2.0%	2031
Lower Berland River - G3	579	174	10,515	1,938	18%	5.1%	2031
Lower Erith River - G1	468	112	19,990	5,220	26%	10.6%	2022
Lower McLeod River - G1	469	112	11,016	2,293	21%	9.0%	2031
Lower Wildhay River - G1	567	112	22,083	5,462	25%	9.4%	2021
Lower Wildhay River - G2	596	267	9,754	2,547	26%	2.5%	2031
Lower Wildhay River - G3	596	267	12,780	1,091	9%	0.8%	2020
Mid Athabasca River - G1	567	112	10,034	1,644	16%	7.5%	2021
Mid Athabasca River - G2	486	112	28,468	5,065	18%	4.6%	2031
Mid Athabasca River - G3	486	229	30,435	3,564	12%	1.5%	2031
Mid Berland River - G1	596	267	33,316	4,424	13%	1.5%	2031
Mid McLeod River - G1	472	112	11,557	2,748	24%	7.7%	2031
Mid McLeod River - G2	478	159	10,988	2,725	25%	6.2%	2031
Mid McLeod River - G3	468	267	8,148	352	4%	0.5%	2031
Mid McLeod River - G4	545	224	14,934	1,682	11%	2.0%	2031
Mid McLeod River - G5	621	267	9,909	1,092	11%	1.4%	2020
Oldman Creek - G1	486	267	13,039	0	0%	0.0%	2015
Oldman Creek - G2	572	267	17,927	1,836	10%	0.9%	2031
Oldman Creek - G3	567	267	13,533	1,530	11%	1.4%	2021
Pembina River - G1	621	266	10,483	3,182	30%	5.6%	2031
Pembina River - G2	621	269	32,690	6,066	19%	1.9%	2021
Pine Creek - G1	567	267	4,974	1,668	34%	3.7%	2030
Pine Creek - G2	567	112	15,595	7,981	51%	28.4%	2022
Pinto Creek - G1	596	267	28,496	1,572	6%	1.2%	2031
Pinto Creek - G2	596	267	25,545	1,405	5%	1.1%	2031
Pinto Creek - G3	596	267	14,005	2,119	15%	1.4%	2020
Sundance - G1	567	112	10,715	3,423	32%	9.2%	2021
Sundance - G2	567	112	10,483	2,176	21%	6.8%	2022
Trout Creek - G1	567	112	19,057	6,360	33%	13.0%	2021
Upper Athabasca River - G1	553	161	28,515	617	2%	0.6%	2021

Watershed	Base Precipitation (mm)	Base Water Yield (mm)	Total Area (ha)	Total Harvest (ha)	Percent Harvest	Maximum Water Yield Increase	
						Amount (%)	Year
Upper Athabasca River - G2	573	133	30,893	1,312	4%	1.8%	2031
Upper Berland River - G1	596	273	32,405	6,063	19%	3.1%	2031
Upper Erith River - G1	508	152	16,226	3,954	24%	7.5%	2021
Upper Erith River - G2	621	192	17,301	5,096	29%	6.6%	2021
Upper Erith River - G3	591	267	19,531	8,890	46%	7.1%	2022
Upper McLeod River - G1	621	267	16,021	2,581	16%	2.7%	2031
Upper McLeod River - G2	621	267	12,237	802	7%	1.0%	2031
Upper McLeod River - G3	621	269	22,874	4,691	21%	2.7%	2022
Upper McLeod River - G4	621	279	6,978	1,230	18%	3.2%	2030
Upper McLeod River - G5	621	267	19,292	5,619	29%	4.2%	2021
Upper Wildhay River - G1	596	267	11,977	418	3%	0.4%	2029
Upper Wildhay River - G2	555	267	21,502	1,236	6%	0.6%	2021
Upper Wildhay River - G3	596	271	31,023	3,123	10%	1.3%	2022
Willow Creek - G1	567	112	19,644	3,356	17%	6.4%	2021
Windfall Creek - G1	567	112	4,676	2,255	48%	29.1%	2021

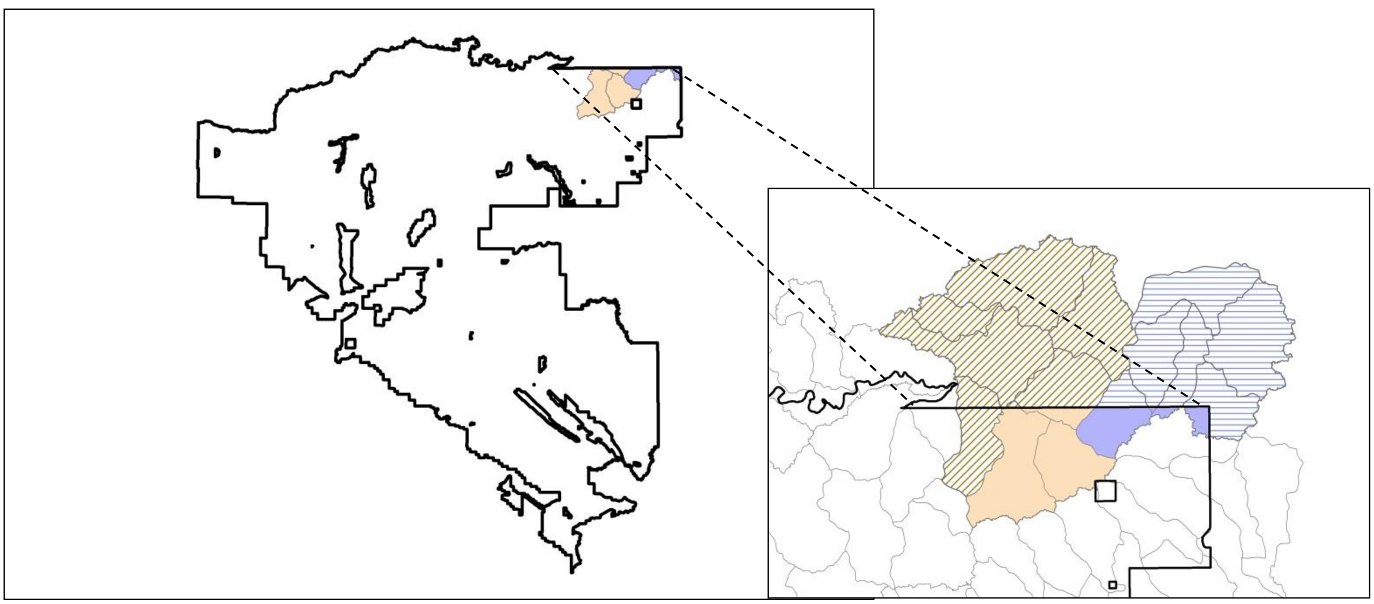


Figure 105 – Watershed Groups with Projected Increase in Water Yield > 15% (Pine Creek and Windfall Creek)

TARGET #34 – Compliance with Riparian-Related sections of OGRs

Value	Effective riparian habitats
Objective	Retain ecological values and functions associated with riparian zones (same as Target 11 & 12).
Indicator	Compliance with the riparian-related sections of the Operating Ground Rules (same as Target 11 & 12).
TARGET #34	100% consistent and compliant with the DFMP's Riparian Management Strategy and associated OGRs
Means to Identify Target	Same as Target 11 & 12.
Legal/Policy Requirements	Same as Target 11 & 12.
Means of Achieving Objective and Target	Same as Target 11 & 12.
Monitoring and Measurement	Same as Target 11 & 12.
Reporting Commitments	Same as Target 11 & 12.
Acceptable Variance	Same as Target 11 & 12.
Response	Same as Target 11 & 12.
HWP Strategy	Same as Target 11 & 12.

1.0 Target #34

This target is very similar as Target 11 and Target 12; the main difference being that the value of Target 11 and 12 is "landscape scale biodiversity", while the value of Target 34 is "effective riparian habitats". All three targets have the similar or the same objective, indicators and targets.

Definitions

A. Riparian areas – Riparian lands are transitional areas between upland and aquatic ecosystems. They have variable width and extent above and below ground. These lands are influenced by and exert an influence on associated waterbodies including alluvial aquifers and floodplains. Riparian lands usually have soil, biological, and other physical characteristics that reflect the influence of water and hydrological processes.

Overview and Analysis

The VOIT is centred on maintaining effective riparian habitats. Riparian habitats are zones of direct interaction between terrestrial and aquatic environments. All riparian areas on the FMA have been identified as part of HWP Riparian Management Strategy – a detailed description of how these riparian were delineated is described in HWP's Riparian Management Strategy, which can be found in Appendix 2 (Appendix 2). Riparian areas as defined under HWP's Riparian Management Strategy includes the entire landform complex (watercourse channel, floodplain, terrace, hillslope, plus in some cases related upland areas). In the past, the most common riparian management approach has been based on measured linear buffers designed primarily to protect the aquatic environment and biodiversity from the effects of harvesting in riparian areas. However, over long periods of time reduced or excluded disturbance rates (both fire and harvesting) would lead to riparian forests with characteristics outside their natural range of variation (NRV). This presumably would have an effect on ecological function of riparian areas and the values they conserve.

In contrast, HWP's Riparian Management Strategy assumes that disturbance and recovery from disturbance in riparian areas is necessary to conserve the variability that maintains ecological function. Regulatory frameworks and social acceptance do not allow unrestricted fires or unconstrained emulation of fires in riparian areas, and a balanced approach must be employed to maintain variability and function within acceptable social limits. In particular, disturbance must be managed to maintain variability without compromising aquatic ecosystem values, which still have primary importance. The management challenge then is to plan and implement changes to the current riparian management approach to more closely approximate natural disturbances and patterns, while maintaining the current focus on conservation of non-timber values, and continuing to manage for a sustainable timber supply.

The overall approach described in the HWP's Riparian Management Strategy is to maintain ecological function by increasing the similarity between natural riparian areas and managed riparian areas. The proportion of riparian area that experiences disturbance will be increased to maintain seral stage amount and other indicators at amounts and patterns within the NRV. Targets for structure and composition variability within NRV will be adjusted to conserve the important values recognized in the traditional riparian conservation management approach. A more conservative approach will be applied to areas close to channels. Professional judgment will be used to determine appropriate management prescriptions for a given site.

Harvesting will be substituted for natural disturbance processes where it can be applied safely and economically without causing environmental damage or impairing ecological function. This will increase riparian area that experiences disturbance but it is expected that many areas will still not be suitable for harvest disturbance treatments. If necessary, other treatments (prescribed fire, mechanical brushing, etc.) may be considered to ensure that these areas remain within the RNV over the long term.

HWP's Operating Ground Rules will be amended to reflect commitments and strategies found in this DFMP and its associated Riparian Management Strategy..

2.0 Report – Target #34 (Compliance with Riparian Management Strategy and OGRs)

This target is essentially the same as Target's 11. Table 49, Table 52, and Table 55 found in Target #1 report on the Natural Range of Variation for riparian areas by Natural Subregion, for each cover type, by each seral stage. Each of these tables also describes the current (2012) status of the number of riparian hectares by cover type and seral stage and forecasts the status for Year 10, 50, and 100. For HWP to be compliant with this Target (#38) riparian areas should remain within their NRV over time; or if this isn't the case, there should be some reasoning for it. This Target will be reported on annually in HWP's Stewardship Report and every five years as part of HWP's DFMP Stewardship Report.

As with Target 12, this Target (#34) is also to have zero Operating Ground Rules non-compliance incidents on an annual basis. For this Target, this means no contraventions of the riparian related sections of HWP's Operating Ground Rules. For example, all required riparian management zones and associated practises must be adhered too. There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. All incidents that are reportable to the government will be reported immediately and then summarized annually in HWP's annual Stewardship Report and every five years in the DFMP Stewardship Report. A brief summary of each incident and the action items taken to prevent similar incidents from reoccurring will be included in HWP's annual Stewardship Report.

TARGET #35 – Reforestation Delay

Value	Ecological processes
Objective	Maintain the ecological processes that are responsible for recycling water, carbon, nitrogen and other life sustaining elements
Indicator	Reforestation Delay
TARGET #35	Commence reforestation on 80% of Hinton Wood Products harvested area within 1 year of harvest, and 100% of harvested area within 2 years of harvest
Means to Identify Target	Annual Silviculture Program
Legal/Policy Requirements	Planning Standard Planning
Means of Achieving Objective and Target	Implement Annual Silviculture Program
Monitoring and Measurement	Annual Silviculture Program, ARIS
Reporting Commitments	Report annually in HWP's Report and every five years in the DFMP Stewardship Report.
Acceptable Variance	± 5% for first harvest year and 0% for second year
Response	Include in next Silviculture Program and complete treatment.
HWP Strategy	The strategy to ensure this Target is achieved is the same as the target. In order to carry out this strategy, HWP Area Silviculturalists are assigned specific working circles (geographic areas - there are five on the Company's FMA) and are responsible to implement the required reforestation activities in a timely manner. Dates of all silviculture activities are recorded so checks can be made to ensure blocks have not been missed. For the purpose of this VOIT, a Leave-for-Natural (LFN) declaration on deciduous blocks is considered a first treatment

1.0 Target #35

Prompt reforestation contributes towards many Sustainable Forest Management goals. In particular, it indicates that the timber resource is being maintained, and that the goal of ensuring the contribution of the forest to carbon sequestering is maintained. Skid clearance and reforestation initiation dates are tracked for all blocks, allowing HWP to accurately track this Target.

Definitions

A. Reforestation delay – This is the time period between skid clearance (completion of harvesting) and initiation of reforestation activities. It is determined by calculating the time (in days) between final skid clearance and the initiation of reforestation activities (generally site preparation) on the site. The operating year for reforestation is May 1–April 30, and regulations allow two full operating years for reforestation treatment after the year in which skid clearance is obtained.

B. Reforestation – Reforestation refers to the process of reforesting a harvested area after it has been logged. For the majority of HWP's operations, this first means some type of site preparation activity. After site preparation, the blocks are either planted or allowed to regenerate naturally. On the HWP FMA, approximately 70% of the blocks logged are planted and the other 30% are planned for natural regeneration (allowing the seeds from the immediate area to regenerate for conifers and deciduous trees to re-sucker after harvest).

2.0 Report – Target #35 (Reforestation Delay)

There is no DFMP report for this target, and because it is a management activity target, there is also no forecast. The results of this Target (reforestation delay) will be reported in HWP's Stewardship Report. Results will also be summarized every five years in the DFMP Stewardship Report.

TARGET #36 – Annual Timber Harvest

Value	Sustainable timber supplies
Objective	Maintain the sustainable productive capacity of ecosystems
Indicator	Annual Timber Harvest (m3)
TARGET #36	Establish appropriate AAC using the process and standards described in Annex 1 & 2 of the GoA Planning Standard and comply with cut control requirements specified in the Forest Management Agreement.
Means to Identify Target	• Growth & Yield data • FMP modelling (e.g. Woodstock) • Public and Aboriginal consultation
Legal/Policy Requirements	• Forest Act • Timber Management Regulation
Means of Achieving Objective and Target	A cut control forecast is incorporated in the annual General Development Plan (GDP). The GDP projected harvest levels are managed to meet the cut control requirements.
Monitoring and Measurement	Cut control will be reported according to the cut control period annually in the SFM Stewardship Report.
Reporting Commitments	Annually in HWP's Stewardship Report and every 5 years as part of the DFMP Stewardship Report. Annually in the GDP.
Acceptable Variance	As per the Forest Management Agreement
Response	Adjust AAC using most current and relevant information
HWP Strategy	Follow the methodology outlined in Annex 1 & 2 of the GoA Planning Manual

1.0 Target #36

Establishing an appropriate annual timber harvest is a complicated process, but is one of the fundamental tenets of Sustainable Forest Management (SFM) – in order to be successfully practising SFM, one needs to establish a cutting rate that is sustainable, taking into account all the values of the forest. The authorized annual timber harvest is established as part of this DFMP and is called an Annual Allowable Cut (AAC).

