FMA #9700035

DFMP
Mountain Pine Beetle Addendum

2008

Weyerhaeuser Company Ltd.
Edson, Alberta

Foreword

This document incorporates a revised Timber Supply Analysis that reflects provincial direction to manage Alberta pine forests in an attempt to reduce the threat of loss by the Mountain Pine Beetle (*Dendroctonus ponderosae* Hopkins). It presents Weyerhaeuser's approach to support this provincial strategy, while managing for a multitude of other values, of which Species of Concern and watershed are only two. This document also updates a number of implementation and monitoring components of the currently approved Detailed Forest Management Plan (January 24, 2008).

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1 Introduction

Extensive tracts of mature lodge pole pine along Alberta's Eastern Slopes are susceptible to Mountain Pine Beetle (MPB) (*Dendroctonus ponderosae* Hopkins) infestations. Epidemic MPB populations have been recorded in British Columbia and new infestations are being identified in Alberta.

In the Edson FMA, approximately 33% of the gross land base contains pine forests, of which 9% have Rank 1 or Rank 2 stands which makes them moderately to highly susceptible to MPB infestations (a detailed explanation of the MPB susceptibility ranking is presented in Appendix 1, Section 1.5). Table 1-1 provides a breakdown of the FMA's MPB susceptibility by FMU.

Table 1-1 Edson Susceptibility to MPB

FMU	Gross FMU Area (ha)	Rank 1 and Rank 2 Gross Area (ha)	Gross Area with Rank 1 and Rank 2 Stands (%)
E1	107,339	15,533	14.5
E2	113,298	5,000	4.4
W5	59,263	1,717	2.9
W6	229,434	23,901	10.4
FMA	509,334	46,151	9.1

This MPB Plan is designed to help attain provincial MPB control objectives outlined in the *Mountain Pine Beetle Action Plan for Alberta* released by the Forest Management Branch of Alberta Sustainable Resource Development (ASRD) in September 2006.

The objectives of the Action Plan are to:

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

The Province has developed three management strategies intended to control or prevent MPB infestations as outlined in the Province's *Interpretive Bulletin, Planning Mountain Pine Beetle Response Operations* (Version 2.6, September 2006).

These strategies are identified as:

1. Control (Beetle) Strategy – The objective is to destroy all of the infested trees by implementing one of two response levels. At a level 1 response, the removal of single infested trees is the responsibility of ASRD. A level 2 response is the responsibility of the forest industry and involves stand level treatments (i.e. harvesting) on the working forest to remove infestations.
2. Prevention (Pine) Strategy – The objective is to modify the age-class structure of susceptible pine forests on the eastern slopes to increase their long-term resistance to MPB infestations. The target set by the Province 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. The Canadian Forest Service Shore/Safranyik Stand Susceptibility Index Model, adapted for use in Alberta and made available by the Forest Management Branch of ASRD, is used to calculate the relative susceptibility of a stand. The model evaluates stand age and density, species composition, and a measure of climate suitability.
3. Salvage Strategy – The objective is to minimize the impact of a major outbreak should MPB populations expand to the point where control is no longer possible. The focus of this strategy is to recover dead and dying trees before the fiber value is lost.

Weyerhaeuser's MPB plan focuses on the Prevention Strategy to reduce the area of MPB susceptible stands on the Defined Forest Area (DFA).

No beetle-infected trees had been located on the FMA as of the spring of 2007. A massive pheromone baiting project has been initiated by ASRD, with help from FMA operators. The objective of the baiting program is to ensure early detection of Mountain Pine Beetle (MPB) in currently uninfested areas located in the likely path of beetles dispersing from infested areas. The dispersal baits are intended to detect large scale aerial dispersal of MPB in the same year as the attack to allow both Level 1 and Level 2 control activities to be carried out in a timely manner.

Both the Forests Act and the Forest Management Agreement (FMA) between the Government of Alberta and Weyerhaeuser define the rights and responsibilities of Weyerhaeuser as the sole area-based forest land manager. The FMA defines an area-based tenure that requires Weyerhaeuser to fulfill timber supply objectives to sustain its own fibre requirements as well as to fulfill a number of other volume-based commitments to the Crown. The TSA will also quantify the other overlapping timber allocations within the FMA area.

Upon approval by ASRD, the Weyerhaeuser Edson MPB Plan will be incorporated into the approved Detailed Forest Management Plan (DFMP) (FMA#9700035) through a separate process.

The MPB plan is applied to the legal boundaries of FMA #9700035 and the embedded grazing dispositions, with the exception of Grazing Reserves, in Forest Management Units (FMUs) E1, E2, W5 and W6. For simplicity, the combined areas will be referred to as the FMA area.

2 Goals and Objectives

The goal of the MPB Management Plan is to define the actions that will be taken to implement the 'Mountain Pine Beetle Action Plan for Alberta' (MPB-AP) on Weyerhaeuser's FMA. Weyerhaeuser and other timber operators acknowledge their responsibilities according to the Alberta Forest Heath Strategy and Shared Roles and Responsibilities between ASRD and the Forest Industry.

The key objectives of this plan are to:

1. Reduce the age class imbalance of the predominantly pine forests;
2. Minimize the long term impacts on future annual allowable cuts directly resulting from the pine reduction strategy;
3. Minimize long-term negative impacts to the deciduous growing stock;
4. Minimize the harvest of spruce-leading stands over the life of the plan; and
5. Maintain a balanced haul distance from the entire DFA.

2.1 Consultation Process

Weyerhaeuser, in conjunction with Alberta Sustainable Resource Development regional staff, developed a public consultation plan (Mountain Pine Beetle Prevention Public Involvement Plan). The goals of the Mountain Pine Beetle Prevention Public Involvement Plan were to:

1. Foster stakeholder[1] understanding and support for the MPB-AP;
2. Provide meaningful opportunities for the public and stakeholders to review and comment on MPB plans;
3. Provide staff the opportunity to obtain information on the MPB-AP and implementation of forest management strategies; and
4. Deliver the MPB message prior to final implementation of the Detailed Forest Management Plan amendment.

Local and regional stakeholders were generally positive about the proposed approach that provided a logical rationale for changes to the forest management plans. However, the level of response and requests for more information from stakeholders and other interested parties was low.

[1] The Province has the mandate to inform Albertans about forest health initiatives and issues on crown land

2.1.1 Weyerhaeuser Forest Advisory Committees (FAC)

Throughout the development of the MPB plans (DFMP and public involvement) Weyerhaeuser's FAC groups were kept well informed of both the progress of the company's activities and the mountain pine beetle status in Alberta. Mountain pine beetle has been and will continue to be an agenda or update item at FAC meetings.

The two Forest Advisory Committees (Drayton Valley FMA and Edson FMA) are comprised of representatives from the public who have an interest on the FMA area and currently include members from:

1. Alberta Trapper's Association;
2. Grazing Community;
3. Educational Institutions;
4. Fish and Wildlife Association;
5. Oil and Gas;
6. Recreational Clubs;
7. Local Governments;
8. General Public;
9. Other Timber Operators;
10. Youth;
11. Seniors Groups;
12. Environmental Groups;
13. Woodlot Associations;
14. Aboriginal – First Nations and Métis; and
15. Guides and Outfitters.

2.1.2 Embedded Timber Operators

The Province reserves timber rights for Quota Holders and individuals accessing timber through the Community Timber Program (CTP) on the FMA area. With timber allocation rights on the FMA areas, both groups have a right to be involved in the MPB planning process.

The Company worked with all Quota Holders and ASRD, representing the CTP Program, keeping all parties as informed of progress on the MPB plan. Initial and follow-up meetings (where requested), were conducted throughout the process to share updates on the plan's development, address issues or concerns as they arose, and discuss implementation (submission timelines, AAC impacts, spatial harvest sequencing, and other matters).

2.1.3 First Nations

Weyerhaeuser had already established ongoing communications with local First Nations communities, for the purposes of gaining involvement in forest management planning and developing cooperative relationships with these key stakeholders. These communities have expressed an ongoing interest in the Company's forest management activities, and have offered input on forest management issues to varying extents over recent years. Communities include the O'Chiese, Sunchild and Alexis First Nations, as well as the Métis Nation of Alberta.

The Company contacted all of the First Nations groups outlined in the above list and offered to share forest management planning information. Only two of the five communities responded and subsequent meetings indicated the need for further dialogue between ASRD and First Nations.

2.1.4 Stakeholders

Throughout the MPB planning process, Weyerhaeuser and ASRD met with stakeholders who have both a long and short term interest in forest management planning and implementation. The intent was to work together on ways to implement the MPB plan so that all forest values are fairly addressed.

Trappers, Grazing Disposition Holders and Tourism and Recreational Operators are the main groups with short to long term interest on large parts of the FMA. These groups were asked to provide input into the strategic planning process; over 200 maps and letters were sent out, but only four responses were received. These responses stressed that open lines of communication would be needed if groups were to have meaningful input into harvest plans in their areas.

Weyerhaeuser encourages ongoing stakeholder input through:

1. Seeking their input into harvest plans as they are developed;
2. Providing feedback to stakeholders outlining how their input into a harvest plan was incorporated; and
3. Annual notification of Annual Operating Plan development.

2.1.5 General Public

The Province is responsible for informing Albertans about forest health initiatives and issues on Crown land. To this end, Weyerhaeuser will continue to co-operate with the Province by participating in or co-sponsoring community based open houses, media releases or other such initiatives. Weyerhaeuser will continue to provide opportunities for public input and issue identification for short term planning (e.g. Annual Operating Plans). Such notice may be given to the public annually through the local media.

The approved amendment to Weyerhaeuser's DFMP will be available for review by the general public at the local regional ASRD offices.

2.1.6 Weyerhaeuser Employees

Pembina Forestlands staff, the mill staff and the prime contractors have been informed about the progress of the Company's MPB planning during both scheduled meetings (staff, safety, etc.) and informally during operational discussions. Forestlands also prepared issue briefs that were made available to staff.

3 Timber Supply Analysis

3.1 Background

This section addresses the timber supply component of Weyerhaeuser Pembina's (Edson FMA) Mountain Pine Beetle Management Plan (MPB Plan). This plan, including revisions to the current timber supply analysis (TSA), are required in order to achieve the objectives of the *Mountain Pine Beetle Action Plan for Alberta* released by the Forest Management Branch of ASRD in September 2006.

The TSA has been revised in accordance with ASRD's Interpretive Bulletin*, Planning Mountain Pine Beetle Response Operations (version 2.6, September 2006)* and this section compares and discusses the timber supply outcomes from the following management scenarios:

1. The existing Detailed Forest Management Plan (DFMP) submitted in April 2006 (with a revised Vol. II submitted November, 2006);
2. The Mountain Pine Beetle Preferred Forest Management Strategy (MPB PFMS);
3. The Weyerhaeuser Prevention (Pine) Strategy aimed at accelerated pine harvest to control MPB; and
4. The MPB outbreak or "Disaster Scenario" modeled according to the Province's *Timber Supply Analysis Criteria for the Mountain Pine Beetle Disaster Scenario Evaluation*.

There have been no changes to the land base assignment or yield curves since the April 2006 DFMP submission. There were no changes to the long run sustained yield (LRSY), cull deduction, or stand structure retention modeling approaches since the April 2006 DFMP submission. Information from the April 2006 DFMP will not be repeated in this report unless changes were made, and these will be discussed.

Weyerhaeuser proposed accelerated harvest levels from May 1, 2007 to April 30, 2025 to reduce the area of susceptible pine stands on the FMA. The selection of a preferred MPB forest management scenario for each FMU will consider:

1. Securing fiber supply to meet the current or expected needs of the sawmill facility.
2. Securing enough fiber supply to meet current threshold levels of both Oriented Strand Board (OSB) facilities for their utilization of pine. The company is committed to evaluating the opportunity to utilize increased levels of pine in the OSB process.
3. The Company's obligations to accept industrial salvage.
4. Current purchase wood agreements with other timber operators.
5. Economic balance of wood supply over the first twenty years of the MPB Plan's implementation plus the measures to control drastic changes in economic viability in subsequent periods.

Similar considerations will be used to assess harvest levels for the Quota Holders and CTP Program Operators. Weyerhaeuser will seek confirmation from ASRD that timber harvest levels below the Province's Prevention (Pine) Strategy target will not be reallocated to other timber operators at this time.

Over the next several years, the Company may analyze both manufacturing capacity and resource allocation, from which a revised new PFMS may be derived. Weyerhaeuser will also initiate discussions with ASRD regarding the planning process to be followed should future amendments to the approved DFMP's be warranted.

3.2 Modeling Overview

The timber supply analysis was modeled using Remsoft's Spatial Planning System (RSPS), specifically Woodstock™, Spatial Woodstock™, and Stanley™. MOSEK optimization software was used to solve the linear programming matrix generated by Woodstock™. Additional information on these software products can be viewed in Appendix 6.5 of the April 2006 DFMP submission.

Due to the different operators and management scenarios, each of the four FMUs was treated as a separate sustainable yield unit (SYU) and modeled independently of others. This resulted in four separate models.

The initial long-term Woodstock™ runs for each FMU were based on the MPB PFMS from the DFMP, with specific changes to constraints and assumptions in order to meet the Mountain Pine Beetle (MPB) objectives of the revised TSA. These changes are discussed in later sections.

The preferred spatial harvest schedule produced by Stanley™ was then incorporated into the original Woodstock™ run, providing a direct linkage between the operationally feasible spatial harvest schedule and long-term sustainability. The harvest schedule in periods 13 to 32 was re-optimized to incorporate adjustments made by Stanley in the first 12 periods of harvest into the long-term harvest schedule. All modeling outputs displayed in this report are based on this harvest schedule unless otherwise specified.

Similar to the DFMP, once the final outputs were calculated the aspatial reduction factors (cull and in-block retention) were applied to the estimated harvest volumes. These final numbers are the proposed sustainable harvest volumes for the FMUs.

Specific assumptions relating to the expected MPB attack are included with the description of the model variables.

There were no changes to the cull deduction between these Woodstock™ models and those provided in April 2006 DFMP submission.

3.3 Alternate Utilization Standards for Conifer

Some of the conifer operators operating on the FMA prefer to harvest at an alternate utilization standard. Rather than operating at a 15/11 utilization standard, some quota holders operate at a 15/10 utilization standard, while Weyerhaeuser, for the immediate future will operate at a 15/13 utilization standard. This means they harvest stems down to a 10 cm or up to a 13 cm minimum top diameter rather than 11 cm. An adjustment factor was applied to convert the yield estimates. In the April 2006 DFMP submission, Appendix 6-11 detailed adjustment factors for the 15/10 utilization factor. Details of the conifer adjustment factor for the 15/13 utilization factor are provided in Appendix 9 of this report.

3.4 Changes to the Woodstock Model Formulation

This section summarizes the modeling approach that differs from those applied toWeyerhaeuser Edson FMA DFMP PFMS described in Chapter 6 of Volume II in the April 2006 DFMP submission. The changes applied to the DMPF PFMS Woodstock™ model formulations include:

1. Input shapefiles;
2. Landscape;
3. Areas;
4. Transitions;
5. Optimize section;
6. Reconciliation volumes; and
7. Outputs.

3.4.1 Input shapefiles

Due to changes in pre-blocks, as well as the addition of a mountain pine beetle strategy, the input shapefiles have been changed since their initial creation from the net land base determination process. The specifics are documented in Appendix 1.

3.4.2 Landscape

The landscape section defines the variables (called themes) that were used during the modeling process. Themes 15 and 16 were added to the Woodstock models while the remaining themes are unchanged. Theme 15 includes the mountain pine beetle susceptibility rating and Theme 16 describes planned cut periods. Detailed descriptions of each theme are presented in Appendix 1.

3.4.3 Areas

The area files were built using the automated Spatial Woodstock function. There were no user-defined locks or proximal analyses.

3.4.4 Transitions

The stand transition rules are identical for all FMU's. There are two different types of transitions, those that occur after death and after harvesting. In all cases, stands transition to a non-ranked MPB stand (Theme15 = "ZZ").

3.4.5 Optimize section

The optimize section is where the objective function and constraints are formulated as a linear program. In general terms, the optimize sections are the same among the four FMU's. However, there are minor differences as explained below.

3.4.5.1 Objective Function

The primary objective of this analysis was to maximize the total primary volume harvested over the planning horizon. This essentially means maximizing the sum of coniferous and deciduous primary harvest volumes (conifer volume from the conifer land base and deciduous volume from the deciduous land base) over the next 160 years.

An additional factor (*srgpj1*) was added to the objective function to aid in MPB management. Adding conifer volume from pine-leading conifer stands in the first 4 periods of the planning horizon to the objective function causes the Woodstock model to focus on pure pine harvests during the main MPB management periods.

3.4.5.2 Volume Flow Constraints

Constraints were applied to ensure that the level of forest management is sustainable over time and to ensure that any specific strategic or operational requirements are met. Constraints to control the flow of both primary and incidental volumes are part of the model.

Due to the introduction of the MPB management strategy requirements, constraints on the primary conifer and deciduous flows had to be applied over distinct timeframes, as follows:

Primary conifer updates include:

1. Period 1 – with a 2004 model reference date, the first 3 years were set at the Stanley allocated volumes from the current DFMP. The harvest level for the remaining 2 years was set at the surge harvest level of period 2.
2. Periods 2 to 4 – strict even flow during the "surge period".
3. Period 5 – in order to allow for 18 years of surge cut, the harvest level for the first year of period 5 was set at the surge harvest level of period 4. The remaining 4 years were set at the post-surge harvest level of period 6.
4. Periods 6 to 12 – strict even flow.
5. Periods 12 to 32 – ± 5% flow variation from the post-surge average harvest level (periods 6-32).
6. The post-surge average was also constrained to a maximum 10% drop from the baseline harvest level (current DFMP average from periods 2 through 32 for E1, E2 and W5, and periods 5 through 32 for W6 (to exclude a surge cut)) consistent with Section 5.6(iv)(c) of Annex 1 of the Alberta Forest Management Planning Standard (2006).

Primary deciduous updates include:

1. Period 1 – Stanley-allocated volume from the current DFMP.
2. Periods 2 to 12 – strict even flow.
3. Periods 12 to 32 – ± 5% flow variation from the period 2 to 32 average with no drop from the baseline (current DFMP average over periods 2-32) allowed.

Incidental conifer updates include:

1. Periods 1 to 32 – ± 10% flow variation. In E1 and W6, this constraint was applied from periods 2 to 32 to prevent an infeasible solution. In E1 and W6, an additional constraint limited the flow variation between period 1 and 2 to 20%.

Incidental deciduous updates include:

1. Periods 1 to 4 – 10% flow variation to allow for the surge cut.
2. Periods 5 to 32 – 10% flow variation. The variation from period 4 to period 5 was unconstrained.

Additional volume flow constraints were included for FMU W6. In W6 there are three different Land Management Units (LMUs). A business decision was made to limit coniferous operators' activities within each LMU. The following updates were applied:

1. Carrot Creek LMU includes Harvest Design Units (HAD's): Nine Mile, North Rat Creek, Tower, and North Minnow
   Operators: Blue Ridge, Millar Western.

2. Wolf Lake LMU includes HDAs: Big Rock, Coyote Creek, North Pembina, South Rat Creek, Zeta Lake, and South Minnow.
   Operators: ANC/BRL.
3. Cynthia LMU includes HDAs: Bigoray, Chip Lake, Eta Lake, Granada, Nojack South, Paddy Creek, and Sinkhole.
   Operators: CCTL, CCTP, Weyerhaeuser.

Controls were placed into the model to ensure that the following minimum percentage of the total primary coniferous harvest volume during each of the first two decades would come out of each LMU:

1. Carrot River - 19%;
2. Cynthia - 36%; and
3. Wolf Lake - 42%.

Profile constraints were used to ensure that there were no significant unforeseen modeling biases toward any strata types (see table 6.12 of the April 2006 DFMP). Goal programming was used when model infeasibilities occurred.

3.4.5.3 Mountain Pine Beetle Constraints

The Prevention (Pine) Strategy proposed by ASRD aims to decrease the spread and outbreak potential of MPB by reducing the area of susceptible pine stands to 25% of that in the baseline scenario (DFMP 2004-2014) at a point 20 years in the future. Weyerhaeuser's strategy for the Preferred Forest Management Scenario attempts to reduce the area of Rank 1 and Rank 2 stands on the net land base by 75% from the initial (year 0) inventory over the first 25 years.

Constraints limiting the decline in the post-surge harvest levels to 90% of those in the baseline (submitted DFMP) make it impossible to realize a 75% reduction in MPB susceptible stands. As a result, whether the target reduction is based on the DFMP inventory after 20 years or the initial inventory in the current model has no effect on the model results.

Rather than implement a 20-year MPB strategy, Weyerhaeuser has utilized an 18 year surge cut on primary conifer, effective May 1, 2007. With a model reference date of May 1, 2004, this means the surge cut extends for the remaining two years in period 1 through to the first year of period 5.

To further reduce the area of Rank 1 and Rank 2 stands beyond the first 25 years, the model is constrained, from period 5 onwards, to harvest all operable Rank 1 and Rank 2 stands in the period in which they are (or become) operable. This constraint is goal programmed to ensure the remaining sustainability constraints are not broken.

3.4.6 Reconciliation Volumes

It was assumed that reconciliation volumes were completed by 2007.

3.4.7 Outputs

Appendix 1 details Woodstock™ model outputs used in the models developing the Mountain Pine Beetle Management Plan.

3.5 Changes to the Stanley™ Model Formulation

Stanley model formulation was the same as for the DFMP 2004 – 2014. Stanley™ model formulation is provided in Appendix 1.

3.6 Preferred Forest Management Strategy

3.6.1 Management Objectives and Model Constraints

In line with the Province's Prevention (Pine) Strategy which is aimed at accelerating the pine harvest in an attempt to control MPB, a preferred scenario that best represented the collective goals and objectives was modeled to estimate sustainable harvest levels for the FMA. This scenario was designed so that the model does not liquidate volume at the close of the planning horizon and ensures that forest timber volume will be present beyond the conclusion of the planning horizon. Additional components of the management strategy modeled by this scenario include:

1. Maximization of primary deciduous and coniferous volume;
2. An operationally based Spatial Harvest Sequence, including maintaining quota volumes within targeted geographic areas;
3. Reduction in area of highly susceptible MPB stands;
4. Maintenance of older seral stages;
5. Adequate average block size;
6. Minimum block size of 2 ha; and
7. Harvesting across the profile.

The harvest sequence selected provides a flexible operationally based scenario that allows Weyerhaeuser and the embedded quota holders to harvest volume from the FMA economically and sustainably. A portion of the blocks in the 20 year spatial harvest sequence were manually planned by the Weyerhaeuser planning team in Edson and some of the other timber operators (mainly Blue Ridge Lumber and Alberta Newsprint

Company) within the FMA. This increases the likelihood that the Spatial Harvest Sequence and the operational harvesting activities will match.

3.6.2 Harvest Levels

3.6.2.1 Harvest Levels

The percentage of volume allocated by operator is shown in Table 3-1. The proposed net harvest levels are provided in Table 3-2. These volumes have been adjusted for cull and stand retention using the percentages shown in Table 3-4. The harvest levels are effective May 1, 2007 to April 30, 2025. The procedures used to calculate the harvest levels, as well as the final timber allocation tables, are presented in appendices 2 and 5 respectively.

Table 3-1 Net Harvest Allocations by Operator

FMU	Operator	Deciduous Volumes		Coniferous Volumes	
		Primary	Incidental	Primary	Incidental
E1	Weyerhaeuser*	100.00%	100.00%	95.30%	100.00%
	ETP	0.00%	0.00%	4.70%	0.00%
	Total	100.00%	100.00%	100.00%	100.00%
E2	Weyerhaeuser	= 100% - 1,500 m3/yr	100.00%	14.91%	20.00%
	EDFOR	0.00%	0.00%	78.60%	80.00%
	MTU	1,500 m^3/yr	0.00%	6.49%	0.00%
	Total	100.00%	100.00%	100.00%	100.00%
W5	Weyerhaeuser	= 100% - 4,000 m3/yr	0.00%	0.00%	0.00%
	MTU	4,000 m^3/yr	100.00%	100.00%	100.00%
	Total	100.00%	100.00%	100.00%	100.00%
W6	Weyerhaeuser	100.00%	= 100.00% - 17,591 m3/yr	= 37.29% - 28,252 m3/yr	100.00%
	Cold Creek TL	0.00%	0.00%	10,000 m^3/yr	0.00%
	MTU/CTP	0.00%	17,591 m^3/yr	18,252 m^3/yr	0.00%
	ANC	0.00%	0.00%	43.14%	0.00%
	Blue Ridge	0.00%	0.00%	18.87%	0.00%
	Millar Western	0.00%	0.00%	0.70%	0.00%
	Total	100.00%	100.00%	100.00%	100.00%

* 1% of Weyerhaeuser AAC is made available to the local MTU program in all FMUs

Table 3-2 Net Harvest Levels by Operator

FMU	Operator	Deciduous Volumes		Coniferous Volumes	
		Primary	Incidental	Primary	Incidental
E1	Weyerhaeuser	22,121	18,057	120,449	15,647
	ETP	-	-	5,940	-
	Total	22,121	18,057	126,390	15,647
E2	Weyerhaeuser	80,063	9,009	9,148	7,183
	EDFOR	-		48,223	28,732
	MTU	1,500	-	3,982	-
	Total	81,563	9,009	61,352	35,916
W5	Weyerhaeuser	34,335	-	-	-
	MTU	4,000	8,051	22,264	7,905
	Total	38,335	8,051	22,264	7,905
W6	Weyerhaeuser	82,987	50,950	55,530	20,704
	Cold Creek TL	-	-	10,000	-
	MTU/CTP	-	17,591	18,252	-
	ANC	-	-	96,926	-
	Blue Ridge	-	-	42,397	-
	Millar Western	-	-	1,573	-
	Total	82987	68,541	224,678	20,704
Total		225,006	103,657	434,684	80,172

Table 3-3 shows the gross volume harvested by Forest Management Unit (FMU), Land Management Unit (LMU), and Harvest Design Area (HDA) for the first 4 periods of the SHS. The LMU will be the base unit to gauge the 20% allowable variance of sequenced harvest area

