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# Mountain Pine Beetle Action Plan

September 10, 2007



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## 1 INTRODUCTION

Sundre Forest Products (SFP) has prepared this plan (referred to subsequently as “the Plan”) in response to the Government of Alberta’s directive to reduce the amount of Mountain Pine Beetle susceptible stands within the R10 FMU. This should be considered an amendment to the currently approved Forest Management Plan.

The Plan will be used as a basis for the upcoming Forest Management Plan submission scheduled for submission in 2010.

The underlying assumption of the Plan is that it will be effective in reducing the risk of Mountain Pine Beetle infestations. If, through the implementation of the Plan, the infestations become significant and the new Forest Management Plan is not approved, this Plan will be revised. The new Plan will provide additional and more detailed information as per the ASRD Forest Management Planning Standard.

This Plan will describe:

- Goals and Objectives
- Communication Plan
- Technical Analysis
- Conclusion outlining the challenges in the Plan’s implementation, and an approach in how they will be resolved.

This document, along with associated maps and analytical output are provided on the enclosed digital media.

## 2 BACKGROUND

Sundre Forest Products is currently operating under a Forest Management Plan that was approved in 1996. A condition of the approval was the requirement to amend the timber supply analysis once the Alberta Vegetation Inventory (AVI) was completed (completed in 1998). Subsequently, the timber supply analysis was revised in 2002 and approved, and the Forest Management Unit boundaries realigned to create one unit (R10) within which is the SFP FMA. This provided for an FMU AAC of 985,145 m<sup>3</sup> (13/7 Utilization).

The Terms of Reference for this Plan was developed and approved on December 16, 2006 (Appendix 1).

## 3 GOALS AND OBJECTIVES

The primary objective of the Plan is to reduce the number of highly susceptible stands within the Forest Management Unit R10 (Prevention Strategy).

The Prevention (Pine) Strategy focuses on decreasing the MPB spread and outbreak potential by reducing the area of MPB susceptible pine stands. A standardized model (currently Shore and Safranyik) is used to identify the susceptibility of the stands by evaluating stand age and size, species composition, and a measure of climate suitability. Alberta Sustainable Resource Development (ASRD) have used the model results to establish the criteria to distinguish stands with high, moderate and low susceptibility.

The primary tactic is to evaluate the feasibility and effectiveness of harvesting to reduce the risk of MPB spread. The target is to do whatever is practical and feasible to reduce the area of susceptible pine stands to 25% of that currently projected in twenty years.

Other objectives include:

- Development of an effective communication strategy in collaboration with ASRD staff, to ensure stakeholders are informed as to the activities to be undertaken as part of the Plan.
- Conserve long-term forest values. Specifically, impacts on Grizzly Bear habitat and risk, and water yields were modelled.

The following documents were used in the development of the Plan:

- Alberta Forest Management Planning Standard (Version 4.1 April, 2006)
- Mountain Pine Beetle Action Plan For Alberta (September, 2006)
- Interpretive Bulletin – Planning Mountain Pine Beetle Response Operations (Version 2.6 September, 2006)
- Mountain Pine Beetle Operating Ground Rules (Pending)

## **4 COMMUNICATION PLAN**

The Mountain Pine Beetle Communication Plan is separated into several stages

- Statement of objectives
- Development of key messages
- Assignment of responsibilities
- Implementation

### **4.1 Objectives:**

- To present the forest management activities as part of a long-term coordinated plan whose goal is to reduce the potential threat of a MPB infestation.
- To provide timely, coordinated communications to help stakeholders prepare for potential impacts from forest management activities
- To ensure staff and stakeholders are able to obtain more information on forest management activities

Between November 2006 and August 2007, Sundre Forest Products and Alberta Sustainable Resource Development, jointly communicated the goals and implications of the Plan to the stakeholders. This included providing a link to the provincial forest health web site.

### **4.2 Stakeholder Involvement**

The Stakeholders consist of:

- Quota Operators – Coniferous and Deciduous
- Commercial Timber Permit Program Operators

- 
- Sundre Forest Products Public Involvement Round Table (SPIRT)
  - First Nations
  - Sundre Forest Products Staff
  - Sustainable Resource Development Staff

### 4.3 Key Messages

In collaboration with ASRD, key messages were developed to summarize background information, government directives and company response to the threat of an MPB spread into the FMU.

The consistent message throughout the communication initiative is that the risk to the pine forest in the SFP FMA from MPB will be reduced by the implementation of the Plan.

#### 4.3.1 KEY MOUNTAIN PINE BEETLE MESSAGES

**Alberta's pine<sup>1</sup> forests are threatened by an infestation of Mountain Pine Beetle.**

Currently, there is a major mountain pine beetle infestation in British Columbia and outbreaks along Alberta's Eastern Slopes including; both Banff and Jasper National Parks, the Bow corridor in Kananaskis Country, Crownsnest Pass and the Grande Prairie Region. With beetle infestations to the north, south and west of the Sundre Forest Products (SFP) Forest Management Area (FMA) there is a high risk that the FMA will come under attack.

**Alberta has developed an action plan, which will reduce the risk to the pine forests of Alberta.**

In response to the MPB threat, the Alberta Government has developed a Mountain Pine Beetle Action Plan which will guide forest companies in the preparation of future forest plans. Stands have been ranked based on the pine susceptibility, climate suitability and the proximity of current MPB infestations and the government target is to reduce these high ranking stands by 75% over 20 years.

**Pine on the Sundre Forest Products FMA is at risk**

The Mountain Pine Beetle population has always been at an endemic level in our forests. However the risk of an epidemic increases as the amount and age of the pine increases. In addition, it is normally kept under control by cold winters which kill off the larva lying under the bark. The accumulation of older pine and warmer than normal winters in recent years are significant factors contributing to the MPB infestation which has spread throughout B.C. and parts of Alberta and is threatening the SFP FMA. Mature pine provides prime habitat for the MPB and the SFP FMA is comprised of more than 70% pine, much of which is mature and over-mature.

**SFP's Proposed Action Plan will increase the pine harvest.**

The provincial goal of reducing the susceptible pine by 75% would mean an increase in harvest of 62% which is beyond the milling capacity of the forest operators in the FMA at this time.

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<sup>1</sup> Refers to Mountain Pine Beetle Susceptible stands as defined by Alberta Sustainable Resources.



SFP has evaluated their fibre sources and current mill capacity and has developed an action plan with the harvest level increasing. Based on the current annual allowable cut (AAC), harvest levels will increase 44% for the next twenty years. It will then decrease to 29% less than the current AAC.

If, in the future, SFP can increase milling capacity to meet the provincial goal of reducing the susceptible pine by 75%, it is prepared to develop appropriate plans

### **Sustainability**

At the epidemic level existing in B.C., the reforestation of areas that will not be harvested presents a serious problem to that province.

All areas harvested under this plan will be reforested to Alberta Government standards. Harvest operations will meet or exceed current standards.

### **Other resource values will be protected.**

SFP remains committed to its current audited environmental standards which meet or exceed provincial regulations and ground rules. As well, Grizzly Bear habitat and the impacts to water yield have been specifically evaluated in this plan amendment.

As operations are implemented, the effectiveness and long-term impacts of the plan will be monitored by the Alberta Government and Sundre Forest Products.

### **SFP remains committed to its people and communities.**

Following the completion of this 20 year government initiative, the AAC will be reduced. SFP's intention is to continue to run operations at capacity and resume purchasing fibre from other sources as it is currently doing. The SFP operations are currently highly competitive. Continued investment in technology will ensure the long term viability of the SFP facilities in the area.

## **4.4 Responsibilities**

Communication of the Provincial Mountain Pine Beetle Action Plan and Interpretative Bulletin is a provincial responsibility. The responsibility to develop an amended Forest Management Plan which meets the intent of the Provincial Mountain Pine Beetle Action Plan is the responsibility of Sundre Forest Products which would include the other timber operators within the FMU.

At the initial Plan Development Team meeting, communication responsibilities associated with the Sundre Forest Products Mountain Pine Beetle Action Plan were identified with regional and coordination responsibilities being assigned to Regional ASRD Staff. Appendix 2 is the communication plan jointly developed by SFP and Regional ASRD. The communication plan is divided into Project Introduction and Project Implementation. The introduction phase of the plan is complete. The implementation phase will be ongoing following submission of the SFP MPB Action Plan.

The SFP FMA has historically engaged substantial stakeholder input and media reporting on its forest management practices. SFP and ASRD staff have worked together to complete the introduction phase and will continue to work together to deliver the implementation phase and to respond to further communication opportunities if they arise.

## 4.5 Communication Roll-Out

Table 1 tracks the communication activities associated with the Project Introduction. An important part of communication plan relates to SFP's public advisory group (SPIRT). This group continues to be an important source of advice on forest management practices and communications based on numerous values that each individual represents, in the SFP FMA. Communications with SPIRT have been ongoing since 1991 and more recently in 2006, meeting agendas have included a staged explanation of the calculation of the annual allowable cut for the FMA. In October 2006, meetings became focused on the development of this Plan. The Communication Plan contains the advice and SFP actions coming from the subsequent meetings. The final draft of the SFP MPB Action Plan was presented to SPIRT on February 22, 2007. SPIRT was provided an update on the Plan at a meeting held on June 7, 2007.

Briefings to the other identified interest groups and individuals are also identified in Table 1. The briefings have been an effective and timely way to communicate both the provincial MPB Plan and the SFP Plan. The agreed to process of presenting the provincial strategy and the company plan as one presentation done by both parties was well received.

*Table 1 Communication and Input Tracking*

Target	Materials Used	Who	Comments
<b>SPIRT Members</b>	<ul style="list-style-type: none"> <li>- Mountain Pine Beetle Mania Primer – pages 1-4</li> <li>- Provincial MPB Risk maps</li> <li>- Information on:                             <ul style="list-style-type: none"> <li>-Mountain Pine Beetle Action Plan</li> <li>- Interpretative Bulletin, September 2006</li> <li>-Key Messages</li> <li>-Staged explanation of Annual Allowable Cut calculations.</li> <li>-Ongoing review of the Mountain Pine Beetle Action Plan.</li> </ul> </li> <li>-Final Review of the Mountain Pine Beetle Action Plan</li> <li>-Update on progress after the first submission</li> </ul>	SRD Staff and SFP Staff	<p>Ongoing explanation, discussion and consultation throughout plan development.</p> <p>Advice provided by members is included in Appendix 2.</p> <p>SPIRT Members given the opportunity to comment and provide advise.</p>
<b>SFP Admin &amp; Supervisory Staff &amp; Strachan LVL Supervisory Staff</b>  <b>SFP Production and Maintenance Staff</b>	<ul style="list-style-type: none"> <li>- Provincial MPB Risk maps</li> <li>Mountain Pine Beetle Action Plan</li> <li>- Interpretative Bulletin, September 2006</li> <li>- Key Messages.</li> </ul> <p>Up-dated presentation including current MPB situation and action plan</p>	SFP Staff	<p>Supervisory and administration staff briefed at both facilities.</p> <p>Common questions were</p> <ul style="list-style-type: none"> <li>-Can pesticides be used?</li> <li>-will beetle only attach pine?</li> <li>-what is considered a susceptible tree?</li> <li>-why can't we plan to consume more volume?</li> </ul> <p>All questions were responded to.</p>
<b>SFP Contractors</b>	<ul style="list-style-type: none"> <li>- Provincial MPB Risk maps</li> <li>- Information on:                             <ul style="list-style-type: none"> <li>Mountain Pine Beetle Action Plan</li> <li>- Interpretative Bulletin, September</li> </ul> </li> </ul>	SFP Staff	<p>Presented to KMD Contracting</p> <p>Presented to Coleman Forest Products</p>

	2006 - Key Messages		
<b>SRD Staff</b>	- Review of SFP plans - Provincial MPB Risk Maps - Information on: Mountain Pine Beetle Action Plan - Interpretative Bulletin – September 2006 - Key Messages	SRD Staff  SFP Staff	Complete
<b>CTP Holders Quota holders</b>	- Provincial MPB Risk maps - Information on: Mountain Pine Beetle Action Plan - Interpretative Bulletin - September 2006 - SFP Risk Analysis - Harvest Level Options	SRD Staff  SFP Staff	Harvest level options were explained and participants were asked to identify the volume increases they were prepared to commit to.
<b>NGO's</b>	Meeting with local NGO member	SRD Staff	complete
<b>Other Ministries - CD, Parks Canada</b>	- Provincial MPB Risk maps Mountain Pine Beetle Action Plan - Interpretative Bulletin of Sept. 2006	SRD Staff	complete
<b>Nordegg Community Association</b>	Presentation on Plan	SRD Staff SFP Staff	complete
<b>First Nations -Big Horn -Ochiese -Sunchild</b>	Regional ASRD Staff to consult with Provincial ASRD Coordinator  SFP to follow provincial guidelines	SRD Staff  SFP Staff	complete  in progress

*Table 2 Designated Spokesmen*

<b>SFP Staff</b>	<b>SRD staff</b>
Greg Neale Woodlands Manager Phone 403 638 6221 Greg.neale@westfraser.com	Kevin Gagne Senior Forester Phone: (403) 845-8250 Email: <a href="mailto:kevin.gagne@gov.ab.ca">kevin.gagne@gov.ab.ca</a>
Bob Held Project Lead and Timber Supply Analyst 403 638 6218 Bob.held@westfraser.com	A.H. (Butch) Shenfield Forestry Manager Phone: (403) 845-8250 Email: <a href="mailto:butch.shenfield@gov.ab.ca">butch.shenfield@gov.ab.ca</a>
Peter Denney Communications Coordinator and Harvest Plan Manager 403 638 6210 <a href="mailto:Peter.denney@westfraser.com">Peter.denney@westfraser.com</a>	Rita Stagman Information Co-ordinator Phone: (780) 542-6616 Email: <a href="mailto:rita.stagman@gov.ab.ca">rita.stagman@gov.ab.ca</a>
Tom Daniels Forestry Superintendent 403 638 6211 <a href="mailto:tom.daniels@westfraser.com">tom.daniels@westfraser.com</a>	

## 5 TECHNICAL ANALYSIS

The technical analysis includes:

- A summary of the land base classification
- A summary of the yield analysis
- A description and summary of the timber supply analyses completed
- A description of the long term road corridor plan
- A description and summary of the non timber value analyses.

### 5.1 Land Base Classification

Since the approval of the revised timber supply analysis in 2002, Sundre Forest Products has completed a land base classification and redefined the AAC land base to be used in the MPB strategy. A revision to the land base has been completed as newer information has become available. The AAC contributing land base has been reduced by 11.8% from 431,209 ha to 380,461 ha.

