April 2010 Mountain Pine Beetle Pine Strategy DFMP Amendment

Version 2.0

Buchanan Lumber
High Prairie, Alta.

Developed With

Silvacom Ltd.

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Section 1: Introduction

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1 INTRODUCTION

1.1 MOUNTAIN PINE BEETLE EPIDEMIC

Western Canada is currently experiencing the largest Mountain Pine Beetle (MPB) epidemic in history. Although MPB is a naturally occurring insect in BC's forests, historical forest management practices (fire suppression in particular) have created an uncharacteristically old forest that is more susceptible to MPB attack. Pine mortality in BC is projected to increase for the next 10 years at which time pine volume loss will total 80% (BC Ministry of Forests, 2004). As such, the MPB pressure on Alberta's forests from the epidemic in BC will continue to increase.

There has always been a level of uncertainty surrounding MPB's ability to establish itself within Alberta's forests given the perceived difficulty the beetles may have crossing the continental divide and their ability to survive the colder, Alberta winters. Recent surveys by Alberta Sustainable Resource Development (SRD) confirm that the epidemic that began in BC in the late 1990s has now taken hold on the eastern slopes of the Alberta Rocky Mountains. New infestations in the Willmore Wilderness Park have spread to adjacent industrial forest land; populations in Jasper National Park continue to rise and Banff National Park continues to attempt a variety of control mechanisms. MPB is beginning to establish in portions of Alberta's forest where it was never thought possible, proactive management by forestry companies is required to address the threat of an Alberta MPB epidemic.

For this reason, Buchanan Lumber Ltd. has taken the lead in developing a strategy to mitigate the potential effects MPB could have on the Buchanan Lumber/Tolko High Prairie Joint FMA area. Less than 30% of the highly susceptible pine on the FMA is currently sequenced for harvest during the first 20 years of the spatial harvest sequence. This has resulted in the need for a Detailed Forest Management Plan Amendment that will generate a new spatial harvest sequence the Companies can follow which will target stands most susceptible to MPB attack.

1.2 MPB MANAGEMENT IN ALBERTA

In September 2006, the Alberta provincial government released the 'Mountain Pine Beetle Action Plan for Alberta' and the 'Interpretive Bulletin: Planning Mountain Pine Beetle Response Operations'. The objectives of the Action Plan are to:

- Effectively detect, accurately survey and aggressively control infested trees;
- Reduce the number of highly susceptible stands;
- Minimize the impact of a major outbreak;
- Establish SRD policies and procedures to facilitate efficient and timely MPB management;
- Conserve all of the long-term forest values and maintain and protect public health, safety and infrastructure;
- Maintain a project management structure that ensures effective planning and implementation of mitigation measures among all land managers and adjacent jurisdictions;
- Communicate to all clients and stakeholders.

Three strategies for MPB control on Provincial lands are presented in the Action Plan:

- Control Strategy (Beetle): Focuses on the treatment of infested trees;
- Prevention Strategy (Pine): Addresses the need to reduce the overall susceptibility of the pine forest;
- Salvage Strategy: Mitigates impacts if a large scale outbreak occurs.

1.3 MPB MANAGEMENT ON THE JOINT FMA

Buchanan Lumber Ltd. (Buchanan) recognizes the threat MPB poses to their Forest Management Agreement (FMA) area, and as a result they are taking a proactive approach to MPB management. The purpose of this document is to present Buchanan's pine management strategy which:

- Results in a revised Preferred Forest Management Strategy (PFMS) for the Joint FMA;
- Demonstrates the sustainability of a revised PFMS;
- Provides a new spatial harvest sequence.

Section 2: 2
Joint FMA Description

2 JOINT FMA DESCRIPTION

The Joint FMA area falls within Forest Management Unit (FMU) S21 and is subsequently divided into two distinct operating areas: Kimiwan and Sweathouse. Kimiwan is formerly known as S19T (P3) and Sweathouse as S1W.

Further to this, the Joint FMA area is also represented by 3 natural sub regions: Central Mixedwood (147,745 ha), Dry Mixedwood (35,060 ha) and Lower Foothills (63,438 ha).

2.1 PINE DISTRIBUTION

The Joint FMA contains a significant amount of pine which is primarily located within the Sweathouse operating area. Table 2-1 presents the Joint FMA composition by cover type. Map 2-1 presents the cover type distribution across the Joint FMA.

Table 2-1: Joint FMA Cover Type Distribution

COVER TYPE DISTRIBUTION						
Cover Type[1]	Kimiwan		Sweathouse		FMA Total	
	Gross Landbase (ha)	Net Landbase (ha)	Gross Landbase (ha)	Net Landbase (ha)	Gross Landbase (ha)	Net Landbase (ha)
Conifer - Pine Leading	878	832	24,616	23,450	25,494	24,282
Conifer	42,198	16,643	40,841	16,088	83,039	32,731
Conifer Dominated Mixedwood - Pine Leading	356	344	4,429	4,295	4,785	4,639
Conifer Dominated Mixedwood	7,009	6,765	5,612	4,997	12,621	11,762
Deciduous Dominated Mixedwood	7,705	7,499	9,128	8,650	16,833	16,150
Deciduous	31,799	31,141	49,199	47,524	80,998	78,666
Non Forested	12,612	0	9,861	0	22,473	0
Total	***102,557***	***63,224***	***143,687***	***105,005***	***246,243***	***168,229***

[1] *Cover type distribution derived from DFMP landbase (2002 effective date).*

Map 2-1: Joint FMA Cover Type Distribution

2.2 AGE CLASS DISTRIBUTION

At endemic levels, MPB typically does not attack small diameter, young pine; generally, pine stands >80 years in age are deemed more susceptible to attack. As a result, an age class distribution can provide a general indication of the level of MPB susceptibility. Figure 2-1 presents the current age class distribution of pine stands across the Sweathouse operating area and Figure 2-2 does the same for the Kimiwan Operating Area. Across the joint FMA, there are currently 8,370 ha of pine leading stands greater than 80 years old and an additional 5,664 ha of pine containing stands greater than 80 years old. Approximately 6 % of the FMA area is represented by these types of stands.

Figure 2-1: Pine Age Class Distribution for the Sweathouse Operating Area

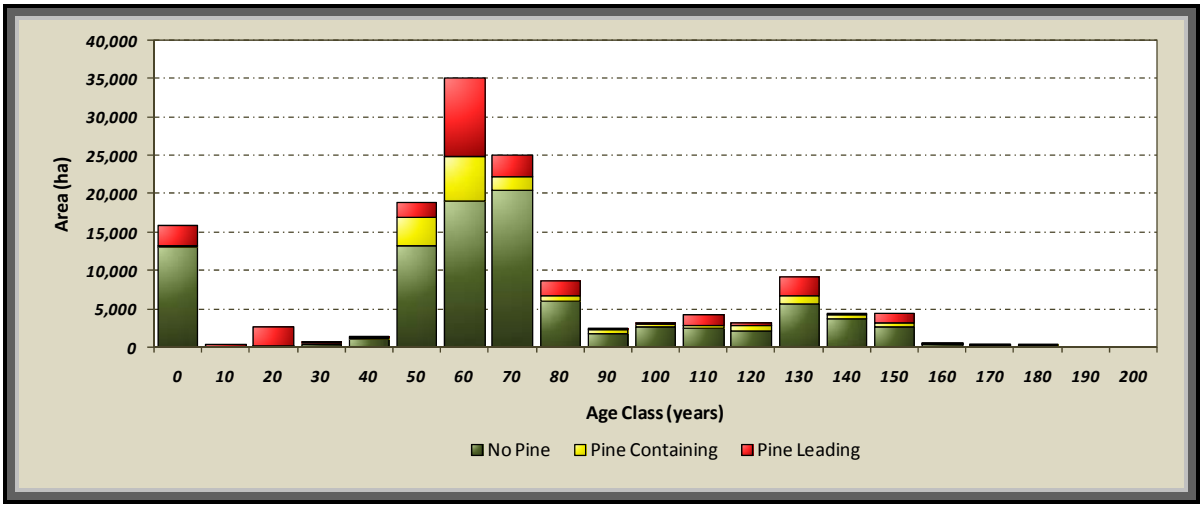
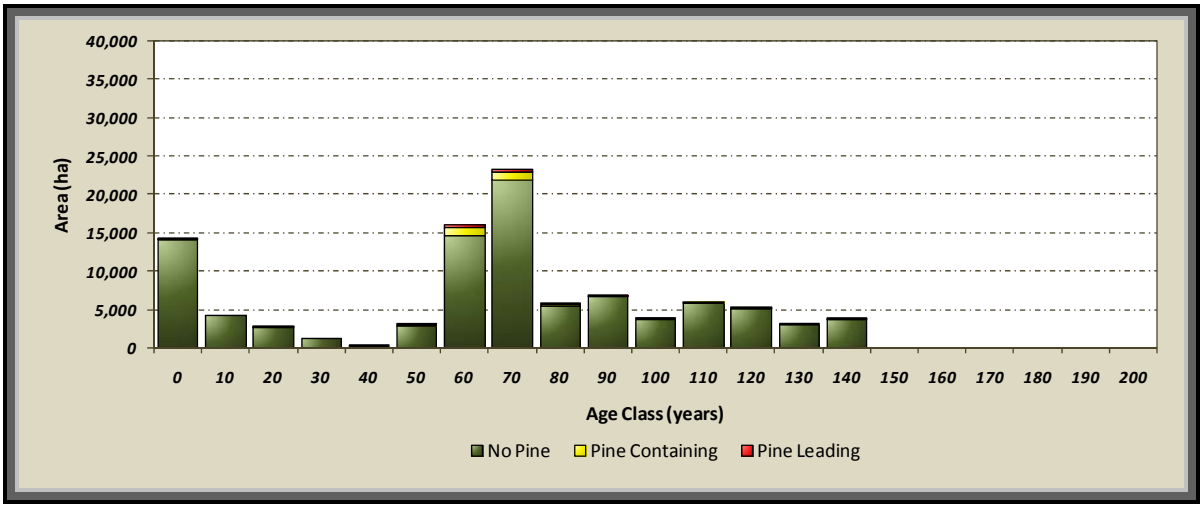


Figure 2-2: Pine Age Class Distribution for the Kimiwan Operating Area



2.3 PINE STAND RANKING

2.3.1 JOINT FMA MPB PINE STAND RANKING PROCESS

The Joint FMA area underwent 3 separate classifications, from which a Pine Stand Ranking was determined at the stand level. The steps taken throughout this process are outlined within the SRD Interpretive Bulletin 'Planning MPB Response Operations, Version 2.6 September 2006'. The 3 classifications are defined as follows:

- Stand Susceptibility Index (SSI): A measure of a stand's ability to produce beetles;
- Climate Factor: A measure of the potential for successful MPB development;
- Compartment Risk: An assessment by the regional Forest Health Officer of the probability that a compartment will be attacked based on existing MPB populations.

The Pine Stand Ranking is used as a primary input in the determination of the selected PFMS. Map 2-2 presents the Pine Stand Ranking distribution across the Joint FMA.

Table 2-2: Area and Volume Summary by MPB Pine Stand Ranking: 2002 Effective Date

PINE STAND RANK[1]																		
Pine Stand Rank	Kimiwan						Sweathouse						FMA Total					
	Passive Landbase			Net Landbase			Passive Landbase			Net Landbase			Passive Landbase			Net Landbase		
	Area (ha)	Conifer Volume (m^3)	Decid. Volume (m^3)	Area (ha)	Conifer Volume (m^3)	Decid. Volume (m^3)	Area (ha)	Conifer Volume (m^3)	Decid. Volume (m^3)	Area (ha)	Conifer Volume (m^3)	Decid. Volume (m^3)	Area (ha)	Conifer Volume (m^3)	Decid. Volume (m^3)	Area (ha)	Conifer Volume (m^3)	Decid. Volume (m^3)
1	5	440	36	102	10,436	747	112	20,479	2,189	3,477	67,431	2,189	117	20,919	2,225	3,579	77,866	2,936
2	287	11,288	7,307	3,879	265,300	252,390	2,361	106,508	58,749	31,501	1,899,595	58,749	2,648	117,796	66,056	35,380	2,164,894	311,139
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	39,040	125,457	119,777	59,244	3,109,741	5,101,643	36,209	247,268	287,235	70,027	2,527,953	287,235	75,249	372,724	407,012	129,271	5,637,694	5,388,878
Total	***39,332***	***137,184***	***127,120***	***63,224***	***3,385,476***	***5,354,780***	***38,682***	***374,255***	***348,173***	***105,005***	***5,703,908***	***348,173***	***78,014***	***511,439***	***475,293***	***168,229***	***9,089,384***	***5,702,953***

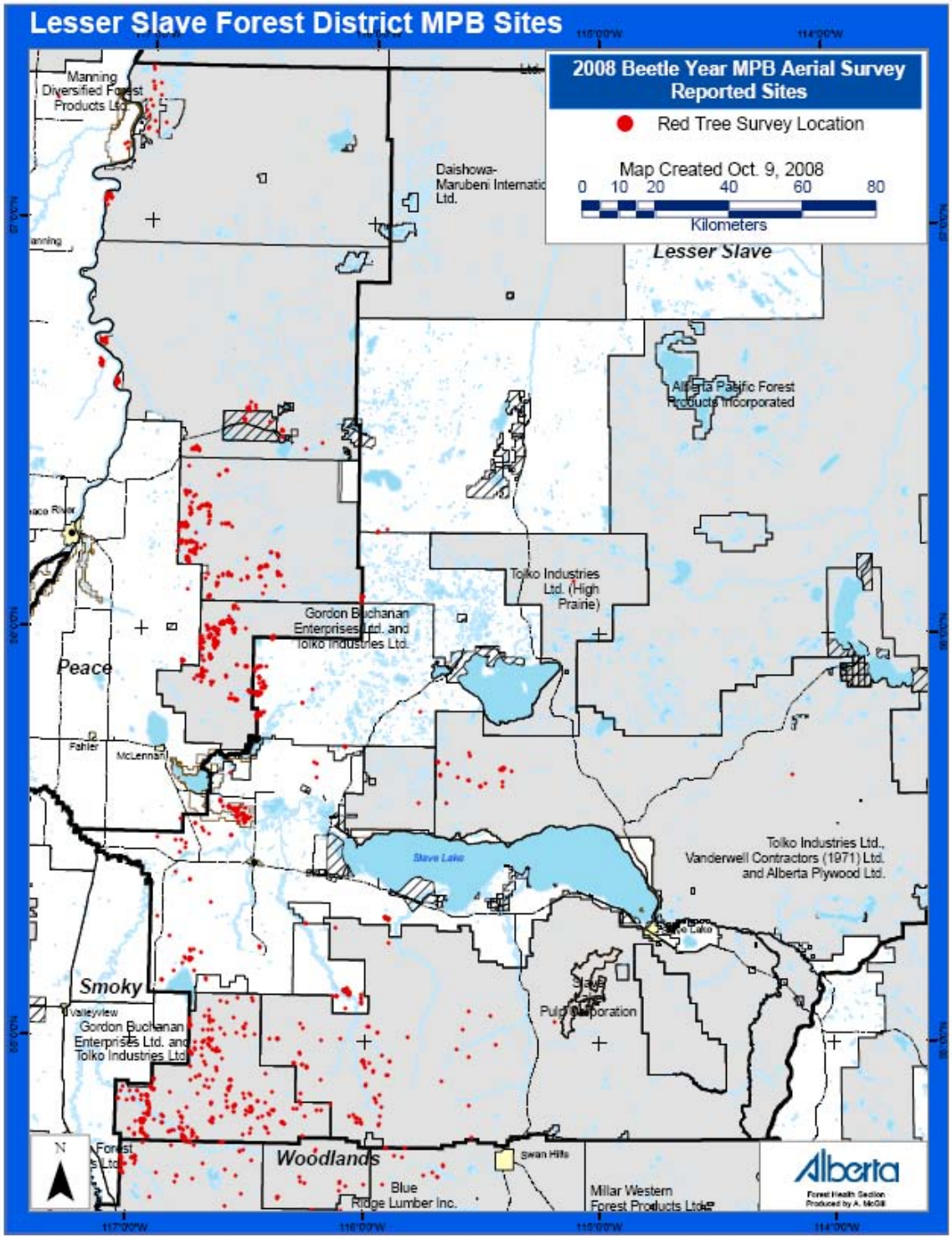
[1] *2002 Effective Date*

Map 2-2: Joint FMA MPB Pine Stand Rank: 2002 Effective Date

2.4 CURRENT MPB INFESTATION

The Joint FMA area and surrounding regions have experienced unprecedented MPB activity over the past two years. To date, numerous MPB infestations extending beyond the FMA area in all directions have been identified. Following the initial discoveries over the summer of 2006, numerous surveys both within the Buchanan/Tolko Joint FMA area and within neighboring FMA areas have been carried out by various agencies. The findings have shown a high level of MPB activity throughout the FMA (Figure 2-3).