Definitions

A. Annual Allowable Cut (AAC) – The AAC is the amount of timber harvest that can be obtained from a forest area on a perpetual sustained yield basis.
B. Cut Control – Cut control is the term used to compare actual cut (harvested volume) to the AAC and is therefore a measure of long-term sustainability of the timber resource. The Forest Management Agreement specifies cut control requirements as a minimum harvest to be achieved (to ensure use of the resource for the economic benefit to Albertans), and a maximum harvest, (to protect against over-harvest).

Overview and Analysis

AACs are calculated based on standing green inventory; therefore, care must be taken to ensure all charges (depletions) against the AAC are accounted. Actual harvest includes the volume delivered across the weigh scale and a number of “depletion factors”, including a scale conversion, losses due to other industrial activities (e.g. oil & gas activities) and utilization standard variances.

The historical and current AACs for the Hinton FMA are shown in Table 75 on the following page. The AAC has changed over time primarily due to changes in the FMA area and utilization standards.

2.0 Report – Target #36 (Annual Allowable Cut)

The current AAC is based on analyses completed as part of this DFMP. Cut control for the next ten years has been calculated at 1,630,701m³ annually for coniferous volume and 346,691m³ annually for deciduous volume. When the unused volume from the previous 10-year period is incorporated into the first 10-year period, the AAC moves to 1,849,991m³ of coniferous and 385,335m³ of deciduous.

For further information, see section 7.4 in this DFMP and Appendix 21.

Cut control will be reported annually in the General Development Plan and HWP's Stewardship Report, as well as every five years as part of the DFMP Stewardship Report.

Table 75 – Historical AAC for the Hinton FMA Landbase

DFMP Year	AAC (m^3/year)	
	Coniferous	Deciduous
1961	701,000	n/a
1986	1,302,000	n/a
1991	1,900,000	126,000
1999	2,236,129	169,449
2006	1,772,840	169,449
2007	1,772,840	169,449
2008	1,535,000	169,449
2010	1,766,576	249,832

TARGET #37 – FireSmart Cooperative Initiatives

Value	Risk to communities and landscape values from wildfire is low
Objective	To reduce wildfire threat potential by reducing fire behaviour, fire occurrence, threats to values at risk and enhancing fire suppression capability
Indicator	FireSmart cooperative initiatives
TARGET #37	Cooperate with all GoA FireSmart initiatives around communities within or bordering the FMA
Means to Identify Target	Hinton is rated as a high risk in the provincial/regional wildfire threat assessment.
Legal/Policy Requirements	GoA Planning Standard
Means of Achieving Objective and Target	Work with local FireSmart initiatives. Work with the GoA and change long range and short term plans where required in order to lower fire risk.
Monitoring and Measurement	Work carried out on FireSmart initiatives will be reported on annually in the SFM Stewardship Report.
Reporting Commitments	Annually in HWP's Stewardship Report and every 5 years in the DFMP Stewardship Report.
Acceptable Variance	None - report annually.
Response	Additional consultation with SRD.
HWP Strategy	Cooperate with all GoA FireSmart initiatives around communities within or bordering the FMA

1.0 Target #37

Communities within or bordering the FMA are situated in a forest setting, which makes them vulnerable to forest fires. The GoA is leading a program called FireSmart to reduce forest fire threats to communities in the wildland-urban interface. FireSmart activities often include forest thinning or harvest in the surrounding FMA and other forested areas. The Company will cooperate with FireSmart activities for the following local communities: Hinton and associated subdivisions, Robb, Cadomin, Brule, and Mercoal.

Definitions

A. FireSmart – The FireSmart philosophy focuses on mitigating the likelihood of large, high-intensity, high-severity fires and the risk associated with the use of prescribed fire.
B. Wildland-Urban Interface – A popular term used to describe an area where various structures (most notably private homes) and other human developments meet or are intermingled with forest and other vegetative fuel types.
C. FireSmart Community – A FireSmart community has addressed seven components designed to reduce fire risk. These are fuel management, education, legislation, development, planning, training, and interagency cooperation.

Overview and Analysis

There are currently three active community protection plans within the Foothills Wildfire Management Area that Hinton Wood Products is involved with. The Hinton/Yellowhead plan was initiated in 2004. HWP's involvement continued through 2006, but was not needed in 2007 and 2008. Supporting harvest plans for the FMA portion of the plans were approved in late 2006 and harvest operations were completed in 2006. The Hinton/Yellowhead plan was completed in 2007.

The Robb plan was initiated in 2005 and continued into 2011. As part of this plan, HWP completed commercial thinning in selected areas surrounding Robb in 2006 and harvested selected areas in early winter 2010-2011. Additional work for this project is now on hold pending proposed coal mine development in the area.

The Carldale plan was initiated in 2008. The plan encompasses the Carldale and Pedley subdivisions located east of Hinton between Highway 16 and the Athabasca River. HWP completed harvest of FireSmart blocks for this plan in 2009-2010.

At the GoA's request, HWP harvested one remaining cutblock immediately west of Highway 40 South just north of Cold Creek. Planning of this cutblock was completed in 2012. The cutblock was harvested in the winter of 2012/13.

2.0 Report – Target #37 (FireSmart Cooperative Issues)

There is no DFMP report for this Target, and because it is a management activity target, there is also no forecast. FireSmart cooperative initiatives will be reported on annually in HWP's Stewardship Report and summarized every five years in the DFMP Stewardship Report.

TARGET #38 – % Reduction in High Fire Behaviour Potential Area

Value	Reduce the risk to communities from wildfire
Objective	To reduce wildfire threat potential by reducing fire behaviour, fire occurrence, threats to values
Indicator	Percentage reduction in Fire Behaviour Potential area (ha) across the DFA now and over the planning horizon
TARGET #38	Reduce the area (ha) in the high, very high and extreme Fire Behaviour Potential rating categories within the FireSmart Community Zones and the overall FMA.
Means to Identify Target	Planning process, wildfire threat assessment
Legal/Policy Requirements	Planning Standard
Means of Achieving Objective and Target	Spatial harvest sequence, thinning, partial harvest techniques, prescribed burns
Monitoring and Measurement	AOPs, Compartment Assessments
Reporting Commitments	FMP: Maps and Tables of indicator at 0, 10, 20, and 50 years Performance: 5-Year DFMP Stewardship Report
Acceptable Variance	Issue specific
Response	Adjust strategies in subsequent DFMP
HWP Strategy	Reduce the fire risk in the communities on or adjacent to the FMA with FireSmart zones by reducing, through harvesting, the highest risk forest stands in these zones by at least 5% over the 20 years Spatial Harvest Sequence (SHS).

1.0 Target #38

Wildfire risk around communities is directly related to the amount, type, and density of forest cover surrounding the community. The objective of this VOIT is to reduce wildfire threat potential by reducing, through harvesting, the forest stands that have the highest fire behaviour potential rating.

Definitions

A. High, very high, or extreme Fire Risk Stands – In HWP's landbase, there are four FireSmart zones. Within these FireSmart zones, any white spruce, black spruce or pine polygon with a stand age greater than 60 and density of C or D was defined as a high risk or greater.

Overview and Analysis

Table 76 below describes the four FireSmart zones in the Hinton FMA and the total hectares of High Fire Risk stands within these zones.

Table 76 – Summary of Current High Fire Risk Area in FireSmart Zones on the Hinton FMA

FSID	Fire Smart Zone	High Fire Risk (hectares)			
		Sw	Pl	Sb	Total
33	Hinton/Carlsdale	6,889	4,113	118	11,121
34	Marlboro/Wapiti Ridge	13	64	7	84
36	Robb/Mercoal	137	11,565	92	11,794
38	Cadomin	232	3,891	-	4,123
Total		**7,271**	**19,634**	**217**	**27,122**

2.0 Report – Target #38 (% reduction in high fire behaviour potential area)

Table 77 on the following page describes the current status (Year 0 – 2012) of High, Very High, and Extreme Fire Risk stands in each of the four FireSmart zones, and then compares Year 0 to Year 10, 20, and 50. The target is to reduce the High Fire Risk stands by 5% over the 20 year SHS (October 2014 version).

This target will be reported on summarized every five years in the DFMP Stewardship Report.

Table 77 – Percentage Reduction in Fire Risk Over Time in FireSmart Zones

Year	Fire Smart Zone	High, very high or extreme Fire Risk (hectares)			
		Sw	Pl	Sb	Total
Year 0 (2012)	Hinton/Carlsdale	6,889	4,113	118	11,121
	Marlboro/Wapiti Ridge	13	64	7	84
	Robb/Mercoal	137	11,565	92	11,794
	Cadomin	232	3,891	-	4,123
	Total (ha)	7,271	19,634	217	27,122
Year 10	Hinton/Carlsdale	6248	1982	102	8332
	Marlboro/Wapiti Ridge	13	62	7	82
	Robb/Mercoal	119	2746	55	2920
	Cadomin	230	3051	0	3281
	Total (ha)	6610	7841	164	14615
	Percent Reduction (%)	9.1%	60.1%	24.4%	46.1%
Year 20	Hinton/Carlsdale	6067	1450	100	7617
	Marlboro/Wapiti Ridge	10	25	7	42
	Robb/Mercoal	119	1881	53	2053
	Cadomin	230	3018	0	3248
	Total (ha)	6426	6374	160	12960
	Percent Reduction (%)	11.6%	67.5%	26.3%	52.2%
Year 50	Hinton/Carlsdale	1202	329	7	1538
	Marlboro/Wapiti Ridge	1	3	0.5	4.5
	Robb/Mercoal	28	889	12	929
	Cadomin	61	691	0	752
	Total (ha)	1292	1912	19.5	3223.5
	Percent Reduction (%)	82.2%	90.3%	91.0%	88.1%

Table 78 summarizes the reduction in high, very high or extreme fire risk (through the harvesting of these timber types) for the entire DFA regardless of species.

Table 78 – Reduction in Fire Risk Over Time on FMA

Year	High, very high or extreme Fire Risk (hectares)	Percent Reduction
Year 0 (2012)	198,574.0	n/a
Year 10	149,460.0	24.7%
Year 20	115,301.0	41.9%
Year 50	21318.5	89.3%

TARGET #39, #40 & #41 – Participate in the Decision Making Process

Value	Provide opportunities to derive benefits and participate in use and management
Objective	Ensure land use management and planning processes include timely, fair, open and equitable public involvement
Indicator	Activities that allow interested parties to participate in the decision making process
TARGET #39	Conduct three open houses annually to provide opportunities for the public to review plans, provide feedback, and ask questions about Hinton Wood Products' sustainable forest management practices.
TARGET #40	Annually, report publicly on FRAG's activities.
TARGET #41	Annually publicly solicit new membership groups/organizations not already represented.
Means to Identify Target	Provide adequate opportunities for the public to provide HWP with timely, fair, open and equitable public involvement.
Legal/Policy Requirements	No legal requirement – best management practice.
Means of Achieving Objective and Target	Implement the Target
Monitoring and Measurement	Report annually in the SFM Stewardship Report – adjust or revise Target as required.
Reporting Commitments	Annually in HWP's Stewardship Report and every 5 years in the DFMP Stewardship Report.
Acceptable Variance	+/- One open house (Grande Cache is optional). No acceptable variance on Target's #40 and #41.
Response	Adjust activities
HWP Strategy	Target #39 – Hold an open house in Edson, Hinton, and Grande Cache (optional) annually in the winter (before the submission of our AOP and GDP). Hold these open houses in venues that naturally have significant numbers of people (e.g. malls, recreation centres, etc.). The main tactic for notifying people of the open house will be through advertising in the local newspapers and through letters to important stakeholders (e.g. trappers, etc.). Target #40 – A report will be published in the local newspaper (Hinton Parklander or Hinton Voice). This report outlines: who FRAG is, what their mandate is, what they have done in the previous year, and how to join FRAG if a member of the public is interested in doing so. Target #41 – The annual FRAG report to the community (a notice in the local newspaper) outlines how the public can apply to join FRAG.

1.0 Target #39, #40, and #41

A key component of sustainable forest management is public involvement. The public is ultimately the owner of the forest and therefore must be given the opportunity to participate in its management. The objective of this VOIT is to ensure that the public has the opportunity to participate in the planning processes in a timely, fair, open and equitable manner.

Definitions

A. Open Houses – These are public open houses hosted by Hinton Wood Products each year (usually in March). They are normally held in Hinton and Edson (and sometimes Grande Cache) at easily accessed venues such as the shopping mall in Hinton and Grande Cache and the Recreation Complex in Edson. At the open house, copies of Stewardship Report, GDP Summary Document, HWP's herbicide plans, and general information about the Woodlands Department will be available for the public to view and comment on.

B. Forest Resources Advisory Group (FRAG) – The Forest Resources Advisory Group was established in 1989 to provide organized and regular public input into the Company's Woodlands department planning and operations. FRAG is also established to select or respond to issues, consider and recommend actions and policies to Hinton Wood Products. FRAG is HWP's main avenue for public participation and feedback. The Group is made up of various stakeholders including those that represent landbases that are adjacent or within our FMA

Overview and Analysis

HWP has held open houses for over 15 years. Open houses are generally held in Hinton and Edson (and sometimes Grande Cache), but the Company has held open houses in other local communities when the need arises (e.g. when harvesting plans more directly affect those communities). For example, the Company has previously held open houses in the communities of Brule, Robb and Cadomin. The need for additional open houses will be dealt with on a case by case basis.

HWP has publicly reported on FRAG's activities since the year 2000. This is done by putting a notice in the local newspaper that explains who the group is and outlines the group's activities for the past year. As part of this notice, there is also information about how the public can apply to join FRAG.

2.0 Report – Target #39 (Open Houses)

There is no DFMP report for this Target, and because it is a management activity target, there is also no forecast. Open Houses will be reported on annually in HWP's Stewardship Report and summarized every five years in the DFMP Stewardship Report.

3.0 Report – Target #40 (Report on FRAG's activities)

There is no DFMP report for this Target, and because it is a management activity target, there is also no forecast. This Target will be considered met if a notice is placed annually in a local newspaper that summarizes FRAG's activities for the year.

4.0 Report – Target #41 (Solicit membership)

There is no DFMP report for this Target, and because it is a management activity target, there is also no forecast. This Target will be considered met if a notice is placed annually in a local newspaper that provides information on the public can participate in or join FRAG. A summary of new FRAG membership will be reported on annually in HWP's Stewardship Report and summarized every five years in the DFMP Stewardship Report.

TARGET #42 – Regenerated Stand Yield Compared to Natural Stand Yield

Value	Forest Productivity
Objective	Maintain Long Run Sustained Yield Average
Indicator	Regenerated stand yield compared to natural stand yield
TARGET #42	Average regenerated stand yield is greater than or equal to average natural stand yield.
Means to Identify Target	HWP's Permanent Sample Plot program and regeneration surveys
Legal/Policy Requirements	GoA Planning Standard
Means of Achieving Objective and Target	Continue to collect data in HWP's PSP plot program, as well as monitor and measure growth & yield performance through HWP's Regeneration Standards of Alberta (RSA) program.
Monitoring and Measurement	Monitoring will be carried out primarily through PGS plots in regenerating and natural stands and through HWP's Regeneration Standards of Alberta (RSA) program.
Reporting Commitments	Annually in HWP's Stewardship Report and every 5 years in the DFMP Stewardship Report.
Acceptable Variance	None - report annually.
Response	As per Forest Management Agreement and GoA directives
HWP Strategy	The primary strategy to meet this Target is to continue to collect data in HWP's PSP plot program, as well as monitor and measure growth and yield performance through HWP's Regeneration Standards of Alberta (RSA) program. If yield is not meeting or exceeding natural stand (fire-origin) yield then there may be impacts to HWP's AAC – this provides the incentive to ensure (through adequate tending activities) that regenerated yield does not fall below natural stand yield.

