FMU C5

FOREST MANAGEMENT PLAN

Development of the Preferred Forest Management Scenario

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EXECUTIVE SUMMARY

A timber supply analysis (TSA) for the C5 Forest Management Unit (FMU) was completed by The Forestry Corp. at the request of Alberta Sustainable Resources Development (SRD) for the 2006 C5 FMU Forest Management Plan (FMP). This analysis determined a preferred forest management scenario with a sustainable conifer harvest level from the managed landbase and a listing of stands selected for harvest in the next 20 years within the C5 FMU.

This analysis was completed under the direction of the Planning Team, which consisted of SRD employees responsible for the development of the 2006 C5 FMU Forest Management Plan. The Planning Team provided the input parameters for the TSA scenarios, identified the condition of the desired future forest, reviewed results of interim TSA scenarios and made the final decisions for the development of the preferred forest management scenario. The timber supply analysis met the requirements of the *Alberta Forest Management Planning Standard Version 3 – June 2005* (Forest Management Branch 2005a).

The input parameters to the timber supply models included a classified landbase, yield curves and TSA management assumptions. The most comprehensive and up-to-date information available was used to develop the inputs.

The preferred forest management scenario was compared to the desired future forest, which had the following objectives:

- Maintain biodiversity;
- Reduce mountain pine beetle susceptibility;
- Reduce risk of large fires; and
- Maintain a sustainable harvest level.

Many TSA scenarios were analyzed during the development of the preferred forest management scenario. Initial TSA parameters were modified as results from interim scenarios were reviewed. Sensitivity analysis was completed for critical assumptions used in the timber supply analysis.

A 200-year spatial analysis was completed using the timber supply tool Patchworks, which modeled a conifer harvest level and a 20-year harvest sequence. This analysis utilized a divided landbase approach where only the conifer timber harvesting landbase was available for forest harvest activities, and only conifer volume was reported.

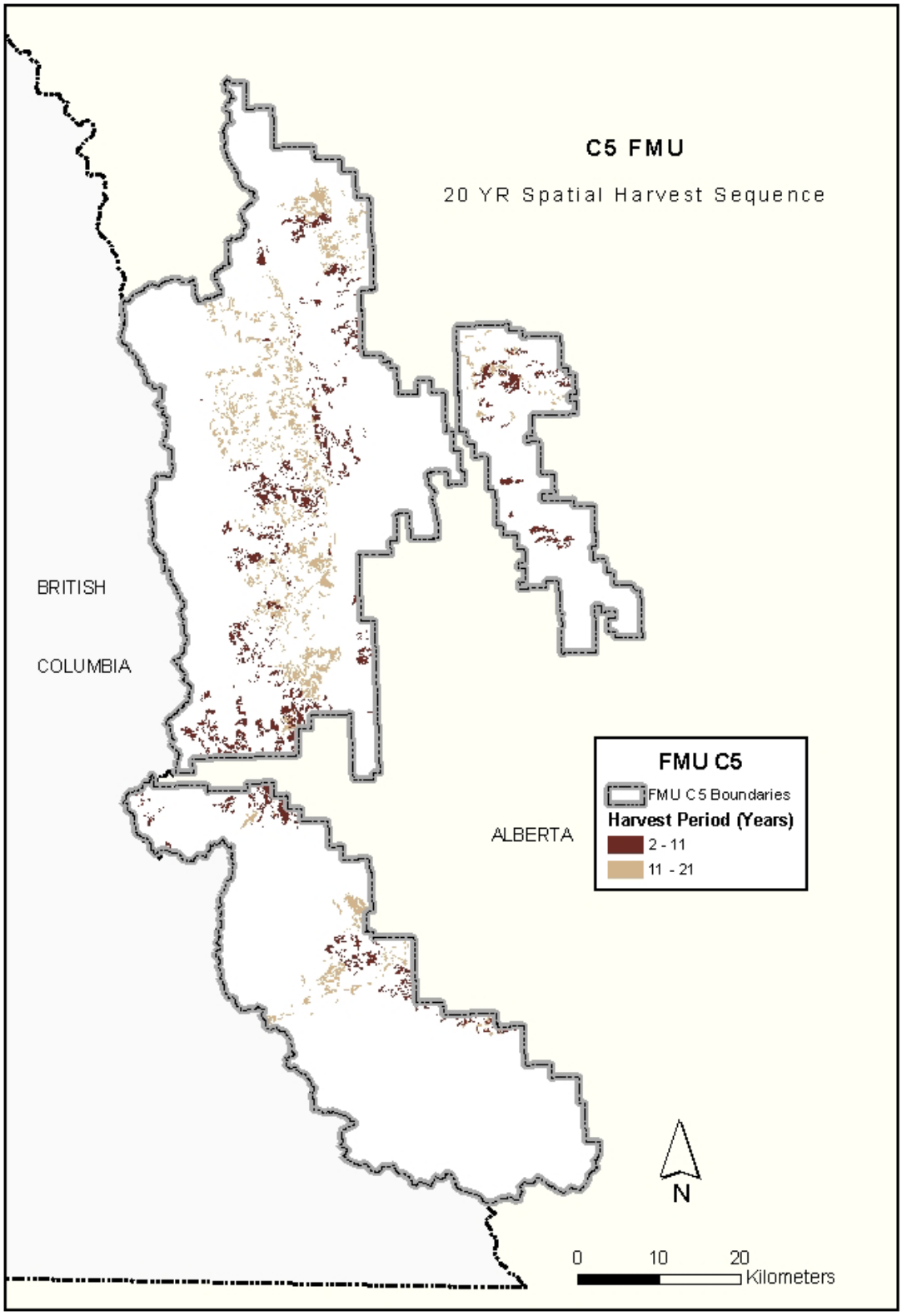
The conifer harvest volume from the preferred forest management scenario is in Table 1-1. The volumes are net, at 15/11 utilization, and include all conifer tree species. Reductions of 3% for stand structure retention and 2.6% for cull have been removed from the reported volumes.

Table 1-1: Harvest volumes from the preferred forest management scenario.

Effective Dates	Conifer Harvest Level
May 1, 2006 to April 30, 2026	209,414 m^3/yr at 15/11
May 1, 2026 to April 30, 2206	157,140 m^3/yr at 15/11
May 1, 2006 to April 30, 2011[1]	143,000 m^3 at 15/11

[1] Carryover

Figure 1-1 is a map of the 20-year spatial harvest sequence.



Note: Harvest period 2-11 corresponds to May 1, 2006 to April 30, 2016.
Harvest period 11-21 corresponds to May 1, 2016 to April 30, 2026.

Figure 1-1: 20-year spatial harvest sequence from the preferred forest management scenario.

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1. Introduction

1.1 Process Overview

The Forestry Corp. was retained by Alberta Sustainable Resource Development (SRD) to develop a preferred forest management scenario (PFMS) for the C5 Forest Management Unit (FMU). The development of the preferred forest management scenario was the last step in the timber supply analysis (TSA), which also included the determination of the timber harvesting landbase and the development of yield estimates. The TSA was required for the 2006 C5 FMU Forest Management Plan (FMP).

The landbase classification and development of timber yield curves are documented in detail in separate reports entitled *Landbase Description* (Forest Management Branch and The Forestry Corp 2006) and *Growth and Yield Determination* (Forest Management Branch 2006), respectively. The *Landbase Description* is located in Appendix 6a of the 2006 C5 FMU Forest Management Plan, and the *Growth and Yield Determination* is located in Appendix 8. Summaries of the classified landbase and yield curves used in the development of the preferred forest management scenario are provided in this document.

This analysis was completed under the direction of the SRD Planning Team which was responsible for developing a forest management plan for this FMU. This analysis meets the *Alberta Forest Management Planning Standard Version 3 – June 2005* (Forest Management Branch 2005a) requirements that have been validated in the RPF checklist in Addendum I. The Planning Team recommends the preferred forest management scenario described in this report. The C5 FMU Forest Management Plan, the preferred forest management scenario, the sustainable conifer harvest level and the 20-year spatial harvest sequence must then be approved by Forest Management Branch, PLFD. The sustainable conifer harvest level becomes the annual allowable cut (AAC) after approval.

The objectives of this analysis were to utilize key forest management objectives, assumptions and datasets developed for the C5 FMU to:

- determine a preferred forest management scenario, which included
  - a sustainable conifer harvest volume from the C5 FMU; and
  - a 20-year spatial harvest sequence (SHS) associated with the sustainable conifer harvest level;

- determine the impacts of the preferred forest management scenario on timber and other forest values; and
- demonstrate the critical factors of the wood supply.

The development of the preferred forest management scenario was completed in multiple stages, with an initial series of TSA scenarios completed and documented in April 2004 (The Forestry Corp 2004). This report replaces the initial version of the report and comprehensively documents all the TSA scenarios used in the development of the preferred forest management scenario, including relevant scenarios from the initial analysis.

Many forest values were considered in the development of the preferred forest management scenario and the interactions between the forest values were assessed in TSA scenarios. The preferred forest management scenario was considered to be the best balance between all the forest values, some of which conflicted.

The harvest sequence from the preferred forest management scenario was assessed for water yield, wildlife and biodiversity concerns. The watershed analysis for water yield is documented in a separate report entitled *Hydrological Effects of the Preferred Forest Management Scenario in the C5 Forest Management Unit* (Watertight Solutions Ltd. 2006), which is located in Appendix 6c of the 2006 C5 FMU Forest Management Plan. Wildlife analysis consisted of a separate review of 1:150 000 overview maps for six SHARP species. The biodiversity analysis regarding interior old forest areas is documented in this report.

Forest management plans are developed every ten years to reflect changes in objectives, assumptions, conditions, knowledge, computing ability and modeling tools. Mountain pine beetle was considered to be one issue that will likely develop over the course of the next ten years. This plan addresses preventative measures against the risk of timber losses to mountain pine beetle however, in the event of a major outbreak, an alternate course of action may be needed. Any disturbances that affect more than 2.5% of the managed landbase area will result in a re-calculation of harvest levels and a revised spatial harvest sequence.

Forest management plans are strategic and can not address all operational issues. The 20-year SHS required in a FMP ensures tight linkages between strategic and operational planning. The 20-year SHS will direct the development of annual operating plans which will follow the operating ground rules, once they are developed. It is in the annual operating plans that operational issues not dealt with in the SHS will be addressed.

1.2 Report Overview

This report documents the forecasting portion of the timber supply analysis. Each section of this report has a specific purpose, and documents the information required for approval as identified in the Forecasting and Harvest Scheduling portions of the Planning Standard. Additional useful information is also included.

The sections are:

1. Introduction and overview
   This section provides an overview of the project and historical harvest levels.

2. Landbase description

   The landbase description section highlights the results of the landbase classification process. It defines the attributes that were used to characterize the landscape, and provides summaries and maps to describe the C5 FMU. It also identifies some of the information that was not included in the landbase classification, but will be important during the implementation of the plan.

3. Growth and yield

   The growth and yield section presents the yield curves, which were the results of the growth and yield determination process.

4. Timber supply analysis

   Timber supply analysis is the largest section in this document. It describes the modeling tools that were used for forecasting. It identifies the key forest management objectives that provided the framework for this analysis. It includes a description of many of the scenarios that were analyzed during the project, with details on all the modeling assumptions and inputs. It identifies the limitations of the modeling tools, and where the modeling assumptions may differ from how the plan will implemented.

   It also provides a description of the desired future forest, which was used to select the preferred forest management scenario.

   Many results are provided. First, results are provided by output for all scenarios. Then, results between scenarios are compared and evaluated. The trade-offs between different values are explored.

5. Preferred forest management scenario

   This section describes the preferred forest management scenario. The modeling assumptions and inputs specific to this scenario are pulled together from the previous section. The preferred forest management scenario is compared to the desired future forest, and reasons why other scenarios weren't selected as the preferred forest management scenario are provided. Detailed results for the preferred forest management scenario and a map of the spatial harvest sequence are provided.

6. References

   A list of the other publications referenced in this report is included in this section.

1.3 Terminology

The terminology used in this document follows the *Alberta Forest Management Planning Standard Version 3 – June* (Forest Management Branch 2005a). Additional terminology specific to this analysis is defined in Table 1-1, in alphabetical order.

Table 1-1: Terminology specific to this analysis.

Term	Definition
Adjusted compartment	Administrative unit, based on compartments, used for reporting and access scheduling.
C5 subregion	Administrative unit used for reporting and setting goals.
Classified landbase	Spatial file covering the gross landbase area with attributes that describe the landscape for the purposes of a timber supply analysis.
Cover group	Broad cover group apply to forested stands only and are defined by proportion of conifer species in the AVI species composition. There are four cover groups for forested stands.
Cover type	Stratification for seral stage definition. There are nine forested cover types and two non-forested.
Ecological indicators	Variables that measure or describe the state or condition of biodiveristy values. Includes area by seral stage and regen patches.
Ending area	Area at end of the planning horizon (2205).
Forested landbase	All forested stands in the gross landbase.
Goal	The desired level of an indicator set in the TSA scenarios.
Gross landbase	Entire area within the C5 FMU boundary.
Gross volume	No reductions for cull or defect.
Highly susceptible	Stands classified into the high or extreme mountain pine beetle hazard classes.
Indicator	Variables that measure or describe the state or condition of values. E.g. Area of late old growth seral stage on the managed landbase.
Landscape management unit	Administrative unit used for setting TSA assumptions.
Late seral	Three groupings of older seral stages used to set targets in the TSA scenarios: late old growth seral stage (L), early+late old growth seral stages (EL) and mature+old growth seral stages (MEL).
Leading species	The first species in the species composition of forested stands. Species compositions are listed in order of highest to lowest proportions.
Managed landbase	The portion of the timber harvesting landbase that is available for forest management activities specific to the 2006 C5 FMU Forest Management Plan (I.e. forested stands in pure conifer or conifer-leading mixedwood cover groups in the timber harvesting landbase.)
Merchantable	Coniferous volume in stands in the managed landbase that meet the minimum harvest age criteria, ***or*** the area with merchantable coniferous volume.
Modelling target	Management assumptions made in the TSA models.
Net volume	Gross volumes reduced by a percentage for cull and defect.
Objective	A broad statement describing the desired future state or condition for a value. E.g. maintain area in all seral stages.
Old forest	Includes early and late old growth seral stages.
Passive landbase	All areas not available for timber harvesting. Equals the gross landbase minus the timber harvesting landbase.
Special management zone	Zones used for reporting and controlling forest management activities.
Target	A specific condition or level of an indicator. E.g. Ensure a minimum of 3,000 ha late old growth on the managed landbase.
Timber harvesting landbase	Area available for forest management activities, ie. Areas where timber harvesting is allowed.

Table 1-1: Terminology specific to this analysis. (continued)

Term	Definition
Unmanaged landbase	All areas not available for forest management activities specific to the 2006 C5 FMU Forest Management Plan (I.e. pure deciduous, deciduous-leading mixedwood, and non-forested stands in the timber harvesting landbase as well as the passive landbase.)
Value	An important characteristic, component or quality. E.g. biodiversity.
Watershed sub-basin	Watershed unit identified in the classified landbase.
Yield curve	Stratification for timber yield estimates. There are ten yield curves developed for the 2006 C5 FMU Forest Management Plan.

The term *landbase* is used to refer to several categories of area. Figure 1-1 shows the relationship between the different landbases referenced in this document.

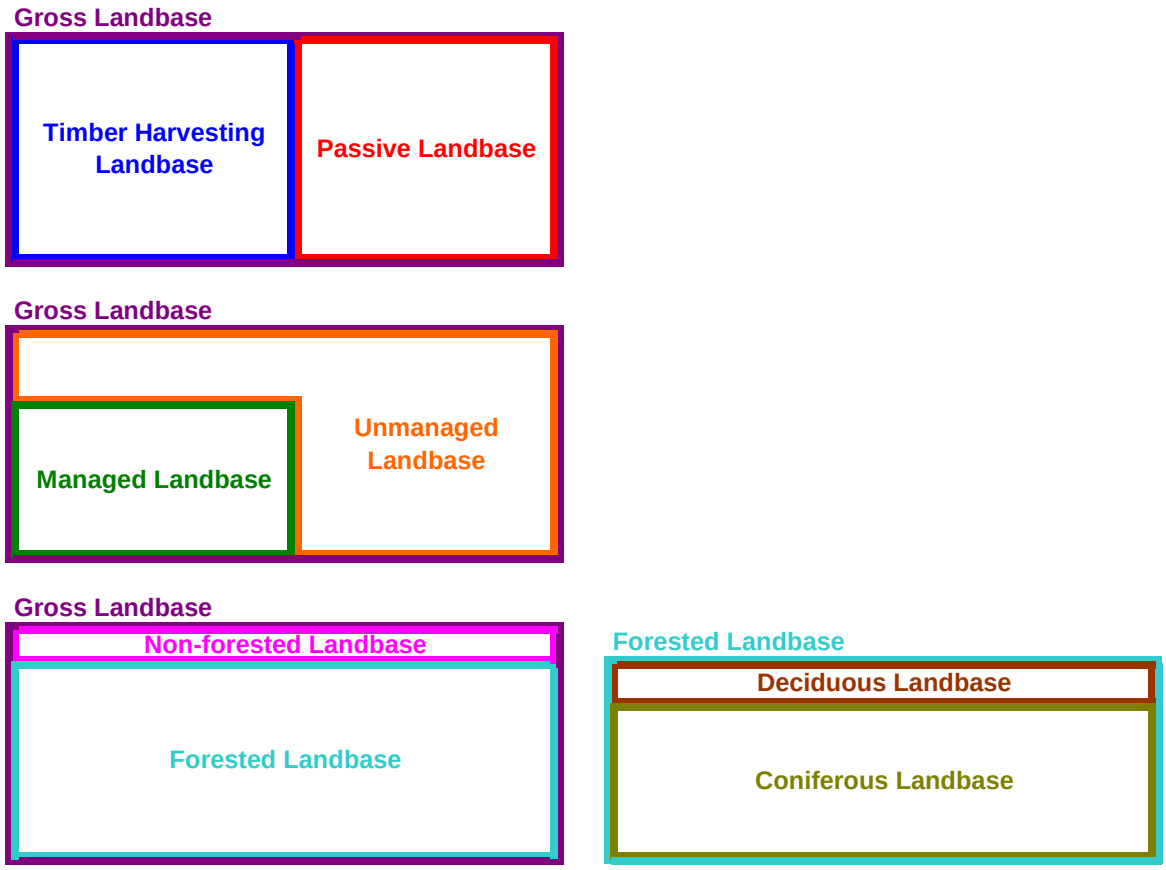


Figure 1-1: Relationship between landbases.

1.4 Historical TSA

Timber harvesting landbase areas and annual allowable cuts from historical analyses and the preferred forest management scenario recommended in this report are presented in Table 1-2 and Table 1-3, respectively. The first documented TSA for the C5 FMU was completed in 1986. It determined both conifer and deciduous AAC's. Adjustments were made to the conifer AAC in 1993, 1996, 1999, 2000 and 2003 due to fires. Some of the historical information for these adjustments was unavailable. The

2006 C5 FMU Forest Management Plan preferred forest management scenario presented in this report utilized a new classified landbase, new yield curves and updated TSA assumptions.

Although there have been large increases in the protected areas in the C5 FMU since 1986, e.g. the Bob Creek Wildland in the Whaleback area, the timber harvesting landbase has remained about the same size. This is the result of large areas removed during the landbase classification process in 1986 using a percentage reduction for generic operational and ground rule deletions that were not normally spatially addressed at that time. With the advances in TSA tools and computer technology, these areas have been spatially identified and the result was a similar amount of land available for timber harvest, although it is geographically different than the 1986 timber harvesting landbase.

Table 1-2: Historical, current and recommended timber harvesting landbase areas.

	Timber Harvesting Landbase				
	Conifer		Deciduous		Total
Timber Supply Analysis	Area (ha)	% Area	Area (ha)	% Area	Area (ha)
1986 FMP	115,511	87%	16,984	13%	132,495
1993, 1996	n/a[1]		n/a		n/a
1999 (Pre-Cherry Hill fire)	n/a[1]		n/a		n/a
2000 (Post-Cherry Hill fire)	102,430		n/a		n/a
2003[2] (Post-Lost Creek fire)	99,180		n/a		n/a
2006 C5 FMU Forest Management Plan Preferred Forest Management Scenario	117,739		16,210		133,949

[1] Not available

[2] Current

Table 1-3: Historical, current and recommended harvest volumes.

		Annual Allowable Cut (m^3/yr at 15/11)					
		Primary		Incidental		Total	
Timber Supply Analysis	Effective Dates	Conif	Decid	Conif	Decid	Conif	Decid
1986 FMP	May 1,1986 to April 30,1993	165,753	17,800	n/a	n/a	165,753	17,800
1993, 1996	May 1, 1993 to April 30, 1999	n/a[1]	n/a	n/a	n/a	n/a	n/a
1999 (Pre-Cherry Hill fire)	May 1, 1999 to April 30, 2000	181,400	n/a	n/a	n/a	181,400	n/a
2000 (Post-Cherry Hill fire)	May 1, 2000 to April 30, 2003	180,752	n/a	n/a	n/a	180,752	n/a
2003[2] (Post-Lost Creek fire)	May 1, 2003 to April 30, 2006	174,920	n/a	n/a	n/a	174,920	n/a
2006 C5 FMU Forest Management Plan Preferred Forest Management Scenario*	May 1, 2006 to April 30, 2026	209,414	n/c[3]	n/c	n/c	209,414	n/c
	May 1, 2026 to April 30, 2206	157,140	n/c[3]	n/c	n/c	157,140	n/c

[1] Not available

[2] Current

[3] Not calculated

* In addition to the values in the volumes reported in the table, there is 143,000 m^3 of conifer carryover volume to be harvested between May 1, 2006 and April 30, 2011.

2. Landbase Description

2.1 Overview

The timber supply analysis required a classified landbase that accurately represented areas both available and unavailable for forest management activities within the C5 FMU. A landbase classification was completed jointly for this 2006 C5 FMU Forest Management Plan by SRD and The Forestry Corp. under the direction of the Planning Team. It is documented in *C5 FMU Forest Management Plan: Landbase Description* (Forest Management Branch and The Forestry Corp 2005), which is provided in Appendix 6a of the 2006 C5 FMU Forest Management Plan.

The classified landbase used in the preferred forest management scenario presented in this report is slightly different than the landbase used to assess interior old forest and water yield. A small error of 98 ha in the managed landbase area was noted, and the preferred forest management scenario results were updated for the corrected landbase. However, the interior old forest and watershed analyses were already completed, and were not re-done. The error was in assigning 98 ha of unmanaged area to the managed landbase. The impact on the results of the interior old forest and water yield analyses is assumed to be very minor given the extremely small proportion of area that switched from the managed landbase to unmanaged, which will result in slightly less harvesting activities than predicted. The results of the interior old forest and watershed analyses also showed no significant negative impacts of timber harvesting on interior old forest patches and water yield. Because the area available for timber harvesting is actually less than identified in these analyses, the results are still valid.

The effective date of the classified landbase was May 1, 2005, which matched the start date of the planning horizon in the TSA scenarios. Although most of the datasets used in the landbase classification process had an effective date of May 1, 2001, the two major types of disturbance that drive landscape patterns, harvesting activities and fires, were updated to May 1, 2005.

This section contains a brief summary of the landbase classification repeated from *C5 FMU Forest Management Plan: Landbase Description* (Forest Management Branch and The Forestry Corp 2005) and a description of the managed landbase in the form of maps, graphs and tables.

2.2 Landbase Classification

The landbase classification determined the portion of the landbase that was available (*timber harvesting* landbase) and unavailable (*passive* landbase) for timber management activities. Many datasets were used in the landbase classification, including:

- Alberta Vegetation Inventory (AVI);
- Elevation;
- Natural Subregions;
- Administrative zones;
- Recreation and protected areas;
- Grazing allotments;
- Roads, cutlines, railways, pipelines, transmission lines, well sites;
- Lakes, rivers and streams;
- Random camping sites; and
- Historic and planned blocks.

For this TSA, only the *managed* landbase was included in the determination of sustainable coniferous harvest level. The managed landbase was the timber harvesting landbase excluding non-forested stands and deciduous (D) and deciduous-leading (DC) cover groups. The *unmanaged* landbase included the passive landbase, D and DC stands and all non-forested areas.

Both the timber harvesting and passive landbases combined equalled the total area within the C5 FMU and was referred to as the *gross* landbase. The combination of the managed and unmanaged landbases also added up to the gross landbase. Area summaries in this report were completed for the managed and gross landbases.

The gross landbase was also divided into conifer and deciduous. The *conifer* landbase included all pure conifer and conifer-leading mixedwood stands; all existing blocks harvested after April 30, 1992 (post-1991); and non-forested stands in the timber harvesting landbase in existing blocks harvested before May 1, 1992. The *deciduous* landbase consisted of pure deciduous and deciduous-leading mixedwood stands.

A summary of the areas in the gross, timber harvesting and managed landbases is provided in Table 2-1. A map of the C5 FMU passive landbase by deletion category is presented in Figure 2-1.

Table 2-1: Classified landbase area summary.

Landbase Netdown Category	Area (ha)[1]			Percent Area		
	Forested	Non-forested	Total	Forested	Non-forested	Total
Gross FMU Area	**247,695**	**104,128**	**351,823**	**100%**	**100%**	**100%**
Deletions						
Land Status						
Private Land (Freehold)	1,747	898	2,645	1%	1%	1%
Protected Areas	23,612	11,834	35,446	10%	11%	10%
ESIP Zone 1 (Prime Protection)	25,721	38,193	63,913	10%	37%	18%
Recreation Areas	250	89	340	0%	0%	0%
Subtotal: Land status	51,330	51,014	102,344	21%	49%	29%
Steep Slopes (>= 45)	30,245	9,243	39,488	12%	9%	11%
Burned Areas in Recent Fires	917	13,434	14,352	0%	13%	4%
Access						
Roads	0	660	660	0%	1%	0%
Cutlines (Seismic)	0	1,685	1,685	0%	2%	0%
Pipeline	0	392	392	0%	0%	0%
Subtotal: Access	0	2,737	2,737	0%	3%	1%
Buffers						
Wetlands	509	987	1,495	0%	1%	0%
Random Camping Sites	552	311	863	0%	0%	0%
Hydrography	1,709	864	2,573	1%	1%	1%
Subtotal: Buffers	2,770	2,161	4,931	1%	2%	1%
Productivity						
Unproductive	12,954	0	12,954	5%	0%	4%
Subjective Deletions	16,850	0	16,850	7%	0%	5%
Non-forested	0	21,891	21,891	0%	21%	6%
Subtotal: Productivity	29,804	21,891	51,695	12%	21%	15%
Isolated Stands	399	3	402	0%	0%	0%
Wildlife Habitat						
Harlequin Duck	71	0	71	0%	0%	0%
Wolverine	2	0	2	0%	0%	0%
Western Frog/Long-toed Salamandar	1,762	90	1,853	1%	0%	1%
Subtotal: Wildlife Habitat	1,835	90	1,925	1%	0%	1%
Passive Landbase (Total Deletions)	**117,300**	**100,573**	**217,873**	**47%**	**97%**	**62%**
Timber Harvesting Landbase[2]	**130,395**	**3,555**	**133,949**	**53%**	**3%**	**38%**
Unmanaged Area on Timber Harvesting Landbase						
Deciduous Landbase						
D Cover Type	14,486	0	14,486	6%	0%	4%
DC Cover Type	1,725	0	1,725	1%	0%	0%
Non-forested	0	3,555	3,555	0%	3%	1%
Subtotal: Unmanaged Area	16,210	3,555	19,765	7%	3%	6%
Managed Landbase	**114,184**	**0**	**114,184**	**46%**	**0%**	**32%**

[1] The total area within FMU C5 is 351,886 ha. There are 63 ha in the unclassified portion of horizontal stands that are not included in this area summary.

[2] Non-forested stands in the timber harvesting landbase are a result of non-forested AVI stand attributes on pre-91 cutblocks.

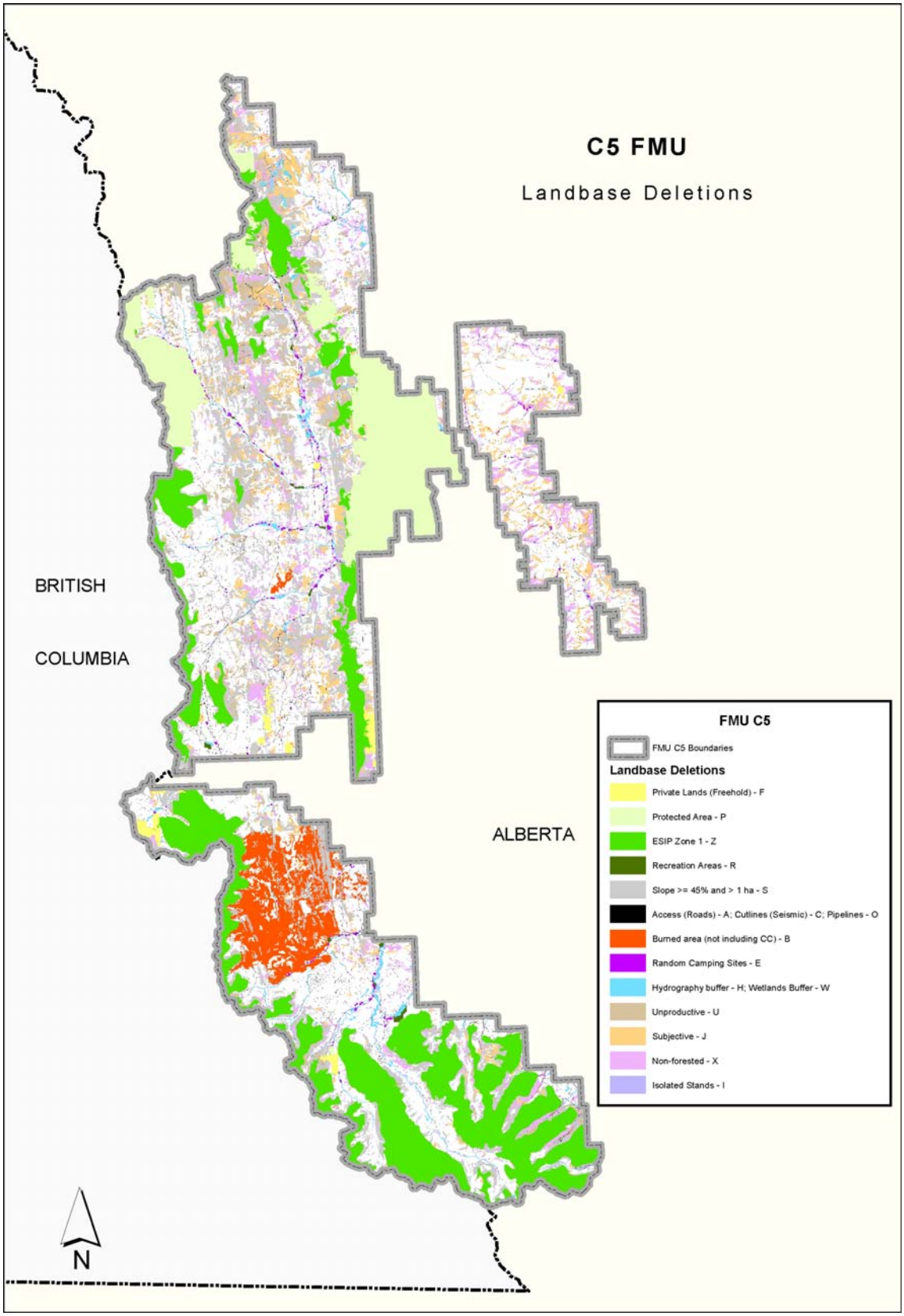


Figure 2-1: Map of landbase deletions.

A summary of key assumptions made in the landbase classification process that were relevant to the development of the preferred forest management scenario is provided in Table 2-2.

Table 2-2: Managed landbase assumptions.

Issue	Assumption
Effective Date	May 1, 2005
Managed Landbase	Areas available for timber harvest within this TSA. Included only forested stands in the conifer landbase in the timber harvesting landbase.
Recent Fires	Area burnt in recent fires (Cherry Hill, Lost Creek and Wintering Creek), with the exception of salvage and regen blocks, was classified as non-forested and completely removed from the managed landbase for the entire planning horizon. It was never regenerated back to forest, and therefore never contributed to cover types, seral stages or yield curves. Over 16,000 ha were burnt in recent fires and deleted from the timber harvesting landbase. While this was a conservative assumption for timber supply analysis, it under-represents the future forested area within the C5 FMU.
Special Management Zones	Special management zones have been identified. There are specific harvest treatments and TSA assumptions associated with these areas.
Access Control Units	Access control units were used in the TSA models to determine when areas were available/unavailable for harvest. Access control units were based on: adjusted compartments, adjusted sub-compartments, current watershed studies, 150 m buffer around the Lost Creek Fire, pine and pine/Engelmann spruce mixes in selected compartments, pine stands susceptible to mountain pine beetle, and scheduled treatments.

The landbase was classified using many attributes, including cover group, cover type, yield curve and seral stage. These definitions are provided in *C5 FMU Forest Management Plan: Landbase Description* (Forest Management Branch and The Forestry Corp 2005) and are summarized in the following sections.

2.2.1 Defining Layer

For each stand, a single set of attributes was used to assign cover group, cover type and yield curve. The *defining* layer was the overstorey layer the Alberta Vegetation Inventory (AVI), with the following three exceptions:

- Horizontal stands where more than 50% of the area was classified by the understorey attributes (the horizontal understorey landbase type) in AVI. The defining layer for these stands was the understorey layer.
- Post-1991 blocks. These areas were assigned to a single cover type (C-Re) because it was not possible to determine the cover type for each block.
- Recent fires. These areas were assigned to the naturally non-forested cover type, which is a conservative assumption consistent with the Planning Standard.

2.2.2 Cover Group

Cover group was assigned to forested stands based on the percentage of conifer species in the defining layer of the AVI species composition (Table 2-3).

Table 2-3: Cover group description.

Cover Group	% Conifer Crown Closure	Description
C	80-100	Pure Conifer
CD	50-70	Conifer-leading Mixedwood
DC	30-40	Deciduous-leading Mixedwood
D	0-20	Pure Deciduous

2.2.3 Cover Type

Cover type was assigned to all areas within the C5 FMU using cover group, leading species and the presence and timing of historical harvesting activities (Table 2-4). Leading species is the first species listed in the AVI species composition for the defining layer. Regardless of the AVI species composition, areas burnt in recent fires were assigned to naturally non-forested (NNF).