Figure 2-3: 2008 Beetle Year MPB Aerial Survey Reported Sites



Section 3: Pine Strategy Development

3

3 PINE STRATEGY DEVELOPMENT

3.1 2002 DFMP SUMMARY

Buchanan Lumber is currently operating under the approved 2005 DFMP which was submitted to SRD on January 31st, 2005 and, following review, approved shortly thereafter. The net landbase area summary is presented in Table 3-1 and the species group and age class distribution within the net landbase is displayed in the growth and yield curves are presented in Figure 3-1 and Figure 3-2.

Table 3-1: DFMP Net Landbase Summary

LANDBASE CATEGORY	AREA (HA)	PERCENT OF GROSS AREA
Gross Area	**246,243**	**100.0**
Water and Landuse Dispositions		
• Water	1,823	0.7
• Landuse Dispositions (GRL and DRS)	479	0.2
Gross FMA Land Area	***243,941***	***99.1***
Buffers		
• Trumpeter Swan Lake Buffers (200m)	145	0.1
• Lake Buffers (100m)	1,631	0.7
• Large Permanent Buffers (60m)	5,642	2.3
• Small Permanent Buffers (30m)	5,484	2.2
Sub-Total	*12,902*	*5.2*
Non Forested		
• Anthropogenic	2,041	0.8
• Natural	14,149	5.7
Sub-Total	*16,190*	*6.6*
Net Forested Area	***214,849***	***87.3***
Non-Merchantable		
• TPR = "U"	24,187	9.8
• Larch SP1 or SP2	7,926	3.2
• Low Productivity SB Stands	14,467	5.9
Sub-Total	*46,580*	*18.9*
Potentially Productive		
• Non-Salvageable Burns	40	0.0
Net Productive Area	***168,229***	***68.3***

AGE CLASS DISTRIBUTION: NET LANDBASE AREA

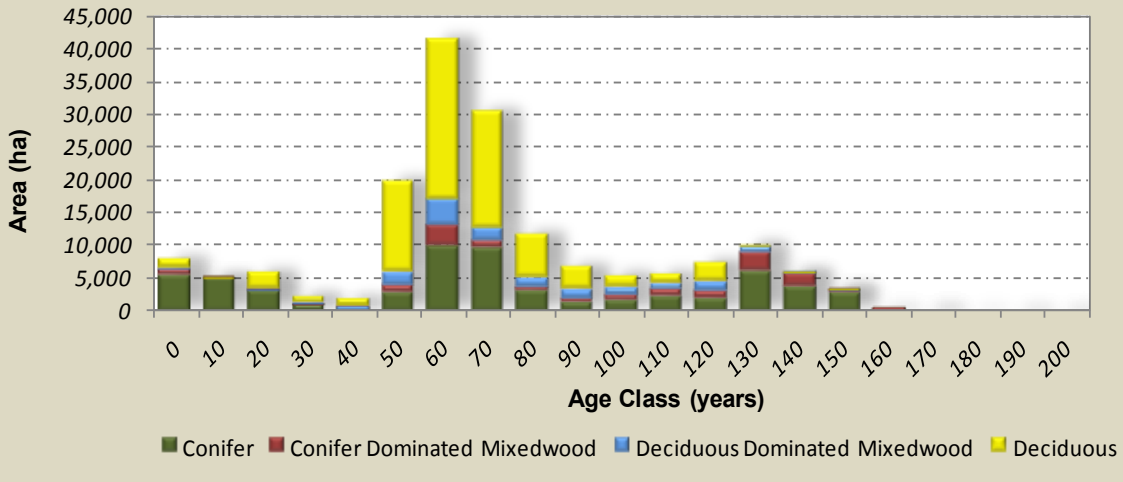
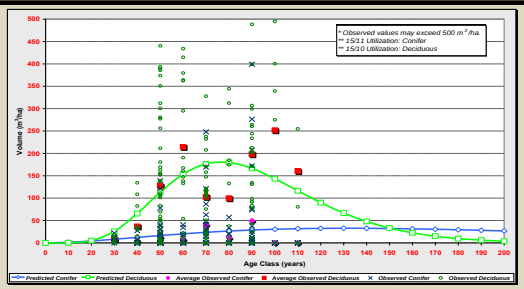


Figure 3-1: Yield Curves – AB Crown Closure

MX-AB-D-A-G



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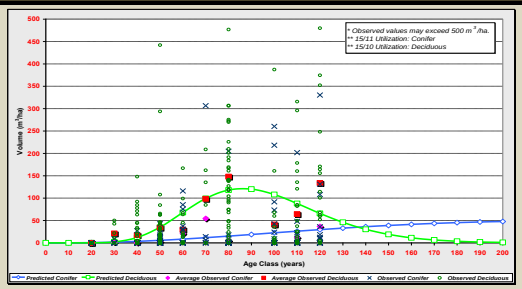

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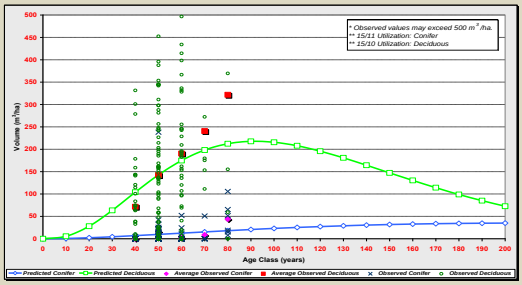

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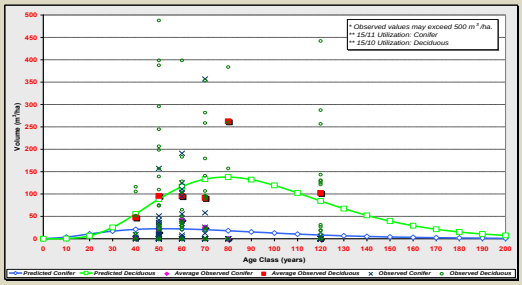
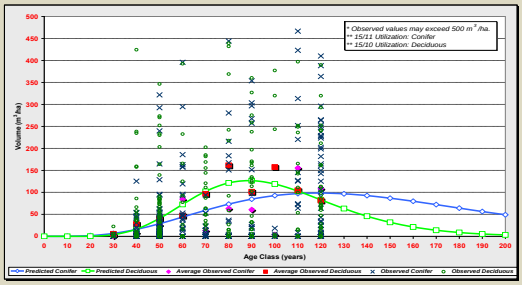
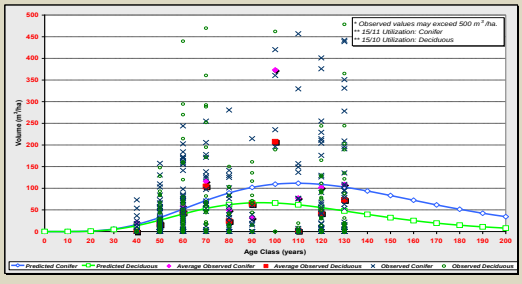


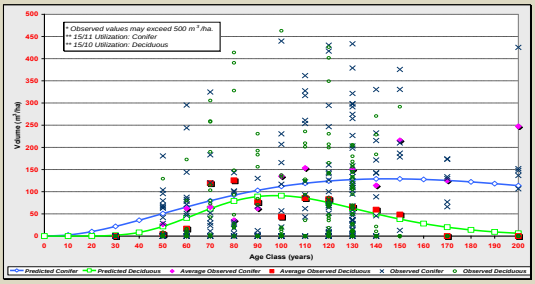
A-AB-DC-A-A



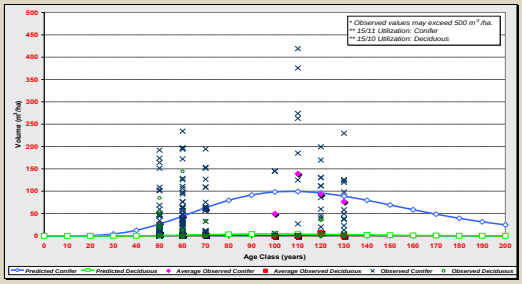
A-AB-CD-A-A



A-AB-C-SW-A



A-AB-C-P-A



A-AB-C-SB-A

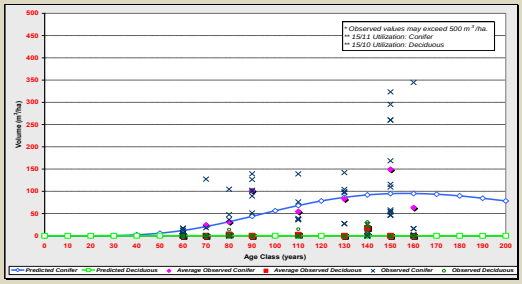
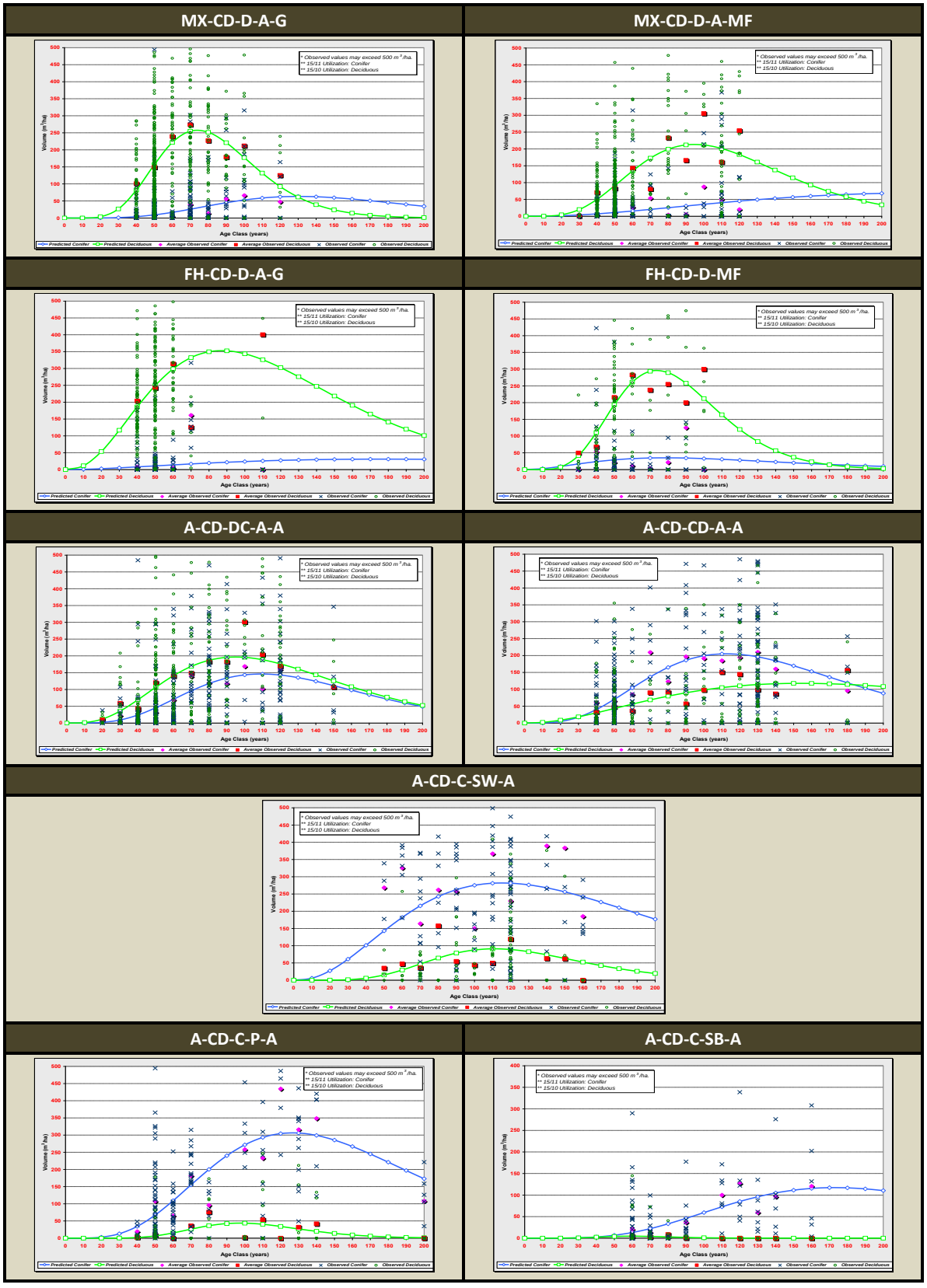


Figure 3-2: Yield Curves – CD Crown Closure



3.2 ALBERTA POLICY FRAMEWORK

The current pine strategy recommendation outlined in SRD's *Interpretive Bulletin Version 2.6 September 2006,* is as follows:

- *"The goal is to reduce the area of susceptible pine stands in the Rank 1 and Rank 2 categories in the Sustained Yield Unit (SYU) to 25% of that projected in the currently approved FMP at a point twenty years into the future."*

Buchanan is completing analysis consistent with provincial recommendations to amend the 2005 DFMP.