1.0 Target #42

Fire-origin stands (so called because they originated naturally after a forest fire) and stands that are regenerated by humans after they have been harvested may have different stand yields (defined as a growth rate per hectare). Typically, stands that are regenerated after harvesting have a higher yield (or growth rate) than fire-origin stands, simply because they are tended by forest managers. The intent of this VOIT is to measure both the growth rate (yield) in regenerated (managed) stands and natural (unmanaged) stands, and to ensure that the average yield in regenerated stands is greater or equal to the average yield in fire-origin stands.

Definitions

A. Stand Yield – The stand yield is the merchantable volume and is typically expressed as cubic metres of growth per hectare (m^3/ha/year).

B. Reforestation Standard of Alberta (RSA) – The RSA are relatively new regeneration standards (2009) that better tie regeneration performance to projected growth and yield of the stand(s), and therefore lead to better Annual Allowable Cut (AAC) projections. The intent of the RSA is to link the performance of regenerated cutblocks to AAC. This is done by comparing performance survey results to target growth & yield for each species class as set out in the DFMP. When performance surveys are compared to target yield in the DFMP and they aren't met – this may affect the future AAC for those stand types.

Overview and Analysis

Forest growth expectations are defined as part of the AAC determination process in the DFMP. Typically, the forest area is stratified into many similar forest types (e.g. pure pine, mixed-wood stands, etc.). Each of these groups has a distinct growth assumption, often illustrated in graphical form and referred to as a "yield curve". The mean annual increment for a given stratum is calculated by dividing yield (m^3/ha) by the age (years) at which the yield is achieved. Mean annual increment (m^3/ha/year) is a common measure of forest productivity. Yield curves are derived from point sample data or through the use of forest growth models. HWP has a well-established grid of Permanent Growth Sample (PGS) plots on the FMA which have decades of growth measurements. These plots have been the primary source of data for the development of the Hinton FMA yield curves and associated mean annual increment (MAI).

Regeneration survey data that is collected as set out in the RSA, and used in combination with forest growth computer models, provide an estimate of MAI for the regenerating forest stands. These assessments will be compiled annually. Every five years, the mean annual increment values will be compared against yield assumptions included in the forest management plan.

2.0 Report – Target #42 (Regenerated stand yield compared to natural stand yield)

There is no forecast for this indicator. The results for the areas surveyed from 2009 to 2012 are as shown below in Table 79. The data in this table shows that the MAI from survey is greater than the fire-origin. A new target has been set based on an analysis of these measurements, as described in Appendix 20 in the Yield Curve document.

Table 79 – Forest Growth Forecast

	Fire Origin			Regenerating				
Yield Class	Fire Origin Mean Annual Increment (m^3/ha/year)			Regenerating Mean Annual Increment (from survey data)			Target Mean Annual Increment (15/10/30 utilization standard)	
	Area (ha)	Conifer	Deciduous	Area (ha)	Conifer	Deciduous	Conifer	Deciduous
Aw	47,881	0.66	1.76	2,476	0.66	1.75	0.66	1.75
Hw/Pl	24,082	1.28	0.91	1,120	2.73	0.89	2.68	0.85
Hw/Sw	23,748	1.50	0.53	1,467	2.57	1.00	2.53	1.00
Sw/Hw	21,092	1.50	0.53	3,030	2.57	1.00	2.53	1.00
Pl/Hw	40,125	1.28	0.91	2,848	2.73	0.89	2.68	0.85
Sb/Hw	487	1.50	0.53	11	2.57	1.00	2.53	1.00
Sw	81,215	1.55	0.08	18,012	2.92	0.55	2.87	0.55
Pl	306,038	1.92	0.08	84,683	3.35	0.35	3.30	0.35
Sb	3,816	1.24	0.00	306	2.33	0.00	2.30	0.00
Total Area	**548,483**			**113,952**				

TARGET #43 & #44 – Aboriginal Consultative Activities

Value	Respect for Aboriginal and treaty rights & Aboriginal consultation
Objective	Respect and accommodate the special and unique rights and needs of aboriginal peoples in forest management decisions.
Indicator	Aboriginal Consultative Activities
TARGET #43	Annually conduct consultative activities as required under Alberta's "First Nations Consultation Guidelines on Land Management and Resource Development" and as directed by Alberta annually as part of the HWP's GDP submission and as outlined in approved HWP Aboriginal Consultation Plans.
TARGET #44	Hinton Wood Products may also conduct consultative activities voluntarily with other local Aboriginal communities.
Means to Identify Target	Decisions in forest management must respect the spiritual, economic, and cultural interests of Aboriginal peoples.
Legal/Policy Requirements	GoA Planning Standard & Aboriginal Consultation Guidelines
Means of Achieving Objective and Target	Implement HWP's GoA-approved Aboriginal Consultation Program.
Monitoring and Measurement	All consultative activities are documented and stored on site. Aboriginal consultation is summarized and provided to the GoA as required.
Reporting Commitments	Reported on annually in the GDP. Voluntary consultation will be documented in HWP's Public Involvement Plan (see Appendix 3b) in this DFMP and records will also be keep internally by HWP
Acceptable Variance	Target #43 – None; report annually Target #44 – Report annually
Response	Adjust consultation activities where required or as directed
HWP Strategy	Implement approved consultative plans

1.0 Target #43 and #44

Aboriginal consultative activities refers to dialogue with Aboriginal persons regarding the impacts of HWP activities on traditional uses and rights. Consultative activities involves dialogue and exchange of views with the intent to understand and influence each other but does not necessarily require or imply consent being given. Aboriginal consultation is ultimately the responsibility of the provincial government; however, some of the government's requirement to consult is delegated to other stakeholders such as HWP. The provincial government has prepared a document called "Alberta's First Nations Consultation Guidelines on Land Management and Resource Development", which outlines what consultative activities are currently required by industry – provincial consultative requirements and direction may change over the term of this DFMP.

Overview and Analysis

With respect to this DFMP, HWP was required by the provincial government to consult with the following First Nations (or equivalent) – Alexis Nakota Sioux Nation, Aseniwuche Winewak Nation, Ermineskin Tribe, and the O'Chiese First Nation. HWP has an approved Aboriginal Consultation Plan (Appendix 4a) associated with the submission of this DFMP.

With respect to HWP's General Development Plan (GDP), HWP is required to consult annually with the following First Nations (or equivalent) – Alexis Nakota Sioux Nation, Aseniwuche Winewak Nation, Ermineskin Tribe, and the O'Chiese First Nation.

HWP may also voluntarily undertake additional consultative activities on the DFMP or GDP with other Aboriginal communities (i.e. in addition to the four required by the GoA mentioned above). Currently, HWP also regularly seeks feedback from three other Aboriginal communities on a voluntary basis – these communities are the Nakcowinewak Nation, the Foothills Ojibway, and the Mountain Cree. Consultation with other Aboriginal communities (e.g. communities not recognized as First Nations by Alberta) is documented and recorded as part of HWP's Public Involvement Program (see Appendix 3a and Appendix 3b)

2.0 Report – Target #43 and #44 (Aboriginal consultative activities)

All interaction (i.e. field trips, meetings, phone calls, etc.) between HWP and any Aboriginal community are documented – records are kept and stored at HWP's Woodlands Office. A record of the consultation for this DFMP can be found in Appendix 4b.

TARGET #45 – Consultation Opportunity and Participation

Value	Meaningful public involvement is achieved
Objective	Implement public involvement program ensuring broad participation of interested parties in forest management decision-making processes.
Indicator	Consultation Opportunity and Participation
TARGET #45	Develop, implement, monitor, and report on a public participation process that meets the requirements of CSA Z809-02 Standard.
Means to Identify Target	Offering the opportunity for the public to provide input and feedback is a cornerstone of SFM and provides a measure of how seriously the HWP values input from other sources
Legal/Policy Requirements	GoA Planning Standard
Means of Achieving Objective and Target	Implement the public participation process outlined in this document.
Monitoring and Measurement	Offering the opportunity for the public to provide input and feedback is a cornerstone of SFM and provides a measure of how seriously the HWP values input from other sources
Reporting Commitments	Reported on annually in HWP's Stewardship Report and every 5 years in the DFMP Stewardship Report.
Acceptable Variance	1. None - report annually
Response	Adjust activities
HWP Strategy	Continue to implement HWP's public participation process as described in the "Overview and Analysis" section below.

1.0 Target #45

A strong public participation process is a vital component of sustainable forest management in Canada. Involvement of interested parties is the best way to ensure that the broad views of society and the local communities are recognized and addressed.

The Company's public involvement program is multi-faceted and includes communication components such as newspaper advertisements, interactive components such as our recreation program, and open houses, as well as a multi-stakeholder consensus-based decision making process called the Forest Resources Advisory Group (FRAG).

HWP is committed to integrating public values into our management activities. The goals of the Public Involvement Program are as follows:

- To give the public an opportunity to become proactively involved in the management of FMA.
- Use the public participation process to help improve the HWP's DFMP.
- To provide awareness regarding the opportunity for interested parties to participate in forest management decision making – this could take place through a local public advisory group member or by direct communication with HWP.
- Collect, consider and respond to all input provided by interested parties.
- To increase general awareness and understanding of sustainable forest management.

Definitions

A. Consultation opportunity – A consultation opportunity is any opportunity provided to the public that allows them input into HWP's forest management activities.

B. Consultation participation – Consultation participation is defined as the participation by the public in forest management issues.

Overview and Analysis

HWP has established a public participation process that meets the requirements of CSA Z809-02 Standard. This process is referred to as HWP's public involvement program and it promotes dialogue between the public and HWP staff and has provided valuable input into the development of this DFMP. The main elements of HWP's public involvement program are outlined below:

1. Forest Resources Advisory Group (FRAG) – The Forest Resources Advisory Group was established to provide organized and regular public input into the Company's Woodlands department planning and operations. FRAG is also established to select or respond to issues, consider and recommend actions and policies to HWP. FRAG is the main avenue for public participation as required and outlined in the CAN/CSA Z809-02 standard. FRAG agreed to a set of Basic Operating Rules, which can be supplied on request. FRAG is made up of various stakeholders including those that represent landbases that are adjacent or within our FMA. At the end of 2013, FRAG has representation from the following stakeholders (this membership list is subject to change, and changes from year to year):

   - Hinton & District Chamber of Commerce
   - United Steel Workers
   - Hinton Ministerial Association
   - Coal Association of Canada
   - Town of Hinton
   - Alberta Trapper's Association
   - Friends of Switzer Park
   - Communications, Energy and Paperworker's Union of Canada
   - Whisky-Jack Bird Club
   - Fox Creek Development Association
   - Robb Hamlet Preservation Association
   - Athabasca Watershed Council
   - Hinton Historical Society Hinton Historical Society
   - Hinton Fish & Game Association
   - Hinton All-Terrain Vehicle Society

   There are also a number of agencies that sit on FRAG and act in an advisory role (i.e. they are non-voting members). These are:

   - Foothills Research Institute
   - Government of Alberta
   - Coalspur Mines

   HWP has publicly reported on FRAG's activities since the year 2000. This is done by putting a notice in the local newspaper that explains who the group is and outlines the group's activities for the past year. FRAG has annually solicited for new membership since 2005.

2. Letters to Stakeholders (DFMP) – HWP has developed a list of stakeholders that may have an interest in participating in the development of VOITs for this DFMP. Letters were sent to each person or organization on the list describing in plain language the major elements of the DFMP and noting the ability to be involved in the development of the identification of values, objectives, indicators, and targets (VOITs) included as part of that plan. The letter also contained information on how they could participate in that process.
3. Letter to Stakeholders (GDP) – The Company annually sends letters to the same stakeholder list advising them of the submission of our General Development Plan (GDP), which includes a plain language description of the GDP, including maps, major non-timber value strategies, cut control reporting, and contact information for questions or concerns. In this letter, HWP also invites the stakeholders to attend HWP's annual Open Houses (see Target #43) to further discuss the contents of the GDP or any other concerns or questions.
4. Annual Open Houses – Copies of approved Forest Harvest Plans, and general information about the Woodlands Department is available for the public to view and comment on. These open houses are an opportunity for the public to provide input into the planning process, ask questions of staff, or look at detailed maps of current and/or planning development. Stakeholders are invited to open houses by letters, while the general public is notified via ads in the local papers.
5. Aboriginal Consultation Process – HWP follows Alberta First Nation consultation guidelines. In 2013, HWP developed and Alberta approved an Aboriginal Consultation Plan for the development of this DFMP (see Target #43 and #44 and Appendix 4a).
6. Public Notification of the Initiation of the Compartment Planning Process – When HWP initiates planning in a new compartment, or when 2nd or 3rd pass planning is beginning in a compartment, advertisements seeking public input are placed in local newspapers. The advertisement contains a map of the area being planned and the scheduled date for plan completion. The public is solicited to provide local knowledge of terrain and resources, resource use patterns and timing, inter-resource conflicts of which they are aware, preferences, and opinions.

7. 1-800 Number – HWP provides a toll free telephone (1-800-293-6955) number – all contacts received are responded to and tracked. This toll-free telephone line is staffed during office hours and has voice recording during all other hours. Any complaints, comments, questions, or suggestions will be forwarded to the appropriate person and promptly dealt with. HWP has made a commitment to track all inquiries on this telephone line in writing and, wherever feasible, respond within 24 hours.
8. Recreation Program – The Company strongly believes that providing the public with opportunities to recreate on the FMA in a safe, affordable, and enjoyable environment, although not required by the provincial government, is part of our mandate as forest stewards of this land. HWP, as part of our participation in the Foothills Recreation Management Association (FRMA) currently manages 24 recreation sites (16 campgrounds and 8 multi-purpose trails) under FRMA's recreation program (see section 4.6.5). We continue to use opportunities within our recreation program, such as kiosks, interpretive trails, and trail maps, to inform and educate the public about our sustainable forest management practices.
9. GDP Summary Document – The GDP Summary Document provides an overview of the General Development Plan. This document is intended to provide a simple overview of the general areas the Company plans on developing during the upcoming operating year (May to April), as well as showing areas where approval has already occurred. The document is given out at the open houses held in the spring and send to our stakeholder list and our Aboriginal communities.
10. DFMP Summary Document – As part of the development of this 2014 DFMP, HWP produced a DFMP Summary Document, which has been distributed to stakeholders, Aboriginal communities, and available at our open houses. This Summary Document provides an overview of the DFMP and the planning process in general. It contains a summary of the main components of DFMP, including the landbase determination, the Annual Allowable Cut calculation, the 20-year Spatial Harvest Sequence, and the VOIT (Values, Objectives, Indicators and Targets) process. It also contains a description of the numerous ways that the public can have direct input into HWP's operations. DFMP Summary Documents were prepared and distributed in 2012, 2013, and 2014.

2.0 Report – Target #45 (Consultation Opportunity and Participation)

The record of all the public consultation opportunities and participation can be found in Appendix 3b.