Table 2-4: Cover type description.

Cover Type	Description	Cover Group	Leading Species	Historic Block
C-Fa	Forested areas with > 80% conifer species composition in the overstory layer with alpine or balsam fir as the leading species	C	Fa, Fb	Not post-1991 cutblock
C-La	Forested areas with > 80% conifer species composition in the overstory layer with alpine larch, tamarak or western larch as the leading species	C	La, Lt, Lw	Not post-1991 cutblock
C-Fd	Forested areas with > 80% conifer species composition in the overstory layer with Douglas-fir as the leading species	C	Fd	Not post-1991 cutblock
C-Px	Forested areas with > 80% conifer species composition in the overstory layer with lodgepole, whitebark, or limber pine as the leading species	C	Pl, P, Pa, Pf	Not post-1991 cutblock
C-Sx	Forested areas with > 80% conifer species composition in the overstory layer with white spruce or Engelmann spruce as the leading species	C	Sw, Se	Not post-1991 cutblock
C-Re[1]	Forested cutblocks harvested post '91. These areas represent an aggregation of all areas harvested, the majority of which are C cover group.	C, CD, DC, D	Any	Post-1991 cutblock
CD	Forested areas with 50% up to 80% conifer species composition in the overstory layer	CD	Any	Not post-1991 cutblock
DC	Forested areas with 30% to 40% conifer speices composition in the overstory layer	DC	Any	Not post-1991 cutblock
D	Forested areas with 20% or less conifer species composition in the overstory layer	D	Any	Not post-1991 cutblock
NNF	Non-Forested (areas that do not currently support forest growth)		None	Not post-1991 cutblock
ANF	Anthropogenic Non-Forested (man-made disturbances)		None	Not post-1991 cutblock

[1] Post-1991 cutblocks are identified by ***z_yr_tsa*** > 1991.

2.2.4 Yield Curve

Yield curve was assigned to all areas within the C5 FMU using cover group, leading species, crown class and natural subregion (Table 2-5). Regardless of the AVI species composition, areas burnt in recent fires were assigned to non-forested (N).

Yield curves are numbered and also given a descriptive name. A description of the codes used in the yield curve names is in Table 2-6. For yield curves 1, 8 and 9 the name consists of the cover type and the word 'All', indicating that only one yield curve was developed for each cover type. For yield curves 2-7 the name consists of the broad cover group, leading species, crown class and natural subregion in that order. If there was no differentiation between crown classes, the word 'All' was used. The R and N yield curves are given descriptive names.

Table 2-5: Yield curve description.

Yield Curve	Cover Group	Leading Species	Crown Class	Natural Subregion	Historic Block
1 C-Fd-All[1]	C	Fd	All	All	Not post-1991 cutblock
2 C-Pl-All-M	C	Pl, P, Pa, Pf	All	Montane, Foothills Parkland, Foothills Fescue	Not post-1991 cutblock
3 C-Pl-AB-SA	C	Pl, P, Pa, Pf	A+B	Subalpine, Alpine	Not post-1991 cutblock
4 C-Pl-CD-SA	C	Pl, P, Pa, Pf	C+D	Subalpine, Alpine	Not post-1991 cutblock
5 C-Sx-All-M	C	Sw, Se, Fa, Fb	All	Montane, Foothills Parkland, Foothills Fescue	Not post-1991 cutblock
6 C-Sx-AB-SA	C	Sw, Se, Fa, Fb	A+B	Subalpine, Alpine	Not post-1991 cutblock
7 C-Sx-CD-SA	C	Sw, Se, Fa, Fb	C+D	Subalpine, Alpine	Not post-1991 cutblock
8 CD-All	CD	All	All	All	Not post-1991 cutblock
9 D/DC-All	DC, D	All	All	All	Not post-1991 cutblock
R Regen	C, CD, DC, D	All	All	All	Post-1991 cutblock
N C-La/Non-forested	C non-forested	Lt, La, Lw none	All n/a	All All	Not post-1991 cutblock

[1] Volume estimates were developed for A+B only, but applied to all crown classes. Validation of this assumption is provided in Appendix 3 of *Growth and Yield* (Forest Management Branch 2004a).

Table 2-6: Description of codes in yield curve names.

Code	Category	Description
C	Cover Group	Pure Conifer
CD	Cover Group	Conifer-leading Mixedwood
DC	Cover Group	Deciduous-leading Mixedwood
D	Cover Group	Pure Deciduous
Fd	Leading Species	Douglas-fir
Pl	Leading Species	Pine
Sx	Leading Species	Spruce and Fir
La	Leading Species	Larch
AB	Crown Class	A and B
CD	Crown Class	C and D
M	Natural Subregion	Montane, Foothills Parkland, Foothills Fescue
SA	Natural Subregion	Subalpine, Alpine
All	Crown Class and/or Natural Subregion	All values
Regen	Descriptive name	Forested cutblocks harvested post '91.
Non-forested	Descriptive name	Non-forested

2.2.5 Seral Stage

Seral stages are broad categories of stand development. Seral stage for the C5 FMU was assigned to each cover type using the stand ages in Table 2-7. The upper limit for the late old growth class was defined by the maximum ages allowed in the TSA modeling (see Table 4-12).

Early and late old growth seral stages were combined to define *old forest*.

Mature, early old growth and late old growth seral stages were considered *late seral*.

Table 2-7: Seral stage description.

	Seral Stage				
Cover Type	Regen-eration	Young	Mature	Early Old Growth	Late Old Growth
C-Fa	< 40	41-100	101-160	161-200	201-350
C-La	< 40	41-100	101-200	200-250	251-400
C-Fd	< 30	31-90	91-200	201-250	251-325
C-Px	< 25	26-80	81-150	151-200	201-275
C-Sx	< 30	31-90	91-180	181-230	231-350
C-Re	< 25	26-85	86-160	161-210	211-260
CD	< 25	26-80	81-150	151-200	201-225
DC	< 25	26-80	81-150	151-175	n/a
D	< 30	31-70	70-130	131-175	n/a
NNF	n/a	n/a	n/a	n/a	n/a
ANF	n/a	n/a	n/a	n/a	n/a

2.2.6 TSA Themes

The landbase classification also created fields required by the TSA modeling tools, including themes, ages, access control units, planned treatments, and volumes. Themes are characteristics of the forest that are required by the TSA models to apply yield estimates and treatments, control the model and report results. The themes used in the C5 FMU TSA models are in Table 2-8. The attributes in each theme are discussed in the next section which provides summaries for all the characteristics of the forest. Each unique combination of attributes and age was called a *forest class*.

Table 2-8: TSA themes for the C5 FMU.

Theme	Description
Theme 1	C5 Subregion
Theme 2	Landscape Management Unit
Theme 3	Adjusted Compartment
Theme 4	Watershed Sub-basin
Theme 5	Deletion
Theme 6	Mountain Pine Beetle Hazard
Theme 7	Status
Theme 8	Yield Curve
Theme 9	Cover Type
Theme 10	Special Management Zone

2.3 Landbase Summaries

This section provides summaries of the classified landbase used in the preferred forest management scenario as of the effective date of May 1, 2005. An understanding of the current state of the forest is critical in determining the appropriate forest management assumptions in the TSA and in interpreting the results of various TSA scenarios. For most criteria, both the managed and gross landbases are described because the entire landscape, not just the timber harvesting landbase, is important for many values such as wildlife habitat and biodiversity. Some of the summaries only relate to the forested landbase.

2.3.1 C5 Subregion

C5 subregion was important in setting TSA assumptions and reporting many results. The area by C5 subregion is presented in Table 2-9. A map of the C5 subregions is in Figure 2-2. Livingstone is the largest subregion in the C5 FMU.

Table 2-9: Area by C5 subregion.

	Managed Landbase		Unmanaged Landbase				Gross Landbase	
	Forested		Forested		Non-forested			
C5 Subregion	ha	%	ha	%	ha	%	ha	%
Castle	14,031	12%	15,127	11%	24,881	24%	54,039	15%
Continental Divide North	16,232	14%	13,099	10%	9,936	10%	39,267	11%
Continental Divide South	19,360	17%	20,083	15%	26,842	26%	66,284	19%
Livingstone	46,542	41%	71,663	54%	34,607	33%	152,812	43%
Porcupine Hills	18,019	16%	13,539	10%	7,862	8%	39,420	11%
Total	**114,184**	**100%**	**133,510**	**100%**	**104,128**	**100%**	**351,823**	**100%**

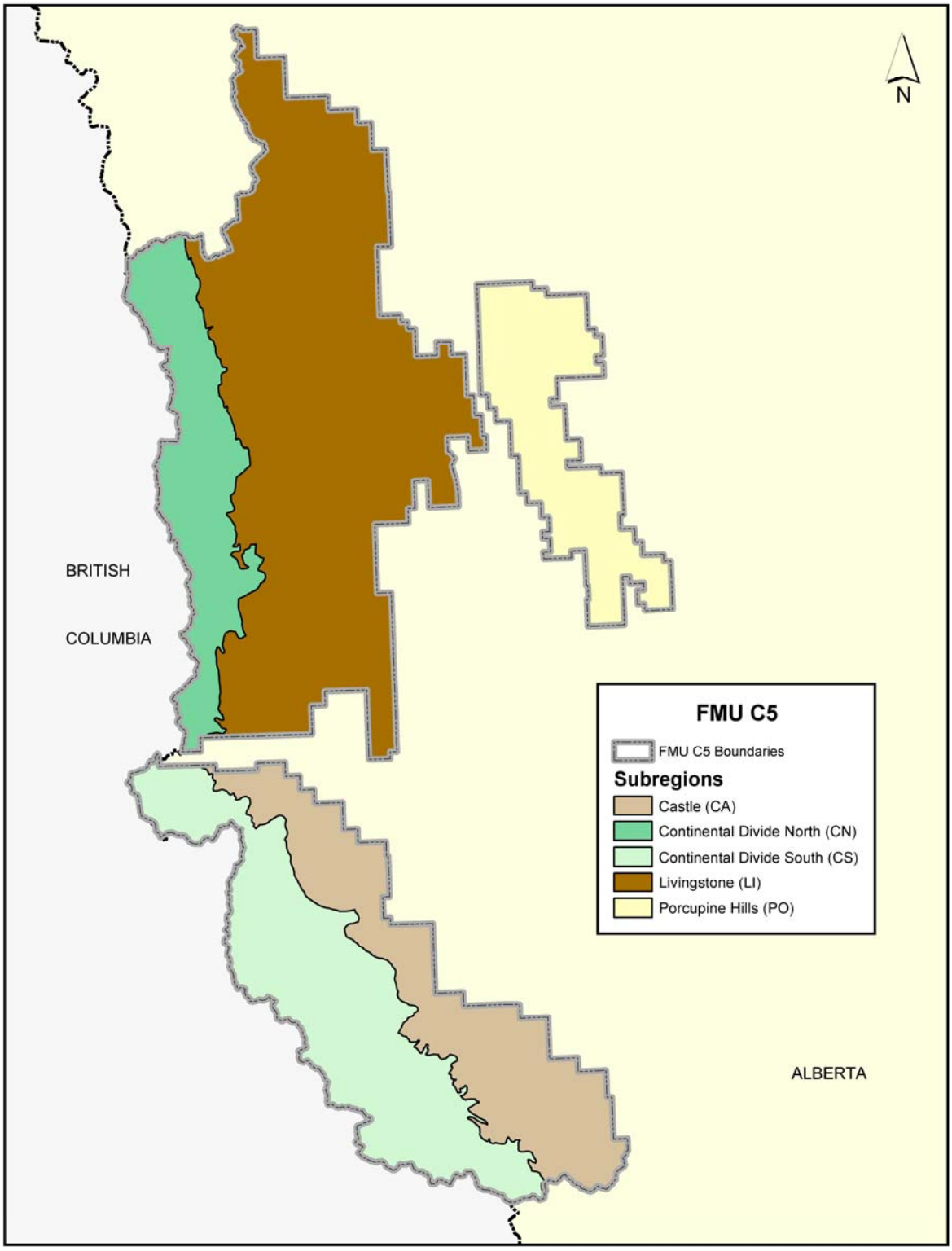


Figure 2-2: Map of C5 subregions.

2.3.2 Landscape Management Unit

Landscape management units were used to apply assumptions in the TSA models. The area by landscape management unit is presented in Table 2-10. A map of landscape management units is in Figure 2-3.

Table 2-10: Area by landscape management unit.

	Managed Landbase		Unmanaged Landbase				Gross Landbase	
Landscape	Forested		Forested		Non-forested			
Management Unit	ha	%	ha	%	ha	%	ha	%
Alpine High Rock	72	0%	1,639	1%	6,634	6%	8,345	2%
Beaver	6,951	6%	2,637	2%	2,903	3%	12,491	4%
Carbondale	2,905	3%	1,980	1%	10,457	10%	15,342	4%
Castle/West Castle	14,988	13%	14,745	11%	10,178	10%	39,911	11%
Chapel Rock	85	0%	277	0%	279	0%	641	0%
Crowsnest Pass	765	1%	243	0%	203	0%	1,211	0%
East Ranchlands	0	0%	46	0%	83	0%	130	0%
Flathead	159	0%	1,994	1%	5,446	5%	7,599	2%
Head Water Valleys	17,793	16%	12,837	10%	4,061	4%	34,692	10%
Horseshoe Parkland	264	0%	1,003	1%	188	0%	1,456	0%
Ironstone	4,703	4%	1,864	1%	6,583	6%	13,150	4%
Livingstone Valley	3,607	3%	1,887	1%	1,526	1%	7,021	2%
Middle Ridges	29,578	26%	26,258	20%	11,605	11%	67,441	19%
North Livingstone	5,600	5%	20,413	15%	11,077	11%	37,090	11%
Porcupine Hills	18,019	16%	13,487	10%	7,774	7%	39,280	11%
Saddle Mountain	4,594	4%	5,653	4%	1,680	2%	11,927	3%
South Fescue	0	0%	48	0%	38	0%	86	0%
South Front Range	2,215	2%	9,416	7%	14,951	14%	26,583	8%
South Livingstone	1,217	1%	3,147	2%	3,417	3%	7,781	2%
Spread Eagle	161	0%	1,243	1%	466	0%	1,871	1%
Whaleback	506	0%	12,692	10%	4,576	4%	17,774	5%
Total	**114,184**	**100%**	**133,510**	**100%**	**104,128**	**100%**	**351,823**	**100%**

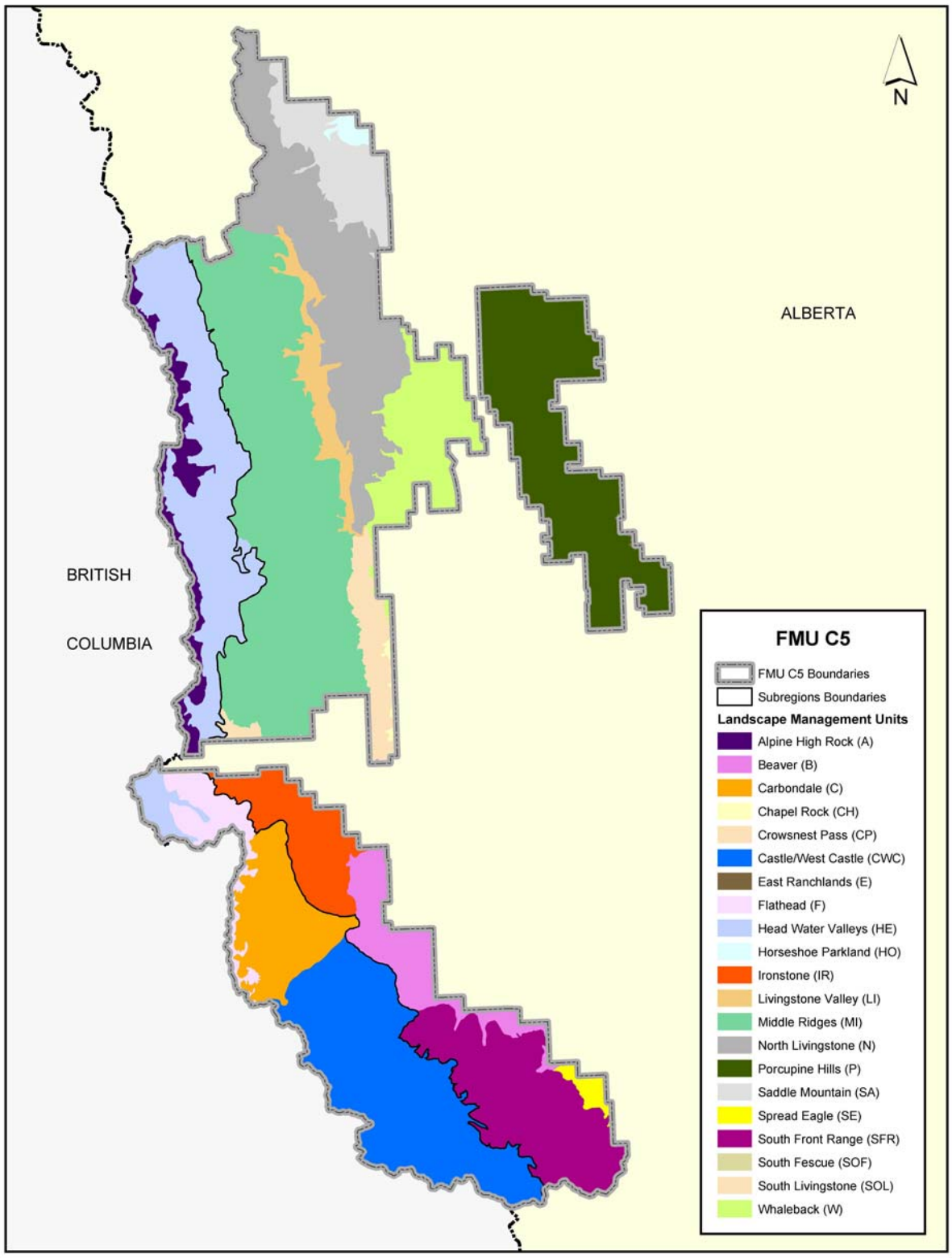


Figure 2-3: Map of landscape management units.

2.3.3 Adjusted Compartment

Adjusted compartments were used to develop access control units in the TSA. Adjusted compartment names were too long for tables and reporting, therefore the codes provided in Table 2-11 are used throughout this document. The area by adjusted compartment is presented in Table 2-12. A map of adjusted compartments is in Figure 2-4.

Table 2-13 provides area, volume, and average age of merchantable stands in each adjusted compartment. Volumes are net 15/11 standing volumes, i.e. reductions for cull have been applied. Merchantable stands are defined as those that currently meet the minimum harvest ages in the TSA models (refer to Table 4-13 for minimum harvest ages).

Table 2-11: Codes for adjusted compartments.

Adjusted Compartment Name	Code
Alpine High Rock - Crowsnest River	ACR
Beaver - Carbondale	BC
Beaver - Crowsnest River	BCR
Beaver - Mill Creek	BMC
Beaver - Middle Castle	BMI
Beaver - Beaver Mines Lake	BML
Beaver - Pincher Creek	BPC
Carbondale - Carbondale River	CCR
Crowsnest Pass - Crowsnest River	CPC
Castle/West Castle - Gardiner Creek	CWG
Castle/West Castle - Middle Castle	CWM
Castle/West Castle - Upper Castle	CWU
Castle/West Castle - West Castle	CWW
Flathead - Crowsnest River	FCR
Head Water Valleys - Crowsnest River	HEC
Head Water Valleys - Dutch Creek	HED
Head Water Valleys - Racehorse Creek	HER
Head Water Valleys - Upper Oldman	HEU
Horseshoe Parkland - Stimson Creek	HOS
Ironstone - Carbondale River	IRA
Ironstone - Crowsnest River	IRC
Ironstone - Hillcrest	IRH
Livingstone Valley - Livingstone	LIL
Middle Ridges - Crowsnest River	MIC
Middle Ridges - Dutch Creek	MID
Middle Ridges - Livingstone	MIL
Middle Ridges - Racehorse Creek	MIR
Middle Ridges - Upper Oldman	MIU
North Livingstone - Livingstone	NLL
North Livingstone - Lower Oldman	NLO
North Livingstone - Willow Creek	NWC
Porcupine Hills - Beaver Creek	PBC
Porcupine Hills - Lower Oldman	PLO
Porcupine Hills - Trout Creek	PTC
Porcupine Hills - Willow Creek	PWC
Saddle Mountain - Willow Creek	SAW
Spread Eagle - Drywood Creek	SED
South Front Range - Middle Castle	SFRD
South Front Range - Mill Creek	SFRM
South Livingstone - Crowsnest River	SOLC
Whaleback - Lower Oldman	WLO
Whaleback - Willow Creek	WWC

Table 2-12: Area by adjusted compartment.

Adjusted Compartment	Managed Landbase Forested		Unmanaged Landbase Forested		Unmanaged Landbase Non-forested		Gross Landbase	
	ha	%	ha	%	ha	%	ha	%
BC	1,796	2%	692	1%	353	0%	2,840	1%
BCR	678	1%	164	0%	524	1%	1,365	0%
BMC	1,384	1%	350	0%	325	0%	2,059	1%
BMI1	327	0%	56	0%	232	0%	614	0%
BMI2	2,282	2%	979	1%	1,159	1%	4,420	1%
BML	352	0%	189	0%	168	0%	709	0%
BPC	151	0%	235	0%	162	0%	548	0%
CCR1	1,514	1%	1,121	1%	3,024	3%	5,659	2%
CCR2	1,395	1%	1,058	1%	9,492	9%	11,944	3%
CPC	754	1%	159	0%	166	0%	1,079	0%
CWG1	1,282	1%	1,126	1%	1,102	1%	3,510	1%
CWG2	2,677	2%	162	0%	381	0%	3,220	1%
CWM	500	0%	224	0%	173	0%	896	0%
CWU1	2,204	2%	2,817	2%	2,668	3%	7,690	2%
CWU2	2,992	3%	5,375	4%	2,410	2%	10,777	3%
CWU3	1,897	2%	2,029	2%	1,440	1%	5,365	2%
CWW	3,661	3%	4,779	4%	4,383	4%	12,823	4%
FCR	164	0%	1,862	1%	3,424	3%	5,450	2%
HEC1	1,447	1%	1,586	1%	1,490	1%	4,522	1%
HEC2	1,298	1%	1,298	1%	724	1%	3,320	1%
HED1	2,742	2%	1,308	1%	1,051	1%	5,101	1%
HED2	1,180	1%	806	1%	920	1%	2,906	1%
HER1	3,376	3%	1,062	1%	530	1%	4,968	1%
HER2	2,146	2%	676	1%	1,350	1%	4,173	1%
HEU1	2,588	2%	5,426	4%	2,173	2%	10,188	3%
HEU2	3,088	3%	2,316	2%	2,457	2%	7,861	2%
HOS	264	0%	897	1%	174	0%	1,335	0%
IRA	526	0%	249	0%	2,491	2%	3,266	1%
IRC1	3,466	3%	1,466	1%	716	1%	5,648	2%
IRC2	444	0%	22	0%	752	1%	1,219	0%
IRH	266	0%	127	0%	2,624	3%	3,017	1%
LIL	3,607	3%	1,887	1%	1,526	1%	7,021	2%
MIC1	3,476	3%	1,805	1%	1,408	1%	6,688	2%
MIC2	2,234	2%	1,310	1%	414	0%	3,958	1%
MID1	1,601	1%	653	0%	234	0%	2,488	1%
MID2	2,815	2%	1,291	1%	920	1%	5,026	1%
MIL	3,174	3%	6,040	5%	2,468	2%	11,681	3%
MIR1	2,836	2%	1,252	1%	895	1%	4,983	1%
MIR2	2,469	2%	1,672	1%	986	1%	5,127	1%
MIR3	4,474	4%	4,867	4%	1,510	1%	10,850	3%
MIU1	1,104	1%	1,120	1%	539	1%	2,763	1%
MIU2	3,030	3%	4,441	3%	1,689	2%	9,160	3%
MIU3	2,368	2%	1,821	1%	543	1%	4,731	1%
NLL	2,384	2%	9,937	7%	5,996	6%	18,317	5%

Table 2-12: Area by adjusted compartment. (continued)

Adjusted Compartment	Managed Landbase Forested ha	%	Unmanaged Landbase Forested ha	%	Unmanaged Landbase Non-forested ha	%	Gross Landbase ha	%
NLO	103	0%	2,341	2%	722	1%	3,166	1%
NWC	2,373	2%	5,222	4%	3,067	3%	10,663	3%
PBC1	2,697	2%	1,558	1%	974	1%	5,230	1%
PBC2	1,273	1%	541	0%	569	1%	2,382	1%
PLO1	730	1%	962	1%	371	0%	2,063	1%
PLO2	1,837	2%	919	1%	651	1%	3,408	1%
PLO3	2,671	2%	559	0%	1,065	1%	4,295	1%
PTC1	5,306	5%	3,454	3%	1,234	1%	9,993	3%
PTC2	1,140	1%	1,394	1%	1,119	1%	3,653	1%
PTC3	905	1%	1,237	1%	917	1%	3,058	1%
PWC	1,459	1%	2,916	2%	963	1%	5,338	2%
SAW1	1,926	2%	5,445	4%	1,840	2%	9,211	3%
SAW2	3,408	3%	3,214	2%	1,146	1%	7,768	2%
SED	143	0%	1,160	1%	408	0%	1,712	0%
SFRD	631	1%	3,697	3%	9,445	9%	13,772	4%
SFRM	1,359	1%	3,975	3%	3,143	3%	8,478	2%
SOLC	1,527	1%	3,824	3%	3,748	4%	9,098	3%
WLO	1	0%	9,733	7%	4,179	4%	13,912	4%
WWC	281	0%	2,651	2%	403	0%	3,335	1%
Total	**114,184**	**100%**	**133,510**	**100%**	**104,128**	**100%**	**351,823**	**100%**

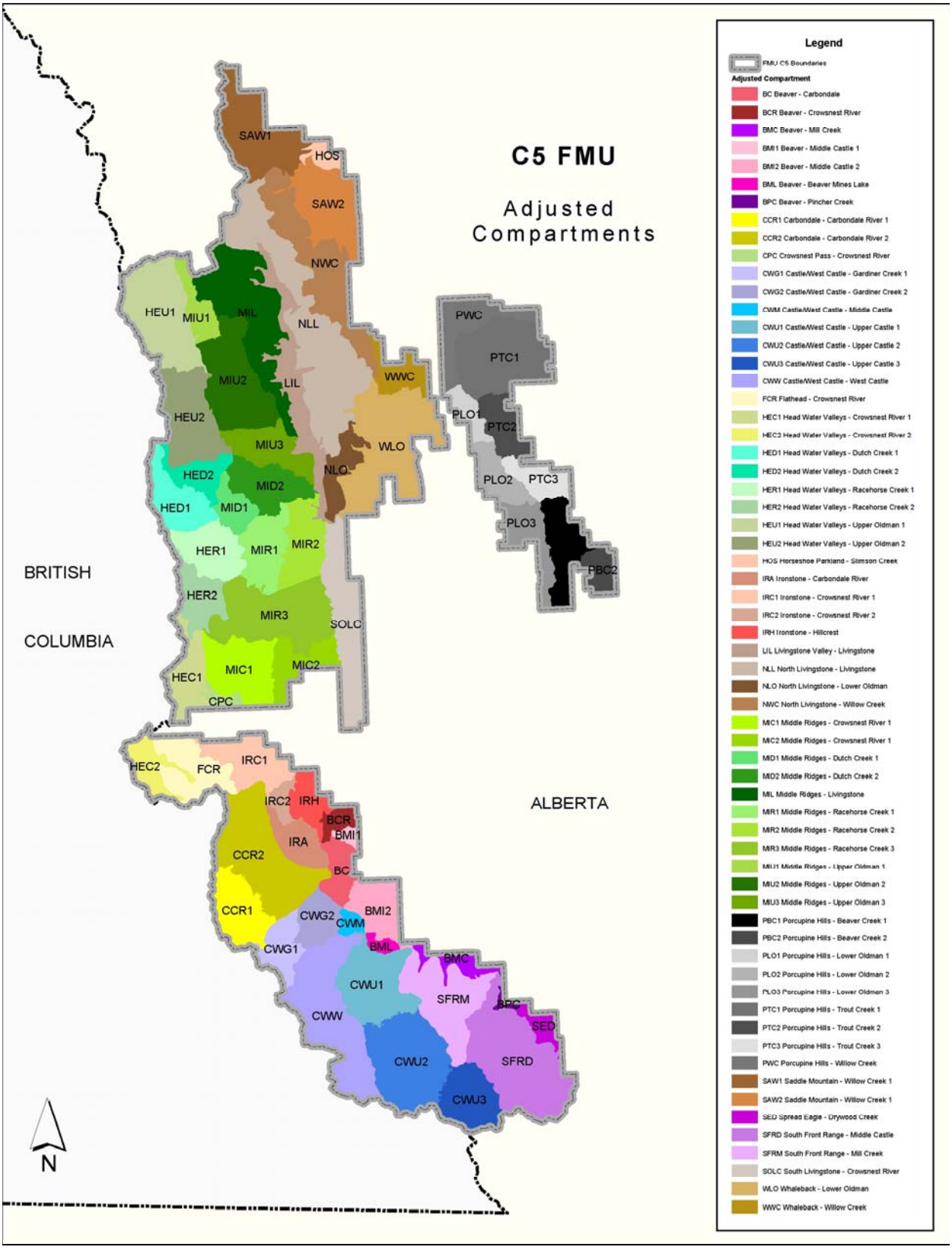


Figure 2-4: Map of adjusted compartments.

Table 2-13: Merchantable landbase by adjusted compartment.

Adjusted Compartment	Managed Landbase Area ha	Managed Landbase Average Age years	Merchantable Landbase[1] Area ha	Merchantable Landbase[1] Conifer Volume m³ at 15/11	Merchantable Landbase[1] Average Conifer Volume m³/ha	Merchantable Landbase[1] Average Age years
BC	1,796	78	540	84,310	156	93
BCR	678	65	338	73,925	219	98
BMC	1,384	83	1,073	204,666	191	99
BMI1	327	59	80	15,216	189	99
BMI2	2,282	86	1,177	250,208	213	107
BML	352	60	46	7,976	173	100
BPC	151	77	49	7,572	155	102
CCR1	1,514	120	938	141,866	151	173
CCR2	1,395	24	118	21,855	186	159
CPC	754	77	476	77,591	163	95
CWG1	1,282	89	359	52,891	147	183
CWG2	2,677	71	441	103,822	235	114
CWM	500	65	89	17,591	198	90
CWU1	2,204	79	361	69,004	191	139
CWU2	2,992	93	936	154,291	165	152
CWU3	1,897	102	730	104,770	143	176
CWW	3,661	81	988	159,568	162	153
FCR	164	70	39	7,356	190	118
HEC1	1,447	91	747	125,109	168	108
HEC2	1,298	74	516	96,735	187	127
HED1	2,742	90	968	129,966	134	219
HED2	1,180	108	516	62,082	120	223
HER1	3,376	78	1,102	147,933	134	198
HER2	2,146	84	558	69,683	125	226
HEU1	2,588	76	1,253	218,893	175	151
HEU2	3,088	121	3,085	531,429	172	121
HOS	264	84	139	34,121	245	94
IRA	526	57	257	44,484	173	98
IRC1	3,466	90	2,077	368,828	178	106
IRC2	444	20	46	8,016	175	105
IRH	266	65	93	15,258	164	126
LIL	3,607	84	2,302	392,820	171	121
MIC1	3,476	83	1,502	258,210	172	100
MIC2	2,234	85	1,414	234,786	166	94
MID1	1,601	100	823	128,715	156	163
MID2	2,815	73	1,071	193,532	181	120
MIL	3,174	114	2,598	455,478	175	135
MIR1	2,836	78	1,379	238,353	173	105
MIR2	2,469	87	1,178	205,713	175	100
MIR3	4,474	107	3,192	504,307	158	129
MIU1	1,104	111	890	161,946	182	136
MIU2	3,030	100	2,701	468,142	173	111
MIU3	2,368	88	1,828	338,562	185	110
NLL	2,384	101	1,826	328,935	180	120

[1] Merchantable is currently meeting the minimum harvest age for operability.

Table 2-13: Merchantable landbase by adjusted compartment. (continued)

	Managed Landbase		Merchantable Landbase[1]			
Adjusted Compartment	Area ha	Average Age years	Area ha	Conifer Volume m³ at 15/11	Average Conifer Volume m³/ha	Average Age years
NLO	103	93	93	16,212	175	99
NWC	2,373	88	1,281	218,750	171	101
PBC1	2,697	95	2,223	385,906	174	112
PBC2	1,273	92	1,062	177,119	167	104
PLO1	730	85	294	46,075	157	105
PLO2	1,837	90	1,106	182,365	165	104
PLO3	2,671	83	1,903	322,716	170	107
PTC1	5,306	84	2,014	407,370	202	107
PTC2	1,140	87	455	76,158	168	106
PTC3	905	97	615	104,135	169	108
PWC	1,459	89	760	130,082	171	103
SAW1	1,926	81	562	111,810	199	97
SAW2	3,408	84	1,642	309,843	189	95
SED	143	103	105	22,425	213	111
SFRD	631	107	481	81,955	170	117
SFRM	1,359	122	884	138,354	156	146
SOLC	1,527	87	1,020	186,648	183	96
WLO	1	100	1	173	255	100
WWC	281	94	227	41,906	184	97
Total	**114,184**		**59,565**	**10,276,513**	**173**	

[1] Merchantable is currently meeting the minimum harvest age for operability.

2.3.4 Watershed Sub-basin

Watershed sub-basins were used in preliminary TSA scenarios to determine appropriate minimum harvest ages. The area by watershed sub-basin is presented in Table 2-14. A map of watershed sub-basins is in Figure 2-5.

Table 2-14: Area by watershed sub-basin.