3.3 UPDATES TO THE 2002 DFMP

The following is a listing of the updates used for the data analysis to develop the Pine Strategy:

- Joint FMA harvest area updates up to the 2006 harvest year (harvested areas outside the net landbase are still considered outside the net landbase for this analysis);
- Climate Factor provided via the SRD MPB Stand Susceptibility Index model;
- Compartment Risk Assessment provided by the regional Forest Health Officer.

3.4 PINE STRATEGY SCENARIO DEVELOPMENT AND ANALYSIS

3.4.1 SCENARIOS

There are a variety of possible outcomes that can result from MPB infestations as well as the management of MPB. Several possible outcomes (scenarios) have been evaluated in order to determine the potential impacts a MPB infestation may have on Buchanan/Tolko's Joint FMA. In addition to the required 'MPB Rank Reduction with MPB Outbreak Scenario' (see Appendix A), Three of these scenarios are summarized here that compare the potential impacts of a MPB epidemic and the management options that Buchanan is considering. Table 3-2 summarizes these three scenarios.

Table 3-2: Scenario Description

SCENARIO #	SCENARIO NAME	DESCRIPTION
1	STATUS QUO	Continue with the 2005 DFMP and assume no MPB outbreak occurs.
2	STATUS QUO WITH MPB INFESTATION	Continue with the 2005 DFMP and assume a MPB outbreak occurs (MPB kills all pine dominated stands[1] within 20 years and stands with a lesser component of pine are adjusted to account for pine mortality).
3	MPB SUSCEPTIBILITY REDUCTION[2]	Increase harvesting for 20 years at a level that will not impact the long-term sustainable harvest by more than 10%. Harvest the most susceptible pine stands first. Assume no MPB outbreak occurs as a result of management activities controlling the MPB threat.

[1] *Stands that are 20 years or older at the beginning of the planning horizon (2005).*

[2] *The results of Scenario 3 show that the SRD Pine Strategy recommendation of reducing the area of susceptible pine stands in the Rank 1 and Rank 2 categories is achieved while maintaining an impact to the long-term sustainable harvest at or below 10%. Thus, additional scenarios limiting the harvest to 10% sustainability impact while attempting to meet the SRD Pine Strategy recommendation are not required.*

3.4.1.1 SCENARIO 1: STATUS QUO

This scenario duplicates the 2005 DFMP sequence, using the same landbase inputs, assumptions and decision rules. It is intended to simply replicate the DFMP PFMS.

Table 3-3: Harvest Simulation Control Parameters – Status Quo

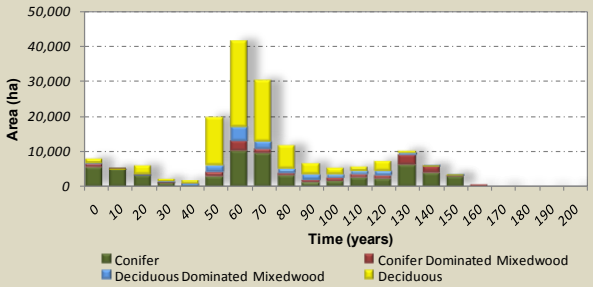
BUCHANAN/TOLKO-HP JOINT FMA HARVEST SIMULATION CONTROL PARAMETERS – 2002 PFMS:	
CONTROL PARAMETER	**PARAMETER SETTING**
Harvest unit:	FMA
Planning horizon:	160 Years
Targeted average harvest age at the end of the planning horizon:	80 ± 5
Minimum harvest age:	70 Yrs (Conifer) 50 Yrs (Deciduous)
Landbase:	Single
Sorting rules:	1) Modulate Conifer Flow 2) Maximize deciduous and conifer harvest
Modulation	Applied
Harvest flow constraint:	Dual Even Flow
Yield curves:	Net yield curves (2002 DFMP curves)
Cull Deductions:	Applied (2% Conifer, 10% Deciduous)
Regeneration transition:	Fully Stocked
Regeneration lag:	Non-Constraining
Introduce harvest plans:	Applied
Patch Size Mitigation Strategy	Applied – 20 Years
DFMP Seral Stage Maintenance Strategy	Applied
Adjacency – Green Up:	Non-Constraining
Adjacency – Accumulate adjacent stands:	Non-Constraining
Compartment sequencing:	Non-Constraining
Number of compartments open simultaneously:	Non-Constraining
MPB Infestation:	Not Applied

Figure 3-3: Harvest Simulation Results – Status Quo

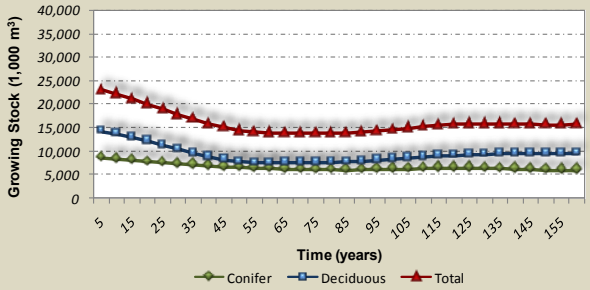
AAC SUMMARY TABLE

Net Productive Area	168,229 ha+167 ha (GRL Conifer Landbase)	
Conifer Harvest Level	Years 1-160:	204,000 m^3/yr
Deciduous Harvest Level	Years 1-20:	280,000 m^3/yr
	Years 21-160:	268,000 m^3/yr

INITIAL AGE CLASS DISTRIBUTION

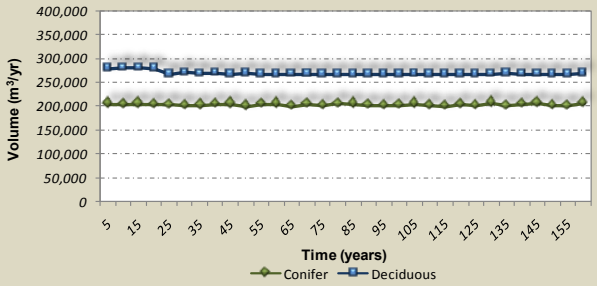


GROWING STOCK



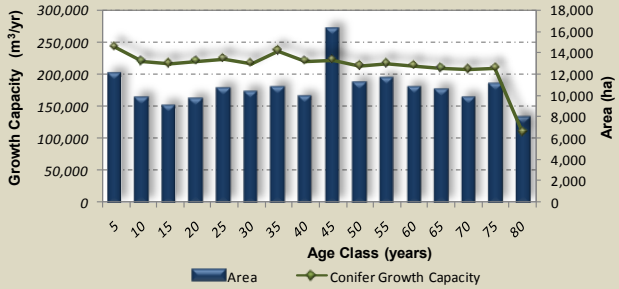
Description: *This graph summarizes the conifer, deciduous, and total growing stock (live volume) over the length of the planning horizon*

HARVEST FLOW SUMMARY



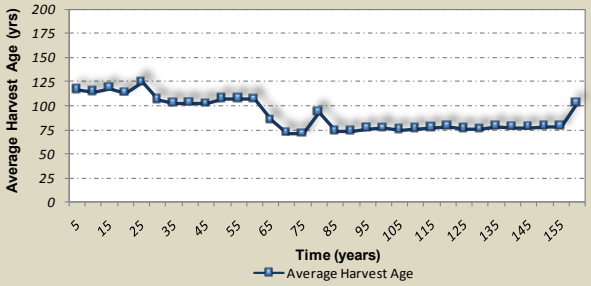
Description: *This graph summarizes the projected conifer and deciduous harvest levels over the planning horizon*

POST HARVEST FOREST CONDITIONS



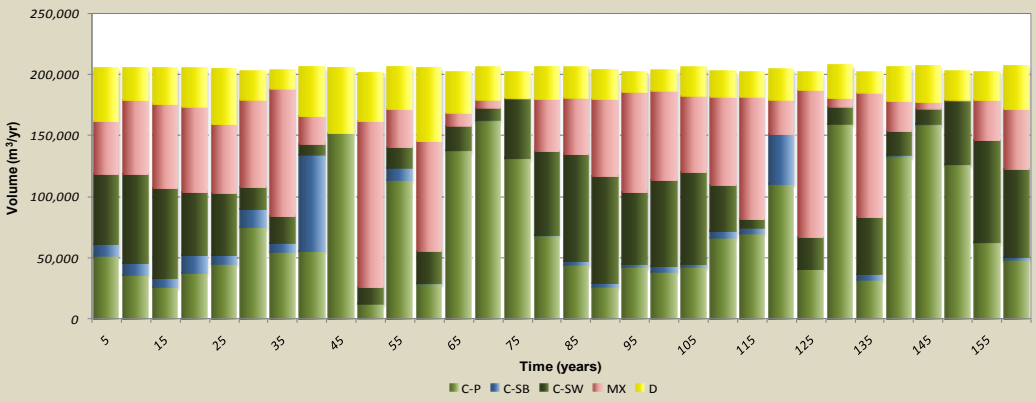
Description: *This graph summarizes the projected growth capacity and area by age class once the planning horizon is over*

AVERAGE HARVEST AGE BY 5 YEAR ITERATION



Description: *This graph summarizes the average age of stands harvested over the planning horizon*

CONIFER AAC VOLUME CONTRIBUTION BY STAND TYPE



Description: *This graph depicts the conifer volume contributed by stand types (based on yield strata) over the entire planning horizon.*

Map 3-1: 20 Year Harvest Sequence: 2002 PFMS

Map 3-2: 2002 PFMS MPB Susceptibility Reduction Time Series

3.4.1.2 SCENARIO 2: STATUS QUO WITH MPB INFESTATION

This scenario will introduce a large scale beetle infestation at year 20 into the Status Quo scenario. To model such a complex landscape level event, a number of simple and quantifiable rules have been employed[1]:

- Set the AAC to the 20 year DFMP approved harvest levels where conifer AAC is 204,000 m^3 and the deciduous AAC is 280,000 m^3;
- Assume massive pine mortality in 10 years;
- Assume harvest of salvage to continue at 'Harvest Rate A' for the next 10 years (years 11 to 20);
- Stands that are salvaged return to normal regeneration transition and normal regeneration lags;
- For stands that aren't salvaged, the following rules apply:
    a. For stands with greater than 60% pine content, assume entire stand mortality (mortality applies to stands that are 20 years or older). Stand goes onto the lowest density yield curve (e.g. AB density) that strata with a 15-year regeneration lag. Stand age is reset to 0.
    b. For stands with less than or equal to 60% pine content, the approved yield curves from the last DFMP are reduced to remove the pine content, on a proportionate basis, and the stand continues to grow at its current age (stand age is not reset to 0). No assumption is made for stand release due to opening of the canopy by the pine mortality.

[1] *As per the SRD MPB Disaster Scenario Evaluation (June, 2007) with the exception of the definition of the harvest levels.*

Table 3-4: Harvest Simulation Control Parameters – Status Quo with MPB Infestation

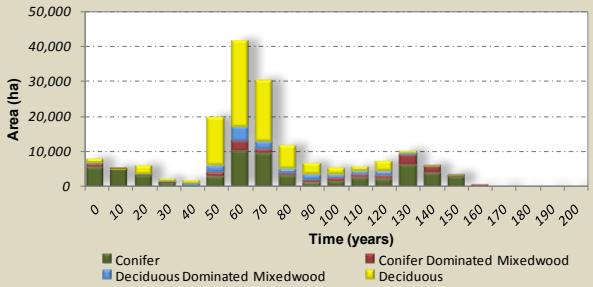
BUCHANAN/TOLKO-HP JOINT FMA HARVEST SIMULATION CONTROL PARAMETERS – STATUS QUO WITH MPB INFESTATION	
CONTROL PARAMETER	**PARAMETER SETTING**
Harvest unit:	FMA
Planning horizon:	160 Years
Targeted average harvest age at the end of the planning horizon:	80 ± 5
Minimum harvest age:	70 Yrs (Conifer) 50 Yrs (Deciduous)
Landbase:	Single
Sorting rules:	1) Modulate Conifer Flow 2) Maximize deciduous and conifer harvest
Modulation:	Applied
Harvest flow constraint:	Dual Even Flow
Yield curves:	Net yield curves (2002 DFMP curves)
Cull Deductions:	Applied (2% Conifer, 10% Deciduous)
Regeneration transition:	Fully Stocked
Regeneration lag:	Applied – (15 Year regeneration lag for MPB killed Stands)
Introduce harvest plans:	Applied
Patch Size Mitigation Strategy:	Applied – 20 Years
DFMP Seral Stage Maintenance Strategy	Applied
Adjacency – Green Up:	Non-Constraining
Adjacency – Accumulate adjacent stands:	Non-Constraining
Compartment sequencing:	Non-Constraining
Number of compartments open simultaneously:	Non-Constraining
MPB Infestation:	Applied

Figure 3-4: Harvest Simulation Results – Status Quo with MPB Infestation

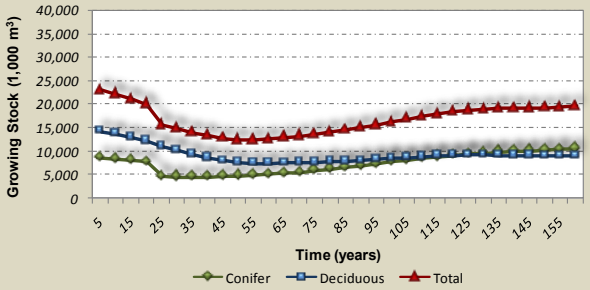
AAC SUMMARY TABLE

Net Productive Area	168,229 ha+167 ha (GRL Conifer Landbase)	
Conifer Harvest Level	Years 1-20:	204,000 m^3/yr
	Years 21-160	126,000 m^3/yr
Deciduous Harvest Level	Years 1-20:	280,000 m^3/yr
	Years 21-160:	257,000 m^3/yr

INITIAL AGE CLASS DISTRIBUTION

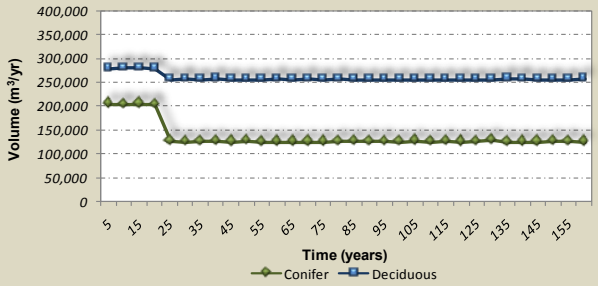


GROWING STOCK



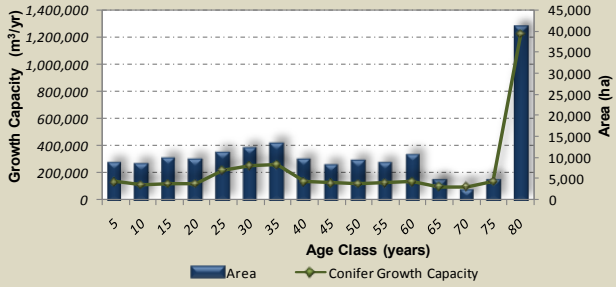
Description: *This graph summarizes the conifer, deciduous, and total growing stock (live volume) over the length of the planning horizon*