Table 3-3 SHS Gross Harvest Volumes by LMU and HDA

LMU	Harvest Design Area	Period 1 (2004 - 2009)			Period 2 (2009-2014)			Period 3 (2014-2019)			Period 4 (2019-2024)		
		Conifer	Decid	Total	Conifer	Decid	Total	Conifer	Decid	Total	Conifer	Decid	Total
Moose Creek (E1)	Broken Cabin	61,808	9,995	71,802	92,987	18,504	111,491	90,524	16,928	107,453	75,364	18,994	94,358
	Erith	61,729	20,251	81,980	206,974	56,039	263,013	183,715	61,057	244,772	171,725	40,942	212,667
	Fickle Lake	94,361	101,206	195,568	0	0	0	0	0	0	0	0	0
	Rodney Creek	105,938	38,121	144,059	260,207	105,146	365,353	356,179	107,094	463,273	341,368	108,101	449,469
	Sang Lake	223,890	117,944	341,834	0	0	0	0	0	0	0	0	0
	Svedberg	77,606	23,487	101,093	233,053	55,872	288,925	173,223	45,631	218,854	224,467	60,991	285,458
Subtotal (E1)		625,333	311,003	936,336	793,221	235,561	1,028,782	803,642	230,710	1,034,352	812,924	229,028	1,041,952
Edson (E2)	Cricks Creek	71,759	235,745	307,503	57,966	128,031	185,997	56,412	108,741	165,153	45,677	133,351	179,028
	Deer Hill	52,633	82,901	135,534	39,089	38,786	77,875	37,497	46,200	83,698	60,166	64,715	124,881
	Grande Prairie Trail	7,035	16,293	23,328	6,687	22,407	29,094	10,218	38,060	48,278	10,467	12,559	23,026
	Grande Trunk	0	0	0	0	0	0	0	0	0	0	0	0
	Medicine Lodge	20,650	7,543	28,193	36,889	10,188	47,077	33,181	9,102	42,284	47,133	11,946	59,079
	Obed Lake	9,752	3,965	13,718	15,240	6,263	21,503	40,573	11,409	51,982	31,925	5,807	37,732
	Oldman Creek	116,396	31,744	148,140	168,500	57,096	225,597	169,835	54,558	224,393	137,057	29,549	166,607
	Pioneer	0	0	0	25,068	63,916	88,985	13,812	15,993	29,805	24,481	31,672	56,152
	Shining bank East	29,513	75,420	104,934	5,246	3,624	8,869	5,571	4,810	10,381	0	0	0
	Sundance Creek	18,049	10,679	28,728	44,658	59,585	104,243	38,252	65,945	104,197	80,913	80,039	160,951
	Surprise Lake	2	1	2	0	0	0	0	0	0	0	0	0
	Swanson	0	0	0	0	0	0	0	0	0	0	0	0
	Tom Hill	101,169	110,909	212,078	66,300	69,141	135,440	76,978	79,953	156,930	71,782	88,030	159,811
	Trout Creek	16,526	9,143	25,668	34,681	52,472	87,153	52,753	76,744	129,497	25,319	53,807	79,125
Subtotal (E2)		443,484	584,344	1,027,828	500,325	511,508	1,011,833	535,082	511,516	1,046,598	534,919	511,474	1,046,394
Beaver Meadows (W5)	East Bank	31,243	6,286	37,529	32,286	7,264	39,550	21,411	5,837	27,249	35,650	8,988	44,638
	Easyford	29,777	114,556	144,334	32,827	66,392	99,219	28,852	52,706	81,558	25,125	117,443	142,569
	Hattonford	19,448	42,901	62,350	21,678	76,903	98,581	33,097	94,772	127,869	17,683	34,611	52,294
	Keyhole	8,533	14,934	23,468	802	81	883	0	0	0	912	242	1,154
	Lobstick	13,421	15,214	28,634	22,797	34,724	57,521	22,370	36,605	58,975	23,588	42,544	66,132
	Lodgepole	12,879	40,181	53,060	7,219	26,866	34,085	11,003	23,375	34,378	13,927	8,205	22,132
	Lost Elk Ridge	3,137	2,600	5,737	10,506	13,730	24,236	14,042	7,918	21,959	4,152	2,055	6,206
	Mackay	3,767	5,382	9,149	2,768	13,785	16,552	7,761	28,269	36,030	10,522	36,695	47,217
	McLeod Crossing	46,975	16,030	63,005	32,350	23,041	55,391	24,625	11,477	36,103	31,587	12,768	44,355
Subtotal (W5)		169,180	258,085	427,264	163,232	262,787	426,019	163,162	260,958	424,120	163,145	263,552	426,697
Carrot Creek (W6)	Nine Mile	7,378	2,516	9,894	85,040	81,526	166,565	75,259	46,135	121,394	170,008	59,442	229,450
	North Minnow	28,579	25,236	53,815	73,478	25,267	98,745	84,102	23,880	107,982	33,580	9,165	42,745
	North Rat Creek	7,591	1,348	8,939	148,538	38,219	186,757	90,503	29,372	119,875	143,610	39,057	182,668
	Tower	16,599	5,475	22,073	28,842	25,817	54,660	25,854	18,533	44,386	43,514	59,071	102,585
	Subtotal (LMU)	60,147	34,574	94,721	335,898	170,829	506,727	275,717	117,920	393,637	390,712	166,736	557,448
Cynthia (W6)	Bigoray	20,765	59,826	80,591	24,258	8,035	32,293	16,509	10,512	27,020	37,178	13,708	50,887
	Chip Lake	5,640	762	6,402	44,001	25,704	69,705	34,711	15,234	49,946	40,558	15,371	55,928
	Eta Lake	231,468	288,598	520,066	126,407	108,598	235,005	126,986	163,772	290,758	146,749	150,756	297,504
	Granada	44,252	94,798	139,050	65,568	65,588	131,156	56,268	90,379	146,647	49,728	90,017	139,744
	Nojack South	60,702	78,021	138,723	29,923	37,327	67,250	39,122	68,303	107,425	34,292	62,126	96,418
	Paddy Creek	46,537	106,179	152,715	39,402	70,837	110,239	34,974	77,588	112,562	45,434	95,553	140,988
	Sinkhole Lake	42,668	70,948	113,616	43,690	42,607	86,297	27,840	39,124	66,964	45,171	38,812	83,984
	Subtotal (LMU)	452,031	699,132	1,151,163	373,250	358,695	731,945	336,410	464,911	801,320	399,109	466,344	865,453
Wolf Lake (W6)	Big Rock	116,970	39,169	156,139	71,962	16,479	88,441	71,403	13,255	84,657	54,566	8,003	62,569
	Coyote Creek	89,306	36,016	125,322	32,180	11,521	43,701	101,580	19,943	121,522	42,779	15,308	58,087
	North Pembina	128,683	49,471	178,155	209,414	52,704	262,118	150,459	46,341	196,801	114,656	35,515	150,170
	South Minnow	27,921	5,490	33,411	44,515	13,212	57,727	36,914	8,455	45,369	79,273	20,482	99,755
	South Rat Creek	128,472	216,363	344,835	129,843	130,462	260,305	180,736	116,656	297,392	60,499	69,889	130,388
	Zeta Lake	332,739	108,652	441,391	153,802	66,693	220,495	191,768	61,573	253,341	208,025	54,046	262,071
	Subtotal (LMU)	824,091	455,163	1,279,253	641,716	291,071	932,787	732,860	266,223	999,083	559,798	203,243	763,041
Subtotal (W6)		1,336,269	1,188,869	2,525,138	1,350,864	820,595	2,171,458	1,344,986	849,055	2,194,041	1,349,619	836,322	2,185,942
Grand Total (ED)		2,574,266	2,342,301	4,916,566	2,807,641	1,830,450	4,638,092	2,846,872	1,852,238	4,699,111	2,860,608	1,840,377	4,700,985
Annual Average (ED)		514,853	468,460	983,313	561,528	366,090	927,618	569,374	370,448	939,822	572,122	368,075	940,197

3.6.2.2 Stand Structure Retention

Stand retention deductions are applied to account for retained patches of standing timber that maintain non-timber values in harvested stands. A volume reduction of 3% in FMUs E2, W5 and W6 and 8% in E1 was deducted from the gross harvest level to account for in-block retention.

3.6.2.3 Cull Deductions

Cull deductions are applied as a method of accounting for non-merchantable volume lost due to defect, substandard and/or marginal quality of the harvested trees. The cull deductions were removed as an aspatial deduction to the gross harvest level. Refer to Table 3-4 for the reduction factors.

Table 3-4 Aspatial Post-modeling Harvest Level Reductions

FMU	Cull Reduction %		Stand Structure Retention %		Total Reduction %	
	Coniferous	Deciduous	Coniferous	Deciduous	Coniferous	Deciduous
E1	3	7	8	8	11	15
E2	3	7	3	3	6	10
W5	3	7	3	3	6	10
W6	3	7	3	3	6	10

3.6.2.4 Combined Primary and Incidental AAC's

Primary and incidental volumes have been difficult to manage over the years since the FMA was signed in 1997. Primary volumes were chargeable to the approved AAC while the incidental volumes were non-chargeable. To alleviate this problem, the proposal being put forward in this DFMP is to manage both as one AAC. In effect, both the primary and incidental volumes harvested from the FMA would be 100% chargeable.

Weyerhaeuser and EDFOR have a combined allocation of 100% of the incidental timber on the FMA, and have agreed in principle that this is the most efficient manner to handle the incidental component generated from the two primary land bases.

Theoretically, by the end of the decade (periods one and two), if the spatial harvest sequence has been followed relatively closely, the results should show that both cuts have been managed effectively. Table 3-5 summarizes the proposed annual allowable cut as described above.

Table 3-5 Total Net Conifer and Deciduous Annual Allowable Cuts by Operator

FMU	Operator	Total Deciduous	Total Coniferous
E1	Weyerhaeuser	40,177	136,096
	ETP	-	5,940
	Total	40,177	142,037
E2	Weyerhaeuser	89,072	16,331
	EDFOR	-	76,955
	MTU	1,500	3,982
	Total	90,572	97,268
W5	Weyerhaeuser	34,335	-
	MTU	12,051	30,169
	Total	46,385	30,169
W6	Weyerhaeuser	133,937	76,235
	Cold Creek TL	-	10,000
	MTU/CTP	17,591	18,252
	ANC	-	96,926
	Blue Ridge	-	42,397
	Millar Western	-	1,573
	Total	151,528	245,382

Figure 3-1 through Figure 3-4 shows the pattern of harvest flows in each of the FMU's over the planning horizon.

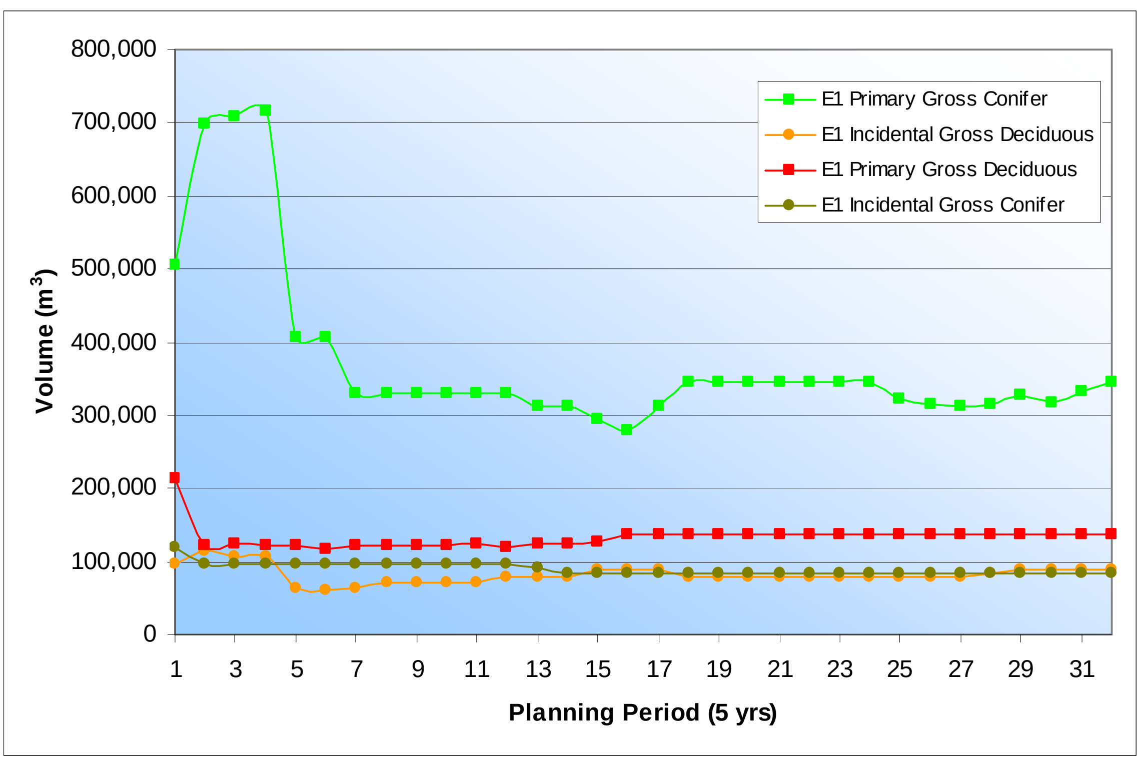


Figure 3-1 E1 Harvest Flows

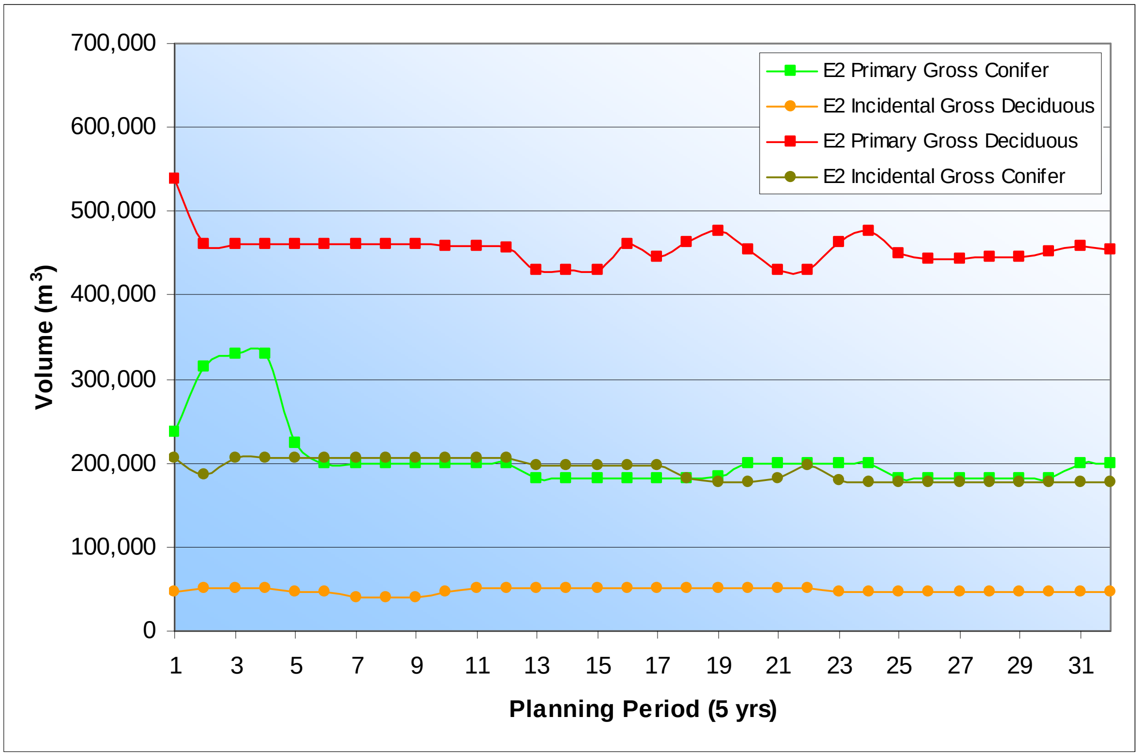


Figure 3-2 E2 Harvest Flows

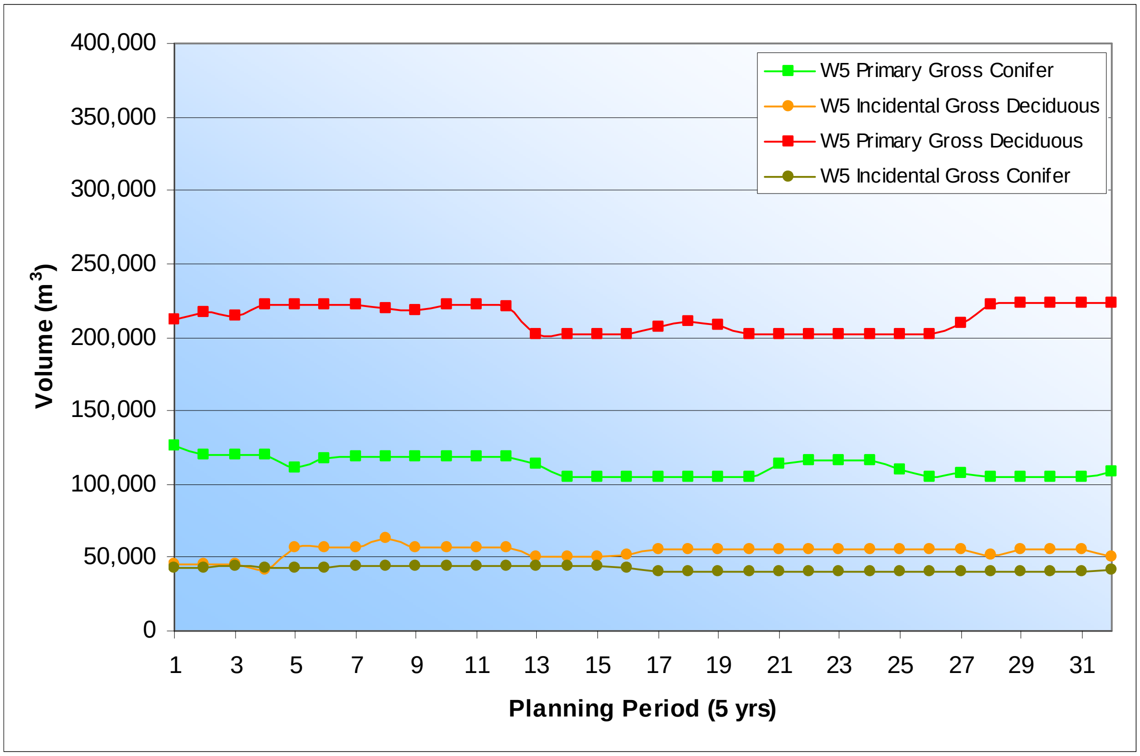


Figure 3-3 W5 Harvest Flows

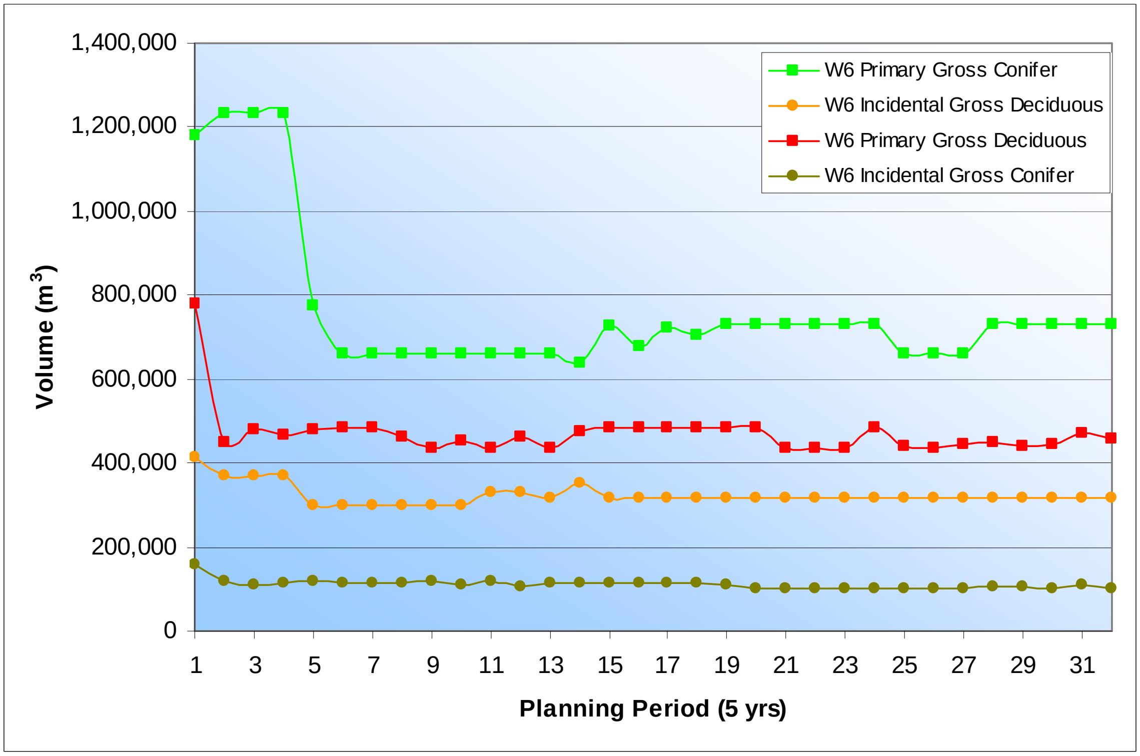


Figure 3-4 W6 Harvest Flows

3.6.3 Indicators from the MPB PFMS

The preferred management strategy was designed to achieve the maximum harvest volume within the objectives for operability and sustainability of both timber and non-timber resources. As always, it is prudent to understand the tradeoffs and impacts that competing values, objectives, and goals have on one another. The remainder of this section will provide a thorough look at the various indicators established and tracked to assess the sustainability of the preferred scenario.

3.6.3.1 Average Volume per Hectare

Coniferous cover types range from 187 to 229 m^3/ha with an average of 209 m^3/ha. Average deciduous harvest volumes range between 166 to 231 m^3/ha with an average of 194 m^3/ha. Conifer volumes decrease gradually until approximately period 16 (Figure 3-5), after which they increase gradually to the end of the planning horizon (except for E2 which spikes in period 16). Deciduous volumes decline slightly over time (Figure 3-6). There are noticeable drops in the deciduous volumes after period 12 and a spike in period 22 (except for E2).

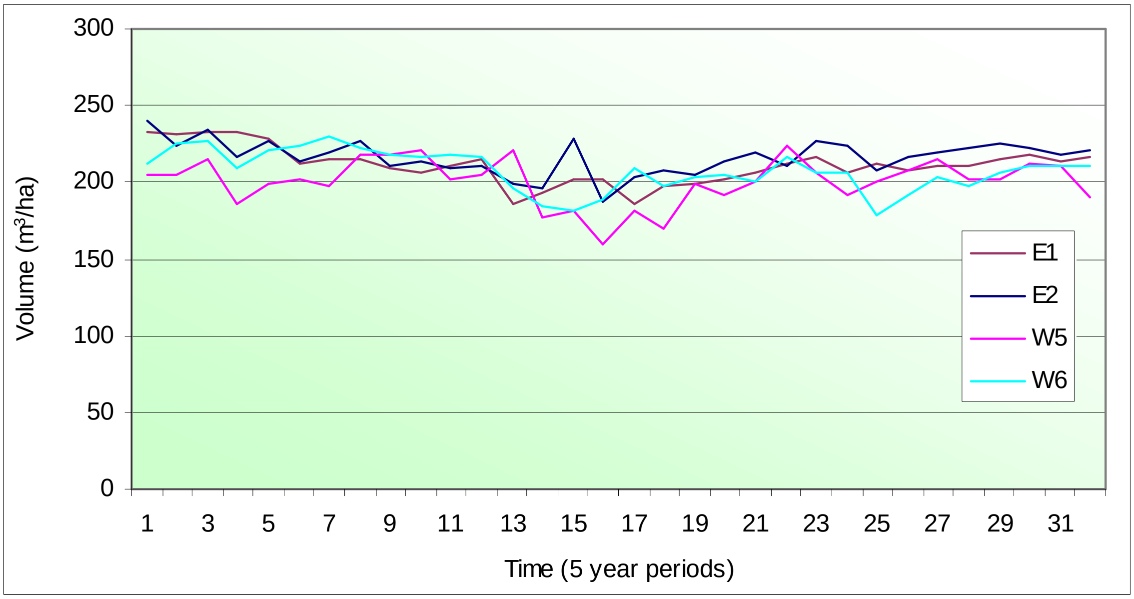


Figure 3-5 Average Volume per Hectare from the Coniferous Land Base

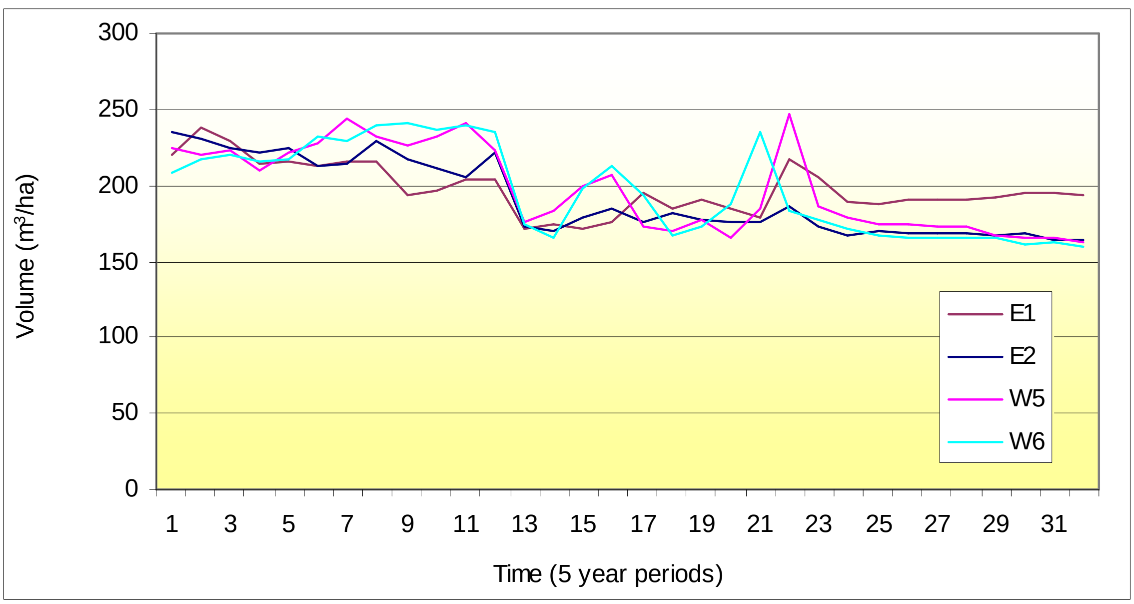


Figure 3-6 Average Volume per Hectare from the Deciduous Land Base

3.6.3.2 Average Harvest Age

Average harvest age is initially relatively stable in the conifer land base (Figure 3-7) for the first 12 to 13 periods, varying between 104 (W6, period 1) and 147 (E1, period 13). After period 13 average harvest age on the conifer land base drops significantly reaching lows of 80 (period 18), 82 (period 18), 75 (period 18) and 74 (period 15) for E1, E2, W5 and W6 respectively. After this the harvest age trends upwards slightly to the end of the planning horizon. The average harvest age on the deciduous land base (Figure 3-8) varies from 92 to 126 over the first 12 periods, with older ages in E1 and E2. Average harvest age declines at that point and generally stabilizes between 60 (lowest point) and 97 (a spike in period 22) for the remainder of the planning horizon.

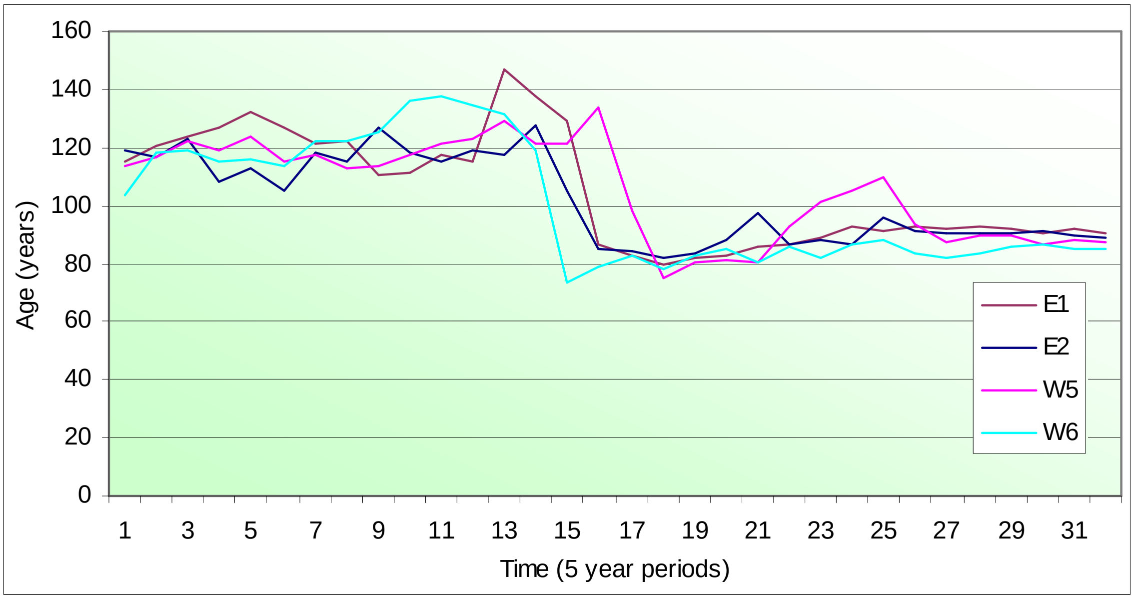


Figure 3-7 Average Harvest Age from the Coniferous Land Base

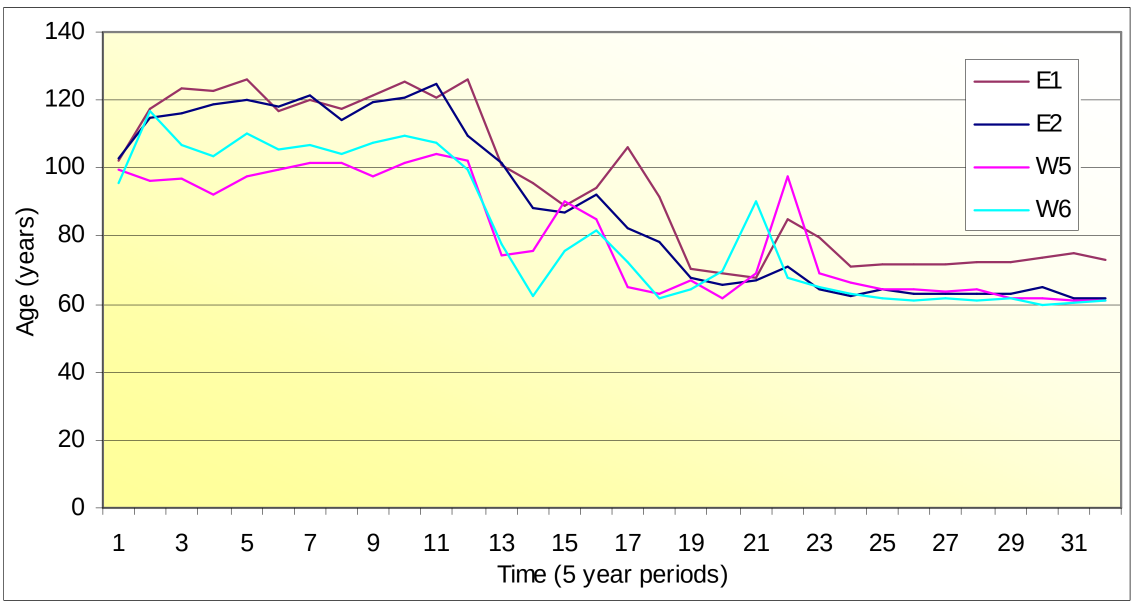


Figure 3-8 Average Harvest Age from the Deciduous Land Base

3.6.3.3 Piece Size

Previous analyses assessed various options for modeling piece size, and better piece size estimates were attained by applying a surrogate variable quadratic mean diameter (DBHq) model than by the piece size estimate using trees/m^3 for all the major strata. Average piece size shows strong consistency between FMUs across the planning horizon, trending down gradually over the period. The coniferous DBHq (Figure 3-9) the ranges between 22-24 cm during periods 1 to 12 and then declines to 21-22 cm by end of the planning period. Similarly, deciduous DBHq (Figure 3-10) ranges between 26-28 cm for the first 12 periods before declining to 23-25 cm by the end of the planning horizon.