	Managed Landbase		Unmanaged Landbase				Gross Landbase	
	Forested		Forested		Non-forested			
Watershed Sub-basin	ha	%	ha	%	ha	%	ha	%
Beaver Creek	3,740	3%	1,491	1%	1,255	1%	6,485	2%
Carbondale	9,107	8%	4,360	3%	15,908	15%	29,376	8%
Carbondale - Lynx Creek	83	0%	47	0%	927	1%	1,057	0%
Crowsnest River	15,175	13%	11,952	9%	13,895	13%	41,022	12%
Crowsnest River - North York Creek	323	0%	231	0%	378	0%	932	0%
Crowsnest River - York Creek	26	0%	32	0%	352	0%	410	0%
Drywood Creek	710	1%	4,036	3%	8,275	8%	13,021	4%
Dutch Creek	8,355	7%	4,062	3%	3,133	3%	15,550	4%
Highwood River	93	0%	281	0%	49	0%	423	0%
Livingstone	8,492	7%	18,085	14%	9,306	9%	35,883	10%
Lower Oldman	7,486	7%	15,095	11%	7,680	7%	30,260	9%
Meadow Creek	230	0%	610	0%	289	0%	1,128	0%
Middle Castle	3,116	3%	1,335	1%	1,678	2%	6,128	2%
Mill Creek	2,744	2%	4,325	3%	3,469	3%	10,538	3%
Pekisko Creek	1,149	1%	4,612	3%	2,157	2%	7,918	2%
Pincher Creek	215	0%	1,056	1%	1,740	2%	3,011	1%
Racehorse Creek	14,481	13%	9,915	7%	6,170	6%	30,565	9%
Stimson Creek	1,330	1%	1,908	1%	321	0%	3,559	1%
Trout Creek	7,351	6%	6,083	5%	3,270	3%	16,704	5%
Upper Castle	11,098	10%	15,113	11%	10,954	11%	37,166	11%
Upper Oldman	11,750	10%	15,114	11%	7,477	7%	34,341	10%
Willow Creek	7,131	6%	13,768	10%	5,444	5%	26,344	7%
Total	**114,184**	**100%**	**133,510**	**100%**	**104,128**	**100%**	**351,823**	**100%**

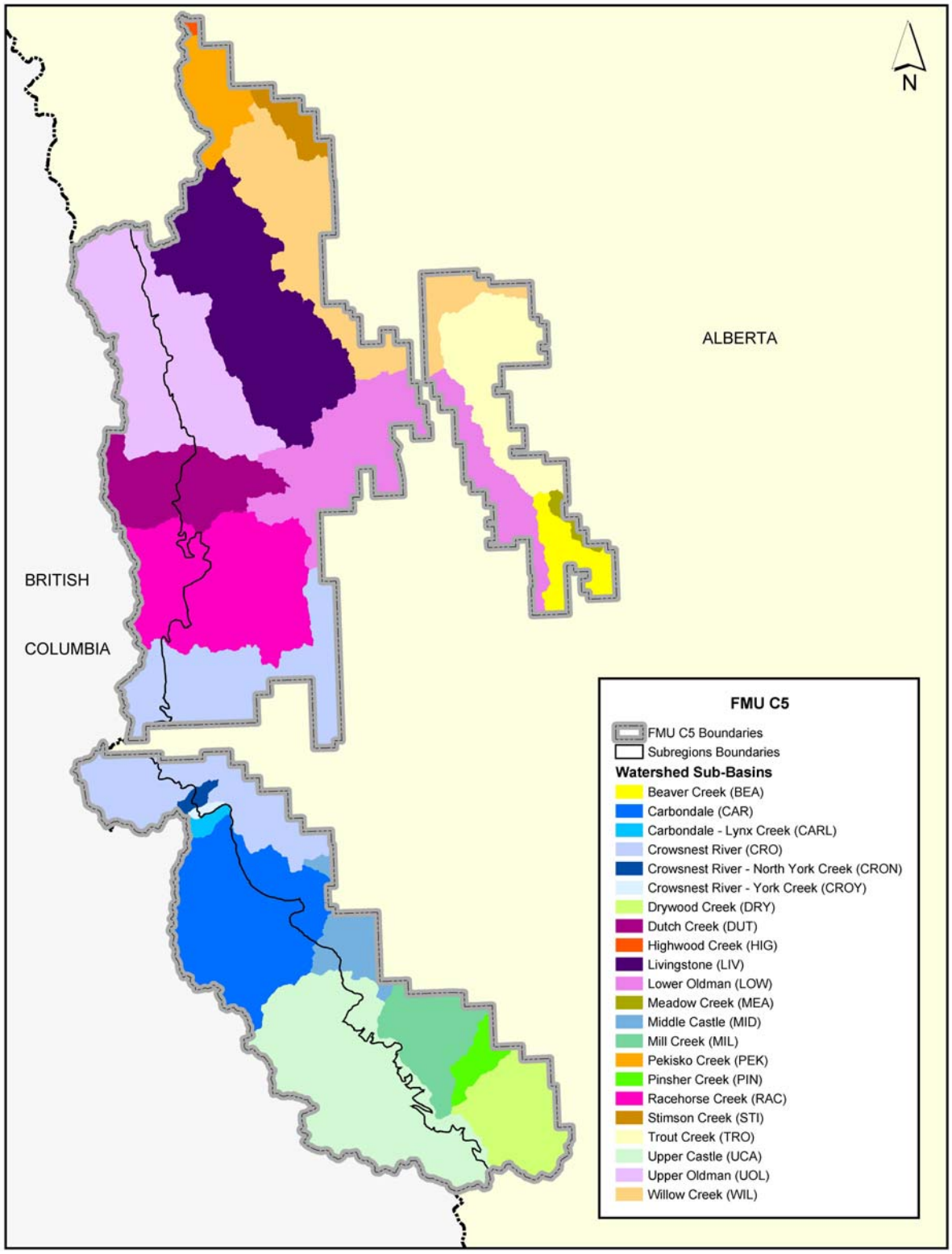


Figure 2-5: Map of watershed sub-basins.

2.3.5 Cover Type

The area by cover type is presented in Table 2-15. A map of cover types is in Figure 2-6. The cover type with the largest area in the C5 FMU is pine (C-Px).

Table 2-16 provides the area by cover type and C5 subregion.

Table 2-15: Area by cover type.

	Landbase					
	Managed		Unmanaged		Gross	
Cover Type	ha	%	ha	%	ha	%
C-Fa	1,422	1%	13,463	6%	14,885	4%
C-La	0	0%	537	0%	537	0%
C-Fd	11,920	10%	10,632	4%	22,552	6%
C-Px	55,904	49%	49,371	21%	105,275	30%
C-Sx	31,147	27%	33,848	14%	64,995	18%
C-Re	11,778	10%	1,279	1%	13,058	4%
CD	2,013	2%	1,310	1%	3,324	1%
DC	0	0%	2,699	1%	2,699	1%
D	0	0%	20,369	9%	20,369	6%
NNF	0	0%	97,575	41%	97,575	28%
ANF	0	0%	6,553	3%	6,553	2%
Total	**114,184**	**100%**	**237,638**	**100%**	**351,823**	**100%**

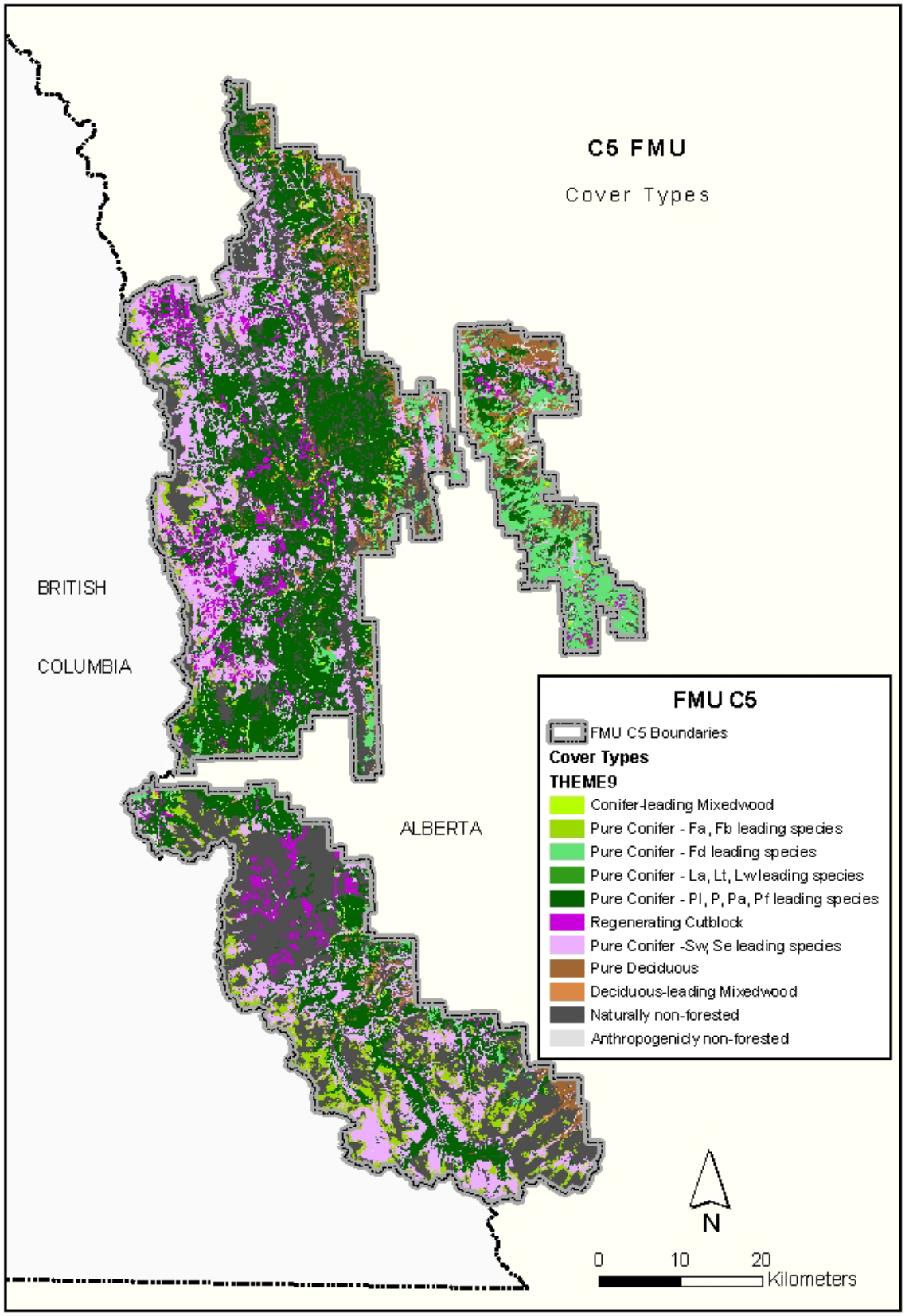


Figure 2-6: Map of cover types.

Table 2-16: Area by cover type and C5 subregion.

		Landbase					
		Managed		Unmanaged		Gross	
C5 Subregion	Cover Type	ha	%	ha	%	ha	%
Castle	C-Fa	205	1%	3,881	10%	4,085	8%
	C-La	0	0%	46	0%	46	0%
	C-Fd	557	4%	789	2%	1,346	2%
	C-Px	7,991	57%	3,869	10%	11,860	22%
	C-Sx	3,695	26%	3,562	9%	7,257	13%
	C-Re	1,291	9%	171	0%	1,462	3%
	CD	292	2%	103	0%	395	1%
	DC	0	0%	320	1%	320	1%
	D	0	0%	2,385	6%	2,385	4%
	NNF	0	0%	24,100	60%	24,100	45%
	ANF	0	0%	781	2%	781	1%
	Total	**14,031**	**100%**	**40,008**	**100%**	**54,039**	**100%**
Continental Divide North	C-Fa	433	3%	2,136	9%	2,570	7%
	C-La	0	0%	238	1%	238	1%
	C-Fd	121	1%	122	1%	243	1%
	C-Px	5,239	32%	3,303	14%	8,542	22%
	C-Sx	6,727	41%	7,049	31%	13,776	35%
	C-Re	3,685	23%	204	1%	3,889	10%
	CD	26	0%	16	0%	42	0%
	DC	0	0%	15	0%	15	0%
	D	0	0%	16	0%	16	0%
	NNF	0	0%	9,399	41%	9,399	24%
	ANF	0	0%	537	2%	537	1%
	Total	**16,232**	**100%**	**23,035**	**100%**	**39,267**	**100%**
Continental Divide South	C-Fa	649	3%	6,722	14%	7,371	11%
	C-La	0	0%	41	0%	41	0%
	C-Fd	196	1%	153	0%	349	1%
	C-Px	9,412	49%	4,493	10%	13,905	21%
	C-Sx	7,561	39%	7,205	15%	14,765	22%
	C-Re	1,333	7%	774	2%	2,107	3%
	CD	209	1%	145	0%	354	1%
	DC	0	0%	131	0%	131	0%
	D	0	0%	419	1%	419	1%
	NNF	0	0%	26,035	55%	26,035	39%
	ANF	0	0%	807	2%	807	1%
	Total	**19,360**	**100%**	**46,924**	**100%**	**66,284**	**100%**

Table 2-16: Area by cover type and C5 subregion. (continued)

		Landbase					
		Managed		Unmanaged		Gross	
C5 Subregion	Cover Type	ha	%	ha	%	ha	%
Livingstone	C-Fa	135	0%	724	1%	858	1%
	C-La	0	0%	212	0%	212	0%
	C-Fd	740	2%	4,390	4%	5,131	3%
	C-Px	28,505	61%	37,572	35%	66,077	43%
	C-Sx	11,105	24%	15,971	15%	27,076	18%
	C-Re	4,755	10%	126	0%	4,881	3%
	CD	1,302	3%	894	1%	2,196	1%
	DC	0	0%	1,938	2%	1,938	1%
	D	0	0%	9,836	9%	9,836	6%
	NNF	0	0%	32,192	30%	32,192	21%
	ANF	0	0%	2,415	2%	2,415	2%
	Total	**46,542**	**100%**	**106,270**	**100%**	**152,812**	**100%**
Porcupine Hills	C-Fa	0	0%	0	0%	-	0%
	C-La	0	0%	0	0%	-	0%
	C-Fd	10,305	57%	5,177	40%	15,482	50%
	C-Px	4,757	26%	0	0%	4,757	15%
	C-Sx	2,058	11%	0	0%	2,058	7%
	C-Re	714	4%	0	0%	714	2%
	CD	184	1%	0	0%	184	1%
	DC	0	0%	0	0%	-	0%
	D	0	0%	0	0%	-	0%
	NNF	0	0%	5,849	45%	5,849	19%
	ANF	0	0%	2,014	15%	2,014	6%
	Total	**18,019**	**100%**	**13,039**	**100%**	**31,059**	**100%**

The landscape in the C5 FMU is defined largely by past harvesting activities in addition to fire. The area by year of harvest and cover type for all existing blocks is presented in Figure 2-7. A map of existing blocks is in Figure 2-8.

Blocks are divided into two classes: pre-1991 (harvested prior to May 1, 1992) and post-1991 (harvested after April 30, 1992). Pre-1991 blocks were assigned a cover type based on the defining AVI layer (primarily the overstorey) as per the requirements of the Planning Standard. There is a large area of pre-1991 blocks classified as non-forested because their assignment was based on photo-interpretation and the regenerating trees in many of those areas were too small to be seen on the photos.

The small amount of non-forested strata assigned to post-91 blocks were the result of access deletions (roads, pipelines, seismic) and recent burns.

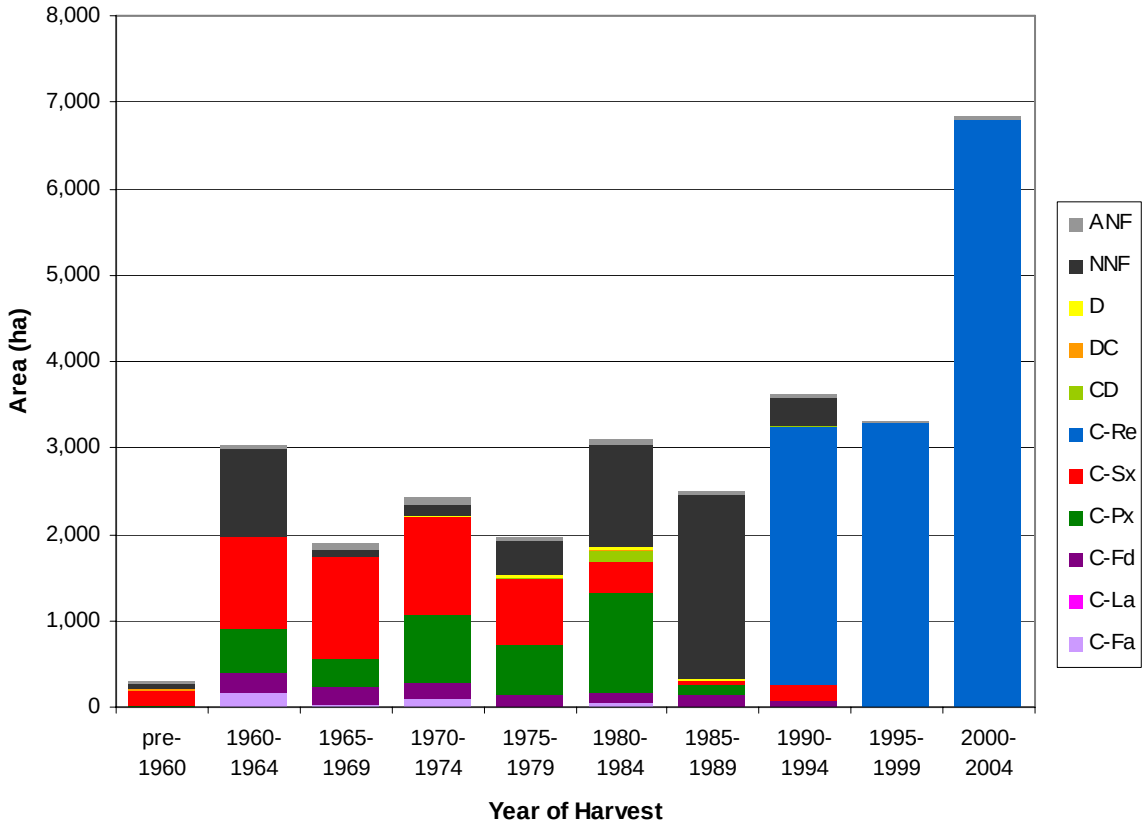


Figure 2-7: Area in existing blocks by harvest year.

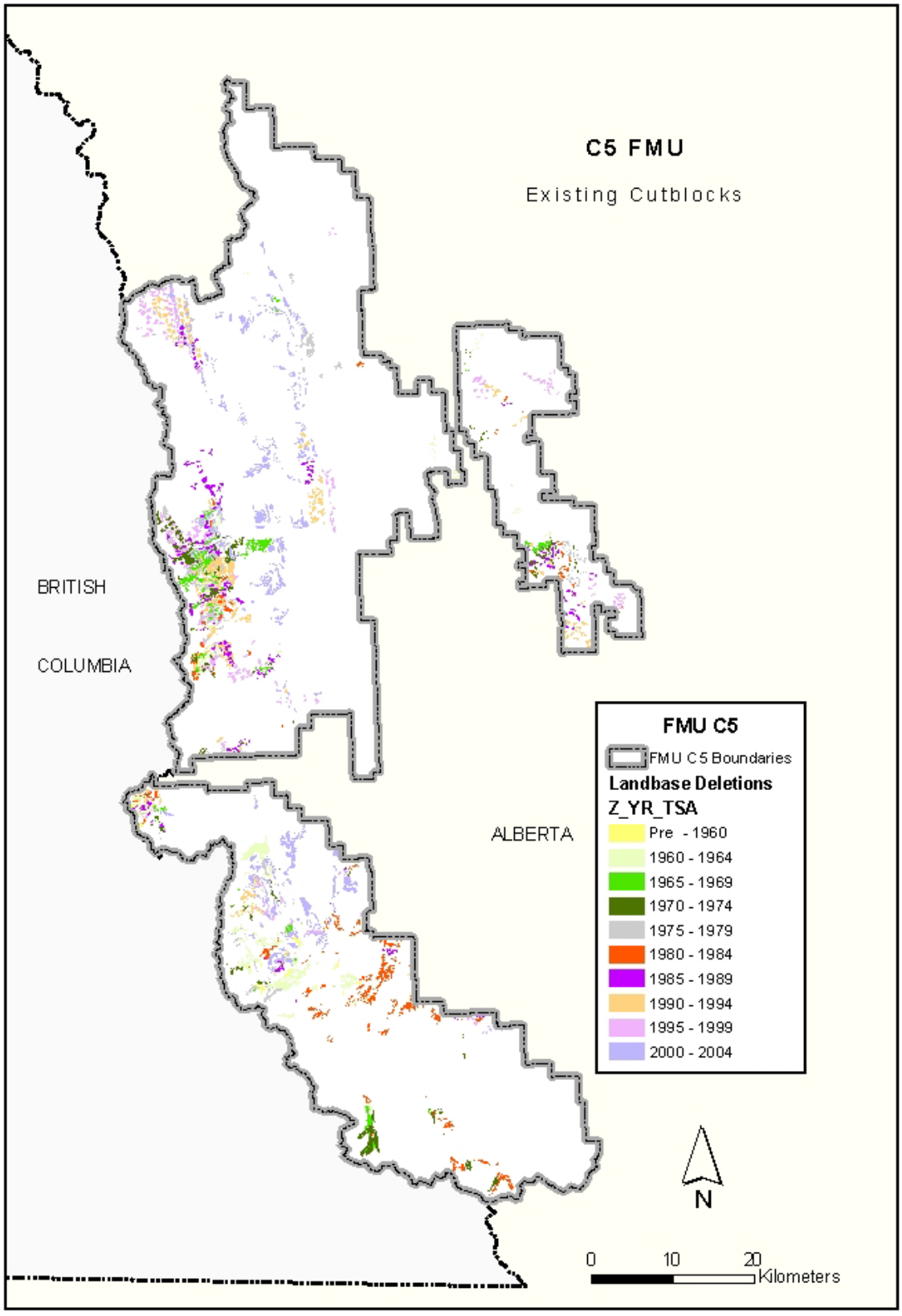


Figure 2-8: Map of existing blocks.

2.3.6 Yield Curve

The area by yield curve for the forested landbase is presented in Table 2-17. A map of yield curves for the managed landbase is in Figure 2-9. Yield curve 4 (C-Pl-CD-SA) is the dominant yield curve in the C5 FMU.

Table 2-18 provides the area by yield curve and C5 subregion.

Table 2-17: Area by yield curve.

	Forested Landbase					
	Managed		Unmanaged		Total	
Yield Curve	ha	%	ha	%	ha	%
1 C-Fd-All	11,920	10%	10,632	8%	22,552	9%
2 C-Pl-All-M	19,827	17%	9,269	7%	29,096	12%
3 C-Pl-AB-SA	8,386	7%	9,557	7%	17,943	7%
4 C-Pl-CD-SA	27,692	24%	30,545	23%	58,236	24%
5 C-Sx-All-M	8,452	7%	4,305	3%	12,757	5%
6 C-Sx-AB-SA	14,738	13%	26,627	20%	41,365	17%
7 C-Sx-CD-SA	9,379	8%	16,379	12%	25,758	10%
8 CD-All	2,013	2%	1,310	1%	3,324	1%
9 D/DC-All	0	0%	23,069	17%	23,069	9%
R Regen	11,778	10%	1,279	1%	13,058	5%
N C-La	0	0%	537	0%	537	0%
Total	**114,184**	**100%**	**133,510**	**100%**	**247,695**	**100%**

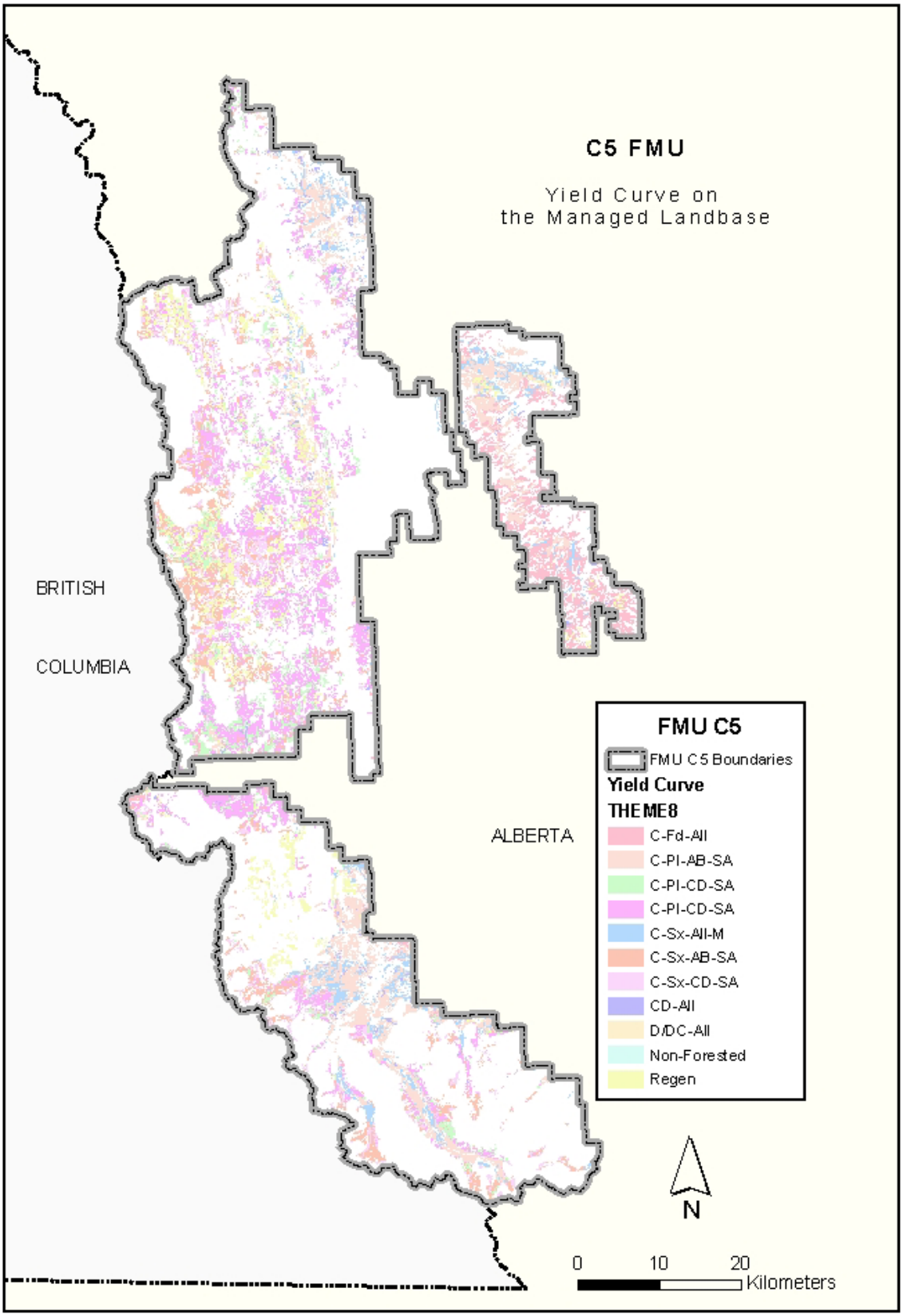


Figure 2-9: Map of yield curves on the managed landbase.

Table 2-18: Area by yield curve and C5 subregion.

		Forested Landbase					
		Managed		Unmanaged		Total	
C5 Subregion	Yield Curve	ha	%	ha	%	ha	%
Castle	1 C-Fd-All	557	4%	789	5%	1,346	5%
	2 C-Pl-All-M	4,304	31%	1,242	8%	5,547	19%
	3 C-Pl-AB-SA	525	4%	711	5%	1,235	4%
	4 C-Pl-CD-SA	3,162	23%	1,916	13%	5,078	17%
	5 C-Sx-All-M	1,837	13%	602	4%	2,438	8%
	6 C-Sx-AB-SA	1,373	10%	4,499	30%	5,871	20%
	7 C-Sx-CD-SA	690	5%	2,342	15%	3,033	10%
	8 CD-All	292	2%	103	1%	395	1%
	9 D/DC-All	0	0%	2,706	18%	2,706	9%
	R Regen	1,291	9%	171	1%	1,462	5%
	N C-La	0	0%	46	0%	46	0%
	Total	**14,031**	**100%**	**15,127**	**100%**	**29,157**	**100%**
Continental Divide North	1 C-Fd-All	121	1%	122	1%	243	1%
	2 C-Pl-All-M	7	0%	1	0%	8	0%
	3 C-Pl-AB-SA	1,815	11%	811	6%	2,626	9%
	4 C-Pl-CD-SA	3,417	21%	2,490	19%	5,908	20%
	5 C-Sx-All-M	0	0%	0	0%	-	0%
	6 C-Sx-AB-SA	5,112	31%	5,733	44%	10,845	37%
	7 C-Sx-CD-SA	2,049	13%	3,452	26%	5,501	19%
	8 CD-All	26	0%	16	0%	42	0%
	9 D/DC-All	0	0%	31	0%	31	0%
	R Regen	3,685	23%	204	2%	3,889	13%
	N C-La	0	0%	238	2%	238	1%
	Total	**16,232**	**100%**	**13,099**	**100%**	**29,331**	**100%**
Continental Divide South	1 C-Fd-All	196	1%	153	1%	349	1%
	2 C-Pl-All-M	5,287	27%	1,043	5%	6,330	16%
	3 C-Pl-AB-SA	1,196	6%	878	4%	2,074	5%
	4 C-Pl-CD-SA	2,929	15%	2,571	13%	5,500	14%
	5 C-Sx-All-M	2,454	13%	846	4%	3,300	8%
	6 C-Sx-AB-SA	3,386	17%	8,984	45%	12,369	31%
	7 C-Sx-CD-SA	2,370	12%	4,097	20%	6,467	16%
	8 CD-All	209	1%	145	1%	354	1%
	9 D/DC-All	0	0%	550	3%	550	1%
	R Regen	1,333	7%	774	4%	2,107	5%
	N C-La	0	0%	41	0%	41	0%
	Total	**19,360**	**100%**	**20,083**	**100%**	**39,442**	**100%**

Table 2-18: Area by yield curve and C5 subregion. (continued)

		Forested Landbase					
		Managed		Unmanaged		Total	
C5 Subregion	Yield Curve	ha	%	ha	%	ha	%
Livingstone	1 C-Fd-All	740	2%	4,390	6%	5,131	4%
	2 C-Pl-All-M	5,471	12%	6,847	10%	12,318	10%
	3 C-Pl-AB-SA	4,850	10%	7,158	10%	12,008	10%
	4 C-Pl-CD-SA	18,184	39%	23,567	33%	41,751	35%
	5 C-Sx-All-M	2,103	5%	2,795	4%	4,898	4%
	6 C-Sx-AB-SA	4,868	10%	7,412	10%	12,280	10%
	7 C-Sx-CD-SA	4,269	9%	6,488	9%	10,757	9%
	8 CD-All	1,302	3%	894	1%	2,196	2%
	9 D/DC-All	0	0%	11,774	16%	11,774	10%
	R Regen	4,755	10%	126	0%	4,881	4%
	N C-La	0	0%	212	0%	212	0%
	Total	**46,542**	**100%**	**71,663**	**100%**	**118,205**	**100%**
Porcupine Hills	1 C-Fd-All	10,305	57%	5,177	38%	15,482	49%
	2 C-Pl-All-M	4,757	26%	135	1%	4,892	16%
	3 C-Pl-AB-SA	0	0%	0	0%	-	0%
	4 C-Pl-CD-SA	0	0%	0	0%	-	0%
	5 C-Sx-All-M	2,058	11%	62	0%	2,121	7%
	6 C-Sx-AB-SA	0	0%	0	0%	-	0%
	7 C-Sx-CD-SA	0	0%	0	0%	-	0%
	8 CD-All	184	1%	152	1%	337	1%
	9 D/DC-All	0	0%	8,007	59%	8,007	25%
	R Regen	714	4%	4	0%	719	2%
	N C-La	0	0%	0	0%	-	0%
	Total	**18,019**	**100%**	**13,539**	**100%**	**31,558**	**100%**

2.3.7 Timber Productivity Rating

Timber productivity rating (TPR) was an input into some of the interim watershed analyses. TPR classes were assigned to forested stands in the AVI. The area by TPR class for the forested landbase is presented in Table 2-19. Forested stands missing TPR were assigned to the medium class because it is the largest class on the managed landbase and because it represents the average condition. This was a result of assigning a regenerating forested cover type to non-forested stands in the AVI. There was very little area that was missing TPR.

Table 2-19: Area by timber productivity rating class.

Cover Type	Area (ha) by Timber Productivity Class				Total
	Unproductive	Fair	Medium	Good	
Managed Landbase					
C-Fa	156	877	301	88	1,422
C-La	0	0	0	0	0
C-Fd	0	4,378	7,346	196	11,920
C-Px	23	20,927	31,478	3,476	55,904
C-Sx	99	16,079	12,042	2,927	31,147
C-Re	1,130	6,117	4,200	331	11,778
CD	0	910	898	205	2,013
DC	0	0	0	0	0
D	0	0	0	0	0
Total	**1,408**	**49,288**	**56,266**	**7,223**	**114,184**
Unmanaged Forested Landbase					
C-Fa	10,558	2,708	186	11	13,463
C-La	276	93	125	43	537
C-Fd	512	5,124	4,894	102	10,632
C-Px	11,190	29,655	8,002	524	49,371
C-Sx	10,963	16,394	6,047	445	33,848
C-Re	61	748	467	3	1,279
CD	268	717	262	63	1,310
DC	350	1,462	869	18	2,699
D	1,888	12,205	6,249	26	20,369
Total	**36,066**	**69,106**	**27,102**	**1,236**	**133,510**
Total Forested Landbase					
C-Fa	10,714	3,585	487	99	14,885
C-La	276	93	125	43	537
C-Fd	512	9,501	12,240	298	22,552
C-Px	11,213	50,581	39,481	4,000	105,275
C-Sx	11,061	32,474	18,088	3,372	64,995
C-Re	1,191	6,866	4,667	334	13,058
CD	268	1,627	1,161	268	3,324
DC	350	1,462	869	18	2,699
D	1,888	12,205	6,249	26	20,369
Total	**37,474**	**118,394**	**83,368**	**8,459**	**247,695**

2.3.8 Age Class

The current age class distribution for the forested landbase in 10-year age classes is provided by cover type in Figure 2-10. The forest is predominantly mature, with most of the area in the 61-100 year age classes. The majority of the area in the younger age classes is the result of past harvesting activities, therefore it is in the regen cover type. The small area of the regen cover type in the unmanaged landbase is a result of the current method of determining the timber harvesting and passive landbases. Some previously harvested areas were removed from the timber harvesting landbase and were unavailable to the TSA models for future treatments due to changes in the deletion rules in the landbase classification.