Table 3 provides a summary of the classification and a comparison to the approved land base. Details of the land base classification are provided in Appendix 3.

The land base is classified as per Sustainable Resource Development's Stand Susceptibility Rating model to provide an index for each stand in the FMU. This information, along with a compartment risk rating, was used to identify the Rank 1 and 2 stands, as defined in the ASRD interpretative bulletin, and is the target of the Plan.

Based on the MPB rank information, the net land base has been further refined to exclude areas of small tree size (contributing 13/7<sup>2</sup>) and poor operability (contributing cable yarding). The land base that will be operated as part of the Plan is approximately 33% of the gross FMU area, or 191,870 hectares (Rank 1 and 2). After the first 20 years, the deferred land base (small tree size and yarding areas) will then contribute to the harvest.

Table 4, Figure 2, Figure 3, Figure 4 and Figure 5 provide maps of the MPB Susceptibility Rating, Compartment MPB Risk Rating, MPB Priority Rank for the gross land base and MPB Rank for the net 20 year operable land base, respectively.

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<sup>2</sup> This area was partitioned from the land base because of small tree size, geographic location and lower imminent risk.

*Table 3 Land Base Classification*

Deletion	Approved 2002 Land Base SYU			2006 Land Base SYU			Variance SYU		
	R10	R10U	Total	R10	R10U	Total	R10	R10U	Total
<i>Non-Forested</i>	3,700.9	48,092.8	51,793.7	4,397.7	47,971.5	52,369.2	18.8%	-0.3%	1.1%
<i>Status</i>	160.2	5,863.0	6,023.2	-	-	-	-100.0%	-100.0%	-100.0%
Land Use				106.9	5,102.0	5,208.9	0.0%	0.0%	0.0%
Protected Areas				222.3	3,267.0	3,489.3	0.0%	0.0%	0.0%
Prime Protection	-	877.7	877.7	-	-	-	0.0%	-100.0%	-100.0%
<i>Total Status</i>	160.2	6,740.7	6,900.9	329.2	8,369.0	8,698.3	105.5%	24.2%	26.0%
<i>Slope</i>	24.7	22,600.0	22,624.7	9.0	20,163.5	20,172.5	-63.7%	-10.8%	-10.8%
<i>Ground Rule</i>	1,164.0	11,235.2	12,399.2	-	-	-	-100.0%	-100.0%	-100.0%
Trail and Seismic	-	-	-	355.5	6,281.0	6,636.5	0.0%	0.0%	0.0%
Stream Buffer	-	-	-	978.0	23,758.0	24,735.9	0.0%	0.0%	0.0%
<i>Total Ground Rule</i>	1,164.0	11,235.2	12,399.2	1,333.5	30,039.0	31,372.5	14.6%	167.4%	153.0%
<i>Productivity</i>	1,176.7	46,733.1	47,909.8	1,279.3	45,806.2	47,085.5	8.7%	-2.0%	-1.7%
<i>Inaccessible</i>	9.9	9,091.2	9,101.1	78.3	29,495.5	29,573.8	691.1%	224.4%	224.9%
<i>Horizontal</i>	120.5	246.1	366.6	-	-	-	-100.0%	-100.0%	-100.0%
<i>Burn Deletions</i>				-	5,093.9	5,093.9	0.0%	0.0%	0.0%
<i>Waived Reforestation Liability</i>				-	16.2	16.2	0.0%	0.0%	0.0%
<i>Net Land Base</i>									
15/11 Merchantability	13,593.8	417,615.0	431,208.8	12,264.6	276,126.5	288,391.2	-9.8%	-33.9%	-33.1%
Yarding	-	-	-	-	9,105.8	9,105.8	0.0%	0.0%	0.0%
13/7 Merchantability	-	-	-	219.1	82,745.3	82,964.3	0.0%	0.0%	0.0%
<i>Total Net Land Base</i>	13,593.8	417,615.0	431,208.8	12,483.7	367,977.6	380,461.3	-8.2%	-11.9%	-11.8%
<b>Land Base Total</b>	<b>19,950.7</b>	<b>562,354.1</b>	<b>582,304.8</b>	<b>19,910.7</b>	<b>554,932.4</b>	<b>574,843.1</b>	<b>-0.2%</b>	<b>-1.3%</b>	<b>-1.3%</b>

Note: There is 13,062.6 ha of area within the contiguous boundary of FMU R10 that is not reported in this table as this area is not assigned to the FMU.

*Table 4 Summary of MPB Rank by Land Classification<sup>3</sup>*

<b>Land base Classification</b>	<b>No Rank</b>	<b>Rank 1</b>	<b>Rank 2</b>	<b>Rank 3</b>	<b>Total</b>
Non Forested	52,369.2	-	-	-	52,369.2
Land Use	4,205.5	120.9	740.9	141.6	5,208.9
Trails and Seismic	6,634.4	0.5	1.6	0.1	6,636.5
Protected Areas	1,444.3	450.4	1,584.6	10.0	3,489.3
Slope	3,229.3	465.9	13,023.0	3,454.3	20,172.5
Stream Buffer	7,723.8	1,394.5	12,686.9	2,930.7	24,735.9
Productivity	27,441.6	155.3	12,769.1	6,719.4	47,085.5
Inaccessible	2,492.8	1,696.7	21,434.4	3,949.9	29,573.8
Burn Deletions	4,836.2	91.9	165.8	-	5,093.9
Waived Reforestation Liability	16.2	-	-	-	16.2
AAC	77,708.8	39,406.9	151,368.8	19,906.6	288,391.2
AAC including Yarding areas	1,393.9	1,118.2	4,237.1	2,356.5	9,105.8
Fair Site Pine	7,403.7	6,017.1	57,990.1	11,553.4	82,964.3
<b>Land Base Total</b>	<b>196,899.9</b>	<b>50,918.2</b>	<b>276,002.3</b>	<b>51,022.7</b>	<b>574,843.1</b>

<sup>3</sup> Rankings were applied as per Interpretive Bulletin – Planning Mountain Pine Beetle Response Operations (Version 2.6 September, 2006)