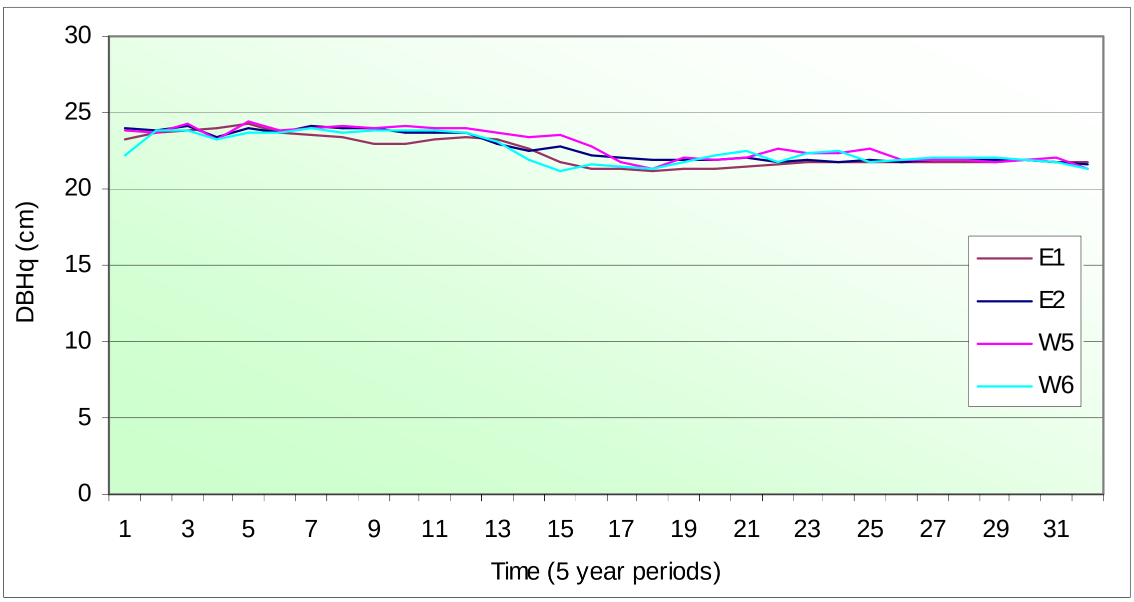


Figure 3-9 Average Conifer Piece Size

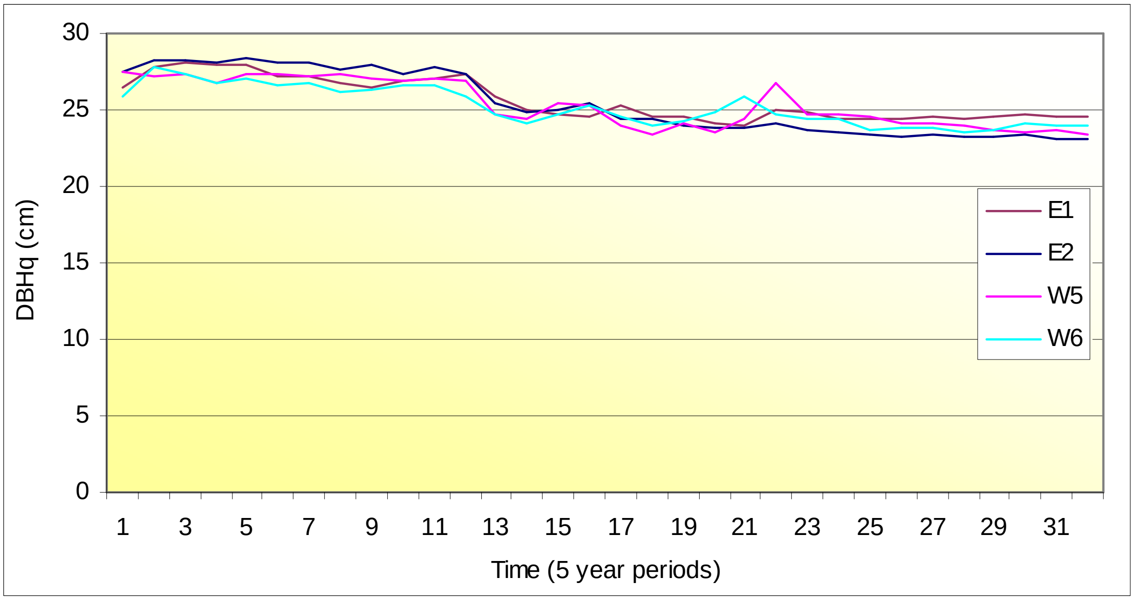


Figure 3-10 Average Deciduous Piece Size

3.6.3.4   Growing Stock

Both coniferous and deciduous total growing stock (GS) generally exhibits a declining trend over the majority of the planning horizon (Figure 3-11 and Figure 3-12 respectively). These patterns are typical of mature forest with plenty of standing merchantable volume at the beginning of the modeling start date. The deciduous operable growing stock (OGS) generally decreases sharply until period 15 (except W6 which decreases until period 12), after which it increases up to periods 16 through 19 and then remains relatively stable for the remainder of the planning horizon. The conifer operable growing stock follows a similar trend, although the inflection point moves forward to approximately period 14.

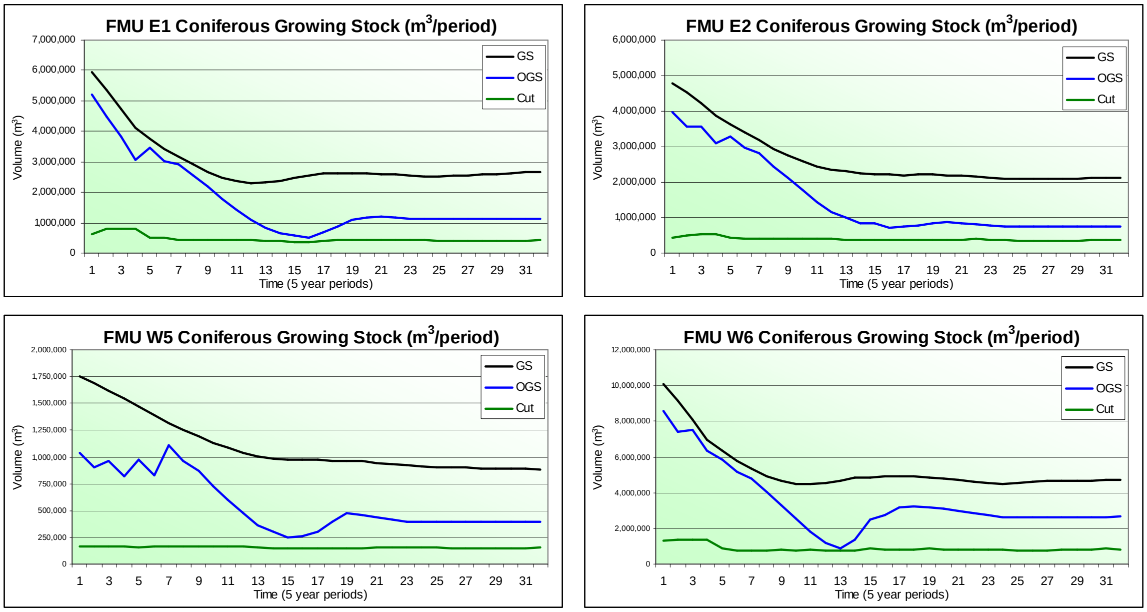


Figure 3-11 Coniferous Growing Stock Projections

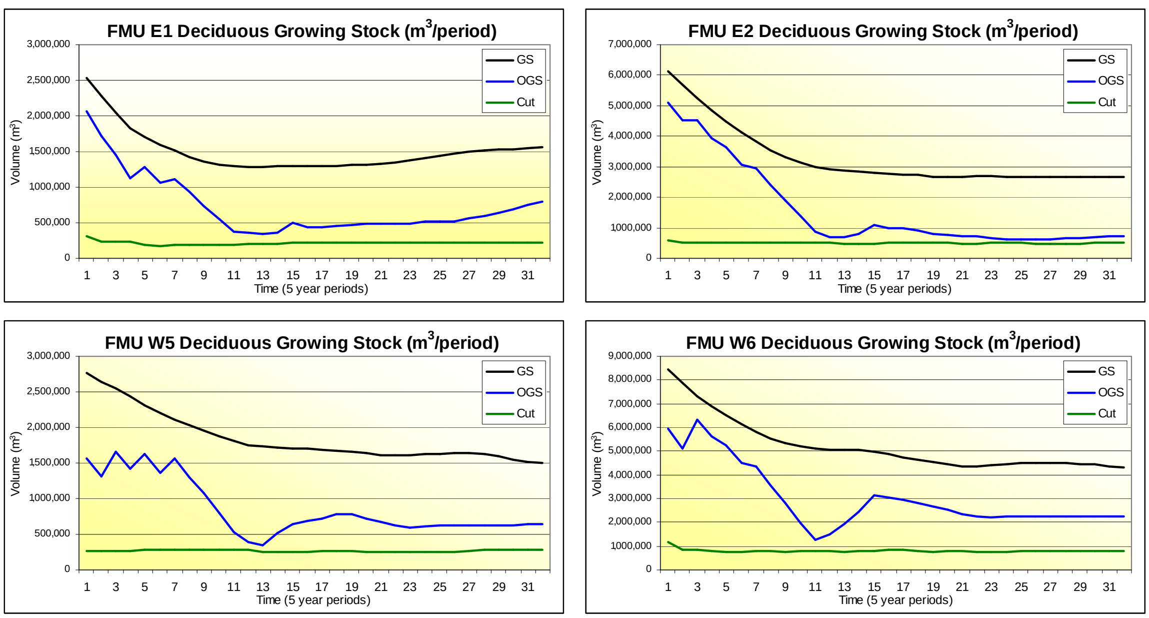


Figure 3-12 Deciduous Growing Stock Projections

3.6.3.5 Seral Stage Retention

Future forest conditions were modified under the modeled management scenario modeled. Retention of late, very late and extremely late seral stages for the Lower and Upper Foothills Natural Subregions over time is shown in Table 3-6 through Table 3-19, for both the gross and net land bases. In general, the seral constraints were easily met with a few exceptions, notably in deciduous and mixedwood classes. Seral stage retention values marked in red represent seral stages area targets that were not achieved.

Table 3-6 E1 Gross Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

E1 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	351	4,215	3,445	1,607	1,032	807
Very Late Decid	1.0	70	2,418	2,013	1,018	673	710
Late DC	5.0	282	3,159	2,609	1,876	456	477
Very Late DC	1.0	56	1,963	1,791	903	423	456
Late CD	5.0	559	4,267	3,604	2,722	1,000	1,594
Very Late CD	1.0	112	418	3,113	1,681	709	915
Late PL	5.0	1,105	15,902	11,899	5,433	1,725	1,687
Very Late PL	1.0	221	405	9,194	2,480	1,672	1,672
Late PS	5.0	188	3,730	2,848	776	515	461
Very Late PS	1.0	38	590	2,506	770	451	451
Late SW	10.0	301	2,875	2,623	2,234	632	626
Very Late SW	2.0	60	1,689	2,482	2,207	626	626
Late 'other' Con	5.0	2,398	30,153	33,772	43,274	42,519	42,537
Very Late 'other' Con	1.0	480	6,165	21,147	38,473	42,328	42,400

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-7 E1 Gross Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

E1 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	4	84	75	5	5	6
Very Late Decid	2.0	2	31	21	5	5	5
Late DC	5.0	3	55	47	16	8	8
Very Late DC	2.0	1	49	41	16	8	8
Late CD	5.0	3	63	63	24	4	4
Very Late CD	2.0	1	0	43	24	4	4
Late PL	2.0	2	121	69	12	4	4
Very Late PL	1.0	1	1	62	12	4	4
Extremely Late PL	0.5	1	0	0	0	4	4
Late PS	10.0	3	26	21	11	3	3
Very Late PS	5.0	1	0	21	11	1	1
Extremely Late PS	2.5	1	0	0	0	1	1
Late SW	10.0	1	10	10	10	1	1
Very Late SW	5.0	0	0	10	10	1	1
Extremely Late SW	2.5	0	0	0	0	1	1
Late 'other' Con	10.0	10	80	97	89	92	88
Very Late 'other' Con	5.0	5	7	73	87	88	88
Extremely Late 'other' Con	2.5	3	0	0	1	86	88

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-8 E2 Gross Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

E2 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	1,594	20,752	19,828	8,910	3,351	3,350
Very Late Decid	1.0	319	6,607	7,790	5,413	3,186	3,350
Late DC	5.0	387	6,163	6,113	2,620	1,091	1,091
Very Late DC	1.0	77	2,334	2,663	2,343	1,070	1,091
Late CD	5.0	460	2,961	2,901	2,405	1,825	2,106
Very Late CD	1.0	92	538	1,628	1,842	900	1,157
Late PL	5.0	291	2,488	1,748	1,456	892	887
Very Late PL	1.0	58	12	614	990	847	847
Late PS	5.0	117	1,644	1,408	467	378	391
Very Late PS	1.0	23	419	577	455	378	378
Late SW	10.0	231	1,716	1,849	1,219	401	485
Very Late SW	2.0	46	1,057	1,422	1,093	401	401
Late 'other' Con	5.0	1,583	16,484	18,417	28,913	28,622	28,670
Very Late 'other' Con	1.0	317	7,188	10,516	24,070	28,531	28,581

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-9 E2 Gross Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

E2 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	124	1,867	1,784	578	199	199
Very Late Decid	2.0	50	483	1,024	467	191	199
Late DC	5.0	103	1,574	1,482	967	132	132
Very Late DC	2.0	41	578	830	798	132	132
Late CD	5.0	98	1,243	1,041	1,028	128	119
Very Late CD	2.0	39	234	558	809	92	99
Late PL	2.0	76	1,247	619	1,546	160	164
Very Late PL	1.0	38	359	412	93	160	160
Extremely Late PL	0.5	19	0	0	18	60	160
Late PS	10.0	62	458	292	76	62	62
Very Late PS	5.0	31	216	207	50	27	27
Extremely Late PS	2.5	16	0	0	19	23	27
Late SW	10.0	74	382	369	228	74	74
Very Late SW	5.0	25	83	147	152	62	25
Extremely Late SW	2.5	12	0	0	35	55	25
Late 'other' Con	10.0	165	787	669	628	541	539
Very Late 'other' Con	5.0	83	226	291	458	525	538
Extremely Late 'other' Con	2.5	41	0	0	146	408	525

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-10 W5 Gross Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

W5 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	922	8,114	9,103	4,495	3,234	1,858
Very Late Decid	1.0	184	1,064	1,002	1,919	1,742	1,858
Late DC	5.0	220	2,560	2,949	1,830	565	2,096
Very Late DC	1.0	44	273	543	1,107	371	380
Late CD	5.0	273	1,493	1,380	1,567	1,995	611
Very Late CD	1.0	55	317	762	1,027	421	548
Late PL	5.0	188	1,549	877	1,298	302	302
Very Late PL	1.0	38	456	545	223	302	302
Late PS	5.0	35	542	414	175	77	77
Very Late PS	1.0	7	184	259	110	77	77
Late SW	10.0	167	1,020	1,270	981	272	286
Very Late SW	2.0	33	161	698	830	272	272
Late 'other' Con	5.0	959	8,495	10,069	17,771	17,510	17,488
Very Late 'other' Con	1.0	192	2,003	4,515	11,674	17,460	17,488

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-11 W6 Gross Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

W6 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	2,007	8,114	9,103	4,495	3,234	1,858
Very Late Decid	1.0	401	1,064	1,002	1,919	1,742	1,858
Late DC	5.0	725	2,560	2,949	1,830	565	2,096
Very Late DC	1.0	145	273	543	1,107	371	380
Late CD	5.0	1,020	1,493	1,380	1,567	1,995	611
Very Late CD	1.0	204	317	762	1,027	421	548
Late PL	5.0	1,234	1,549	877	1,298	302	302
Very Late PL	1.0	247	456	545	223	302	302
Late PS	5.0	217	542	414	175	77	77
Very Late PS	1.0	43	184	259	110	77	77
Late SW	10.0	1,259	1,020	1,270	981	272	286
Very Late SW	2.0	252	161	698	830	272	272
Late 'other' Con	5.0	3,810	8,495	10,069	17,771	17,510	17,488
Very Late 'other' Con	1.0	762	2,003	4,515	11,674	17,460	17,488

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-12 W6 Gross Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

W6 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	31	477	205	57	221	63
Very Late Decid	2.0	13	144	182	57	56	63
Late DC	5.0	17	258	200	66	37	36
Very Late DC	2.0	7	109	171	66	20	25
Late CD	5.0	49	224	173	200	57	59
Very Late CD	2.0	20	4	117	43	32	57
Late PL	2.0	87	4,266	2,726	501	303	303
Very Late PL	1.0	43	164	1,743	500	303	303
Extremely Late PL	0.5	22	0	0	11	302	303
Late PS	10.0	12	115	97	30	18	18
Very Late PS	5.0	6	37	74	30	18	18
Extremely Late PS	2.5	3	0	0	7	18	18
Late SW	10.0	31	165	160	115	60	62
Very Late SW	5.0	10	15	144	109	60	60
Extremely Late SW	2.5	5	0	0	4	60	60
Late 'other' Con	10.0	908	5,937	5,893	6,314	6,300	6,294
Very Late 'other' Con	5.0	454	2,486	4,477	6,230	6,215	6,293
Extremely Late 'other' Con	2.5	227	164	164	2,398	6,144	6,215

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-13 E1 Net Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

E1 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	351	3,694	2,907	934	323	98
Very Late Decid	1.0	70	2,090	1,647	480	0	0
Late DC	5.0	282	2,891	2,328	1,469	0	21
Very Late DC	1.0	56	1,782	1,583	622	0	0
Late CD	5.0	559	3,845	3,181	2,127	84	678
Very Late CD	1.0	112	358	2,728	1,232	0	0
Late PL	5.0	1,105	14,788	10,768	3,762	53	15
Very Late PL	1.0	221	362	8,292	1,338	0	0
Late PS	5.0	188	3,291	2,401	325	65	10
Very Late PS	1.0	38	466	2,104	321	0	0
Late SW	10.0	301	2,265	2,008	1,608	6	0
Very Late SW	2.0	60	1,314	1,917	1,585	0	0
Late 'other' Con	5.0	2,398	3,292	2,794	953	119	137
Very Late 'other' Con	1.0	480	498	1,811	671	0	0

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-14 E1 Net Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

E1 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	4	79	69	0	323	0
Very Late Decid	2.0	2	28	19	0	0	0
Late DC	5.0	3	47	39	7	0	0
Very Late DC	2.0	1	43	35	7	0	0
Late CD	5.0	3	59	59	20	84	0
Very Late CD	2.0	1	0	41	20	0	0
Late PL	2.0	2	117	65	9	53	0
Very Late PL	1.0	1	1	58	9	0	0
Extremely Late PL	0.5	1	0	0	0	65	0
Late PS	10.0	3	26	20	10	0	2
Very Late PS	5.0	1	0	20	10	6	0
Extremely Late PS	2.5	1	0	0	0	0	0
Late SW	10.0	1	9	9	9	119	0
Very Late SW	5.0	0	0	9	9	0	0
Extremely Late SW	2.5	0	0	0	0	0	0
Late 'other' Con	10.0	10	17	11	1	0	0
Very Late 'other' Con	5.0	5	7	11	1	0	0
Extremely Late 'other' Con	2.5	3	0	0	0	0	0

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-15 E2 Net Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

E2 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	1,594	18,474	17,238	5,817	1	0
Very Late Decid	1.0	319	5,991	6,715	2,823	0	0
Late DC	5.0	387	5,353	5,179	1,551	0	0
Very Late DC	1.0	77	2,104	2,301	1,409	0	0
Late CD	5.0	460	2,703	2,577	1,648	668	950
Very Late CD	1.0	92	486	1,465	1,339	0	0
Late PL	5.0	291	2,175	1,428	627	45	40
Very Late PL	1.0	58	11	488	299	0	0
Late PS	5.0	117	1,423	1,139	90	0	13
Very Late PS	1.0	23	379	454	86	0	0
Late SW	10.0	231	1,477	1,553	818	0	84
Very Late SW	2.0	46	944	1,248	749	0	0
Late 'other' Con	5.0	1,583	1,293	1,156	385	41	89
Very Late 'other' Con	1.0	317	550	718	296	0	0

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-16 E2 Net Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

E2 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	124	1,703	1,610	387	0	0
Very Late Decid	2.0	50	463	906	293	0	0
Late DC	5.0	103	1,469	1,367	835	0	0
Very Late DC	2.0	41	546	751	683	0	0
Late CD	5.0	98	1,177	976	939	29	19
Very Late CD	2.0	39	225	520	734	1	0
Late PL	2.0	76	1,192	564	1,387	0	5
Very Late PL	1.0	38	345	373	34	0	0
Extremely Late PL	0.5	19	0	0	4	0	0
Late PS	10.0	62	438	272	50	35	35
Very Late PS	5.0	31	207	191	26	0	0
Extremely Late PS	2.5	16	0	0	10	0	0
Late SW	10.0	74	362	349	204	49	49
Very Late SW	5.0	25	76	136	131	37	0
Extremely Late SW	2.5	12	0	0	28	34	0
Late 'other' Con	10.0	165	424	298	104	3	1
Very Late 'other' Con	5.0	83	101	83	50	0	0
Extremely Late 'other' Con	2.5	41	0	0	21	0	0

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-17 W5 Net Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

W5 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	922	7,284	7,826	2,783	1,376	0
Very Late Decid	1.0	184	954	737	641	0	0
Late DC	5.0	220	2,317	2,645	1,459	176	1,715
Very Late DC	1.0	44	240	469	802	0	0
Late CD	5.0	273	1,339	1,201	1,188	1,467	63
Very Late CD	1.0	55	297	666	757	0	0
Late PL	5.0	188	1,431	755	997	8	0
Very Late PL	1.0	38	430	466	70	0	0
Late PS	5.0	35	494	359	98	0	0
Very Late PS	1.0	7	174	223	48	0	0
Late SW	10.0	167	864	1,057	708	0	13
Very Late SW	2.0	33	134	581	597	0	0
Late 'other' Con	5.0	959	697	637	311	279	0
Very Late 'other' Con	1.0	192	179	282	139	0	0

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-18 W6 Net Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

W6 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	2,007	8,114	9,103	4,495	3,234	1,858
Very Late Decid	1.0	401	1,064	1,002	1,919	1,742	1,858
Late DC	5.0	725	2,560	2,949	1,830	565	2,096
Very Late DC	1.0	145	273	543	1,107	371	380
Late CD	5.0	1,020	1,493	1,380	1,567	1,995	611
Very Late CD	1.0	204	317	762	1,027	421	548
Late PL	5.0	1,234	1,549	877	1,298	302	302
Very Late PL	1.0	247	456	545	223	302	302
Late PS	5.0	217	542	414	175	77	77
Very Late PS	1.0	43	184	259	110	77	77
Late SW	10.0	1,259	1,020	1,270	981	272	286
Very Late SW	2.0	252	161	698	830	272	272
Late 'other' Con	5.0	3,810	8,495	10,069	17,771	17,510	17,488
Very Late 'other' Con	1.0	762	2,003	4,515	11,674	17,460	17,488

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-19 W6 Net Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

W6 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	31	477	205	57	221	63
Very Late Decid	2.0	13	144	182	57	56	63
Late DC	5.0	17	258	200	66	37	36
Very Late DC	2.0	7	109	171	66	20	25
Late CD	5.0	49	224	173	200	57	59
Very Late CD	2.0	20	4	117	43	32	57
Late PL	2.0	87	4,266	2,726	501	303	303
Very Late PL	1.0	43	164	1,743	500	303	303
Extremely Late PL	0.5	22	0	0	11	302	303
Late PS	10.0	12	115	97	30	18	18
Very Late PS	5.0	6	37	74	30	18	18
Extremely Late PS	2.5	3	0	0	7	18	18
Late SW	10.0	31	165	160	115	60	62
Very Late SW	5.0	10	15	144	109	60	60
Extremely Late SW	2.5	5	0	0	4	60	60
Late 'other' Con	10.0	908	5,937	5,893	6,314	6,300	6,294
Very Late 'other' Con	5.0	454	2,486	4,477	6,230	6,215	6,293
Extremely Late 'other' Con	2.5	227	164	164	2,398	6,144	6,215

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

3.6.3.6 Patches

Patches, the areas of contiguous forest (defined using BCG and Seral Stage) during the spatial harvest sequence, were analyzed in periods 0 (initial), 2 (10 years), and 10 (50 years). Patch sizes across the FMA varied widely. The average patch size, depending on FMU, planning period and seral stage, (Table 3-20) ranged from approximately 1.0 to 11.1 ha. The range of average patch sizes decreases over the spatial harvest planning horizon (i.e. the minimum increases and the maximum decreases). By period 10, average patch size ranges from 1.5 to 9.7 ha. Individual BCG patch size summaries are provided in the enclosed DVD.

Table 3-20 Patch Size Distribution

Time From Now (yrs)	Seral Stage	Average Patch Area (ha) by FMUs				
		E1	E2	W5	W6	FMA
0	Early	3.1	2.2	1.3	4.3	2.9
	Immature	1.3	1.0	1.1	1.1	1.1
	Mature	8.6	5.3	4.7	6.5	6.1
	Late	7.9	5.6	4.6	6.0	6.1
	Very Late	5.3	6.0	3.1	5.0	5.1
	Over Mature	11.1	4.7	9.7	6.8	6.8
	Total	6.1	4.3	3.5	5.0	4.8
	Avg of Stages	6.2	4.1	4.1	4.9	4.7
10	Early	1.7	1.8	1.9	1.9	1.8
	Immature	2.4	1.8	1.5	2.3	2.1
	Mature	6.5	4.2	4.1	5.6	5.0
	Late	6.0	4.9	4.4	5.3	5.1
	Very Late	5.0	4.2	2.3	3.9	4.1
	Over Mature	6.9	3.1	9.7	6.7	6.6
	Total	4.3	3.5	3.0	3.6	3.6
	Avg of Stages	4.7	3.3	4.0	4.3	4.1
50	Early	1.7	1.5	1.7	1.5	1.5
	Immature	2.3	1.9	1.9	1.8	1.9
	Mature	2.3	2.3	1.8	2.3	2.2
	Late	2.1	1.8	2.5	2.1	2.1
	Very Late	3.9	2.2	2.0	2.4	2.6
	Over Mature	4.1	3.5	2.1	3.4	3.4
	Total	2.7	2.0	2.0	2.1	2.2
	Avg of Stages	2.7	2.2	2.0	2.2	2.3

3.6.3.7 Interior Older Forest

Patches of Interior Older Forest (IOF) were also analyzed. Interior older forests are defined by ASRD as contiguous forested area greater than 100 ha with no part of the area less than the following distance from a forest edge:

1. 60 m from a linear disturbance greater than 8 m in width;
2. 30 m from the line which cover group changes; and
3. 30 meters from the line which forest seral stage changes.

IOF age classes are defined as:

1. Deciduous - 100 years or older;
2. Mixedwood (DC & CD BCG combined) - 100 years or older;
3. Pine leading - 100 years or older;
4. White Spruce leading - 120 years or older; and
5. Black Spruce leading - 140 years or older.

Table 3-21 shows the modeled amount of IOF at 0, 10, and 50 years both ignoring and incorporating seismic lines as hard edges. Both the total area of IOF and the average IOF patch size increase over time where seismic lines are ignored. Supporting tables are provided on the enclosed DVD. Maps of the IOF are located in Appendix 10.

Table 3-21 Average Interior Older Forest Patch Size

Time From Now		Ignoring Seismics					Incorporating Seismics				
(yrs)	Cover Type	E1	E2	W5	W6	FMA	E1	E2	W5	W6	FMA
0	Decid	-	179.8	-	114.4	173.2	-	146.1	-	-	146.1
	MX	-	122.7	-	-	122.7	-	-	-	-	-
	Pine	179.6	123.2	-	181.3	167.8	-	-	-	-	-
	SB	-	127.8	-	-	127.8	-	-	-	-	-
	SW	-	-	-	-	-	-	-	-	-	-
	Total	179.6	157.3	-	168.0	162.5	-	146.1	-	-	146.1
10	Decid	-	159.9	-	-	159.9	-	146.1	-	-	146.1
	MX	-	111.4	-	-	111.4	-	-	-	-	-
	Pine	175.6	-	-	-	175.6	-	-	-	-	-
	SB	-	127.8	-	281.1	250.4	-	-	-	-	-
	SW	-	-	-	-	-	-	-	-	-	-
	Total	175.6	151.9	-	281.1	187.1	-	146.1	-	-	146.1
50	Decid	-	108.4	-	-	108.4	-	-	-	-	-
	MX	-	108.2	-	-	108.2	-	-	-	-	-
	Pine	-	245.2	-	135.1	190.1	-	-	-	-	-
	SB	161.5	139.3	190.0	217.7	183.5	-	-	-	-	-
	SW	0	-	-	-	-	-	-	-	-	-
	Total	161.5	144.2	190.0	212.2	179.6	-	-	-	-	-

3.6.3.8 Area Harvested

The area harvested during periods 2 to 4 on the coniferous land base (Figure 3-13) reflects the intended surge cut during this period. After the surge cut, the area harvested remains relatively stable for the remainder of the planning period, with W6 showing the most volatility. The total area of conifer harvested ranges from a high of 13,732 ha (period 4) to a low of 8,069 ha (period 7) with an average of 9,382 ha per period over the entire planning horizon.