Areas burnt in recent fires are not classified as forested land, which resulted in the small area in the youngest age class on the unmanaged landbase.

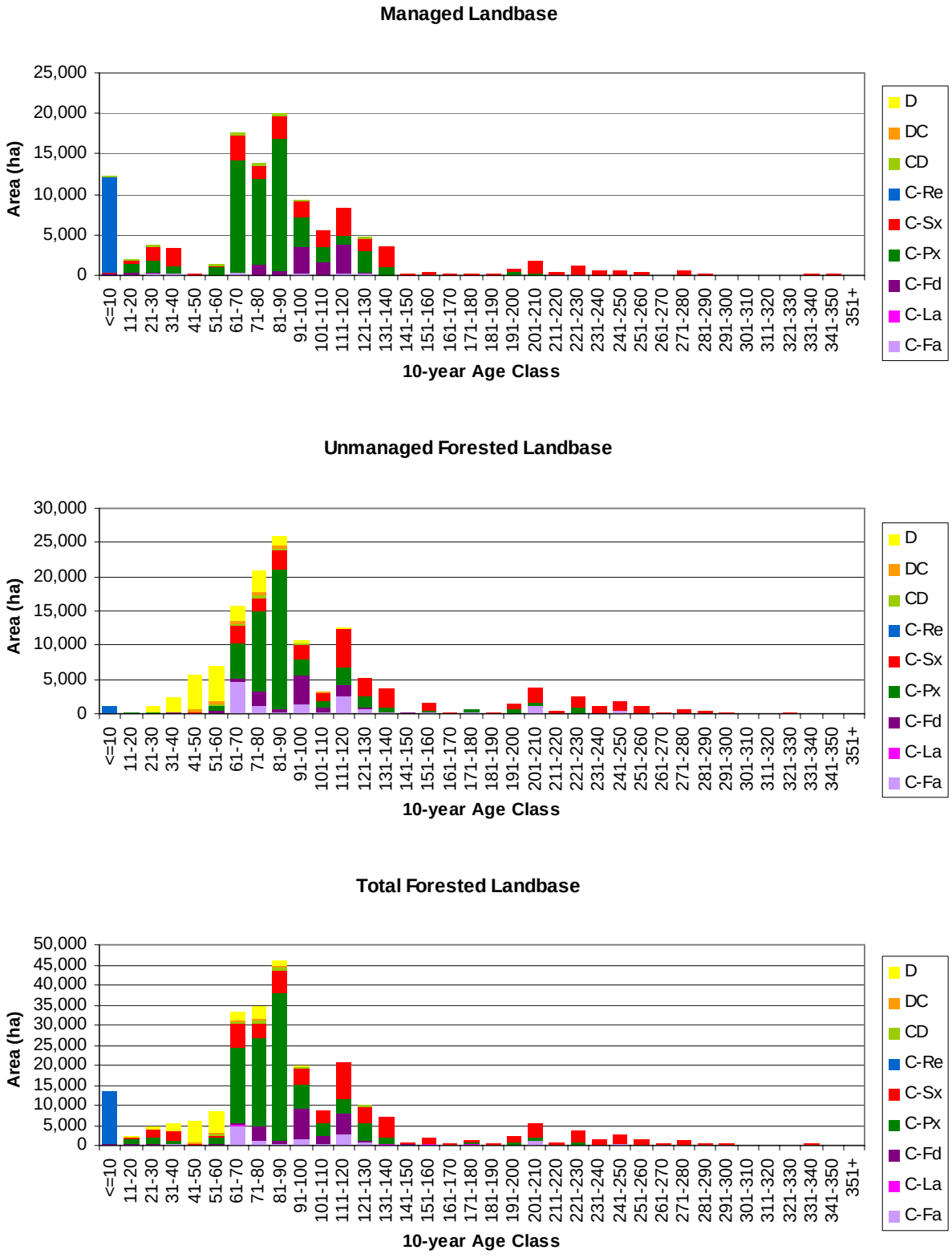


Figure 2-10: Forested area by 10-year age class and cover type.

2.3.9 Seral Stage

Seral stages were used to define old forest and goals were set by seral stage in TSA scenarios. Area by seral stage is presented in Table 2-20 and Figure 2-11. A map of seral stages is in Figure 2-12. The majority of the area in the regen seral stage on the managed landbase was in existing blocks.

Table 2-20: Area by seral stage.

Area (ha)						
Cover Type	Seral Stage					Total
	Regen	Young	Mature	Early Old Growth	Late Old Growth	
Managed Landbase						
C-Fa	321	577	437	21	66	1,422
C-La	0	0	0	0	0	0
C-Fd	856	2,144	8,920	0	0	11,920
C-Px	1,637	26,915	26,625	369	358	55,904
C-Sx	2,555	9,757	12,479	3,630	2,726	31,147
C-Re	11,778	0	0	0	0	11,778
CD	162	1,022	817	11	0	2,013
DC	0	0	0	0	0	0
D	0	0	0	0	0	0
Total	**17,310**	**40,417**	**49,277**	**4,031**	**3,150**	**114,184**
Unmanaged Forested Landbase						
C-Fa	57	7,418	3,885	315	1,787	13,463
C-La	0	172	263	76	27	537
C-Fd	13	3,625	6,979	14	0	10,632
C-Px	330	17,766	28,510	1,247	1,518	49,371
C-Sx	157	7,645	15,735	5,135	5,176	33,848
C-Re	1,279	0	0	0	0	1,279
CD	3	755	547	5	0	1,310
DC	49	1,981	669	0	0	2,699
D	929	14,184	5,248	8	0	20,369
Total	**2,819**	**53,546**	**61,836**	**6,801**	**8,508**	**133,510**
Total Forested Landbase						
C-Fa	379	7,996	4,321	336	1,853	14,885
C-La	0	172	263	76	27	537
C-Fd	869	5,770	15,899	14	0	22,552
C-Px	1,967	44,681	55,135	1,616	1,876	105,275
C-Sx	2,712	17,402	28,214	8,765	7,901	64,995
C-Re	13,058	0	0	0	0	13,058
CD	166	1,777	1,364	17	0	3,324
DC	49	1,981	669	0	0	2,699
D	929	14,184	5,248	8	0	20,369
Total	**20,130**	**93,963**	**111,113**	**10,832**	**11,658**	**247,695**

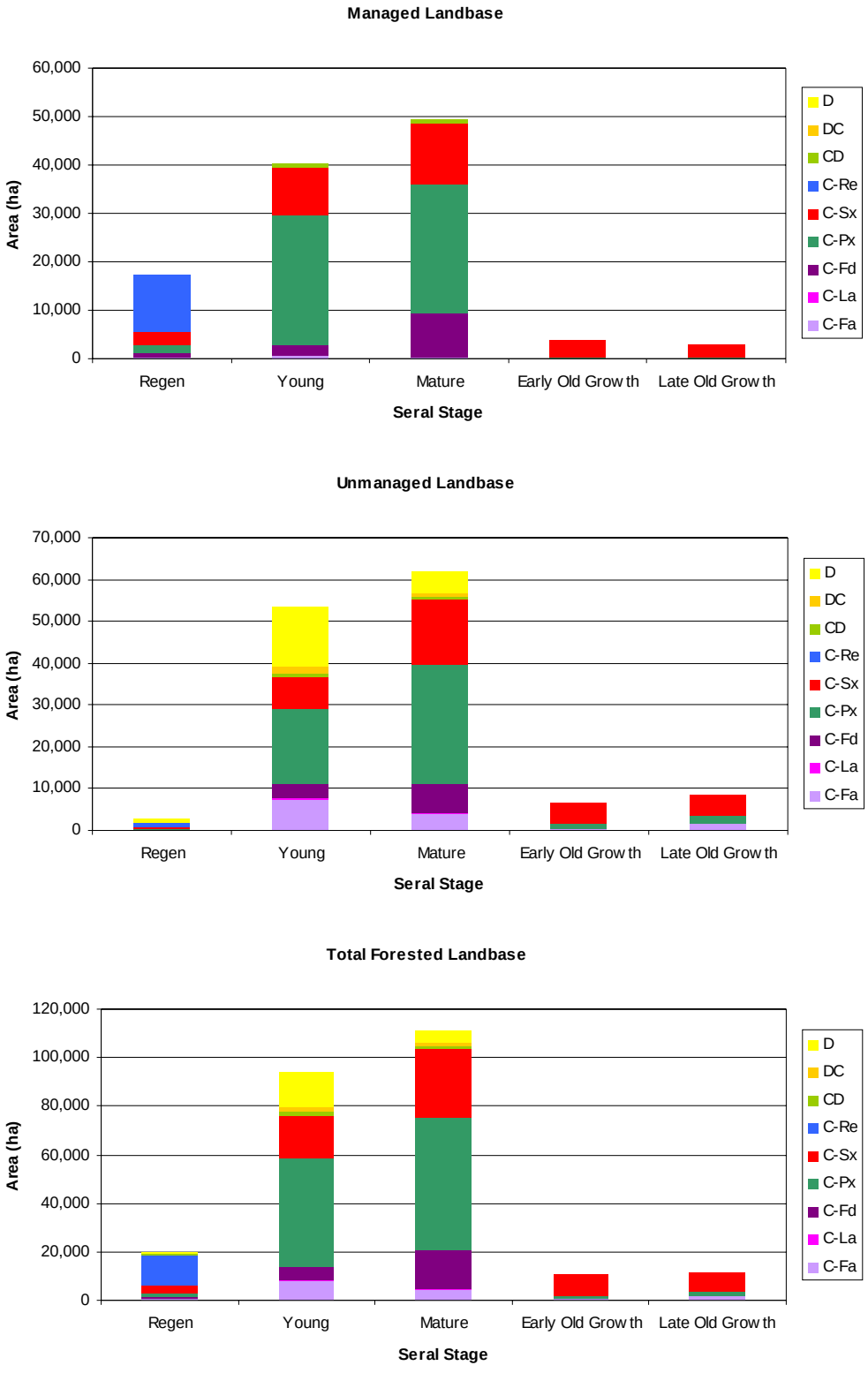


Figure 2-11: Area by seral stage.

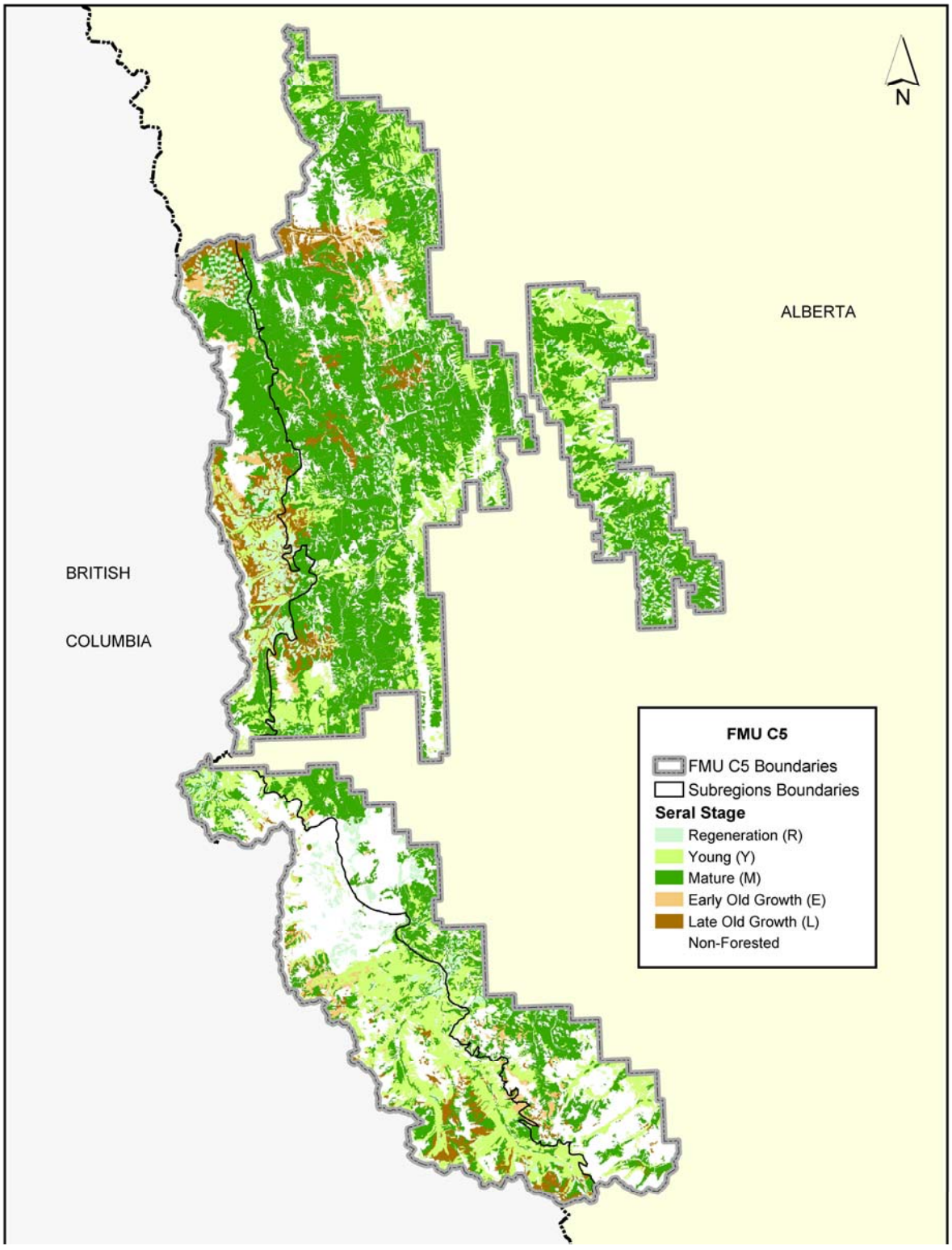


Figure 2-12: Map of seral stages.

2.3.10 Wildlife

The impact of harvesting activities on wildlife habitat was assessed for many wildlife species in the development of the preferred forest management scenario. The following species were identified in the landbase classification process:

- harlequin duck,
- wolverine,
- long-toed salamander,
- western frog,
- Clark's nutcracker, and
- elk.

For harlequin duck and wolverine, areas of highly suitable habitat were removed from the timber harvesting landbase.

The area by habitat suitability index is provided for harlequin duck (Table 2-21) and wolverine (Table 2-22). The few hectares of highly suitable habitat the managed landbase are the result of planned block treatments.

Table 2-21: Area by habitat suitability index for harlequin duck.

	Forested Landbase					
	Managed		Unmanaged		Total	
Habitat Suitability Index	ha	%	ha	%	ha	%
Unclassified	4,832	4%	10,302	8%	15,134	6%
Highly Unsuitable	109,227	96%	121,279	91%	230,506	93%
Somewhat Unsuitable	121	0%	201	0%	322	0%
Somewhat Suitable	3	0%	411	0%	413	0%
Highly Suitable	2	0%	1,317	1%	1,319	1%
Total	**114,184**	**100%**	**133,510**	**100%**	**247,695**	**100%**

Table 2-22: Area by habitat suitability index for wolverine.

	Forested Landbase					
	Managed		Unmanaged		Total	
Habitat Suitability Index	ha	%	ha	%	ha	%
Unclassified	4,835	4%	10,314	8%	15,149	6%
Highly Unsuitable	89,761	79%	85,528	64%	175,289	71%
Somewhat Unsuitable	17,316	15%	24,902	19%	42,219	17%
Somewhat Suitable	2,272	2%	11,446	9%	13,717	6%
Highly Suitable	0	0%	1,321	1%	1,321	1%
Total	**114,184**	**100%**	**133,510**	**100%**	**247,695**	**100%**

For long-toed salamander and western frog, areas within 400 m of probable habitat for these species at risk were removed from the timber harvesting landbase.

For Clark's nuthatch, habitat was defined as pure conifer stands in the regular landbase type with whitebark or limber pine component. These stand types were removed from the timber harvesting landbase.

For elk, important habitat types were identified in the classified landbase and reported upon in the preferred forest management scenario. The area by elk habitat type is provided in Table 2-23.

Table 2-23: Area by elk habitat type.

	Forested Landbase					
	Managed		Unmanaged		Total	
Elk Habitat Type	ha	%	ha	%	ha	%
Unclassified	81,526	71%	94,162	71%	175,688	71%
Calving	13,325	12%	12,727	10%	26,052	11%
Winter Habitat	3,025	3%	12,009	9%	15,034	6%
Migration Area	16,308	14%	14,510	11%	30,818	12%
Calving + Winter Habitat	0	0%	103	0%	103	0%
Total	**114,184**	**100%**	**133,510**	**100%**	**247,695**	**100%**

2.3.11 Mountain Pine Beetle Susceptibility

Mountain pine beetle (MPB) is a very real and serious threat to the forests in the C5 FMU. In the event of an epidemic, the challenge will be the commercial removal of infected stands. This would require a specific strategy to deal with mountain pine beetle and could cause an immediate changes to the preferred forest management scenario and spatial harvest sequence. The first priority of a new strategy would be to control the mountain pine beetle and reduce pine mortality. If that is not possible, the preferred forest management scenario would need to be adjusted to balance the salvage of pine to reduce timber losses and while managing for biodiversity and social values.

The impacts of prioritizing the highly susceptible stands in the managed landbase for harvest were assessed in the TSA scenarios. The intent of these scenarios was to remove areas of highly susceptible stands prior to probable beetle attack. Although the amount of preferred habitat can be reduced through forest management activities, it is impossible to remove every tree that may be utilized by the beetle. In a major infestation, beetles will use less desirable trees (e.g. younger pine), if preferred habitat is less available. Twenty four percent of the highly susceptible stands were in the unmanaged landbase and as such, could not be included in this sensitivity analysis.

A hazard rating was assigned to stands using the Shore/Safranyik Susceptibility and Risk Rating System. Stands with a rating of 30 or greater were assigned to the high and extreme hazard classes because they were considered highly susceptible to mountain pine beetle. Generally, this included south and east aspects with pine stands older than 80 years. Stands were assigned to these hazard ratings where the climate favourable for mountain pine beetle frequently occurs. These highly susceptible stands were identified in the classified landbase. For this analysis, all areas not assigned to a high or extreme hazard class were called *unclassified,* even though the Rating System identifies other hazard classes. Table 2-24 shows area by mountain pine beetle hazard class for the pine cover type in the classified landbase. A map of highly susceptible areas is in Figure 2-13.

Table 2-24: Area of pine by mountain pine beetle hazard class.

	Pine (C-Px) Cover Type					
	Managed		Unmanaged		Total	
Mountain Pine Beetle Hazard	ha	%	ha	%	ha	%
Unclassified	33,578	60%	42,394	86%	75,972	72%
High[1]	13,704	25%	4,681	9%	18,386	17%
Extreme[1]	8,622	15%	2,296	5%	10,918	10%
Total	**55,904**	**100%**	**49,371**	**100%**	**105,275**	**100%**

[1] High and Extreme mountain pine beetle hazard classes were *highly susceptible.*

Table 2-25 provides area and volumes by broad age class and adjusted compartment for the highly susceptible pine stands in the managed landbase. In this table, the adjusted compartments are ordered by descending pine susceptible volume. Adjusted compartments with the most volume were considered a priority for sequencing in the spatial TSA models. Almost half of the area classified as highly susceptible is 61-80 years old, which is just below the minimum harvest ages used in the TSA scenarios.

It was felt that the unclassified pine stands could also be at risk to mountain pine beetle, especially in catastrophic invasions and epidemic situations. Therefore, some TSA scenarios also made these stands a priority for harvest. Table 2-26 provides areas and volumes for stands in the managed landbase greater than 80 years old. The areas and volumes are reported in three categories: non-pine, unclassified pine and highly susceptible pine stands by adjusted compartment. In this table, the adjusted compartments are ordered by descending volume in highly susceptible stands.

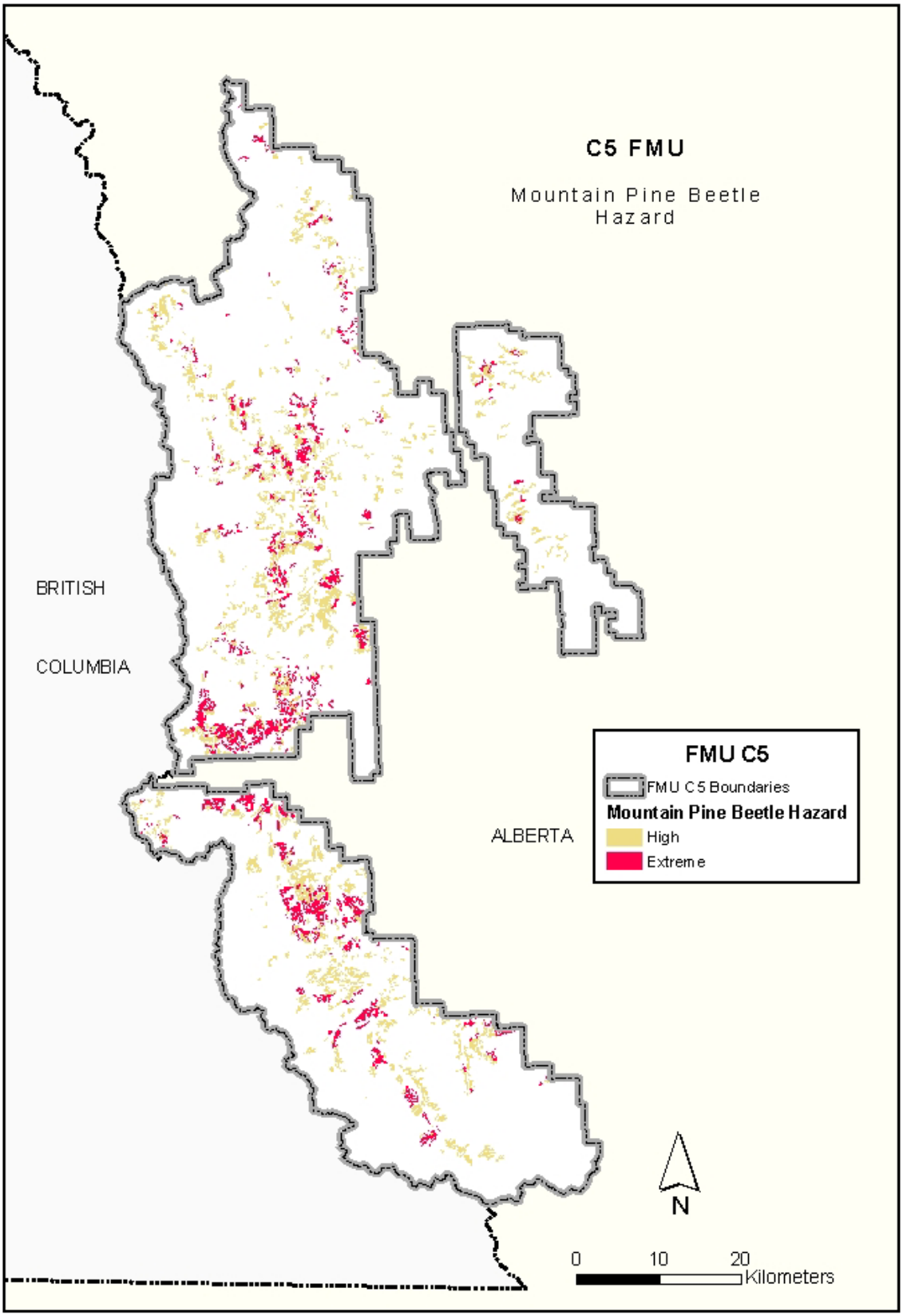


Figure 2-13: Map of mountain pine beetle hazard classes.

Table 2-25: Area and conifer volume for highly susceptible pine stands in the managed landbase.

Adjusted	Area (ha) by Age Class (years)					Conifer Volume (m³ at 15/11) by Age Class (years				
Compartment	< 60	61-70	71-80	> 80	Total	< 60	61-70	71-80	> 80	Total
MIC1	153	483	133	644	1,413	21,198	76,755	23,459	122,231	243,643
IRC1	0	286	188	676	1,151	0	45,572	33,071	130,983	209,625
MIR3	0	0	216	791	1,007	0	0	38,041	150,175	188,216
MIR2	70	154	455	344	1,023	9,705	24,558	79,927	65,370	179,560
MIU3	0	0	0	845	845	0	0	0	165,052	165,052
MIU2	0	5	0	841	846	0	761	0	160,540	161,302
LIL	0	15	0	948	963	0	1,945	0	150,266	152,212
MIR1	0	193	345	308	845	0	30,685	60,682	59,639	151,006
MIC2	0	13	187	613	814	20	2,036	32,935	113,960	148,951
PTC1	21	76	716	149	962	2,294	9,644	99,359	22,609	133,906
NWC	0	105	99	463	668	0	16,503	17,474	87,849	121,826
CWU2	1	905	0	0	906	35	120,994	0	0	121,030
CWG2	0	910	0	22	932	4	113,743	0	3,259	117,006
SOLC	40	49	8	537	634	5,510	7,843	1,438	100,174	114,965
CWU1	0	800	1	3	804	0	101,292	77	499	101,868
BC	13	23	500	186	722	1,442	2,811	69,437	27,848	101,539
HEC1	14	34	149	333	530	1,522	5,423	26,224	63,177	96,346
MID2	0	94	209	214	517	0	14,798	36,792	44,091	95,681
HEU1	0	0	0	417	418	0	63	0	85,455	85,518
SAW2	0	214	86	305	606	0	27,342	11,989	45,909	85,239
BMC	0	0	31	470	501	6	0	4,476	78,187	82,668
NLL	0	0	4	352	356	0	0	698	70,825	71,523
CPC	3	24	14	382	422	79	3,328	1,928	64,041	69,375
PLO2	44	295	120	25	484	4,828	37,331	16,631	3,839	62,629
MIL	0	0	0	274	274	0	0	0	56,193	56,193
SFRM	0	0	258	47	305	0	0	44,639	8,937	53,575
HEU2	0	0	0	273	273	0	47	0	52,901	52,948
BMI2	0	169	36	107	313	5	19,897	5,018	16,221	41,141
CWW	0	319	0	5	324	0	39,128	0	968	40,095
HEC2	12	10	18	147	188	490	1,635	3,159	32,023	37,307
CWU3	0	233	0	8	241	0	31,780	0	1,291	33,071
HER2	0	42	123	23	189	0	6,709	21,698	4,428	32,835
CWM	0	258	0	0	258	0	30,369	0	0	30,369
HED1	0	0	0	132	132	0	0	0	28,133	28,133
IRA	2	0	22	126	150	49	0	3,789	21,505	25,342
PTC2	22	28	106	0	156	2,483	3,492	14,774	0	20,749
CWG1	0	137	0	0	137	0	20,146	0	0	20,146
HER1	0	5	0	95	100	5	805	0	17,956	18,766
SAW1	0	0	111	3	114	0	0	16,597	454	17,051
PWC	3	0	65	48	116	170	0	8,963	7,239	16,372
PLO3	4	0	18	84	106	63	0	2,529	13,178	15,771
MIU1	0	0	0	73	73	0	0	0	15,547	15,547
MID1	0	71	0	10	81	0	10,428	0	1,893	12,321
BML	0	88	0	0	88	0	10,354	0	0	10,354

Table 2-25: Area and conifer volume for highly susceptible pine stands in the managed landbase. (continued)

Adjusted	Area (ha) by Age Class (years)					Conifer Volume (m³ at 15/11) by Age Class (years				
Compartment	< 60	61-70	71-80	> 80	Total	< 60	61-70	71-80	> 80	Total
BCR	0	0	6	46	52	0	0	1,079	6,877	7,956
PTC3	0	25	16	13	54	0	3,126	2,248	2,045	7,419
IRC2	0	0	16	20	37	0	0	2,861	3,887	6,748
FCR	0	5	0	26	31	0	773	0	5,251	6,024
HED2	10	28	0	5	43	581	4,069	0	1,100	5,750
CCR2	0	9	1	13	24	0	1,095	193	2,231	3,519
BMI1	0	0	17	7	23	0	0	2,326	987	3,312
IRH	0	0	10	10	19	0	0	1,705	1,575	3,280
SED	0	0	0	20	20	0	0	10	3,265	3,274
PBC1	0	0	1	19	20	0	0	81	3,013	3,094
SFRD	0	0	13	0	13	0	0	2,021	13	2,034
CCR1	0	0	0	8	8	0	0	0	1,454	1,454
NLO	0	0	0	0	0	0	69	0	0	69
PLO1	0	0	0	0	0	0	6	26	0	33
BPC	0	0	0	0	0	0	0	0	0	0
HOS	0	0	0	0	0	0	0	0	0	0
PBC2	0	0	0	0	0	0	0	0	0	0
WLO	0	0	0	0	0	0	0	0	0	0
WWC	0	0	0	0	0	0	0	0	0	0
Total	413	6,105	4,298	11,510	22,326	50,491	827,355	688,352	2,126,539	3,692,737

Table 2-26: Area and conifer volume by compartment for stands in the managed landbase > 80 years old.

Adjusted Compartment	Area (ha) by Cover Type				Conifer Volume (m^3 at 15/11) by Cover Type			
	Non-pine	C-Px		Total	Non-pine	C-Px		Total
		N[1]	H/E[1]			N[1]	H/E[1]	
MIU3	94	888	845	1,828	13,894	160,707	165,052	339,653
MIU2	655	1,205	841	2,701	103,088	206,021	160,540	469,650
LIL	478	876	948	2,302	108,169	135,649	150,266	394,084
MIR3	1,084	1,318	791	3,192	134,477	221,280	150,175	505,931
IRC1	532	869	676	2,077	84,127	154,906	130,983	370,015
MIC1	288	570	644	1,502	42,026	94,794	122,231	259,051
MIC2	331	469	613	1,414	50,042	71,541	113,960	235,542
SOLC	178	306	537	1,020	28,756	58,319	100,174	187,249
NWC	496	321	463	1,281	72,276	59,329	87,849	219,454
HEU1	639	197	417	1,253	97,763	36,379	85,455	219,597
BMC	385	253	470	1,108	92,795	39,674	78,187	210,656
NLL	479	995	352	1,826	79,356	179,814	70,825	329,995
MIR2	409	425	344	1,178	67,719	73,287	65,370	206,376
CPC	11	83	382	476	1,736	12,093	64,041	77,869
HEC1	104	309	333	747	16,706	45,629	63,177	125,512
MIR1	770	301	308	1,379	124,285	55,197	59,639	239,121
MIL	1,609	715	274	2,598	263,818	136,934	56,193	456,945
HEU2	1,767	1,045	273	3,085	281,228	199,011	52,901	533,140
SAW2	705	631	305	1,642	169,614	95,318	45,909	310,841
MID2	480	377	214	1,071	76,475	73,589	44,091	194,155
HEC2	125	244	147	516	19,520	45,503	32,023	97,046
HED1	772	64	132	968	92,439	9,812	28,133	130,384
BC	150	267	186	603	26,575	39,784	27,848	94,207
PTC1	1,657	208	149	2,014	354,449	31,623	22,609	408,681
IRA	58	73	126	257	10,592	12,531	21,505	44,628
HER1	965	42	95	1,102	124,429	6,024	17,956	148,409
BMI2	799	378	107	1,285	194,507	56,755	16,221	267,483
MIU1	626	192	73	890	108,493	38,427	15,547	162,467
PLO3	1,804	14	84	1,903	308,306	2,271	13,178	323,755
SFRM	793	64	47	904	120,424	12,405	8,937	141,766
PWC	508	205	48	760	91,281	31,981	7,239	130,501
BCR	286	65	46	397	66,744	9,557	6,877	83,178
FCR	12	1	26	39	2,029	99	5,251	7,379
HER2	527	8	23	558	65,479	0	4,428	69,907
IRC2	22	4	20	46	3,575	580	3,887	8,042
PLO2	893	188	25	1,106	149,758	29,355	3,839	182,952
SED	55	31	20	105	14,101	5,132	3,265	22,497
CWG2	340	80	22	441	89,062	11,835	3,259	104,156
PBC1	2,145	59	19	2,223	374,404	9,732	3,013	387,148
CCR2	99	5	13	118	18,934	760	2,231	21,925
PTC3	645	2	13	660	108,932	290	2,045	111,267
MID1	566	247	10	823	78,112	49,124	1,893	129,130
IRH	59	27	10	95	8,986	5,032	1,575	15,593
CCR1	901	30	8	938	135,251	5,618	1,454	142,323

Table 2-26: Area and conifer volume by compartment for stands in the managed landbase > 80 years old. (continued)

Adjusted Compartment	Area (ha) by Cover Type				Conifer Volume (m³ at 15/11) by Cover Type			
	Non-pine	C-Px		Total	Non-pine	C-Px		Total
		N[1]	H/E[1]			N[1]	H/E[1]	
CWU3	609	113	8	730	86,842	16,974	1,291	105,107
HED2	486	25	5	516	56,456	4,725	1,100	62,282
BMI1	28	46	7	80	7,343	6,936	987	15,265
CWW	787	196	5	988	129,420	29,694	968	160,082
CWU1	293	66	3	361	58,671	10,057	499	69,226
SAW1	325	234	3	562	75,681	36,035	454	112,170
SFRD	450	31	0	481	76,236	5,969	13	82,218
PBC2	1,127	0	0	1,127	187,690	0	0	187,690
CWU2	667	269	0	936	116,175	38,612	0	154,788
PTC2	423	50	0	473	71,022	8,134	0	79,156
CWG1	352	7	0	359	51,914	1,147	0	53,061
PLO1	322	0	0	322	50,464	66	0	50,530
WWC	227	0	0	227	42,041	0	0	42,041
HOS	139	0	0	139	34,190	41	0	34,231
NLO	7	85	0	93	1,315	14,949	0	16,264
CWM	54	34	0	89	12,548	5,099	0	17,647
BPC	23	26	0	49	3,150	4,446	0	7,597
BML	8	38	0	46	2,351	5,651	0	8,001
WLO	1	0	0	1	174	0	0	174
Total	32,629	15,869	11,510	60,008	5,538,419	2,712,233	2,126,539	10,377,192

[1] N is unclassified Mountain Pine Beetle Hazard

H/E is High and Extreme Mountain Pine Beetle Hazard

2.3.12 Special Management Zones

Special management zones identify areas that required special considerations for harvesting treatments in the TSA scenarios. These areas will have limited forest management activities and included:

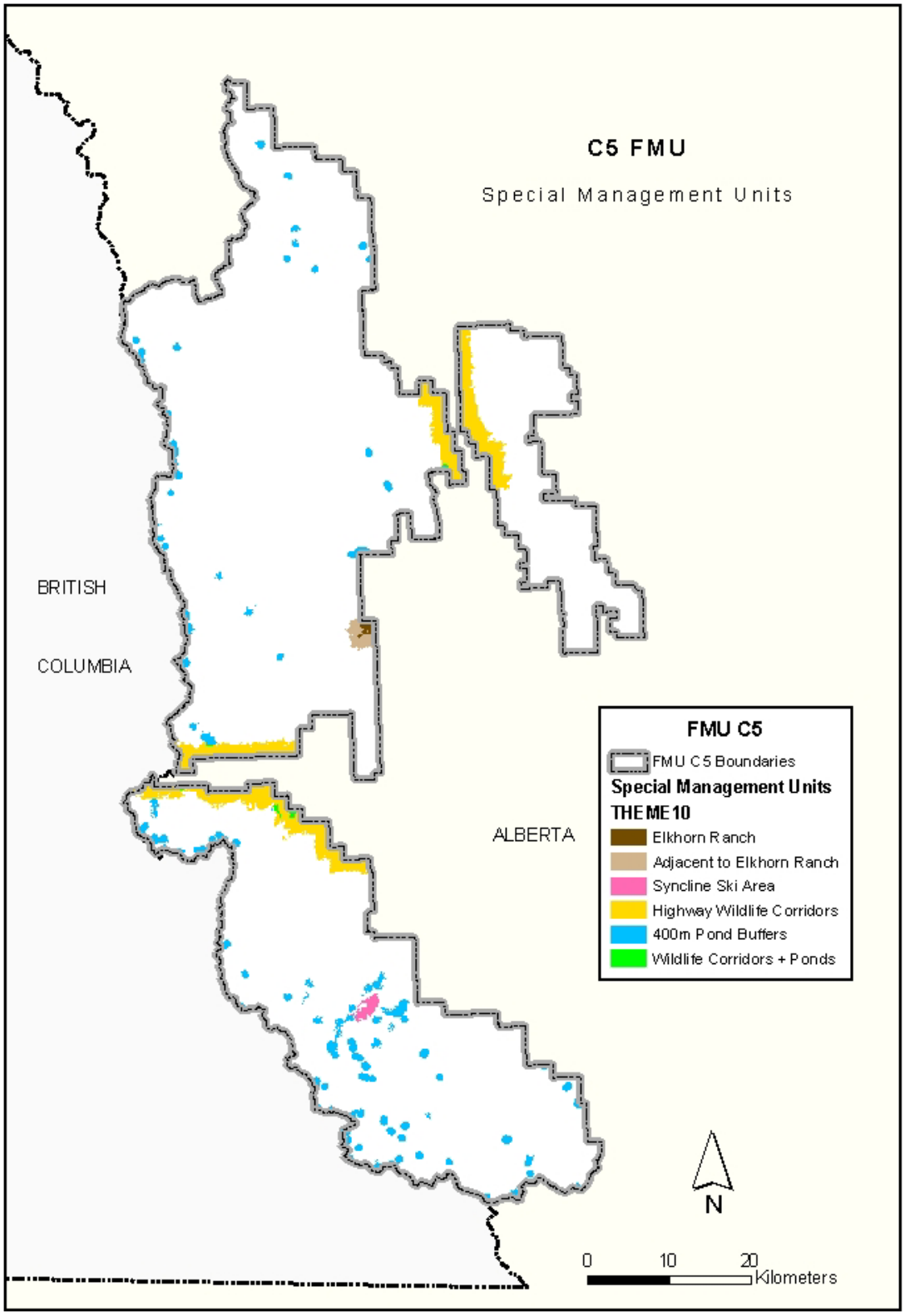
- Area within 3.2 km of the Elkhorn Ranch (private land bordering the C5 FMU),
- Syncline ski area,
- Areas 1.6 km wide along the highway 3 and 22 corridors, and
- Areas within 400 m of ponds that are probable habitat for long-toed salamander and western toad.