HARVEST FLOW SUMMARY



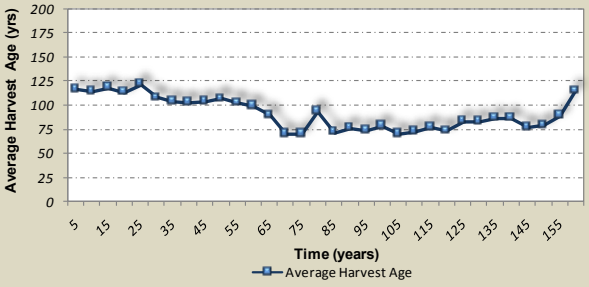
Description: *This graph summarizes the projected conifer and deciduous harvest levels over the planning horizon*

POST HARVEST FOREST CONDITIONS



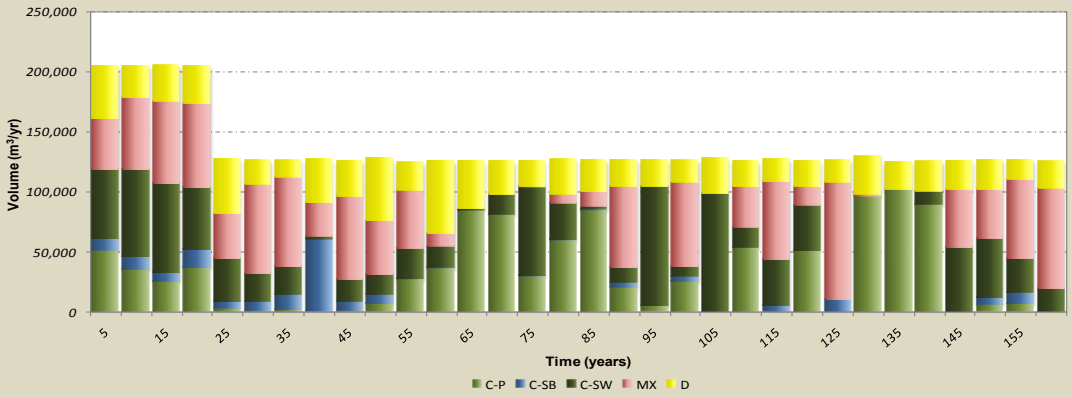
Description: *This graph summarizes the projected growth capacity and area by age class once the planning horizon is over*

AVERAGE HARVEST AGE BY 5 YEAR ITERATION



Description: *This graph summarizes the average age of stands harvested over the planning horizon*

CONIFER AAC VOLUME CONTRIBUTION BY STAND TYPE



Description: *This graph depicts the conifer volume contributed by stand types (based on yield strata) over the entire planning horizon.*

3.4.1.3 SCENARIO 3: MPB SUSCEPTIBILITY REDUCTION

This scenario will focus on decreasing the highly susceptible pine stands over the next 20 years to the 'MPB Interpretive Bulletin' reduction target while not exceeding a 10% impact to the long term AAC. A "no beetle infestation" assumption will be used in order to evaluate long-term impacts to the AAC as a result of accelerating the harvest of pine stands in the absence of MPB.

Table 3-5: Harvest Simulation Control Parameters – MPB Susceptibility Reduction

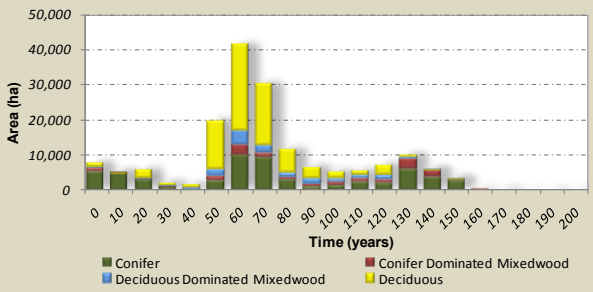
BUCHANAN/TOLKO-HP JOINT FMA HARVEST SIMULATION CONTROL PARAMETERS – MPB SUSCEPTIBILITY REDUCTION	
CONTROL PARAMETER	**PARAMETER SETTING**
Harvest unit:	FMA
Planning horizon:	160 Years
Targeted average harvest age at the end of the planning horizon:	80 ± 5
Minimum harvest age:	70 Yrs (Conifer) 50 Yrs (Deciduous)
Landbase:	Single
Sorting rules:	1) Modulate Conifer Flow 2) Maximize deciduous and conifer harvest
Modulation:	Applied
Harvest flow constraint:	Dual Even Flow
Yield curves:	Net yield curves (2002 DFMP curves)
Cull Deductions:	Applied (2% Conifer, 10% Deciduous)
Regeneration transition:	Fully Stocked
Regeneration lag:	Non-Constraining
Introduce harvest plans:	Applied
Patch Size Mitigation Strategy:	Applied – 20 Years
DFMP Seral Stage Maintenance Strategy	Applied
Adjacency – Green Up:	Non-Constraining
Adjacency – Accumulate adjacent stands:	Non-Constraining
Compartment sequencing:	Non-Constraining
Number of compartments open simultaneously:	Non-Constraining
MPB Infestation:	Not Applied

Figure 3-5: Harvest Simulation Results – MPB Susceptibility Reduction

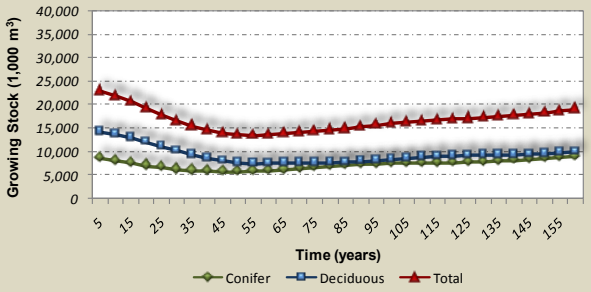
AAC SUMMARY TABLE

Net Productive Area	168,229 ha+167 ha (GRL Conifer Landbase)ha	
Conifer Harvest Level	Years 1-20:	216,500 m^3/yr
	Years 21-160	185,000 m^3/yr
Deciduous Harvest Level	Years 1-20:	280,000 m^3/yr
	Years 21-160:	268,000 m^3/yr

INITIAL AGE CLASS DISTRIBUTION

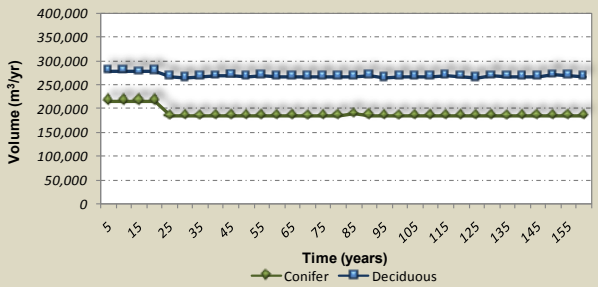


GROWING STOCK



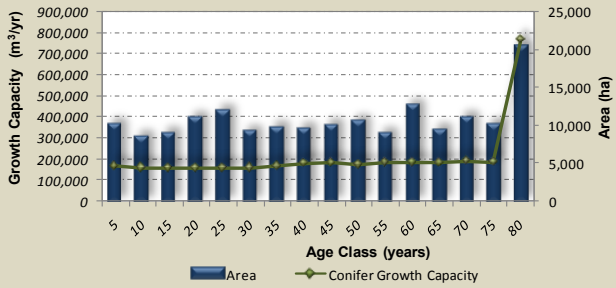
Description: *This graph summarizes the conifer, deciduous, and total growing stock (live volume) over the length of the planning horizon*

HARVEST FLOW SUMMARY



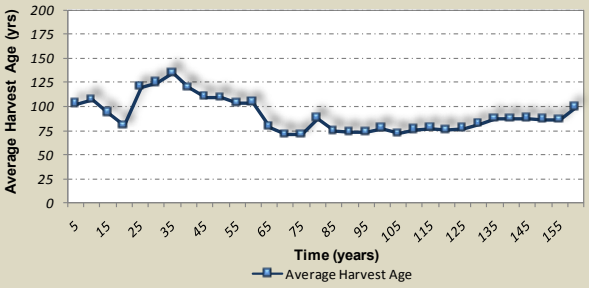
Description: *This graph summarizes the projected conifer and deciduous harvest levels over the planning horizon*

POST HARVEST FOREST CONDITIONS



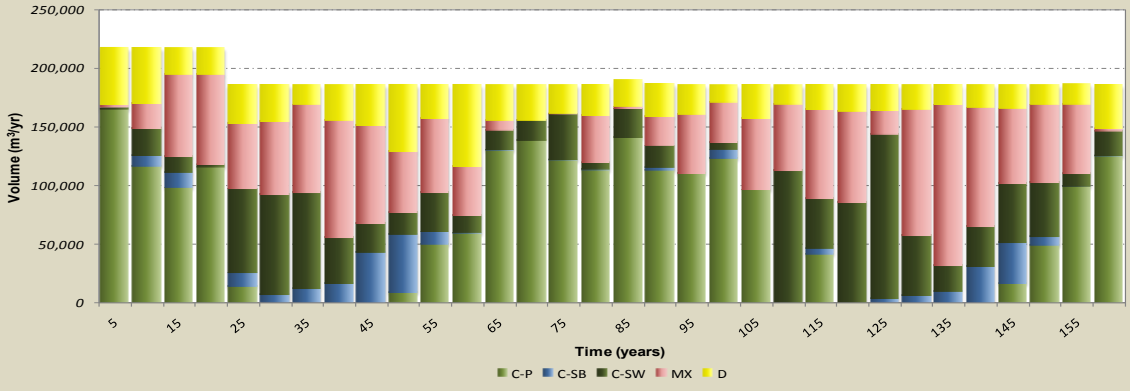
Description: *This graph summarizes the projected growth capacity and area by age class once the planning horizon is over*

AVERAGE HARVEST AGE BY 5 YEAR ITERATION



Description: *This graph summarizes the average age of stands harvested over the planning horizon*

CONIFER AAC VOLUME CONTRIBUTION BY STAND TYPE



Description: *This graph depicts the conifer volume contributed by stand types (based on yield strata) over the entire planning horizon.*

The results of this scenario show that the SRD Pine Strategy recommendation of reducing the area of susceptible pine stands in the Rank 1 and Rank 2 categories is achieved while maintaining an impact to the long-term sustainable harvest at or below 10%. Thus, additional scenarios limiting the harvest to 10% sustainability impact while attempting to meet the SRD Pine Strategy recommendation are not required.

3.4.1.4 SCENARIO COMPARATIVE ANALYSIS

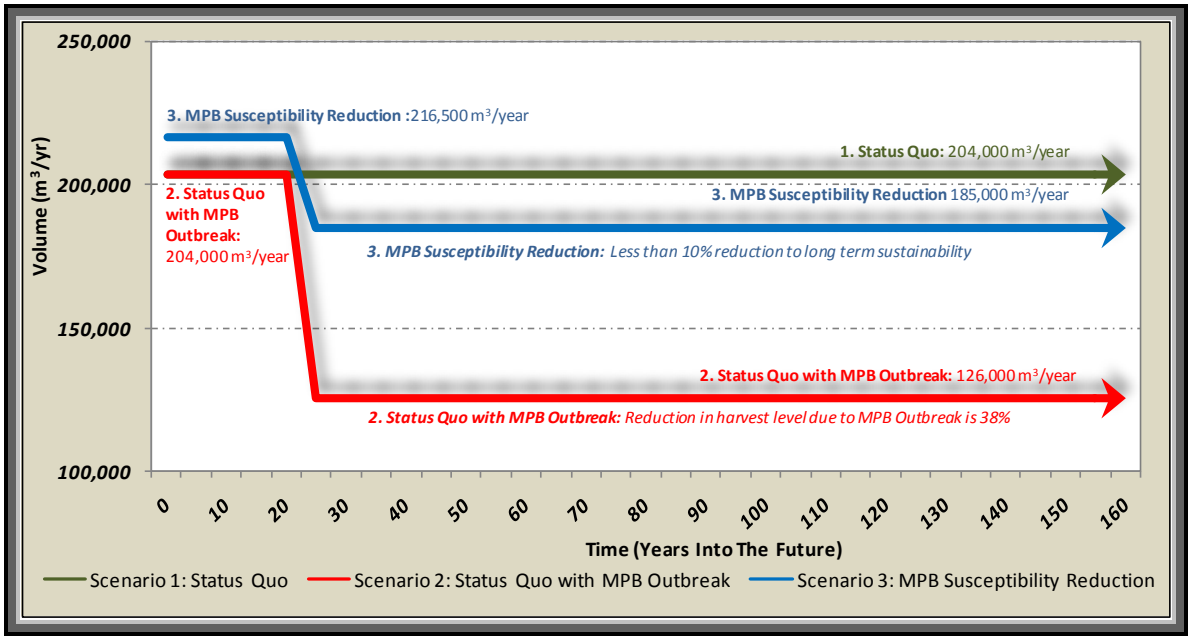
This section presents and compares, where applicable, the results of Scenarios 1 to 3 in terms of their impacts on:

- Long Term Fibre Sustainability;
- MPB Pine Stand Ranking Reduction;
- Watersheds;
- Access;
- Probability of Grizzly Bear Occurrence and Mortality.

3.4.1.4.1 LONG TERM SUSTAINABILITY

The Buchanan/Tolko Joint FMA is managed through harvesting, planting and conserving at a level that ensures sustainability of the timber supply over a long term planning horizon (160 years). Possible changes to this timber supply due to MPB itself and through managing for it have the potential to impact this long term sustainability. Figure 3-6 illustrates the impact of each scenario as it relates to the long term sustainability of the fibre resource.