On the deciduous land base the area harvested is fairly stable over periods 2 to 12 (Figure 3-14), but tends to be relatively volatile from period 13 to 22, particularly E2 and W6, and then stabilizes with an upward trend to the end of the planning horizon. Total deciduous area harvested ranges from a low of 7,497 ha (period 8) to a high of 10,328 ha (period 1) with an average of 8,928 ha per period over the entire planning horizon.

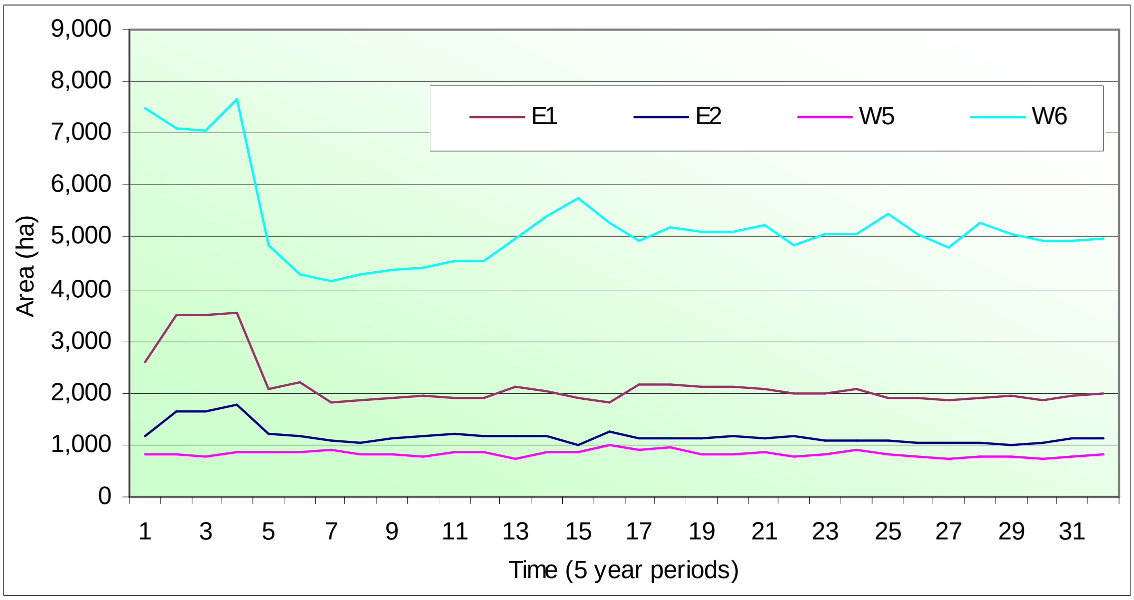


Figure 3-13 Area Harvested – Coniferous Land Base

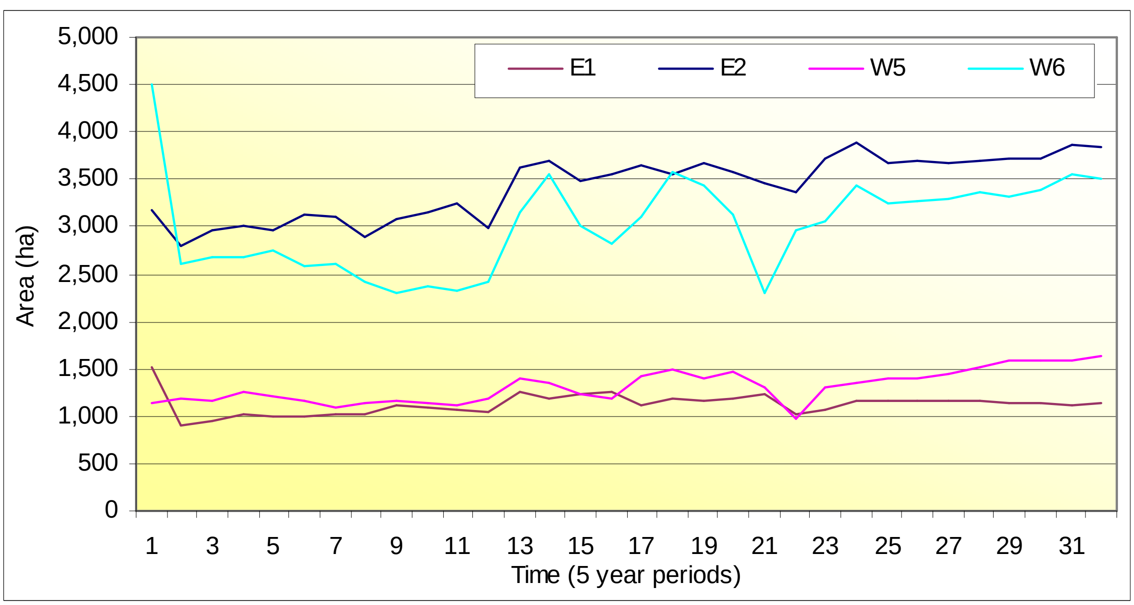


Figure 3-14 Area Harvested – Deciduous Land Base

3.6.3.9 Age Class Distribution

The initial age class structure of the net harvestable land base is skewed towards the late seral stages. There is a large concentration of merchantable timber between 65 and 115 years of age and a relative shortage of younger (<65 years) stands (Figure 3-15). The large spike at age 115 is the primary focus area of much of the harvest until enough area is converted to younger stands and the forest age class distribution becomes more balanced. Refer to Figure 3-15 through Figure 3-19 for modeled views of the age class distribution over time.

These age class distribution models are based on planned forest management activities and stand dynamics, in the absence of influence from other industries or natural disturbances.

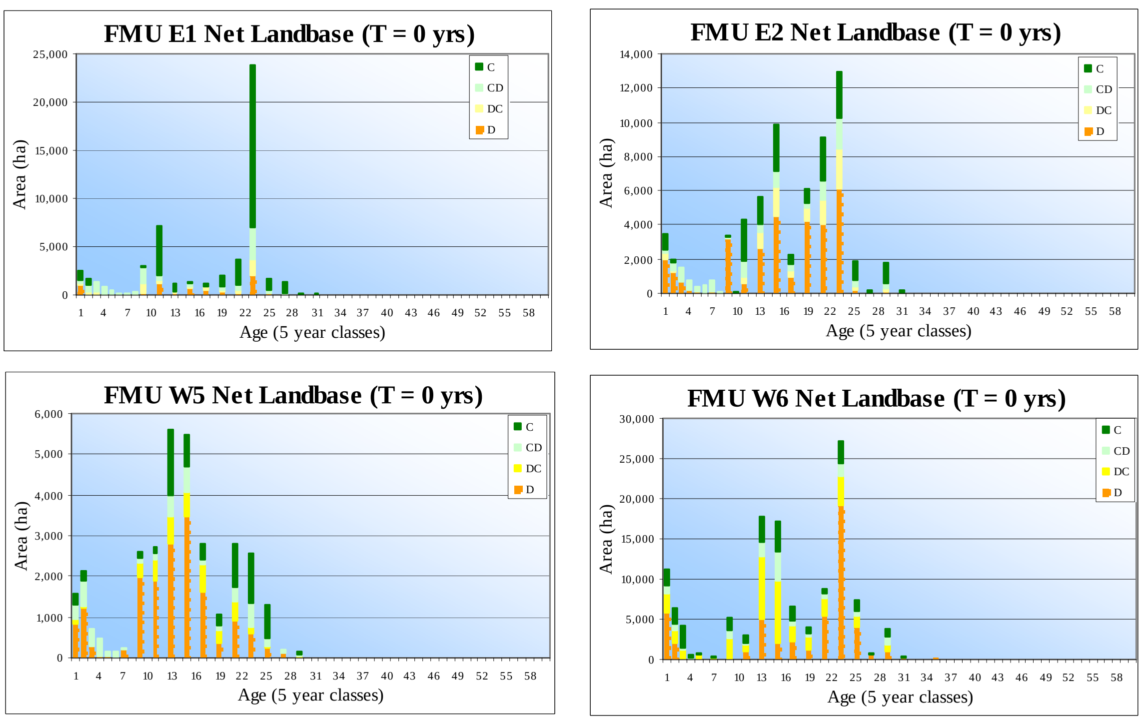


Figure 3-15 Age Class Distribution of the Net Harvestable Land Base at T = 0 years

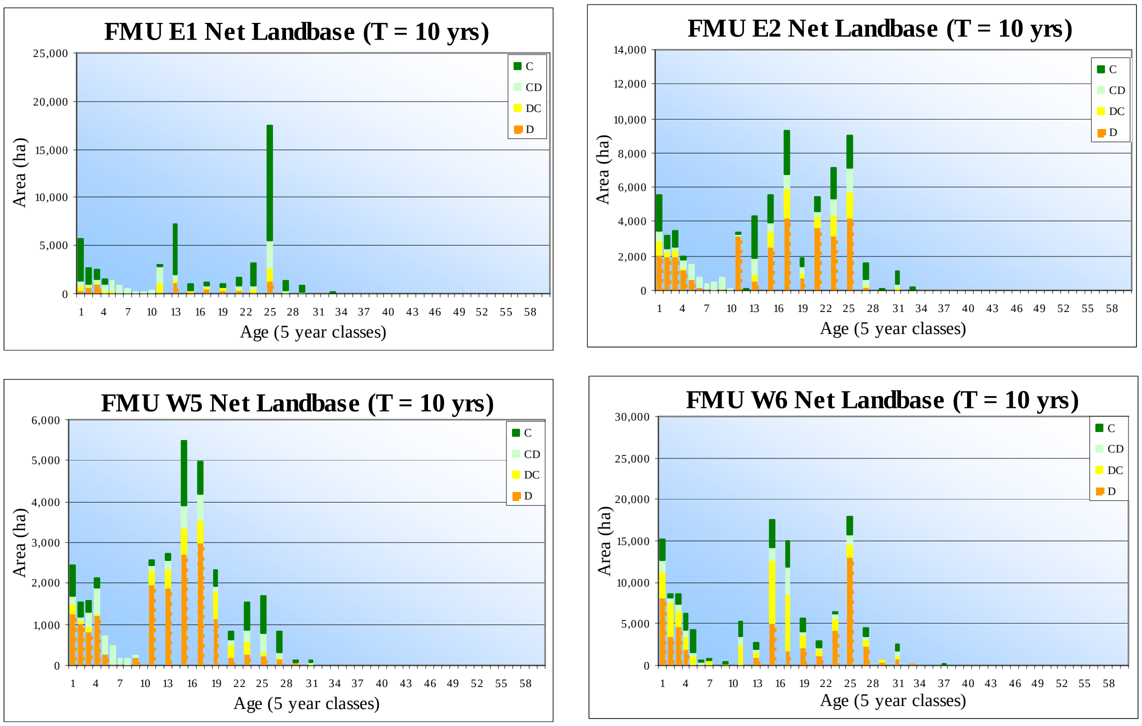


Figure 3-16 Age Class Distribution of the Net Harvestable Land Base at T = 10 years

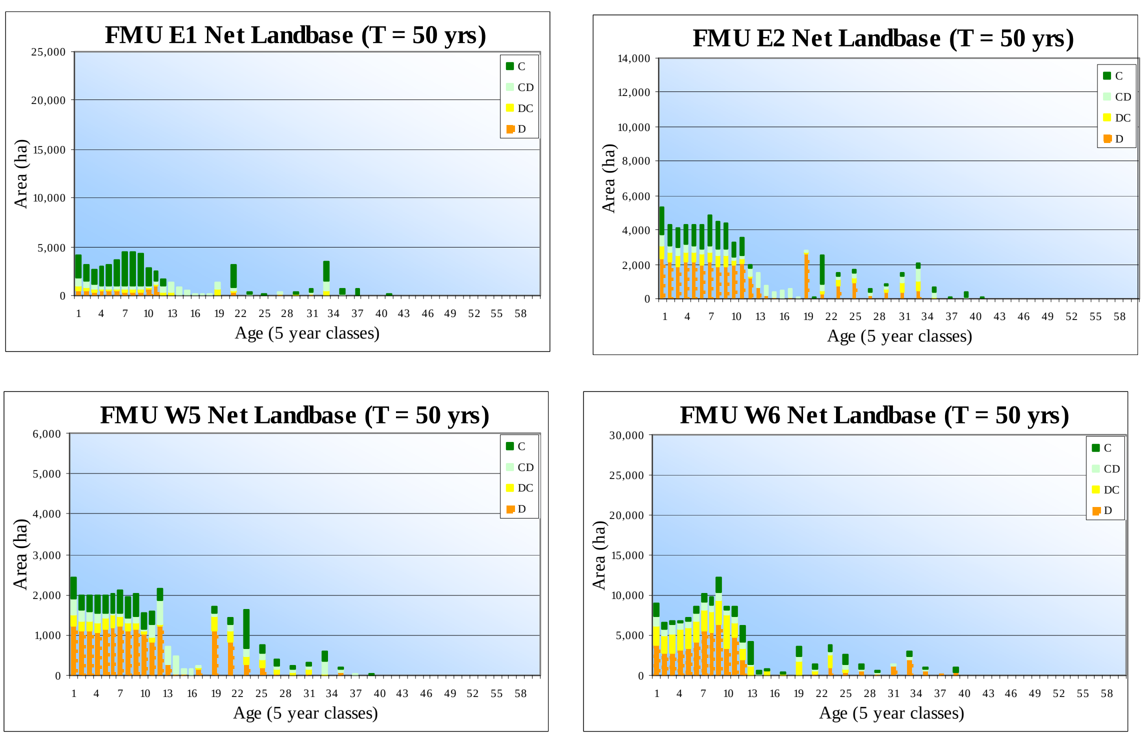


Figure 3-17 Age Class Distribution of the Net Harvestable Land Base at T = 50 years

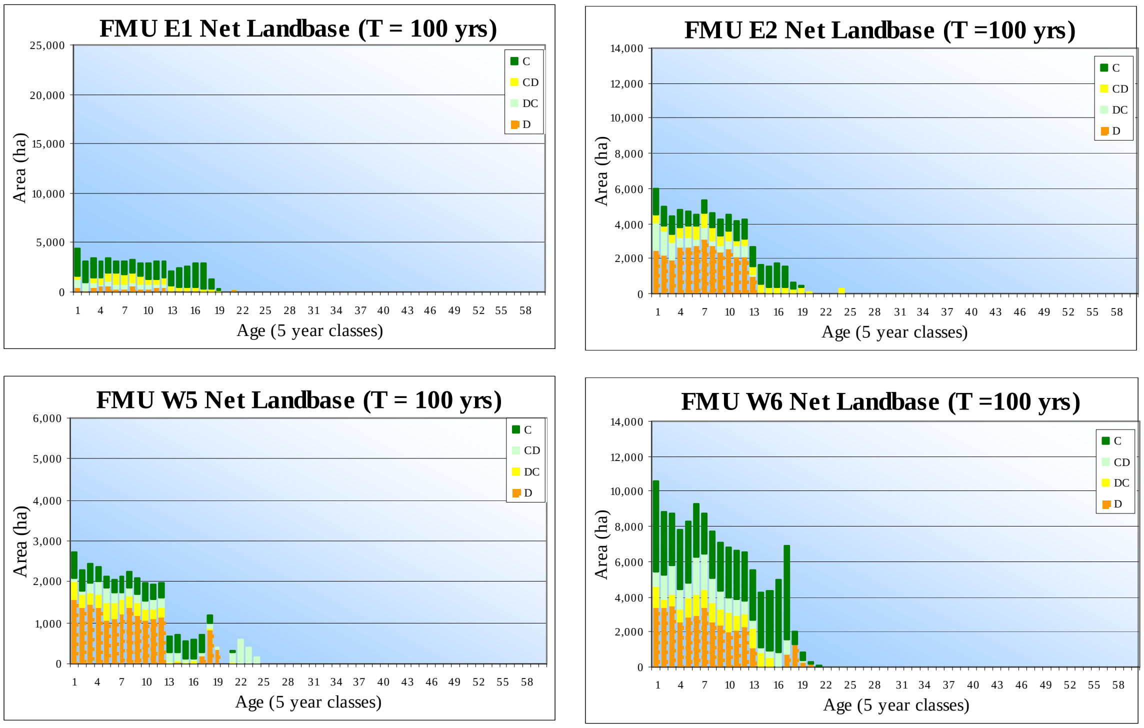


Figure 3-18 Age Class Distribution of the Net Harvestable Land Base at T = 100 years

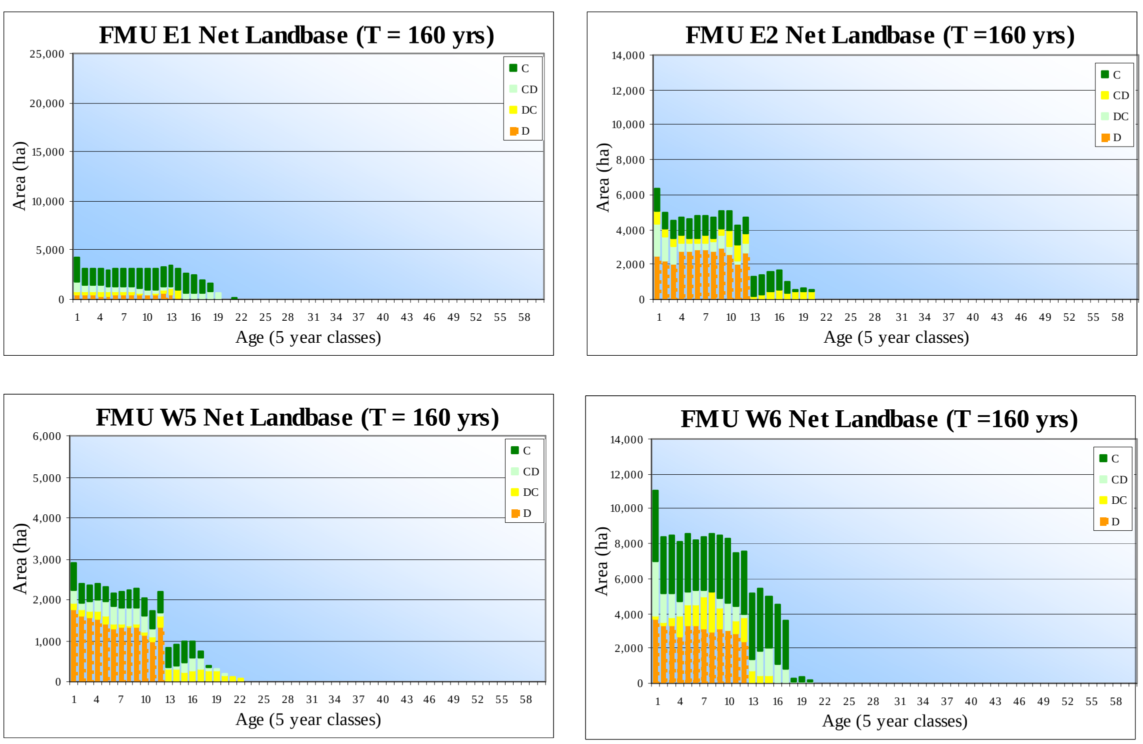


Figure 3-19 Age Class Distribution of the Net Harvestable Land Base at T = 160 years

The data tables for Figure 3-15 through Figure 3-19 are provided in the enclosed DVD. The DVD also contains more detailed information about the harvest levels by strata and age class, and a patch size database for periods 0, 2, and 10. Maps of the spatial harvest sequence can be found in Appendix 4. Weyerhaeuser's statement concerning quota production chargeability and supporting tables are given in Appendix 5.

3.6.3.10 Mountain Pine Beetle

To attain desired level of MPB control, the goal is to harvest at least 75% of all highly susceptible stands (Rank 1 or Rank 2) within 20 years (by the end of period 4). Table 3-22 below summarizes the net area of Rank 1 and Rank 2 stands for each FMU after 20 years (both aspatial and spatial results) while Figure 3-20 shows the susceptible area and the cumulative reduction of the area over time for each FMU, based on spatial outputs.

It is clear from Figure 3-20 that the reduction target was not met for any of the FMUs. Goal programming was used in Woodstock for all FMUs to prevent model infeasibility and to provide a means to determine the maximum MPB-susceptible areas that could be harvested during the first 4 periods. The main issue relates to the operable area relative to the net susceptible area. For all FMUs, harvesting 100% of the initial operable area would not have been sufficient to achieve the 75% reduction target.

The main reason why a higher percentage of the MPB operable area was not harvested during the 20 year period is that the post-surge constraint means the average cut could not fall below 10% of the baseline. The spatial (Stanley) results are similar to the aspatial results as the harvested Rank 1 and Rank 2 stand areas were used as objectives in Stanley for all the FMUs.

Table 3-22 MPB Net Rank 1 and 2 Areas after 20 years

	FMU			
	E1	**E2**	**W5**	**W6**
Initial Net MPB inventory (ha)	38,818	26,405	7,806	57,111
Target Net MPB inventory (ha)	9,705	6,601	1,952	14,278
Target Net MPB Area reduction (ha)	29,114	19,804	5,855	42,834
Aspatial				
Actual inventory (ha)	19,448	10,110	3,356	20,949
Inventory excess/(shortfall) (ha)	9,743	3,509	1,405	6,671
Inventory reduction (%)	50%	62%	57%	63%
Spatial				
Actual inventory (ha)	20,275	13,246	4,024	24,376
Inventory excess/(shortfall) (ha)	10,571	6,644	2,072	10,098
Inventory reduction (%)	48%	50%	48%	57%

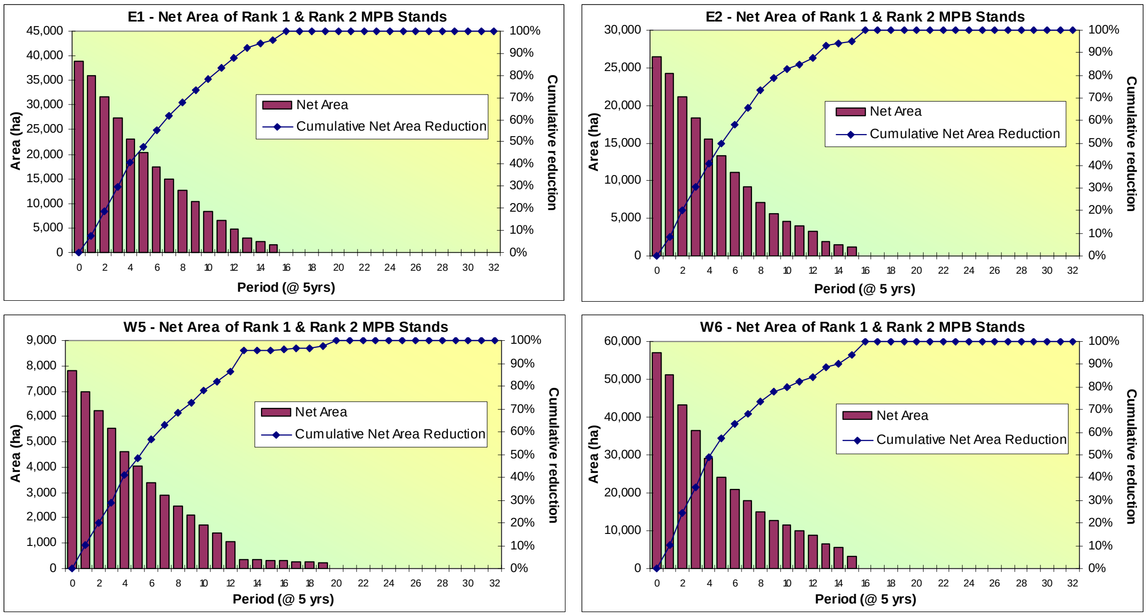


Figure 3-20 Highly Susceptible MPB Area by FMU

It is evident from Figure 3-20 that the 75% reduction target is only achieved in period 9 (40 years) for E2 and W6 and period 10 (50 years) for E1 and W5. With the exception of W5, 100% reduction in the area of Rank 1 and 2 stands is achieved by period 16 for all FMUs.

3.7 Comparison of MPB PFMS and DFMP PFMS

Long-term average primary conifer harvest level in the aspatial PFMS was 90% of the 2006 DFMP harvest levels, due to the 10% fall-down constraint. Average primary deciduous harvest in the aspatial PFMS was equal to the 2006 DFMP also due to a model constraint requiring such. Incidental harvest levels were not constrained relative to the 2006 DFMP, however, incidental conifer average harvest showed moderate increases due to the emphasis on MPB stands, which also resulted in moderate decreases in average incidental deciduous harvest.

3.8 Pine Strategy

3.8.1 Background

The Prevention (Pine) Strategy aims to decrease the spread and outbreak potential of mountain pine beetle by reducing the area of susceptible pine stands by 75%. Reduction targets were defined from the initial (time 0) inventory of highly susceptible (Rank 1 and Rank 2) stands on the net land base. Targets were to be met by the end of the 5th period (April 30, 2029), 22 years from the start of the accelerated harvest (May 1, 2007).

Although reduction targets were to be defined from a projected DFMP inventory 20 years into the future, which would represent additional harvest area requirements, two models (E1 and W5) were incapable of meeting the current targets. The remaining two models (E2 and W6) could only meet their targets by relaxing numerous constraints. Because the target cannot be met, the Prevention (Pine) Strategy is essentially a sensitivity analysis that indicates the possible outcomes of accelerated harvest.

3.8.2 Model Formulation

The model formulation was based heavily on the MPB PFMS, with the following exceptions:

1. The accelerated primary conifer harvest was extended to a full 20 years instead of 18 years for the MPB PFMS.
2. The 10% primary conifer fall down constraint (post-surge average harvest levels ≥ 90% of the DFMP average harvest level) was removed.
3. The constraint limiting the primary deciduous average harvest level to be ≥ the DFMP average harvest level was removed.
4. In E1 and E2, the variation in incidental conifer harvest flows was unconstrained between periods 5 and 6, allowing an accelerated harvest coincident with the primary conifer harvest. This change was not required in W5 and W6.
5. In E1, flow constraints on incidental deciduous were extended by one period (1-5 and 6-32 versus 1-4 and 5-32 in the MPB PFMS) to better reflect the 20-year accelerated primary conifer harvest. This change was not required in E2, W5 and W6.
6. The goal programming of the mountain pine beetle constraints was removed. The models were required to meet the 75% Rank 1 and Rank 2 reduction target if possible (met in E2 and W6), otherwise the models had to harvest 100% of the operable Rank 1 and Rank 2 stands (E1 and W5).
7. All profile constraints (crown closure and site class) were removed in E1 due to extensive infeasibilities. The remaining models required goal programming of some profile constraints to provide a feasible solution.
8. Goal programming was required on some additional seral stage targets to produce feasible solutions.

3.8.3 Results

3.8.3.1 Harvest Volume

Table 3-23 provides a summary of the Pine Strategy AAC levels for a 160 year planning period (5 year average AAC's) in each FMU.

Table 3-23 Net Harvest Levels for Pine Strategy for Weyerhaeuser Edson FMA

<table>
<tr><th>FMA</th><th>Source</th><th>May 1, 2007 – April 30, 2024</th><th>May 1, 2024 – April 30, 2027</th><th>May 1, 2027 – April 30, 2029</th><th>May 1, 2029 – April 30, 2164</th></tr>
<tr><td rowspan="4">E1</td><td>Prim Con</td><td colspan="2">187,539</td><td colspan="2">35,616</td></tr>
<tr><td>Prim Dec</td><td colspan="4">24,542</td></tr>
<tr><td>Inc Dec</td><td colspan="3">25,981</td><td>9,692</td></tr>
<tr><td>Inc Con</td><td colspan="3">30,775</td><td>14,604</td></tr>
<tr><td rowspan="4">E2</td><td>Prim Con</td><td colspan="2">74,712</td><td colspan="2">35,844</td></tr>
<tr><td>Prim Dec</td><td colspan="4">85,747</td></tr>
<tr><td>Inc Dec</td><td>12,554</td><td colspan="3">8,067</td></tr>
<tr><td>Inc Con</td><td>59,323</td><td colspan="3">34,985</td></tr>
<tr><td rowspan="4">W5</td><td>Prim Con</td><td colspan="2">26,351</td><td colspan="2">20,838</td></tr>
<tr><td>Prim Dec</td><td colspan="4">39,171</td></tr>
<tr><td>Inc Dec</td><td>9,642</td><td colspan="3">10,642</td></tr>
<tr><td>Inc Con</td><td colspan="4">8,118</td></tr>
<tr><td rowspan="4">W6</td><td>Prim Con</td><td colspan="2">337,259</td><td colspan="2">130,510</td></tr>
<tr><td>Prim Dec</td><td colspan="4">84,446</td></tr>
<tr><td>Inc Dec</td><td>101,075</td><td colspan="3">49,892</td></tr>
<tr><td>Inc Con</td><td colspan="4">20,517</td></tr>
<tr><td rowspan="4">FMA</td><td>Prim Con</td><td colspan="2">625,861</td><td colspan="2">222,808</td></tr>
<tr><td>Prim Dec</td><td colspan="4">233,905</td></tr>
<tr><td>Inc Dec</td><td>149,251</td><td colspan="2">94,582</td><td>155,973</td></tr>
<tr><td>Inc Con</td><td>118,733</td><td colspan="2">94,395</td><td>78,224</td></tr>
</table>

Pine Strategy harvest volumes are compared with the MPB PFMS and the MPB Disaster scenario in Section 3.10.