Figure 1 Land Base Classification

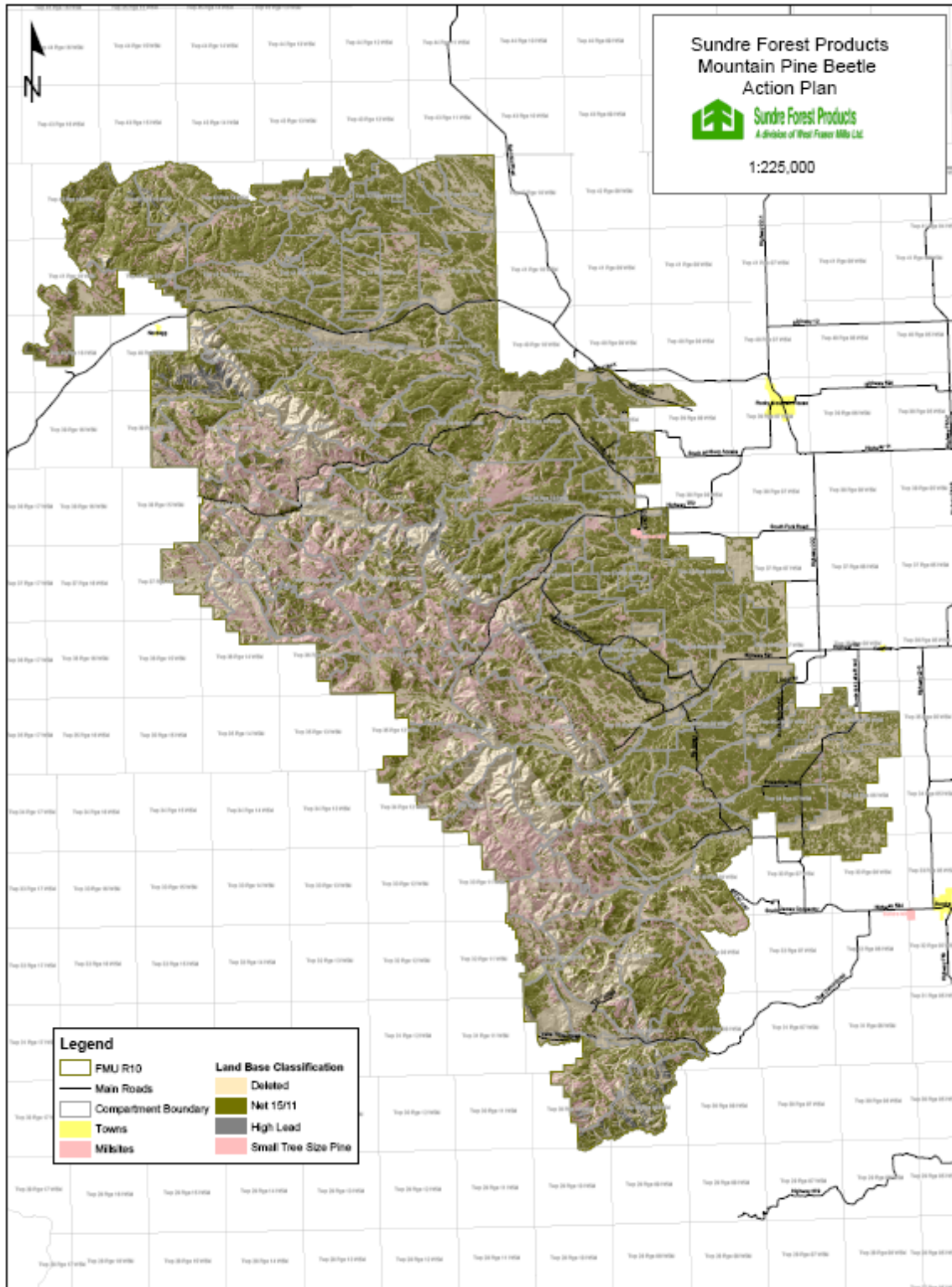




Figure 2 MPB Susceptibility Rating

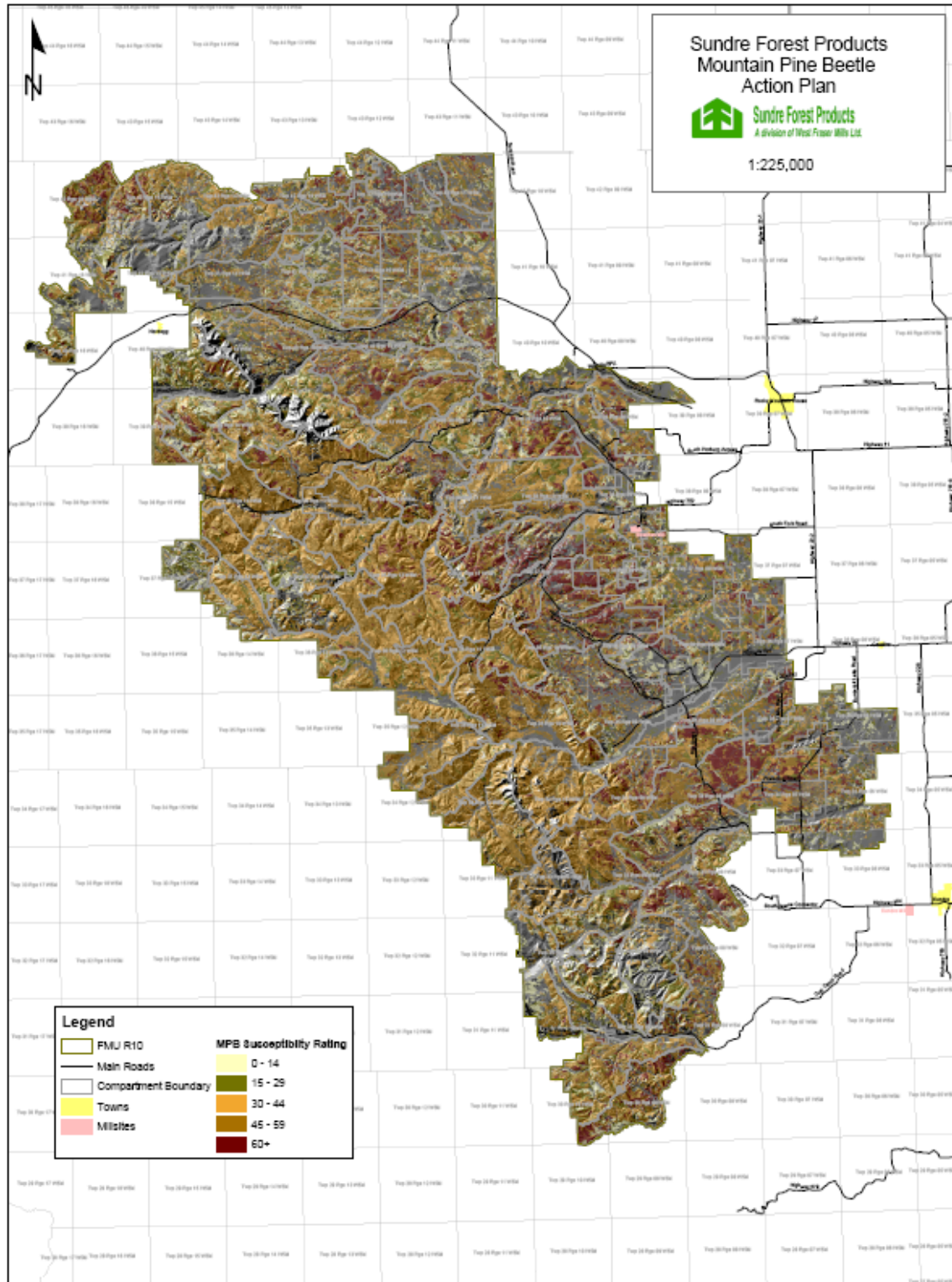




Figure 3 Compartment MPB Risk Rating

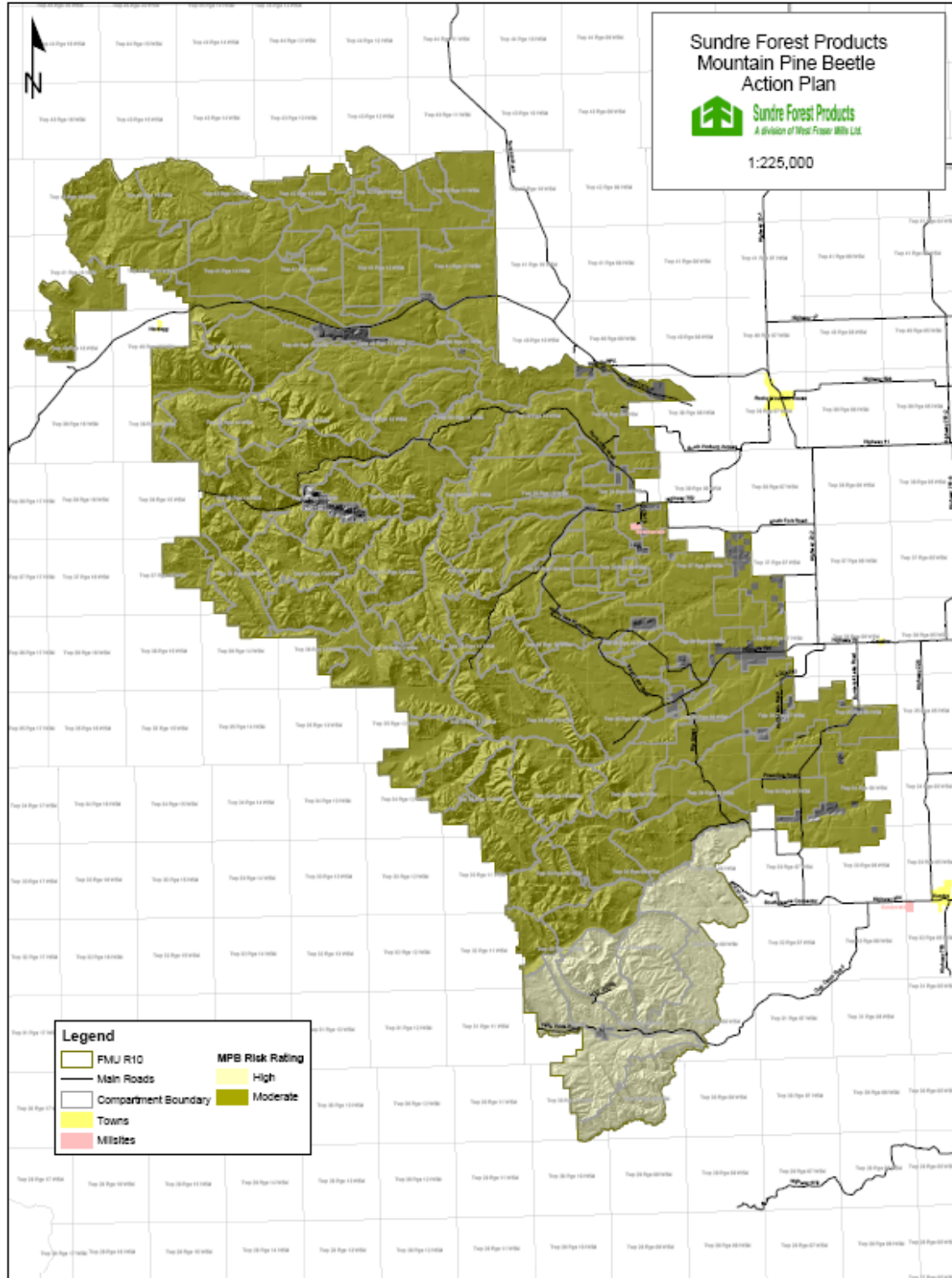


Figure 4 MPB Priority Rank

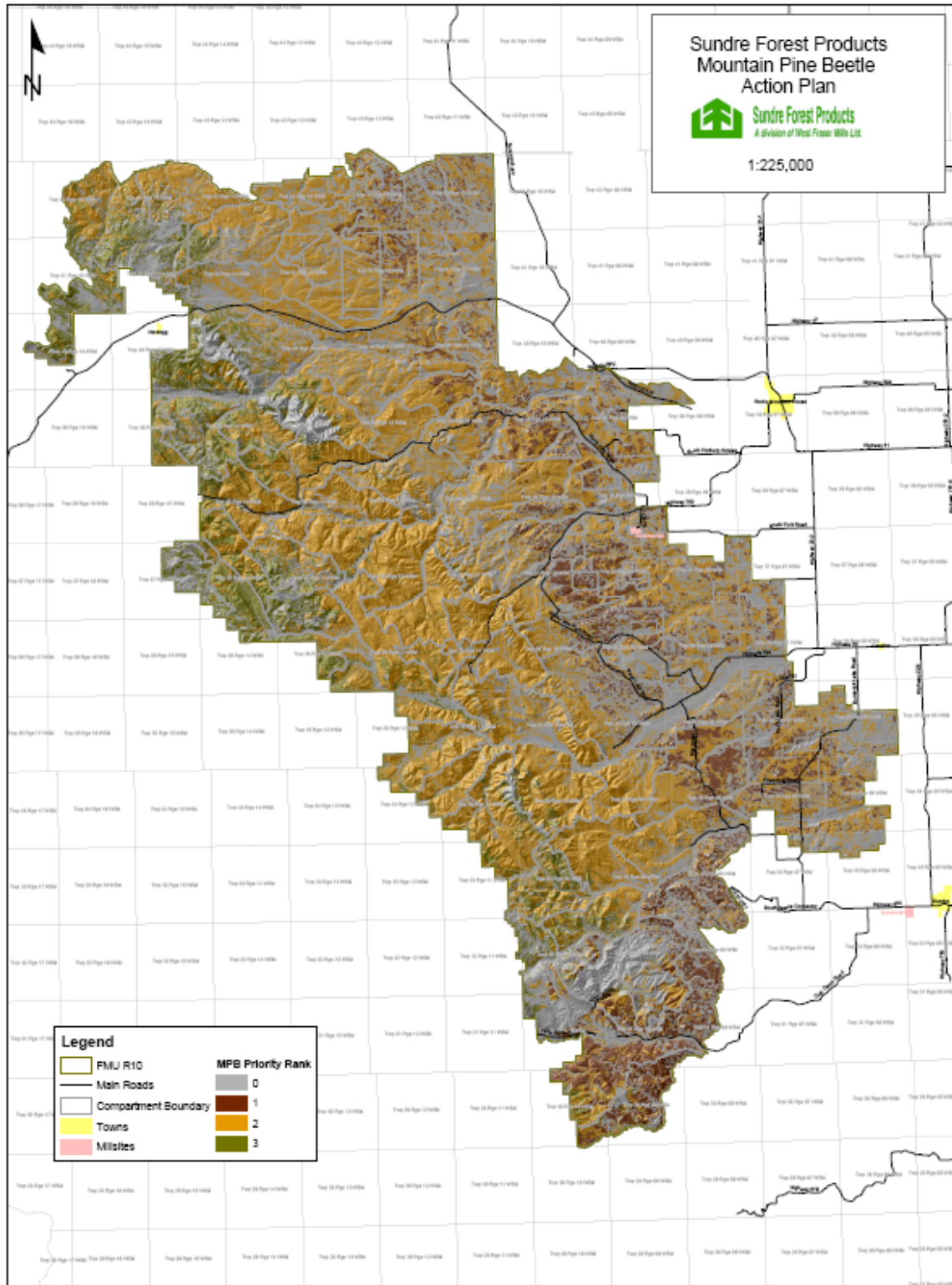
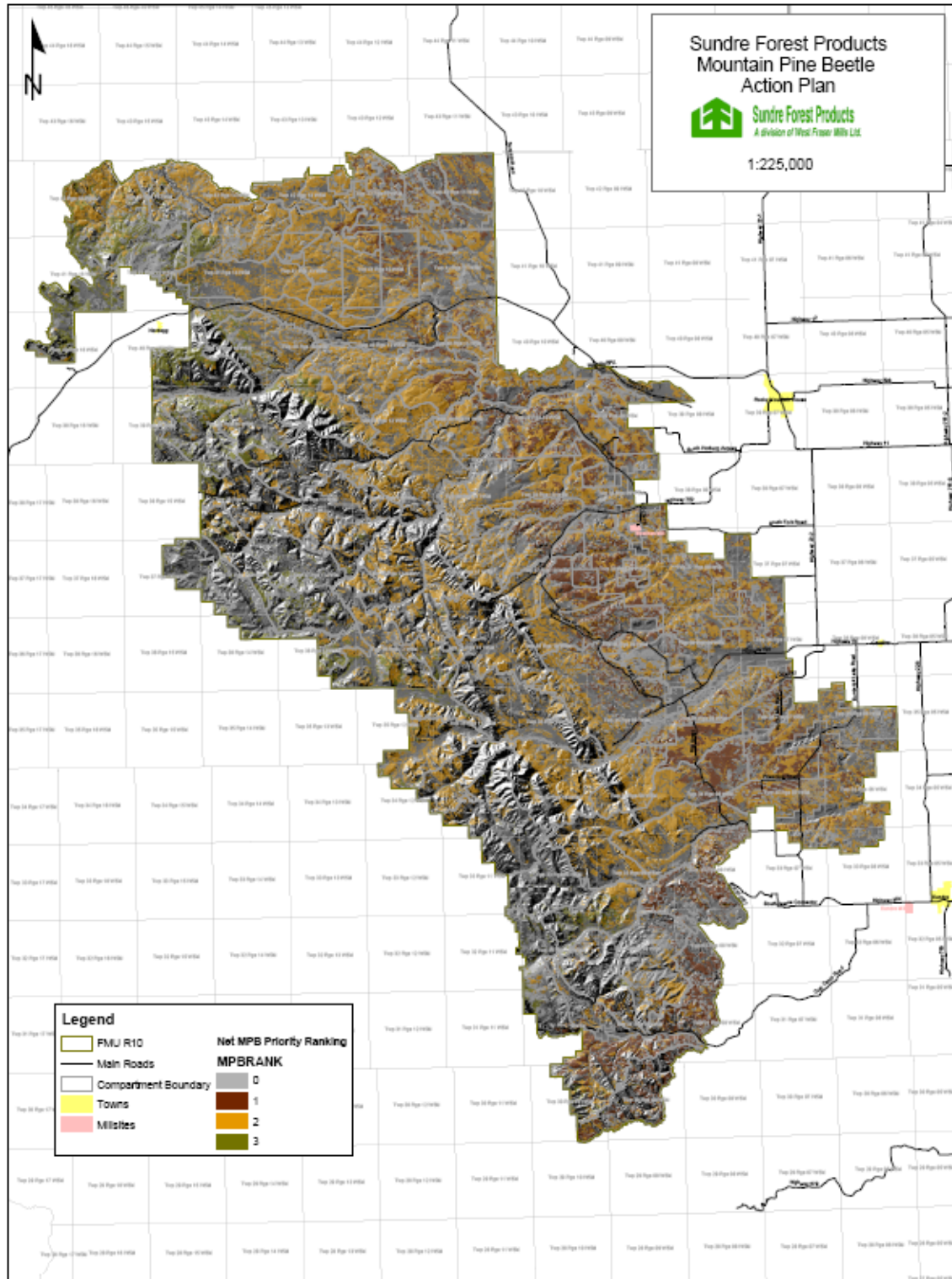


Figure 5 Net MPB Priority Ranking



## 5.2 Yield Relationships

The approved 2002 yields<sup>4</sup> relationships were used for the timber supply analysis.

20 Yield Classes are used and are defined by:

- Natural Sub-Region (Upper and Lower Foothills)
- Crown Closure (A/B and C/D)
- Productivity Class (Fair and Medium/Good)
- Cover Group (Pure Coniferous, Mixed wood and Pure Deciduous)

Table 5 provides a summary of the yield stratification. Table 6 provides the area weighted yield relationships for the AAC contributing land base (13/7 and 15/11 coniferous volume and 15/11 deciduous volume). Appendix 4 provides the individual stratum relationships.

The approved yield relationships do not provide for tree size estimates. This was not a requirement in the approved 2002 timber supply analysis. Therefore, no projection of tree size is provided in the timber supply analyses.

*Table 5 Yield Strata*

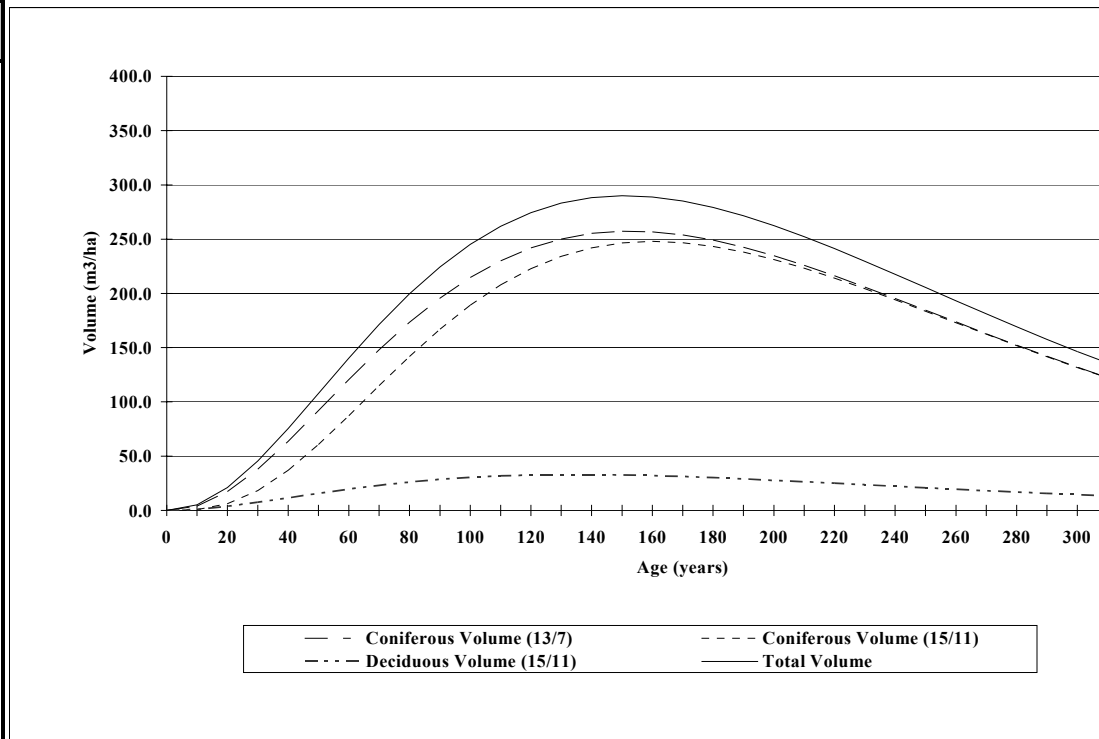
Yield Class	Cover Group	Natural Sub-region	Crown Closure	Site Class
1	Pure Coniferous	Upper Foothills	A/B	U/F
2	Pure Coniferous	Upper Foothills	A/B	M/G
3	Pure Coniferous	Upper Foothills	C/D	U/F
4	Pure Coniferous	Upper Foothills	C/D	M/G
5	Pure Coniferous	Lower Foothills	A/B	U/F
6	Pure Coniferous	Lower Foothills	A/B	M/G
7	Pure Coniferous	Lower Foothills	C/D	U/F
8	Pure Coniferous	Lower Foothills	C/D	M/G
9	Mixed wood	Upper Foothills	A/B	U/F
10	Mixed wood	Upper Foothills	A/B	M/G
11	Mixed wood	Upper Foothills	C/D	U/F
12	Mixed wood	Upper Foothills	C/D	M/G
13	Mixed wood	Lower Foothills	A/B	U/F
14	Mixed wood	Lower Foothills	A/B	M/G
15	Mixed wood	Lower Foothills	C/D	U/F
16	Mixed wood	Lower Foothills	C/D	M/G
17	Pure Deciduous	All	A/B	U/F
18	Pure Deciduous	All	A/B	M/G
19	Pure Deciduous	All	C/D	U/F
20	Pure Deciduous	All	C/D	M/G

<sup>4</sup> Yield Analysis – June 4, 2002 Submitted by Sunpine Forest Products Ltd.