Figure 3-6: Scenario Comparison: Run Results Summary[1]

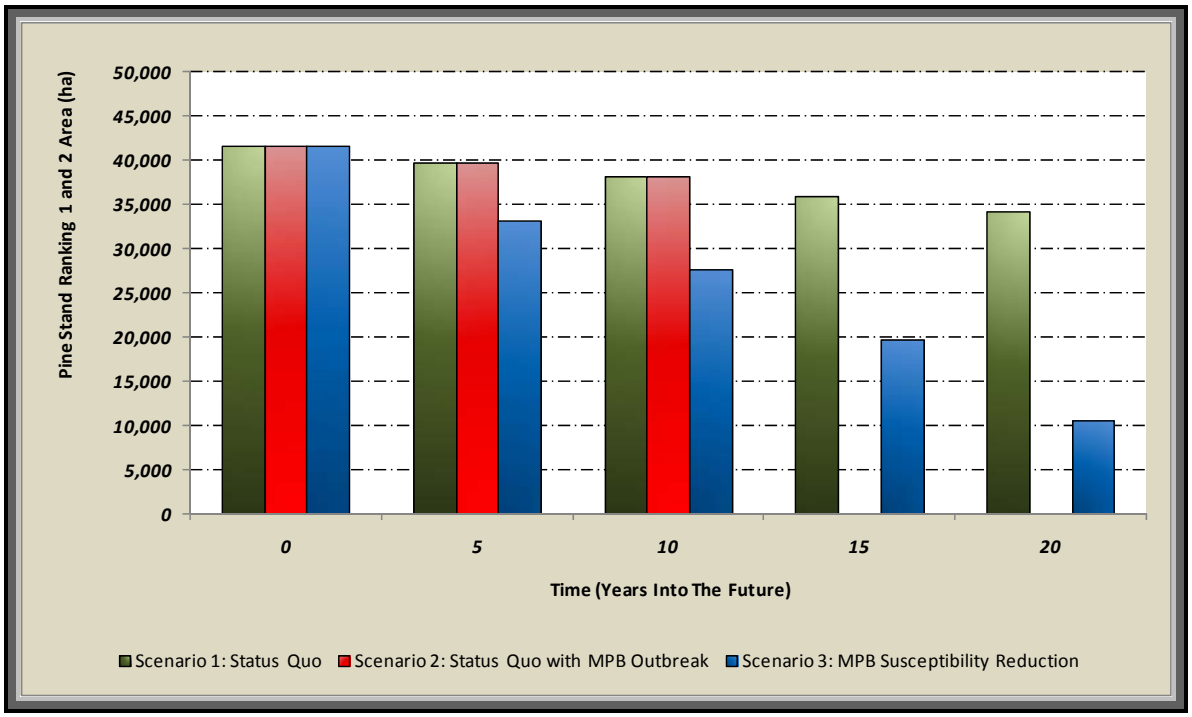


[1] *2002 Effective Date*

3.4.1.4.2 REDUCTION IN MPB PINE STAND RANKING

The reduction in MPB susceptibility achieved under Scenario 1 is compared against Scenarios 2 and 3 in Figure 3-7. The initial 10-year susceptibility reduction for both Scenarios 1 and 2 are the same because stand conditions are the same and they both follow the same management strategy. However, MPB susceptibility, represented by Rank 1 and 2 area, is zero beginning at year 11 under Scenario 2 as the pine mortality from the MPB takes effect. Because Scenario 3 is focusing on management of the Rank 1 and 2 stands, this area is reduced from 41,723 ha to 10,544 ha or 75% over the 20 year period compared with Scenario 1 which only reduces this area by 18%.

Figure 3-7: Scenario Comparison: Reduction in Pine Stand Ranking[1]



[1] *2002 Effective Date*

3.4.1.4.3 WATERSHEDS

A MPB outbreak has the potential to significantly impact watersheds across the FMA. Thus, a watershed analysis was performed to assess the hydrologic response to a potential MPB outbreak, and compared to the response if the pre-emptive management strategy is implemented. Watersheds within the Buchanan/Tolko FMA were determined within the 2005 DFMP and used to complete an analysis of the impact of each scenario on long-term water yields, using the ECA-Alberta model which is a Cumulative Watershed Disturbance and Hydrologic Recovery Simulator[1]. The ECA-Alberta hydrologic model projects average streamflow changes over time by considering the amount and type of area disturbed within a watershed, average precipitation & streamflow of the area in question. Precipitation and streamflow assume average climatic conditions while growth rates of disturbed areas assume average provincial rates of stand growth. Therefore, it is important to note that deviation of climate, stand growth and regeneration from long-term averages will affect results. Map 3-3 displays watershed boundaries and Figure 3-8 summarizes and compares the potential impacts of Scenarios 1 through 3 on watershed streamflow through the long-term average water yield increase at the FMA level. The results for each of the three scenarios are summarized by watershed in Table 3-6 to Table 3-8.

NOTE:

- Streamflow gauging station(s), with at least 5 years of data, representing a watershed with like topography and vegetation to those of a given operating area were used to derive the long term streamflow averages;
- Precipitation station(s) within close proximity to a given operating area were used to derive the long term precipitation averages;
- Most streamflow gauging stations are shut down during certain times of the year and therefore, the gaps in data must be estimated to determine a year round average;
- Model accuracy depends primarily on accurate hydrologic recovery information of forest stands after disturbance, as well as representative regional streamflow and precipitation data;
- Hydrologic recovery of mixedwood stands is not simulated by this model;
- Model assumes that maximum volume growth rate represents the age at which full hydrologic recovery is obtained;
- Model calculations reflect provincial averages for unmanaged (primarily fire origin) stands;
- Deviation of regional forest growth from provincial averages may produce unreliable results for some regions;
- This analysis only represents the incremental cumulative effect of harvesting;
- Watersheds having only small fractions within the FMA may be inaccurately represented and therefore not included in this analysis;
- The objective of this model is not to produce a detailed, highly accurate simulation of streamflow, but rather a projection of streamflow changes over time assuming average climatic conditions in the region;
- ECA-Alberta describes how disturbance will affect streamflow based on long-term climatic conditions and may not represent actual changes in any given year.

[1] *Developed by Dr. Uldis Silins, University of Alberta.*

Map 3-3: Joint FMA Area Watersheds

Table 3-6: Joint FMA Watershed Summary – Scenario 1

WATERSHED SUMMARY – SCENARIO 1					
Watershed	Area (ha)	Long Term Average Yield Increase (%)			
		YEAR 10	YEAR 20	YEAR 30	YEAR 40
1	3,631	4%	9%	3%	2%
2	9,124	2%	1%	2%	1%
3	12,736	3%	3%	5%	3%
4	11,968	6%	6%	4%	1%
5	5,481	7%	4%	9%	6%
6	18,613	6%	4%	5%	4%
7	4,506	4%	6%	7%	5%
8	15,974	3%	2%	3%	9%
9	10,109	3%	2%	1%	7%
10	4,305	3%	1%	1%	6%
11	1,285	2%	1%	2%	1%
12	27,161	2%	1%	1%	5%
13	5,365	1%	6%	3%	7%
14	10,196	4%	5%	4%	6%
15	3,234	3%	3%	4%	8%
16	9,130	5%	21%	24%	27%
17	4,374	9%	41%	28%	18%
18	3,335	13%	20%	18%	6%
19	6,660	7%	5%	9%	4%
20	8,408	15%	20%	23%	17%
21	9,167	6%	3%	21%	18%
22	8,578	14%	20%	26%	15%
23	9,735	14%	15%	23%	11%
24	7,891	14%	17%	12%	13%
25	7,006	22%	17%	13%	25%
26	10,828	7%	21%	19%	14%
27	10,435	5%	46%	17%	10%
28	7,010	1%	32%	11%	14%
Total Area / Average Yield Increase*	**246,243**	**6%**	**11%**	**10%**	**9%**

* Area weighted average.

Table 3-7: Joint FMA Watershed Summary – Scenario 2

WATERSHED SUMMARY – SCENARIO 2					
Watershed	Area (ha)	Long Term Average Yield Increase (%)			
		YEAR 10	YEAR 20	YEAR 30	YEAR 40
1	3,631	4%	16%	9%	4%
2	9,124	2%	8%	9%	4%
3	12,736	3%	39%	38%	14%
4	11,968	6%	28%	25%	9%
5	5,481	7%	13%	16%	8%
6	18,613	6%	13%	14%	7%
7	4,506	4%	17%	17%	8%
8	15,974	3%	29%	29%	14%
9	10,109	3%	17%	16%	11%
10	4,305	3%	21%	20%	12%
11	1,285	2%	1%	2%	2%
12	27,161	2%	4%	3%	6%
13	5,365	1%	11%	9%	8%
14	10,196	4%	16%	15%	9%
15	3,234	3%	3%	4%	8%
16	9,130	5%	27%	28%	21%
17	4,374	9%	41%	26%	18%
18	3,335	13%	20%	18%	7%
19	6,660	7%	5%	7%	5%
20	8,408	15%	22%	24%	18%
21	9,167	6%	5%	18%	21%
22	8,578	14%	24%	29%	17%
23	9,735	14%	20%	28%	13%
24	7,891	14%	21%	15%	10%
25	7,006	22%	17%	13%	13%
26	10,828	7%	26%	24%	13%
27	10,435	5%	48%	18%	10%
28	7,010	1%	36%	15%	14%
Total Area / Average Yield Increase*	**246,243**	**6%**	**20%**	**18%**	**11%**

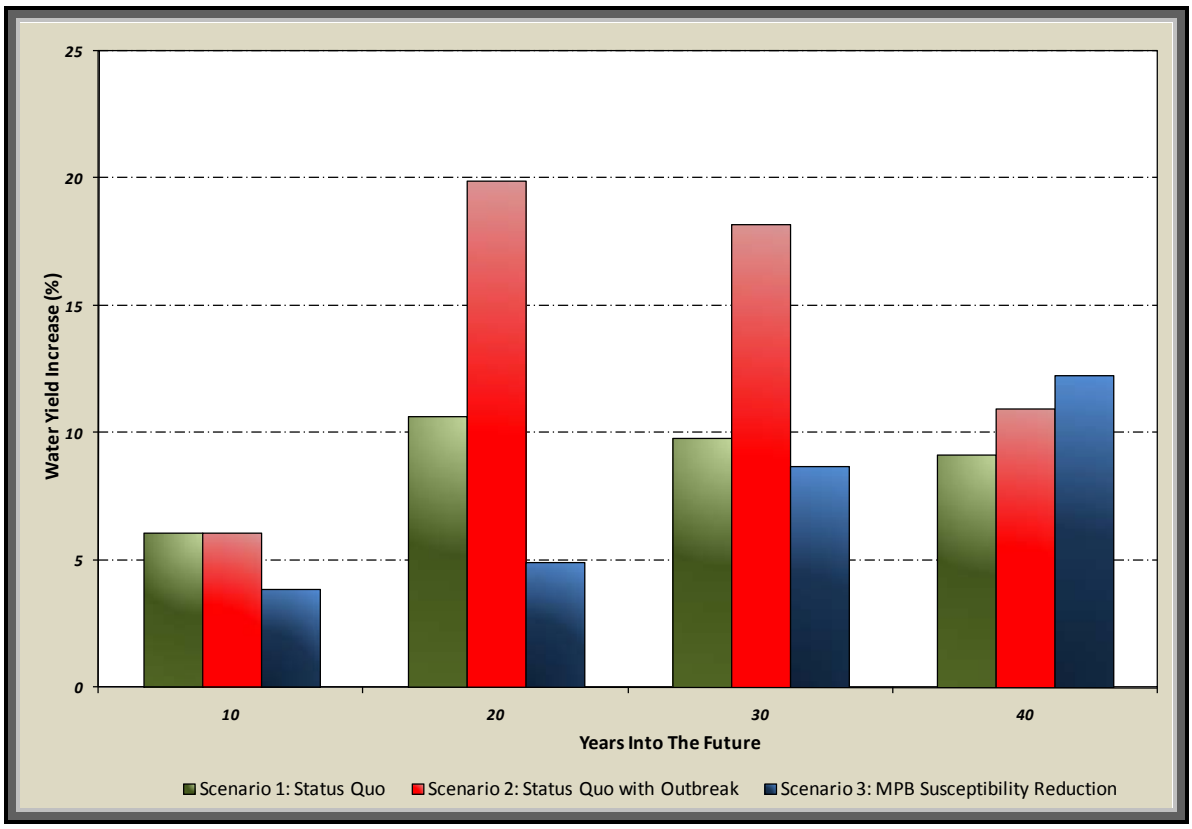
* Area weighted average.

Table 3-8: Joint FMA Watershed Summary – Scenario 3

WATERSHED SUMMARY – SCENARIO 3					
Watershed	Area (ha)	Long Term Average Yield Increase (%)			
		YEAR 10	YEAR 20	YEAR 30	YEAR 40
1	3,631	10%	3%	4%	4%
2	9,124	3%	2%	2%	2%
3	12,736	8%	11%	2%	2%
4	11,968	10%	4%	5%	4%
5	5,481	2%	3%	7%	5%
6	18,613	1%	4%	5%	5%
7	4,506	5%	8%	4%	6%
8	15,974	6%	9%	1%	2%
9	10,109	1%	11%	1%	3%
10	4,305	1%	10%	1%	4%
11	1,285	0%	0%	2%	1%
12	27,161	0%	1%	1%	2%
13	5,365	1%	2%	3%	2%
14	10,196	1%	6%	6%	8%
15	3,234	1%	1%	5%	8%
16	9,130	2%	4%	19%	31%
17	4,374	1%	0%	41%	49%
18	3,335	0%	1%	24%	26%
19	6,660	2%	1%	11%	14%
20	8,408	4%	8%	28%	38%
21	9,167	5%	1%	4%	24%
22	8,578	14%	7%	8%	46%
23	9,735	6%	5%	14%	24%
24	7,891	8%	8%	22%	14%
25	7,006	7%	1%	24%	18%
26	10,828	3%	4%	17%	19%
27	10,435	2%	2%	14%	16%
28	7,010	1%	11%	7%	13%
Total Area / Average Yield Increase*	**246,243**	**4%**	**5%**	**9%**	**12%**

* Area weighted average.

Figure 3-8: Scenario Comparison: Long Term Average Yield Increases[1]



3.4.1.4.4 GRIZZLY BEAR AND FMA ACCESS

Grizzly bear, *Ursus arctos*, populations and habitat important to grizzly bear have been identified within the Joint FMA area. These landscape values are sensitive to all forms of human activity, including forest operations. As a result, through partnership with the Foothills Model Forest (FMF) Grizzly Bear Program, Buchanan has aided in the development of a series of planning tools with the objective of ensuring the long-term sustainability of grizzly bears within both the FMA area and throughout Alberta.

The first of these tools is the Resource Selection Function (RSF) model (Phase 6)[2] which classifies the FMA area according to the probability of grizzly bear occurrence. This is done through tracking grizzly bear activity using GPS collars, determining their habitat preferences and applying these preferences to habitats of the same type while factoring in anthropogenic activity such as access and harvesting. Through this, a comparison between Scenarios 1 through 3 of the probability of Grizzly Bear occurrence over time is illustrated in Figure 3-9.

In addition, one of the driving factors that influence grizzly bear populations and habitat quality is the existence of access corridors as these increases the probability of grizzly bear encounters with operational activity. The FMF Grizzly Bear Program suggests that 0.3 km/km^2 of permanent all-weather road is a

[1] *2002 Effective Date*

[2] *Requires proprietary FMF landbase (2005 effective date). Only covers Sweathouse Operating Area. Kimiwan not considered within Grizzly Bear range by FMF.*

critical threshold for Grizzly Bear Habitat. Buchanan does not currently have any existing all-weather roads on the FMA, but instead maintains dry-weather roads and gates to manage access. Further to this, a revised PFMS in response to MPB will not result in the need for more dry weather roads but may mean that certain roads will be required to be open at different times.

Using the Grizzly Bear Mortality risk models (Phase 6)1, the probability of Grizzly Bear Mortality has been assessed at both the beginning of Scenarios 1 through 3 and at year 20.