3.8.3.2 Harvest Area

Figure 3-21 and Figure 3-22 summarize coniferous and deciduous harvest area projections when the pine strategy is implemented. The coniferous harvest area peaks in period 4 and declines significantly and stabilizes for all FMU's.

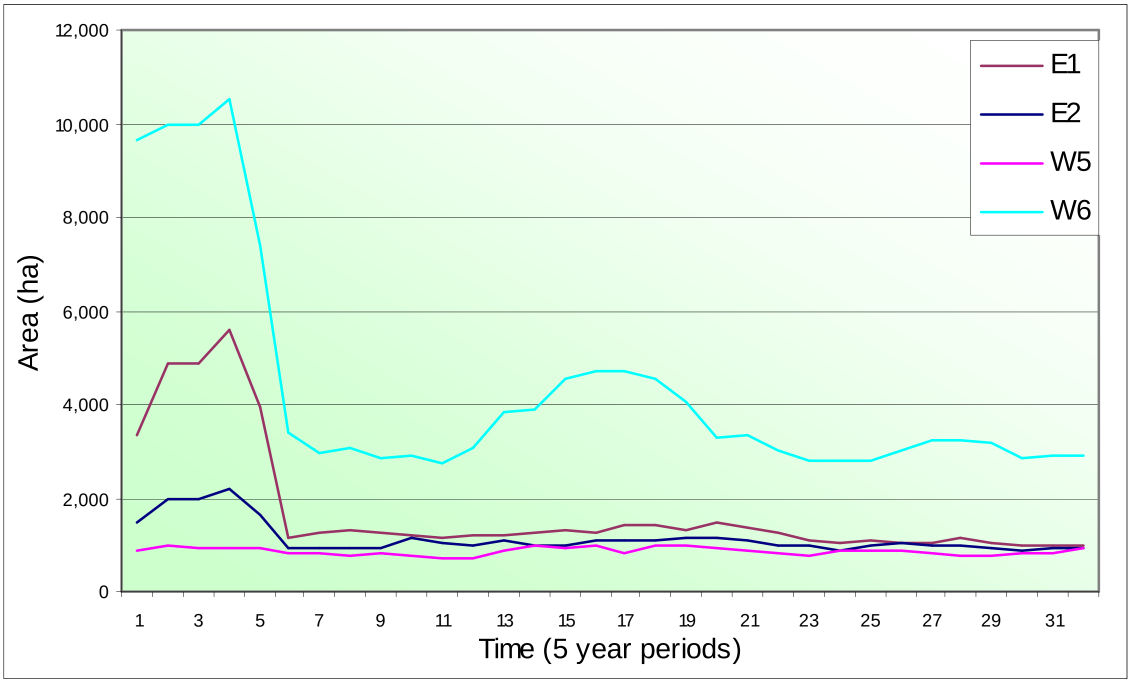


Figure 3-21 Coniferous Harvest Area Projections with Implementation of the Pine Strategy

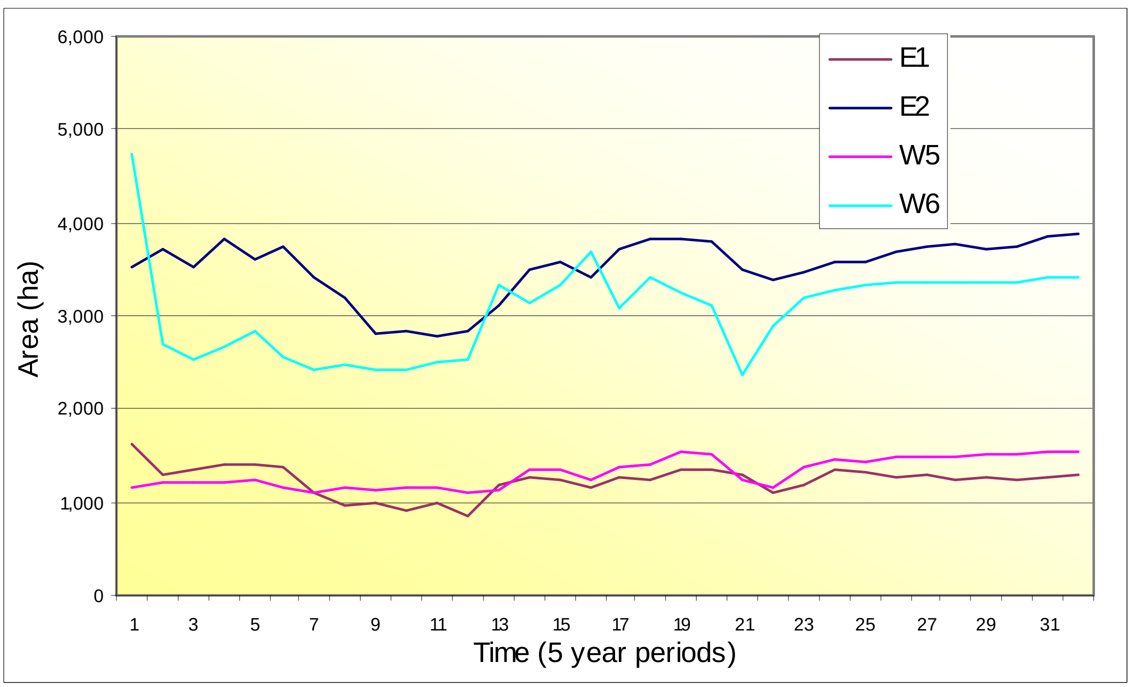


Figure 3-22 Deciduous Harvest Area Projections with the Implementation of the Pine Strategy

The deciduous growing stock curves exhibit fairly similar trends to the MPB PFMS. However, ending operable growing stock is generally higher in all FMUs under the pine strategy.

3.8.3.3 Mountain Pine Beetle

The MPB reduction targets were modeled to conclude by the end of period 5 (22 years from May 1, 2007). As shown in Figure 3-23, the reduction targets were achieved in FMU E2 and W6. Although the reduction targets were not met in FMU E1 and W5, 100% of the operable highly susceptible (Rank 1 and Rank 2) stands were harvested in period 5 for those FMUs, under the DFMP rules. There was therefore no means of optimizing a solution.

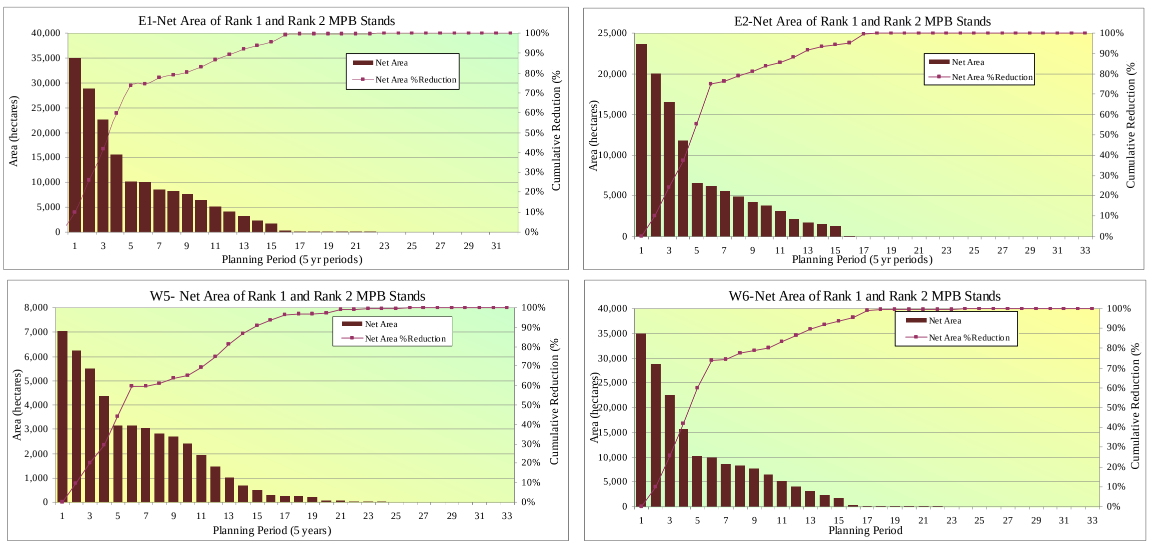


Figure 3-23 Highly Susceptible MPB Area by FMU

3.8.3.4 Growing Stock

Figure 3-24 and Figure 3-25 provide an overview of the changes in coniferous and deciduous growing stock over 160 years in the pine strategy. In each FMU there is a significant decline in coniferous growing stock in periods one through five, likely due to both the MPB mortality and salvage harvesting. The proportionate reduction in conifer volume of stands not harvested during the salvage, also likely contributes to this decline.

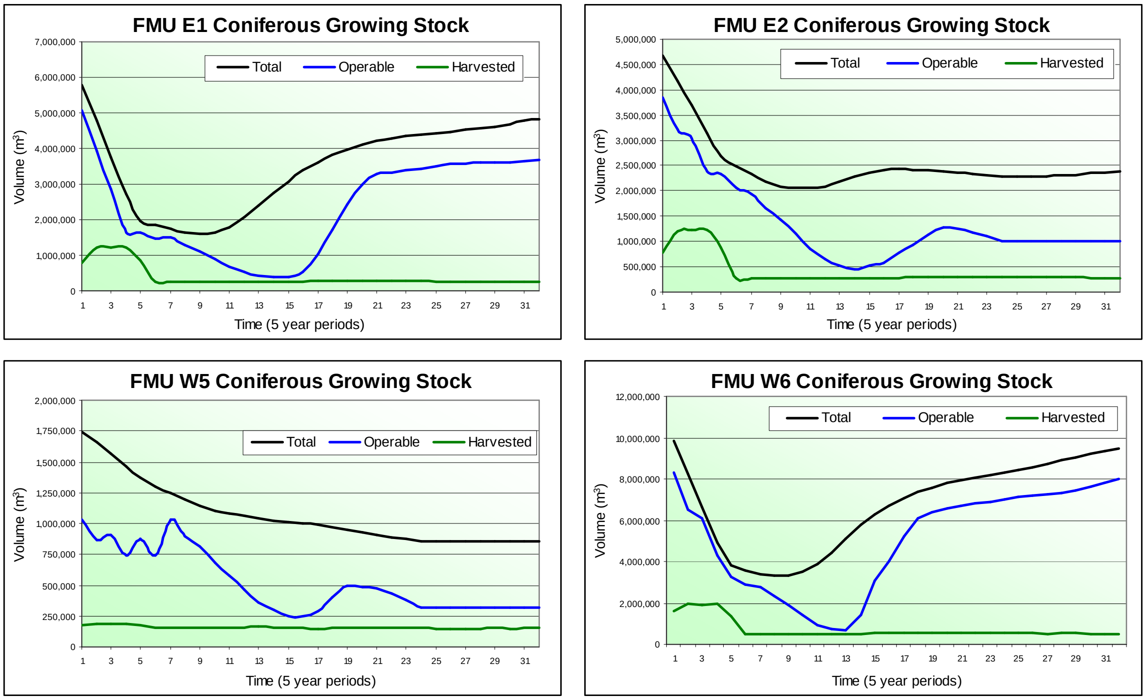


Figure 3-24 Coniferous Growing Stock Projections with Implementation of the Pine Strategy

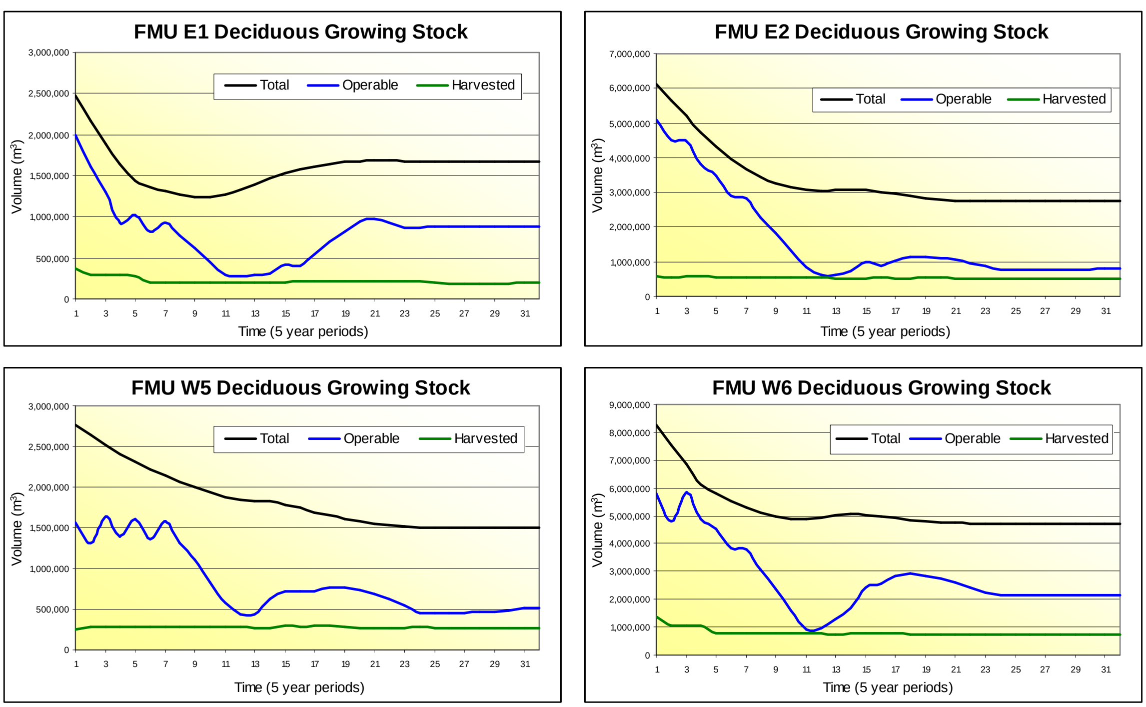


Figure 3-25 Deciduous Growing Stock Projections Due to the Implementation of the Pine Strategy

In FMU E1, in period 15, the conifer operable growing stocks begin to increase and start to level off at the end of the planning period. Like the conifer growing stock, the deciduous operable growing stock exhibits a decline in the first five periods, and recovers beginning in period 14.

In FMU E2, the operable conifer growing stock begins to recover in period 14 and again levels off towards the end of the planning horizon. The deciduous growing stock declines in the first 12 periods and then levels off.

In FMU W5, the conifer growing stock declines in periods one through five. The operable coniferous growing stock drops significantly in periods 8 through 15 and then levels off. In period 15 the total and operable coniferous growing stocks begin to increase and recover. The deciduous growing stock is volatile in periods one through five and drops significantly in periods 7 through 12. The deciduous operable stocks recover slightly and stability after period 12.

In FMU W6, the coniferous growing stock drops very dramatically in periods one through 13 and begins to recover significantly starting in period 13. The operable deciduous growing stock decreases in periods 1 through 11 but recovers and stabilizes for the remainder of the planning period.

3.9 MPB Disaster Scenario

3.9.1 Background

Alberta Sustainable Resource Development's *Interpretive Bulletin: Planning Mountain Pine Beetle Response Operation* (September 2006) outlines a salvage strategy in the event of a MPB outbreak.

The following timber supply analysis was provided by ASRD:

1. Set the harvest rate at a level to "reduce the area of Rank 1 and Rank 2 stands to 25% of that in the currently approved FMP at a point 20 years in the future" ("Harvest Rate A").
2. Assume massive mortality in 10 years.
3. Assume harvest of salvage to continue at "Harvest Rate A" for the next 10 years (years 11 to 20).
4. Stands that are salvaged return at normal regeneration transition and normal regeneration lags.
5. For stands that are not salvaged the following rules apply:
    a. For stands with greater than 60% pine content, assume entire stand mortality (mortality applied to stands that are 20 years or older). The stand goes onto the lowest density yield curve (e.g. A/B density) for that strata with a 15-year regeneration lag. The 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 it's 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.

6. Calculate an even flow AAC for years 21 to 200 using normal planning criteria.

The absolute pine content was used to establish if a stand had greater or less than 60% pine content. Stands with greater than 60% pine had a "D" code appended to the MPB theme (theme 15), signifying the stand would undergo the mortality event. Stands with less than or equal to 60% pine content had a value appended to the MPB theme representing the proportional reduction in conifer volume to be applied to the stand. Because the conifer yield is tracked separately, in the yield curves, the proportionate reduction represents the relative pine percent rounded to the nearest 10%. Values 0-9 represent reduction of 0% to 90%, with X representing 100%. As the mortality event applies only to stands greater than 20 years of age at the time of the mortality event (10 years from the start date of the model), stands currently less than 10 years of age were re-classified as non-MPB stands (Theme 15 = "ZZ") and were not subject to volume reductions.

3.9.2 Model Formulation

The MPB PFMS playback model formulations were used as a base for the disaster scenario models. A variety of model changes were made to accommodate the MPB disaster strategy, as follows:

1. Because the model begins three years into the first period, the mortality event was assumed to occur after 7 years, instead of after 10.
2. Mortality affects all stands with >= 60% pine and >= 20 years old.
3. The Stanley™ run associated with the MPB PFMS was used as the SHS that was played back for periods 1 and 2.
4. Salvage can occur for ten years (periods 3 and 4).
5. Constraints were used to force primary harvest volumes equal to the spatial harvest sequence in periods 3 and 4. Those volumes are presented in Table 3-24.
6. Harvest flows were constrained as follows:
    a. Primary Conifer: in period 5-12 strict even flow; periods 5-32 even flow within 10%
    b. Primary Deciduous: in period 5-12 strict even flow; periods 5-32 even flow within 10%.
    c. Incidental Conifer and Deciduous: even flow within 10% for periods 3 to 32. In the case of E1, the incidental deciduous even flow constraint caused an infeasibility therefore the constraint was broken up to force strict even flow in periods 3 and 4 and allow even flow within 10% for periods 4 through 32.
7. The mortality event is modeled as a harvest action. The "harvest" occurs in period 4, after stands killed by MPB are no longer eligible for salvage.

a. Stands killed by MPB and not salvaged are transitioned with a 5 year regeneration lag (which is equivalent to a regeneration lag of 15 years after the mortality event).
b. After MPB attack, the un-salvaged stands regenerate to the same stand type as before MPB, but on the lowest density yield curves (transition to A density). Salvaged stands regenerate to normal post-harvest conditions.
c. Volumes are adjusted for MPB killed stands starting in period 4. Un-salvaged stands contribute no harvest volume or growing stock. This is true for both deciduous and conifer, as it is assumed that the deciduous volume in these stands is unavailable for harvest.
d. Stands with <60% pine have their conifer volumes adjusted to reflect how much of the conifer volume is pine. If a stand is 40% pine, but pine represents half the conifer volume (the stand is 80% conifer), the stand's conifer volume is reduced by 50%. Harvest volume and growing stock are represented by adjusting the percent of pine starting in period 6.

8. Seral stage and harvest profile constraints from the MPB PFMS scenario were included in the disaster scenarios, however due to infeasibilities some constraints had to be removed. Table 3-25 shows which constraints were removed in each FMU.

Table 3-24 Volume Constraint for Periods 3 and 4

Volume (m3)	E1		E2		W5		W6	
	Period 3	Period 4	Period 3	Period 4	Period 3	Period 4	Period 3	Period 4
Coniferous	707,983	717,253	329,634	329,620	119,580	119,643	1,233,715	1,233,734
Deciduous	123,499	121,866	460,145	460,128	215,067	222,322	478,547	465,871

Table 3-25 Removed Seral Stage and Harvest Profile Constraints

Constraint Type	E1	E2	W5	W6
Seral Stage		UF_03CX > 42 UF_03SW > 13		UF_03CX > 227 UF_03SW > 5
Harvest Profile		CON_A < 358 CON_B < 445 CON_D > 94 CON_M > 172	DEC_P >= 2	CON_D > 125 CON_M > 82 DEC_P > 4

3.9.3 Results

The disaster scenario was applied to each FMU in the FMA. The effects are different for each FMU if the massive mortality event were to occur. Given the provincial direction of maximizing the economic recovery of MPB affected areas subject to conservation objectives, the harvest levels would likely need to be recalculated, possibly resulting in a new surge harvest level. Operability limits would likely need to be reconsidered as well. Ideally, harvest levels would be non-declining, rather than even flow, to capture the increasing growing stock after the outbreak. It is also highly unlikely that a mortality event would kill every pine over 20 years old in a single period across the FMA.

3.9.3.1 Harvest Volume

Table 3-26 provides a summary of MPB disaster AAC levels for a 160 year planning period (5 year average AAC's) in each FMU.

Table 3-26 Net Harvest Levels for MPB Disaster Scenario for Weyerhaeuser Edson FMA

FMA	Source	May 1, 2007 – April 30, 2014	May 1, 2014 – April 30, 2024	May 1, 2024 – April 30, 2164
E1	Prim Con	126,324		30,219
	Prim Dec	21,059		25,583
	Inc Dec	17,891	18,258	7,632
	Inc Con	30,775	15,261	
E2	Prim Con	60,968		19,557
	Prim Dec	83,491		85,416
	Inc Dec	8,773	6,414	
	Inc Con	36,795	32,647	
W5	Prim Con	21,378		12,341
	Prim Dec	39,368		39,026
	Inc Dec	8,260	8,364	
	Inc Con	8,183	7,816	
W6	Prim Con	225,783		80,979
	Prim Dec	84,014		84,738
	Inc Dec	70,396	50,029	
	Inc Con	25,727	19,870	
FMA	Prim Con	434,452		143,095
	Prim Dec	227,932		234,763
	Inc Dec	105,320	83,066	72,440
	Inc Con	101,480	75,594	

Disaster Scenario harvest volumes are compared with the MPB PFMS and the Pine Strategy scenario in Section 3.10.

3.9.3.2 Harvest Area

Figure 3-26 and Figure 3-27 show changes in coniferous and deciduous harvest area through 32 periods when the MPB Disaster Scenario is applied.

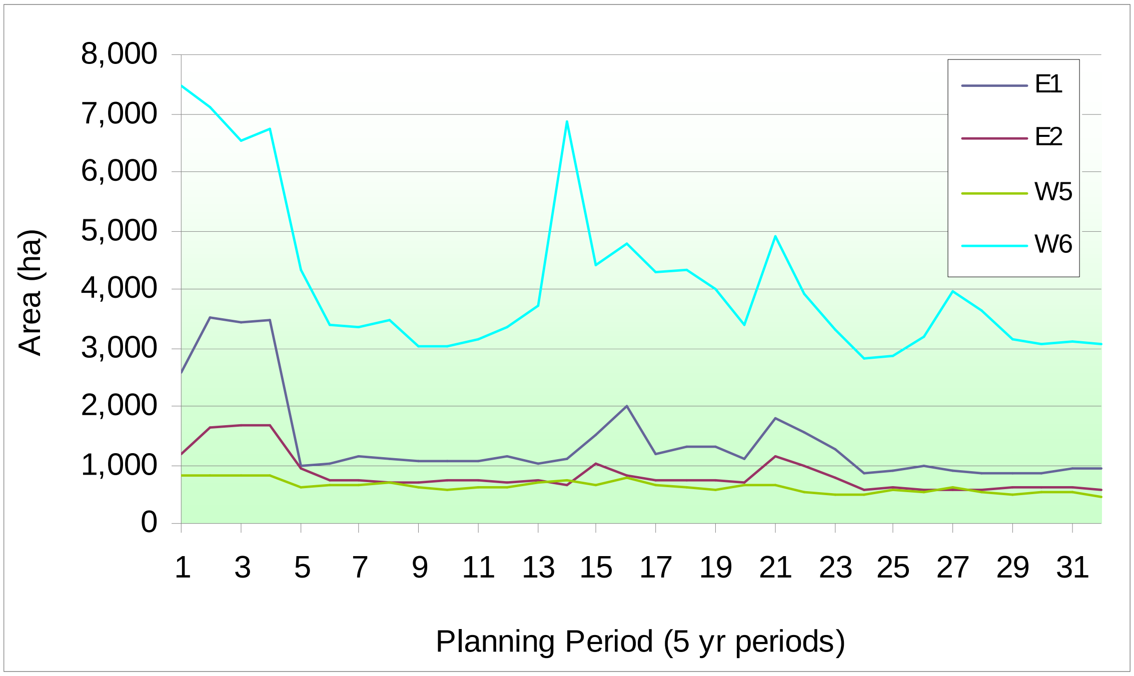


Figure 3-26 Coniferous Harvest Area Projections Due to MPB Disaster Scenario

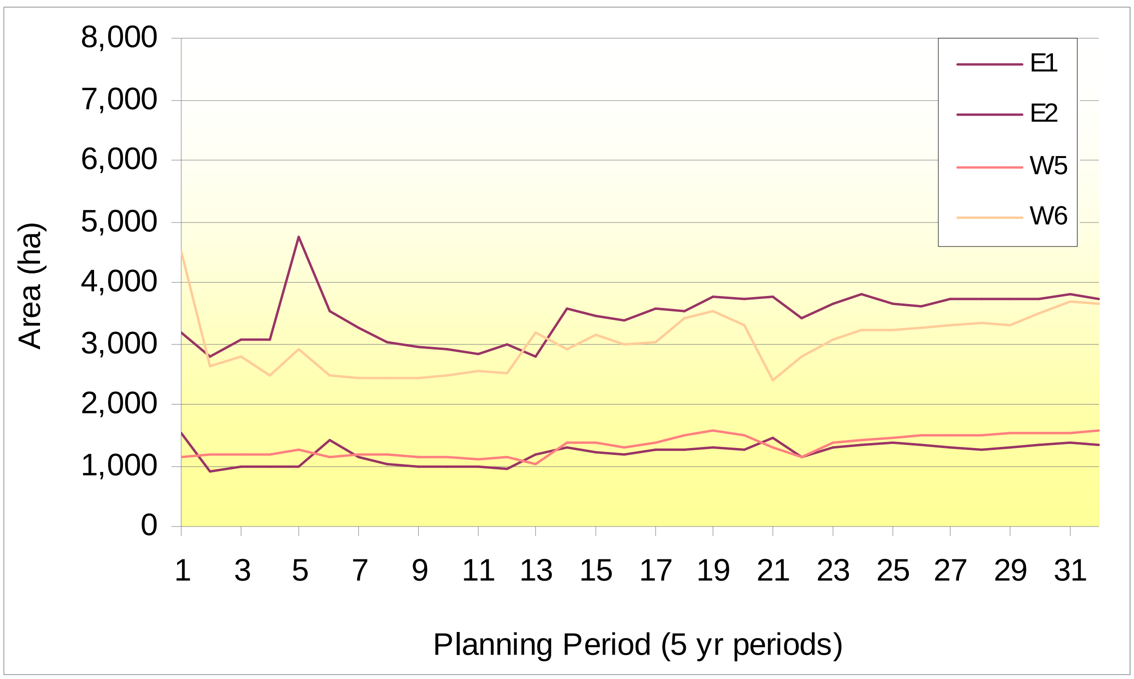


Figure 3-27 Deciduous Harvest Area Projections Due to MPB Disaster Scenario

The modeled harvest area with the implementation of the Disaster Scenario on the coniferous land base is highly variable between periods 1 and 21. The variability is likely explained by the massive mortality event and the salvage periods. The average coniferous harvest areas for the FMA is 6,961 ha/period and the maximum harvest area

(7,477 ha) occur in FMU W6 in period 1. The area harvested from the deciduous land base is much more stable with an average harvest of 8,989 ha/period.

3.9.3.3 Mountain Pine Beetle

Salvage and mortality assumptions in the model causes the area of pine stands with a Rank 1 or Rank 2 MPB susceptibility index to decrease sharply after the fourth period in all four FMU's (Figure 3-28).

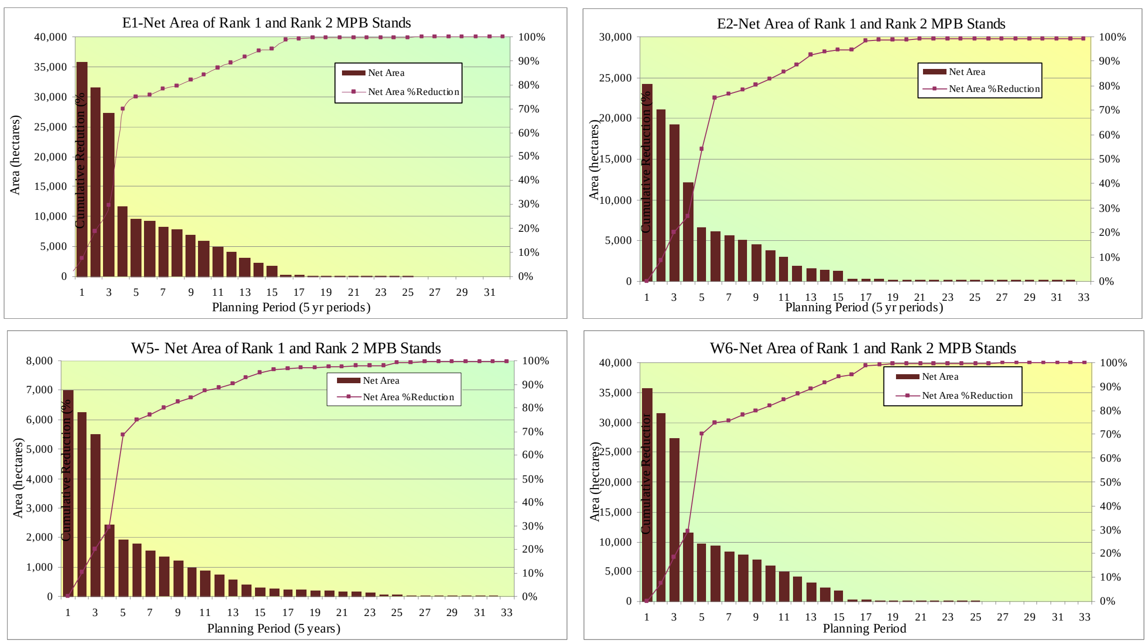


Figure 3-28 Mountain Pine Beetle Susceptible Area Reduction in FMU E1, E2, W5, W6

3.9.3.4 Growing Stock

Figure 3-29 and Figure 3-30 provide an overview of the changes in coniferous and deciduous growing stock over 160 years in the disaster scenario. In each FMU there is a significant decline in coniferous growing stock in periods one through five because of the MPB mortality and salvage. The proportional reduction in conifer volume of stands not harvested during the salvage, also `contributes to this decline.