The area by special management zone is provided in Table 2-27. A map of special management zones is in Figure 2-14.

The special management zones identified in the timber supply analysis are only a portion of the areas within the C5 FMU that require special harvesting considerations. The Allison-Chinook Forest Landuse Zone (FLUZ) was not identified, however, operational planning will reflect the uniqueness of this area. Subsequent to the public open houses, additional area west of the Castle Mountain Resort requiring special considerations for forest management activities were identified. These areas will be recognized through regional operating ground rules and annual operating plan approvals.

Table 2-27: Area by special management zone.

	Landbase					
	Managed		Unmanaged		Gross	
Special Management Zone	ha	%	ha	%	ha	%
Adjacent to Elkhorn Ranch	694	1%	293	0%	987	0%
Syncline Ski Area	337	0%	83	0%	420	0%
Highway Wildlife Corridors outside of 400m Pond Buffers	6,355	6%	5,857	4%	12,212	3%
400m Pond Buffers outside of Highway Wildlife Corridors	58	0%	4,346	3%	4,404	1%
400m Pond Buffers within Highway Wildlife Corridors	65	0%	278	0%	343	0%
Subtotal	**7,509**	**7%**	**10,858**	**8%**	**18,367**	**5%**
Outside of Special Mgmt Zone	106,675	93%	122,652	92%	333,456	95%
Total	**114,184**	**100%**	**133,510**	**100%**	**351,823**	**100%**



Note: Areas colored as *Elkhorn Ranch* are adjacent to Elkhorn Ranch.

Figure 2-14: Map of special management zones.

2.3.13 Access Control Units

Access control units gave the TSA modeling tools the ability to control the timing of the availability of each area for timber harvesting activities. Access control units were defined using:

- adjusted compartments,
- adjusted sub-compartments,
- Star and North York watershed study areas,
- areas within 150 m of the Lost Creek fire,
- stands of pine/pine-Engelmann spruce in the Middle Ridges Racehorse Creek and Middle Ridges Crowsnest River adjusted compartments,
- sixteen licence areas, and
- scheduled treatments.

2.3.14 Planned Blocks

Planned blocks were areas where timber harvesting activities will occur after May 1, 2005, the effective date of the landbase. The planned blocks identified in this process were in various stages. Some of the planned blocks were actually harvested by the time this analysis was completed. Some of the planned blocks were in approved annual operating plans, while others were just groups of stands that were combined together to make likely operationally feasible patterns. The planned block information represents the best knowledge available at the time of the landbase classification. The planning process is continual and already some of the planned treatments have been modified.

The planned FireSmart treatments identified in *FireSmart Landscape Assessment* (Trees 2004) were also incorporated into the TSA models where they occurred on the managed landbase.

Planned blocks were identified by many sources throughout the landbase classification process. The information regarding planned blocks was reconciled by ranking the different sources of information. Generally, more recent information took precedence over previously received information and existing block information took precedence over planned block information. Only planned treatments in the managed landbase were included in the TSA models.

Table 2-28 identifies the areas and volumes (at time of harvest) for planned blocks in the managed landbase by year of planned treatment. Table 2-29 provides the planned block areas and volumes by cover type. A map of planned blocks is provided in Figure 2-15.

Table 2-28: Area and volume of planned blocks by compartment and year of treatment.

Adjusted Compartment	Area (ha) by Period of Planned Treatment					Total	Proposed Conifer Harvest Volume (m³ at 15/11)
	2005-2009	2010-2014	2015-2019	2020-2024	2030-2034		
Clearcut							
BC	32	0	0	0	0	32	4,803
BMC	0	0	128	0	0	128	23,449
BMI2	432	0	0	0	0	432	86,140
CPC	360	0	0	0	0	360	60,980
CWG2	7	0	0	0	0	7	1,023
CWM	6	0	0	0	0	6	872
HEC1	480	0	0	0	0	480	85,458
HEU1	2	0	0	0	0	2	286
IRC1	471	51	0	0	25	546	100,581
LIL	62	0	0	0	0	62	11,953
MIC1	762	0	0	0	0	762	140,725
MIC2	33	0	176	0	0	209	39,279
MID1	66	0	0	0	0	66	10,479
MID2	54	0	0	0	0	54	10,054
MIL	23	0	0	0	0	23	4,929
MIR1	217	0	0	0	0	217	40,806
MIR3	2	3	45	0	0	50	9,739
MIU1	44	0	0	0	0	44	7,316
MIU2	157	0	0	0	0	157	25,983
MIU3	118	0	0	0	0	118	23,691
NLL	3	0	0	0	0	3	436
NWC	253	0	128	0	0	381	72,495
PBC1	87	0	0	0	0	87	14,832
PLO2	357	0	0	0	0	357	55,823
PLO3	55	0	0	0	0	55	7,815
PTC1	208	62	0	119	0	389	77,636
PTC2	35	0	0	0	0	35	4,977
PTC3	24	0	0	0	0	24	4,242
SAW1	0	0	0	0	0	0	22
SAW2	153	0	275	0	0	428	65,051
SFRM	0	0	3	0	0	3	550
SOLC	255	0	0	0	0	255	48,706
Total	4,755	116	755	119	25	5,770	1,041,131
Partial Cut							
IRC1	202	60	0	0	55	317	35,792
SOLC	36	0	0	0	0	36	4,216
Total	238	60	0	0	55	353	40,008
Burn							
CPC	7	0	0	0	0	7	0
HEC1	5	0	0	0	0	5	0
IRC1	22	0	0	0	0	22	0
MIC1	56	0	0	0	0	56	0
Total	90	0	0	0	0	90	0

Table 2-29: Area and volume of planned blocks by cover type.

Cover Type	Area (ha)	Proposed Conifer Harvest Volume (m^3 at 15/11)
Clearcut		
C-Fd	302	51,142
C-Px	4,811	849,606
C-Sx	598	132,653
CD	59	7,730
Total	5,770	1,041,131
Partial Cut		
C-Fd	70	7,009
C-Px	277	32,397
C-Sx	6	602
CD	0	0
Total	353	40,008

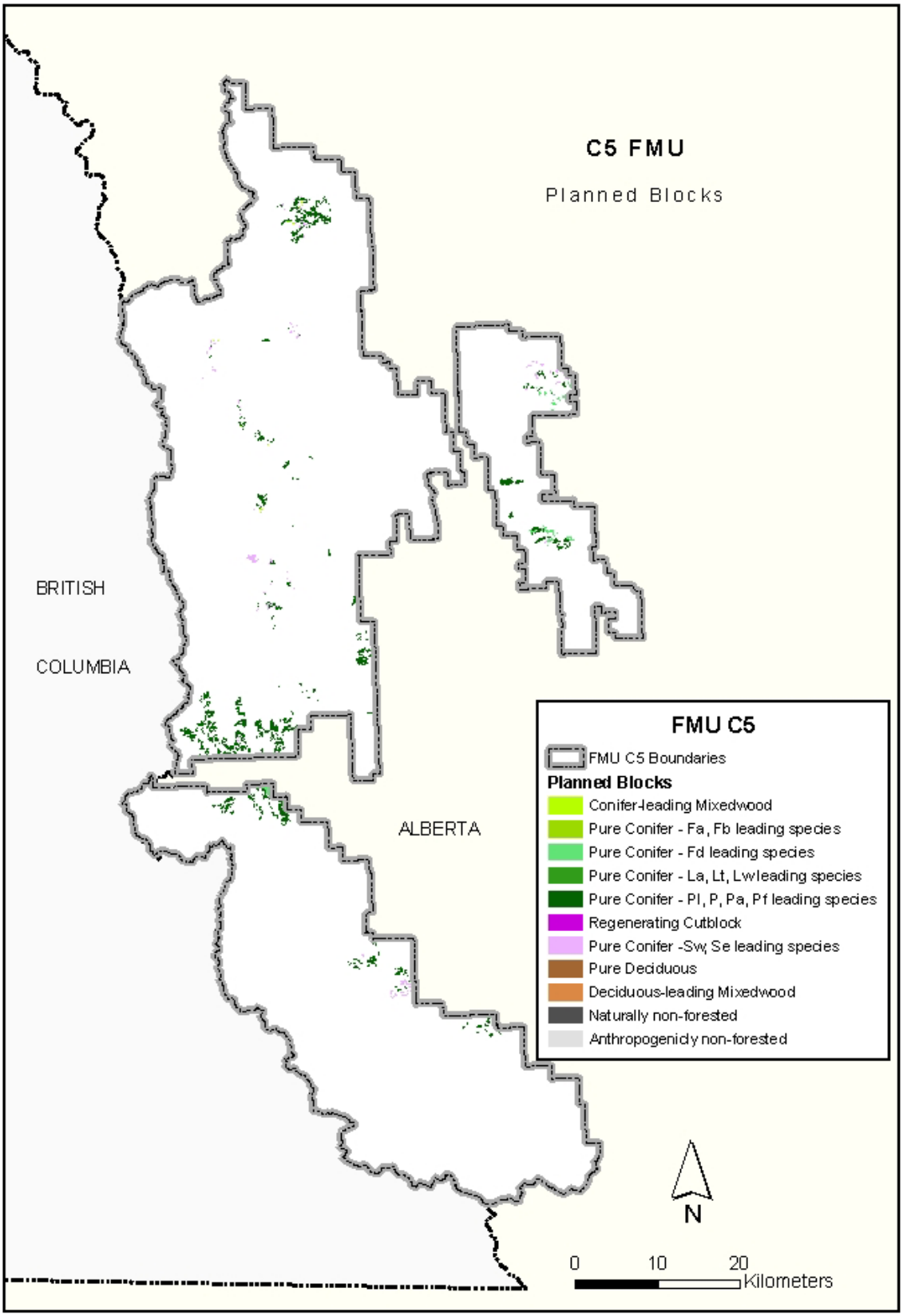


Figure 2-15: Map of planned blocks.

3. Growth and Yield

3.1 Overview

The timber supply analysis required estimates of timber volume and other non-timber values for each yield curve. The process to develop the yield curves used in the forecasting is described in *FMU C5 Forest Management Plan: Growth and Yield* (Forest Management Branch 2006), which is provided in Appendix 8 of the 2006 C5 FMU Forest Management Plan. The timber volume yield curves include:

- empirical yield curves developed from regression analysis;
- an area-weighted yield curve required for existing blocks harvested after 1991; and
- reduced yield curves for:
    - areas in specified AVI stands outside of existing blocks;
    - partial cut action; and
    - FireSmart treatments.

The empirical yield curves were developed by SRD and digital files of the yield curves were provided to The Forestry Corp. These yield curves required re-formatting to be compatible with the TSA modeling tools.

This section briefly describes all the yield curves used in the forecasting.

3.2 Utilization

All volumes presented in this report are net at 15/11 utilization (Table 3-1).

Table 3-1: Utilization definitions.

Utilization	Minimum Stump Diameter Outside Bark (cm)	Minimum Top Diameter Inside Bark (cm)	Minimum Log Length (m)	Stump Height Above Ground (cm)
15/11	15	11	2.4	30

3.3 Cull Reduction

The yield curves developed by SRD were for gross standing volume. 2.6% was removed from these estimates for cull to get net volumes for conifer only. No cull reductions were applied to the deciduous volumes.

3.4 Regen Delay

A regen delay was incorporated for managed stands as age adjustments in all the TSA models. The regen delay was 10 years for Douglas-fir (C-Fd) stands and 5 years for all other cover types in the preferred forest management scenario.

3.5 TSA Yield Curves

The yield curves as developed by SRD were used directly in the TSA scenarios for fire-origin stands. Managed stands also used the fire-origin estimates, with adjustments for regen delay.

3.5.1 Timber Volume Curves

Volume curves estimate volume for all live conifer trees that meet the utilization criteria. Volumes were calculated to 300 years, however the maximum age for some yield curves extend beyond 300 years in the TSA models (see section 4.7.4). In these cases, the volume at 300 years was held constant until the death age.

Natural stand volume curves for net 15/11 standing volumes (i.e. not reduced for stand structure retention after harvest) used in the TSA models are presented in Figure 3-1.

Natural stand yield curve volumes were reduced for partial harvesting treatments in the TSA scenarios. Two types of partial harvest yield curves were used in the analysis:

- 60% volume removal for partial harvest activities in planned FireSmart partial harvest treatments, and
- 50% volume removal for partial harvest activities in adjacent to Elkhorn Ranch and Syncline Ski Area special management zones.

The harvest volume for the partial harvest treatments is the difference between the natural stand and the partial harvest volume curves. An example of the 50% removal yield curve used in the TSA models is presented in Figure 3-2. The partial harvest in this example is assumed to occur at 115 years old.

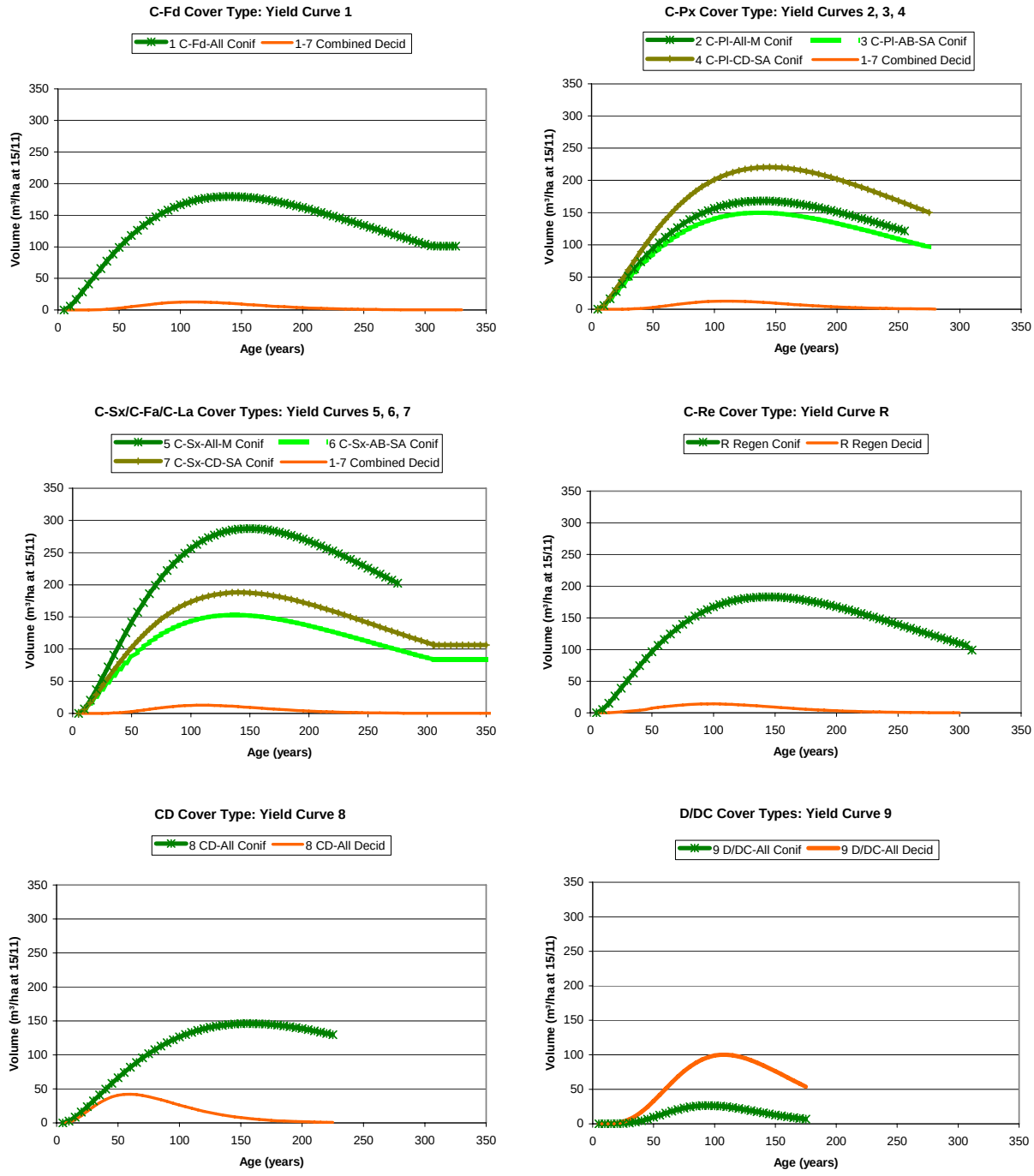


Figure 3-1: Natural stand timber yield curves.

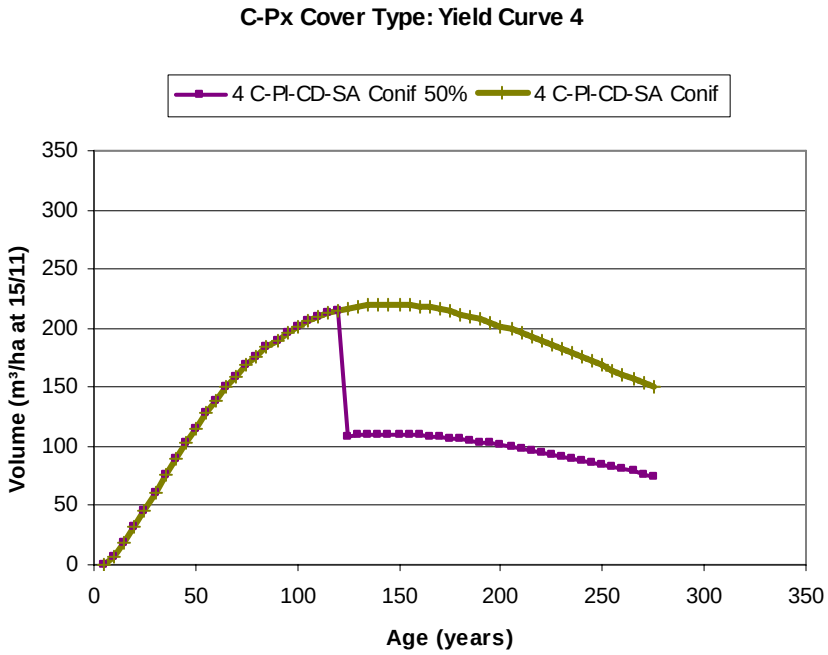


Figure 3-2: 50% thinning yield curve for yield curve 4 C-Pl-CD-SA.

3.5.2 Additional Curves for TSA Models

Additional curves for both volume and area, were required for one of the TSA modeling tools for reporting purposes.

For volume, a representation of the approved yield curves for merchantable volume was created where the volume was 0 until minimum harvest age, and then the curve was the same as the standing volume yields.

The volume yield curves for the C-Fd cover type were modified for some sensitivity analyses. Douglas-fir has thick bark, and the utilization standard is defined for diameter *outside* bark, therefore there was concern that the utilization should be increased for Douglas-fir trees. Instead of developing new yield curves, the conifer volume for yield curve 1 C-Fd was reduced by 5 and 10% to accommodate the reduced useable volume with the existing utilization. These percents were based on professional judgment, not empirical data.

Area yield curves allowed areas with specific attributes to be summarized in the TSA modeling tool. They consisted of two values: 1 or 0. Yield curve values were multiplied by the area, where 1 ensured the areas contribute to the feature of interest, and 0 ensured it did not. The area yield curves in the TSA models calculated:

- area by cover type, yield curve, and seral stage;
- regen patches; and
- greenup patches.

4. Forecasting

4.1 Overview

This analysis determined a coniferous harvest level and associated 20-year spatial harvest sequence for the preferred forest management scenario for the C5 FMU using the classified landbase, yield curves and management assumptions provided by the Planning Team. Analysis was undertaken to understand the critical components of the fiber supply (growing stock assumptions, minimum harvest age assumptions, etc.) and the trade-offs between timber and non-timber values. Many scenarios were reviewed by the Planning Team leading to the development of the preferred forest management scenario.

The preferred forest management scenario was completed using a spatial modeling tool, therefore a harvest sequence showing the timing and treatments of all stands throughout the planning horizon is available. The first 20 years of the spatial harvest sequence (SHS) identifies the stands scheduled for harvest. Maintaining the sustainable harvest level and other values is dependent upon following the 20-year spatial harvest sequence.

This section describes the modeling tools used in forecasting, the key objectives of the analysis, the desired future forest and the inputs and outputs of the many scenarios that were analyzed. Results are presented in the last two subsections: first, results for all TSA scenarios are grouped by output and second, multiple outputs are grouped together for related TSA scenarios in sensitivity and trade-off analyses.

4.2 Modeling Tools

Two timber supply modeling tools were used: Woodstock for non-spatial analysis and Patchworks for spatial analysis. Recent improvements to Patchworks allow the conversion of Woodstock models into Patchworks format, therefore common datasets were utilized to ensure continuity and meaningful comparison of results.

Woodstock was used for strategic, non-spatial analysis to test and compare different management assumptions. Many scenarios in Patchworks dealing with spatial issues were also compared, and for this TSA, the recommended harvest level and the spatial harvest sequence were set using one scenario, which was developed in Patchworks.

4.2.1 Woodstock

Woodstock is a strategic forest estate-modeling tool developed and serviced by Remsoft[1]. It was used for strategic analysis of timber supply and comparisons of alternative strategies and formulations. This strategic analysis provided insight for the resolution of specific issues including growing stock, minimum harvest age and harvest flow.

Woodstock is completely non-spatial, therefore every unique type is rolled up into forest classes (TSA themes by age class). The model can then apply treatments to all or a portion of that unique forest class. Post-treatment transitions can be one to many relationships defined as percentages. The optimizer selects the optimal combination of treatments throughout the entire planning horizon to solve the objective function.

Woodstock can be formulated as either:

- basic optimization where there was one modeling objective with rigid constraints; or
- goal programming where the modeling objective was to minimize deviations from a goal or target.

Goal programming required the identification of a weighting, which is the penalty for deviating from the goal, to allow the model to rank the goals. Typically, a high weighting results in a small deviation from the goal.

For this timber supply analysis, two Woodstock formulations were used:

- the basic optimization (BO), where the modeling objective was to maximize harvest volume subject to constraints such as evenflow harvest volume and minimum ending growing stock; and
- a mixed approach (MA), where the modeling objective was a combination of maximizing harvest volume and minimizing deviation from goals. It included rigid constraints such as evenflow harvest volume and minimum ending growing stock combined with goals such as minimum area of late old growth at the end of the planning horizon.

Woodstock uses a mathematical technique called linear programming to quickly determine the absolute answer to the management assumptions.

A structured, progressive approach was used in the development and analysis of Woodstock scenarios. Increasing levels of constraints were applied in successive scenarios to meet forest management objectives and to answer specific management questions and issues. The end result of the Woodstock stage was scenarios that met all of the non-spatial key objectives.

Woodstock runs and reports in 5-year periods in this analysis.

[1] Remsoft Inc. 332 Brunswick Street, Fredericton, NB E3B 1H1

4.2.2 Patchworks

Patchworks is relatively new to forest management planning in Alberta. It is a spatially-explicit wood supply modeling tool developed and serviced by Spatial Planning Systems[2]. Patchworks was designed to provide the user with operational-scale decision-making capacity within a strategic analytical environment. Trade-off analysis of alternative operational decisions are quickly determined and visually displayed.

Patchworks operates at the polygon level. In Patchworks terminology, polygons are the smallest element, which in this case are the subdivided AVI stands in the classified landbase. The treatments applied to each polygon are an *all or nothing* decision for the model. There is only one post-treatment transition for each polygon. When Patchworks operates, one or more polygons adjacent to each other that meet specific criteria can be combined to form "patches". The classified landbase is made up of many small polygons to allow for more options in creating patches.

The tool is fully spatial through time and the impact on an adjacent polygon 190 years into the future is considered in the first year of the simulation. Patchworks decision space can be thought of as a matrix consisting of each polygon and each potential outcome for every time slice in the planning horizon.

Patchworks is a heuristic model that attempts to achieve close to an optimal solution for the defined targets (similar to the goal-programming in Woodstock). Its modeling objective is to minimize deviation from the modeling targets. The term *goal* will be used in this document to define the modeling targets used in both Patchworks and Woodstock models, to distinguish them from other types of targets. Patchworks uses a stochastic solving technique called simulated annealing. Unlike Woodstock, spatial relationships (*i.e.* patch size distributions) can be applied in the objective function.

In this analysis, a variety of goals were defined such as harvest levels, minimum growing stock levels, minimum seral stage areas maximum block size and range of regen patch sizes by period. Goals were represented by different features (*e.g.* cubic meters or hectares) and weighting factors, which ranked the importance and contribution of each feature towards the modeling objective. Patchworks allows planners to explore the interactions between attributes such as physical wood supply, harvesting economics and other values.

Patchworks solves in annual periods, however, it was set up to model and report in 5-year increments to match Woodstock for this analysis. For the preferred forest management scenario, the 5-year increments were aligned with the C5 FMU timber quadrants.

Patchworks scenarios were developed from Woodstock, to ensure identical assumptions, including landbase, yield curves, treatments and responses.

Improvements to Patchworks are ongoing, and several different versions of this tool were used during this analysis. There have been some significant changes to the algorithms used by Patchworks in these versions, which caused difficulties in comparing scenarios solved by different versions.

[2] Spatial Planning Systems. 134 Frontenac Cres., Box 908, Deep River, ON K0J 1P0

4.3 FMP Key Objectives

This timber supply analysis was developed from the 2006 C5 FMU Forest Management Plan performance matrix. The values, objectives, indicators and targets (VOITs) identified in this matrix are grouped into six Canadian Council of Forest Ministers (CCFM) criteria regarding environmental, social and economic values that must be addressed in Forest Management Plans (Forest Management Branch 2005a). Specific objectives for these values were developed for the 2006 C5 FMU Forest Management Plan, however not all of these affected the TSA. The FMP objectives relevant to this analysis are listed in Table 4-1.

These objectives were incorporated into the TSA in a variety of ways, including:

- Identification and removal of areas from the managed landbase;
- Constraints or goals in the TSA modeling tools (depending on the model formulation);
- Access schedule using access control units in Patchworks;
- Adjustments to results (e.g. proportional reduction to the yield curves for stand structure retention); and
- Forcing planned treatments for FireSmart and mountain pine beetle.

Table 4-2 identifies how each FMP key objective was addressed in the TSA.

Table 4-1: FMP key objectives relevant to TSA.

FMP Unique Number	Matrix Number[1]	Objective
1	1.1.1	To maintain the full range of cover groups and seral stages.
2	1.1.2	To minimize landscape fragmentation.
3	1.1.3	To minimize the impacts of motorized access.
4	1.1.4	To retain stand level structural attributes.
7	1.2.2	To retain, create and enhance habitats capable of supporting selected species.
15	2.1.2	To minimize losses to human life, communities, soil, watersheds, natural resources and infrastructure from wildfire.
16	2.1.3	To minimize the impacts of pests (i.e., insects and disease) which have the ability to kill healthy trees.
17	2.1.4	To maintain the longterm sustainability of the land base by managing those forest health agents that can reduce growth, alter form, or kill trees after several years of infection/attack.
22	3.1.2	To minimize soil erosion and slope failure.
24	3.2.2	To manage forest cover in a manner that places a priority on the conservation and protection of watersheds.
26	5.1.1	To maintain sustainable timber harvest levels; i.e., timber harvesting shall not exceed the forest's productive (renewal) capacity.
33	5.1.8	To promote cooperation between forest harvesting operators and other forest users.
34	5.1.9	To ensure broad participation of disposition holders in forest management decision-making processes.
35	5.1.10	To integrate recreational activities with forest management practices.
40	5.2.1	To ensure that local/regional businesses have an opportunity to share in the economic benefits that can be derived from the C5 forest.
42	5.2.3	To provide economic opportunities for forest-dependant businesses while maintaining the integrity of the C5 forest ecosystem.
48	6.3.4	To be responsive to changing social values concerning sustainable forest management.

[1] Matrix numbers are based on the numbering scheme that has been applied to "Elements" (Forest Management Branch 2005).

Table 4-2: How FMP key objectives were incorporated into the TSA.

FMP Unique Number	How addressed in TSA
1	* Cover types: no transition of cover types after harvest, therefore current area distribution of cover types are maintained. * Seral stage: targets set for minimum areas in older seral stages and maximum areas in younger seral stages.
2	* Large areas of protected lands are removed from the timber harvesting landbase. * Areas adjacent to watercourses are removed from the timber harvesting landbase. * Recently burned areas are removed from the timber harvesting landbase. * Access scheduling concentrates forest management activities in specific areas for a specified period of time. * Block size targets ensure forest mangement activities mimic natural disturbance patterns.
3	* Access scheduling concentrates forest management activities in specific areas for a specified period of time.
4	* Harvest levels are reduced by 3% to account for stand structure retained within harvest blocks. Although the average reduction is 3%, the actual structure retained will range from 0 to 5%, dependent on the size of the harvest blocks.
7	* Areas surrounding select ponds for long-toed salamander and western toad habitats are removed from the classified landbase. * Highly suitable areas for wolverine and harlequin duck habitats are removed from the timber harvesting landbase. * Cover types: no transition of cover types after harvest, therefore current area distribution of cover types are maintained. * Seral stage: set targets for minimum areas in older seral stages and maximum areas in younger seral stages. * Large areas of protected lands are removed from the timber harvesting landbase. * Areas adjacent to watercourses are removed from the timber harvesting landbase. * Recently burned areas are removed from the timber harvesting landbase. * Access scheduling concentrates forest management activities in specific areas for a specified period of time. * Block size targets ensure forest mangement activities mimic natural disturbance patterns (which are typically large). * Harvest levels are reduced by 3% to account for stand structure retained within harvest blocks. Although the average reduction is 3%, the actual structure retained will range from 0 to 5%, dependent on the size of the harvest blocks.
15	* Incorporate activities identified in the FireSmart Landscape Plan.
16	* Prioritize highly susceptible pine areas in the timber harvesting landbase to address mountain pine beetle.
17	* Prioritize highly susceptible pine areas in the timber harvesting landbase to address mountain pine beetle. * Reduce excessively large areas of older, dying forests to reduce the probability of wildfire.