6.7 VOIT References

Andison D.W. 1996. Managing for Landscape Patterns in the Sub-Boreal Forests of British Columbia

Andison D.W. September 2003. Natural Disturbance Program Quicknote #22 – Surviving as (Surprise!) a Matrix Remnant

Andison D.W. November 2003. Disturbance Events on Foothills and Mountain Landscapes of Alberta. Part I. Alberta Foothills Disturbance Ecology Research Series; Report No. 5

Andison D.W. January, 2013. Wildfire Patterns in Western Boreal Canada, Healthy Landscapes Research Series Report No. 8

GoA. 2013. https://aesrd.wordpress.com/tag/alberta-tree-improvement-and-seed-centre-atisc/ accessed 25 May 2014

ASRD (Alberta Sustainable Resource Development).2009a. Alberta Forest Genetic Resource Management and Conservation Standards. Alberta Sustainable Resource Development. Pub No. T/213. June 30, 2009. 122pp.

ASRD (Alberta Sustainable Resource Development).2009b. Gene Conservation Plan for Native Trees of Alberta. Working Group on Native Tree Gene Conservation in Alberta (Alberta Sustainable Resource Development and Alberta Tourism, Parks and Recreation). Pub No. T/141. 108pp.

Beckingam, J.D., I.G.W. Corns, and J.H. Archibald. 1996. Field Guide to Ecosites of West-Central Alberta. Natural Resources Canada, Canadian Forest Service, Northwest Region, Northern Forestry Centre, Edmonton, AB. Special Report 9.

Lofroth, Eric. 1998. The dead wood cycle. In: Conservation biology principles for forested landscapes. Edited by J. Voller and S. Harrison. UBC Press, Vancouver, B.C. pp. 185-214. 243 p.

BC Chief Forester Guidance. 2010. Coarse Wood Debris – EBM approach.

BC Ministry of Forest. March 2002. Stand Level Biodiversity – web based training course. (http://www.for.gov.bc.ca/hfp/training/00001/index.htm)

Golder Associates Ltd. 1999. Strategic Planning Tools for Hydrologic Resources Phase 2 Study.

McCleary, R.J. 2011. Landscape organization based on application of the process domain concept for a glaciated foothills region. PhD thesis. University of British Columbia. Vancouver, B.C. https://circle.ubc.ca/bitstream/handle/2429/32154/ubc_2011_spring_mccleary_richard.pdf?sequence=1 (Accessed June 14, 2012).

McCleary, R.J, Haslett S. and Christie, K. Nov 2012. Field Manual for Erosion-Based Channel Classification Version 7.0, Fish and Watershed Program, Foothills Research Institute.

NatureServe Explorer: URL downloaded on October 28, 2007. http://www.natureserve.org/explorer/

Silnis, Uldis. 2003. Centre for Enhanced Forest Management. Advances in Forest Research. Department of Renewable Research (UoA). An integrated forest-watershed planning an assessment model: “ECA-Alberta”. Research Note 07/2003.

7.0 PREFERRED FOREST MANAGEMENT STRATEGY

7.1 Net Landbase Determination

Landbase technical document is in Appendix 19.

7.2 Yield Curve Development

Yield Curve Technical Document is in Appendix 20.

7.3 Silviculture Assumptions and Strategies

7.3.1 Introduction

The Alberta Forest Management Planning Standard requires, as a component of the FMP Standard, a detailed description of the reforestation commitment to achieving the proposed regenerated yield trajectories operationally. This usually translates into those activities applied to a regenerating stand that achieves crop tree survival, suitable productivity and meets the proposed forest structure intended, within the Reforestation Phase period. The commitment described in this DFMP takes the form of a description and justification of the reforestation program and a reforestation strategy table referred to as the Silviculture Matrix (Table 85). The reforestation objectives are:

- The establishment and survival of a productive forest on the cutblock opening
- Creating the forest structure proposed, by species, proportion, density and distribution
- Meeting or exceeding the productivity trajectory proposed in the regenerated yield projection

7.3.2 Natural Subregions

The HWP FMA area includes six Natural Sub-regions. They are described in the Landscape Assessment in section 4.1.4. Silvicultural prescriptions are created based on the moisture and nutrient regimes which exist in each of the Natural Sub-regions that form part of the active landbase. Areas are distributed as shown in Table 80 below.

Table 80 – Natural Sub-regions on the HWP FMA Area

Name	Total Area (ha)	Percent of FMU
(NA)	16,787.4	1.6%
Sub-Alpine	147,089.5	14.4%
Montane	22,379.5	2.2%
Upper Foothills	529,683.3	51.8%
Lower Foothills	306,525.7	30.0%
Total	**1,022,465.4**	**100.0%**

7.3.3 Approved Tree Species

Development of the landbase as well as all growth and yield modeling has been based on nine of the 10 Provincial base strata. Douglas fir does not occur in any measurable amount on the HWP FMA area, so Stratum X has not been used. Details are described in Appendix 19 (Landbase) and Appendix 20 (Yield Curves).

7.3.4 Seed Zones

The seed plan (Table 81) shows all seed in inventory with germination greater than 80% (stratified) as of September 2015. To calculate the amount of seed required, the spatial harvest sequence was intersected with the landbase to determine the areas of each stratum by seed zone. Areas that are in the SHS but have been harvested and planted since 2012 were subtracted. The number of seedlings required was based on the resulting areas and some assumptions:

- 30% of the deciduous-leading mixedwood area will be planted at 1,800 stems per hectare
- 70% of the coniferous-leading mixedwood area will be planted at 1,800 stems per hectare
- 40% of the pine stratum will be planted at 1,000 stems per hectare
- 40% of the pine stratum will be planted at 1,800 stems per hectare
- 20% of the pine stratum will be Scarified for Natural regeneration
- 100% of the Sw and Sb strata will be planted at 1,800 stems per hectare

Table 81 – Seed Plan

Seed Zone or CPP Region	Seed Inventory > 80% (as of Oct 15/2015) (kg)			SHS Seedlings required*			SHS Seed Required (kg)			Shortfall of Seed kg		
	PL	Sw	SB	PL	Sw	SB	PL	Sw	SB	PL	Sw	SB
LF 1.5	13.3	0.0	0.0	115,513	168,688	5,058	1.2	1.3	0.0	12.1	(1.3)	0.0
LF 2.1	240.4	380.4	0.0	19,743,668	5,579,811	490,338	197.4	44.6	1.2	43.0	335.8	(1.2)
M 3.2	6.1	21.4	0.0	395,110	74,647	1,584	4.0	0.6	0.0	2.1	20.8	0.0
SA 1.1	61.5	53.5	0.0	3,265,188	2,208,342	36,835	32.7	17.7	0.1	28.8	35.8	0.1
SA 1.2	67.4	51.2	0.2	3,708,551	84,316	887	37.1	0.7	0.0	30.3	50.5	0.2
SA 2.1	0.0	0.0	0.0	15,413	205,123	-	0.2	1.6	0.0	(0.2)	(1.6)	0.0
UF 1.2	270.5	122.6	0.1	9,135,224	3,795,946	460,286	91.4	30.4	1.2	179.1	92.2	(1.1)
UF 1.3	459.8	231.4	0.7	11,584,368	1,677,365	54,820	115.8	13.4	0.1	344.0	218.0	0.6
UF 1.4	421.7	298.1	0.1	29,284,789	3,634,304	252,499	292.8	29.1	0.6	128.9	269.0	(0.5)
A- Low elevation Pl	7.1									7.1		
B1- Low elevation Pl	1.2									1.2		
B2- High elevation Pl	3.3									3.3		
I- Low elevation Sw		89.4									89.4	
L1-Low elevation Sb			3.6									3.6

* less seedlings planted from 2012 to 2015

Table 81 shows current shortfalls (). The following lists our plans or strategy to address shortfalls:

- (1.3) kg for white spruce LF 1.5; will collect at next best spruce cone crop or use Region I improved seed which we have in Inventory in.
- (1.2) kg of black spruce in LF2.1. We have abundant orchard seed from the G802 and G806 orchards which we can deploy up to 1200 metres.
- (0.2) kg of Pine and (1.6) Sw/Se in SA2.1. We will collect such seed as needed once we access that compartment in the Spatial Harvest sequence. The B2 high elevation pine improved seed may be suitable for deployment depending on the elevation as per the Alberta Standards (FGRMS).
- (1.1) kg black spruce in UF 1.2 and (0.5) kg shortfall in UF1.4 will be partially addressed with improved seed from the G802 and G806 orchards up to 1200m. We plan on collecting more black spruce over the next 3 years at higher elevation crop and insect and disease dependent.

7.3.5 Improved Stock

Hinton Wood Products has produced improved seed, or has access to seed in its inventory, in the Controlled Parentage Program regions as described in Table 82.

Table 82 – Improved Seed

Species	CPP Region	Orchard codes	Approved operational elevations (metres) as of May 1,2013
Lodgepole Pine	Region A	WWG801 (Presslee)	1050 -1350
Lodgepole Pine	Region B2	HASOCIG303	1200-1600
Lodgepole Pine	Region B1	G147 orchard	800-1200 (north of the Athabasca River Only
White Spruce	Region I	HASOCIG333	800-1200
Black Spruce	Region L1	WWG802 (Lanaria)or WWG806 (Presslee)	800-1200

The Region L1 black spruce program does not have a genetic gain associated with it but could over time as test sites were established with this program. For the purpose of this Timber Supply Analysis and tracking, the seedlots from the G802 and G806 orchards are not considered “improved”

7.3.6 Deployment Strategy of Improved Stock

The most effective deployment that allows the capture of genetic gain associated with orchard seedlots is to deploy in regenerated stands where not much ingress is expected. For this reason, those blocks or parts of blocks, that have been identified through our prescriptions with a reforestation tactic of "Site Prepared and Planted" (SPP) or "Direct Planting" (P) are the most suitable for deployment of improved seed. Improved orchard seedlots will have a spatial shape linked in Cengea (TFM) with the seedlot to enable future regenerated yield analysis and RSA population assignment.

Deployment of improved stock or orchard origin stock within a Controlled Parentage Program (CPP) will be in accordance with the Silviculture Matrix (Table 85) and consistent with the Silviculture Strategy and Tactic of the appropriate the Operating Working Group (OWG) discussed under the "Prescription and Decision Making" section of this document (section 7.3.9). We will deploy our improved pine seedlots in areas with a reforestation tactic of site preparation and plant (SPP) or direct planning (P). We will prioritize pure species deployment for improve seed on the best sites with best standing opportunities. Because our pine orchards are under-producing, and because we rely heavily on natural ingress in openings that we "scarify for naturals" (SFN) and supplemental plant for areas of low cone load (SFN/P), we will continue to use wild seed in all of our silviculture tactics (including SPP). For ecologically suited prescribed species mixes (Sw/Pl), or to make use of nursery overruns, or for NSR fill-in planting, some improved stock may be deployed but may not be tracked as an enhanced strata population.

Our intent is to use improved seed for the all the low elevation spruce; that is, the Lower Foothills Natural Subregion and most of the Upper Foothills Natural Subregion less than 1200m or as enabled through the Alberta Standards (FGRMS). Where a harvested opening is intersected by a CPP region boundary, deployment of the CPP region stock will be in accordance with Alberta Standards (FGRMS) in the full opening as long as the highest or lowest elevation of the block or opening is within 50m of the CPP region elevation limits. A request for movement of seed or vegetative propagules out of the CPP region of origin will only be considered in emergencies by the Alberta Tree Improvement and Seed Centre. However, due to recent climate change modeling, some movement up in elevation may be requested in the future if scientific evidence indicates it is warranted.

7.3.7 Secondary Timber Species

There are no imbedded disposition holders within the HWP FMA area and the Company holds most of the coniferous and all of the deciduous volume allocations. While the TSA does model an even flow of deciduous volume over the next 200 years, the company's focus is on the production of coniferous fibre.

7.3.8 Transition Assumptions

It is the intent of HWP to balance the regenerating stand structure to the original stand structure assessed in the forest inventory supporting the TSA. It is assumed that regenerating stand composition will be quantitatively and compositionally the same as shown in the pre-harvest forest inventory.

7.3.9 Decision Process

Strategies for site preparation, establishing regeneration and stand tending interventions are chosen based on the ecosite(s) present in an opening. All of the Hinton FMA was ecologically classified as of 2002 with a heavy emphasis on ground verification. The Ecological Land Classification (ELC) information is a base layer to our Geographic Information System. Management interpretations have been developed by HWP over the years to provide guidance to staff and contractors in the development of Pre-Harvest Prescriptions (PHPs) and post-harvest Management Opportunity Surveys (MOS). Fundamental to the Management Interpretation implementation of this approach is the Operational Working Group (OWG), a collection of ecologically similar sites that are managed to a particular silviculture regime and objective and therefore, expected to respond similarly to treatment. Ten operational working groups are defined, ranging from the very dry, nutrient poor lichen OWG to the wet, nutrient rich horsetail OWG (Figure 106).

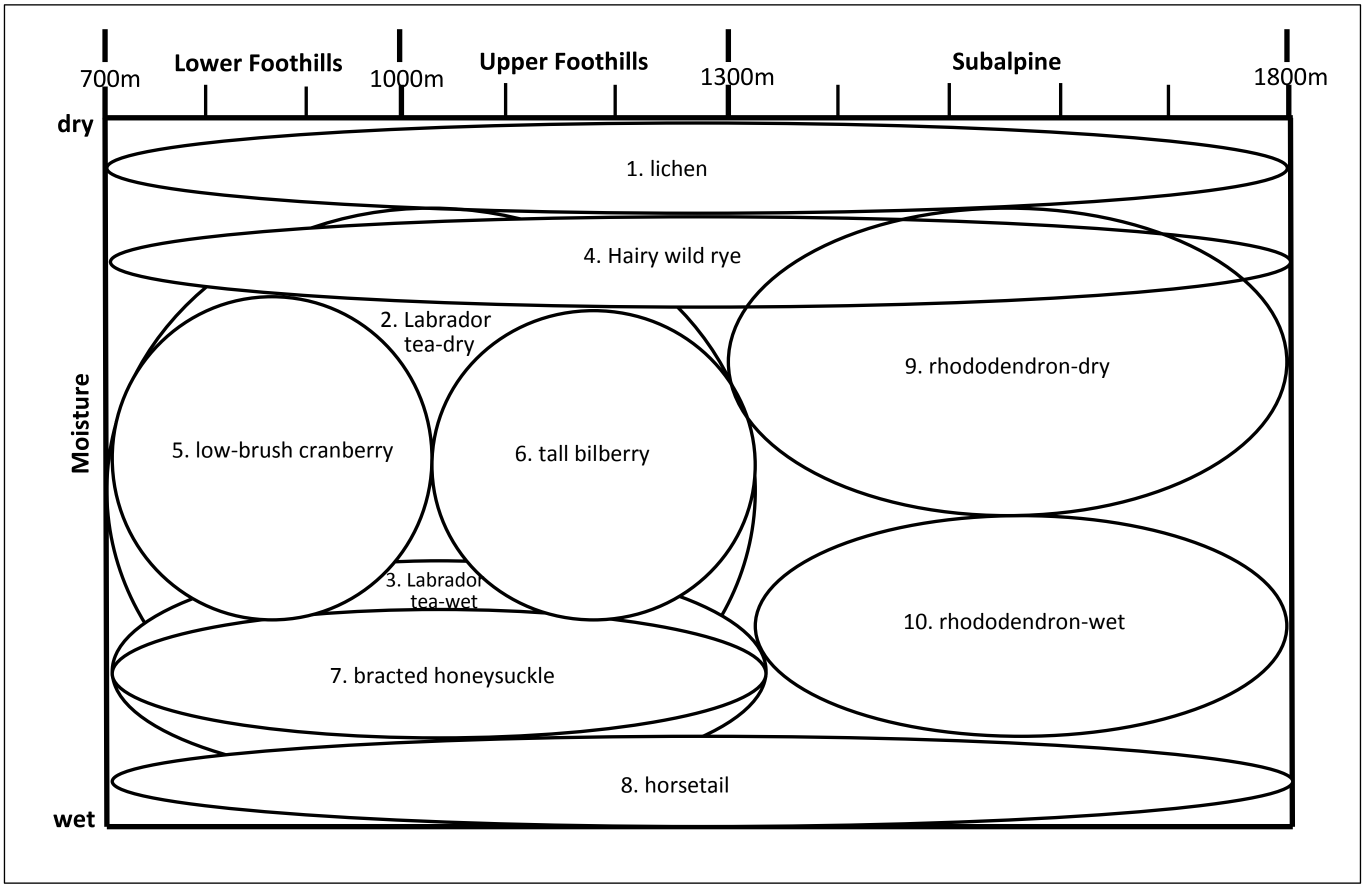


Figure 106 – Operational Working Groups on the HWP FMA Area

More detailed site information is used to refine Pre-Harvest Prescriptions and post-harvest activities as outlined in Table 83:

Table 83 – Detailed site information to refine PHPs and post-harvest activities

Parameter	Use
Edaphic conditions	• Predict harvest season. • Plan for road access/reclamation.
Ecosite	• Identify areas to avoid due to poor reforestation chance.
Ecosite and ecosite phase	• Project an average treatment regime for program planning. • Derive the tending liability component of regenerated stands by stratum.
Ecosite phase and community type	• Identify opportunities for retention and estimate deciduous component. • Derive likely regeneration stratum declaration and potential for swapping.
Operational conditions such as: slash load, cone load and distribution; access conditions, retention, depth and type of organic, expected vegetation complex, slope, aspect, other site limiting factors such as water features, rockiness etc.	• Refinement of the reforestation tactic (Scarify for Naturals-SFN, Planting –P, Site Preparation and Plant-SPP, Direct Plant-P, and a combination of SFN/P) • Site prep primary tool and timing of site preparation • Species, density and stock type selection for tree planting • Tending methods and timing

For Company use, Operating Working Groups with similar treatment regimes and expected responses to management intervention are summarized in Table 84. At post-harvest, a company silviculture forester conducts a Management Opportunity Survey (MOS) and makes a prescription for each treatment unit within an opening based on all parameters including operational conditions post-harvest. At this point in time, the Silviculture Tactic maybe modified by the Company to reflect site limitations.

Table 84 – Ecosite listing, silviculture strategy and tactic by Operating Working Group

OWG	Edatope	Ecosites	Silviculture Strategy	Silvi. Tactic*
OWG1	submesic-mesic/medium	LF c2, c3, c4; UF c2, c3, c4; SA c3, d1	CC; CC with retention	SFN/P
OWG2	mesic-submesic/medium	LF e2, e3, e4, e5; UF e2, e3, e4, e5; MN d1, d2; SA d2, d3	CC; CC with retention	SFN/P
OWG3	very dry-mesic/poor-medium	LF b1, c1, d1; UF b1, c1, d1; MN b2, c2; SA b1, c1, c2	CC; CC with retention	SFN/P
OWG4	submesic-mesic/medium	LF e1; UF e1	CC; CC with retention	SFN/P
OWG5	submesic/medium	MN b1, b3, b4, b5, c1, c3, c4, c5	CC; CC with retention	SPP
OWG6	subhygric/rich	LF f1, f2, f3, f4; UF f1, f2, f3, f4, f5; SA f1, f2	CC; CC with retention	SPP
OWG7	subhygric/poor	LF h1; UF h1	CC; CC with retention	SFN/P, SPP; P
OWG8	hygric/rich	LF i1, i2, i3, j1; UF i1, j1; MN f1, f2; SA g1	CC; CC with retention; Partial Cut	SPP,LFN-S,P,LFN-R

**Silviculture Tactic:* Initial silviculture tactic bases on opening level declaration after harvest; individual treatment units could differ.
SFN/P – Predominantly scarify for naturals with or without supplemental plant to account for poor coned load; or could use other site prep method and plant
SPP – Site preparation and plant
P – Direct plant with no site preparation
LFN-R – Leave for naturals for resuckering species; might do planting of roads and landings/ site prep, tending and planting could take place depending on reforestation phase success
LFN-S – Leave for naturals for seeding-in of seed bearing tree species such as spruce and balsam poplar

7.3.10 Understory Management Strategy

No pre-commercial thinning, commercial thinning, fertilization, under-planting, stand density management, pruning or drainage activities are planned at this time.

7.3.11 Enhanced Forest Management Strategies

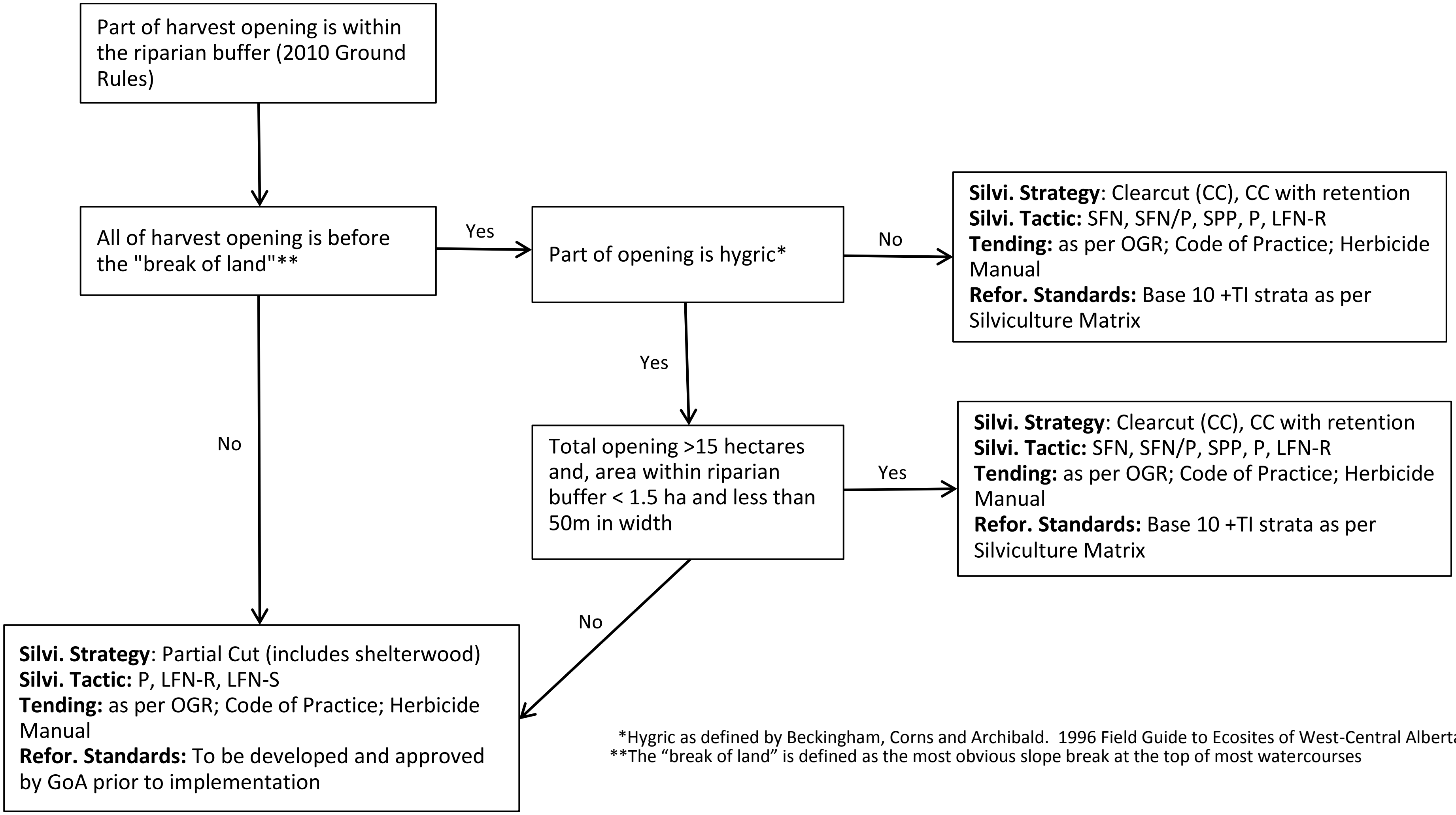
Some manual brushing and basal bark single stem applications will be completed, as required to meet strata objectives and to create appropriate species composition mixes prior to performance surveys. Aerial or backpack herbicide will take place following an on-site Competition Assessment as required to control herbaceous, deciduous tree and shrub competition. Brushing and herbicide that take place are used prior to performance surveys are not considered to be enhanced forest management. Those tending treatments are necessary interventions aimed at ensuring that regenerating stand composition will be quantitatively and compositionally the same as shown in the pre-harvest forest inventory.

As per the Silviculture Matrix in Table 85 and as per our Deployment Strategy of Improved Stock previously discussed in section 7.3.6, an Enhanced RSA yield curve will be assigned for improved stock that meet the following conditions:

1. The deployment of improved stock is with seedlots that has an approved Genetic Worth;
2. The deployment takes place on bare earth conditions (i.e. not fills, not replants, no other existing regeneration),
3. The deployment takes place on >70% of the opening.

7.3.12 Riparian Management Strategy Reforestation

Once HWP's Riparian Management Strategy is approved, the Company proposes a hierarchal approach to the reforestation strategy, tactic and reforestation standards. Figure 107 summarizes the silvicultural decision making process and is based on: whether part of the opening that would fall in a riparian buffer (according to 2010 OGR) is before or after the "break of land"; the size of the area within the break of land in relationship to the rest of the opening; and, whether the opening is in a "hygric" edatope according to the ecosite classification (OWG8 in Table 84). In general, the Company will employ a conventional reforestation strategy in all openings harvested as part of the Riparian Management Strategy; except in those cases where the opening is after the major slope break, is wet (hygric) and the area is greater than 1.5 hectares. The Company will not implement any partial cutting (other than on areas <1.5 ha not attached to openings greater than 15 hectares) until the appropriate Reforestation Standards have been approved by the GoA.



*Hygric as defined by Beckingham, Corns and Archibald. 1996 Field Guide to Ecosites of West-Central Alberta.
**The "break of land" is defined as the most obvious slope break at the top of most watercourses

Figure 107 – Flow chart of silviculture strategy, tactic, tending and Reforestation Standards for openings harvested a part of the Riparian Strategy

Table 85 – Silviculture Matrix

1	2	3	4	5	6	7	8	9	10
Regenerated Yield Trajectory	**Strata Standard**	**Transition Toward Climax**	**Species Proportions**	**Limitations to Crop Establishment**	**Silviculture System**	**Site Prep**	**Silviculture Tactic & Seedling Establishment (includes LFN)**	**Seedling Density (stems/ha)**	**Reforestation Stage Intervention**
Deciduous	D	No transition assumed	80% Deciduous	elevation, soil moisture, soil temperature, soil porosity & grass competition	clear cut; clear cut with retention	no site prep unless sucker response is poor; then could be mechanical or chemical	LFN - deciduous	3,000	chemical or mechanical stand tending; SPP or fill-in plant as required
Hardwood/Pine	DC	No transition assumed	50% Deciduous, 30% Pine Leading Coniferous	elevation, soil moisture, soil temperature, soil porosity, browsing & grass competition	clear cut; clear cut with retention	elevated microsite/mineral soil exposure, soil mixing, chemical, raw planting	SFN or planting pine; Planting white spruce or spruce/pine mixtures when ecologically suited; LFN deciduous	1,800	chemical or mechanical stand tending; SPP or fill-in plant as required
Hardwood/Spruce	DC	No transition assumed	50% Deciduous, 30% Spruce Leading Coniferous	elevation, soil moisture, soil temperature, soil porosity, winter desiccation & grass competition	clear cut; clear cut with retention	elevated microsite/mineral soil exposure, soil mixing, chemical, raw planting	LFN deciduous; Planting white spruce or pine/spruce mixtures when ecologically suited. Take advantage of understory where feasible.	1,800	chemical or mechanical stand tending; SPP or fill-in plant as required
White Spruce/Hardwood	CD	No transition assumed	50% White Spruce Leading Coniferous, 30% Deciduous	elevation, soil moisture, soil temperature, winter desiccation, soil type, grass & aspen competition	clear cut; clear cut with retention	elevated microsite/mineral soil exposure, soil mixing, chemical, raw planting	Planting white spruce, planting pine or pine/spruce mixture when ecologically suited; LFN deciduous	1,800	chemical or mechanical stand tending; SPP or fill-in plant as required
Pine/Hardwood	CD	No transition assumed	50% Pine Leading Coniferous, 30% Deciduous	grass & aspen competition, soil temperature, elevation, duff depth, winter desiccation, slope	clear cut; clear cut with retention	mineral soil exposure/elevated microsite, chemical, raw planting	SFN; Planting pine or planting pine/spruce mixtures when ecologically suited; LFN deciduous	1,800	chemical or mechanical stand tending; SPP or fill-in plant as required
Black Spruce/Hardwood	CD	No transition assumed	50% Black Spruce Leading Coniferous, 30% Deciduous	elevation, soil moisture, cold soils, winter desiccation, soil type, grass & aspen competition, cold air pondage	clear cut; clear cut with retention	elevated microsite/mineral soil exposure, soil mixing, chemical, raw planting	Plant black spruce; plant pine or plant pine/black spruce mixtures when ecologically suited; LFN deciduous	1,800	chemical or mechanical stand tending; SPP or fill-in plant as required
White Spruce pure or leading	C	No transition assumed	80% White Spruce Leading Coniferous	elevation, soil moisture, cold soils, winter desiccation, soil type, grass & aspen competition, slope	clear cut; clear cut with retention	elevated microsite/mineral soil exposure, soil mixing, chemical, raw planting	Planting white spruce, planting pine or pine/spruce mixture when ecologically suited; LFN deciduous	1,600	chemical or mechanical stand tending; SPP or fill-in plant as required
TI Improved Spruce or spruce leading	C	No transition assumed	80% White Spruce Leading Coniferous	elevation, soil moisture, cold soils, winter desiccation, soil type, grass & aspen competition, slope	clear cut; clear cut with retention	elevated microsite/mineral soil exposure, soil mixing, chemical, raw planting	SPP; P	1,800	chemical or mechanical stand tending; SPP or fill-in plant as required
Pine pure or leading	C	No transition assumed	80% Pine Leading Coniferous	grass & aspen competition, cold soils, elevation, duff depth, cone load and distribution, soil moisture, browsing, slope	clear cut; clear cut with retention	elevated microsite/mineral soil exposure, soil mixing, chemical, raw planting	SFN Pine or planting pine or pine/spruce mixtures when ecologically suited	1,800	chemical or mechanical stand tending; SPP or fill-in plant as required
TI2 Improved Pine or pine leading	C	No transition assumed	80% Pine Leading Coniferous	elevation, soil moisture, cold soils, winter desiccation, soil type, grass & aspen competition, slope	clear cut; clear cut with retention	elevated microsite/mineral soil exposure, soil mixing, chemical, raw planting	SPP; P	1,800	chemical or mechanical stand tending; SPP or fill-in plant as required
TI4 Improved Pine or pine leading	C	No transition assumed	80% Pine Leading Coniferous	elevation, soil moisture, cold soils, winter desiccation, soil type, grass & aspen competition, slope	clear cut; clear cut with retention	elevated microsite/mineral soil exposure, soil mixing, chemical, raw planting	SPP; P	1,800	chemical or mechanical stand tending; SPP or fill-in plant as required