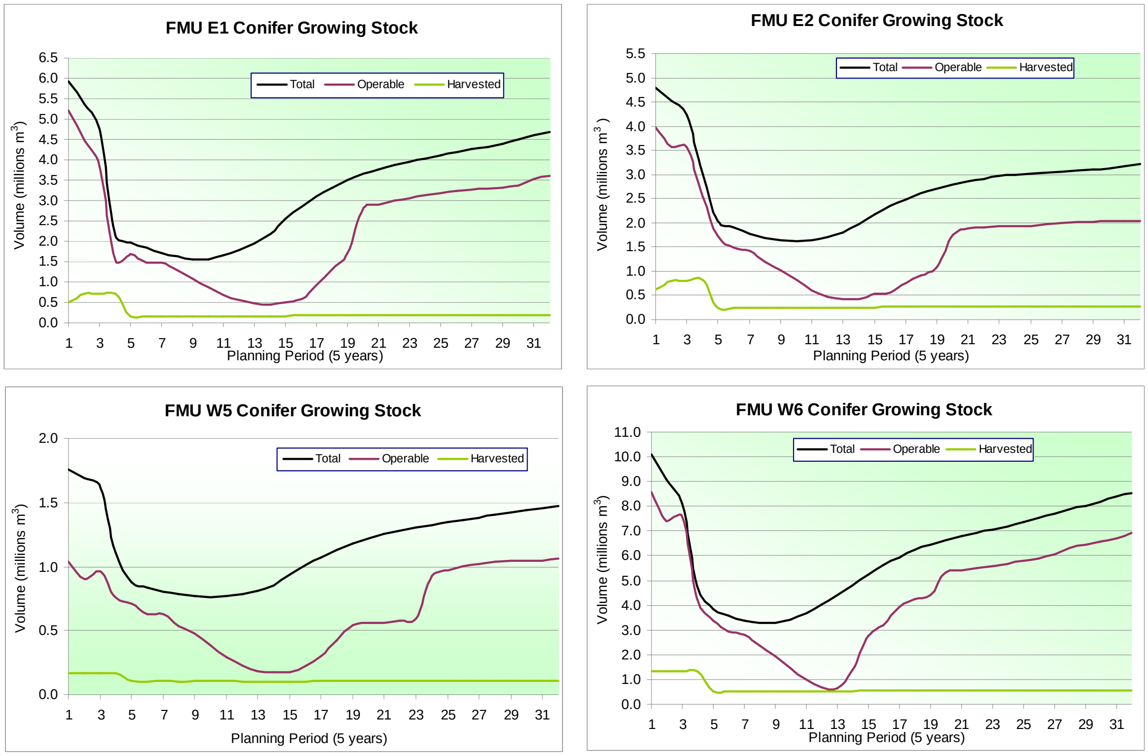


Figure 3-29 Coniferous Growing Stock Projections with Implementation of the Disaster Scenario

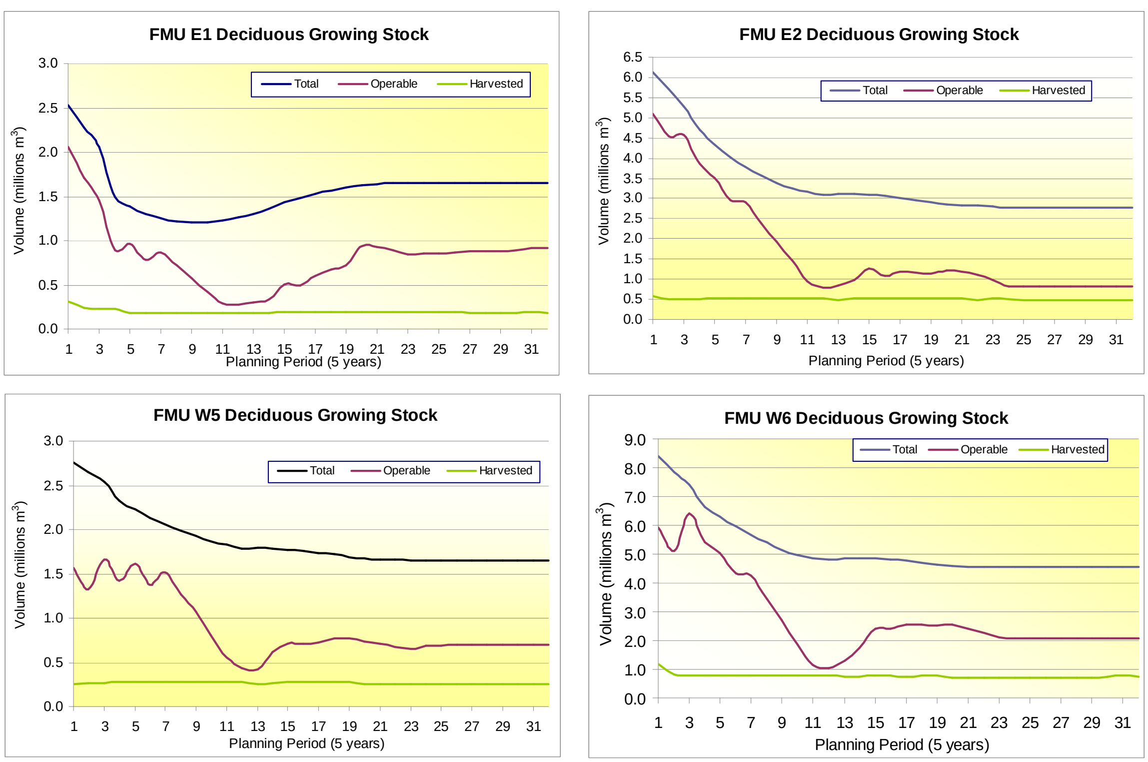


Figure 3-30 Deciduous Growing Stock Projections with Implementation of the Disaster Scenario

In FMU E1, in period 15, the operable conifer growing stocks begin to increase and start to level off at the end of the planning period. Operable deciduous growing stock exhibits a decline in the first five periods, but recovers more quickly beginning in period 10.

In FMU E2, it takes slightly longer for the growing stock to recover from the massive mortality event. The operable conifer growing stock begins to recover in period 21 and again levels off towards the end of the planning horizon. The operable deciduous growing stock declines in the first 12 periods and then levels off.

In FMU W5, the conifer and deciduous growing stocks decline in periods one through five. In period 15 the total and operable coniferous growing stocks begin to increase and recover. The operable deciduous growing stock drops significantly in periods 7 through 13 and then levels off.

In FMU W6, the coniferous growing stock drops very dramatically in periods one through 5 and begins to recover significantly in periods 11-13. The operable deciduous growing stock decreases in periods 1 through 15 but recovers and stabilizes for the remainder of the planning period.

3.9.3.5 Age Class Distribution

Figure 3-31 to Figure 3-35 shows the modeled age class distribution for the following time periods: currently , in 10 years, in 50 years, in 100 years and in 160 years for each FMU. It is important to note the huge age class spike created by the MPB disaster scenario at 50 years and that continues in 100 years and in 160 years. This spike is present in all four FMUs. The model projects that 35% to 41% of all coniferous stands will be in the 30 year age class in 50 years for FMU E1, E2, W5, and W6.

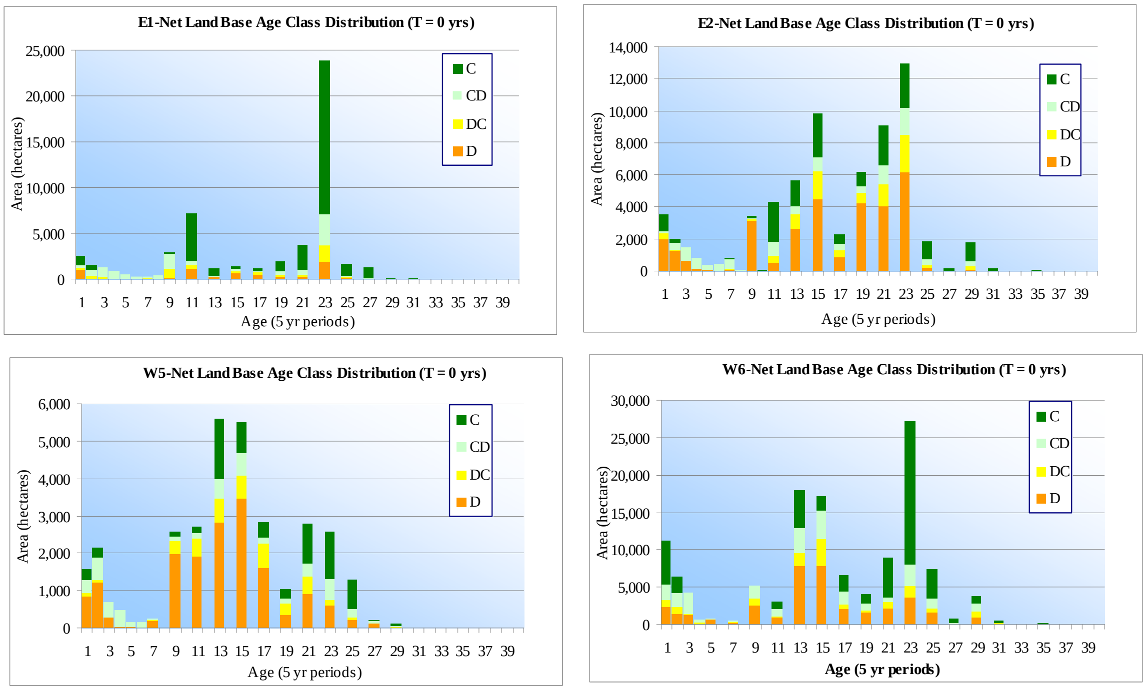


Figure 3-31 Age Class Distribution across the Net Land Base at T = 0 years

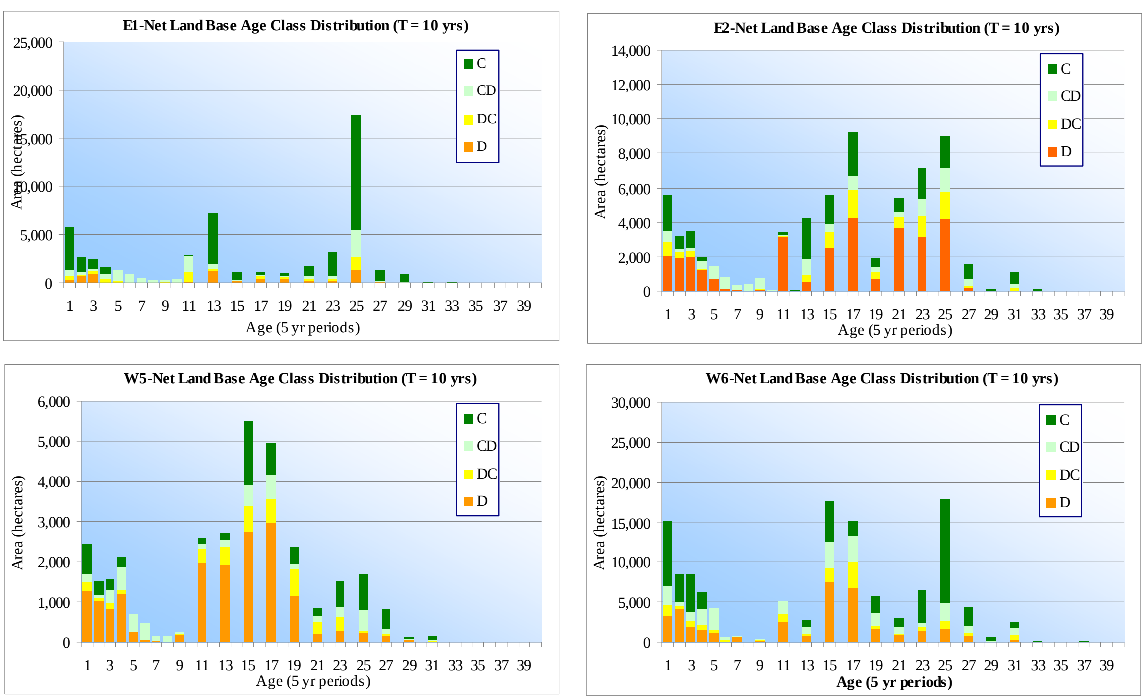


Figure 3-32 Age Class Distribution across the Net Land Base at T = 10 years

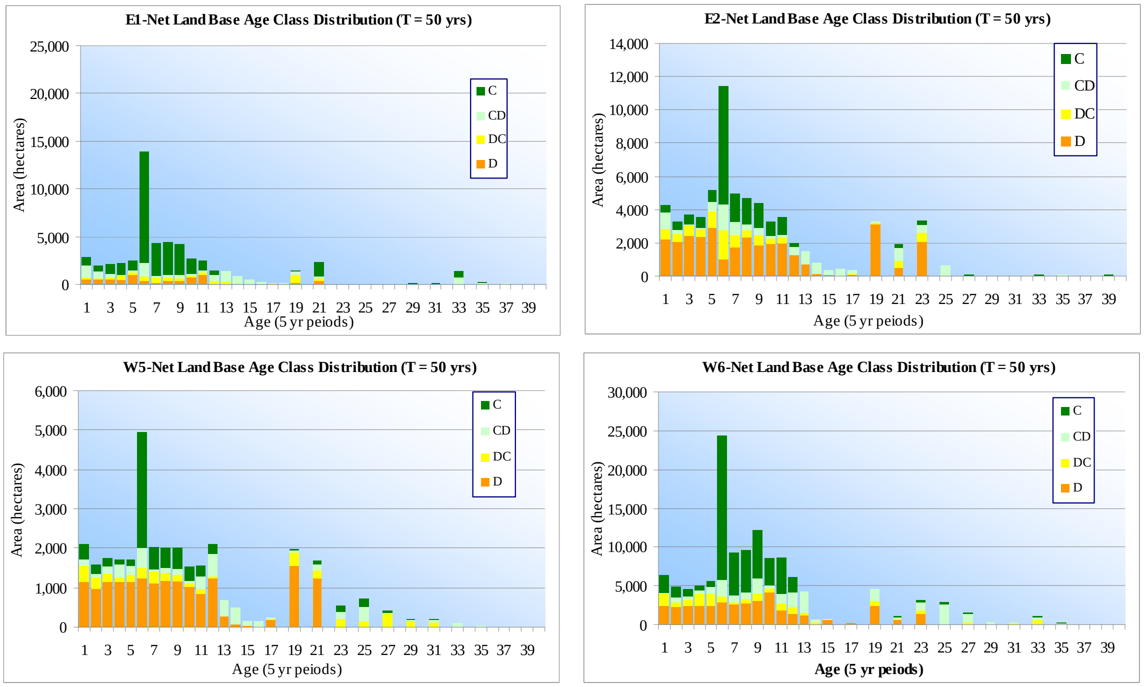


Figure 3-33 Age Class Distribution across the Net Land Base at T = 50 years

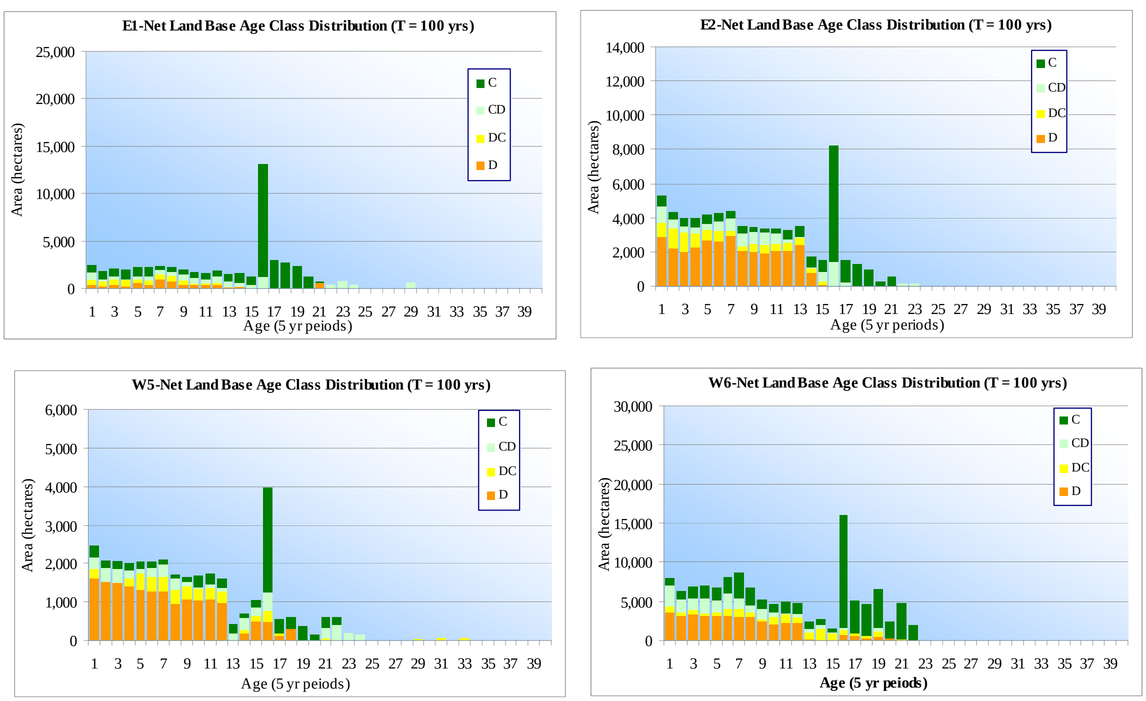


Figure 3-34 Age Class Distribution across the Net Land Base at T = 100 years

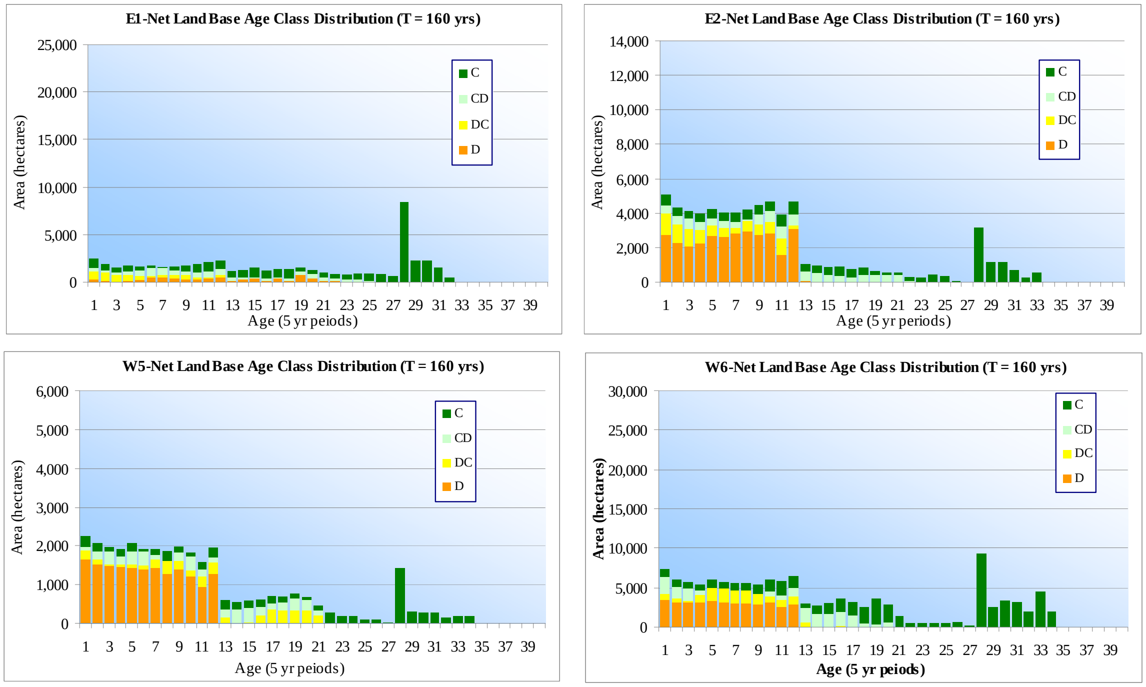


Figure 3-35 Age Class Distribution across the Net Land Base at T = 160 years

3.9.3.6 Seral Stage Distribution

Seral stage distribution in the Lower and Upper Foothills Natural Subregions from the disaster scenario is shown in Table 3-27 through Table 3-40 for FMU's E1, E2, W5 and W6, for both the gross and net land bases. The pine and spruce/pine distribution is significantly diminished after period 5 in both Natural Subregions. This is likely as a result of the salvage harvest conifer reduction and the massive mortality event. Seral stage retention values marked in red represent seral stages area targets that were not achieved.

Table 3-27 E1 Gross Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

E1 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	351	4,215	3,445	1,204	1,000	710
Very Late Decid	1.0	70	2,418	2,013	538	673	710
Late DC	5.0	282	3,159	2,609	1,543	472	456
Very Late DC	1.0	56	1,963	1,791	281	423	456
Late CD	5.0	559	4,267	3,604	2,032	2,151	3,859
Very Late CD	1.0	112	418	3,113	1,251	621	919
Late PL	5.0	1,105	15,902	11,899	2,441	2,953	9,338
Very Late PL	1.0	221	405	9,194	788	1,094	8,235
Late PS	5.0	188	3,730	2,848	634	667	1,337
Very Late PS	1.0	38	590	2,506	632	370	757
Late SW	10.0	301	2,875	2,623	935	821	2,251
Very Late SW	2.0	60	1,689	2,482	931	626	1,166
Late 'other' Con	5.0	2,398	30,153	33,772	42,874	42,114	44,075
Very Late 'other' Con	1.0	480	6,165	21,147	37,892	42,012	43,243

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-28 E1 Gross Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

E1 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	4	84	75	5	5	5
Very Late Decid	2.0	2	31	21	5	5	5
Late DC	5.0	3	55	47	25	8	8
Very Late DC	2.0	1	49	41	25	8	8
Late CD	5.0	3	63	63	43	3	4
Very Late CD	2.0	1	0	43	43	3	2
Late PL	2.0	2	121	69	3	22	62
Very Late PL	1.0	1	1	62	3	2	60
Extremely Late PL	0.5	1	0	0	0	2	0
Late PS	10.0	3	26	21	11	4	13
Very Late PS	5.0	1	0	21	11	0	5
Extremely Late PS	2.5	1	0	0	0	0	0
Late SW	10.0	1	10	10	7	1	10
Very Late SW	5.0	0	0	10	7	1	1
Extremely Late SW	2.5	0	0	0	0	1	1
Late 'other' Con	10.0	10	80	97	88	88	90
Very Late 'other' Con	5.0	5	7	73	86	88	90
Extremely Late 'other' Con	2.5	3	0	0	1	86	88

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-29 E2 Gross Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

E2 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	1,594	20,752	19,828	8,490	3,353	3,350
Very Late Decid	1.0	319	6,607	7,790	4,293	3,186	3,350
Late DC	5.0	387	6,163	6,113	1,783	1,091	1,091
Very Late DC	1.0	77	2,334	2,663	1,334	1,069	1,091
Late CD	5.0	460	2,961	2,901	1,777	1,222	2,497
Very Late CD	1.0	92	538	1,628	713	813	1,157
Late PL	5.0	291	2,488	1,748	435	600	2,207
Very Late PL	1.0	58	12	614	334	273	1,696
Late PS	5.0	117	1,644	1,408	332	355	513
Very Late PS	1.0	23	419	577	311	316	473
Late SW	10.0	231	1,716	1,849	781	451	1,367
Very Late SW	2.0	46	1,057	1,422	701	401	665
Late 'other' Con	5.0	1,583	16,484	18,417	28,732	28,613	29,252
Very Late 'other' Con	1.0	317	7,188	10,516	23,851	28,340	28,901

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-30 E2 Gross Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

E2 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	124	1,867	1,784	529	199	199
Very Late Decid	2.0	50	483	1,024	340	191	199
Late DC	5.0	103	1,574	1,482	534	132	132
Very Late DC	2.0	41	578	830	312	132	132
Late CD	5.0	98	1,243	1,041	532	102	110
Very Late CD	2.0	39	234	558	343	89	95
Late PL	2.0	76	1,247	619	490	434	2,303
Very Late PL	1.0	38	359	412	41	75	1,830
Extremely Late PL	0.5	19	0	0	7	31	36
Late PS	10.0	62	458	292	71	100	158
Very Late PS	5.0	31	216	207	68	21	99
Extremely Late PS	2.5	16	0	0	9	19	21
Late SW	10.0	74	382	369	239	74	298
Very Late SW	5.0	25	83	147	178	56	141
Extremely Late SW	2.5	12	0	0	17	53	56
Late 'other' Con	10.0	165	787	669	553	759	852
Very Late 'other' Con	5.0	83	226	291	403	505	815
Extremely Late 'other' Con	2.5	41	0	0	127	393	505

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-31 W5 Gross Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

W5 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	922	8,114	9,103	4,621	3,391	1,858
Very Late Decid	1.0	184	1,064	1,002	1,278	1,741	1,858
Late DC	5.0	220	2,560	2,949	1,793	860	2,210
Very Late DC	1.0	44	273	543	1,144	371	380
Late CD	5.0	273	1,493	1,380	1,042	1,486	1,126
Very Late CD	1.0	55	317	762	602	369	548
Late PL	5.0	188	1,549	877	266	511	1,640
Very Late PL	1.0	38	456	545	116	187	1,486
Late PS	5.0	35	542	414	143	99	280
Very Late PS	1.0	7	184	259	96	67	191
Late SW	10.0	167	1,020	1,270	711	286	1,211
Very Late SW	2.0	33	161	698	530	272	621
Late 'other' Con	5.0	959	8,495	10,069	17,782	17,929	18,096
Very Late 'other' Con	1.0	192	2,003	4,515	11,763	17,386	17,761

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-32 W6 Gross Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

W6 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	2,007	21,362	23,807	8,268	6,746	3,678
Very Late Decid	1.0	401	6,617	4,726	3,974	3,479	3,678
Late DC	5.0	725	8,458	8,976	4,131	3,427	1,615
Very Late DC	1.0	145	3,073	2,637	3,228	1,152	1,237
Late CD	5.0	1,020	7,174	6,286	4,576	1,751	2,187
Very Late CD	1.0	204	2,968	4,348	2,582	1,174	1,744
Late PL	5.0	1,234	17,786	13,060	1,634	4,307	11,594
Very Late PL	1.0	247	1,682	9,921	1,180	1,231	9,982
Late PS	5.0	217	2,667	2,271	799	666	1,056
Very Late PS	1.0	43	1,073	1,400	599	399	597
Late SW	10.0	1,259	4,805	6,097	3,993	2,010	3,801
Very Late SW	2.0	252	2,246	3,273	3,578	1,345	2,175
Late 'other' Con	5.0	3,810	46,445	52,146	62,880	66,619	66,835
Very Late 'other' Con	1.0	762	17,728	34,919	59,318	61,660	65,743

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-33 W6 Gross Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

W6 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	31	477	205	49	357	63
Very Late Decid	2.0	13	144	182	49	49	63
Late DC	5.0	17	258	200	34	223	52
Very Late DC	2.0	7	109	171	34	20	25
Late CD	5.0	49	224	173	213	51	256
Very Late CD	2.0	20	4	117	42	29	48
Late PL	2.0	87	4,266	2,726	165	1,395	3,185
Very Late PL	1.0	43	164	1,743	164	151	2,725
Extremely Late PL	0.5	22	0	0	0	151	54
Late PS	10.0	12	115	97	17	33	38
Very Late PS	5.0	6	37	74	17	17	21
Extremely Late PS	2.5	3	0	0	1	17	17
Late SW	10.0	31	165	160	87	67	185
Very Late SW	5.0	10	15	144	80	60	126
Extremely Late SW	2.5	5	0	0	2	60	60
Late 'other' Con	10.0	908	5,937	5,893	6,192	8,390	8,597
Very Late 'other' Con	5.0	454	2,486	4,477	6,100	6,155	8,509
Extremely Late 'other' Con	2.5	227	2,486	4,477	6,100	6,155	8,509

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-34 E1 Net Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

E1 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	351	3,694	2,907	531	291	0
Very Late Decid	1.0	70	2,090	1,647	0	0	0
Late DC	5.0	282	2,891	2,328	1,136	16	0
Very Late DC	1.0	56	1,782	1,583	0	0	0
Late CD	5.0	559	3,845	3,181	1,523	1,328	2,944
Very Late CD	1.0	112	358	2,728	871	0	4
Late PL	5.0	1,105	14,788	10,768	1,202	1,858	8,234
Very Late PL	1.0	221	362	8,292	0	0	7,275
Late PS	5.0	188	3,291	2,401	264	297	886
Very Late PS	1.0	38	466	2,104	264	0	306
Late SW	10.0	301	2,265	2,008	309	195	1,625
Very Late SW	2.0	60	1,314	1,917	309	0	541
Late 'other' Con	5.0	2,398	3,292	2,794	869	32	1,675
Very Late 'other' Con	1.0	480	498	1,811	391	0	843