Table 4-2: How FMP key objectives were incorporated into the TSA. (continued)

FMP Unique Number	How addressed in TSA
22	* Removed slopes > 45% from the timber harvesting landbase.
24	* Areas adjacent to watercourses are removed from the timber harvesting landbase. * Access scheduling concentrates forest management activities in specific areas for a specified period of time. * Impacts of harvesting is assessed with ECA-Alberta and WRENSS-Alberta.
26	* Long-term harvest levels can be maintained over the entire planning horizon. * Maintain growing stock levels over last quarter of planning horizon.
33	* The public involvement process allowed all stakeholders a means of contributing to the preferred forest management strategy. * High-use random camping sites were removed from the timber harvesting landbase. * Large areas of protected lands are removed from the timber harvesting landbase.
34	* The public involvement process allowed all stakeholders a means of contributing to the preferred forest management strategy.
35	* The public involvement process allowed all stakeholders a means of contributing to the preferred forest management strategy. * High-use random camping sites were removed from the timber harvesting landbase. * Large areas of protected lands are removed from the timber harvesting landbase.
40	* Community Timber Permit program provides timber to local businesses. * Quota holders are located within the region.
42	* Community Timber Permit program provides timber to local businesses. * Quota holders are loacted within the region. * Areas surrounding select ponds for long-toed salamander and western toad habitats are removed from the timber harvesting landbase. * Highly suitable areas for wolverine and harlequin duck habitats are removed from the timber harvesting landbase. * Cover types: no transition of cover types after harvest, therefore current area distribution of cover types are maintained. * Seral stage: set targets for minimum areas in older seral stages and maximum areas in younger seral stages. * Large areas of protected lands are removed from the timber harvesting landbase. * Areas adjacent to watercourses are removed from the timber harvesting landbase. * Recently burned areas are removed from the timber harvesting landbase. * Access scheduling concentrates forest management activities in specific areas for a specified period of time. * Block size targets influence forest mangement activities and are based on natural disturbance patterns. * Harvest levels are reduced by 3% to account for stand structure retained within harvest blocks. Although the average reduction is 3%, the actual structure retained will range from 0 to 5%, dependent on the size of the harvest blocks.
48	* Alberta Forest Management Planning Standard, which incorporates many social values, was used to develop the PFMS and the C5 FMU Forest Management Plan. * Forest Management Plans are developed every 10 years.

4.4 TSA Issues

Issues relating to the TSA were identified in meetings and discussions during this analysis. Every identified issue was considered in the development of the Forest Management Plan and the preferred forest management scenario. Most of these issues were addressed in the landbase classification, yield curve development or sensitivity analyses as appropriate.

Table 4-3 lists other issues and deviations from the Planning Standard that are not addressed elsewhere in this report.

Table 4-3: TSA issues.

Issue	Status	Resolution
road density forecasts	have a roads network but needs to be modified for use in TSA	* Road density forecasts are not included due to time constraints.
private land	2,000 ha removed from active landbase which seemed high	* Areas were removed by quarter section, perhaps legal subdivision (LSD) would have been more appropriate. This will be addressed in the next FMP.
volume flow from Porcupine Hills	monitor volume flow from Porcupine Hills	* Volume flow was determined by the current age class distribution and compartment access schedule. In the Porcupine Hills, volume harvested in the 20-year spatial harvest sequence was limited to existing quota holder licenses and CTP designs.
meadows	restrict harvest in areas adjacent to meadows and meadow complexes for grizzly bear habitat	* Another analysis is concurrently being completed by SRD which will influence operational planning. * Harvesting is allowed in stands adjacent to these meadows greater than 5 ha, but there are operational constraints such as leaving at least 50% of the lineal edge of the meadow unharvested.
slivers in net landbase	still have small areas in the managed landbase not adjacent to other managed stands	* AVI stands that were split in the landbase classification process were re-combined and entire AVI stands were scheduled for harvest in the preferred forest management scenario.
piece size and log profile	mills have a desired log profile	* Information was not available therefore piece size was not modeled. Minimum harvest ages were selected to represent stands with appropriate piece sizes.
threat of wildfire	FireSmart addressed wildfire issues	* Not modeled in the TSA.
rare and endangered species/plant communities		* Not modeled in the TSA.

4.5 Desired Future Forest

The desired future forest represented the ideal characteristics and products of the C5 FMU through time, and the results of TSA scenarios were compared to the desired future forest. It was impossible to meet all the criteria of the desired future forest in every single planning period, and the Planning Team placed

priorities on each to find a balance that best met sustainable forest management principles and stakeholder interests in the preferred forest management scenario.

Three of the FMP key objectives were selected to define the desired future forest. Indicators were selected for those key objectives, and then specific goals were developed in the TSA scenarios to meet the targets of the desired future forest.

4.5.1 Key Objectives

Although there were many key objectives listed in the 2006 C5 FMU Forest Management Plan, the three most important for defining the desired future forest as identified by the Planning Team were:

- To maintain the full range of seral stages (FMP Unique Number 1);
- To maintain the long term sustainability of the land base by managing forest health agents (FMP Unique Number 17), specifically;
    - mountain pine beetle; and
    - fire; and
- To maintain sustainable timber harvest levels (FMP Unique Number 26).

These three key objectives proved to be the most difficult to balance, e.g. a high harvest level caused low late seral areas at the end of the planning horizon and large areas of late seral increased the risk of wildfire. The many scenarios that were analyzed in this TSA helped to determine the trade-offs between these key objectives and what was possible to achieve given the current state of the forest and feasible forest management alternatives.

Many of the other key objectives were related to these three, and generally the other objectives were met if one of the above three criteria was met.

4.5.1.1 Maintenance of Seral Stages

The maintenance of seral stages was a means of conserving landscape scale biodiversity. Only late seral, which consisted of mature, early old growth and late old growth seral stages, was considered for maintenance. Area in the younger seral stages was present by default as it takes time for stands to age into late seral. TSA scenarios with harvesting objectives but without a target of minimum area of late seral in the TSA scenarios had very little late seral area throughout the planning horizon. The main reason for this was the ages at which stands were considered late old growth were very high relative to the length of the planning horizon. Pine stands that were harvested by the model would never contribute to late old growth because the minimum age of late old growth was 201 years and in the 200-year planning horizon, they would not have enough time to reach late old growth again. Therefore, the only way to create late old growth stands at the end of the planning horizon was to not harvest existing forested stands. Even in the current landbase, the areas of late old growth were very small.

4.5.1.2 Reduction of Mountain Pine Beetle Susceptibility

There is a high probability of a mountain pine beetle epidemic spreading into the C5 FMU from British Columbia. The peak year for mountain pine beetle activity in Elk Valley is predicted to be 2013. Mountain pine beetle can devastate huge areas of mature timber in a very short period of time. Although trees killed by the beetle are still useable as forest products for a short time, a proactive strategy to reduce

the risk of mountain pine beetle is desired. Trees killed by mountain pine beetle have reduced value due to the blue stain fungi carried by the beetles.

The strategy in the 2006 C5 FMU Forest Management Plan is to reduce the amount of highly susceptible area in the FMU as quickly as possible. The *Mountain Pine Beetle Emergency Response Plan For Alberta* suggests "removing 75% of the susceptible stands…over a 20 year period" (Forest Management Branch 2005b). This was accomplished by increasing the short-term harvest levels and prioritizing the susceptible stands for harvest. Highly susceptible stands are mature, and removing them and establishing younger, regenerating stands considerably reduced possible timber losses. To reduce the impact on the landscape, non-pine stands were unavailable for harvest in areas that will have heavy harvesting of pine, such as the Crowsnest corridor.

It is unreasonable to have 100% of the harvest from only pine stands given all the plan objectives and the amount of area of non-pine stands that has already been planned for harvest. Because the harvest is concentrated in pine, other stands are getting bypassed and must wait until they get older before they can be harvested. This increase in average age of non-pine stands can be detrimental to forest health as well.

4.5.1.3 Reduction of Fire Hazard

The current forest is largely mature, which is likely the result of fire suppression activities. The aging forest presented an increasing risk of large fires. The Planning Team believed the reduction of the fire hazard could be accomplished by reducing the fuel loading. Harvesting was a very efficient method with added economical benefits. Reducing the average harvest age and growing stock of the forest are two measurements that can be used to determine the success. Average harvest age was used as a proxy for the average age of the forest, because it is a good indication of the average age of the mature forest as well as the maximum age. This objective directly conflicted with the biodiversity goals that desired an increase in the area of old forest.

The reduction of the fire hazard was also accomplished through FireSmart initiatives, which were designed to reduce the fire hazard at an operational stand-level scale (*i.e*. instead of removing all the old timber, create fire breaks in large contiguous areas of older forests to reduce the probability of large fires).

4.5.1.4 Sustainability of Harvest

The harvest levels must be adequate to maintain existing wood processing facilities in Cochrane and support local woodlands employment.

To meet the objectives of maintaining forest health against mountain pine beetle and fire, a short-term increased harvest level at the beginning of the planning horizon was investigated. Short-term accelerated harvest levels are considered sustainable if they meet sustainability criteria. Two methods of assessing the sustainability of the harvest levels were: long range sustained yield and the level of the drop down in long-term harvest levels if a short-term accelerated harvest is modeled.

The long range sustained yield (LRSY) is the average annual harvest of a fully-regulated forest. It is required by the Planning Standard and usually calculated as the maximum mean annual increment (max MAI) for each yield curve multiplied by the area of each curve in the managed landbase. The max MAI for net 15/11 conifer volumes, and the associated ages, are in Table 4-4.

Table 4-4: Maximum conifer MAI by yield curve.

Yield Curve	Age at Max MAI (yr)	Conifer Max MAI (m^3/yr)
1 C-Fd-All	50	2.03
2 C-Pl-All-M	50	1.93
3 C-Pl-AB-SA	50	1.76
4 C-Pl-CD-SA	55	2.39
5 C-Sx-All-M	60	2.95
6 C-Sx-AB-SA	50	1.79
7 C-Sx-CD-SA	55	2.10
8 CD-All	65	1.40
R Regen	55	1.99

The max MAI for every yield curve in the C5 FMU is at very young ages, well below the minimum harvest age. It is inappropriate to calculate LRSY at these young ages, therefore it was calculated using the MAI at the minimum clearcut ages (Table 4-5) for net conifer volumes at 15/11 with 3% reduction for stand structure retention.

Table 4-5: Calculation of LRSY.

Yield Curve	LMU's	Managed Landbase Area (ha)	Min Harvest Age[1] (yr)	MAI at Min Harvest Age (m^3/ha/yr)	LRSY (m^3/yr at 15/11)
1 C-Fd-All	All	11,920	90	1.70	20,313
2 C-Pl-All-M	A, C, CWC, F, HE	5,288	110	1.43	7,558
	Not A, C, CWC, F, HE	14,538	90	1.61	23,345
3 C-Pl-AB-SA	A, C, CWC, F, HE	3,019	110	1.28	3,866
	Not A, C, CWC, F, HE	5,367	90	1.45	7,759
4 C-Pl-CD-SA	A, C, CWC, F, HE	6,358	110	1.85	11,738
	Not A, C, CWC, F, HE	21,334	90	2.05	43,732
5 C-Sx-All-M	A, C, CWC, F, HE	2,452	130	2.11	5,179
	Not A, C, CWC, F, HE	6,000	90	2.60	15,587
6 C-Sx-AB-SA	A, C, CWC, F, HE	8,589	130	1.14	9,788
	Not A, C, CWC, F, HE	6,149	90	1.47	9,060
7 C-Sx-CD-SA	A, C, CWC, F, HE	4,478	130	1.40	6,249
	Not A, C, CWC, F, HE	4,900	90	1.78	8,699
8 CD-All	All	2,013	90	1.27	2,560
R Regen	All	11,778	105	1.58	18,593
Total		**114,184**			**194,024**

[1] Based on minimum clearcut ages rounded to the nearest half-decade for the preferred forest management strategy.

Typically, to determine if a short-term increased harvest level was sustainable, the results of the scenario with a short-term increased harvest was compared to an evenflow scenario. The objective function of both scenarios was maximize harvest volume. The first harvest level is called pre-stepdown, and the second harvest level is called post-stepdown and was maintained until the end of the planning horizon. The harvest level post-stepdown is compared to the maximum evenflow harvest level. If the difference is less than 10%, then the increased harvest level is considered sustainable.

4.5.2 Indicators and Targets

The previous section identified the indicators selected for each key objective related to the desired future forest. Results of TSA scenarios were used to determine the interactions of the conflicting values and what levels were achievable for each indicator. Trade-off analysis was used to determine a feasible and realistic balance between the three key objectives.

The target levels for each indicator are presented in this section, in the same order that they are described in the TSA scenario inputs and results sections, which is products from forest management activities first and then features of the forest. In addition to the harvest volume, pine harvest area, average harvest age, merchantable growing stock and late seral goals, the access schedule had a large impact on the ability of the model to achieve the goals, so it is also discussed below.

4.5.2.1 Harvest Volume

There was a high correlation between harvest level and area in late seral: as one increased, the other decreased. High harvest levels would achieve two of the three key objectives related to the desired future forest. To achieve a balance between harvest level and late seral, a moderate increase in the harvest level of 20% above the current AAC for a short time (20 years) was desired, followed by a stepdown to 90% of the current AAC for the rest of the planning horizon. Setting the harvest level in this manner ensured that the two criteria for sustainability of the harvest, *i.e.* long-term post-stepdown harvest levels less than LRSY and within 10% of the current AAC, would be met.

4.5.2.2 Pine Harvest Area

In the non-spatial analysis, the prioritizing of pine for harvest in the first few periods of the planning horizon did not have a large effect on the harvest level or late seral areas. This was due to the relatively unconstrained nature of these scenarios and the ability of the model to select any other stand type for harvest. In the spatial scenarios where the access schedule restricted the stands available for harvest and prioritized pine, the late seral were severely impacted. However, the desired future forest removed highly susceptible areas as quickly as possible. The limitations on the harvest volume levels prevented the removal of susceptible pine stands at the rate suggested in the *Mountain Pine Beetle Emergency Response Plan For Alberta* (Forest Management Branch 2005b), which was removing 75% over 20 years.

4.5.2.3 Average Harvest Age

The current forest is largely mature, and will continue to age as the first rotation is harvested across the landscape. Restricting the harvest to one stand type, such as younger, highly susceptible pine, resulted in old stands getting older before they are eligible for harvest, thus increasing the average age and average harvest age.

Average harvest ages could be kept at a minimum if there was the ability to harvest the oldest stands first. However, in the spatial modeling, the access schedule limited the areas available for harvest in each period. If access control units were designed with most of the area in a single age class and access control units with older average ages are open before younger units, an access schedule may not significantly adversely affect the average harvest age. However, limitations of existing roads and past disturbances in addition to selecting units with large areas of highly susceptible pine, dictated an access schedule that caused higher than desired average harvest ages.

The Planning Team identified the desired average harvest ages to be below the following ages:

- 150 years for C-Fa cover type;
- 140 years for C-Px cover type; and
- 200 years for C-Sx cover type.

4.5.2.4 Merchantable Growing Stock

The ending merchantable growing stock must be assessed to ensure the sustainability of the forest past the end of the planning horizon. The current age class distribution and harvesting activities in the C5 FMU result in low ending growing stock if it is unconstrained. Historically, three different methods have been used to assess the sustainability of merchantable growing stock.

The first method sets minimum levels of merchantable growing stock to meet the requirement in the Planning Standard of stable growing stocks over the last quarter of the planning horizon. The minimum level is determined through non-spatial sensitivity analysis. Minimum merchantable growing stock levels from the non-spatial scenarios were set as goals in the spatial scenarios.

Another assessment that has traditionally been used calculated the number of years of harvest from the amount of merchantable growing stock at the end of the planning horizon. If there were at least 10 years worth of harvest, then the ending merchantable growing stock was considered sustainable.

A third criteria was provided that ensures the minimum growing stock level does not drop below 90% of the ending level.

The growing stocks for the preferred forest management scenario were assessed using all three methods. With all the other goals and access control unit availability, merchantable growing stock was sustainable and was not a limiting factor in the desired future forest.

4.5.2.5 Late Seral

SRD biologists identified ecological benchmarks for area of late seral for both the managed and forested landbases (see section 4.7.8.7), however only one of these was selected as the indicator for the desired future forest. The indicator was the area of late old growth seral stage on the managed landbase at the end of the planning horizon. The selection of this one indicator was based on an assessment of all the late seral target levels (including the mature and early old growth seral stages on both the managed and forested landbases) identified in section 4.7.8.7. Table 4-6 shows the level 1 target areas provided by SRD biologists and the area at the end of the planning horizon for the preferred forest management scenario. Although the level 1 target levels were not achieved on the managed landbase, the ending area in late seral for the total forested landbase was more than double the target area for the late old growth (L) and 25% higher for the mature + old growth (MEL). The unmanaged landbase comprised 2/3 of the area of the C5 FMU, and approximately 1/2 of the forested landbase.

Caution should be noted when interpreting these results. No disturbances other than stand breakup were modeled for the unmanaged landbase in the timber supply analysis, which is typical of timber supply analyses in Alberta. It is likely there will be fires and other natural disturbances that will affect the stands on the unmanaged landbase. Therefore, the predicted late seral areas on the unmanaged landbase may be slightly biased.

Table 4-6: Area of late seral by landbase from the preferred forest management scenario.

	Level 1 Target Area (ha)		Ending Area (ha)	
	Landbase		Landbase	
Late Seral Class	Managed	Forested	Managed	Forested
Mature + Old Growth (MEL)	38,096	83,143	30,085	104,188
Early + Late Old Growth (EL)	17,822	37,894	6,466	55,023
Late Old Growth (L)	9,548	20,282	3,449	48,850

Achieving the level 1 late seral targets resulted in harvest levels that were much lower than the current approved annual allowable cut. Therefore, the Planning Team determined that approximately 1/3 of the level 1 late old growth seral stage target on the managed landbase was acceptable in the desired future forest.

4.5.2.6 Access Schedule

Depending on the design of the access control units and the access schedule, the harvest level, pine harvest area, average harvest age, merchantable growing stock, and area of late seral were all affected. The access schedule for the desired future forest had to be operationally feasible while minimizing the adverse effects on the other criteria.

4.6 TSA Scenarios

Many TSA scenarios were analysed in the development of the preferred forest management scenario, and all of the relevant scenarios are documented in this report. Many of the scenarios were developed as part of sensitivity analysis to determine the impact of some of the management assumptions used in the models. The most appropriate modeling tool was used for each sensitivity analysis. The non-spatial timber supply tool Woodstock was used for the initial strategic scoping analysis, and then the spatial modeling tool Patchworks was used for additional sensitivity analysis and the harvest sequence.

Scenarios were developed in “rounds”, and a new round was created when there was a major change to the managed landbase, yield curves or management assumptions. A brief description of the rounds follows:

- Round 2 utilized the initial classified landbase developed by SRD after modifications for polygon numbers and planned block areas.
- Round 3 added areas in salvage and regen blocks in the Lost Creek fire to the Round 2 managed landbase.
- Round 4 removed inaccessible areas from the Round 3 managed landbase.
- Round 5 removed isolated stands from the Round 3 managed landbase.
- Round 6 used the Round 5 classified landbase with small modifications to correct errors.
- Round 7 altered the effective date of the landbase from May 1, 2003 to May 1, 2005 by incorporating additional harvesting activities.
- Round 8 utilized the Round 2 classified landbase with updated management assumptions.
- Round 9 utilized the final landbase, yield curves and management assumptions and produced the preferred forest management scenario.

Scenarios were numbered in a sequential fashion to help make comparisons easy. Each scenario also has a unique, short descriptive name, which is provided with the number throughout this report to help distinguish between scenarios. This name is not comprehensive, contains abbreviations and does not reflect all assumptions that were used in the scenario.

The TSA scenarios analysed are briefly described in Table 4-7 and Table 4-8 for non-spatial and spatial analysis, respectively. A full description of the TSA scenarios is available in Addendum III. Each TSA scenario has a *reference scenario*, which is the earlier TSA scenario that was used as a base. Typically, there were very few changes in inputs and assumptions from the reference scenario. The incremental changes from the reference scenario are described in the last column of the tables. All inputs between two scenarios, as identified in Addendum III should be assessed when making comparisons.

Where similar scenarios were repeated in later rounds, only the most recent TSA scenario is presented here. For example, there was a Round 1 using the initial classified landbase in non-spatial analysis, however all of those scenarios were repeated in Round 2 with a modified landbase and are therefore not presented here.

A scenario that prohibited any forest management activities (RUN61002 No harvest) was developed for comparison purposes. In this TSA scenario, stands grew until they reached the maximum age set in the model and then they transitioned to a younger age (same yield curve and cover type) based on the succession assumptions in the TSA model.

Table 4-7: Non-spatial TSA scenario description.

TSA Scenario		Round	TSA Tool Version[1]	Reference Scenario	Incremental Change from the Reference Scenario
RUN21	Round 2 unconstrained	2	3.25 (BO)	baseline	Baseline scenario with Round 2 landbase, natural stand yield curves, clearcut actions and back-to-itself (CD density) transitions and only one constraint of maximum evenflow conifer harvest volume
RUN22	Decrease min harvest ages by 10 yrs	2	3.25 (BO)	RUN21	Decreased minimum harvest ages for all yield classes in all watershed sub-basins by 10 years
RUN23	Decrease C-Fd yields by 5%	2	3.25 (BO)	RUN21	Decreased yield curve 1 (C-Fd-All) by 5% to approximate increase in utilization.
RUN24	Decrease C-Fd yields by 10%	2	3.25 (BO)	RUN21	Decreased yield curve 1 (C-Fd-All) by 10% to approximate increase in utilization.
RUN25	Decrease min harvest ages for C-Sx	2	3.25 (BO)	RUN21	Decreased minimum harvest ages for yield curves 5-7 (C-Sx and C-Fa cover types) in 5 age-restricted watersheds from 150 years to 130 years
RUN32	Add Lost Creek Fire blocks	3	3.25 (BO)	RUN21	Added salvage and regen blocks burnt in the Lost Creek Fire to the managed landbase
RUN41	Remove inaccessible stands	4	3.25 (BO)	RUN32	Removed inaccessible stands from the managed landbase
RUN51	Remove isolated stands	5	3.25 (BO)	RUN32	Removed isolated stands from the managed landbase
RUN81	Ecological indicators by subregion	8	3.25 (BO)	baseline	Baseline scenario to test late seral goals. Set by C5 subregion (not covertype)
RUN82	Ecological indicators by covertype	8	3.25 (BO)	RUN81	Set late seral goals by covertype (not C5 subregion)
RUN83	Ecological indicators by subregion and covertype	8	3.25 (BO)	RUN81	Set late seral goals by C5 subregion and covertype
RUN901	Round 9 unconstrained	9	3.25 (BO)	baseline	Baseline scenario with Round 9 landbase, natural stand yield curves, clearcut actions and back-to-itself (cover type and density) transitions and only one constraint of maximum evenflow conifer harvest volume
RUN902	Ending gs >= avg	9	3.25 (BO)	RUN901	Added growing stock constraint where ending merchantable growing stock >= average across the entire planning horizon
RUN903	ND gs last 50 yrs	9	3.25 (BO)	RUN901	Added growing stock constraint where merchantable growing stock did not decline for last 50 years of planning horizon

Table 4-7: Non-spatial TSA scenario description. (continued)

TSA Scenario		Round	TSA Tool Version[1]	Reference Scenario	Incremental Change from the Reference Scenario
RUN904	+- 10% variance in gs	9	3.25 (BO)	RUN901	Added growing stock constraint where merchantable growing stock was within +- 10% of the average across the entire planning horizon
RUN905	Include all treatments	9	3.25 (BO)	RUN903	Included partial cut in special management zones adjacent to Elkhorn Ranch and Syncline Ski Area, modified harvest strategy in wildlife highway corridors and all FireSmart treatments
RUN906	Remove pond buffers	9	3.25 (BO)	RUN905	Excluded areas within 400 m of ponds with long-toed salamandar/western toad habitat from the managed landbase
RUN907	Future blocks to CD density	9	3.25 (BO)	RUN903	Regenerated all future blocks back to the CD density yield curve (if available)
RUN908	Decrease min harvest ages by LMU	9	3.25 (BO)	RUN903	Decreased minimum harvest ages for yield curves 2-7 (C-Px, C-Sx and C-Fa cover types) by 10 years in 5 age restricted LMU's
RUN909A	All historic and future blocks to CD density	9	3.25 (BO)	RUN903	Assumed all pre-91 blocks are regenerating back to forested covertypes (C-Re), and all post-91 and future blocks regenerated back to the CD density yield curve (if available)
RUN909B	All pre-91 historic blocks forested	9	3.25 (BO)	RUN903	Assumed all pre-91 blocks are regenerating back to forested covertypes (C-Re)
RUN910	Force ecological indicators	9	3.25 (MA)	RUN906	Forced ecological indicators (both late seral and regen modelling targets)
RUN911	Force harvest of "E" MPB stands	9	3.25 (MA)	RUN910	Forced harvest of extreme mountain pine beetle hazard pine stands within the first 10 years of the planning horizon
RUN912	Defer harvest of non-pine stands	9	3.25 (MA)	RUN911	Relaxed the ecological indicator modeling targets and deferred harvest of non-extreme mountain pine beetle hazard pine stands in those adjusted compartments with > 5% of the area within extreme hazard
RUN913A	Maximize evenflow harvest	9	3.25 (MA)	RUN906	Included 143,000 m^3 of carryover volume to be harvested within the first 5 years and reduced late seral modeling target levels
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	9	3.25 (MA)	RUN913A	Forced harvest of high and extreme mountain pine beetle hazard pine stands within the first 20 years of the planning horizon
RUN914	Stepdown harvest in 20 years	9	3.25 (MA)	RUN913A	Maximized harvest level for first 20 years and planned stepdown of harvest level to 90% of the current AAC

Table 4-7: Non-spatial TSA scenario description. (continued)

TSA Scenario		Round	TSA Tool Version[1]	Reference Scenario	Incremental Change from the Reference Scenario
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	9	3.25 (MA)	RUN913B	Forced harvest of high and extreme mountain pine beetle hazard pine stands within the first 20 years of the planning horizon
RUN916	Stepdown harvest in 30 years	9	3.25 (MA)	RUN913A	Maximized harvest level for first 30 years and planned stepdown of harvest level to 90% of the current AAC
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	9	3.25 (MA)	RUN913B	Forced harvest of high and extreme mountain pine beetle hazard pine stands within the first 30 years of the planning horizon
RUN918	Stepdown harvest in 40 years	9	3.25 (MA)	RUN913A	Maximized harvest level for first 40 years and planned stepdown of harvest level to 90% of the current AAC
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	9	3.25 (MA)	RUN913B	Forced harvest of high and extreme mountain pine beetle hazard pine stands within the first 40 years of the planning horizon

[1] TSA Tool is Woodstock. Formulation is basic optimization (BO) or a mixed approach (MA).

Table 4-8: Spatial TSA scenario description.

TSA Scenario		Round	TSA Tool Version[1]	Reference Scenario	Incremental Change from the Reference Scenario
RUN21001	Round 2 baseline	2	Jan-04	baseline	Baseline scenario which incorporated Round 2 landbase, planned treatments, Mar 14/04 access schedule and original min and max block size, greenup and adjacency goals
RUN21002	Level 1 late seral	2	Jan-04	RUN21001	Added level 1 late seral goals
RUN21003	Level 2 late seral	2	Jan-04	RUN21001	Added level 2 late seral goals
RUN21004	Regen patches	2	Jan-04	RUN21006	Added regen patch goals
RUN21006	Regen seral stage	2	Jan-04	RUN21002	Added regen seral stage goals
RUN21007	Modified regen patches	2	Jan-04	RUN21006	Modified regen patch goals
RUN21008	Reduced regen patch weighting	2	Jan-04	RUN21007	Reduced the weighting for regen patch goals
RUN21009	No greenup and adjacency	2	Jan-04	RUN21008	Removed min and max block size, greenup and adjacency goals
RUN31002	Lost Creek fire blocks	3	Jan-04	RUN21001	Added salvage and regen blocks in the Lost Creek fire and used Mar 17/04 access schedule
RUN41001	Remove inaccessible stands	4	Jan-04	RUN31002	Intended to remove inaccessible stands from the managed landbase, but inadvertantly used Round 3 landbase
RUN41002	Inaccessible stands and ecological indicators	4	Jan-04	RUN41001	Removed inaccessible stands from the managed landbase and added level 2 late seral goals, regen seral stage goals, modified regen patch goals with reduced weighting
RUN51001	Remove isolated stands	5	Jan-04	RUN31002	Removed isolated stands from the managed landbase
RUN51002	Isolated stands and ecological indicators	5	Jan-04	RUN51001	Added level 2 late seral goals, regen seral stage goals, modified regen patch goals with reduced weighting
RUN61001	SHS Version 1	6	Jan-04	RUN51002	Used Round 6 landbase, level 1 late seral goals, added 2 ha min block size target and adjacency, decreased min. harvest ages for C-Sx in 5 age-restricted watersheds from 150 to 130 yrs
RUN61002	No harvest	6	Jan-04	baseline	No harvest
RUN61003	SHS Version 2	6	Apr-04	RUN61001	Modified the 20-year SHS
RUN71001	Round 7 baseline	7	Nov 15-04	baseline	Baseline scenario which used Round 7 landbase and the RUN61003 balanced weighting between the harvest level and ecological indicators, no planned blocks
RUN71002	Force ecological indicators	7	Nov 15-04	RUN71002	Forced ecological indicators to determine impact on harvest level

Table 4-8: Spatial TSA scenario description. (continued)

TSA Scenario		Round	TSA Tool Version[1]	Reference Scenario	Incremental Change from the Reference Scenario
RUN71003	Eco sensitivity #1	7	Nov 15-04	RUN71002	Weighted ecological indicators moderately high to determine impact on harvest level
RUN71004	Eco sensitivity #2	7	Nov 15-04	RUN71002	Weighted ecological indicators moderately to determine impact on harvest level
RUN71005	Eco sensitivity #3	7	Nov 15-04	RUN71002	Weighted ecological indicators to balance with harvest level to determine impact on harvest level
RUN90001	Round 9 baseline	9	Feb 8-05	baseline	Baseline scenario which incorporated Round 9 landbase, all harvest treatments, max harvest level, min and max block size, greenup, adjacency, level 1 late seral, regen seral stage and regen patch goals
RUN90002	Include planned blocks	9	Feb 8-05	RUN90001	Forced planned harvest treatments
RUN90003	60% access schedule	9	Feb 8-05	RUN90002	Included access scheduling for first 40 years that has approximately 60% of the area available for harvest in any given period
RUN90004	40% access schedule	9	Feb 8-05	RUN90002	Included access scheduling for first 40 years that has approximately 40% of the area available for harvest in any given period
RUN90005	Force harvest of "E" MPB stands	9	Feb 8-05	RUN90004	Forced harvest of extreme hazard mountain pine beetle stands and deferred harvest of non-extreme mountain pine beetle hazard stands in compartments where >5% of the area is classified as extreme hazard for the first 11 years
RUN90006	Maximize harvest	9	Feb 8-05	RUN90004	Removed ecological indicator goals
RUN90010	Maintain current AAC with 97,000 carryover	9	Feb 8-05	RUN90012	Included 97,000 m^3 carryover to be harvested in the years 2-6
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	9	Feb 8-05	RUN90013	Included 97,000 m^3 carryover to be harvested in the years 2-6
RUN90012	Maintain current AAC	9	Feb 8-05	RUN90004	Forced current AAC for the entire planning horizon
RUN90013	Stepdown harvest in 21 years	9	Feb 8-05	RUN90004	Forced current AAC for the first 21 years, then planned stepdown to 90% of the current AAC for rest of planning horizon
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	9	Feb 8-05	RUN90013	Included 143,000 m^3 carryover to be harvested in the years 2-6

Table 4-8: Spatial TSA scenario description. (continued)

TSA Scenario		Round	TSA Tool Version[1]	Reference Scenario	Incremental Change from the Reference Scenario
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	9	Feb 8-05	RUN90013	Forced harvest of high and extreme hazard mountain pine beetle stands within the first 21 years
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	9	Feb 8-05	RUN90015	Increased harvest level for first 11 years and forced harvest of high and extreme hazard mountain pine beetle stands within the first 11 years
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	9	Feb 8-05	RUN90014	Forced harvest of high and extreme hazard mountain pine beetle stands within the first 21 years using Jun 1/05 access schedule
RUN90018	Reduce average harvest age	9	Feb 8-05	RUN90014	Increased harvest level to 125% of current AAC for first 20 years and forced harvest of high and extreme hazard mountain pine beetle stands within the first 21 years using June 1/05 access schedule
RUN90020	Maximize harvest in first 21 years	9	Feb 8-05	RUN90018	Maximized harvest in first 21 years and used Jun 6/05 access schedule
RUN90021	Modified compartment sequence	9	Feb 8-05	RUN90014	Used Jun 7/05 access schedule
RUN90021A	SHS Version 3	9	Aug 4-05	RUN90021	Increased weighting on all ecological indicators
RUN90022	Preferred Forest Management Scenario	9	ver 1.3 Aug 17-05	RUN90021A	Balanced weighting for all goals and used Oct 20/05 access schedule

[1] TSA Tool is Patchworks.

4.7 Assumptions and Inputs

The assumptions and inputs to the TSA scenarios were specified by the Planning Team in documents, meetings and other communications during the course of this project.

The assumptions and inputs to the TSA scenarios are presented in this section and organized in the same general manner as a Woodstock model, with additional headings for spatial concerns. Generally, harvesting constraints or goals are presented first, followed by inventory-type values which identify the amount present on the landscape. Although different assumptions were tested, the inputs to the preferred forest management scenario are clearly identified in each section.

Common datasets were used in both TSA modeling tools to provide consistency. Due to the nature of each modeling tool, some assumptions had to be treated differently.