**Table 6 Area Weighted Yields<sup>5</sup>**

Gross merchantable volume (m3/ha)					
Age	Coniferous Volume (13/7)	Coniferous Volume (15/11)	Deciduous Volume (15/11)	Total Volume	M.A.I
0	0.0	0.0	0.0	0.0	0.000
10	4.0	0.9	1.1	5.1	0.404
20	17.3	6.3	3.8	21.1	0.867
30	38.1	18.4	7.5	45.6	1.271
40	63.8	37.1	11.6	75.4	1.596
50	92.0	60.7	15.8	107.8	1.840
60	120.6	87.4	19.7	140.3	2.010
70	148.1	115.0	23.2	171.3	2.116
80	173.4	142.0	26.2	199.6	2.168 *
90	195.8	167.0	28.6	224.4	2.175 *
100	214.7	189.1	30.5	245.2	2.147
110	230.1	207.8	31.8	261.9	2.092
120	241.9	222.8	32.7	274.5	2.015
130	250.2	234.2	33.1	283.2	1.924
140	255.2	242.0	33.1	288.3	1.823
150	257.3	246.4	32.7	290.0	1.715
160	256.8	247.9	32.1	288.9	1.605
170	253.9	246.8	31.3	285.2	1.494
180	249.1	243.4	30.2	279.3	1.384
190	242.6	238.1	29.1	271.7	1.277
200	234.8	231.3	27.8	262.6	1.174
210	225.9	223.1	26.4	252.3	1.076
220	216.2	214.1	25.1	241.3	0.983
230	206.0	204.3	23.7	229.6	0.896
240	195.4	194.1	22.2	217.6	0.814
250	184.6	183.6	20.9	205.4	0.738
260	173.7	172.9	19.5	193.2	0.668
270	162.9	162.3	18.2	181.1	0.603
280	152.3	151.9	16.9	169.3	0.544
290	142.0	141.7	15.7	157.7	0.490
300	132.0	131.8	14.5	146.6	0.440
310	122.4	122.3	13.4	135.9	0.395
320	113.3	113.1	12.4	125.7	0.354
330	104.6	104.5	11.4	116.0	0.317
340	96.3	96.2	10.5	106.8	0.283



<sup>5</sup> Total Volume is the sum of Coniferous Volume (13/7) and Deciduous Volume (15/11)

### 5.3 Timber Supply Analysis

This section describes the approach and process of the AAC calculation. The AAC calculation is separated into three sections:

- Calculate the AAC using Woodstock, Copyright© Remsoft® version 2006.10. Woodstock provides the non-spatial optimized solution.
- Develop a spatial harvest sequence (SHS) using inputs from above, spatial layers and the Tesera Systems Inc. Spatial Allocation Model.
- Assess impacts on water yields and grizzly bear habitat using the Foothills Model Forest Grizzly Bear Model<sup>6</sup> and the University of Alberta's Water Yield Model<sup>7</sup>.

Six scenarios are provided as per the interpretive bulletin and discussions in the Plan development team meetings. They include:

Scenario 1 - Approved 2002 Timber Supply Analysis for comparison purposes.

Scenario 2 - The current approved FMP with the revised land base (Non-spatial only)

Scenario 3 - The scenario providing the level of harvest required to meet the ASRD guidelines (Non-spatial only)

Scenario 4 - The proposed Preferred Forest Management Scenario including a spatial harvest sequence (SHS).

Scenario 5 - The MPB outbreak (disaster scenario, Non-spatial only)

Scenario 6 - Non – FMA Portion of FMU R10

In addition, the following concepts are recognized:

- A spatial harvest sequence is provided for the coniferous harvest and deciduous harvests for Weyerhaeuser (Drayton Valley) operations only.
- Stand level MPB infestation management (Level II) will be addressed at an operational level in consultation with ASRD staff.

The following section describes the input and outputs for both the Woodstock and spatial harvest sequencing analysis. A description of the input files (in brackets) specific to each scenario will be described, along with summary output information.

#### 5.3.1 STANDARD SCENARIO INFORMATION

Woodstock was used to optimize the AACs for each scenario. Each Woodstock scenario contains the same basic assumptions as outlined below. Additional assumptions are identified in the specific scenarios. The basic assumptions are:

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<sup>6</sup> Foothills Model Forest - Grizzly Bear Resource Selection Function v2.0 and Grizzly Bear Mortality Risk Model v1.0

<sup>7</sup> University of Alberta - Cumulative Watershed Disturbance and Hydrologic Recovery Simulator version 1.0

- 200 year planning horizon
- 15/11 coniferous and deciduous utilization in the planning horizon
- A cull deduction of 1.5% for coniferous and 9% for deciduous is applied to provide a net merchantable harvest volume.
- 10 year periods
- 350 year life span for all types (Woodstock File MPB.lif)
- Minimum harvest age of 80 years for coniferous and 70 years for deciduous
- One sustained yield unit
- Stable Growing stock in the remaining 4 periods (except for the Disaster Scenario)

Woodstock Landscape themes used in Scenarios 1 to 4:

This file (*mpb.lan*) provides the land base categories used. Categories are provided in Table 7. The combination of these categories is referred to as a development type.

*Table 7 Landscape Themes*

Order	Name	Description
1	Sustained Yield Unit (SYU)	Defines the FMA and Non FMA areas within FMU R10
2	Compartment	Defines the smaller subunits of the FMU
3	Land Base	Defines coniferous vs. deciduous land bases
4	Deletions	Defines contributing vs. non contributing land bases
5	Dominant Species/MPB Rank	Defines MPB Risk
6	Yield Class	Defines the yield strata
7	Status	Defines standing vs. regeneration areas

*Yields (Y00\_L2\_v2.YLD) – Scenarios 1 to 4 and 6 only*

This file provides age dependent yield class projection information in 10 year age classes. The estimates are provided for age classes 7 to 18. The yield information file provides estimates by yield class for coniferous 15/11 volume (CONIF), coniferous 13/7 volume (CONIFS) and deciduous volume (DECID) (Appendix 4 provides the individual Yield Relationships).

Ages 70 to 180 are used for the timber supply scenarios. Woodstock will use the age at 70 years for any projections younger than 70 years and the age at 180 years for projections older than 180 years. Since a minimum harvest age of 80 years is applied the truncation at the younger age will have no effect in volume projections. Projections in the older ages will be slightly over projected. However, the total overestimate will be insignificant as the majority of the stands harvested will be less than 180 years. This assumption is consistent with the approved plan and was not

changed for this amendment. These projections will be addressed in the next FMP submission.

*Actions (mpb.act) – Scenarios 1 to 5 only*

This file defines the coniferous and deciduous harvest actions applied to the land base. Actions are constrained to the coniferous vs. deciduous land base, net land base and minimum harvest age. Minimum harvest ages for coniferous harvests are set to 80 (age class 8) years while the minimum for deciduous harvests is set to 70 years (age class 7).

*Transition (mpb.trn) – Scenarios 1 to 4 and 6 only*

This file defines the yield class transitions after coniferous and deciduous harvest. Yield transitions assume a fully stocked state after harvest (i.e. All A/B stands will move to C/D curves), a 2 year regeneration lag, and gross merchantable 13/7 and 15/11 coniferous and deciduous volumes. All harvested stands are assigned a regeneration status. Any development type that senesce will transition to the same yield class. Table 8 provides a summary of the yield transitions.

*Table 8 Yield Transitions*

Yield Class	CoverGroup	Natural Subregion	Crown Closure	Site Class	Normal Harvest Transition	MPB Infestation Transition (Scenario 5 Only)
1	Pure Coniferous	Upper Foothills	A/B	U/F	3	1
2	Pure Coniferous	Upper Foothills	A/B	M/G	4	2
3	Pure Coniferous	Upper Foothills	C/D	U/F	3	1
4	Pure Coniferous	Upper Foothills	C/D	M/G	4	2
5	Pure Coniferous	Lower Foothills	A/B	U/F	7	7
6	Pure Coniferous	Lower Foothills	A/B	M/G	8	8
7	Pure Coniferous	Lower Foothills	C/D	U/F	7	7
8	Pure Coniferous	Lower Foothills	C/D	M/G	8	8
9	Mixed wood	Upper Foothills	A/B	U/F	11	11
10	Mixed wood	Upper Foothills	A/B	M/G	12	12
11	Mixed wood	Upper Foothills	C/D	U/F	11	11
12	Mixed wood	Upper Foothills	C/D	M/G	12	12
13	Mixed wood	Lower Foothills	A/B	U/F	15	15
14	Mixed wood	Lower Foothills	A/B	M/G	16	16
15	Mixed wood	Lower Foothills	C/D	U/F	15	15
16	Mixed wood	Lower Foothills	C/D	M/G	16	16
17	Pure Deciduous	All	A/B	U/F	19	19
18	Pure Deciduous	All	A/B	M/G	20	20
19	Pure Deciduous	All	C/D	U/F	19	19
20	Pure Deciduous	All	C/D	M/G	20	20

*Optimize (mpb.opt)*

This file defines the objective function and constraints. The objective is to maximize total fibre harvested (coniferous and deciduous) over a 200 year planning horizon, subject to even flow sustainable coniferous and deciduous harvest.

*Queue (mpb.que)*

This file provides the stand sequencing priority. The objective is to harvest oldest stand first, subject to other constraints.



### 5.3.2 SCENARIO 1 – APPROVED 2002 TIMBER SUPPLY ANALYSIS

The approved Forest Management Plan was completed in 1996. A condition of approval of this plan was the completion of a revised timber supply analysis with the completion of AVI. The revised timber supply analysis was approved in 2002.

### 5.3.3 SCENARIO 2 - THE CURRENT APPROVED FMP (MPB\_V2) WITH REVISED LAND BASE

This scenario provides the AAC based on the assumptions used in the 2002 amended timber supply analysis. The only change was that the updated land base will be used.

The assumptions, in addition to those listed in Section 5.3.1 are:

- Even flow harvest over the planning horizon.
- No compartment sequencing
- All yield transitions to fully stocked state

#### 5.3.3.1 Woodstock files

##### *Areas File (Land\_v16.are)*

This file provides the age (10 year periods) and area information for each of the development types. This file is created from the land base file and was updated to include more recent information.

Areas are excluded from this file according to the following criteria:

- A land base code of 0
- Missing ages, where not identified
- Areas are rounded to .1 ha.

Ages were classed into 10 year periods (e.g. Age Class 1 = 0 to 10 years, Age Class2 = 11 to 20 years, etc.)

New compartment information was acquired after the submission of the land base document to address changes in the Quota operators' spheres of interest. This information was obtained from regional SRD staff. Compartments that have been modified are provided in Table 9.

*Table 9 Updated Compartments*

Compartment ID Number	Name
9002	Bob Mclean Quota
9003	Gray Quota
9180	Lone Pine Financial Corporation
9181	Strachan Forest Products
9182	Vanderleek and Opendries Investments Ltd.

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### 5.3.4 SCENARIO 3 - ASRD PINE PREVENTION STRATEGY (MPB\_V3)

This scenario provides the AAC based on the guidelines provided in the Interpretive Bulletin – Planning Mountain Pine Beetle Response Operations (Version 2.6 September, 2006). It used scenario MPB\_V2 as base.

In discussions with SFP mill personnel and other operators, this strategy was not achievable as the harvest volumes projected exceed milling capacities for SFP and other operators. The Preferred Forest Management Strategy will address this milling capacity constraint.

The assumptions, in addition to those listed in Section 5.3.1 are:

- Even flow harvest in the first 20 years and even flow harvest from 20 to 200 years, which will be at different levels.
- Reduce the susceptible area to 75% of that calculated in period 2 of Scenario 2 (MPB\_v2).
- Deferral of non rank 1 and 2 stands, small tree size and yarding areas for 20 years
- No compartment sequencing
- All yield transitions to fully stocked state

#### 5.3.4.1 Woodstock files

*Areas File (Land\_v16.are)*

This file provides the age (10 year periods) and area information for each of the development types. This file is created from the land base file and was updated to include more recent information.

Areas are excluded from this file according to the following criteria:

- A land base code of 0
- Missing ages, where not identified.
- Areas are rounded to .1 ha.

Ages were classed into 10 year periods (e.g. Age Class 1 = 0 to 10 years, Age Class2 = 11 to 20 years, etc.)

The total area of FMU R10 = 587,838 ha with reductions for land base 0, missing ages, and rounding the total area represented in the areas file is 512,302 ha.

New compartment information was acquired after the submission of the land base document to address changes in the Quota operators' spheres of interest. This information was obtained from regional SRD staff. Compartments that have been modified are provided in Table 9.

### 5.3.5 SCENARIO 4 - SUNDRE FOREST PRODUCTS PREFERRED MANAGEMENT SCENARIO (MPB\_V6)

This scenario is the preferred forest management scenario (PFMS). It outlines proposed harvest levels for Sundre Forest Products and other embedded operators. It used Scenario 2 (MPB\_v2) as a base.

Scenario 3 (MPB\_v3) provides a harvest level that exceeds current mill capacities for Sundre Forest Products and the other operators. Therefore, this scenario was constrained to the FMU AAC to meet mill capacities and to account for the decreased utilization levels. Table 10 provides the AAC constraints for Sundre Forest Product, Quota Holders and the CTPP Program. The values provided in the table are net merchantable volumes (i.e. net of cull).