1	2	3	4	5	6	7	8	9	10
Regenerated Yield Trajectory	**Strata Standard**	**Transition Toward Climax**	**Species Proportions**	**Limitations to Crop Establishment**	**Silviculture System**	**Site Prep**	**Silviculture Tactic & Seedling Establishment (includes LFN)**	**Seedling Density (stems/ha)**	**Reforestation Stage Intervention**
Black Spruce pure or leading	C	No transition assumed	80% Black Spruce Leading Coniferous	elevation, soil moisture, soil temperature, winter desiccation, cold air pondage, soil type, grass & aspen competition	clear cut; clear cut with retention	elevated microsite/mineral soil exposure, soil mixing, chemical, raw planting	Plant black spruce; Plant pine or plant pine/black spruce mixtures when ecologically suited	1,800	chemical or mechanical stand tending; SPP or fill-in plant as required
Roads and Landings				puddling, lack of organic, compaction	clear cut; clear cut with retention	road roll-back; SFN or SPP in conjunction with opening level treatments when needed; raw planting when suited	SFN, SPP; Raw planting of conifer		chemical or mechanical stand tending; SPP or fill-in plant as required

- **The Regenerated Yield Trajectory (column 1)** as approved in the TSA.
- **Broad Cover Groups (column 2)** C (pure coniferous), CD (mixedwood – conifer leading), DC (mixedwood – deciduous leading) and D (pure deciduous).
- **Transitions Toward Climax (column 3)** whether the regenerating stand's composition or stand structure is intended to deviate from the original as it grows towards its objective.
- **Stand Structure (column 4)** each of the tree species that are intended or expected to make up the climax stand and their proportions.
- **Climatic/Site Limitations (column 5)** climatic and site limitation factors that are anticipated to affect seedling survival and short-term productivity.
- **Silviculture System (column 6)** Choices include clearcut, clearcut with retention, partial cut, shelterwood, seed-tree, patch cut or understory protection.
- **Site Preparation (column 7)** operational strategies chosen to create a suitable microsite for germination of seed, promotion of suckering or optimum growth of planted stock.
- **Silviculture Tactic & Seedling Establishment (column 8)** the operational strategies for establishing the tree species of choice on a site to be reforested.
- **Seedling Density (column 9)** planting density or the density of regeneration desired to be achieved and maintained in the Reforestation Phase.
- **Reforestation Phase Intervention (column 10)** any silviculture-driven intervention planned on a regenerating stand, after initial treatment and establishment during the Reforestation Phase.
- **Roads, Landings and Processing Areas** If these areas are being site prepared, or the soil decompacted, then they may be amalgamated into the rest of the cutblock or strata, after having been reforested accordingly.

7.4 Timber Supply Analysis Procedures

The current annual allowable cut was set following an amendment to the 1999 DFMP completed in 2009 to address the mountain pine beetle epidemic in Alberta. The amendment was approved in 2010 and set the coniferous harvest at 1,766,576m³ and the deciduous at 249,832m³.

A new Timber Supply Analysis was completed as part of this Detailed Forest Management Plan which has been prepared to meet the requirements of the Alberta Forest Management Planning Standard Version 4.1 – April 2006 (Alberta Sustainable Resource Development 2006). The new Annual Allowable Cut (AAC) proposed in this plan, based on tree length utilization standards, is 1,630,701m³ of coniferous and 346,691m³ of deciduous in the first 10 year period (May 1, 2013 to April 30, 2023).

A reconciliation volume (unused volume from previous 10-year period) from the most-recent quadrant has been scheduled to be harvested in the first period of this plan. When the unused volume from the previous 10-year period is incorporated into the first 10-year period, the AAC moves to 1,849,991m³ of coniferous and 385,335m³ of deciduous. The new annual allowable cut is shown below (Table 86). The TSA technical document is in Appendix 21.

Table 86 – Annual Harvest levels for the Preferred Forest Management Scenario

Period (10 years per period)	Scheduled periodic volume (m³/decade) (with unused volume)		Unused volume (m³)		Scheduled annual volume (m³/year) (without unused volume)	
	Coniferous	Deciduous	Coniferous	Deciduous	Coniferous	Deciduous
Period 1	18,499,910	3,853,345	2,192,901	386,432	1,630,701	346,691
Period 2	14,538,260	2,817,414			1,453,826	281,741
Period 3	13,833,906	2,574,116			1,383,391	257,412
Period 4	13,614,966	2,741,312			1,361,497	274,131
Period 5	13,480,886	2,857,251			1,348,089	285,725
Period 6	13,795,469	2,858,932			1,379,547	285,893
Period 7	13,582,679	2,860,047			1,358,268	286,005
70 year spatial average					1,416,474	288,228
Long term aspatial value	18,278,959	3,200,630			1,827,896	320,063

7.4.1 Timber Supply Model

A series of non-spatial timber supply runs was completed to explore the impact and interactions of various goals and objectives. Once an acceptable combination of inputs was achieved, a spatial harvest sequence was created to demonstrate that the harvest level was achievable. The TSA technical document is in Appendix 21. The Spatial Harvest Sequence may be found in Appendix 22.

7.4.2 Key Assumptions and Inputs

A. Planning Horizon

All of the results show the 200 year planning horizon from 2012 to 2212.

B. Yield Curves

Yield curves were developed based on the provincial base 10 strata. Both tree length and cut-to-length curves were used for all of the analyses to provide comparisons and allow operational flexibility. Curves were adjusted, as required, to show the impact of improved seed use.

C. Mountain Pine Beetle

The mountain pine beetle ranking was calculated using the standard three-component process that combines a Stand Susceptibility Index, Climate Factor and Compartment Risk.

D. Transitions

It is the intent of HWP to balance the regenerating stand structure to the original stand structure assessed in the forest inventory supporting the TSA. No pre-commercial thinning, commercial thinning, fertilization, under-planting, stand density management, pruning or drainage activities are planned at this time.

E. Seral Stage

Seral stage definitions, as described in Section 4.3.4 were applied throughout the analyses and changes are reported for both the regenerating and unmanaged areas.

7.4.3 Issues and Decisions

There were many decisions that needed to be made throughout the TSA process to create the Preferred Forest Management scenario (PFMS). These decisions covered a wide range of topics, including harvest levels, special management areas and improved stock deployment as some examples. The PFMS was developed by changing input parameters in a controlled sequential way to assess the impact of different objectives.

A. Baseline

Reliable wood flows are required for community stability and company planning purposes. The decision was made to produce coniferous and deciduous timber on an even-flow basis, with a non-declining growing stock for the last 50 years of the DFMP.

B. Improved Stock

The full suite of benefits to the forest and to HWP of improved stock have not yet been fully described or agreed upon. In addition to increased volume, it is thought that other genetic traits such as insect or disease resistance as well as the ability to adapt to a changing climate may also result from selective breeding. As this issue is likely to receive more attention in the future, it was decided to include improved stock in the model. This will allow HWP to easily assess the impacts of changes to Provincial policies and to new scientific knowledge as they occur.

C. Biological Constraints

Special management areas (SMA's) have been defined for certain species that are present on the HWP FMA area. Two caribou herds, high elevation sheep and goats and trumpeter swans all have SMA's included in the landbase. All of these areas were included in the timber supply analysis with constraints on harvesting with the exception of trumpeter swans. All trumpeter swan areas were excluded from scheduled harvest.

Caribou range management plans are currently being prepared. Some harvesting was scheduled within the identified ranges in accordance with the draft plan following discussion with HWP's biologist. No harvesting was scheduled in the identified core area that is within the HWP FMA boundary.

Although trumpeter swans are recovering, the buffer areas around nesting lakes were removed from the timber supply analysis. It is expected that some area may be harvested with ground rule deviations being issued as agreed between HWP and the GoA.

A large FireSmart Community Zone exists around the Town of Hinton and other nearby communities. Reduction of identified fire risk by harvesting high risk areas was another objective of the timber supply analysis.

D. Operational Considerations

Compartment constraints were placed on the model to guide the spatial phase of the timber supply analysis. The carryover volume of coniferous and deciduous from the previous reporting period was also added at this time.

E. Spatial Constraints

As the HWP FMA area is a single landbase, with no imbedded quotas, comprised of 70% pine-leading stands, the calculated AAC could be realized in an infinite number of spatial distributions. In order to guide future planning and achieve other, non-timber objectives, the spatial harvest sequence was constrained in a stepwise fashion. This resulted in a spatial harvest sequence that was more operationally feasible.

7.4.4 Analysis of the Preferred Forest Management Strategy

The preferred forest management scenario is the final product of a complex timber supply process described in Appendix 21. It is the result of balancing a large number of targets and indicators in the model to achieve what is believed to be a biologically, socially, and economically viable harvest pattern. HWP plans to follow this harvest pattern for at least the next 10 years. The harvest levels are higher in the first 10 year period for conifer and for deciduous to incorporate a carryover volume, dropping in subsequent periods. The Spatial Harvest Sequence can be found in Appendix 22. A Strata Description Table described hectares harvested by cut period, compartment, yield strata, and age class can be found in Appendix 26.

8.0 PLAN IMPLEMENTATION AND MONITORING

8.1 Implementation of the Detailed Forest Management Plan

Once approved, this DFMP will replace HWP's 1999 DFMP and its associated 2010 MPB amendment (and the interim AAC approved in that 2010 amendment). The strategies outlined in this DFMP will be followed by HWP to ensure Objectives and Targets are met; however, where Targets cannot be met, reasons will be provided, and where appropriate, action plans will be developed and described in HWP's DFMP Stewardship Report (produced every 5 years). A new DFMP will be developed for submission in 2024.

The success of this DFMP will be measured by the meeting the Objectives and Targets found within this plan, while balancing social, environmental, and economic factors associated with operating on a public land base in a climate of continually evolving science, public opinion, policy, and economic forces. The overriding mechanism for implementing this plan will be to follow the Spatial Harvest Sequence to the greatest extent possible – the implementation of the SHS is accomplished through a number of lower level plans as outlined in section 8.4 and Figure 108.

Due to the complexity of this plan; some uncertainty surrounding still-to-come land use decisions; and, a number of new initiatives based on natural disturbance research at the Foothills Research Institute, there are a number of implementation challenges and/or issues associated with this DFMP. These issues and challenges and how they are being addressed are briefly described Table 87 below.

Table 87 – Implementation Issues and Challenges

Implementation Issue	Description	Strategies to Address Issue
Two different Riparian Management Strategies (See Targets #11, Target #12, Target #34, and Appendix 2).	HWP has proposed a new Riparian Management Strategy in this DFMP, based on research from the Foothills Research Institute (FRI). The GoA has provided some conditional approval to this strategy contingent on a number of other factors that could not be addressed before the submission of this plan. Therefore, portions of the FMA (still to be determined) will be planned based on the existing provincial riparian standards (i.e. fixed-width buffers based on stream widths), while other portions of the FMA will be planned based on HWP's new Riparian Management Strategy (i.e. riparian areas classified on morphological features; streams classified on erosion-based processes; and no fixed width-buffers, but rather a "channel recruitment zone").	The landbase for this DFMP has been determined based on the HWP's Riparian Management Strategy and NRV for riparian areas has been calculated based on HWP's riparian definition (see Appendix 2 and Target #11). Moving forward, Forest Harvest Plans will primarily be developed using the existing (fixed-width) riparian management system, with some smaller portion of the FMA area being planned using HWP's new Riparian Management Strategy. The scale and pace of the roll-out of HWP's Riparian Management Strategy will depend primarily on the following two factors: 1. That HWP and the GoA reach agreement on the parameters of HWP's Monitoring and Measuring Program (including reference streams) 2. GoA satisfaction that the strategy is having the intended effect. When using HWP's Riparian Management Strategy, the NRV calculations for riparian areas will be used for helping to determine the target of how many hectares, and what cover types, should be disturbed within the riparian areas.
Caribou (See Appendix 16a.)	The Hinton FMA area contains portions of the ranges of the A la Peche and Little Smoky caribou herds. There is currently a range plan being developed for these two herds in a process led by the provincial government (with input from other stakeholders). Originally, it was thought this process would be finished by the time this DFMP was submitted; however, this was not the case. Current projections are for this process to be completed by the end of 2014, and therefore any findings or recommendations resulting from these range plans could not be incorporated into this DFMP.	HWP has had a voluntary deferral in place within the caribou range on our FMA since 2007; however, this has been a deferral, not a deletion. For this DFMP, HWP has scheduling some harvest in the caribou area, however; no harvesting will be scheduled in the first five years of this plan. In addition, any zoning, land use decisions, or other requirements coming out of the Range Plans for the A La Peche and Little Smoky herds or the Land Use Plan for the Upper Athabasca Region will override any planned harvesting in the caribou area. For more specific information on HWP's harvesting plans within the caribou area on the FMA, please see HWP's Species Conservation Strategy in Appendix 16a.
Mountain Pine Beetle	MPB has an established foothold within HWP's	HWP has a number of strategies to address the issue of

Implementation Issue	Description	Strategies to Address Issue
(MPB)	FMA area, since its original arrival in 2006. Due to aggressive control tactics employed by the GoA and HWP, along with winters that have been cold enough to keep beetles in endemic levels, the population of MPB on the FMA area has not yet reached outbreak levels. However, only a few warm winters in a row could result in a MPB outbreak, which due to the high percentage of pine on the FMA (49%), could be disastrous. Because of this, the GoA has given HWP direction to harvest 75% of susceptible pine of the FMA area over the 20 year period of this DFMP's Spatial Harvest Sequence (SHS). In addition, the GoA and HWP want to move harvesting as quickly as possible into areas of new MPB attack, even if these blocks are not in the SHS. Depending on what happens with MPB attack in the future, there may be some issues with HWP ability to meet the SHS.	MPB and potential outbreaks: 1. A dispersal monitoring program has been in place since 2006 and has been continued each year. Detection monitoring for both red-attack and green-attack trees will continue subject to funding and necessity. 2. The entire FMA is in the leading edge zone, where the beetle management objective is to eradicate all MPB infestations as they become known. Attacked bait trees and known natural MPB green-attack have been controlled as they have been discovered, either by the GoA or HWP. 3. Each year, the GoA conducts aerial and ground-based MPB surveys, to determine the location and extent of MPB attack. This information is shared with HWP and is used to inform planning and harvesting priorities. 4. HWP will conduct Level II treatments (cutblocks) on active infestations on the FMA where beneficial and affordable. Any proposed Level II programs, not part of the SHS, will be discussed with Alberta prior to implementation. Harvesting MPB attacked stands will take priority over following the SHS.
Operating Ground Rules	New OGRs will need to be developed in order to be consistent with this DFMP. In addition, this revamping of the OGRs will allow for improvements in some areas of the OGRs such as the methodology for reporting variance to the Spatial Harvest Sequence.	Develop and implement a joint process between the GoA and HWP to review the existing OGRs to ensure consistency between the OGRs and this DFMP, and to make updates and improvements to the new OGRs as required.

8.2 Performance Monitoring

The majority of the DFMP's forest strategies, and associated Objectives and Targets are described in section 6.0 (Resource Management Goals and VOITs). Each Target in this section outlines how it will be measured, monitored, and reported on. This provides HWP with a mechanism to assess our forest management performance and compare desired and forecasted outcomes with actual outcomes.