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-35 E1 Net Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

E1 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	4	79	69	0	0	0
Very Late Decid	2.0	2	28	19	0	0	0
Late DC	5.0	3	47	39	16	0	0
Very Late DC	2.0	1	43	35	16	0	0
Late CD	5.0	3	59	59	40	0	0
Very Late CD	2.0	1	0	41	40	0	0
Late PL	2.0	2	117	65	0	20	60
Very Late PL	1.0	1	1	58	0	0	60
Extremely Late PL	0.5	1	0	0	0	0	0
Late PS	10.0	3	26	20	10	4	12
Very Late PS	5.0	1	0	20	10	0	4
Extremely Late PS	2.5	1	0	0	0	0	0
Late SW	10.0	1	9	9	6	0	9
Very Late SW	5.0	0	0	9	6	0	0
Extremely Late SW	2.5	0	0	0	0	0	0
Late 'other' Con	10.0	10	17	11	0	0	2
Very Late 'other' Con	5.0	5	7	11	0	0	2
Extremely Late 'other' Con	2.5	3	0	0	0	0	0

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-36 E2 Net Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

E2 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	1,594	18,474	17,238	5,398	3	0
Very Late Decid	1.0	319	5,991	6,715	1,703	0	0
Late DC	5.0	387	5,353	5,179	714	0	0
Very Late DC	1.0	77	2,104	2,301	401	0	0
Late CD	5.0	460	3,845	3,181	1,523	1,328	2,944
Very Late CD	1.0	92	358	2,728	871	0	4
Late PL	5.0	291	14,788	10,768	1,202	1,858	8,234
Very Late PL	1.0	58	11	488	0	0	1,540
Late PS	5.0	117	1,423	1,139	16	39	135
Very Late PS	1.0	23	379	454	3	0	96
Late SW	10.0	231	1,477	1,553	380	50	965
Very Late SW	2.0	46	944	1,248	357	0	264
Late 'other' Con	5.0	1,583	1,293	1,156	396	224	670
Very Late 'other' Con	1.0	317	550	718	247	0	320

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-37 E2 Net Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

E2 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	124	1,703	1,610	338	0	0
Very Late Decid	2.0	50	463	906	166	0	0
Late DC	5.0	103	1,469	1,367	402	0	0
Very Late DC	2.0	41	546	751	197	0	0
Late CD	5.0	98	1,177	976	444	4	16
Very Late CD	2.0	39	225	520	269	0	0
Late PL	2.0	76	117	65	0	20	60
Very Late PL	1.0	38	345	373	5	0	1,735
Extremely Late PL	0.5	19	0	0	0	0	0
Late PS	10.0	62	438	272	45	78	136
Very Late PS	5.0	31	207	191	45	0	78
Extremely Late PS	2.5	16	0	0	0	0	0
Late SW	10.0	74	362	349	214	49	274
Very Late SW	5.0	25	76	136	156	31	117
Extremely Late SW	2.5	12	0	0	10	31	31
Late 'other' Con	10.0	165	424	298	48	240	314
Very Late 'other' Con	5.0	83	101	83	10	0	277
Extremely Late 'other' Con	2.5	41	0	0	4	0	0

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-38 W5 Net Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

W5 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	922	7,284	7,826	2,909	1,533	0
Very Late Decid	1.0	184	954	737	0	0	0
Late DC	5.0	220	2,317	2,645	1,422	479	1,830
Very Late DC	1.0	44	240	469	840	0	0
Late CD	5.0	273	1,339	1,201	715	993	578
Very Late CD	1.0	55	297	666	349	0	0
Late PL	5.0	188	1,431	755	31	324	1,489
Very Late PL	1.0	38	430	466	0	0	1,376
Late PS	5.0	35	494	359	76	32	203
Very Late PS	1.0	7	174	223	43	0	114
Late SW	10.0	167	864	1,057	439	13	939
Very Late SW	2.0	33	134	581	297	0	349
Late 'other' Con	5.0	959	697	637	397	517	607
Very Late 'other' Con	1.0	192	179	282	252	0	272

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-39 W6 Net Area (ha) of Older Seral Stages in the Lower Foothills Natural Subregion

W6 Lower Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	2,007	19,631	20,976	4,971	3,068	0
Very Late Decid	1.0	401	421	148	0	294	0
Late DC	5.0	725	7,758	7,988	3,022	2,190	378
Very Late DC	1.0	145	2,857	2,365	2,241	0	0
Late CD	5.0	1,020	6,585	5,553	3,409	70	443
Very Late CD	1.0	204	2,736	3,879	1,711	0	0
Late PL	5.0	1,234	16,377	11,620	196	3,021	10,233
Very Late PL	1.0	247	1,535	8,762	14	0	8,728
Late PS	5.0	217	2,454	1,992	400	265	557
Very Late PS	1.0	43	1,002	1,221	296	0	98
Late SW	10.0	1,259	4,176	5,252	2,674	608	2,399
Very Late SW	2.0	252	1,959	2,758	2,496	0	772
Late 'other' Con	5.0	3,810	4,093	3,346	1,231	1,820	1,768
Very Late 'other' Con	1.0	762	949	2,196	1,034	0	676

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

Table 3-40 W6 Net Area (ha) of Older Seral Stages in the Upper Foothills Natural Subregion

W6 Upper Foothills	Target Minimum Area		Time from Start Date (years)				
Seral Stage	(%)	(ha)	0	10	50	100	160
Late Decid	5.0	31	421	148	0	294	0
Very Late Decid	2.0	13	134	134	0	0	0
Late DC	5.0	17	238	180	14	198	28
Very Late DC	2.0	7	102	153	14	0	0
Late CD	5.0	49	204	154	182	2	208
Very Late CD	2.0	20	3	109	22	0	0
Late PL	2.0	87	3,965	2,425	5	1,245	2,985
Very Late PL	1.0	43	155	1,532	5	0	2,533
Extremely Late PL	0.5	22	0	0	0	0	0
Late PS	10.0	12	97	79	0	17	20
Very Late PS	5.0	6	35	59	0	0	3
Extremely Late PS	2.5	3	0	0	0	0	0
Late SW	10.0	31	106	101	27	7	125
Very Late SW	5.0	10	13	85	20	0	66
Extremely Late SW	2.5	5	0	0	0	0	0
Late 'other' Con	10.0	908	597	490	37	2,157	2,305
Very Late 'other' Con	5.0	454	91	358	16	0	2,217
Extremely Late 'other' Con	2.5	227	0	0	0	0	0

PL = Pine, PS = Pine/White Spruce, SW = White Spruce

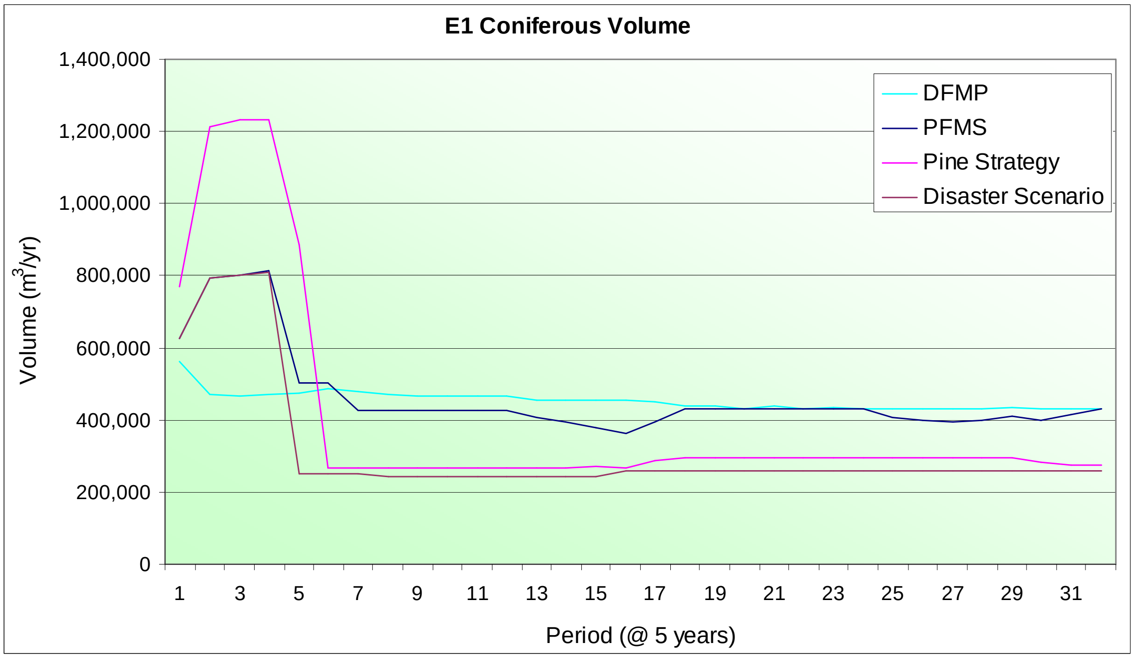
3.10 DFMP PFMS, MPB PFMS, Pine Strategy, and MPB Disaster Run Comparison

This section summarizes and compares harvest volumes and key indicators from the DFMP, MPB PFMS, Pine Strategy, and MPB Disaster runs.

3.10.1 Harvest Volumes

Figure 3-36 through Figure 3-39 show the patterns of coniferous and deciduous harvest flows over the planning horizon for all four FMUs.

The disaster scenario overlaps the MPB PFMS scenario for the first four periods for primary volumes. Conifer harvest levels decline in FMU E1 as a result of the disaster scenario as shown in Figure 3-36. The disaster scenario in period 5 (252,572 m^3) reduced the average conifer harvest by 50% compared to the MPB PFMS scenario (502,572m^3), 71% compared to the pine strategy scenario (885,608 m^3) and 46% compared to the DFMP (474,885 m^3).



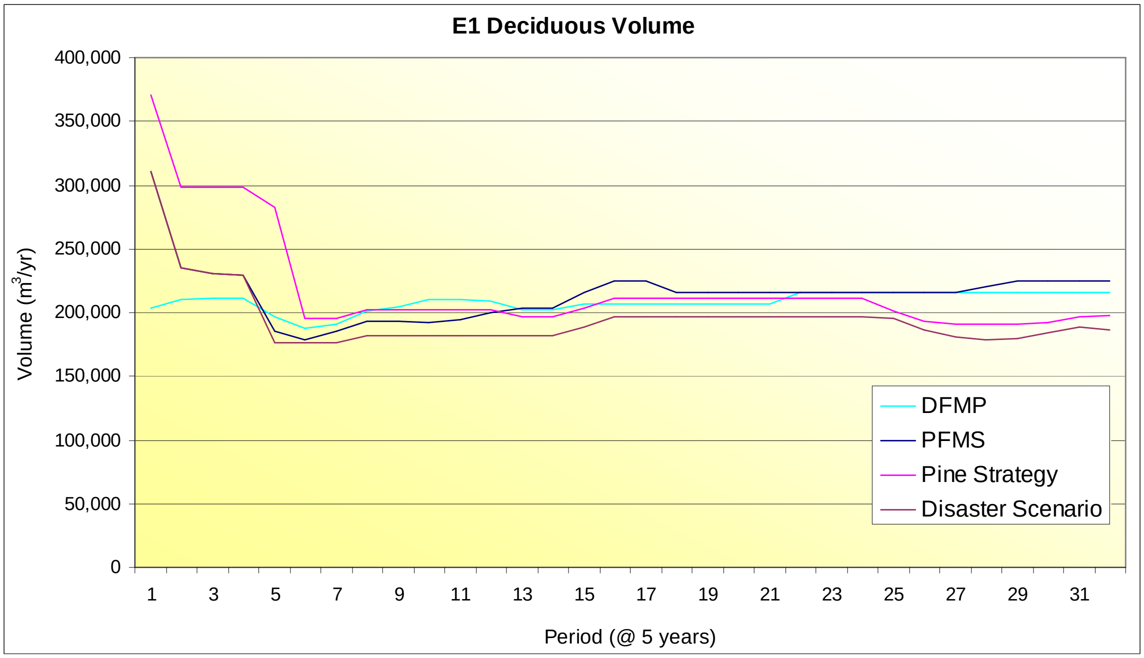
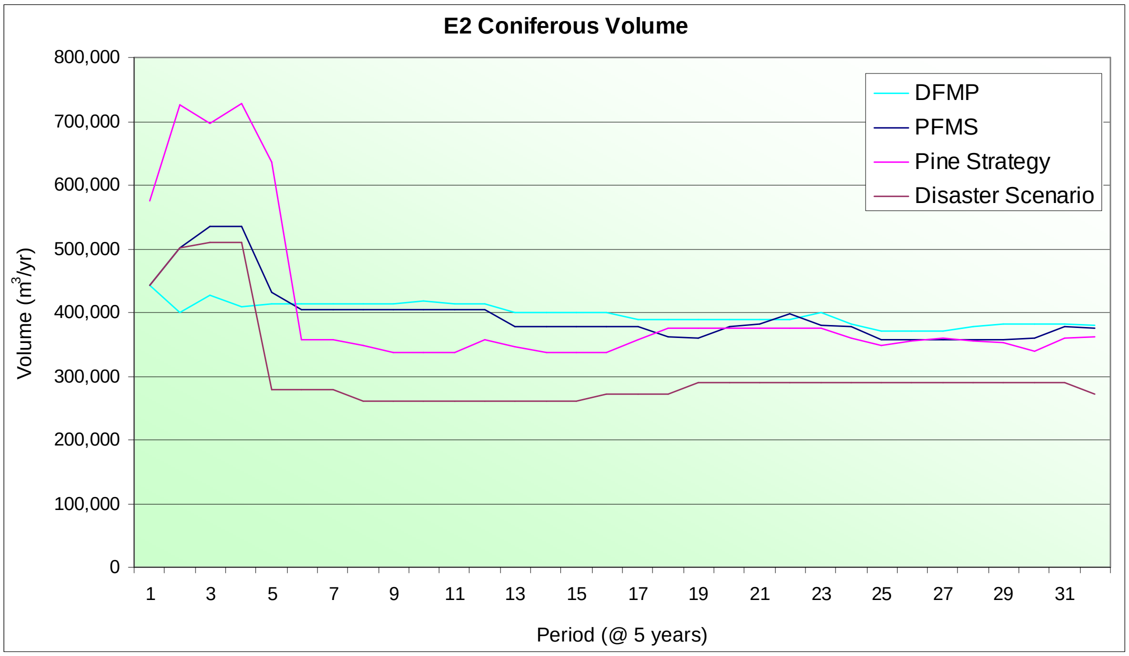


Figure 3-36 FMU E1 Average Annual Total Conifer and Deciduous Harvest Volumes

In FMU E2 (Figure 3-37), the disaster scenario in period 5 (278,338 m^3) reduced the average conifer harvest by 35% compared to the MPB PFMS scenario (430,361 m^3), 56% compared to the pine strategy scenario (636,811 m^3) and 33% compared to the DFMP (412,889 m^3).



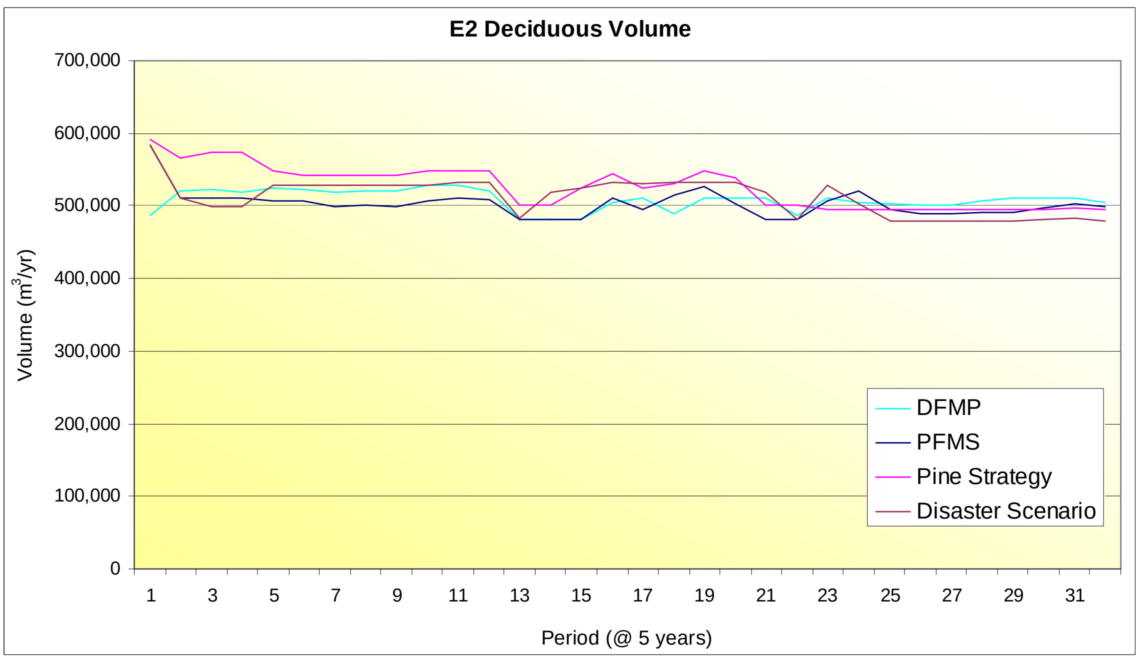
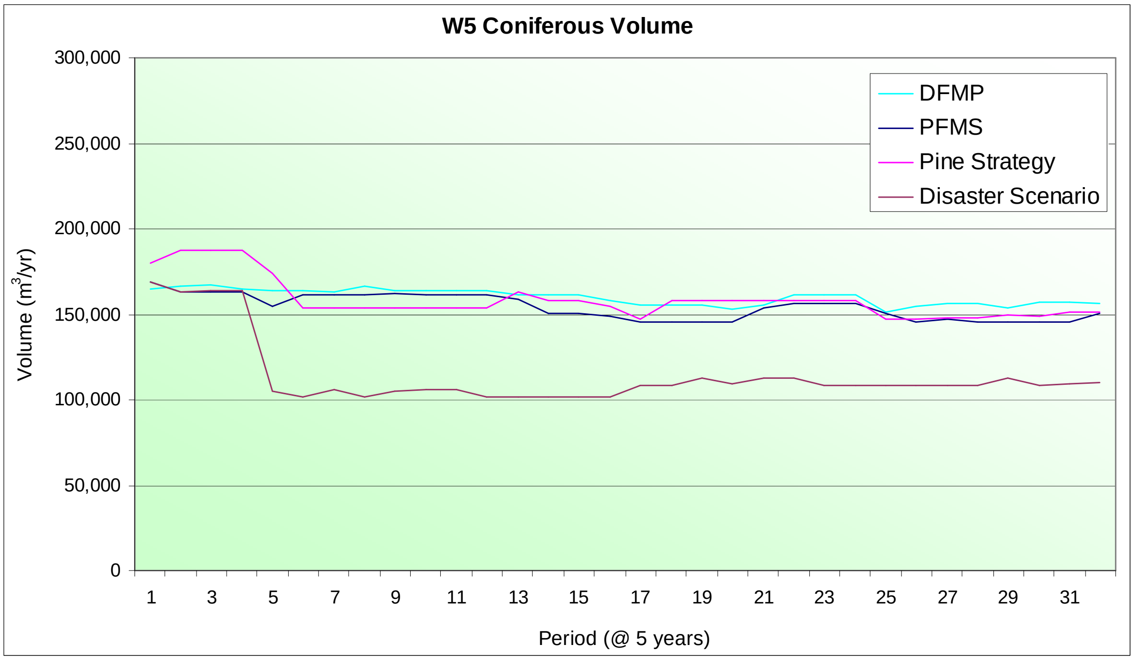


Figure 3-37 FMU E2 Average Annual Total Conifer and Deciduous Harvest Volumes

In FMU W5 (Figure 3-38), the disaster scenario in period 5 (504,597 m^3) reduced the average harvest by 32% compared to the MPB PFMS scenario (154,685 m^3), 40% compared to the pine strategy scenario (173,791 m^3) and 36% compared to the DFMP (163,612 m^3).



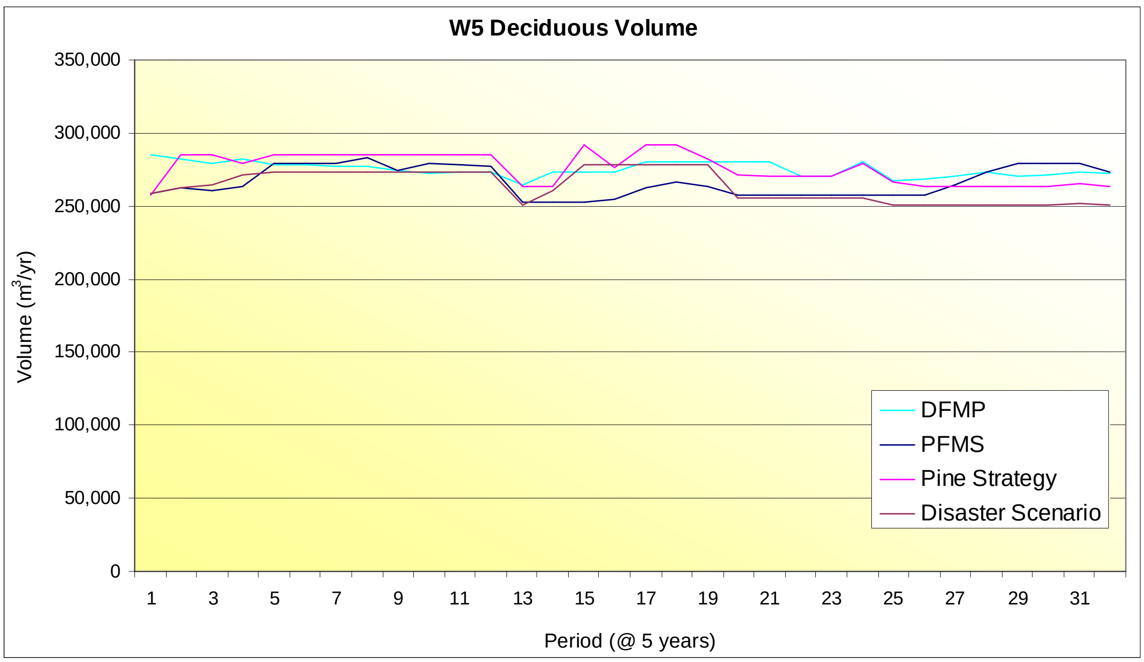


Figure 3-38 FMU W5 Average Annual Total Conifer and Deciduous Harvest Volumes

In FMU W6 (Figure 3-39), the disaster scenario in period 5 (504,597 m^3) reduced the average conifer harvest by 43% compared to the MPB PFMS scenario (892,356 m^3), 63% compared to the pine strategy scenario (1,370,041 m^3) and 44% compared to the DFMP (904,407 m^3).

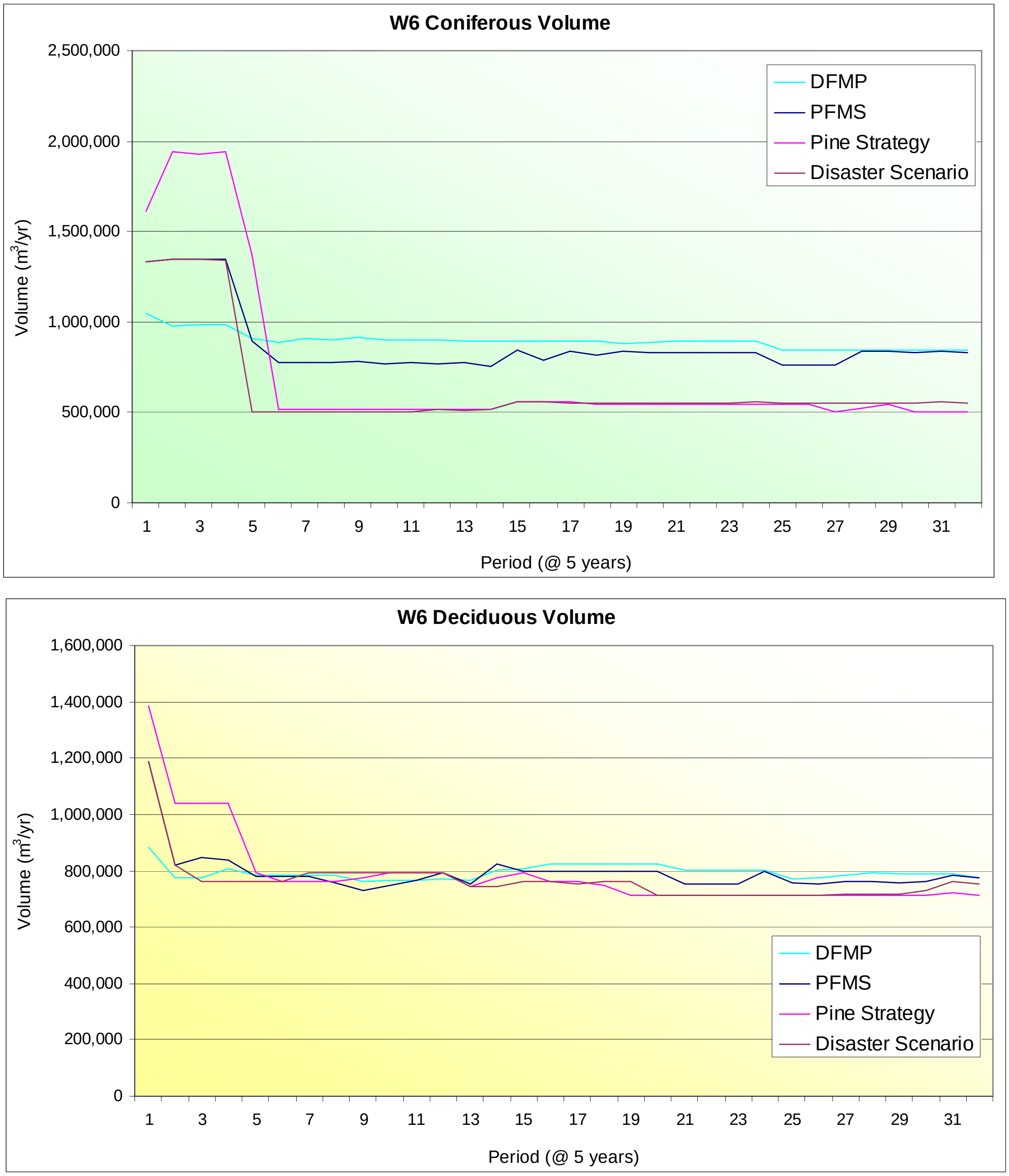


Figure 3-39 FMU W6 Average Annual Total Conifer and Deciduous Harvest Volumes

The MPB disaster scenario model indicates no significant changes to the deciduous harvest levels in all four FMUs. There is a slight increase in deciduous harvest in both the disaster scenario and the pine strategy compared to the MPB PFMS in periods 5 through 26.

3.10.2 Key Indicators

Table 3-41 through Table 3-44 summarizes the average harvested volume per hectare, harvest age, and piece size for each FMU area. The significant change between the 4 scenarios is the difference in volume harvested per hectare in conifer stands. In all four FMUs, the disaster scenario and the pine strategy results in a drop in conifer volume harvested per hectare over the planning period when compared to both the DFMP PFMS and the MPB PFMS. There is very little change in the MPB disaster scenario harvest age or piece size compared to the DFMP PFMS, MPB PFMS and pine strategy scenarios in all four FMUs (except for conifer volume harvested per hectare which is lower in the DFMP scenario compared to the other 3 scenarios).

Table 3-41 FMU E1 Comparison of Key Indicators by Land Base (160 yr averages)

Scenario	Area Weighted Harvest Age (Yrs)		Average Volume Per Ha Harvested (m^3/ha)		Average harvested piece size (DBHq cm)		Area Harvested per Period (ha)	
	Conifer	Decid	Conifer	Decid	Conifer	Decid	Conifer	Decid
DFMP	111	92	175	119	23	26	2,120	1,186
PFMS	90	95	211	198	22	26	2,144	1,125
Pine Strategy	108	88	219	198	23	25	1,723	1,232
Disaster Scenario	112	90	203	193	23	25	1,399	1,204

Table 3-42 FMU E2 Comparison of Key Indicators by Land Base (160 yr averages)

Scenario	Area Weighted Harvest Age (Yrs)		Average Volume Per Ha Harvested (m^3/ha)		Average harvested piece size (DBHq cm)		Area Harvested per Period (ha)	
	Conifer	Decid	Conifer	Decid	Conifer	Decid	Conifer	Decid
DFMP	105	89	175	137	23	26	1,204	3,307
PFMS	90	88	216	191	23	25	1,172	3,427
Pine Strategy	97	86	220	195	23	25	1,139	3,409
Disaster Scenario	102	88	203	191	23	26	825	3,447

Table 3-43 FMU W5 Comparison of Key Indicators by Land Base (160 yr averages)

Scenario	Area Weighted Harvest Age (Yrs)		Average Volume Per Ha Harvested (m^3/ha)		Average harvested piece size (DBHq cm)		Area Harvested per Period (ha)	
	Conifer	Decid	Conifer	Decid	Conifer	Decid	Conifer	Decid
DFMP	102	81	133	166	23	25	907	1,294
PFMS	92	80	200	198	23	25	832	1,311
Pine Strategy	90	81	202	201	23	25	863	1,316
Disaster Scenario	105	80	193	200	23	26	625	1,318

Table 3-44 FMU W6 Comparison of Key Indicators by Land Base (160 yr averages)

Scenario	Area Weighted Harvest Age (Yrs)		Average Volume Per Ha Harvested (m^3/ha)		Average harvested piece size (DBHq cm)		Area Harvested per Period (ha)	
	Conifer	Decid	Conifer	Decid	Conifer	Decid	Conifer	Decid
DFMP	98	81	142	162	23	25	5,833	2,938
PFMS	85	82	208	196	23	25	5,226	3,022
Pine Strategy	94	80	216	197	23	25	4,315	3,056
Disaster Scenario	91	82	200	198	22	25	4,111	3,020

4 Implementation

The implementation plan will provide direction to adaptive forest management practices on the FMA, the benefits of which include:

1. Confidence in forest management practices by identifying variances between forecasted conditions and actual conditions;
2. Flexibility in adjustments to management for identified variances; and
3. Accumulation of an information base for continued improvement for future planning requirements.