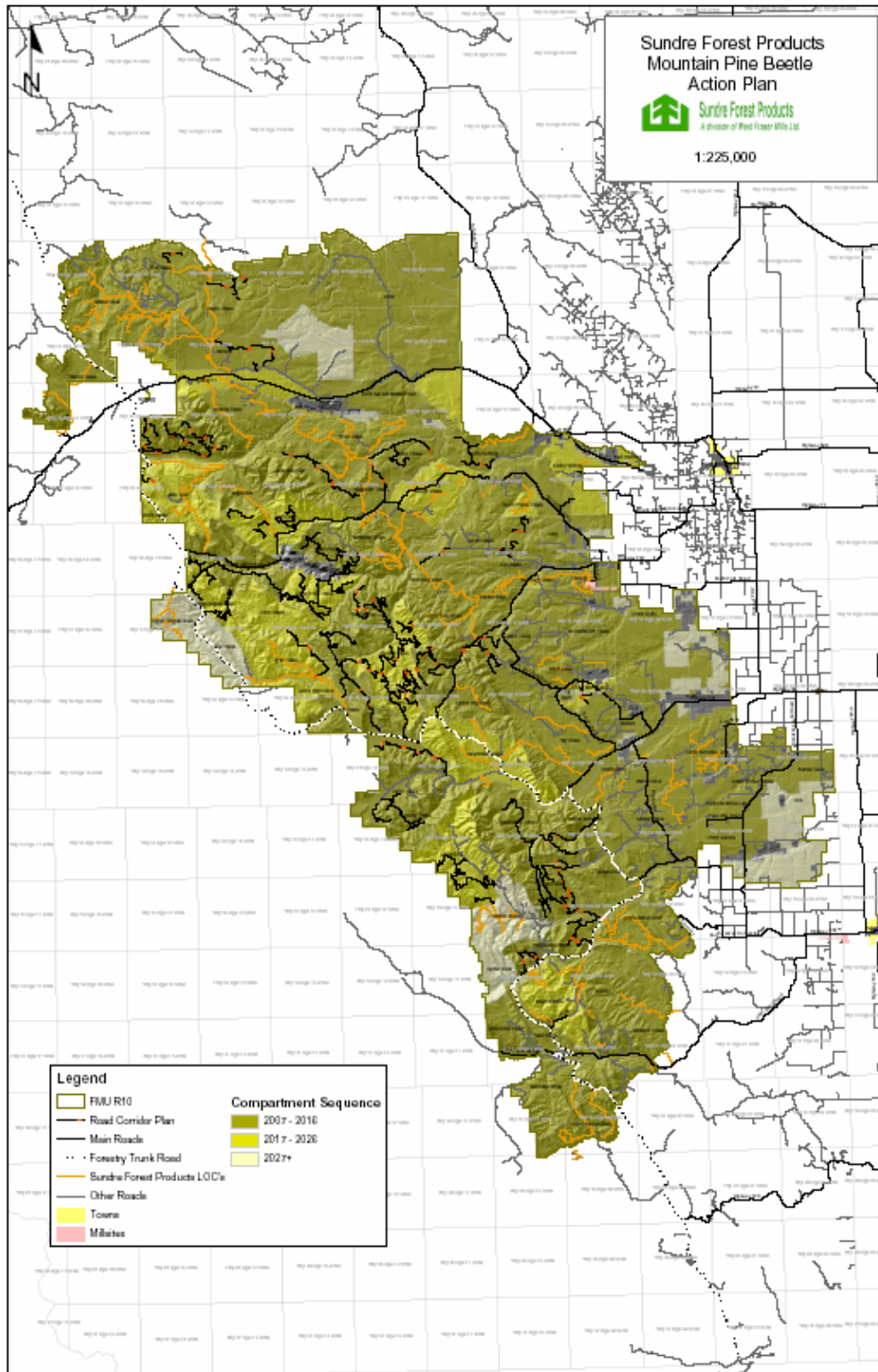
*Table 10 Harvest Level Constraints<sup>8</sup>*

Disposition	Current AAC (13/7)	AAC Allocation	Revised Harvest Level (15/11)	Change (%)	20 Year Harvest Level Allocation (%)
SFP	828,628	84.11%	1,200,000	44.8%	85.04%
RWP	74,083	7.52%	96,308	30.0%	6.82%
Cech	672	0.07%	672	0.0%	0.05%
Gray	8,190	0.83%	8,190	0.0%	0.58%
Mclean	4,652	0.47%	4,652	0.0%	0.33%
Lone Pine Financial Corporation	10,500	1.07%	21,000	100.0%	1.49%
Strachan Forest Product Ltd.	10,500	1.07%	13,000	23.8%	0.92%
Vanderleek and Opendries Investments Ltd.	10,500	1.07%	16,275	55.0%	1.15%
<b>Quota and FMA Total</b>	<b>947,725</b>	<b>96.20%</b>	<b>1,360,097</b>	<b>43.5%</b>	<b>96.38%</b>
<b>Commercial Timber Permit Program Total</b>	<b>30,900</b>	<b>3.14%</b>	<b>51,025</b>	<b>65.1%</b>	<b>3.62%</b>
<b>FMU Total</b>	<b>978,625</b>	<b>99.34%</b>	<b>1,411,122</b>	<b>44.2%</b>	<b>100.00%</b>

In addition, access to the FMU has been constrained at the compartment level. Specific entry to compartments has been restricted to ensure a logical flow of wood and to manage haul distances. Figure 6 provides a map of the compartment sequence. Appendix 5 provides the compartment sequence schedule.

<sup>8</sup> Cech AAC is based on a 15/11 Utilization. All volumes are net merchantable volume (i.e. 1.5% and 9.0% deduction coniferous and deciduous cull respectively).

Figure 6 Compartment Sequence



The assumptions, in addition to those listed in Section 5.3.1 are:

- Even flow harvest in the first 20 years and even flow harvest from 20 to 200 years.
- Deferral of non rank 1 and 2 stands, small tree size and yarding areas for 20 years

#### 5.3.5.1 Woodstock files

Information required by Woodstock includes:

##### *Areas File (Land\_v16.are)*

This file provides the age (10 year periods) and area information for each of the development types. This file is created from the land base file and was updated to include more recent information.

Areas are excluded from this file according to the following criteria:

- A land base code of 0
- Missing ages, where not identified.
- Areas are rounded to .1 ha.

Ages were classed into 10 year periods (e.g. Age Class 1 = 0 to 10 years, Age Class 2 = 11 to 20 years, etc.).

The total area of FMU R10 = 587,930 ha with reductions for land base 0, missing ages and rounding the total area represented in the areas file is 512,302 ha.

New compartment information was acquired after the submission of the land base document to address changes in the Quota operators' spheres of interest. This information was obtained from regional SRD staff. Compartments that have been modified are provided in Table 9.

The most current inventory information was used in this analysis. However, passive land base existed within the actual designs. This is due to the date and scale of the information used in development of the land base. To account for this, the land base was adjusted for areas within blocks to ensure that they are all active land base. The passive land base code was changed to the active land base code (99) for each polygon with the block boundaries.

##### *LP Schedule File (MPB.LPS)*

Areas selected for harvest in the spatial harvest sequence (SHS) vary from those scheduled for harvest in the Woodstock solution. Therefore, a replay of the SHS is required to assess the impact on the long term AAC scheduling different development types provided by the Woodstock sequence. The LP Schedule file is a listing of actions to perform on specific areas associated with specific age classes within development types in each planning period.

#### 5.3.5.2 Spatial Harvest Sequence

A spatial harvest sequence (SHS) was developed for this scenario. The approach is to use, wherever possible, existing designs. Where complete designs exist (i.e. first,

second and third pass blocks have been identified) the entire block will define the Sequence.

The SHS represents the most likely plan considering current knowledge from inventory and economic considerations. It is anticipated that further field verification and changing conditions will result in minor and potentially major changes to the sequence and schedule. Most of these changes will be made at the block and stand level. The factors most likely to trigger changes would be variations between inventory and field verifications, changes in mill capacity, weather, and changes to market conditions.

The process for developing the final SHS is as follows:

- Create layers for the land base depending on the planning stage. There are 3 planning stages, complete, incomplete and none.
- Run Tesera Simulation Model (TSM) on the layers that have incomplete and no designs to block off the operable land base.
- Sequence the blocks according the Woodstock sequence targeting the most operable first.
- Select scheduled polygons for each planning stage layer and combine into one layer (SHS\_v9).
- Create a block layer from SHS\_v9. Assign a theoretical year of harvest to each block and update distances to the compartment entry point. This information is used in the Grizzly Bear and Water yield modeling discussed later in the report.
- Create Summary reports.
- Create the LP Schedule file from the SHS.
- Replay the scenario using the LP Schedule file to force harvest from specific development types.

A summary of the Woodstock targets and SHS solutions by compartment are provided in Appendices 6 and 7. Figure 7 provides a map of the final spatial harvest sequence. Figure 8 provides a map of the cover group distributions for the spatial harvest sequence. No changes were assumed in cover group transitions. Therefore this distribution applies for the 20 year period.

In some cases, field verification of the design was not possible. This resulted in some inconsistencies in the spatial harvest sequence.

- Existing designs are being used. Due to the date and scale of the information used, there are areas within blocks that are ineligible for harvest (non AAC contributing and not MPB rank 1 or 2). Since they are within blocks they will be sequenced (Summary provided Appendix 7).
- Areas within blocks that are not MPB rank 1 or 2 are present because existing designs did not exclude these areas, due to inaccuracies in the inventories. The contribution of the area relative to the sequence (9.0%) is provided Appendix 7.

The average score for the 20 year projection is 91.9% (25,236,121 m<sup>3</sup> (SHS) / 27,455,036 m<sup>3</sup> (aspatial)). The scores for years 1 – 10 and 11 to 20 are 96.3%

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(13,361,522 m<sup>3</sup> (SHS) / 13,880,002 m<sup>3</sup> (aspatial)) and 87.5% (11,874,600 m<sup>3</sup> (SHS) / 13,575,033 m<sup>3</sup> (aspatial)) respectively.

Sundre Forest Products will be completing field verification of these areas with regional staff prior to finalization of the operational harvest plans.

Weyerhaeuser Canada (Drayton Valley) Ltd. currently has an AAC allocation of 23,643 m<sup>3</sup> 15/11 Deciduous in the FMU. Currently, the sequenced area is within Rocky Wood Preservers Quota Sphere.

The SHS has sequenced 416,867 m<sup>3</sup> of net deciduous volume over 20 years. This provides for 88% of the required AAC (23,643 \* 20 = 472,680 m<sup>3</sup>). This volume is sourced, primarily from the operable coniferous land base.

The LP Schedule scheduled one development type that created an infeasibility in the optimized solution. This infeasibility occurred in Compartment 9180 (Lone Pine quota area). Approximately 59.4 ha were identified in the SHS for harvest. However, this violated the harvest constraint of 20,000 m<sup>3</sup> for the first 20 year period. Since the area is small, and resultant effect on the harvest levels minimal, this type was not included in the LP Schedule.

The results of the re-planning scenario showed a slight increase of 6,193 m<sup>3</sup> or 0.45% from 1,367,158 m<sup>3</sup> in the first 20 years, and a slight decrease to the long term AAC of 300 m<sup>3</sup> or 0.18% from 730,497 m<sup>3</sup>.



Figure 7 Spatial Harvest Sequence.