The monitoring and measurement of HWP's performance against the Objective, Indicators, and Targets is ongoing. Since 2000, HWP has developed an annual Stewardship Report (this is voluntary) that reports on all the Objectives and Targets that HWP has set. This annual, voluntary, Stewardship Report is reviewed each spring by our Forest Resources Advisory Group (FRAG). A copy of this report will be provided to the GoA for information purposes.

In addition to this voluntary Stewardship Report, HWP will also develop a DFMP Performance Stewardship Report. The DFMP Performance Stewardship Report is a report prepared every five years that HWP will submit to the provincial government. A copy of this report will also be reviewed by HWP's public advisory group (FRAG). The report enables the Companies and the provincial government to assess if the desired future forest, as outlined in the DFMP, is in line with what is actually occurring on the FMA and if any improvements or adjustments need to be made.

8.2.1 Previous FMP and Management Outcomes

Section 2.2.2 of the Alberta Planning Standard requires the Company to provide a summary of any previous FMP and management outcomes including: the learnings associated with a management review, a description of performance with respect to past plans, and significant events affecting the DFA since the last plan.

The 1999 DFMP is the last complete DFMP that HWP has approved. The current Planning Standard was not in effect when the 1999 Plan was developed and therefore there were no requirements for VOITs or a 5-Year

Stewardship Report. What was included in the 1999 Plan was a "commitment matrix". This was a table that outlined and summarized all of the commitments made in the 1999 Plan including who was accountable for carrying them out, the status of the commitment, and the target date for completion.

In 2007 and 2008, HWP was preparing to submit a new DFMP in 2009. During 2007 and 2008, ESRD and HWP were meeting regularly in Integrated Resource Management Steering Committee (IRMSC) meetings (a committee made up of representative from the GoA and HWP) and had discussed the requirement of closing off (and reporting on) the commitments made in the 1999 FMP. It was agreed that for the next DFMP, in order to meet the requirement of describing the performance of past DFMPs, HWP would report on the status of all of the commitments made in the "commitment matrix" from the last (1999) DFMP.

On February 25, 2008, HWP submitted a Commitment Matrix (containing all the commitments made in the 1999 FMP) and assigned one of four categories to each commitment – complete, deleted, on-going, or carry forward (to the next 2009 DFMP). A copy of this February 25, 2008 covering letter and the attached Commitment Matrix can be found in Appendix 25.

On March 6, 2008, HWP received a letter from the GoA (Bill Tinge), approving HWP's Feb 25, 2008 submission, with the acknowledgement of HWP's intent "to include on-going and carry forward items into the new matrix that will be developed for the 2009 DFMP". A copy of this letter can also be found in Appendix 25.

The 2009 DFMP was not submitted, but instead a mountain pine beetle (MPB) amendment to the 1999 DFMP was completed in 2010, and an extension was given to 2014 for HWP's new DFMP (i.e. this one). In August 2010, HWP's DFMP amendment was approved. This DFMP amendment contained no VOITs (as they were not a requirement); nor was there a requirement for a 5-Year Stewardship Report.

The Commitment Matrix from the 1999 DFMP found in Appendix 25 contains 18 commitments that were to be carried forward to the new DFMP. Of those 18 commitments, nine commitments (72, 80, 83, 85, 86, 88, 89, 102 and 103) were not carried forward into the 2014 DFMP, either because there was no requirement to, or because HWP had changed its strategy and was no longer contemplating implementing those commitments (e.g. particularly around thinning and fertilization commitments).

During discussions with the GoA in October of 2015, GoA representatives also asked HWP to submit a copy of the Company's voluntary 2013 Stewardship Report to help meet the requirements of section 2.2.2 of the Planning Standard. This voluntary Stewardship Report is a report that the HWP prepares annually to report on all of the commitments it has with respect to the various certification systems the Company participates in (e.g. ISO, SFI). A copy of the 2013 HWP Stewardship Report can also be found in Appendix 25.

Each spring, HWP carries out an extensive and well documented management review. The intent of this management review is to have HWP's Woodlands Manager go through all of the various commitments (e.g. VOITs, training, incident reviews, etc.) that HWP has made in various plans and certification schemes to ensure commitments are being followed through on and that there are adequate resources to do so. After each management review, it is common for there to be a number of action items that must be implemented in the following months. A copy of HWP's 2013 management review can also be found in Appendix 25.

8.3 Adaptive Management and Continual Improvement

Where appropriate, each Target in section 6.0 has an identified acceptable tolerance. As part of the Stewardship Reporting process described in section 8.2, HWP will review the Target at a regular interval (i.e. a minimum of every five years) and if the Target is not met within the acceptable variance, HWP will respond in one or both of the following two ways:

1. Describe the rationale behind why the Target was not met or cannot be met.

2. Develop a correction action to either help ensure the Target is met by the next reporting period or that the Target is moving in the direction it needs to move to be met over time (e.g. moving a seral stage back into NRV may take many decades).

The response will be determined in consultation with the Government if the variance is significant.

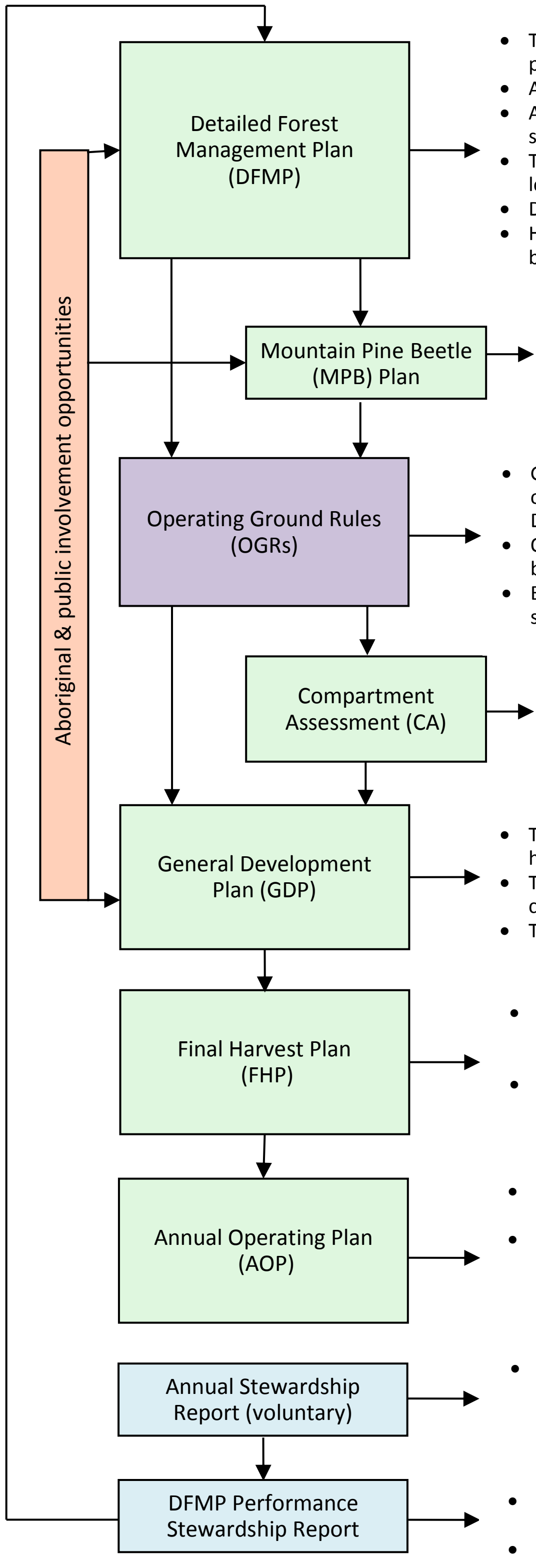
Within this DFMP, HWP is also proposing a number of new strategies that have not been implemented before in Alberta – this includes our Riparian Management Strategy and other strategies outlined in HWP's Natural Disturbance Strategy found in Appendix 2. It is expected that these strategies will be closely monitored by HWP and the GoA, and that there will be opportunities for improvement and/or adaptive management as our experience in implementing these strategies increases.

Forests are dynamic environments that constantly change; the management of forests is also dynamic, as our understanding about forest management increases due to research and experience. As new information becomes available, through research or staff expertise, strategies can adapt and improve, with the ultimate goal of creating a forest landscape that will continue to produce all the values that have been associated with it over time.

8.4 DFMP Links to Other Operational Plans

The DFMP is the highest level plan that HWP develops for the FMA area. It provides direction and strategies for all operational plans below it, such as the General Development Plan (GDP), Forest Harvest Plan (FHP), and Annual Operating Plan (AOP). There are other plans that are higher level than the DFMP, but these plans are generally developed and approved by Alberta – this includes land use plans, recovery plans (e.g. caribou, grizzly bear, etc.), and other similar land zoning plans. Where these higher level plans exist, HWP incorporates their requirements into the DFMP. Where these plans don't exist, HWP is cognizant that if these plans come into force during the term of this DFMP, then the strategies and Targets in this DFMP might have to be amended to be consistent with these other higher level plans.

Figure 108 illustrates the connections between the DFMP and other HWP plans, monitoring, reporting, and continual improvement. Aboriginal and public consultation is actively sought at the DFMP and the GDP stages. General public awareness also takes place during the FHP stage, as HWP puts notices in the local newspaper letting the public know that planning is starting in a particular compartment and how to provide feedback if they want to. Monitoring and reporting takes place in the Stewardship Report – both the annual report that HWP voluntarily compiles, and the 5 Year Performance Stewardship Report that HWP compiles and provides to the GoA every five years.



- The DFMP is the highest level plan – it plans over a 200 year time horizon and provides direction to all other plans below it.
- An Annual Allowable Cut (AAC) is recommended in the DFMP.
- All important non-timber values (e.g. biodiversity, recreation, etc.) are identified and strategies identified to manage them
- The DFMP contains a 20 year spatial harvest sequence (this means proposed cut block locations are shown on a map for the first 20 years of the plan).
- DFMPs are generally redone every 10 years (although there are exceptions)
- HWP's current (1999) DFMP was approved in 2000 and then amended in 2010 (see below) – the submission date for the next DFMP is September 2014.

- Technically, the MPB Plan is an amendment to the approved DFMP.
- The intent of the MPB Plan is to reduce (through harvesting) the number of pine stands that are highly susceptible to mountain pine beetle
- HWP's MPB Plan (approved in 2010) includes an interim AAC (until this DFMP is approved), a 10-year spatial harvest sequence, and addresses some of the major non-timber values (e.g. water, caribou, etc.).

- Ground rules are the practices used in planning and conducting timber harvesting operations which constitute the methods used to implement decisions made in the DFMP and other higher level plans such as Regional Land Use Plans.
- OGRs are normally developed in a joint process between the Company and ESRD, based on a provincial template.
- ESRD may waive or amend the application of specific ground rules in unusual or specific circumstances.

- A CA is only required when information or major issues are identified, that in the government's opinion, have not been addressed in the approved DFMP (e.g. a large forest fire or a large outbreak of MPB.

- The GDP provides a 5-year projection of the compartments that HWP may be harvesting within, as well as any proposed main road construction and reclamation.
- The GDP describes HWP's cut control; reporting on the status and forecast of the coniferous and deciduous Annual Allowable Cut.
- The GDP, which is produced annually, provides a link between the FMP and AOP.

- The primary components of a FHP are a map and report that clearly shows the proposed cutblock boundaries, roads, and watercourse crossings for the area being harvested.
- The design is valid for five operating years after the year of approval, unless issues deemed significant by the government arise during this period.

- Once approved by government, the AOP authorizes all HWP road, harvest and forest management activities.
- The AOP describes the activities proposed for the current AOP year (i.e. May 1 to April 30). The AOP components include: an operating and timber production schedule, all applicable FHPs, CAs (if applicable), a reforestation program, a fire control plan, and a road plan.

- This Stewardship Report is completed annually by HWP and reports on the progress made in meeting the Objectives and Targets set in the DFMP, as well as other targets and commitments HWP has made as part of other certification Standards like ISO 14001 and SFI. The annual Stewardship Report is voluntary (i.e. not require by ESRD).

- The DFMP Performance Stewardship Report is submitted to ESRD every 5 years and reports on HWP's progress in meeting the Objectives and Targets in the DFMP.
- This Report is the main mechanism for monitoring, reporting, and continual improvement.

Figure 108 – HWP's Planning and Reporting Process

8.4.1 Operating Ground Rules (OGR)

HWP's current set of OGRs was last revised in October 1, 2011. OGRs are a mechanism to implement the strategies, objectives, and targets from the DFMP. It is anticipated that as this DFMP begins to be implemented, that the 2011 OGRs will need to be amended as required. The amendment of existing OGRs or the creation of new ones is normally a collaborative process that involves both the Company and the GoA. Operations may only deviate from the OGRs under the authority of the appropriate authority from the GoA.

8.4.2 General Development Plan

The GDP is produced annually and links the DFMP and the Annual Operating Plan.

The Hinton FMA area is divided into 140 geographic areas called compartments. The GDP provides a five-year projection of the compartments that HWP will be harvesting in, as well as any proposed main road construction. The GDP also describes HWP's cut control: reporting on the status and forecast of the coniferous and deciduous Annual Allowable Cut.

Referral of the GDP to First Nations is a requirement of the government's Alberta First Nations Consultation Guidelines on Land Management and Resource Development.

8.4.3 Forest Harvest Plan and Annual Operating Plan

The FHP is where the majority of the field layout takes place. The FHP, which is submitted to the GoA, includes the location of all the cutblocks, roads, watercourse crossings, area and volume summaries, descriptions of any unique features, and deviations from the spatial harvest sequence.

Once the FHP has been approved by the GoA, it can become part of an AOP. In general, the AOP outlines the following: approved cutblocks which are being harvested, the timing of operations, the reforestation program, and the road plan. AOP approval gives HWP the authority to carry out the activities in the AOP.

8.5 Additional Plan and Programs

8.5.1 Public Involvement Program

The Public Involvement Program is described in more detail in section 5.1 and in the document found in Appendix 3a titled, "*Basic Operating Rules for the DFMP Public Participation Process*". It is a living document that is reviewed with HWP's Forest Resources Advisory Group from time to time. HWP's Public Involvement Program is designed around the requirements for public participation outlined in section 5.3.1 of the CSA Z809 SFM Standard. In the CSA standard, there is a requirement to ensure that the public participants have some degree of ownership of the process in which they are being asked to participate, so the Standard requires that there be agreement on the basic operating rules that will guide the public participation process. In consultation with FRAG, HWP has developed a set of basic operating rules for the public participation process – these rules were last reviewed and approved by FRAG in June 2013. A copy of the Basic Operation Rules that govern HWP's Public Involvement Program can be found in Appendix 3a. A log of the Public Involvement Program as it relates to this DFMP can be found in Appendix 3b.

8.5.2 Silviculture Plan

A silviculture plan is submitted annually in conjunction with the General Development Plan. It outlines the previous and coming year's silviculture activities and the Companies' reforestation liabilities.

8.5.3 Fire Control Plan (FCP)

This Fire Control Plan is prepared annually each spring. The FCP is a joint submission for both FMA's (FMA8800025 and FMA 9700032) that are managed by Hinton Wood Products and meets those standards as described pursuant to the May 6, 2013 Fire Control Agreement for both FMA's Schedules 1A - Minimum

Standard Fire Control Plan contents, Schedule 1B - Wildfire Prevention Tactics and Response, Schedule 2(3) and Schedule 3.