[1] *Requires proprietary FMF landbase (2005 effective date). Only covers Sweathouse Operating Area. Kimiwan not considered within Grizzly Bear range by FMF.*

Map 3-4: Joint FMA Access

Figure 3-9: Scenario Comparison: Probability of Grizzly Bear Occurrence – Year 0

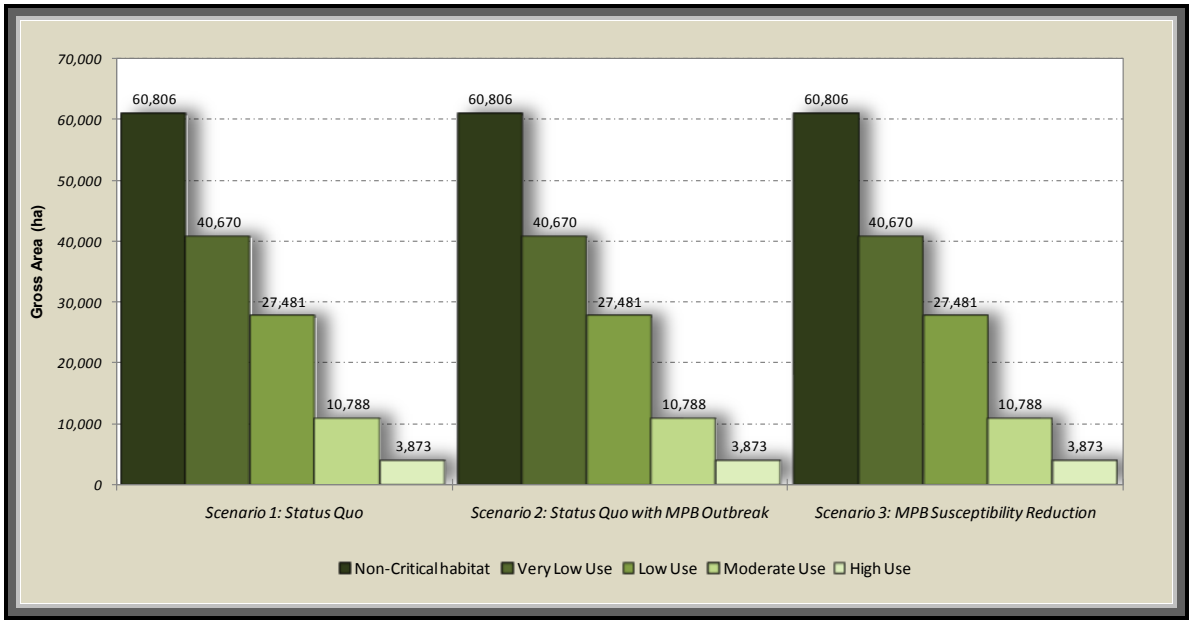


Figure 3-10: Scenario Comparison: Probability of Grizzly Bear Occurrence – Year 20

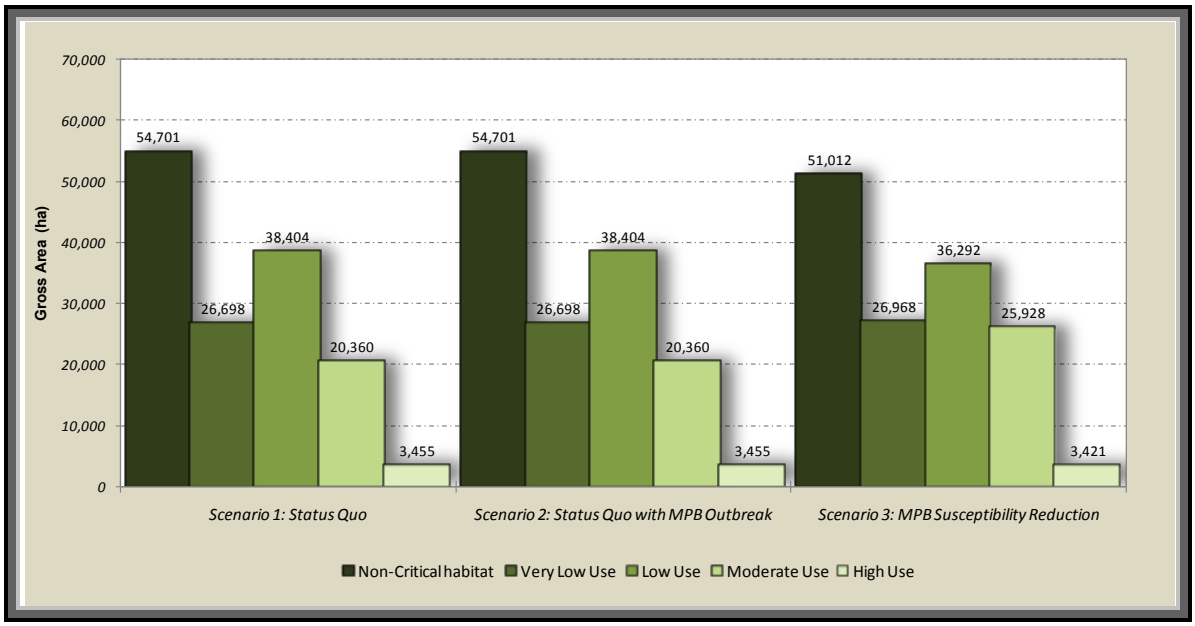


Figure 3-11: Scenario Comparison: Probability of Grizzly Bear Mortality – Year 0

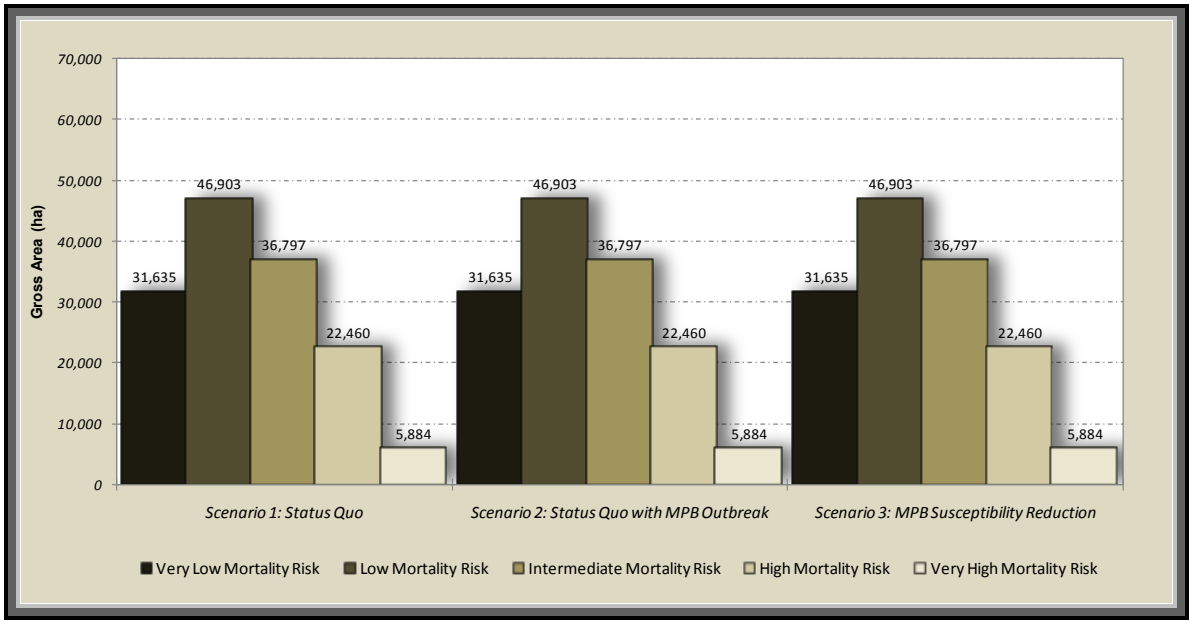
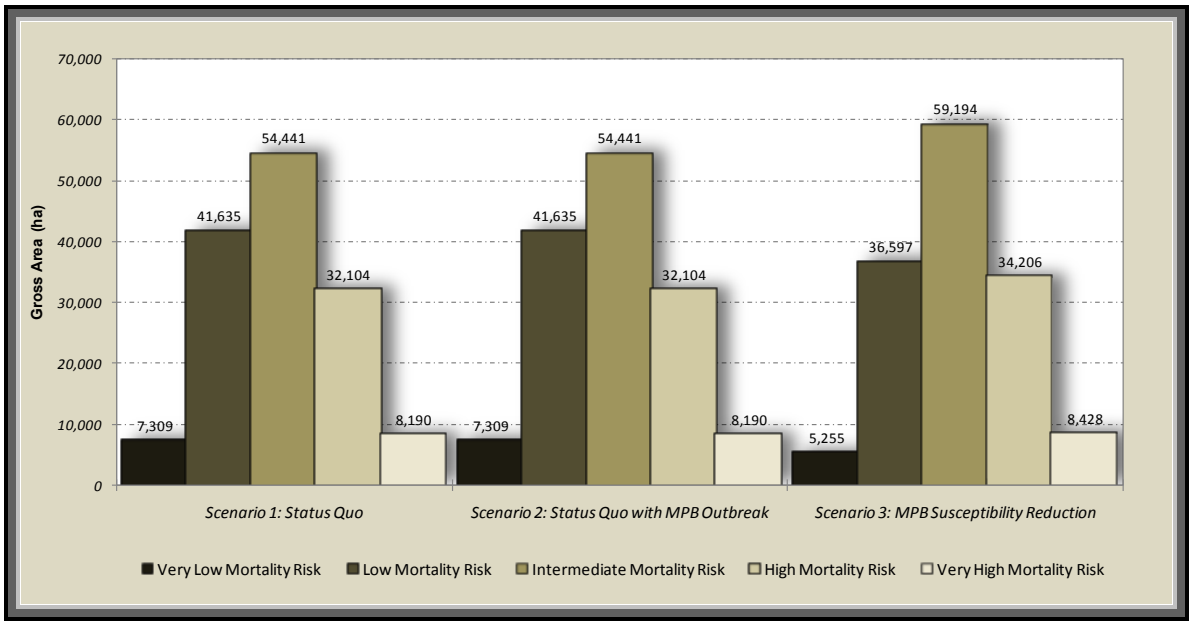


Figure 3-12: Scenario Comparison: Probability of Grizzly Bear Mortality – Year 20



3.5 SCENARIO SELECTION

Consistent with SRD's *Interpretive Bulletin Version 2.6 September 2006,* Buchanan is pursuing a forest management strategy that follows the Scenario 3 guidelines while also addressing the various landbase values in an operationally viable manner.

Section 4: Pine Management Strategy

4

4 PINE MANAGEMENT STRATEGY

4.1 SCENARIO 4: MPB PREFERRED FOREST MANAGEMENT STRATEGY

The following scenario represents the selected MPB Preferred Forest Management Strategy. Additional updates relative to the previously described 3 scenarios have been incorporated into this strategy and are as follows:

- Landbase age and age class are updated to the 2007 effective year.
- Buchanan and Tolko HP harvest area updates up to and including the 2006 harvest year (harvested areas outside the net landbase are still considered outside the net landbase for this analysis). These areas have the age and age class set to zero and are transitioned to a yield strata based on the 2005 DFMP transition rules.

In operationalizing scenario 3, the following sorting rules were used to prioritize stands for harvest in the PFMS:

- Stands that were “A” density, less than 15m tall or SB/LT leading were avoided in the first 10 years.
- Rank 1 and Rank 2 stands within the following compartments were prioritized first to create an East to West break and to recover the most valuable and accessible timber first: Sweathouse-1, Sweathouse-2, Sweathouse-8, Sweathouse-7, Sweathouse-3, Sweathouse-9 and Sweathouse-10.
- Rank 1 and Rank 2 stands within the following compartments were prioritized next: Sweathouse-11, Sweathouse-12, Sweathouse-6, Sweathouse-5 and Sweathouse-4.
- The remainder of the 20 year sequence was topped up by selecting the highest susceptibility stands remaining first.

Issues surrounding isolated stands and sliver stands have also been addressed in the operationalization process (i.e. small or isolated stands were avoided).

Table 4-1: Harvest Simulation Control Parameters – MPB PFMS Scenario

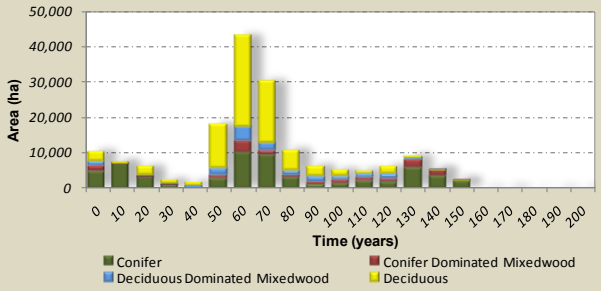
BUCHANAN/TOLKO-HP JOINT FMA HARVEST SIMULATION CONTROL PARAMETERS – MPB SUSCEPTIBILITY REDUCTION	
CONTROL PARAMETER	**PARAMETER SETTING**
Harvest unit:	FMA
Planning horizon:	160 Years
Targeted average harvest age at the end of the planning horizon:	80 ± 5
Minimum harvest age:	70 Yrs (Conifer) 50 Yrs (Deciduous)
Landbase:	Single
Sorting rules:	1) Modulate Conifer Flow 2) Maximize deciduous and conifer harvest
Modulation:	Applied
Harvest flow constraint:	Dual Even Flow
Yield curves:	Net yield curves (2002 DFMP curves)
Cull Deductions:	Applied (2% Conifer, 10% Deciduous)
Regeneration transition:	Fully Stocked
Regeneration lag:	Non-Constraining
Introduce harvest plans:	Applied
Patch Size Mitigation Strategy:	Applied – 20 Years
DFMP Seral Stage Maintenance Strategy	Applied
Adjacency – Green Up:	Non-Constraining
Adjacency – Accumulate adjacent stands:	Non-Constraining
Compartment sequencing:	Applied
Number of compartments open simultaneously:	Non-Constraining
MPB Infestation:	Not Applied

Figure 4-1: Harvest Simulation Results – MPB PFMS Scenario

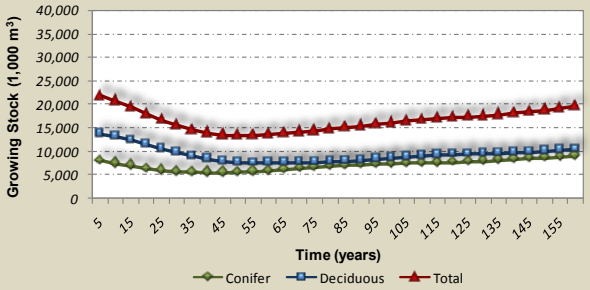
AAC SUMMARY TABLE

Net Productive Area	168,229 ha+167 ha (GRL Conifer Landbase)	
Conifer Harvest Level	Years 1-20:	216,500 m^3/yr
	Years 21-160	185,000 m^3/yr
Deciduous Harvest Level	Years 1-20:	281,000 m^3/yr
	Years 21-160:	270,000 m^3/yr