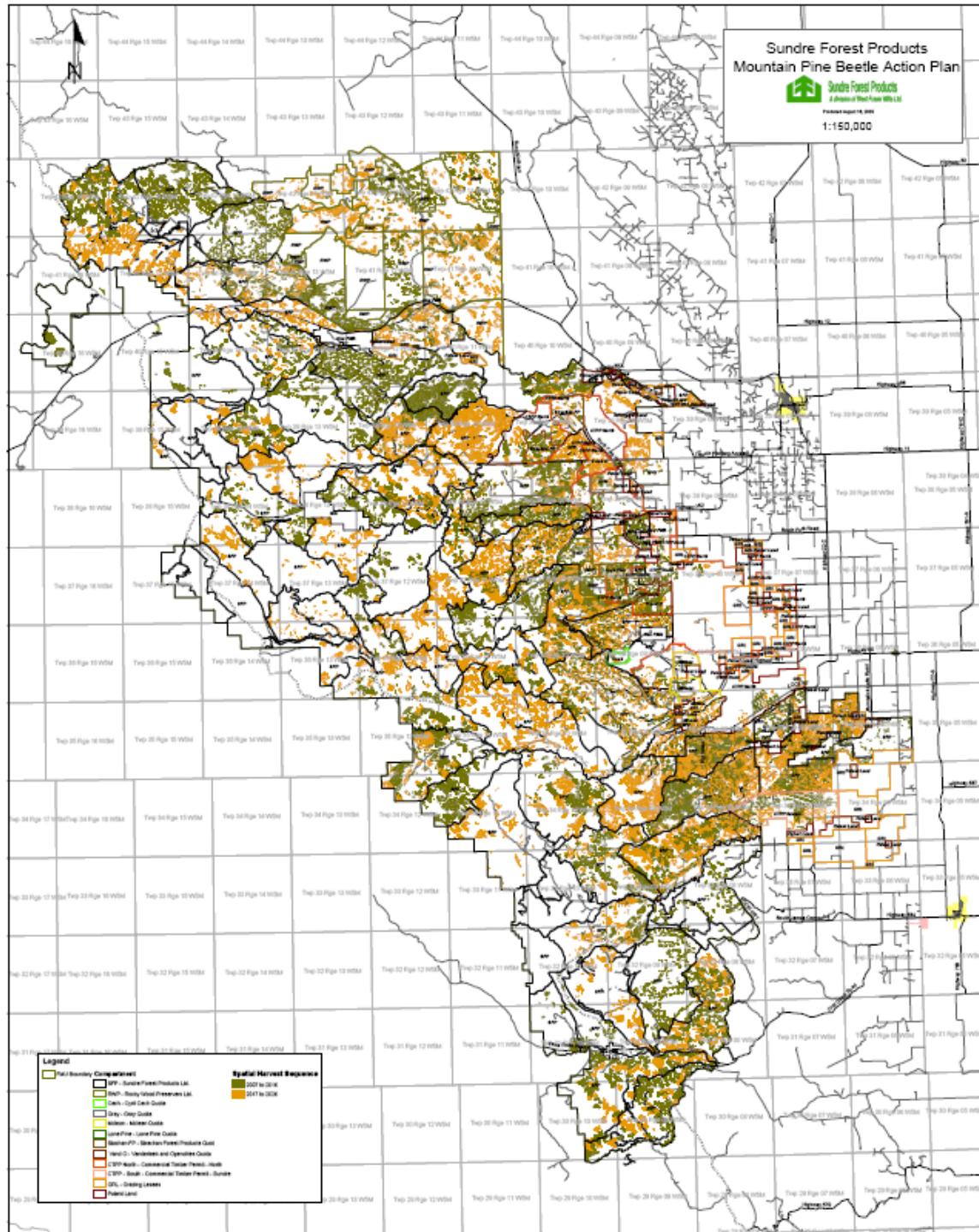
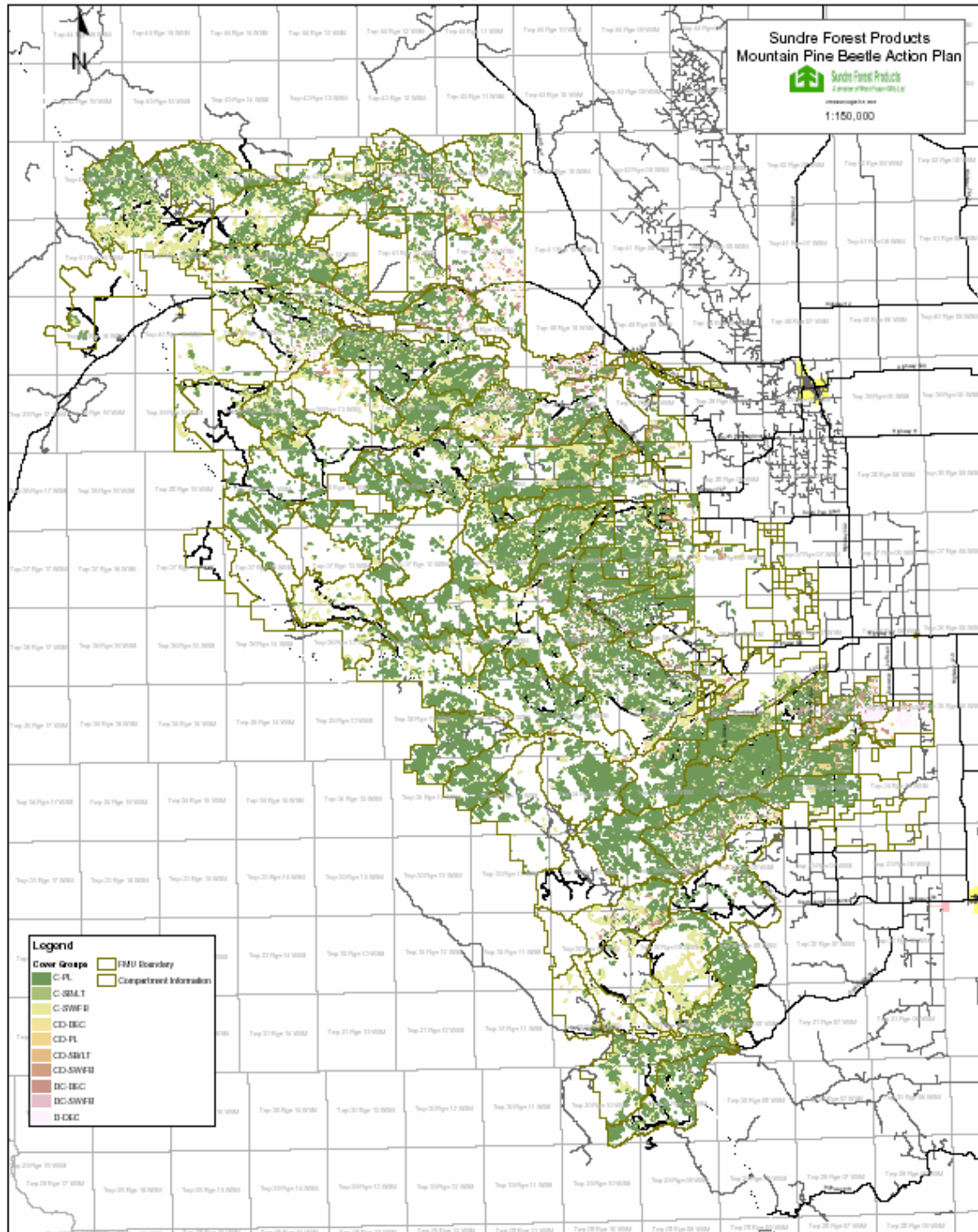




Figure 8 Spatial Harvest Sequence Cover Groups



### 5.3.6 SCENARIO 5 - DISASTER SCENARIO (MPB\_V5)

This scenario illustrates the effect on AAC levels given a catastrophic Mountain Pine Beetle out break.

The assumptions are:

- Even flow harvest in the first 20 years and even flow harvest from 20 to 200 years.
- Reduce the susceptible area to 75% of that calculated in period 2 of Scenario 2 (MPB\_v2).
- Deferral of non rank 1 and 2 stands, small tree size and yarding areas for 20 years
- Minimum harvest age of 80 years for coniferous and 70 years for deciduous
- No compartment sequencing
- Stands on the AAC contributing land base with  $\leq 60\%$  pine component will have their volumes reduced proportionally after 20 years. When harvested they will transition to a fully stocked state with a 2 year regeneration lag. These stands are assumed to be salvaged. Therefore, salvaged volume contributes to the AAC.
- Stands on the deferred, non contributing land base with  $\leq 60\%$  pine component will have their volumes reduced proportionally after 10 years. When harvested they will transition to a fully stocked state with a 2 year regeneration lag. No salvage will be assumed on this area.
- Stands with  $\geq 70\%$  are assumed to be killed in the first 10 years. They will transition to lower density yield curves with 15 year regeneration lag.

#### 5.3.6.1 Woodstock files

Information required by Woodstock includes:

*Landscape Themes (mpb.Lan)*

These are categorized as per Table 11.

*Table 11 Landscape Themes*

Order	Name	Description
1	Land Base	Defines coniferous vs. deciduous land bases
2	Deletions	Defines contributing vs. non contributing land bases
3	Dominant Species/MPB Rank	Defines MPB Risk
4	Pine Proportion	Defines the proportion of pine as defined by AVI

Order	Name	Description
5	Yield Class	Defines the yield strata
6	Status	Defines standing vs. regeneration areas (2 and 15 year lags)

*Areas File (Dland\_v3.are)*: This file is created from the land base file<sup>9</sup>. It is an aggregation of stands as per Table 11 and age in 10 year periods.

This file was updated to include more recent information.

Areas are excluded from this file according to the following criteria:

- A land base code of 0
- Missing ages, where not identified
- Areas are rounded to .1 ha.

Ages were classed into 10 year periods (e.g. Age Class 1 = 0 to 10 years, Age Class2 = 11 to 20 years, etc.).

The total area of FMU R10 587,930 ha with reductions for land base 0, missing ages, and rounding, the total area represented in the areas file is 512,302 ha.

New compartment information was acquired after the submission of the land base document to address changes in the Quota operators' spheres of interest. This information was obtained from regional SRD staff. Compartments that have been modified are included in Table 9.

#### *Yields (DistScen\_v2.YLD)*

The yield information file contains age dependent yield estimates by yield class for Coniferous 15/11 volume (CONIF), Coniferous 13/7 volume (CONIFS) and Deciduous volume (DECID) (Appendix 4 provides the individual Yield Relationships).

#### *Actions (mpb.act)*

This file defines the coniferous and deciduous harvest actions applied to the land base.

Four actions have been identified:

- Coniferous Harvest. This action constrains the coniferous harvest to the contributing 15/11 coniferous land base with a rank of 1 and 2 for the first 2 periods and the entire contributing land base for the remainder of the planning horizon.
- Deciduous Harvest. This action allows deciduous harvest of the entire deciduous contributing land base for the entire planning horizon.

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<sup>9</sup> See Sundre Forest Products Mountain Pine Beetle Plan Land Classification Document (January 15, 2007)

- Total infestation. This action causes mortality on the coniferous land base in the first period of the planning horizon if the stand is not harvested.

*Transition (mpb.tm)*

This file defines the yield class transitions after coniferous and deciduous harvest and total infestations.

Yield transitions assume a fully stocked state after harvest (i.e. All A/B stands will move to C/D curves), a 2 year regeneration lag, and gross merchantable 13/7 and 15/11 coniferous and deciduous volumes and a 15 year lag after total infestation. All harvested stands are assigned a regeneration status. Any development type that senesce will transition to the same yield class. Table 8 provides a summary of the yield transitions.

*Optimize (mpb.opt)*

This file defines the objective function and constraints. The objective is to maximize total fibre harvested (coniferous and deciduous) over a 200 year planning horizon, subject to an even flow of net (pine volume removed) coniferous harvest in periods 1 and 2 and net even flow coniferous harvest in periods 3 to 20 and even flow deciduous harvest over the entire planning horizon.

### 5.3.7 SCENARIO 6 - SUSTAINED YIELD UNIT R10 (MPB\_V10)

This scenario is a separate run intended to determine the allocation of coniferous and deciduous AACs from those portions of the FMA not within Sundre Forest Products FMA and not sequenced as part of the PFMS.

This scenario is identical to MPB\_v2, except that the areas file (Land\_v16s.are) includes only those areas within the portion of FMU R10 not covered by Sundre Forest Products' FMA.

Even flow coniferous and deciduous AACs were projected over a 200 year time period, for the non-FMA Portion of the FMU.

To calculate the allocation for the non-FMA portion, the coniferous and deciduous AAC's from this scenario are divided by the coniferous and deciduous AAC's provided from the PFMS.

Based on this scenario there is an even flow net merchantable AAC of 19,811 m<sup>3</sup> (Coniferous) and 13,689 m<sup>3</sup> (Deciduous)<sup>10</sup>. This provides for a coniferous and deciduous allocation of 1.45% and 9.23% respectively for the non-FMA portion of FMU R10.

*Table 12 Non-FMA Coniferous and Deciduous Ratios*

AAC	Non-FMA	PFMS	Non-FMA Portion
<b>Coniferous 15/11</b>	19,811	1,367,158	1.45%
<b>Deciduous 15/11</b>	13,689	148,265	9.23%
<b>Total</b>	33,499	1,515,424	2.21%

<sup>10</sup> Coniferous and Deciduous AAC's are reduced by 1.5% and 9.0 % respectively, as per the approved plan to account for cull.

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### 5.3.8 SUMMARY OF RESULTS

Each scenario is compared to the approved AAC. Long run sustained yield averages, 13/7 and 15/11 net merchantable volume estimates are provided.

- Scenario 1 – Provides the approved 13/7 net AAC of 985,145 m<sup>3</sup>.
- Scenario 2 - The base MPB Scenario 2 (MPB\_v2) shows a decrease of approximately 19.5% from 985,145 m<sup>3</sup> (13/7) to 792,358 m<sup>3</sup> (15/11). The decrease is due primarily to a reduction in the land base and a change in utilization.
- Scenario 3 - To achieve the ASRD objective, the net AAC increased to 1,783,775 m<sup>3</sup> (15/11) in the first 20 years. The objective of reducing the susceptible area by 75% was achieved. The net AAC for the remainder of the planning horizon decreased to 721,755 m<sup>3</sup> (15/11). An 8.9% reduction from the MPB\_v2 even flow net AAC.
- Scenario 4 - The preferred management scenario provided a net AAC of 1,367,158 m<sup>3</sup> (15/11) in the first 20 years, with a subsequent reduction to 730,497 m<sup>3</sup> (7.8% reduction from MPB\_v2) for the remainder of the planning horizon. This scenario reduces the amount of susceptible stand by 54%. The spatial harvest sequence indicates that 91.9% of the aspatial AAC can be realized (96.3% and 87.5% in periods 1 and 2 respectively). Since actual designs are used in some instances, deleted, deferred and non susceptible areas are indicated for harvest. The ratio of non-susceptible area is 9.0. Appendix 7 provides more detailed information by compartment.
- Scenario 5 - The disaster scenario increased the net AAC to 1,750,057 m<sup>3</sup> (15/11) for 20 years. With a subsequent reduction to the net AAC to 245,301 m<sup>3</sup> (15/11) for the remainder of the planning horizon.
- Scenario 6 – This scenario provides for an allocation to those areas outside of SFP's FMA, but still within FMU R10. It provides an allocation of 1.45% and 9.23% of the total coniferous and deciduous AACs respectively.

A comparison of each of the scenarios is provided in Table 13.

*Table 13 Summary of Results*

Scenario	LRSYA		AAC 1 - 20 Years			AAC 20+		MPB Susceptible Area after 20 Years (ha)	
	15/11	13/7	15/11	13/7	Variance	15/11	13/7		
1 APPROVED 2002 TIMBER SUPPLY ANALYSIS	N/A	1,100,157	909,682	985,145	-7.66%	862,513	985,145	N/A	
2 THE CURRENT APPROVED FMP (MPB_V2) WITH REVISED LAND BASE	786,026	897,413	792,358	847,053	-6.46%	792,358	876,907	153,880	
3 ASRD PINE PREVENTION STRATEGY (MPB_V3)	786,026	897,413	1,783,775	1,936,701	-7.90%	721,755	834,612	38,000	25%
4 SUNDRE FOREST PRODUCTS PREFERRED MANAGEMENT SCENARIO (MPB_V6)	786,026	897,413	1,367,158	1,491,314	-8.33%	730,497	827,932	70,515	46%
5 DISASTER SCENARIO (MPB_V5)	706,680	807,776	1,750,057	1,927,624	-9.21%	245,301	282,522	37,000	24%
6 SUSTAINED YIELD UNIT R10 (MPB_V10)	19,829	22,242	19,513	20,703	-5.75%	19,513	21,336	6,148	16%

### 5.3.9 HARVEST LEVEL ALLOCATIONS

The ASRD Pine Prevention Strategy (Scenario 3) results in a harvest level of 1,783,775 m<sup>3</sup> (15/11) for the first 20 years of the projection. This harvest level will reduce the area of Rank 1 and 2 stands to 25% of that provided at the currently approved FMP, with a revised land base, at a point 20 years in the future.

However, to achieve this harvest level, mill capacity would be significantly exceeded for Sundre Forest Products and other operators within the Forest Management Unit.

Therefore, a harvest level of 1,411,122 m<sup>3</sup> was targeted in the PFMS as this more adequately reflects the milling capacities of the operators within the FMU (See Table 10).

A modeled harvest volume of 1,367,158 m<sup>3</sup> was achieved in the PFMS (Scenario 4), based on constraints that were imposed on compartment sequencing, volume flow from each compartment, available growing stock in each compartment and ending growing stock. This harvest level will reduce the amount of Rank 1 and 2 stands to 46% of that provided at the currently approved FMP, with a revised land base, at a point 20 years in the future.