4.7.1 Planning Horizon

The planning horizon was 200 years which is approximately two rotations for pine with a minimum harvest age of 90 years. The non-spatial TSA modeling tool reported results in 5-year periods, as did Patchworks for the Rounds 2-7 spatial TSA scenarios. However, in Round 9, Patchworks was modeled to report a one-year period at the beginning of the planning horizon, then thirty-nine 5-year periods and a 4-year period at the end to align the TSA with the effective date of the 2006 C5 FMU Forest Management Plan and timber quadrants. Table 4-9 describes the different reporting periods from the preferred forest management scenario (a Round 9 scenario).

Table 4-9: Description of reporting periods from the preferred forest management scenario.

Years in Future	Corresponding Timber Years	Comments
0	May 1, 2005	This is the effective date of the classified landbase.
1	May 1, 2005 to April 30, 2006	This one-year period was needed to align the TSA with the FMP. This was required because the effective date of the classified landbase was May 1, 2005 and the effective date of the FMP will be May 1, 2006 (which also corresponds with the next timber quadrant). It was part of the 200-year planning horizon, and modeled with the same goals at the first period of the SHS, however, this year does not contribute to the targets for implementation.
2-6	May 1, 2006 to April 30, 2011	This five-year period was the beginning of the SHS. The start of this period aligns with the effective date of the FMP. Carryover volumes were cut within this quadrant. Implementation targets begin in this period.
7-11	May 1, 2011 to April 30, 2016	This five-year period was the second of the SHS. Results for this period were combined with years 2-6 to provide results for the first decade of the SHS. This is the last period for which the SHS and this FMP will be implemented.
12-16	May 1, 2016 to April 30, 2021	This five-year period was the third of the SHS.
17-21	May 1, 2021 to April 30, 2026	This five-year period was the fourth of the SHS. It is the last period required for reporting implementation targets according to the planning standard.
22-26	May 1, 2026 to April 30, 2031	This five-year period was the fifth of the SHS. Results for this period are included for information purposes only. It was used by the Planning Team to assess the long-term impacts of the TSA scenario in determining the desired future forest.
27-31	May 1, 2031 to April 30, 2036	This five-year period was the sixth of the SHS.
32-36	May 1, 2036 to April 30, 2041	This five-year period was the seventh of the SHS.
37-41	May 1, 2041 to April 30, 2046	This five-year period was the eight of the SHS. It is the last period used to assess the desired future forest in detail, although some results are reported for the entire planning horizon.

4.7.2 Landbase

Table 4-10 shows the difference in the managed landbase area between the rounds of timber supply analysis.

Table 4-10: Description of managed landbase by rounds.

Landbase Type	TSA Start Year	Description of landbase	Managed Landbase Area (ha)
Round 2	2003	Initial landbase for TSA. Includes only the operable conifer landbase area as defined by the initial net landbase parameters (deletions for land status, steep slopes, burned areas in recent fires, access, buffers, and productivity).	115,664
Round 3	2003	Round 2 landbase plus salvage and regenerated blocks in the Lost Creek fire.	117,923
Round 4	2003	Round 3 landbase minus inaccessible stands.	117,699
Round 5	2003	Round 3 landbase minus isolated stands.	117,551
Round 6	2003	Round 5 landbase.	117,551
Round 7	2005	Round 6 landbase with updated with harvesting activity between May 1, 2003 and May 1, 2005.	118,181
Round 9[1]	2005	Round 7 with additional historic block information, additional planned blocks, wildlife habitats and revised mountain pine beetle hazard ratings minus highly suitable wildlife habitat for harlequin duck, wolverine and western toad/long-toed salamandars.	114,184
Modified Round 9	2005	Round 9 with pre-1991 blocks assigned the C-Re cover type.	114,184

[1] Used in the preferred forest management scenario.

The theme fields in the shapefile used in the forecasting were modified slightly from the attributes described in section 2. The number of forest classes directly affects the matrix size in the TSA modeling tools, therefore reducing the number of forest classes speeds up the processing times. The C5 subregion, landscape management unit, adjusted compartment and watershed sub-basin themes were reduced to the level of detail required to increase the efficiency of solving the models while maintaining the level of detail required to control and report the TSA modeling tools. For example, only the Middle Ridges and Head Water Valley LMU's were important for modeling in Woodstock, therefore all stands in the other LMU's were set to a default value of "CH".

Patchworks has the ability to reference any field in the landbase shapefile for reporting, therefore it was possible to still report by LMU, even though the field *THEME2* in the shapefile did not identify all LMU's.

4.7.3 Yield Curves

Volume and area yield curves as described in Section 3.3 were used in the TSA models. Table 4-11 summarizes how the reductions for cull, stand structure retention and conversion to 15/11 utilization were incorporated into the TSA models.

Table 4-11: Reductions to reported volumes.

Reduction Type	Reduction to Volume	How Applied	Volumes Reported by the TSA Models
Cull	2.6%	Applied to the conifer volume component of yield curves that were inputs to the TSA model. No reduction was applied to the deciduous component.	Cull has been accounted for in the volumes reported by the TSA models.
Stand Structure Retention[1]	3%	Applied to all volume components of yield curves that were inputs to the TSA model.	Stand structure has been accounted for in the volumes reported by the TSA models. Note: This percent has been added back to reported growing stock (standing volumes) to reflect the net 15/11 volume that's present.
Conversion to 15/11	2.6%	Applied to the conifer volume component in summaries of TSA outputs.	15/10 volumes were modelled in the TSA models. All volumes reported by the TSA models were reduced by this percent to convert from 15/10 to 15/11 utilization. This reduction was applied to all volumes presented in this report.

[1] An average % reduction was used for stand structure retention. Actual amounts will be determined by block and will vary from 0-5%.

4.7.4 Lifespan

Maximum ages were required by the TSA modeling tools and successional patterns for undisturbed stands by yield curve were provided (Table 4-12). After stands reach the maximum age, they regenerated back to themselves at 0 years of age, with no change to cover type or yield curve.

Table 4-12: Maximum stand ages.

Yield Curve	Cover Type	Death Age (years)[1]
1 C-Fd-All	C-Fd	325
2 C-Pl-All-M	C-Px	250
3 C-Pl-AB-SA	C-Px	275
4 C-Pl-CD-SA	C-Px	275
5 C-Sx-All-M	C-Sx C-Fa	275
6 C-Sx-AB-SA	C-Sx C-Fa	350
7 C-Sx-CD-SA	C-Sx C-Fa	350
8 CD-All	CD	225
9 D/DC-All	D DC	175
R Regen	C-Re	260
N C-La	C-La	400

[1] After death, stands transition back to same yield curve at age 0.

4.7.5 Treatments and Responses

Three treatments: clearcut, partial cut (commercial thin) and burn (prescribed) were modeled. Each stand was eligible for only one of these actions, therefore the model only had to choose the timing of the specified treatment. Clearcut was the most common treatment. In most scenarios, clearcut was the only eligible treatment, and all stands in the managed landbase were clearcut by the model. Partial cutting was identified for the special management zones adjacent to Elkhorn Ranch and Syncline Ski Area, and some FireSmart prescriptions. FireSmart also utilized burn as a treatment in the first 5 years of the SHS, however no harvest volume was realized.

Minimum harvest ages for both clearcut and partial harvest were selected and represent a proxy for piece size (Table 4-13). There were perceived differences in volumes and growth rates at higher elevations in certain areas that were not reflected in the yield estimates, therefore the minimum harvest ages was set higher to account for this. Several minimum harvest ages were tested, and the reduced minimum harvest age for C-Sx and C-Fa cover types at the higher elevations were used in the preferred forest management scenario.

Minimum harvest ages for highly susceptible pine stands were reduced from 91 to 81 years in the preferred forest management scenario because trees younger than 91 years old were considered susceptible to mountain pine beetle, and reducing the minimum harvest age allowed them to be harvested by the model. Almost half of the area of highly susceptible pine stands on the managed landbase was between 60 and 80 years old.

Table 4-13: Treatment criteria (minimum harvest ages).

Treatment Group	Treatment	Cover Type	Administrative Units	Minimum Harvest Operability (years)
Baseline	Clearcut	C-Px	Watersheds UOL, DUT, RAC, CAR, UCA	111
			Other Watersheds	91
		C-Sx, C-Fa	Watersheds UOL, DUT, RAC, CAR, UCA	151
			Other Watersheds	91
		C-Fd, CD	All Watersheds	91
Decrease 10	Clearcut	C-Px	Watersheds UOL, DUT, RAC, CAR, UCA	101
			Other Watersheds	81
		C-Sx, C-Fa	Watersheds UOL, DUT, RAC, CAR, UCA	141
			Other Watersheds	81
		C-Fd, CD	All Watersheds	81
Decrease C-Sx	Clearcut	C-Px	Watersheds UOL, DUT, RAC, CAR, UCA	111
			Other Watersheds	91
		C-Sx, C-Fa	Watersheds UOL, DUT, RAC, CAR, UCA	131
			Other Watersheds	91
		C-Fd, CD	All Watersheds	91
Modified baseline	Clearcut	C-Px	LMU's A, C, CWC, F, HE	111
			Other LMU's	91
		C-Sx, C-Fa	LMU's A, C, CWC, F, HE	131
			Other LMU's	91
		C-Fd, CD	All LMU's	91
Reduced Ages	Clearcut	C-Px	LMU's A, C, CWC, F, HE	101
			Other LMU's	91
		C-Sx, C-Fa	LMU's A, C, CWC, F, HE	121
			Other LMU's	91
		C-Fd, CD	All LMU's	91

Table 4-13: Treatment criteria (minimum harvest ages). (continued)

Treatment Group	Treatment	Cover Type	Administrative Units	Minimum Harvest Operability (years)
All treatments[3]	Clearcut	C-Px[1]	LMU's A, C, CWC, F, HE	111
			Other LMU's	91
		C-Px[2]	All LMU's	81
		C-Sx, C-Fa	LMU's A, C, CWC, F, HE	131
			Other LMU's	91
		C-Fd, CD	All LMU's	91
		C-Re	All LMU's	106
	Partial Harvest	C-Px	LMU's A, C, CWC, F, HE	111
			Other LMU's	91
		C-Sx, C-Fa	LMU's A, C, CWC, F, HE	131
			Other LMU's	91
		C-Fd, CD	All LMU's	91
		C-Re	All LMU's	106
	Burn	All	All LMU's	none

[1]Unclassified mountain pine beetle hazard

[2]High and extreme hazard for mountain pine beetle

[3] Used in the preferred forest management scenario.

Table 4-14 provides the stand level response after treatment. The transition rules were dependent on the treatments that were applied. There was a 10-year regen delay for Douglas-fir and 5-year regen delay for all other cover types for the clearcut and burn treatments modeled in the TSA scenarios. To model regen delay in Woodstock, stands were placed in a regen state for 5 (or 10) years, after which they transitioned back to an age of 0 on the fire-origin yield curve. To achieve the same effect in Patchworks, stands were assigned a post-harvest age of –5 (or –10) years immediately after treatment.

In the highway wildlife corridors in Round 9 scenarios, only one clearcut harvest was modeled in the entire planning horizon, to approximate the limitations of clearcutting in these sensitive areas. A strategy for the actual treatments will be developed and implemented on a block-by-block basis at the annual operating plan level.

Operators are committed to regenerating the forests to a fully-stocked status, however most of the scenarios assumed stands regenerated back the pre-harvest stand density. There is the potential for increased yields by regenerating the forests to CD density yield curves, and this assumptions was tested.

In addition, there were over 10,000 ha in existing pre-1991 blocks assigned to the non-forested cover types based on the available information from AVI. Many of these stands were probably forested, but the trees were too small to be seen in the photos used for interpretation. Therefore, some scenarios assumed these stands were forested (C-Re cover type) to determine the impact of the Planning Standard requirements on the harvest levels.

For the preferred forest management scenario, stands were regenerated back to the same pre-harvest yield curve at age 0 after clearcut and burn. Mountain pine beetle susceptibility was removed from stands after the clearcut and burn treatments. After a partial cut, thinned stands were placed on a partial harvest yield curve for the same cover type. Stands that were partial cut could be subsequently clearcut after 40 years.

Table 4-14: Transition after treatment.

Transition	Treatment Group	Treatment	Cover Type	Crown Class	Age (years)	Restrictions
Baseline	Baseline Decrease 10 Decrease C-Sx Modified Baseline	Clearcut	no change	C+D	-5 all cover types	
Back to itself	Modified Baseline Reduced Ages	Clearcut	no change	no change	-10 C-Fd -5 all other cover types	
CD Density	Modified Baseline	Clearcut	no change	C+D	-10 C-Fd -5 all other cover types	
Back to itself with wildlife restriction[1]	Modified Baseline	Clearcut	no change	no change	-10 C-Fd -5 all other cover types	Only one harvest in highway wildlife corridors
	All Treatments	Clearcut	no change	no change	-10 C-Fd -5 all other cover types	Only one harvest in highway wildlife corridors
		Partial Cut	no change	no change	no change	Eligible for clearcut after 40 years, then another partial cut
		Burn	no change	no change	-10 C-Fd -5 all other cover types	Eligible for partial cut, then clearcut, then another partial cut

[1] Used in the preferred forest management scenario

4.7.6 Planned Blocks

Planned blocks were scheduled in some of the Patchworks scenarios. They were not incorporated in the non-spatial Woodstock models. The planned blocks described in section 2.3.14 were forced in the preferred forest management scenario.

4.7.7 Access Schedule

The purpose of an access schedule is to aggregate harvest in desired areas and prevent harvest in undesirable areas. An access schedule was developed for the first 60 years of the planning horizon in the spatial TSA scenarios. Access was controlled by decade using access control units. Each unit was identified as:

- open (the model can choose to apply harvest treatments),
- closed (the model can not apply any harvest treatment), or
- scheduled (the model must apply scheduled treatments to planned blocks).

Initially, the access schedule was quite unrestrictive. However, this led to a spatial harvest sequence that was quite spread out, which is operationally challenging and environmentally undesirable, so it was modified and tested many times until the preferred forest management scenario was developed.

Many factors affected the access schedule and the following deferrals were included in the preferred forest management scenario:

- The following compartments were deferred for 20 years due to heavy logging in the recent past to allow the area to recover:
  - CCR (Carbondale – Carbondale River),
  - HED (Head Water Valleys - Dutch Creek),
  - HEU (Head Water Valleys - Upper Oldman),

    - HER (Head Water Valleys - Racehorse Creek); and
- The following compartments were deferred for 5 years to allow for land use review and clarification of Grizzly modeling outputs and management recommendations expected in the 2005/2006 from the SRD Grizzly recovery plan:
    - CWU (Castle/West Castle – Upper Castle), and
    - CWW (Castle/West Castle - West Castle); and
- Pine and pine/Engelmann spruce stand types <= 13 m tall in Compartments MIC (Middle Ridges - Crowsnest River) and MIR (Middle Ridges - Racehorse Creek) were deferred for 40 years to allow stand diameters time to reach sawlog size; and
- Stands within 150 m of the Lost Creek fire were deferred for 30 years.

In addition, the following criteria was used in the development of the access schedule for the preferred forest management scenario:

- areas within the traditional landbase for each operator had to be open to ensure all quota holders received an adequate wood supply;
- areas with high concentrations of highly susceptible pine and mature, unclassified pine were opened early in the planning horizon to reduce the threat of mountain pine beetle;
- areas with no current road networks were opened in the early part of the planning horizon to establish access routes in case of fire or mountain pine beetle infestations; and
- planned blocks were forced to be treated at the appropriate time, regardless of the above deferrals.

A full-sized map of the access schedule for the first 40 years of the planning horizon for the preferred forest management scenario is provided in Addendum V.

4.7.8 Management Assumptions

Management assumptions are the modeling targets that control the decisions made by the TSA modeling tools. They are in the form of modeling objectives and constraints, or goals depending on the modeling tool and formulation. Many of the management assumptions developed as the analysis progressed and the trade-offs between desired results were assessed. Assumptions related to forest management activities, *e.g*. harvesting, are presented first, followed by the constraints and goals related to the features or characteristics of the forest.

In Woodstock basic optimization, management assumptions were in the form of one modeling objective, in this case maximize conifer harvest volume, which was subject to a number of constraints. If the constraints could not be achieved, then the solution was infeasible.

In Woodstock mixed approach and Patchworks, goals were identified with weightings identifying the relative importance of each, and the model minimized the deviation from the targeted level. If however, the goal could not be achieved, then the model tried to achieve it as close as possible and still provided a solution. Levels for modeling targets in Patchworks were initially set based on results of the Woodstock scenarios. Relative weightings for goals were developed in conjunction with the Planning Team to achieve the desirable results.

The following sections describe the management assumptions in the TSA modeling tools.

4.7.8.1 Modeling Objective

The modeling objective was set in the Woodstock basic optimization model, and for this analysis it was to maximize the conifer harvest volume from managed landbase over the entire planning horizon.

In Woodstock mixed approach, the objective was to maximize the conifer harvest volume in addition to minimizing the deviation from the goals.

The modeling objective in Patchworks is inherent to the modeling tool, and is to minimize the deviation from the goals.

4.7.8.2 Harvest Volume

Both evenflow and planned stepdown conifer harvest flow scenarios were tested. Initially, an accelerated harvest level of 125% of the current harvest level was tested. This level was chosen because it is the maximum permitted in the Planning Standard. For the preferred forest management scenario, the harvest level was set by the Planning Team at 120% of the current harvest level for 20 years, then a planned step down to 90% of the current harvest level. The accelerated harvest level was reduced by 5% after trade-off analysis showed that a harvest level of 125% adversely affected other non-timber values.

In Patchworks, absolute evenflow is difficult to enforce, but for the preferred forest management scenario, the harvest flow is well within the +/- 5% tolerance specified by SRD. For some of the sensitivity analysis scenarios, the harvest level goal in Patchworks was set higher than what could be achieved which resulted in larger fluctuations and the minimum harvest level occurred in the middle of the planning horizon. This was done to ensure the maximum harvest volume was achieved and did not affect the comparison of results.

Carryover volume is the difference between the approved annual allowable cut (AAC) and the actual volumes harvested by the quota holders within a quadrant. If the actual harvest volume is less than the AAC, the difference can be "carried over" into the next quadrant as harvest volume over and above the new approved annual allowable cut if approved. Carryover volume is expected for the first quadrant of the spatial harvest sequence, and was included in some TSA scenarios, including the preferred forest management scenario.

There is incidental deciduous volume produced, however it is not reported or used to control the TSA models in any way.

4.7.8.3 Harvest Area

In some sensitivity analysis scenarios, a goal to preferentially harvest unclassified pine areas was set to reduce the amount of mature and old pine on the landscape in case of an epidemic mountain pine beetle infestation. This goal was used in the preferred forest management scenario.

4.7.8.4 Greenup Patch

The Patchworks modeling tool deals with patch sizes exceptionally well and patches were a spatial issue that could only be addressed in the spatial TSA scenarios. Patches were created by determining which adjacent stands met certain criteria and the summing the area of these adjacent stands. Neighboring stands within 15 m were considered adjacent.

Greenup patch goals in this analysis represented young, regenerating areas. Operating ground rules prevent harvesting adjacent to a block that's been harvested until that block has met the greenup criteria.

Three types of greenup patches were tested (Table 4-15), with the "final" greenup patch goals were used in the preferred forest management scenario. The maximum patch size of 250 and 500 ha, depending on the LMU, was selected by the Planning Team for social reasons.

Table 4-15: Greenup patch size modeling targets.

Greenup Patch Targets	Landscape Management Unit	Greenup Patch Size Class (ha)	Maximum Age of Stands in Greenup Patch (years)
Original	Middle Ridges (MI)	1-500	10
	Other LMU's	1-250	10
Modified	Middle Ridges (MI)	>=2	10
	Other LMU's	>=2	10
Final[1]	Middle Ridges (MI)	0.5-500	30
	Other LMU's	0.5-250	30

[1] Used in the preferred forest management scenario

The area of each patch was calculated and goals were expressed as the proportion of area meeting the patch criteria within each size class. For greenup patches, 100% of the area within the greenup patch was the goal.

Figure 4-1 shows seven patches of equal size, but very different shapes. Although the modeling tools interpreted each patch as being equal, a person typically does not visually interpret them as such. The dark blue shape is typically how a patch is visualized (one solid area with the smallest perimeter to area ratio). However, the patch might be long and narrow (red), comprised of two smaller areas either connected through a narrow strip (olive green) or physically separate but within the adjacency tolerance (pink), a checkerboard pattern where many small areas touch at the corners (dark green), or completely surround another stand (light blue). In this analysis, patches were made of forest stands, which typically have irregular shapes (orange).

Caution should be used when interpreting patch results because although there may be patches that exceed the goal, the patch shape plays an important role in the functioning of the patch towards biodiversity.

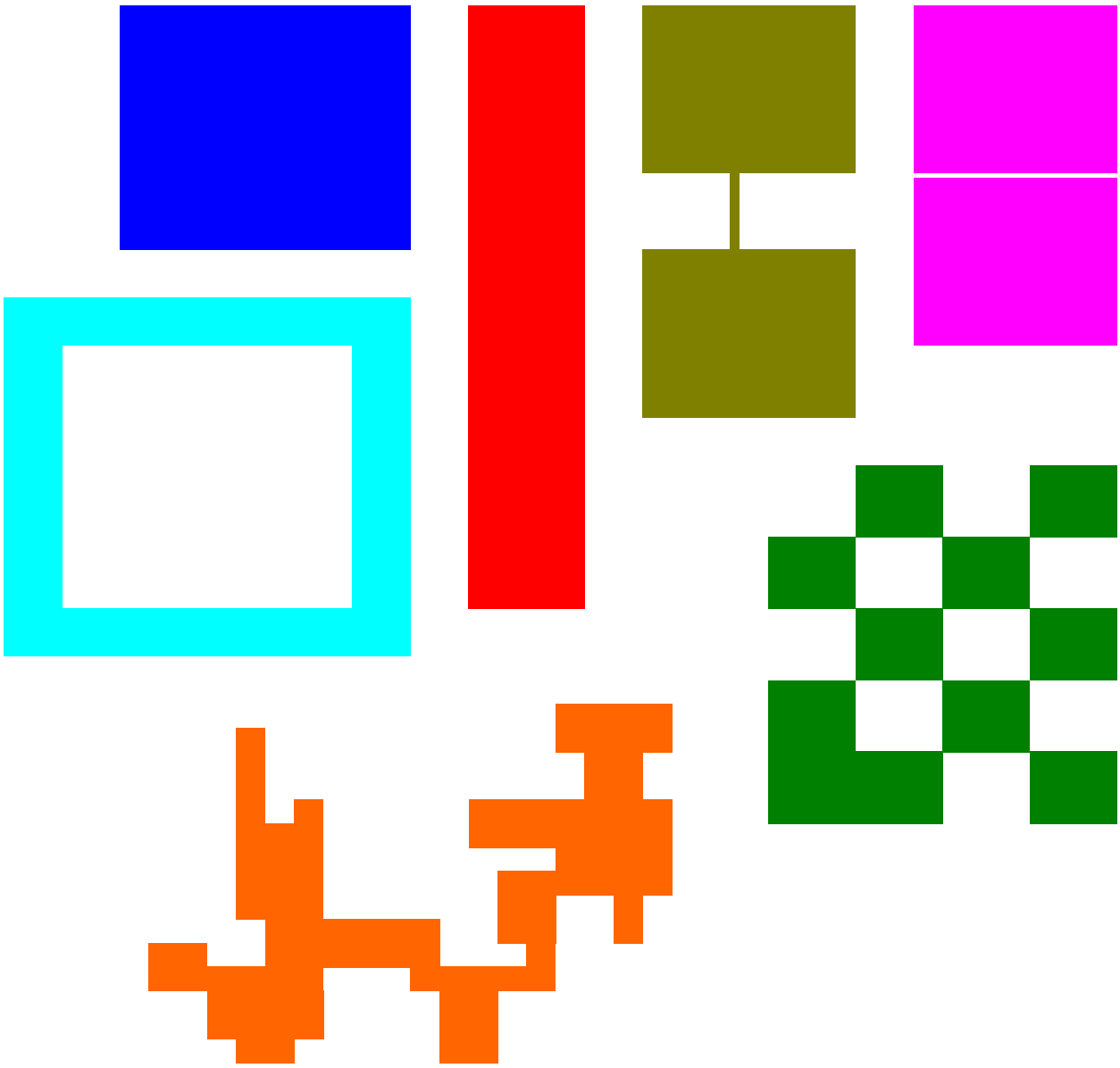


Figure 4-1: Examples of patch shapes.

4.7.8.5 Merchantable Growing Stock

Merchantable conifer growing stock was controlled in both the Woodstock and Patchworks modeling tools as an indicator of sustainability. Growing stock was merchantable if the stand met the minimum harvest age and was on the managed landbase. In keeping with the Planning Standard (Versions 2 and 3), different formulations of ending growing stock levels were investigated in Woodstock, for example,

- ending growing stock greater than or equal to the average over the entire planning horizon,
- non-declining growing stock in the last 50 years, and
- maximum 10% variance in growing stock over the last 100 years of the planning horizon and non-declining for the last 10 years.

In the spatial TSA scenarios, including the preferred forest management scenario, a minimum merchantable growing stock goal was set and monitored to ensure that the growing stock was relatively even over the last 50 years of the planning horizon. The level of the growing stock was based on the Woodstock results.

4.7.8.6 Pine Area

In sensitivity analysis and the preferred forest management scenario, a goal was set to reduce the amount of highly susceptible pine on the landscape as quickly as possible through harvesting. The goal was zero area of highly susceptible pine with high weighting for not achieving the goal in the early part of the planning horizon.

4.7.8.7 Late Seral

Ecological benchmarks were developed in an exercise that incorporated an analysis of natural disturbance on the C5 landbase, expert knowledge, and appropriate literature review. These benchmarks represent one estimate of seral stage cover within the natural variation required for maintaining biodiversity values in the C5 FMU. A discussion of ecological benchmarks was provided by SRD biologists (Addendum II).

Ecological benchmarks for *late seral* included the mature, early old growth and late old growth seral stages. A nested approach was used to provide targets for three categories of late seral:

- late old growth seral stage (L),
- early and late old growth seral stages (EL), and
- mature, early old growth and late old growth seral stages (MEL).

These targets were a minimum proportion of the area in each late seral category for both the managed and total forested landbase by C5 subregion. However, Forest Management Plans only address forest management activities on the timber harvesting landbase, and therefore only the managed landbase targets were considered in the timber supply models in this analysis. Under different legislation and/or planning processes, it may be possible to manage for late seral on the unmanaged landbase.

Targets for each late seral category for each of the five C5 subregions (15 in total) were given in percentages that required conversion into hectares for Patchworks. Two levels of targets were provided, level 1 (the preferred level) and level 2 (30% less than level 1). The level 1 targets were used as *ecological benchmarks* in the plan objectives to compare TSA scenarios. For most scenarios, the level 1 targets were used as goals in the models, even though they were often unachievable. The goals were still set at the level 1 area targets in the TSA models to ensure the resulting levels were as high as possible as the model would try to minimize the deviation from the goal. Late seral goals were set only in the Woodstock mixed approach and Patchworks TSA scenarios.

The goals in hectares used in the preferred forest management scenario are provided in Table 4-16. In most cases, on the current landscape, there is less than the target areas, therefore the goals were active for the entire planning horizon to force the model to achieve them as early as possible. It took time, in some cases a full rotation, for the current forest to age into late seral, thus meeting the goals.

Sensitivity analysis regarding other late seral goals were tested: by cover type (Table 4-17) and by both cover type and C5 subregion Table 4-18. The goals were calculated using the level 1 targets by C5 subregion provided and the current proportion of each cover type in each C5 subregion. The preferred

forest management scenario did not have goals by cover type, however, the cover type distribution in each late seral category was assessed to ensure that there was a diversity of cover types.

Table 4-16: Late seral modeling targets by C5 subregion.

Late Seral Class	C5 Subregion					Managed Landbase
	Castle	Continental Divide North	Continental Divide South	Livingstone	Porcupine Hills	
Managed Landbase Area[1]	14,031	16,232	19,360	46,542	18,019	114,184
Level 1						
Target Percents						
Mature + Old Growth (MEL)	35%	35%	30%	35%	30%	
Early + Late Old Growth (EL)	13%	23%	20%	13%	13%	
Late Old Growth (L)	7%	13%	10%	7%	7%	
Target Area (ha)						
Mature + Old Growth (MEL)	4,911	5,681	5,808	16,290	5,406	38,096
Early + Late Old Growth (EL)	1,824	3,733	3,872	6,050	2,343	17,822
Late Old Growth (L)	982	2,110	1,936	3,258	1,261	9,548
Level 2						
Target Percents						
Mature + Old Growth (MEL)	23%	23%	23%	23%	20%	
Early + Late Old Growth (EL)	9%	15%	13%	9%	9%	
Late Old Growth (L)	4%	9%	7%	4%	4%	
Target Area (ha)						
Mature + Old Growth (MEL)	3,227	3,733	4,453	10,705	3,604	25,722
Early + Late Old Growth (EL)	1,263	2,435	2,517	4,189	1,622	12,025
Late Old Growth (L)	561	1,461	1,355	1,862	721	5,960

[1]Round 9 landbase was used to calculate target areas for the preferred forest management strategy.

Table 4-17: Late seral modeling targets by cover type.

Late Seral Class	Late Seral Target Percents by Cover Type					
	C-Fa	C-La	C-Fd	C-Px	C-Sx	CD
Mature + Old Growth (MEL)	33%	33%	33%	33%	33%	33%
Early + Late Old Growth (EL)	16%	16%	16%	16%	16%	16%
Late Old Growth (L)	8%	8%	8%	8%	8%	8%

Table 4-18: Late seral modeling targets by C5 subregion and cover type.

Late Seral Class	Late Seral Target Percents by Cover Type					
	C-Fa	C-La	C-Fd	C-Px	C-Sx	CD
Castle Subregion						
Mature + Old Growth (MEL)	35%	35%	35%	35%	35%	35%
Early + Late Old Growth (EL)	13%	13%	13%	13%	13%	13%
Late Old Growth (L)	7%	7%	7%	7%	7%	7%
Continental Divide North Subregion						
Mature + Old Growth (MEL)	35%	35%	35%	35%	35%	35%
Early + Late Old Growth (EL)	23%	23%	23%	23%	23%	23%
Late Old Growth (L)	13%	13%	13%	13%	13%	13%
Continental Divide South Subregion						
Mature + Old Growth (MEL)	30%	30%	30%	30%	30%	30%
Early + Late Old Growth (EL)	20%	20%	20%	20%	20%	20%
Late Old Growth (L)	10%	10%	10%	10%	10%	10%
Livingstone Subregion						
Mature + Old Growth (MEL)	35%	35%	35%	35%	35%	35%
Early + Late Old Growth (EL)	13%	13%	13%	13%	13%	13%
Late Old Growth (L)	7%	7%	7%	7%	7%	7%
Porcupine Hills Subregion						
Mature + Old Growth (MEL)	30%	30%	30%	30%	30%	30%
Early + Late Old Growth (EL)	13%	13%	13%	13%	13%	13%
Late Old Growth (L)	7%	7%	7%	7%	7%	7%

4.7.8.8 Regen Seral Stage

The maximum proportion of area in the regen seral stage in each C5 subregion was a goal in some of the TSA scenarios. The regen seral stage targets had the same issues as the late seral: targets were provided for both the managed and total forested landbases but goals were set only for the managed landbase. The regen seral goals for the preferred forest management scenario are in Table 4-19. The area in the regen seral stage was also indirectly regulated by the evenflow harvest goal.

Table 4-19: Regen seral stage modeling targets.

	C5 Subregion					Managed Landbase
	Castle	Continental Divide North	Continental Divide South	Livingstone	Porcupine Hills	
Managed Landbase Area[1]	14,031	16,232	19,360	46,542	18,019	114,184
Target Percent	40%	30%	30%	40%	40%	
Target Area (ha)	5,612	4,870	5,808	18,617	7,208	42,114

[1]Round 9 landbase was used to calculate target areas for the preferred forest management strategy.

4.7.8.9 Regen Patches

Regen patch goals were designed to provide a range of disturbance areas on the landscape. A description of the development of these targets is provided in Addendum II. Regen patches were classified as areas on the managed landbase within the regen seral stage. Stands within the 15 m adjacency limits provided by SRD were considered to be within the same patch.

Regen patch goals were set for the Castle, Continental Divide North and South, and Livingstone C5 subregions combined and Porcupine Hills on its own. The original and modified modeling targets are provided in Table 4-20. Modifications to these modeling targets also included reducing the time they were active from the entire planning horizon to the last 100 years and reducing the weighting. The modified targets were used in the preferred forest management scenario.

Table 4-20: Regen patch size modeling targets.

Regen Patch Targets	C5 Subregion	Target Percent by Regen Patch Size Class (ha)			
		<6	6-80	80-500	>500
Original	Porcupine Hills	0 - 10%	60 - 80%	20 - 30%	0%
	Other subregions combined[1]	No Target	50 - 70%	30 - 40%	10 - 20%
Modified[2]	Porcupine Hills	0 - 10%	60 - 80%	20 - 30%	No Target
	Other subregions combined[1]	No Target	40 - 70%	30 - 60%	No Target

[1] Includes Castle, Continental Divide North, Continental Divide South and Livingstone.

[2] Used in the preferred forest management scenario

4.7.8.10 Interior Old Forest Patches

Interior old forest patches could not be calculated using the TSA modeling tools, therefore they were assessed for the results of three TSA scenarios, including the preferred forest management scenario, using vector-type processing in GIS tools.

Old forest was defined as both the early and late old growth seral stages. Interior old forest was the area of old forest further than a specified distance from the edge of the old forest patch. The distance from the edge depended upon what was adjacent to the old forest. For this analysis, the distances were:

- 60 m for forested areas < 40 years old or non-forested areas > 8 wide,
- 30 m for forested areas >= 40 years old but less than mature, and
- 0 m for mature forest or the boundary of the C5 FMU.

Linear disturbances less than or equal to 8 m wide were not considered edges, nor were changes in cover type. For this analysis, narrow linear disturbances were identified as seismic lines and narrow roads. Both managed and unmanaged landbases could contribute to interior old forest patches. There was no adjacency limitations for interior old forest patches, i.e. stands had to share a similar boundary to be considered adjacent and within the same patch.