The General Development Plan (GDP) and an Annual Operation Plan, guided by the Ground Rules, will be the planning documents within which the MPB plan will be implemented.

4.1 Timber Operations

4.1.1 Sequencing

Timber supply models (Woodstock and Stanley) will provide information on the shape, size, and distribution of harvest areas for the first twelve periods (60 years). Harvest areas identified through previous planning exercises (pre-planned) have been scheduled for harvest in period one or two (2004-2014).

The first planning period will commence on (May 1st, 2004). Variance tracking will commence from the effective date of the new AAC, or May 1, 2007.

For operational planning purposes, the spatial harvest sequence (SHS) for the first five periods will be utilized. It is expected that the SHS as submitted and approved, will be followed by all timber operators. Harvest areas are identified by operator for the first three periods of the DFMP.

There may be the opportunity to exchange blocks between operators if particular block do not fit a desired profile. This will occur during the operational planning stage and must be agreed to jointly.

4.1.2 Salvage

The Company has been using the normal industrial timber salvage tracking and reporting system for many years and it is our understanding that this remains acceptable to the Province. A percent proportional to the company's AAC of the estimated TDA volume for each FMU will be charged against Weyerhaeuser's Periodic Allowable Cut.

However, it is recognized by both industry and government that there may be opportunities to move away from the current status quo for the tracking and chargeability of timber salvage in order to address issues around the accuracy and appropriateness of methods. It is our understanding that the Alberta Forest Products Association and ASRD have agreed to look at alternatives to the current means as described above. We feel that it would be best to await the outcome of any industry – Government level review of this subject before we recommend any new methods to ASRD.

4.1.3 Green-up Constraints

Green-up constraints are not applied for any period in the TSA.

4.1.4 Silviculture

The Forest Management Agreement gives Weyerhaeuser the right to grow timber and carry out reforestation programs. The agreement also requires Weyerhaeuser to progressively reforest all land cut over by the Company. In addition, a goal of this management plan is to increase the sustainable harvest level of deciduous and coniferous timber from the FMA area. These rights, responsibilities, and goals are supported by a set of regeneration assumptions, silviculture strategies, and reforestation standards.

The provincial regeneration standards (C, CD, DC, D) will be used to evaluate the performance of regenerating harvest areas until alternative regeneration standards are developed and approved that specifically link regeneration standards to yield stratum. To use resources efficiently while maintaining relative proportions of coniferous, mixedwood, and deciduous stands, certain considerations apply to reforestation decisions including:

1. Site suitability and stand condition;
2. Declining deciduous stand condition and associated low natural regeneration potential;
3. Residual immature coniferous trees; and
4. Regenerating stand stocking and condition.

To effectively integrate these considerations into the operational decision making process while supporting the assumptions of future forest composition, an exchange of areas between different stand type strata following Provincial policy may be considered. There are not anticipated to be any major shifts in leading species across the landscape resulting from the implementation of the silviculture strategies description in the April, 2006 DFMP.

Immature coniferous understorey trees will be evaluated and considered in the operational decision making process. Retention of coniferous understorey in both deciduous and coniferous overstorey stands can contribute to regeneration objectives and availability of merchantable coniferous forests for mid-term (30-60 years) timber supply.

Harvested areas will be promptly reforested to sustain long term forest productivity. Planning regeneration activities prior to harvest and scheduling treatments as soon as logistically feasible after harvest will facilitate prompt regeneration. Planting and natural seeding will be used to establish coniferous seedlings. Where planting of coniferous seedlings is used to regenerate C, CD, and DC openings, a target of 1400, 1000, and 800 stems per hectare (SPH) will be used in prescribing planting density. For C stratum openings 1400 SPH is deemed adequate to meet the associated regeneration standard while accounting for normal levels of mortality. Where higher levels of mortality are suspected after planting, openings will be monitored to support early detection and remedial action. Distribution of seedlings for CD and DC openings can be either an even distribution of 1000 and 800 SPH respectively or concentrated higher density planting of an area proportionally less than the entire block. A typical application of this would be to plant the road and decking areas of a DC block at 1400 SPH to the extent that 60 percent of the block is planted. This equates to an average planting density of 840 SPH, which correspond with the guideline of a target of 800 SPH.

When establishing a planting density for specific openings, factors of pre-harvest understorey or post-harvest advanced regeneration and ingress potential will be considered. Ingress potential will be evaluated based on seed source and seedbed conditions. Target planting densities may be adjusted for specific site conditions in recognition of these factors. Adjusted planting densities will be presented in the Silviculture Annual Operating Plan.

All regenerating stands will pass an establishment standard. If an opening does not pass the establishment standard then one or more of the following tactics will be employed to address the failed status.

1. Re-treat using combinations of site preparation, planting, or tending;
2. Leave stands to grow where height performance is the cause for failure; or
3. Change the opening stratum declaration.

Balsam fir and alpine fir are considered an acceptable crop tree for coniferous species. Fir species constitute a part of the inventory and their presence is incorporated in the development of yield curves. Merchantable fir is utilized as a component of the coniferous harvest. Where understorey fir exists in an opening it is often retained to provide value in aesthetics, habitat, structure, and fibre production.

The primary harvesting system used is patch cutting with variable retention, with subsequent reforestation activities to provide for a sustainable timber harvesting land base. Patch cutting involves the removal of a majority of merchantable stems from the harvest area. As part of this harvesting system Weyerhaeuser will be employing the Stand Level Ecological Guidelines that provide for both vertical and horizontal structure to be left on the harvest area.

4.1.5 Incidental Timber Replacement Strategies on the FMA

The DFMP incorporates strategies within the Timber Supply Analysis that account for the primary and incidental components supporting the deciduous and coniferous annual allowable cuts. In general, all strata transition to similar strata of 'C' crown closure (equivalent to full stocking).

Silviculture strategies that support the maintenance of incidental species are identified for all strata (C, DC, CD, D, Switch stands and in-block temporary roads) in the approved plan.

Silviculture activities that contribute to the sustainability of the incidental components of the stands will be undertaken. These activities will be applied at various levels and will include:

1. Establishment of coniferous trees on new harvest areas that do not support deciduous regeneration, most notably on roads and non-satisfactorily restocked areas in deciduous (D) harvest areas;
2. Avoidance and planned protection of coniferous understorey during logging operations in predominately deciduous areas; and
3. Protection of some of the deciduous component in regenerating stands when tending coniferous harvest areas.

Review of establishment and performance survey results of pure 'C' and pure 'D' declared blocks will occur periodically to document the incidental replacement strategy effectiveness.

4.1.6 Corridor Planning

The FMA has been reviewed regarding corridor road plans. The appropriate map can be found in Appendix 10.

4.2 Landscape Strategies

4.2.1 Operational Planning Considerations

4.2.1.1 Stand retention

The retention of trees, snags and woody debris in harvest areas is a significant component of ecologically based forestry.

1. Retaining trees within harvest blocks creates areas that more closely mimic natural

disturbance conditions and can therefore help lessen the impact of logging on ecosystem structure and function. Individual trees, clumps and snags increase the structural diversity of the regenerating stand, retain some later seral conditions such as a multi-layered canopy, provide a future supply of large snags and down logs, and increase micro-site variability for a more diverse plant understorey. In block structure retention can also provide ecological sites (refugia) from which unaffected plant and animal species can disperse onto the surrounding harvest area.

2. Snags (dead trees) play a very important role in a functioning forest ecosystem. In addition to their value in recycling nutrients, snags provide habitat for many species of plants, invertebrates, birds and mammals. The absence of snags can be a major limiting factor for cavity nesting birds, influencing their occurrence and distribution. Retention of large snags on cut-over areas may provide effective habitat for cavity nesters.

3. Woody debris left in piles and dispersed over the block provides valuable hiding and nesting cover for a variety of small mammals. These piles also help reduce the amount of nutrients leaving the harvest area.

In order to achieve or maintain stand level structural diversity, the following general principles will be followed:

1. Safety is a primary concern and must be ensured at all times as noted in the Alberta Forest Products Association tree retention guidelines (Residual Trees in Harvest areas Guidelines).
2. Effort will be made to retain some form of vertical structure in most harvest areas.
3. The amount of retention within a harvest block is site specific and may vary as site conditions and site-specific objectives allow.

Wet sites, unmerchantable areas and understorey protection provide opportunities to retain various structural components (clumps, etc.) and contribute to stand diversity in the regenerating forest. This practice will also help to protect soil and sensitive sites that may harbor rare plants and small wildlife species.

Retention opportunities are available on a site-specific basis and depend on:

1. Pre-harvest stand condition;
2. Topography;
3. Identified values; and
4. Operational and economic feasibility.

Several retention options are available for consideration by the operations planner and supervisor:

1. Snags;
2. Single green trees;
3. Patches varying in size, shape and location of unmerchantable and merchantable trees; and
4. Coarse, down woody debris (including brush pile retention).

Merchantable retention can vary over a harvest area and retention targets are based on an average across the landscape. A monitoring program was established to assess the implementation of structure retention and to determine the amount of merchantable trees left on site. The monitoring program estimates the percent of merchantable volume retained on a block-by-block basis by sampling a sub set of all blocks harvested during a specific time period.

Past monitoring program results show that merchantable retention can vary from zero to ten percent or more. For E1, the target for merchantable retention is 8% and for the remaining FMUs, the target is 3% merchantable volume.

4.2.1.2 Recognition of areas of special importance to plants and wildlife species

In a forest ecosystem, many unique sites can host rare plant communities and/or species and provide habitat for small mammals, amphibians, reptiles, and invertebrate species. Where these sites (e.g., nest sites of raptors, large mineral licks) are identified, every effort will be made to integrate them into the forest management planning.

Structure retention can be prescribed for important wildlife habitat areas such as:

1. Recognized wildlife travel corridors ,
2. Important wildlife ranges, and
3. Identified fisheries.

The size and location of residual areas is governed by the need to provide a balance between protective cover and the desire to minimize disturbance.

4.2.1.3 Timing of operations in breeding bird habitat

To avoid impacts on most bird species, efforts will be made to avoid harvesting from May 1 to early July. The intent is to allow birds to reach the fledgling stage, thereby increasing their capacity to move away from any disturbance. If this is not operationally possible, the following will be done to minimize impacts on nesting birds:

1. Minimize the area harvested during this period to;
2. Harvest as late as possible in this period,

3. Delay harvesting in pure deciduous and mixedwood stands as much as possible; this would avoid the areas with the highest nesting activity; and
4. Prioritize pure conifer stands.

4.2.2 Grizzly Bear

The grizzly bear (*Ursus arctos*) is classified as 'may be at risk' in Alberta and as a species of 'special concern' by COSEWIC (Committee on the Status of Endangered Wildlife in Canada). The province is currently (June 2005) reviewing a draft version of the Grizzly Bear Recovery Plan. Included in the recovery plan are draft versions of the 'habitat' and 'mortality risk' maps. These maps have been made available to any interested parties and are available for the Pembina FMA's.

The maps are based on Resource Selection Functions (RSF) models. They describe areas of high habitat value for grizzly bears and areas of low mortality risk. The maps are intended to provide operational tools to adjust harvest designs (e.g. cut block shape and size) and road density and alignment. Resource Selection Maps could also be used in the future to help forecast habitat availability in prime areas, as identified in conjunction with Alberta Fish and Wildlife.

The distribution of grizzly bear habitat in the Weyerhaeuser Edson FMA is shown in Figure 4-1. Based on the calculated RSF's, the map indicates that there is very little high quality grizzly bear habitat within the Edson FMA. This was confirmed through consultation with biologists from Alberta Fish and Wildlife. Further discussions with Alberta Fish and Wildlife have determined that there is currently no need to pursue additional analysis on discreet areas within the FMA.

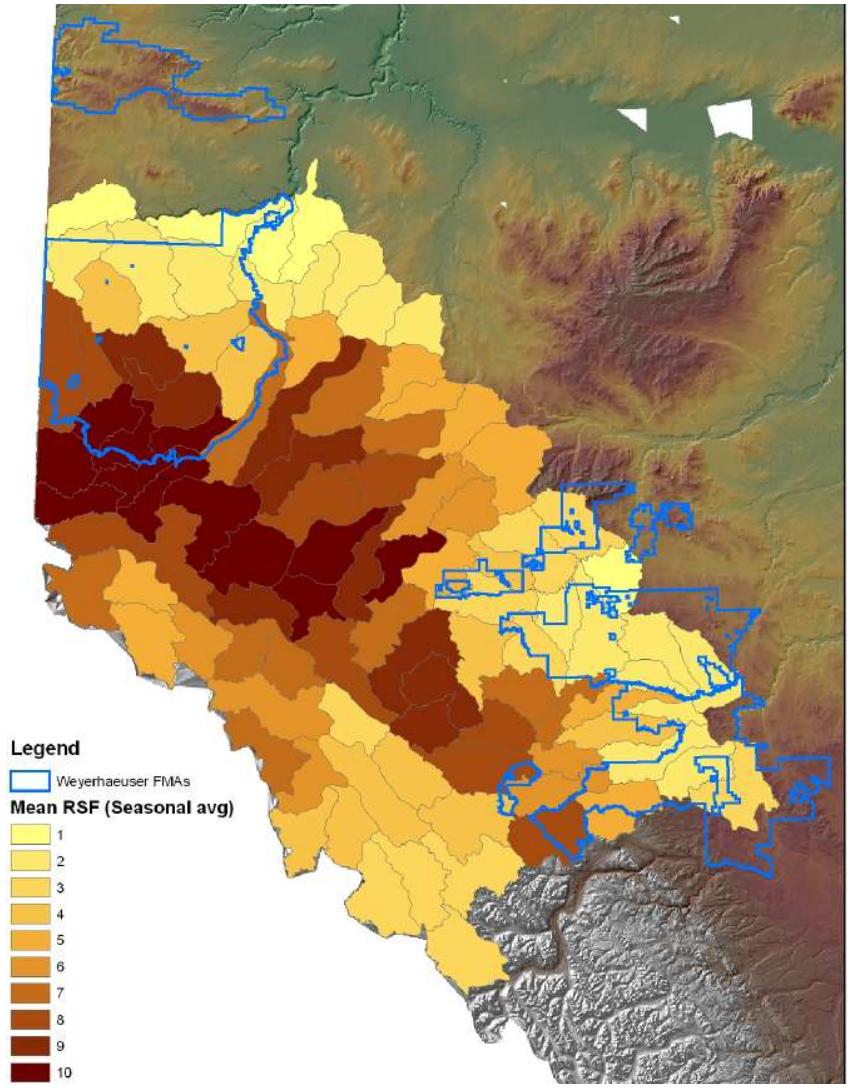


Figure 4-1 Distribution of Grizzly Bear Habitat

To ensure the existence of a viable population of grizzly bears on the Weyerhaeuser Edson FMA, it is of critical importance to reduce the overall amount of permanent access in prime grizzly bear habitat so to minimize bear mortality risk.

4.2.3 Trumpeter Swan

The approved net land base has taken into account know locations of Trumpeter Swan (*Cygnus buccinator*). Lake buffers were increased to 200 meters from the nominal 100 meters. The Pembina ground rules provide direction for planning and operating within vicinities of lakes known to have or have had populations of Trumpeter Swan.

4.3 Watersheds

The hydrologic effects of forest harvesting on water yield and watershed disturbance in Weyerhaeuser Canada's Edson Forest Management Area was assessed, by Watertight Solutions, using the ECA-AB model. Details of this analysis are provided in Appendix 3.

4.3.1 Methods

The ECA-AB model was used to evaluate water yield responses to the spatial harvest sequence (SHS) and was applied for the first 60 years (12 periods) of the planning horizon. Pre-SHS disturbances (natural and anthropogenic) were included in the ECA-AB model through the DFMP (April 2006) land base assignment. Average precipitation and water yield for each watershed was estimated from isolines for the FMA area. Long term average precipitation and water yield data from Environment Canada (2007) were used to build isolines for precipitation and water yield.

Percent watershed equivalent clearcut area (%ECA) for each watershed was based on basal area growth, using total watershed area for each ECA calculation. This approach was taken as it expresses the amount of disturbance within each watershed attributable to timber harvesting conducted by the Company. The effects of other land uses and disturbances (e.g. oil and gas development, roads) within each watershed were not included in these calculations.

Percent increase in water yield within the ECA-AB model is obtained by expressing the extra water generated by harvesting (i.e. reduction of evapotranspiration) as a percent of the average annual water yield for a watershed. Percent water yield increases therefore will tend to be smaller in areas of high water yield and greater in areas of low water yield.

Hydrologic recovery, the time for increased water yield to return to pre-disturbance levels, was assumed to occur when increases were ≤5%.

4.3.2 Summary of Results

Water yield increases varied from 21% in Granada Creek to <1 % in six different watersheds (Table 4-1). Average water yield increase for all watersheds in the FMA with increases >1% was 7.6%. Watersheds with no harvests were assumed to have zero increase in water yield.

Maximum annual water yield increases followed an increasing trend with percent watershed area harvested. Harvesting in the 4 watersheds with increases >15% averaged 60% with minimum and maximum values of 53% and 80%. The average area harvested for all watersheds was ~25% with minimum and maximum values of 0.06 and 80%. Increases in water yield of 15-25% are expected to have recurrence intervals less than 5 years and to fall within the range of natural variability for the region (i.e. mean water yield ± 0.5 standard deviations).

Watershed ECA in the Edson FMA ranged from a maximum of 41% to minimums < 1%. Watersheds with %ECA < 1% were considered as undisturbed (i.e. unharvested). Average %ECA for watersheds with water yield increases greater than 1% was 14%. Median %ECA was approximately 13%. Average %ECA corresponded to a water yield increase of about 7%.

Hydrologic recovery is the time for water yield increases to approach pre-disturbance levels. It was defined to occur when water yield increases were < 5%. Hydrologic recovery in the Edson FMA varied from 0 to 42 years, with an average time 14 years. Hydrologic recovery in 28 watersheds was zero because of low levels of harvesting and low water yield responses (i.e. < 5%).

Table 4-1 Water Yield Responses to Harvesting Edson FMA Ranked Maximum to Minimum

Watershed Name	Total Watershed Area km^2	% of Total Watershed Harvested	Maximum Annual % Increase Water Yield	Year of Maximum Increase	Maximum % Watershed ECA	Years to Hydrologic Recovery ΔQ ≤ 5%
Granada	21.85	80.17	21.17	2047	40.92	29
Chevron	23.66	52.38	19.9	2053	30.48	26
Cynthia	42.74	53.53	16.39	2064	27.48	15
Carrot Tower	44.56	53.69	14.17	2060	30.1	15
West Eta	133.98	55.72	14.02	2029	27.14	42
Mason	12.02	46.3	13.03	2063	28.5	11
Zeta	207.07	48.18	11.57	2023	22.84	31
Ladd	41.04	35.2	11.12	2019	22.56	12
Rat North	309.08	40.25	10.98	2029	21.35	28
Cricks	70.2	58	10.62	2062	28.06	11
Bigoray	472.54	33.01	10.17	2056	17.05	16
Sinkhole	146.74	37.08	10.16	2057	19.26	18
Raven	164.42	24.91	9.35	2022	15.72	18
Coyote	255.06	39.42	9.3	2024	19.65	22
Miller	20.39	34.66	8.31	2030	19.23	14
Rat South	178.17	39.1	7.77	2011	16.71	20
Graham	93.75	27.44	7.69	2030	12.27	12
Slide	46.82	40.84	7.48	2028	19.13	12
Paddy	238.95	31.5	7.2	2024	13.6	9
Rally	33.46	27.86	7.17	2063	14.94	5
Hardluck	152.59	24.85	7.14	2063	14.15	5
Deerhill	126.01	16.72	6.87	2063	9.33	4
Bear	193.7	33.11	6.79	2022	14.27	5
Moose	146.07	25.34	6.51	2058	15.31	8
Swartz	246.98	29.04	5.82	2064	16.08	1
Half Moon	198.68	29.11	5.81	2022	15.18	7
Sang	231.82	25.02	5.58	2028	12.7	2
Hinton	31.31	17.95	5.14	2049	12.94	0
Trout	15.23	26.46	5.03	2061	12.95	0
Oldman	147.59	21.96	4.97	2023	10.38	0
Minnow	149.5	23.86	4.94	2016	10.78	0
Carrot	278.09	18.71	4.88	2043	10.7	0
Kathleen	67.96	18.29	4.54	2024	9.24	0
Erith	316.43	23.79	4.48	2024	11.08	0
Tom Hill	104.53	23.84	4.38	2057	12.36	0
Shiningbank	78.47	10.1	4.06	2053	6.2	0
Fairless	31.89	19.59	4.04	2047	10.03	0
Groat	26.15	10.84	3.76	2045	6.28	0
Whitefish	156.71	18.51	3.4	2024	8.12	0
Obed	124.99	17.49	3.36	2039	8.02	0
Sundance	392.22	13.32	3 .07	2048	7.51	0
East Pembina	843.94	12	2.12	2023	5.26	0
Edson	328.95	7.19	1.86	2063	4.15	0
Lobstick	827.05	8.01	1.81	2064	3.79	0
Poison	250.52	7.43	1.77	2054	3.82	0
Pembina	818.69	6.48	1.69	2023	3.06	0
Paddle	154.97	4.66	1.49	2064	2.55	0
Cairn	167.73	4.98	1.47	2054	3.61	0
McLeod	1460	8.82	1.4	2049	4.77	0
Athabasca	302.35	2.76	0.75	2058	1.89	0
Embarras	206.85	3.22	0.7	2008	1.65	0
Fickle	151.48	3.37	0.55	2052	1.67	0
Edson North	99.78	0.56	0.25	2008	0.35	0
Hanlan	128.14	0.26	0.1	2026	0.21	0
Chip	40.15	0.06	0.06	2049	0.47	0

4.4 Grazing

In June of 2006, ASRD released the Grazing Timber Integration Manual (Appendix 7). Weyerhaeuser follows this manual on all planning and harvesting areas overlapped by grazing dispositions (permits and leases) being managed by Weyerhaeuser Pembina Forestlands staff.

Timber operators and the grazing disposition holder(s) will develop joint Grazing-Timber Agreements (GTA). These agreements set periods and/or conditions for the integration of harvesting and grazing. These agreements also provide several principles to assist in integration; as well as cost sharing of any activities (cross fencing projects) that would assist in mitigating any impacts on either party, and scheduled joint inspections (before, during, and after operations). These agreements are signed off by both parties prior to commencing operations and become part of the operating conditions for each disposition holder.

Recently a Regional Grazing Plan was approved which covers a large portion of the FMA as well as the quota area. This plan will direct the issuance of all new grazing applications within the plan area and provide a dispute resolution mechanism.

4.5 Forest Protection and Health

4.5.1 Insects and Disease

Weyerhaeuser is part of the Northern East Slopes Region Integrated Pest Management Working Group. Weyerhaeuser has an insect and disease coordinator that participates in provincial meetings on insects and disease. These forums provide an opportunity for discussion of issues related to insects and disease. This is especially important because of the gap that has been created because the Canadian Forest Service's Forest Insect and Disease Survey (FIDS) has been stopped. This puts an onus on the forest industry and ASRD to address insect and disease monitoring.

ASRD has supplied Weyerhaeuser with a number of "Insect & Disease Report Card" forms (FP213A) to be used by field crews undertaking a number of surveys on the FMA. This would include the establishment of permanent sample plots, temporary sample plots, and regeneration surveys. The insect and disease coordinator will collect all reports as they are completed. Significant outbreaks are reported to ASRD as encountered.

Weyerhaeuser will also work with the Forest Management Branch in a co-operative effort as they implement their forest pest monitoring program, which has been strengthened to fill the gap left by the cessation of FIDS. Aerial surveys for defoliation and surveys with pheromones have been the main monitoring tools used by the Forest Health Branch.

In 2007, Weyerhaeuser, in cooperation with ASRD, placed a total of 27 baits on the Pembina FMA's (20 in Edson, 7 in Drayton Valley) based on the Provincial grid pattern. No Mountain Pine Beetle hits were recorded.

During the 2007/08 block layout season, pitch tubes were noted on two trees, one on each FMA (Edson and Drayton Valley). Both were checked, and it was determined that neither was a result of Mountain Pine Beetle attack.

4.6 Ground Rule Development

During 2006, Weyerhaeuser, overlapping timber operators, and ASRD developed a new set of Operating Ground Rules for the Pembina (Edson and Drayton Valley) FMA's. The new Provincial template was used to develop the Ground Rules. The final set of ground rules were approved for use on March 1, 2007.

5 Performance Monitoring– VOIT's

Performance monitoring will be undertaken that reflects current Values, Objectives, Indicators and Targets (VOIT's) as identified by Provincial minimums or objectives within the approved DFMPs.

The following VOITs were updated based on the MPB TSA:

Edson : 1, 2, 3 and 5 (See Appendix 8)

Performance reporting occurs in two formats; an annual report, and a five-year stewardship report.

5.1 Annual Performance Monitoring Reports

The annual performance report presents the planning and operating activities in the previous year. It also tracks cumulative results from the time of DFMP implementation (May 1, 2006). The Stewardship report will be due November 1, 2011.

The content of the annual performance report may be adjusted from time to time, at the start of a tracking year, upon mutual agreement between Weyerhaeuser, ASRD, and the other timber operators.

Information summarized below will also be provided by ASRD and other timber operators on the Edson FMA.

The report will include, but will not be limited to, the following:

1. Summary of reforestation activities (area of site preparation, number of seedlings planted, area of stand tending, area of chemical treatments (by application type)) by operating year.
2. Cumulative variance of the SHS by LMU (from GDP) by operating year.
3. Summary of inventory work (timber and non-timber) including PSP's and TSP's, wildlife and fisheries, by calendar year.
4. List of research (includes annual report of summary of expenditures of $0.25 per meter of drain by Weyerhaeuser) by operating period.
5. Summary of public involvement initiatives.

5.2 Stewardship Report Contents

5.2.1 Purpose

The purpose of the Stewardship Report is to:

1. Summarize the previous five annual reports;
2. Discuss opportunities for change or adjustments in forest management practices that have been identified;
3. Provide the public with an overall assessment of the DFMP progress, i.e. “Are we doing what we said we would do?”
4. Identify deviations to the approved plan;
5. Undertake analysis of unacceptable deviations as identified by the Company and Alberta; and
6. Provide corrective actions.

5.2.2 Content

The content of the Stewardship Report may be adjusted over time with mutual agreement between ASRD and the Company. Therefore, the Report will include, but may not be limited to the following DFMP indicators and the TSA assumptions:

1. Identify emerging trends or issues;
2. Identify deviations from the approved plan;
3. Track all variances to the SHS from the effective date of May 1, 2007; where the 20% threshold (by LMU, by decade) is exceeded, an assessment will be made to identify the impacts to the affected objectives and resulting AAC implications;
4. Describe any analysis that has been undertaken of deviations; and
5. Describe the corrective actions to be taken.

6 Future Considerations: Alternative Regeneration Standards

Weyerhaeuser has communicated a commitment to pursue alternative regeneration standards (ARS) for FMA operations in Alberta. Weyerhaeuser is actively pursuing the development of ARS in cooperation with Canadian Forest Products and in consultation with Alberta Sustainable Resource Development. Incremental components of an ARS will be applied as they are developed and approved by ASRD. Completion of ARS by May 1, 2010 has been agreed to with ASRD. In accordance with agreements with ASRD, once these alternative regeneration standards are approved, they will be used to evaluate regeneration performance until 2010. Any adjustment in harvest levels associated with regeneration performance will be deferred until 2010.

7 References

ASRD 2006a. Mountain Pine Beetle Action Plan for Alberta. A publication by Alberta Sustainable Resource Development. ISBN 0-7785-4819-8. September 2006.

ASRD 2006b. Interpretive Bulletin, Planning Mountain Pine Beetle Response Operations. A publication by Alberta Sustainable Resource Development. Version 2.6. September 2006.

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Weyerhaeuser. April 2006. Detailed Forest Management Plan. Volume II.

Appendix 1: Woodstock™ Setup

Appendix 2: Determining Harvest Levels in MPB PFMS

Appendix 3: Watershed Analysis

Appendix 4: Map of Spatial Harvest Sequence

Appendix 5: Timber Allocation Tables

Appendix 6: Data Dictionary

Appendix 7: Grazing and Timber Integration Manual – June 2006

Appendix 8: VOITs

Appendix 9: Adjustment Factor for Conifer 15/13 Utilization in Edson FMA

Appendix 10: Supporting Maps