Since the objective of the PFMS (Scenario 4) is to meet milling capacities, we recommend that the harvest levels provided in Table 14 be allocated to the operators within FMU R10. To accommodate the difference in volume between the mill requirements and the modeled harvest volume (approximately 3% less than the initial targeted harvest level), some stands scheduled in period 11 to 20 will be accessed in period 1 to 10. This variance will be tracked and reported as part of the implementation of this plan.

After 20 years the harvest level fall is projected to fall to 730,497 m<sup>3</sup>. Analysis of the post 20 year harvest levels will require further analysis which will be completed as part of the next Forest Management Plan submission

*Table 14 Recommended Harvest Level Allocations*

Disposition	Recommended Harvest Level (15/11)	Allocation (%)
SFP	1,200,000	85.04%
RWP	96,308	6.82%
Cech	672	0.05%
Gray	8,190	0.58%
Mclean	4,652	0.33%
Lone Pine Financial Corporation	21,000	1.49%
Strachan Forest Product Ltd.	13,000	0.92%
Vanderleek and Opendries Investments Ltd.	16,275	1.15%
<b>Quota and FMA Total</b>	<b>1,360,097</b>	<b>96.38%</b>
<b>Commercial Timber Permit Program Total</b>	<b>51,025</b>	<b>3.62%</b>
<b>FMU Total</b>	<b>1,411,122</b>	<b>100.00%</b>

## 5.4 Road Corridor Plan

Sundre Forest Products has developed a Road Corridor Plan to access compartments that will be sequenced in the next twenty years (See Table 15 and Figure 9). The road plan is currently the first approximation of the compartment entry points and alignments based on current information.

As more information becomes available and the compartments scheduled access nears, more detailed plans will be developed. In addition to identifying access to the compartments, this information will be used in future modelling to assess impacts on Grizzly Bear habitat.

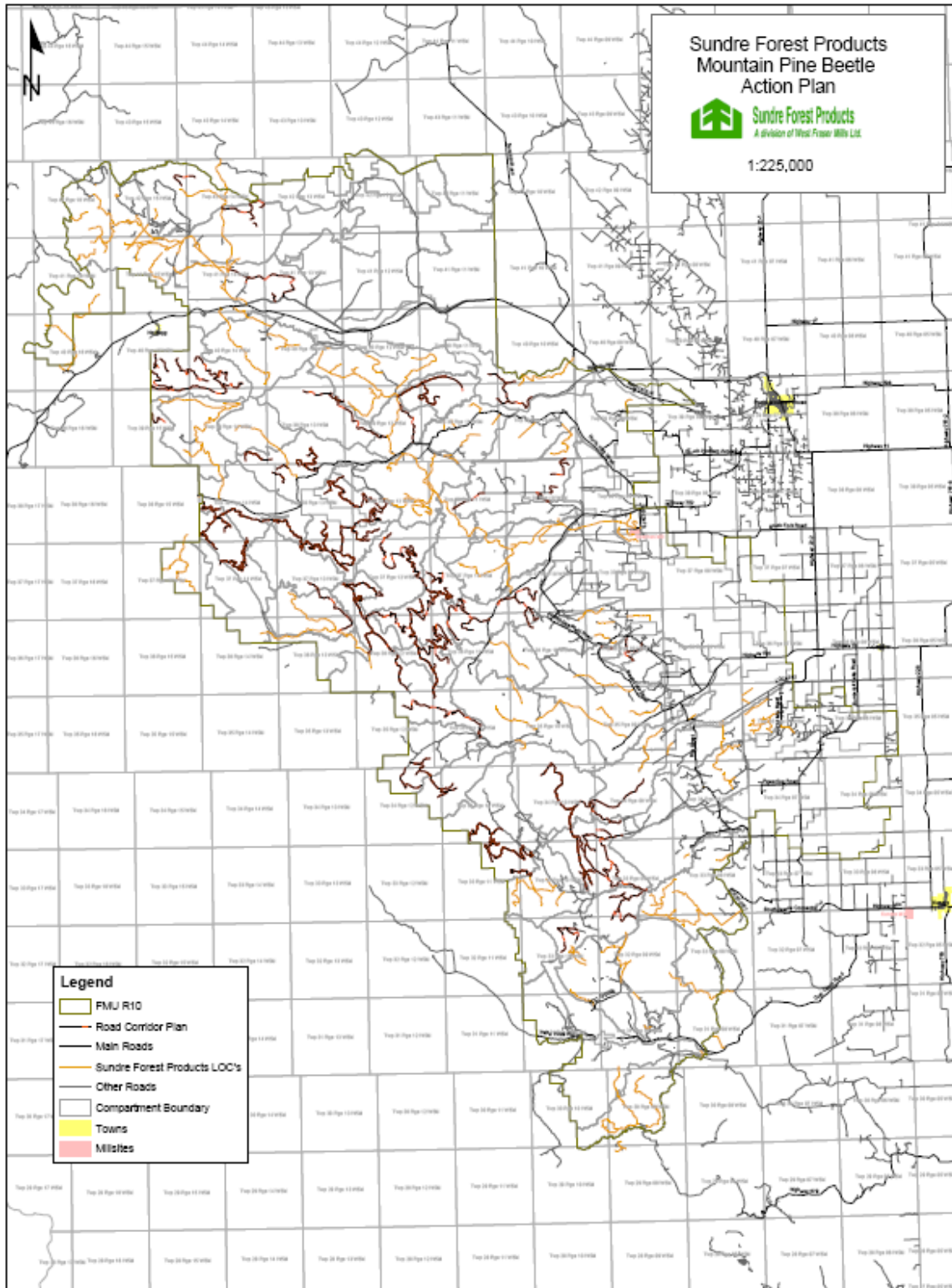
Thirty compartments will be accessed as part of the Plan (See Appendix 5).

*Table 15 Road Plan Compartments*

Compartment	Compartment_ID
Bridgeland Creek	7
Cutoff Creek	12
Dutch Creek	13
Elk Creek	16
Falls Creek	17
Gap Lake	19
Gloomy Creek	20
Harlech	177
Highway 752	23
Lewis Creek	27
Limestone	29
Lower Cripple Creek	30
Lower Pinto Creek	31
Lynx Creek	32
Marble Mountain	33
Meadows Creek	35
North Horburg	175
North Ram River	36
Pineneedle Creek	38
Pinto Creek	39
Radiant Creek	50
Ram Mountain	51
Rapid Creek	52
Rocky Creek	55
Skunk Creek	59
South Swan Lake	173
Teepee Creek	68
The Forks	69
Upper Tay River	74
Willson Creek	78



Figure 9 Road Plan



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## 5.5 Non-Timber Values

Analysis of the impacts MPB strategy on non-timber values is required. For the Plan two values have been analyzed. This analysis was completed on the preferred management scenario only.

- Grizzly Bear Habitat
- Water Yields

### 5.5.1 GRIZZLY BEAR

The Foothills Model Forest Grizzly Bear model is used in this analysis. This model assesses the impacts of disturbances (harvest, fire and roads) on the resource selectivity function, mortality risk and safe harbour. Figure 10 provides the areas of secure, vulnerable and unsuitable Grizzly Bear Zones.

In order to adequately assess the impact of the harvest scenario on grizzly bear habitat, blocks and roads have been sequenced into discrete one year intervals. Blocks furthest from the entry point to the compartment are scheduled first. In addition, roads are assumed to be open 2 years prior to harvest in the compartment and 3 years after completion of harvest to allow for road construction and silvicultural treatments.

Six 5 year time periods (2001 to 2026) have been modelled to assess the impact of harvests and roads. Four input layers have been created to complete the grizzly bear habitat and risk modelling. They include:

- Forest Management Unit defines extent of the analysis
- Harvest blocks including actual approved blocks and blocks created as part of the spatial harvest sequencing.
- Constructed roads included actual and planned. Includes only LOC roads and permanent roads.
- Open roads including actual and planned. Roads are assumed to be opened 2 years prior to harvest for road construction and 3 years after completion of harvest to complete silvicultural treatments.

The modeling was completed in 3 phases:

- Calculate the Resource Selectivity Function (RSF) using the RSF Calculator from the Foothills model forest and the harvest blocks and constructed roads information for each time period as inputs.
- Calculate the mortality risk using the risk calculator and the open road information as input.
- Calculate the safe harbour by combining the RSF and Risk layers.

Summaries of RSF, Mortality Risk and Safe Harbour are provided for the FMU as a whole (Table 16) and for the Secure Grizzly Habitat Zone (Table 17). Maps of RSF, Risk and Safe harbour for years 2001 and 2026 are provided in the enclosed digital media. Appendix 8 provides more detailed results.

Figure 10 Grizzly Bear Habitat Zones



**Table 16 FMU Summary of RSF, Mortality Risk and Safe Harbour Analysis**

Attribute	Value	2001		2006		2011		2016		2021		2026	
		Area	Area	Change From Previous	Area	Change From Previous	Area	Change From Previous	Area	Change From Previous	Area	Change From Previous	
Resource Selectivity Function	1	117,235	134,450	14.7%	109,741	-18.4%	110,299	0.5%	109,741	-0.5%	109,741	0.0%	
	2	150,308	150,072	-0.2%	151,932	1.2%	147,504	-2.9%	151,932	3.0%	151,932	0.0%	
	3	177,435	174,985	-1.4%	164,837	-5.8%	174,556	5.9%	164,837	-5.6%	164,837	0.0%	
	4	98,803	88,898	-10.0%	111,300	25.2%	108,296	-2.7%	111,300	2.8%	111,300	0.0%	
	5	43,225	38,600	-10.7%	49,200	27.5%	46,352	-5.8%	49,200	6.1%	49,200	0.0%	
Mortality Risk	1	342,256	353,815	3.4%	293,002	-17.2%	295,557	0.9%	308,507	4.4%	309,916	0.5%	
	2	75,209	73,862	-1.8%	88,769	20.2%	87,987	-0.9%	86,181	-2.1%	86,221	0.0%	
	3	35,798	34,280	-4.2%	43,208	26.0%	42,745	-1.1%	40,902	-4.3%	40,761	-0.3%	
	4	31,667	30,102	-4.9%	38,585	28.2%	38,172	-1.1%	36,218	-5.1%	35,980	-0.7%	
	5	25,429	23,896	-6.0%	31,104	30.2%	30,806	-1.0%	29,036	-5.7%	28,789	-0.9%	
	6	19,853	18,566	-6.5%	24,215	30.4%	24,000	-0.9%	22,594	-5.9%	22,376	-1.0%	
	7	17,275	15,961	-7.6%	20,877	30.8%	20,723	-0.7%	19,420	-6.3%	19,236	-0.9%	
	8	13,937	12,840	-7.9%	16,730	30.3%	16,614	-0.7%	15,543	-6.4%	15,383	-1.0%	
	9	11,570	10,708	-7.5%	13,788	28.8%	13,721	-0.5%	12,909	-5.9%	12,793	-0.9%	
	10	14,423	13,447	-6.8%	17,197	27.9%	17,092	-0.6%	16,105	-5.8%	15,960	-0.9%	
Safe Harbour	1	129,100	145,455	12.7%	129,973	-10.6%	132,553	2.0%	128,480	-3.1%	129,130	0.5%	
	2	98,784	105,413	6.7%	91,992	-12.7%	91,874	-0.1%	95,745	4.2%	96,254	0.5%	
	3	113,272	112,566	-0.6%	90,045	-20.0%	96,748	7.4%	95,754	-1.0%	95,918	0.2%	
	4	63,715	53,925	-15.4%	63,327	17.4%	59,557	-6.0%	65,476	9.9%	65,499	0.0%	
	5	19,268	16,380	-15.0%	19,077	16.5%	16,763	-12.1%	20,485	22.2%	20,560	0.4%	

**Table 17 Secure Area Summary of RSF, Mortality Risk and Safe Harbour Analysis**

Attribute	Value	2001		2006		2011		2016		2021		2026	
		Area	Area	Change From Previous	Area	Change From Previous	Area	Change From Previous	Area	Change From Previous	Area	Change From Previous	
Resource Selectivity Function	1	16,851	20,736	23.1%	12,419	-40.1%	13,190	6.2%	12,419	-5.8%	12,419	0.0%	
	2	34,846	36,747	5.5%	30,695	-16.5%	31,256	1.8%	30,695	-1.8%	30,695	0.0%	
	3	75,363	75,006	-0.5%	72,055	-3.9%	74,834	3.9%	72,055	-3.7%	72,055	0.0%	
	4	50,314	46,143	-8.3%	59,374	28.7%	56,848	-4.3%	59,374	4.4%	59,374	0.0%	
	5	14,347	13,088	-8.8%	17,180	31.3%	15,593	-9.2%	17,180	10.2%	17,180	0.0%	
Mortality Risk	1	136,026	132,377	-2.7%	108,744	-17.9%	111,293	2.3%	112,639	1.2%	112,639	0.0%	
	2	18,145	18,951	4.4%	26,575	40.2%	25,799	-2.9%	25,724	-0.3%	25,724	0.0%	
	3	8,033	8,633	7.5%	12,303	42.5%	11,842	-3.7%	11,714	-1.1%	11,714	0.0%	
	4	7,059	7,650	8.4%	10,824	41.5%	10,406	-3.9%	10,236	-1.6%	10,236	0.0%	
	5	5,626	6,080	8.1%	8,603	41.5%	8,304	-3.5%	8,110	-2.3%	8,110	0.0%	
	6	4,333	4,709	8.7%	6,575	39.6%	6,362	-3.2%	6,178	-2.9%	6,178	0.0%	
	7	3,762	4,029	7.1%	5,565	38.1%	5,405	-2.9%	5,215	-3.5%	5,215	0.0%	
	8	3,049	3,260	6.9%	4,415	35.4%	4,305	-2.5%	4,144	-3.8%	4,144	0.0%	
	9	2,488	2,644	6.3%	3,562	34.7%	3,493	-2.0%	3,386	-3.1%	3,386	0.0%	
	10	3,234	3,483	7.7%	4,650	33.5%	4,545	-2.2%	4,409	-3.0%	4,409	0.0%	
Safe Harbour	1	32,330	36,931	14.2%	35,294	-4.4%	36,098	2.3%	34,979	-3.1%	34,979	0.0%	
	2	31,210	34,489	10.5%	27,697	-19.7%	29,066	4.9%	28,051	-3.5%	28,051	0.0%	
	3	56,435	54,406	-3.6%	44,771	-17.7%	48,146	7.5%	46,031	-4.4%	46,031	0.0%	
	4	34,399	28,184	-18.1%	33,747	19.7%	31,044	-8.0%	34,614	11.5%	34,614	0.0%	
	5	7,288	5,675	-22.1%	6,239	9.9%	5,176	-17.0%	6,702	29.5%	6,702	0.0%	

**5.5.1.1 Interpretation of Grizzly Bear Analysis Results**

The interpretation of the Grizzly Bear analysis will focus on the RSF, Mortality and Safe Harbour results provided in the Secure Habitat Zone (Table 17). Interpretations will be provided for the highest values (5, 10 and 5 for RSF, Mortality Risk and Safe Harbour respectively) and time periods 2011, 2016 and 2021.