INITIAL AGE CLASS DISTRIBUTION

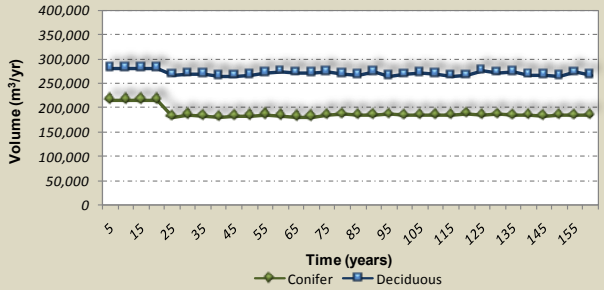


GROWING STOCK



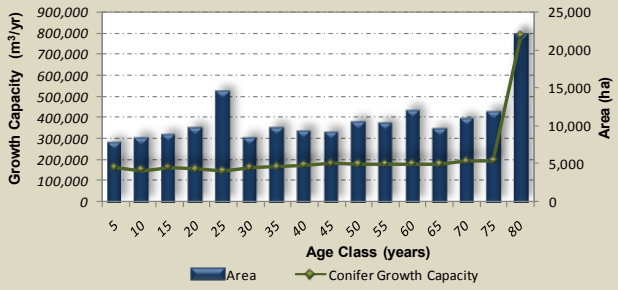
Description: *This graph summarizes the conifer, deciduous, and total growing stock (live volume) over the length of the planning horizon*

HARVEST FLOW SUMMARY



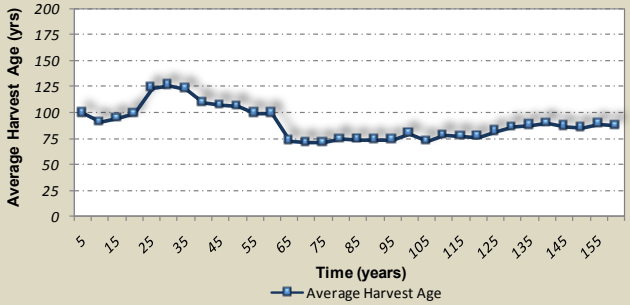
Description: *This graph summarizes the projected conifer and deciduous harvest levels over the planning horizon*

POST HARVEST FOREST CONDITIONS



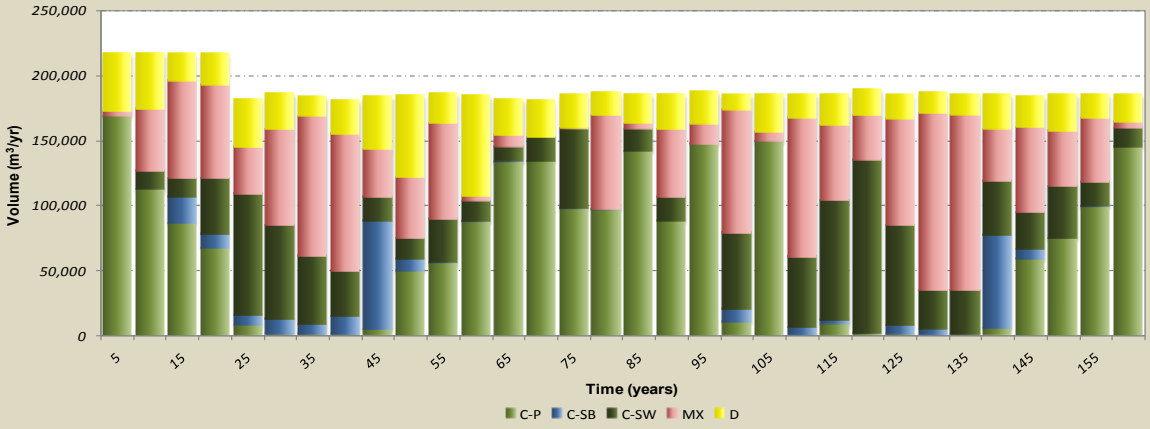
Description: *This graph summarizes the projected growth capacity and area by age class once the planning horizon is over*

AVERAGE HARVEST AGE BY 5 YEAR ITERATION



Description: *This graph summarizes the average age of stands harvested over the planning horizon*

CONIFER AAC VOLUME CONTRIBUTION BY STAND TYPE



Description: *This graph depicts the conifer volume contributed by stand types (based on yield strata) over the entire planning horizon.*

Map 4-1: 20 Year Harvest Sequence: MPB PFMS

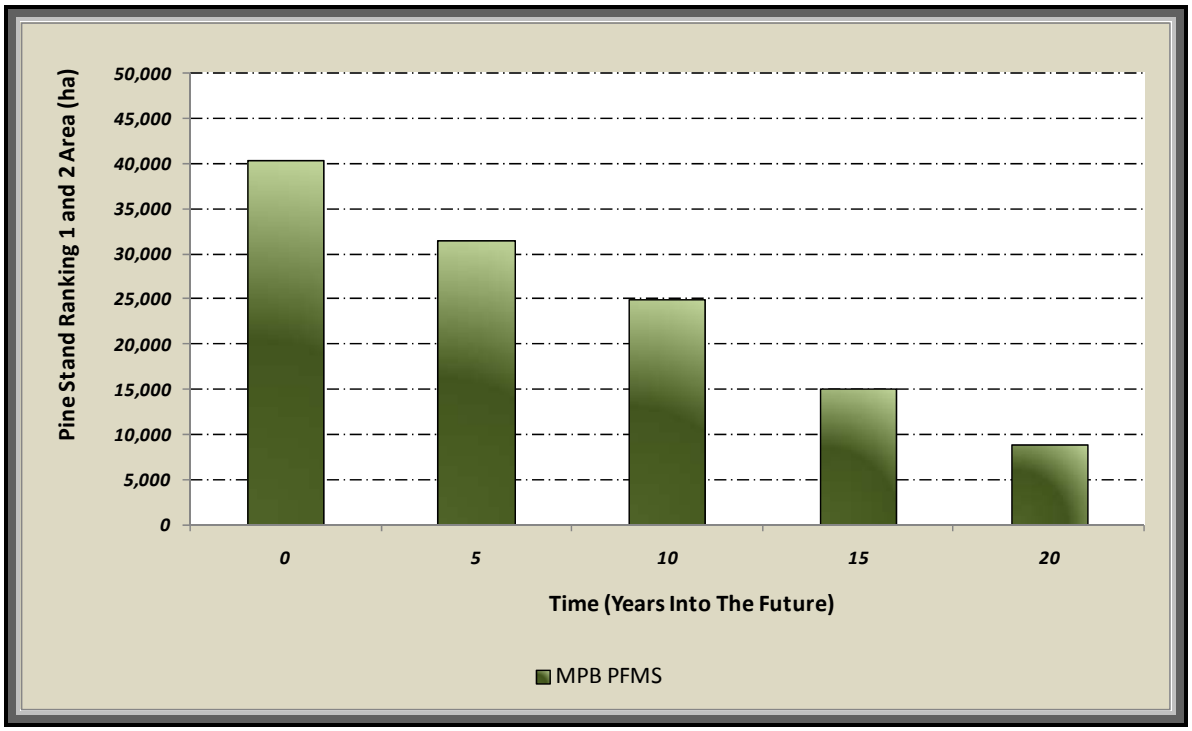
4.1.1 MPB PFMS ANALYSIS

The 2005 DFMP recognizes many non-timber values and presented several detailed analyses on each one. This section addresses some of the values related to the selection of the MPB PFMS.

4.1.1.1 REDUCTION IN MPB PINE STAND RANKING

The reduction in MPB susceptibility achieved under the MPB PFMS is illustrated in Figure 4-2 and succeeds in reducing the Rank 1 and Rank 2 area by 76% from its 2002 landbase amount of 41,723 ha to 8,800 ha.

Figure 4-2: MPB PFMS: Reduction in Pine Stand Ranking



Map 4-2: MPB PFMS: MPB Susceptibility Reduction Time Series

4.1.1.2 WATERSHEDS

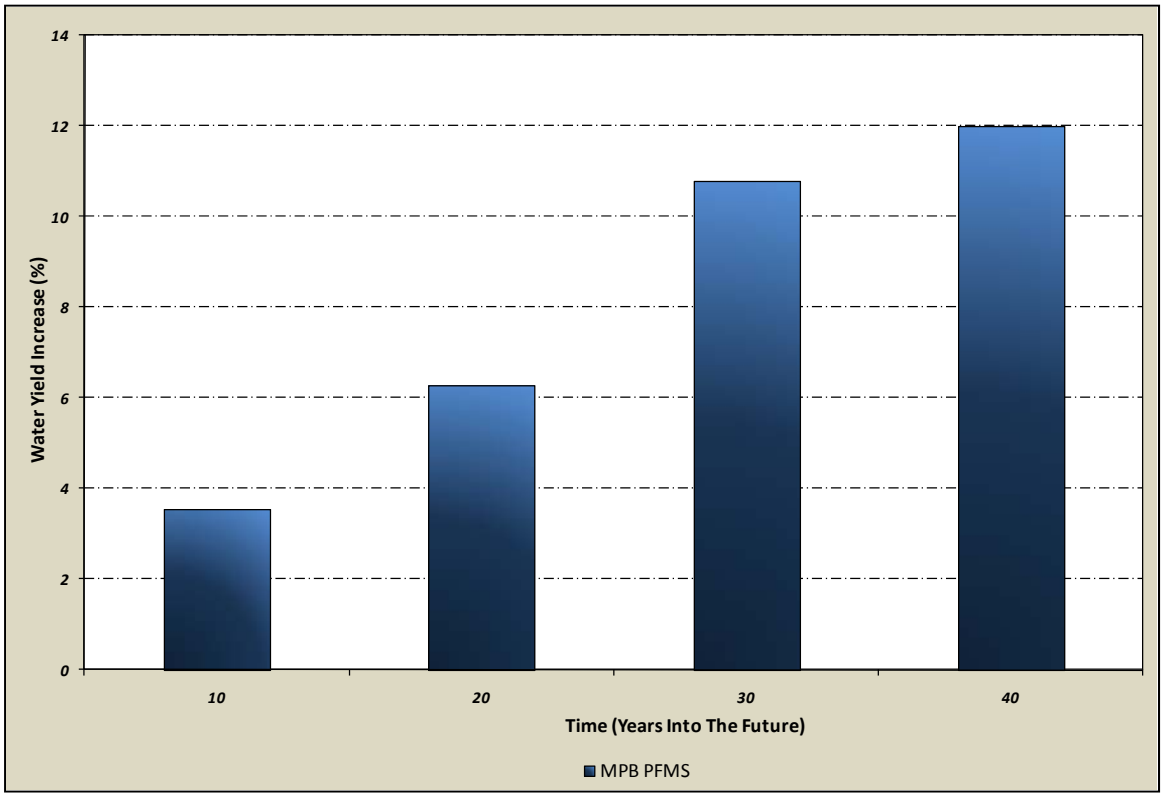
The MPB PFMS is estimated to result in the following long term average water yield increases over the next 40 years as indicated in Figure 4-3. The results by watershed are displayed in Table 4-2.

Table 4-2: Joint FMA Watershed Summary – PFMS

WATERSHED SUMMARY – PFMS					
Watershed	Area (ha)	Long Term Average Yield Increase (%)			
		YEAR 10	YEAR 20	YEAR 30	YEAR 40
1	3,631	4%	7%	5%	4%
2	9,124	2%	4%	3%	1%
3	12,736	11%	7%	3%	2%
4	11,968	6%	6%	5%	3%
5	5,481	3%	3%	7%	5%
6	18,613	1%	4%	7%	4%
7	4,506	8%	7%	3%	6%
8	15,974	9%	7%	1%	2%
9	10,109	5%	4%	1%	4%
10	4,305	4%	6%	1%	5%
11	1,285	0%	1%	2%	2%
12	27,161	0%	2%	1%	2%
13	5,365	0%	2%	3%	2%
14	10,196	2%	5%	7%	5%
15	3,234	1%	2%	4%	5%
16	9,130	1%	8%	21%	23%
17	4,374	1%	1%	69%	45%
18	3,335	0%	8%	36%	23%
19	6,660	2%	11%	9%	13%
20	8,408	4%	22%	34%	38%
21	9,167	7%	2%	2%	35%
22	8,578	11%	10%	19%	37%
23	9,735	3%	8%	13%	23%
24	7,891	2%	18%	23%	14%
25	7,006	5%	3%	26%	14%
26	10,828	1%	6%	29%	23%
27	10,435	2%	4%	16%	17%
28	7,010	1%	14%	8%	20%
Total Area / Average Yield Increase*	**246,243**	**4%**	**6%**	**11%**	**12%**

* Area weighted average.

Figure 4-3: MPB PFMS: Long Term Average Water Yield Increase



In the 2005 DFMP, Kimiwan operating area (42% of the gross FMA area) was identified as having significantly lower streamflow rates than the Sweathouse operating area (58% of the gross FMA area). Therefore, only a small amount of activity in Kimiwan would result in a large percent increase in streamflow. It is important to consider the absolute projected change when analyzing the results of the analysis. Please refer to Section 6.7.1 and Appendix G in the 2005 DFMP for a more detailed discussion of the watershed analysis.

In the new PFMS, the 20 year SHS is more focused in Sweathouse (which contains most of the FMA pine). This results in a lower water yield increase in periods 10 and 20, when compared to the 2005 DFMP (Scenario 1). In the following periods, the oldest first harvest modeling results in primarily harvesting in Kimiwan, which results in a larger water yield increase for periods 30 and 40, than in periods 10 and 20.

Although the first 40 years of the MPB PFMS are increasing, the trend does not continue. The water yield increase values are within relatively the same range as the 2005 DFMP.

Due to the impact of the MPB in the Buchanan FMA, the company has adjusted harvesting activities to target pine dominated stands. With this strategy there is the potential to increase water yield in some watersheds within the FMA. However, the impact to these watersheds is seen as inevitable, whether it is from harvesting activities or from MPB killed trees. Where harvesting occurs, the trees removed and access into these areas will be quickly replanted and reclaimed to ensure a healthy forest grows back. If the pine stands are left and killed by the MPB, these stands would die and remain standing for years before the stands begin to regenerate. Therefore, with quick replanting of these sites, reclamation of the roads and landings and operational strategies like maintaining available non pine structure retention within blocks and leaving standing timber for buffers along water courses, Buchanan believes the pine strategy provides an overall benefit to the forest.

4.1.1.3 GRIZZLY BEAR AND FMA ACCESS

The impact of the MPB PFMS to grizzly bear occurrence and mortality is illustrated in Figure 4-4 and Figure 4-5 below[1].