The Plan contains most information necessary for any person to initiate the Forest Protection objectives of detection, communication, prevention, pre-suppression and suppression of fires.

8.5.4 Growth and Yield Program

HWP's Growth and Yield Program is described in detail in Appendix 23. The goals adopted provide the basis for long term data collection and analysis in support of timber supply modeling. The goals are:

1. Estimate historical growth rates on the HWP FMA area at the forest and yield stratum level.
2. Validate yield curves for the HWP FMA area and develop new curves, if necessary.
3. Monitor growth in regenerating harvested areas.
4. Work with FGrOW to implement a *Vision for Growth and Yield in Alberta*.

8.6 VOIT Reporting Summary Matrix

Table 88 summarizes the Targets that will be reported on by HWP. This table allows the reader to easily identify the report timing and frequency for each target.

Table 88 – VOIT Reporting Matrix

Target #	2014 DFMP	5-Year Performance Stewardship Report	Annual (voluntary) Stewardship Report	Annual Operating Plan or Forest Harvest Plan	ARIS or Silviculture AOP	General Development Plan	Next DFMP	Other
1. Biological Diversity								
1	X	X					X	
2	X	X					X	
3	X	X					X	
4	X	X	X				X	
5	X	X	X				X	
6		X	X					As required by the GoA and directed by approved caribou range plans
7	X	X	X	X			X	
8	X	X	X				X	
9	X	X	X				X	
10	X	X	X				X	
11	X	X	X	X			X	
12		X	X					Incidents will also be reported immediately to Alberta
13		X	X				X	
14		X	X				X	
15		X	X				X	
16		X	X				X	
17	X	X					X	
18	X	X	X				X	
19	X	X	X				X	
20		X	X	X				
21								No HWP reporting - see Foothills Stream Crossing Program report
22		X	X					
23		X	X					
24	X	X					X	
25			X				X	
26	X	X					X	
27	X	X					X	
28		X	X					
2. Maintenance and Enhancement of Forest Ecosystem Condition and Productivity								
29		X	X		X			
30		X	X		X			
31	X	X	X				X	
32	X	X	X	X			X	
33		X	X					
3. Conservation of Soil and Water Resources								
34		X	X					
35		X	X					
36		X	X					
37	X	X					X	
38	X	X	X	X			X	

Target #	2014 DFMP	5-Year Performance Stewardship Report	Annual (voluntary) Stewardship Report	Annual Operating Plan or Forest Harvest Plan	ARIS or Silviculture AOP	General Development Plan	Next DFMP	Other
4. Forest Ecosystem Contributions to Global Ecological Cycles								
39		X	X					
5. Multiple Benefits to Society								
40	X	X	X			X		
41		X	X					
42		X					X	
43		X	X					
44		X	X					
45		X	X					
46	X	X	X					
47	X					X		
48	X							Internal records will be kept
49		X	X					

9.0 FOREST MANAGEMENT RESEARCH

Hinton Wood Products has and will continue to participate in various research projects relevant to the FMA area. HWP is also a member in numerous associations and research groups.

9.1 Past and present research initiatives

A summary of some of the previous and ongoing research is summarized below. This is not an all-inclusive list.

A. Foothills Research Institute – Core Programs

HWP is a founding members and sponsoring partner of the Foothills Research Institute. One of FRI's primary objectives is to conduct research to be used in sustainable land and resource management. To do this, it engages a range of forest and forest resource users; has a consensus-driven partnership, and a shared decision-making process. FRI looks at the impact of primarily industrial use on the local ecology, economy, society, and culture. The research carried out at FRI is practical—in search of answers to specific land and resource management questions. West Fraser provides annual core funding to FRI, which supports four core areas – the Healthy Landscape Program (natural disturbance research), the Fish and Watershed Program, the Communications Program, and project administration.

B. Foothills Research Institute – Caribou Program

HWP provides funding to FRI's new Caribou Program. This Caribou Program, which began in 2013, will undertake research related to conservation of caribou in Alberta.

C. Foothills Research Institute – Grizzly Bear Program

HWP provides is a long-time supporter of FRI's Grizzly Bear program. Findings from this program have been incorporated into this DFMP (e.g. road density targets in core and secondary grizzly bear habitat). The Foothills Research Institute's Grizzly Bear Program was created in 1999 to provide knowledge and planning tools to land and resource managers to ensure the long-term conservation of grizzly bears in Alberta. Key to its efforts is sound scientific field research, practical results, and a large-scale or "landscape level" approach toward grizzly bear conservation.

D. Pinto Creek Goat Monitoring/Research

The Pinto Creek Mountain Goat Monitoring Project monitors cliff use and population composition of mountain goats within the Pinto Creek Canyon Natural Area (PCCNA). Monitoring of the population by standardized ground-based survey has occurred each year since 1996 during the spring, summer, and fall. Plans and funding is in place to continue with this monitoring. In addition to this population monitoring, there has also been other research into the Pinto Creek goats, including:

- A Fiera Biological Consulting Report in 2008, titled, "Pinto Creek Mountain Goat Behavioral Monitoring: Response to Harvest", in which the authors looked at the behavioural response to the goats to nearby harvesting.
- A report in 2009 authored by Heidi M. Schindler, B.Sc., where goat hair samples from 2005, 2006, 2007 and 2008 were selected to do a genetic analysis that used nine polymorphic microsatellite markers to estimate the census population size.

E. Foothills Stream Crossing Partnership (FSCP)

This partnership of mining, energy, forestry, NGO, and government representatives are working to together to monitor and repair stream crossings within and beyond the Hinton FMA area. Monitoring protocols were researched and developed to determine how to best inspect and monitor stream crossing. There has also been electro-fishing research into the difference in fish presence before and after crossing repair. There has also been an on-going effort to recruit all crossing owners into the program, so when land sales occur; there is an even greater effort to ensure that those areas historically covered by the program will continue under new ownership.

F. Uncommon Plant Communities

Research was undertaken in 2008/2009 to define and identify uncommon plant species communities on the HWP FMA area. The project, carried out by Fiera Biological Consulting, defined, mapped and tabulated uncommon plant communities on the Hinton FMA. This research was incorporated into a Handbook and Standard Operating Procedure, which have both been incorporated into this DFMP.

G. Trumpeter swan monitoring

Monitoring the presence and population of trumpeter swans on the Hinton FMA area and how these swans respond to disturbance.

H. Hinton FMA Area Natural Disturbance Modelling Project

Using research and models developed in FRI's Healthy Landscapes Program, HWP contracted Bandaloop Landscape-Ecosystems Services (Dr. Dave Andison) to develop a Natural Range of Variation (NRV) for all upland and riparian areas on the Hinton FMA area based on seral stage, cover type, Natural Subregion, patch size, watershed, passive landbase, active landbase, and caribou range. This NRV information was then incorporated in this DFMP (see Targets #1 and #2).

I. Riparian Monitoring and Measuring Program

Using research developed in FRI's Fish and Watershed Program, HWP contracted McCleary Aquatic Systems Consulting (Dr. Rich McCleary) to develop a Monitoring and Measuring Program that will monitor and measure any changes in stream channel morphology and ecosystem function as a result of the implementation of HWP's new Riparian Management Strategy. This Monitoring and Measuring Program is still in development.

J. FP Innovations

West Fraser contributes annually to FP Innovations. This organization conducts research into various forest industry related aspects such as: logging equipment and productivity, milling, wood products, and environmental impact. West Fraser maintains membership in this organization allowing HWP to access all FP Innovations research results.

K. GYPSY Regenerated Stand Management

The purpose of the project was to develop in a timely and cooperative manner the capability needed to establish regeneration standards linked to stand growth and yield. The project was designed to support the rapid development of the provincial Growth and Yield Projection System (GYPSY) in the following areas:

1. Extension to all species groups and strata recognized in the regeneration standard of Alberta (RSA);
2. Improved linkage to measures of regeneration performance in post-harvest stands.

L. NetMap

HWP contracted Earth Systems Institute and McCleary Aquatic Systems Consulting to create a digital watershed using 'NetMap'. NetMap's digital watershed consists of a spatial data structure and tools that are designed for analysis of resource use and risk mitigation. A digital watershed contains a geospatial data structure used within GIS software or web browsers where all topographic locations are referenced to all others, allowing landforms and ecological processes to be placed in spatial context with resource use activities and infrastructure. Landforms include small streams, large rivers, floodplains, wetlands, and other topography including hillsides and alluvial fans. Physical processes encompass climate in the form of storms, fires, floods, climate change, and erosion and habitat forming processes. Human activities that can be addressed involve energy development (roads, drill pads, pipelines, and open pit mines), forestry, transportation, agriculture, grazing, and urbanization.

This project combined LiDAR, 25m and 10 m digital elevation models (DEMs) to create a single seamless elevation model; that included warping and merging DEMs of different resolutions, filling in of gaps, and surface smoothing. In addition, the program 'Netrace' was used to create a new stream layer that included the new data layers from HWP that identifies all known road-stream crossings so that the traced stream network will not be diverted by roads, and created a NetMap basin scale data sets of a size and dimensions as outlined by HWP.

M. Foothills Growth and Yield Association - Lodgepole Pine Regeneration Trials

The purpose of the project was to forecast and monitor the growth and yield of regenerated lodgepole pine, in relation to site, initial spacing of planted stock, natural ingress and mortality, competing vegetation (brush), and density regulation (pre-commercial thinning). The results of the project have implications for silvicultural prescriptions, crop planning, regeneration standards, and allowable cut.

N. Empirical Post Harvest Stand Growth Assessments

This was a multi-partner project (11 forest industry partners and the GoA). The project arose due to a significant knowledge gap exists regarding the growth of post-harvest stands. Despite the fact that these openings are prevalent across the province, there is very little empirical data available that quantifies the changes in these stands over time. Consequently, the development of forest growth models to date has been largely based on data from natural stands. This reduces the confidence in the application of these models to managed stand conditions. By leveraging information gained in previous studies, this project sought to fill in these data gaps in a timely and cost-effective manner.

O. MPB Program - Detection and Control

HWP has had an ongoing program on FMA area for the monitoring, detection and control of mountain pine beetle (MPB). This program includes: a FMA-wide MPB dispersal monitoring pheromone bait grid, ground surveys, single tree control, and the protection of the Presslee Seed Orchard. HWP has also established a Hinton logyard mass trapping program (using funnel traps) and implemented spot baiting of known MPB-attacked trees. In all of these MPB related initiatives, HWP and the GoA work collaboratively by keeping each other up-to-date on the MPB situation and mobilizing appropriate resources to address issues as they arise.

P. MPB Program Pine Seed Collection and Protection of Genetic Trials, Orchards and Research Plots

This program involves the collection of pine seed from areas under threat of MPB attack for which there has been an identified projected shortfall in current seed storage banks. It also includes the continued protection from MPB attack of the genetic test sites, G801 lodgepole pine seed orchard and the associated pine breeding orchard at the Presslee orchard site.

Q. Development of Forest Harvest Residual Biomass Estimates for the Hinton Region

Working with FP Innovations, HWP helped to develop a properly validated biomass supply model for this region. In partnership with the Forest Feedstock Program at FP Innovations, detailed field assessments were conducted in newly harvested cutblocks which were typical of the stand types to be harvested in the next 10-20 years. FP Innovations conducted the cutblock assessments (pre-harvest, post-harvest, post-grinding); quantified the recovered biomass; updated the BiOS model for HWP (results would also be applicable for the east-slopes in Alberta); and wrote a report summarizing the methods and results.

R. Foothills Landscape Management Forum (FLMF)

Foothills Research Institute facilitated collaboration among a number of industry operators (and one Aboriginal group) to create a forum for managing the industrial footprint management within the ranges of the Little Smoky and A la Peche caribou herds. The FLMF and its partners have also been working closely with Alberta in the development of caribou range plans in this region.

S. Silviculture Systems

This project includes the ground survey collection of RSA plots on shelterwood blocks that are passed performance.

T. Tree Improvement - Breeding trial

This is West Fraser's Pine Population demonstration breeding trial.

U. Tree Improvement - Drought stress

This project researches lodgepole pine drought stress resistance in 'Region A' population.

V. Tree Improvement - Climate change

This is a climate change and tree adaptation project.

W. Seedlings - Frozen plugs

This project examines viability of the planting of frozen plugs. Field trial are complete- findings to be published in 2014.

X. Seedlings - Copper versus non-copper plugs

This projects looks at copper treated plugs versus non-copper treated plugs, by evaluating seedling performance in the field.

APPENDIX 1

Terms of Reference for the Development of the 2014 DFMP

APPENDIX 2

Natural Disturbance Strategy for the 2014 DFMP

APPENDIX 3a

Basic Operating Rules for the DFMP Public Participation Process

APPENDIX 3b

Public Consultation Log for the DFMP

APPENDIX 4a

HWP's Approved Aboriginal Consultation Program for the 2014 DFMP

APPENDIX 4b

First Nation Consultation Record

Consultation from 2012 to October 31, 2014

Consultation from November 1, 2014 to December 2014

APPENDIX 5

NRV graphs for the gross FMA landbase by cover types and seral stages

APPENDIX 6

NRV Graphs by forest cover type and seral-stage for the upland, riparian, and wetland areas on the gross FMA Landbase

APPENDIX 7

NRV graphs for the contributing FMA landbase by cover types and seral stages

APPENDIX 8

NRV Graphs by forest cover type and seral-stage for the upland, riparian, and wetland areas on the contributing FMA Landbase

APPENDIX 9

NRV graphs for the passive FMA landbase by cover types and seral stages

APPENDIX 10

NRV Graphs by forest cover type and seral-stage for the upland, riparian, and wetland areas on the passive FMA Landbase

APPENIDIX 11

NRV graphs for the gross FMA landbase for patch size and seral stage

APPENIDIX 12

NRV patch size class for every seral stage by cover type for the gross FMA

APPENIDIX 13

Long Term Access Management Plan

APPENIDIX 14

Standard Operating Procedure for Uncommon Plant Communities

APPENIDIX 15

Uncommon Plant Community Guidebook

APPENIDIX 16a

Species Conservation Strategy for Woodland Caribou

APPENIDIX 16b

Species Conservation Strategy for Trumpeter Swan

APPENIDIX 16c

Species Conservation Strategy for Grizzly Bear

APPENIDIX 16d

Species Conservation Strategy for Common Nighthawk

APPENIDIX 16e

Species Conservation Strategy for Olive-Sided Flycatcher

APPENIDIX 16f

Species Conservation Strategy for Athabasca Rainbow Trout, Bull Trout, and Arctic Grayling

APPENIDIX 16g

Species Conservation Strategy for Pinto Creek Mountain Goats

APPENIDIX 17

Habitat Modelling for Barred Owl

APPENIDIX 18

Habitat Modelling for American Marten

APPENIDIX 19

Development of the Landbase

APPENIDIX 20

Yield Analysis for the 2014 DFMP

APPENIDIX 21

Timber Supply Analysis

APPENIDIX 22

Spatial Harvest Sequence

- 20 Year Spatial Harvest Sequence Map
- 20 Year SHS Cover Type Map

APPENIDIX 23

Growth and Yield Program

APPENIDIX 24

Bandaloop Final NRV Report

APPENIDIX 25

A summary of any previous FMP and management outcomes

This appendix includes:

- Feb 25, 2008 letter to the GoA submitting Commitment Matrix from 1999 DFMP
- 1999 Commitment Matrix report
- March 6, 2008 letter from the GoA acknowledging and approving the Commitment Matrix Report
- 2013 HWP Annual Stewardship Report
- 2013 Management Review

APPENIDIX 26

Strata Description Table