1. RSF - In 2011 the area for value 5 increases by 31.3% from the 2006 values (13,088 ha), then decreases in 2016 by 9.2% and increases by 10.2% in 2021. The change from 2006 to 2011 is primarily due to the increase in harvest levels and road construction realized in the southern and northern most compartments. The change from 2011 to 2016 is primarily due to the increase in opening sizes as the second pass is removed. The Grizzly Bear Model uses distance to edge as part of the RSF calculation. As opening sizes become larger the RSF values are reduced. The change from 2016 to 2021 is primarily due to harvests within compartments that had proportionately less volume harvested in the first 10 year period. This occurs in the central and northern most compartments.

2. **Mortality Risk** – In 2011 the area of highest risk (value 10) increases by 33.5% from the 2006 level (3,483 ha). It then decreases by 2.2% in 2016 and decreases again by 3.0% in 2021. The reason for this is similar to that provided above. The amount of open roads increases in the southern and northern most compartments from 2006 to 2011 but decreases for subsequent years, thereby decreasing the mortality risk. The amount of open roads required to access the central compartments in the second period is not as intense as is required for the northern and southern most compartments. Therefore, the affect on mortality risk is not as great and the overall effect is a reduction in risk from previous 2011 level.
3. **Safe Harbour** – In 2011 the area (5,675 ha) of highest value safe harbour (value 5) increases by 9.9%, then decreases by 17% in 2016 and increased by 29.5% in 2021. Since this layer is created from a combination of RSF and Mortality Risk the reason for the change is not as clear. Since the amount of high value RSF (value 5) is greater than the high value mortality risk (value 10), the amount of safe harbour will tend to follow the same trend as the RSF

The Grizzly Bear modelling indicates a large increase in mortality from 2006 to 2011, with a relatively slight decline in subsequent years. Safe harbour fluctuates more with increases and decreases over the projection period. The analysis assumes roads were closed 3 years following harvest and no longer affect Mortality risk. However, if this assumption is incorrect, and roads continue to have some motorized use after 3 years, the analysis would underestimate the planned impact on Grizzly Bear mortality risk.

In the upcoming Forest Management Plan, the modelling results will analyzed in more depth to better understand the inter-relationships between RSF, Mortality Risk and Safe Harbour.

During the implementation of this plan Sundre Forest Products will work closely with regional SRD staff to ensure that the affects of increased access on morality are addressed and mitigated.

The Grizzly Bear model provided by the Foothills Model Forest is good first attempt a modelling Grizzly Bear habitat and mortality. However, care must be taken in the length of the projection periods. The model, currently, does not project forest growth. Therefore, it is unknown at what point in the future that crown closure and edge effect have on habitat and mortality.

## 5.5.2 WATER YIELDS

In order to adequately assess the impact of the harvest scenario on water yields, blocks have been sequenced into discrete one year intervals. Blocks furthest from the entry point to the compartment are scheduled first

Water yield modelling completed for the period between 1992 and 2026. Both harvest and fire have been included in the analysis.

Summarization of the information has been completed for 11 watersheds (Figure 11).

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Table 18 and Figure 12 provide the watershed and yield increase information.  
Appendix 9 provides detailed output for each watershed.



Figure 11 FMU R10 Watersheds

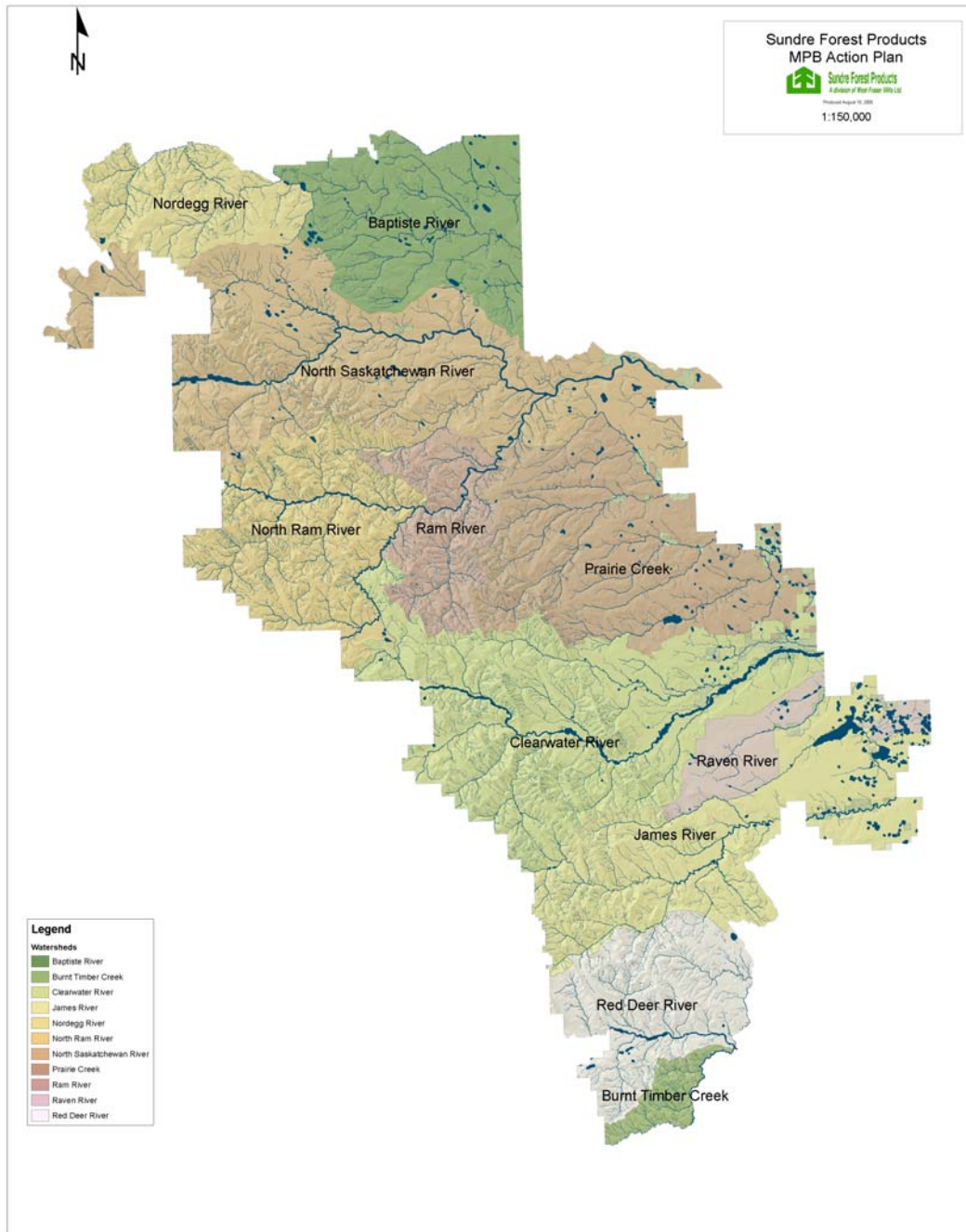
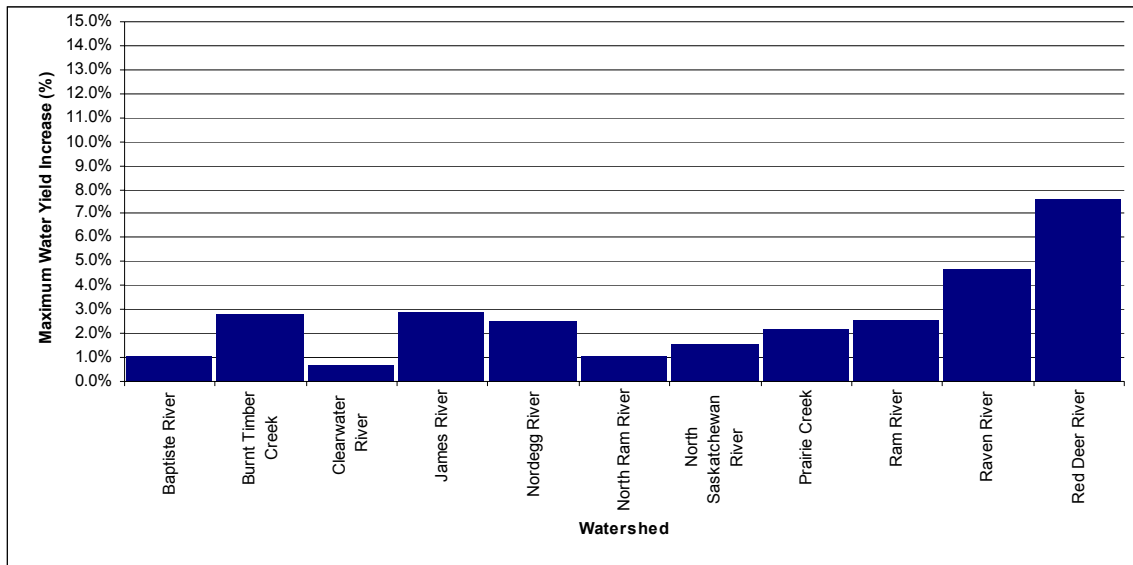




Table 18 Watersheds

Watershed	Area	Percent of Total	Maximum Yield (1992 to 2026)	Maximum Yield (2007 to 2026)	Projected Year of Maximum Water Yield
Baptiste River	52,822	9.2%	1.1%	1.1%	2014
Burnt Timber Creek	6,971	1.2%	2.8%	2.3%	2007
Clearwater River	100,498	17.5%	0.7%	0.7%	2012
James River	66,792	11.6%	2.9%	2.9%	2022
Nordeg River	30,599	5.3%	2.5%	2.5%	2010
North Ram River	51,716	9.0%	1.1%	0.7%	2007
North Saskatchewan River	110,168	19.2%	1.6%	1.6%	2016
Prairie Creek	72,232	12.6%	2.2%	2.2%	2025
Ram River	26,671	4.6%	2.6%	2.6%	2020
Raven River	16,801	2.9%	4.7%	4.7%	2011
Red Deer River	39,557	6.9%	7.6%	5.3%	2007
Total	574,827	100.0%	2.2%	2.0%	

Figure 12 Maximum Water Yield Increases by Watershed



### 5.5.2.1 Interpretation of Water Yield Analysis

Table 18 provides the maximum water yields for the entire simulation period (1992 to 2026). It also provides the maximum projected water yield for the 2007 to 2026 period and the expected year of maximum water yield.

In general the Raven River and Red Deer River Watersheds will realize the greatest water yield increases at about 5% for period from 2007 to 2026.

The greatest water yield is realized in the Red Deer River Compartment. However, this has occurred in 2003 after a significant wildfire event in the area. Assuming no significant wildfire or natural disturbance events in the future, the maximum water yield that can be anticipated in the Red Deer River watershed is approximately 5%. The remainder of the compartments will see a maximum water yield in the future between 1% and 5%. The timing of these events will vary by watershed (See Appendix 9), and is primarily due to the timing of the first and second pass removals.

## 6 IMPLEMENTATION

Once the Plan is approved, implementation will commence in 2007. The implementation will be consistent with the assumptions laid out in the Plan, along with the MPB Ground Rules.

Field verification will be part of the implementation process. This will involve assessment of stands to ensure they meet the assumptions in the Plan. SFP and the regional Forest Health Officer will be responsible to ensure the proper selection and sequencing of stands.

### 6.1 Level II Treatments

If any level of active MPB infestations is confirmed by a SFP, FHO or Regulated Forestry Professional (RFP), Level II treatments will be engaged, subject to the resolution of economical and logistical issues for the upcoming operating year.

### 6.2 Access Management

SFP will work with Government of Alberta staff to minimize impacts on known Grizzly bear habitat. Access controls for those areas that have been identified as secure (Figure 10) Grizzly Bear habitat will be addressed at the operational level to ensure the logical opening and closure of roads to meet Sundre Forest Products operational needs and to mitigate impacts on Grizzly Bear.

## 7 CONCLUSION

The current FMU approved AAC of 985,145 m<sup>3</sup> (13/7) has been increased to a recommended harvest level of 1,411,122 m<sup>3</sup> (15/11). The change is primarily due an accelerated harvest in the next 20 years to reduce the area of susceptible stands in the FMA and a change in utilization from 13/7 to 15/11.

Differences between the Plan objectives and the final implementation will arise. This Plan was intended to provide an abbreviated analysis of the impacts that would occur if harvest levels were increased. Outlined below are items that were not addressed in this Plan.

- The Forest Planning Standard was used as a guide in the Plan. Not all items outlined in the Standard were analyzed or reported.
- Grazing Leases are not sequenced for access. The upcoming DFMP will focus on accessing these areas. A separate non-spatial timber supply run was completed to determine the allocation for these areas.
- Tree size estimates are not provided. This was not a requirement for the current yield relationships approved in 2002.
- Up to date and accurate harvest and silvicultural treatments for all the harvest plans was not available for the Plan
- Non eligible areas are identified in the spatial harvest sequence. This will be verified as part of the field verification process and, in some cases eliminated when new harvest plans are developed as part of the Plan
- The PFMS reduces the amount of susceptible stands by 54%. This under achieves the target.

- 
- The PFMS does not provide for 20 years of harvests in some compartments. This is mainly within other operators current operating spheres as these areas had been set assigned to provide volumes under a non MPB strategy.
  - Recommended harvest levels provided, ensure that mill capacity requirements are met. This will create a variance that will be tracked and reported.

The above noted differences will be addressed and corrected where possible in the upcoming Forest Management Plan submission.

The Plan provides for new challenges for SFP that are not currently part of the approved management plan. The Plan is viewed as a dynamic document that will require continued review to ensure that the MPB objectives are met.

Sundre Forest Products Ltd. is committed to continuing to explore opportunities to increase its ability to access the high risk stands, and to reducing the Mountain Pine Beetle threat within the FMU.