Figure 4-4: MPB PFMS: Probability of Grizzly Bear Occurrence

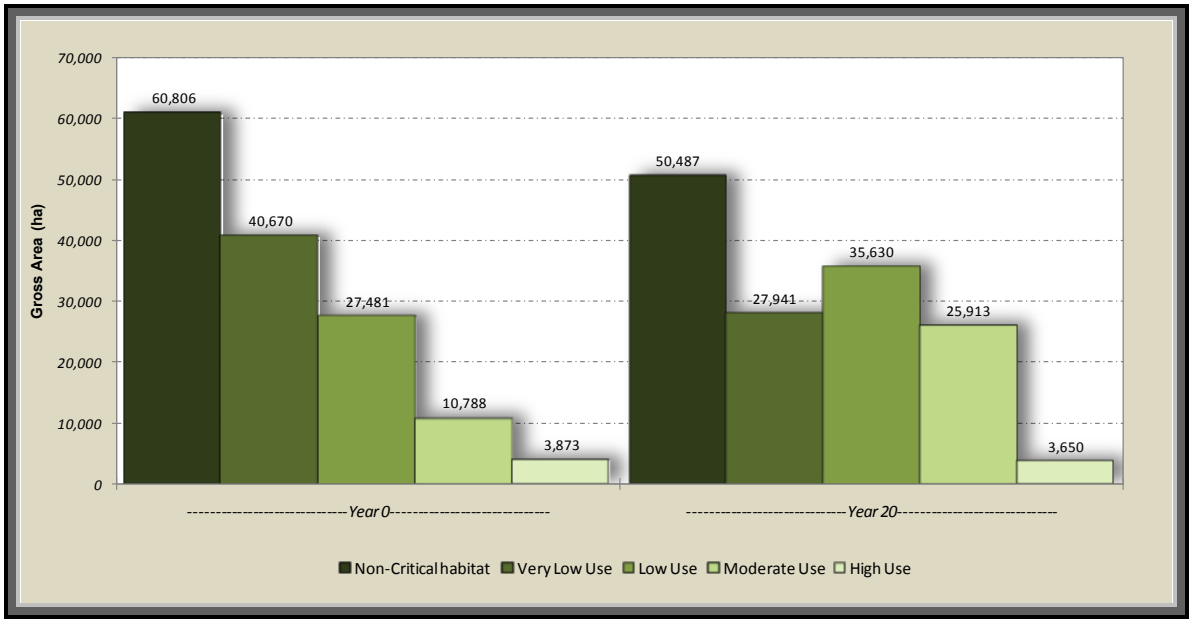
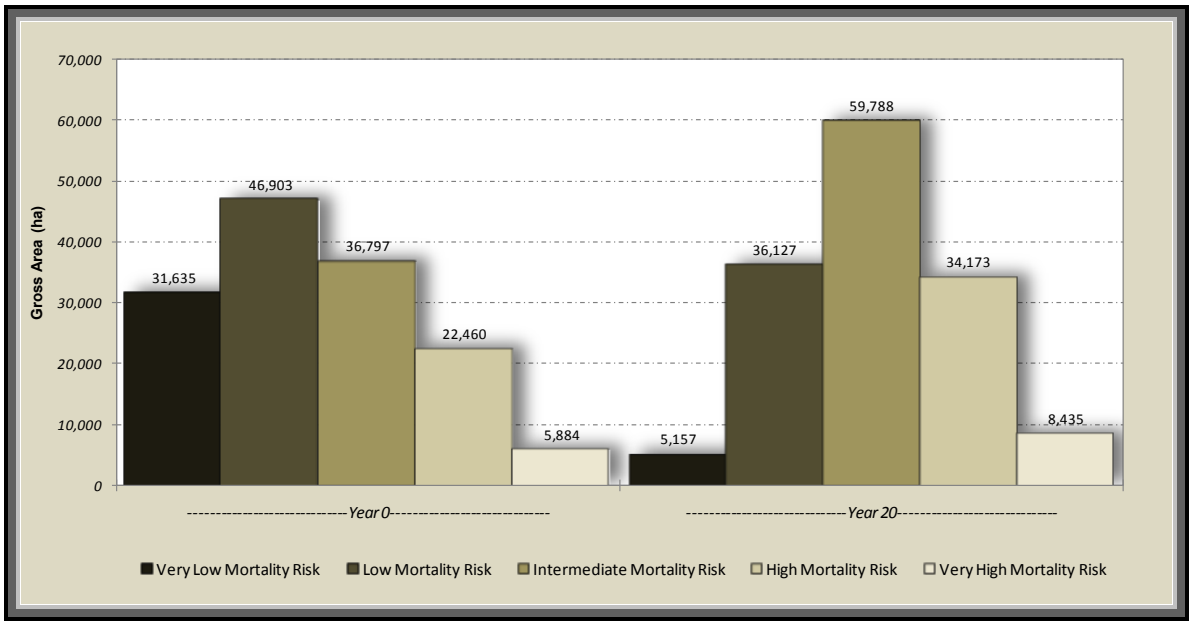


Figure 4-5: MPB PFMS: Probability of Grizzly Bear Mortality



[1] *Requires proprietary FMF landbase (2005 effective date). Only covers Sweathouse Operating Area. Kimiwan not considered within Grizzly Bear range by FMF.*

4.1.1.4 TRUMPETER SWAN

Trumpeter swan, *Cygnus buccinator*, occupies a habitat range within Alberta that covers primarily lakes and marshes within the Aspen Parkland and Boreal Ecoregions. It is currently identified as 'Threatened' under the Alberta Wildlife Act, however, populations have increased over the past 50 years and the species is no longer listed under 'At Risk' by the Committee on the Status of Endangered Wildlife in Canada.

Through the management objectives outlined under the approved 2005 DFMP, Buchanan endeavors to conduct its activities such that Trumpeter Swan habitat features are maintained. Specifically, a buffer zone strategy has been created to maintain trumpeter swan nesting lakes identified within the DFMP while any new nesting areas will be incorporated into strategic and operational plans (see Strategy 2.5.4, page 3-29, 2005 DFMP).

Section 5: Conclusion 5

5 CONCLUSION

As confirmed in Figure 2-1 and Table 2-2, a significant amount of mature pine exists primarily in the Sweathouse Operating Area within the Joint FMA area. In the event of a large-scale MPB infestation, this resource not only has the potential of being removed from Buchanan's wood supply, but also contributes to an increased fire risk that could impact additional fibre resources and values. In an effort to maintain the sustainability of such resources, Buchanan has prepared this plan with the intention to amend the management strategy outlined in the 2005 DFMP to address these challenges.

Appendix A

MPB Susceptibility Reduction with MPB Outbreak

APPENDIX A. MPB SUSCEPTIBILITY REDUCTION WITH MPB OUTBREAK

This scenario will introduce a large scale beetle infestation at year 20 into the MPB Susceptibility Reduction scenario (Scenario 3). To model such a complex landscape level event, a number of simple and quantifiable rules have been employed[1]:

- Set the AAC to the MPB Susceptibility Reduction Scenario harvest levels where conifer AAC is 216,500 m^3 and the deciduous AAC is 280,000 m^3;
- Assume massive pine mortality in 10 years;
- Assume harvest of salvage to continue at 'Harvest Rate A' for the next 10 years (years 11 to 20);
- Stands that are salvaged return to normal regeneration transition and normal regeneration lags;
- For stands that aren't salvaged, the following rules apply:
    a. For stands with greater than 60% pine content, assume entire stand mortality (mortality applies to stands that are 20 years or older). Stand goes onto the lowest density yield curve (e.g. AB density) that strata with a 15-year regeneration lag. Stand age is reset to 0.
    b. For stands with less than or equal to 60% pine content, the approved yield curves from the last DFMP are reduced to remove the pine content, on a proportionate basis, and the stand continues to grow at its current age (stand age is not reset to 0). No assumption is made for stand release due to opening of the canopy by the pine mortality.

[1] *As per the SRD MPB Disaster Scenario Evaluation (June, 2007) with the exception of the definition of the harvest levels.*

Table A-1: Harvest Simulation Control Parameters – MPB Susceptibility Reduction with MPB Outbreak

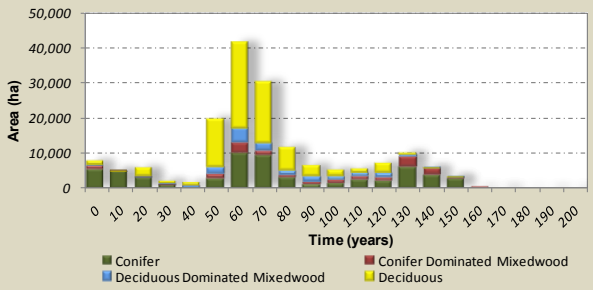
BUCHANAN/TOLKO-HP JOINT FMA HARVEST SIMULATION CONTROL PARAMETERS – MPB SUSCEPTIBILITY REDUCTION WITH MPB OUTBREAK	
CONTROL PARAMETER	**PARAMETER SETTING**
Harvest unit:	FMA
Planning horizon:	160 Years
Targeted average harvest age at the end of the planning horizon:	80 ± 5
Minimum harvest age:	70 Yrs (Conifer) 50 Yrs (Deciduous)
Landbase:	Single
Sorting rules:	3) Modulate Conifer Flow 4) Maximize deciduous and conifer harvest
Modulation:	Applied
Harvest flow constraint:	Dual Even Flow
Yield curves:	Net yield curves (2002 DFMP curves)
Cull Deductions:	Applied (2% Conifer, 10% Deciduous)
Regeneration transition:	Fully Stocked
Regeneration lag:	Non-Constraining
Introduce harvest plans:	Applied
Patch Size Mitigation Strategy:	Applied – 20 Years
DFMP Seral Stage Maintenance Strategy	Applied
Adjacency – Green Up:	Non-Constraining
Adjacency – Accumulate adjacent stands:	Non-Constraining
Compartment sequencing:	Non-Constraining
Number of compartments open simultaneously:	Non-Constraining
MPB Infestation:	Applied

Figure A-1: Harvest Simulation Results – MPB Susceptibility Reduction with MPB Outbreak

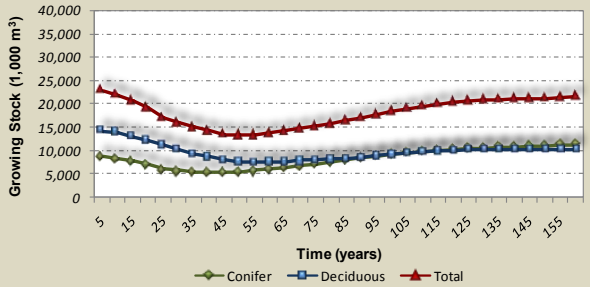
AAC SUMMARY TABLE

Net Productive Area	168,229 ha+167 ha (GRL Conifer Landbase)ha	
Conifer Harvest Level	Years 1-20:	216,500 m^3/yr
	Years 21-160	144,000 m^3/yr
Deciduous Harvest Level	Years 1-20:	280,000 m^3/yr
	Years 21-160:	256,000 m^3/yr

INITIAL AGE CLASS DISTRIBUTION

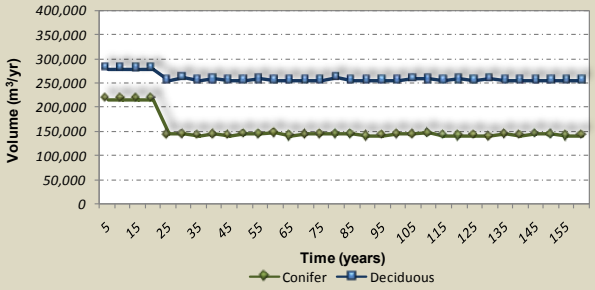


GROWING STOCK



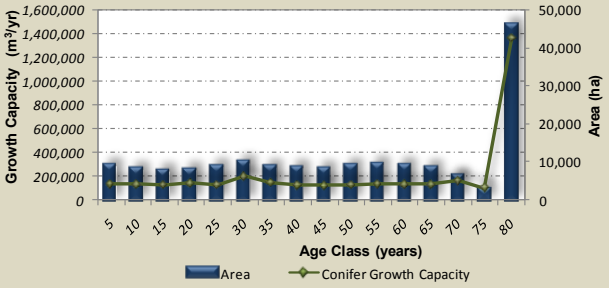
Description: *This graph summarizes the conifer, deciduous, and total growing stock (live volume) over the length of the planning horizon*

HARVEST FLOW SUMMARY



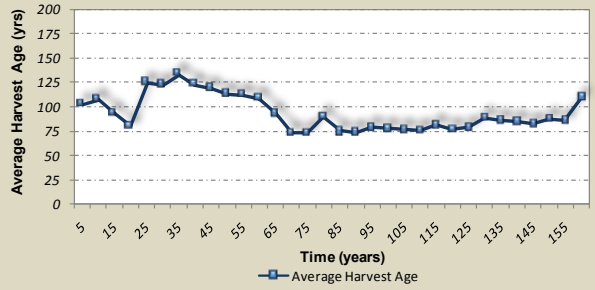
Description: *This graph summarizes the projected conifer and deciduous harvest levels over the planning horizon*

POST HARVEST FOREST CONDITIONS



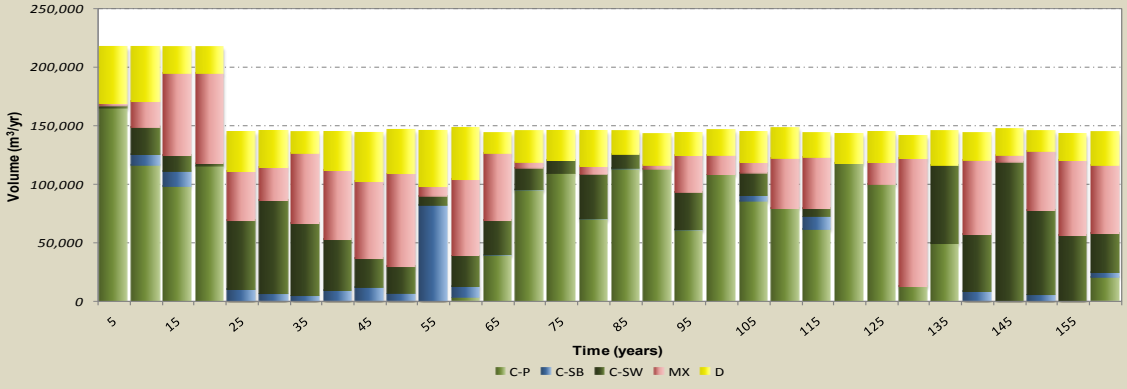
Description: *This graph summarizes the projected growth capacity and area by age class once the planning horizon is over*

AVERAGE HARVEST AGE BY 5 YEAR ITERATION



Description: *This graph summarizes the average age of stands harvested over the planning horizon*

CONIFER AAC VOLUME CONTRIBUTION BY STAND TYPE



Description: *This graph depicts the conifer volume contributed by stand types (based on yield strata) over the entire planning horizon.*