The assessment of interior old forest was completed in two steps: first, patches of old forest were identified, then the edge of the patch was buffered depending on the neighboring stand type and the area of interior old forest was determined. Interior old forest patches were determined at four points in time: 0 (current), 10, 50 and 100 years into the future. Patches of interior old forest at least 40 and 100 ha in size were desired, therefore they were identified as well.

There was no assessment of the shape of interior old forest patches. Areas by cover type were assessed to ensure there was a range of cover types present in large interior old forest patches.

In some TSA scenarios (but not the preferred forest management scenario) a goal was set to approximate interior old forest patches. Interior areas could not be directly modeled in Patchworks, therefore a minimum old forest patch size of 120 ha was the goal, with the additional area to account for edge effects. This number was determined by assuming a circular patch shape 100 ha in size entirely surrounded by non-forest, which is adequate area to account for the edge zone of most patches. The Planning Team

believed setting goals for large interior old patches in addition to setting goals for minimum areas in late seral may adversely affect one or both goals by forcing the model to either reduce the amount of old forest and/or create small interior old forest patches, therefore it was not used in the preferred forest management scenario.

4.8 TSA Results

The TSA scenarios were designed to provide insight into the timber supply and other forest values. The level of each output varies for each TSA scenario and often by period over the planning horizon. Therefore, each output was simplified into one or, at most, a few numbers and the results of all TSA scenarios were reported in tables in this section for easy comparison.

Results from selected scenarios, most often the preferred forest management scenario, are also presented in this section to portray the variation in the level of the output over the planning horizon. Complete results from all scenarios are provided on the DVD in Addendum VII. A comparison of the scenarios, and the learning from each, is provided in the next section (Section 4.9 Comparison of Results).

Patchworks uses simulated annealing, therefore the longer it is allowed to run, the higher the probability it will find the global optimum. In this analysis, some scenarios were given more time to solve than others, which prevented the direct and meaningful comparison of these scenarios. The different versions of Patchworks used throughout this analysis also confounded some of the findings. Very slight differences have been observed in the results of the different TSA modeling tools because they use different precisions in their calculations. Some Patchworks reports round the outputs to the nearest cubic metre or hectare.

All harvest volumes have been reduced by 3% for stand structure retention, however all area and standing volume (growing stock) results have not been modified. All volumes are net at 15/11 utilization. No adjustments were made for area losses due to roads and landings.

4.8.1 Harvest Volume

The goal for all scenarios was either:

- an evenflow harvest throughout the planning horizon, or
- a planned stepdown in harvest level at some point in the future, where both the pre- and post-stepdown harvest levels were constant.

Strict evenflow was maintained in the non-spatial scenarios, however, it fluctuated in the spatial TSA scenarios due to the model formulation. In general, the harvest levels were relatively evenflow, with the harvest level fluctuations well within the 10% tolerance specified by SRD to be considered evenflow.

Figure 4-2 shows the variation in the harvest levels over the 200-year planning horizon for selected scenarios. In the non-spatial TSA scenario (RUN906), there was no variation in harvest level. In the spatial TSA scenario (RUN90022), there was a small variation in the post-stepdown harvest level (21-200 years in the future). The RUN906 TSA scenario was selected from the Round 9 non-spatial scenarios as representative of the evenflow non-spatial TSA scenarios.

Conifer harvest levels are provided for all scenarios in Table 4-21 and Table 4-22 for non-spatial and spatial TSA scenarios, respectively. These tables present the average harvest levels for the entire planning horizon for easy comparison between scenarios. A forest-level MAI using a 200-year average

harvest level, was calculated using the area of the managed landbase for each scenario. Carryover volumes are reported separately.

In Rounds 2-6 of the Patchworks scenarios, there was a tendency for the model to harvest at extremely high levels in the first few periods, which is likely due to the current age class distribution. The weighting of the harvest volume goals was increased to prevent this and force a more evenflow harvest level. However, this indicated that a short-term accelerated harvest could be investigated as a means of increasing current harvest levels, while maintaining a sustainable long-term timber supply and other forest values. An accelerated harvest level was tested and ultimately selected for the preferred forest management scenario for many reasons.

For all stepdown TSA scenarios, the post-stepdown harvest level was set at 90% of the current AAC. The preferred forest management scenario pre-stepdown harvest level was set at 20% above the current AAC. This level was much less than the pre-stepdown harvest level in the non-spatial TSA scenarios where the pre-stepdown harvest level was maximized.

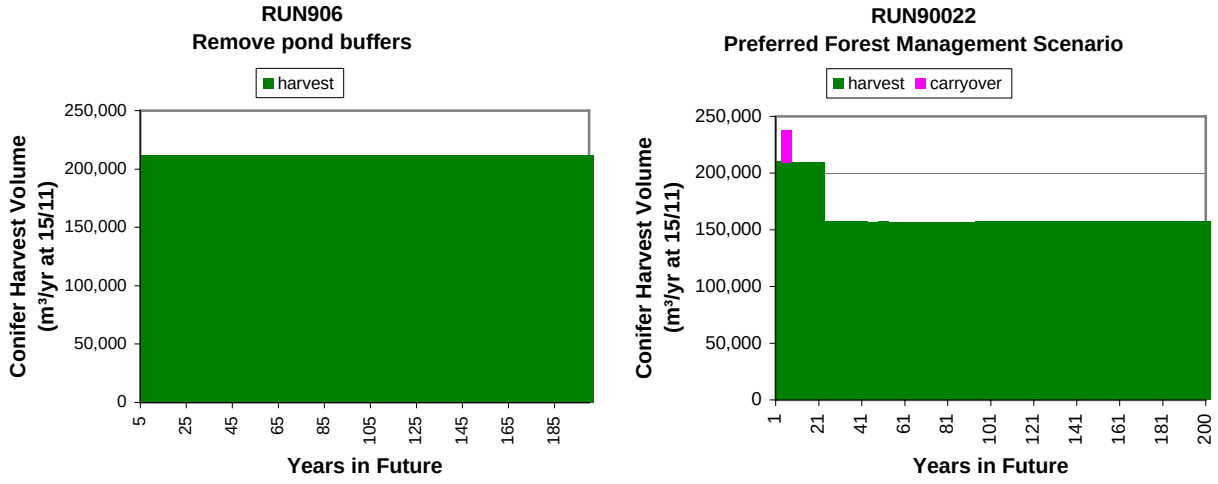


Figure 4-2: Conifer harvest level for selected scenarios.

Table 4-21: Non-spatial TSA scenario harvest level results.

TSA Scenario		Forest-level MAI (m^3/ha/yr)[1]	Harvest Flow[2]	Conifer Harvest Level (m^3/yr at 15/11)* Carryover (m^3)[3]	Evenflow/ Pre-stepdown	Post-stepdown
RUN21	Round 2 unconstrained	1.67	EF		192,682	
RUN22	Decrease min harvest ages by 10 yrs	1.77	EF		205,215	
RUN23	Decrease C-Fd yields by 5%	1.66	EF		191,720	
RUN24	Decrease C-Fd yields by 10%	1.65	EF		190,757	
RUN25	Decrease min harvest ages for C-Sx	1.69	EF		195,367	
RUN32	Add Lost Creek Fire blocks	1.66	EF		195,579	
RUN41	Remove inaccessible stands	1.66	EF		195,194	
RUN51	Remove isolated stands	1.66	EF		194,955	
RUN81	Ecological indicators by subregion	1.28	EF		153,299	
RUN82	Ecological indicators by covertype	1.31	EF		157,756	
RUN83	Ecological indicators by subregion and covertype	1.29	EF		154,489	
RUN901	Round 9 unconstrained	1.82	EF		219,668	
RUN902	Ending gs >= avg	1.49	EF		180,225	
RUN903	ND gs last 50 yrs	1.82	EF		219,664	
RUN904	+- 10% variance in gs	1.39	EF		167,800	
RUN905	Include all treatments	1.78	EF		214,968	
RUN906	Remove pond buffers	1.76	EF		212,179	
RUN907	Future blocks to CD density	1.88	EF		226,649	
RUN908	Decrease min harvest ages by LMU	1.74	EF		209,362	
RUN909A	All historic and future blocks to CD density	1.82	EF		226,736	
RUN909B	All pre-91 historic blocks forested	1.82	EF		225,902	
RUN910	Force ecological indicators	1.32	EF		159,335	
RUN911	Force harvest of "E" MPB stands	1.29	EF		156,146	
RUN912	Defer harvest of non-pine stands	1.38	EF		166,739	
RUN913A	Maximize evenflow harvest	1.47	EF	143,000	176,104	
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	1.46	EF	143,000	175,684	
RUN914	Stepdown harvest in 20 years	1.46	SD in 20 years	143,000	332,893	157,428
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	1.45	SD in 20 years	143,000	327,717	157,428
RUN916	Stepdown harvest in 30 years	1.46	SD in 30 years	143,000	275,362	157,428
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	1.45	SD in 30 years	143,000	271,545	157,428
RUN918	Stepdown harvest in 40 years	1.46	SD in 40 years	143,000	246,313	157,428
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	1.46	SD in 40 years	143,000	244,443	157,428

* All harvest volumes have been reduced by 3% for stand structure retention.

[1] Forest-level MAI was calculated using the average harvest over the 200-year planning horizon.

[2] EF=Evenflow, SD=Planned Stepdown

[3] Harvested within the first 5-years of the SHS.

Table 4-22: Spatial TSA scenario harvest level results.

TSA Scenario		Forest-level MAI (m^3/ha/yr)[1]	Harvest Flow	Conifer Harvest Level (m^3/yr at 15/11)* Carryover (m^3)[2]	Evenflow/ Pre-stepdown	Post-stepdown
RUN21001	Round 2 baseline	1.51	EF		174,739	
RUN21002	Level 1 late seral	1.43	EF		164,943	
RUN21003	Level 2 late seral	1.49	EF		171,963	
RUN21004	Regen patches	0.72	EF		83,088	
RUN21006	Regen seral stage	1.51	EF		174,615	
RUN21007	Modified regen patches	1.47	EF		169,908	
RUN21008	Reduced regen patch weighting	1.49	EF		172,874	
RUN21009	No greenup and adjacency	1.53	EF		177,320	
RUN31002	Lost Creek fire blocks	1.50	EF		177,151	
RUN41001	Remove inaccessible stands	1.55	EF		182,274	
RUN41002	Inaccessible stands and ecological indicators	1.52	EF		179,125	
RUN51001	Remove isolated stands	1.57	EF		184,393	
RUN51002	Isolated stands and ecological indicators	1.53	EF		179,865	
RUN61001	SHS Version 1	1.47	EF		172,985	
RUN61003	SHS Version 2	1.47	EF		172,323	
RUN71001	Round 7 baseline	1.51	EF		177,971	
RUN71002	Force ecological indicators	1.35	EF		159,562	
RUN71003	Eco sensitivity #1	1.40	EF		165,362	
RUN71004	Eco sensitivity #2	1.45	EF		171,516	
RUN71005	Eco sensitivity #3	1.47	EF		173,793	
RUN90001	Round 9 baseline	1.41	EF		167,853	
RUN90002	Include planned blocks	1.38	EF		164,375	
RUN90003	60% access schedule	1.39	EF		165,591	
RUN90004	40% access schedule	1.37	EF		162,989	
RUN90005	Force harvest of "E" MPB stands	1.36	EF		162,678	
RUN90006	Maximize harvest	1.55	EF		185,284	
RUN90010	Maintain current AAC with 97,000 carryover	1.47	EF	97,000	174,917	
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	1.34	SD in 21 years	97,000	174,924	157,397
RUN90012	Maintain current AAC	1.47	EF		174,918	
RUN90013	Stepdown harvest in 21 years	1.34	SD in 21 years		174,923	157,398
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	1.35	SD in 21 years	143,000	174,917	157,397
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	1.34	SD in 21 years		174,935	157,420
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	1.35	SD in 21 years		185,187	157,279
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	1.35	SD in 21 years	143,000	176,501	157,355
RUN90018	Reduce average harvest age	1.38	SD in 21 years	143,000	218,205	157,102
RUN90020	Maximize harvest in first 21 years	1.45	SD in 21 years	143,000	295,003	157,371
RUN90021	Modified compartment sequence	1.39	SD in 21 years	143,000	218,622	157,373
RUN90021A	SHS Version 3	1.38	SD in 21 years	143,000	218,607	157,392
RUN90022	Preferred Forest Management Scenario	1.43	SD in 21 years	143,000	209,414	157,140

* All harvest volumes have been reduced by 3% for stand structure retention.

[1] Forest-level MAI was calculated using the average harvest over the 200-year planning horizon.

[2] EF=Evenflow, SD=Planned Stepdown

[3] Harvested within the first 5-years of the SHS.

4.8.2 Harvest Area

Harvest area by cover type for selected scenarios is in Figure 4-3. The optimization nature of Woodstock tends to harvest all areas of certain types in one period, and then all of another type in the next. This trend is evened out in Patchworks as can be seen in Figure 4-3 when RUN906 (Woodstock) and RUN90001 (Patchworks) are compared. The area harvested by cover type was quite similar when a simple access schedule was added (RUN9004 compared to RUN90001), which shows that access schedules do not have to affect the proportion of area harvested. The increased proportion of pine harvest area in the first 20 years of the planning horizon is obvious in the preferred forest management scenario (RUN90022).

Area harvested for carryover volume was included in all harvest area results reported.

For this analysis, harvest area results were summarized into the following two assessments:

- Proportion of the harvest area that is pine, and
- Proportion of the pine area harvested that is highly susceptible.

Results for these assessments are presented in Table 4-23 and Table 4-24, for the spatial and non-spatial scenarios respectively. Three average proportions were calculated for the pine, which includes both unclassified and pine highly susceptible to mountain pine beetle. They were:

- 10-year average harvest for the first 10 years of the planning horizon,
- 10-year average harvest for the second 10 years of the planning horizon, and
- 200-year average across the entire planning horizon.

For highly susceptible pine stands, two average proportions were calculated for the time periods when mountain pine beetle is a concern:

- 10-year average harvest for the first 10 years of the planning horizon, and
- 10-year average harvest for the second 10 years of the planning horizon.

Currently in the C5 FMU, almost half of the managed landbase is pine. These results show that generally, the proportion of pine area harvested over 200 years was representative of the pine area on the managed landbase (49-53% for the Round 9 spatial TSA scenarios).

When pine was prioritized for harvest in the early part of the planning horizon, the proportion of pine harvest area increased from about 50-70% to around 80-100% (Table 4-24). This is a deviation from traditional timber supply analysis that attempts to harvest the same proportions by cover type that exist on the landscape. However, the prioritization of pine was desirable to reduce the area highly susceptible to mountain pine beetle.

For the preferred forest management scenario, the pine proportion of harvest area is 81% in the first decade, and 72% in the second, which is in between the unconstrained values and prioritizing pine with a heavy weighting (Table 4-24). There is also a priority on harvesting highly susceptible pine, as seen by comparing the preferred forest management scenario proportions of 47-48% to the early round 9 scenarios (RUN90001-RUN90013).

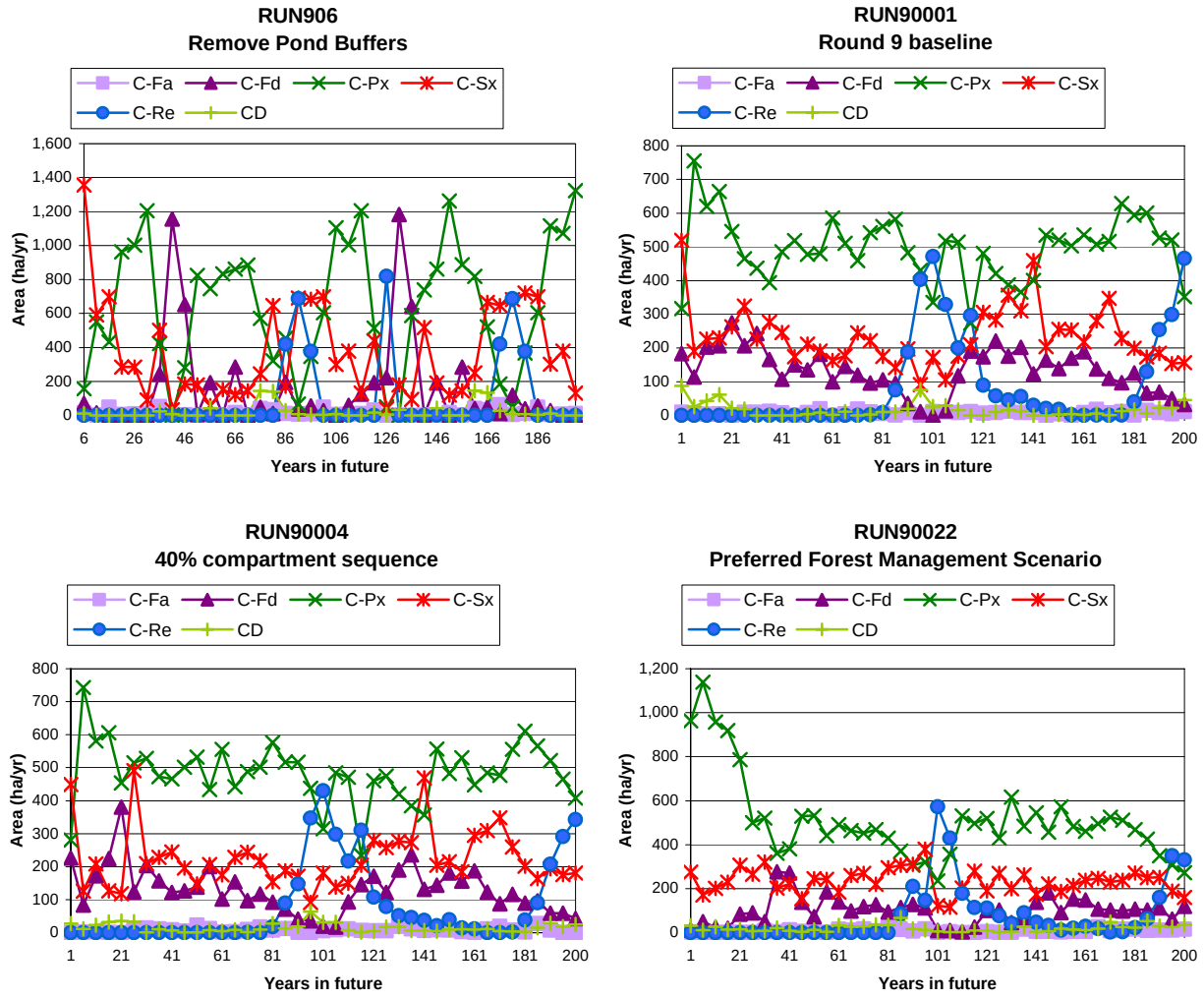


Figure 4-3: Area harvested by cover type for selected scenarios.

Table 4-23: Non-spatial TSA scenario harvest area results.

TSA Scenario		Average % Pine of Area Harvested			Average Highly Suceptible Pine % of Pine Area Harvested	
		10-year avg (Years 1-10)	10-year avg (Years 11-20)	200-year avg (Years 1-200)	10-year avg (Years 1-10)	10-year avg (Years 11-20)
RUN21	Round 2 unconstrained	33%	60%	64%		
RUN22	Decrease min harvest ages by 10 yrs	33%	46%	63%		
RUN23	Decrease C-Fd yields by 5%	33%	60%	64%		
RUN24	Decrease C-Fd yields by 10%	32%	60%	64%		
RUN25	Decrease min harvest ages for C-Sx	28%	46%	63%		
RUN32	Add Lost Creek Fire blocks	32%	54%	63%		
RUN41	Remove inaccessible stands	32%	53%	64%		
RUN51	Remove isolated stands	33%	53%	64%		
RUN81	Ecological indicators by subregion	60%	65%	54%		
RUN82	Ecological indicators by covertype	55%	66%	50%		
RUN83	Ecological indicators by subregion and covertype	57%	60%	49%		
RUN901	Round 9 unconstrained	22%	65%	50%	37%	23%
RUN902	Ending gs >= avg	43%	65%	53%	47%	37%
RUN903	ND gs last 50 yrs	22%	65%	50%	37%	22%
RUN904	+- 10% variance in gs	24%	64%	48%	8%	46%
RUN905	Include all treatments	25%	58%	50%	27%	27%
RUN906	Remove pond buffers	26%	57%	50%	27%	26%
RUN907	Future blocks to CD density	37%	41%	50%	8%	23%
RUN908	Decrease min harvest ages by LMU	33%	36%	48%	13%	28%
RUN909A	All historic and future blocks to CD density	24%	53%	48%	26%	22%
RUN909B	All pre-91 historic blocks forested	24%	54%	49%	24%	24%
RUN910	Force ecological indicators	71%	50%	50%	28%	66%
RUN911	Force harvest of "E" MPB stands	71%	53%	52%	95%	19%
RUN912	Defer harvest of non-pine stands	76%	39%	53%	83%	40%
RUN913A	Maximize evenflow harvest	22%	53%	51%	52%	32%
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	25%	65%	51%	77%	90%
RUN914	Stepdown harvest in 20 years	26%	35%	49%	28%	34%
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	27%	83%	48%	28%	100%
RUN916	Stepdown harvest in 30 years	25%	50%	49%	29%	29%
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	24%	51%	49%	30%	56%
RUN918	Stepdown harvest in 40 years	24%	63%	49%	29%	27%
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	25%	66%	49%	31%	30%

Table 4-24: Spatial TSA scenario harvest area results.

TSA Scenario		Average % Pine of Area Harvested			Average Highly Suceptible Pine % of Pine Area Harvested	
		10-year avg (Years 1-10)[1]	10-year avg (Years 11-20)[2]	200 year avg (Years 1-200)	10-year avg (Years 1-10)[1]	10-year avg (Years 11-20)[2]
RUN21001	Round 2 baseline	57%	59%	64%		
RUN21002	Level 1 late seral	62%	57%	68%		
RUN21003	Level 2 late seral	61%	54%	67%		
RUN21004	Regen patches	49%	42%	58%		
RUN21006	Regen seral stage	67%	59%	69%		
RUN21007	Modified regen patches	58%	54%	66%		
RUN21008	Reduced regen patch weighting	57%	57%	67%		
RUN21009	No greenup and adjacency	73%	69%	69%		
RUN31002	Lost Creek fire blocks	63%	62%	64%		
RUN41001	Remove inaccessible stands	57%	59%	65%		
RUN41002	Inaccessible stands and ecological indicators	73%	73%	69%		
RUN51001	Remove isolated stands	57%	60%	65%		
RUN51002	Isolated stands and ecological indicators	75%	78%	69%		
RUN61001	SHS Version 1	77%	66%	71%		
RUN61003	SHS Version 2	73%	63%	68%		
RUN71001	Round 7 baseline	33%	32%	34%		
RUN71002	Force ecological indicators	63%	62%	68%		
RUN71003	Eco sensitivity #1	75%	66%	70%		
RUN71004	Eco sensitivity #2	73%	65%	71%		
RUN71005	Eco sensitivity #3	75%	65%	71%		
RUN90001	Round 9 baseline	63%	53%	52%	17%	15%
RUN90002	Include planned blocks	67%	54%	52%	21%	10%
RUN90003	60% access schedule	65%	58%	52%	19%	14%
RUN90004	40% access schedule	68%	54%	52%	20%	14%
RUN90005	Force harvest of "E" MPB stands	90%	53%	53%	83%	17%
RUN90006	Maximize harvest	67%	53%	49%	18%	15%
RUN90010	Maintain current AAC with 97,000 carryover	66%	51%	50%	19%	16%
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	67%	53%	51%	20%	17%
RUN90012	Maintain current AAC	67%	51%	50%	20%	16%
RUN90013	Stepdown harvest in 21 years	68%	52%	51%	21%	16%
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	65%	51%	50%	47%	43%
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	87%	91%	52%	76%	96%
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	99%	90%	50%	100%	92%
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	92%	91%	51%	82%	95%
RUN90018	Reduce average harvest age	81%	70%	52%	64%	78%
RUN90020	Maximize harvest in first 21 years	76%	53%	50%	53%	44%
RUN90021	Modified compartment sequence	64%	64%	50%	55%	72%
RUN90021A	SHS Version 3	75%	73%	51%	50%	62%
RUN90022	Preferred Forest Management Scenario	81%	72%	53%	47%	48%

[1] 10-year average is calculated for years 1-10 for TSA Scenarios RUN21001 to RUN 71005, and years 2-11 for TSA Scenarios RUN90001 to RUN90022.

[2] 10-year average is calculated for years 11-20 for TSA Scenarios RUN21001 to RUN 71005, and years 12-21 for TSA Scenarios RUN90001 to RUN90022.

Figure 4-4 presents the area harvested by seral stage from the preferred forest management scenario. It shows increasing area of early and late old growth stands were harvested by the model over the first 100 years. This is a result of the current age class distribution where most of the forest is mature.

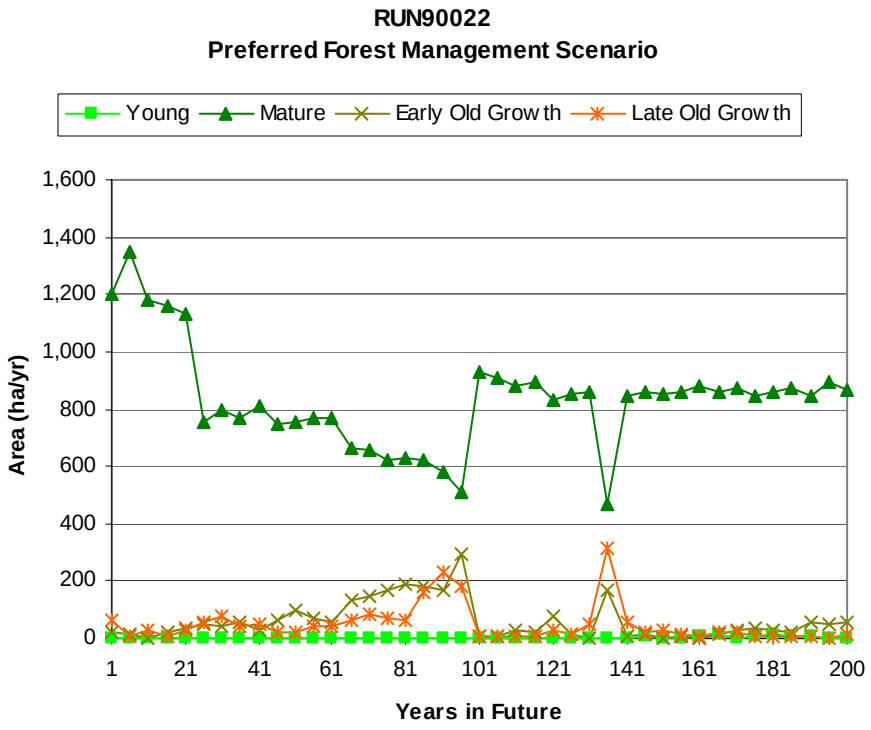


Figure 4-4: Area harvested by seral stage for selected scenarios.

4.8.3 Average Harvest Age

Only areas harvested with the clearcut action in the TSA models are included in these harvest age results. Figure 4-5 provides average harvest ages for pine, spruce and all cover types combined for the entire planning horizon for selected scenarios. It shows that a landscape with mature forests like the C5 FMU, the average harvest age tends to decrease in the second rotation. Due to the access schedule in Patchworks, which limits the model from harvesting all the older aged stands first, the average harvest age increased for the first rotation, which is the opposite trend in the non-spatial TSA scenario RUN906. At the end of the planning horizon for the preferred forest management scenario, average harvest ages are slightly above the minimum specified harvest age. Generally, the average harvest ages are higher in spruce than the other species, which is to be expected given the minimum harvest ages in the model.

Table 4-25 and Table 4-26 provide the maximum and average harvest ages over the first 100 years of the planning horizon for the non-spatial and spatial TSA scenarios, respectively. Average harvest ages were calculated for the first 20 years, years 21-50 and 50-100 years into the future. Average harvest ages were not readily available for Rounds 2-7 spatial TSA scenarios and are therefore not presented. Maximum and average harvest ages for pine and spruce cover types were available only for selected spatial TSA scenarios and are provided in Table 4-27 and Table 4-28, respectively.

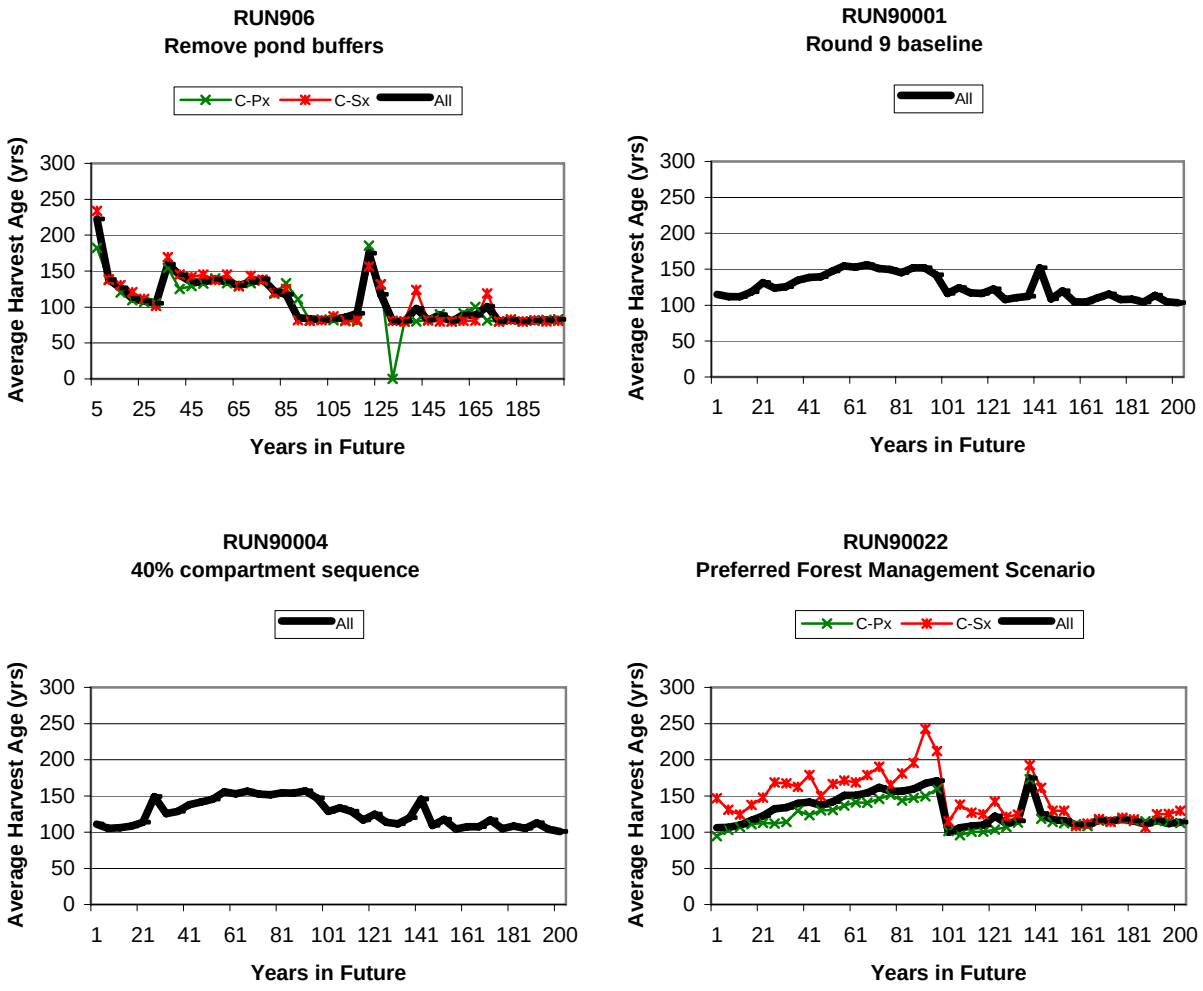


Figure 4-5: Average harvest age for selected scenarios.

Table 4-25: Non-spatial TSA scenario average harvest age results.

TSA Scenario		Maximum Average Clearcut Age	Average Clearcut Age (years)		
			20 yr avg (years 1-20)	30 yr avg (Years 21-50)	50 yr avg (Years 51-100)
RUN21	Round 2 unconstrained	252	183	145	130
RUN22	Decrease min harvest ages by 10 yrs	248	172	126	141
RUN23	Decrease C-Fd yields by 5%	252	183	145	130
RUN24	Decrease C-Fd yields by 10%	252	183	145	130
RUN25	Decrease min harvest ages for C-Sx	248	179	147	97
RUN32	Add Lost Creek Fire blocks	246	178	123	122
RUN41	Remove inaccessible stands	246	178	123	122
RUN51	Remove isolated stands	245	178	123	122
RUN81	Ecological indicators by subregion	326	116	109	162
RUN82	Ecological indicators by covertype	266	191	144	127
RUN83	Ecological indicators by subregion and covertype	322	200	139	164
RUN901	Round 9 unconstrained	225	159	108	109
RUN902	Ending gs >= avg	345	83	96	196
RUN903	ND gs last 50 yrs	225	159	108	108
RUN904	+- 10% variance in gs	246	101	173	124
RUN905	Include all treatments	234	156	136	105
RUN906	Remove pond buffers	234	156	136	118
RUN907	Future blocks to CD density	231	163	124	91
RUN908	Decrease min harvest ages by LMU	225	163	137	103
RUN909A	All historic and future blocks to CD density	225	156	107	118
RUN909B	All pre-91 historic blocks forested	225	156	131	119
RUN910	Force ecological indicators	332	135	110	183
RUN911	Force harvest of "E" MPB stands	329	141	126	187
RUN912	Defer harvest of non-pine stands	290	166	138	164
RUN913A	Maximize evenflow harvest	242	179	144	123
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	273	193	150	124
RUN914	Stepdown harvest in 20 years	345	142	106	131
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	345	149	111	132
RUN916	Stepdown harvest in 30 years	324	149	128	131
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	345	116	126	134
RUN918	Stepdown harvest in 40 years	332	116	129	130
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	349	116	127	135

Table 4-26: Spatial TSA scenario average harvest age results.

TSA Scenario		Maximum Average Clearcut Age	Average Clearcut Age (years)		
			20 yr avg (years 2-21)	30 yr avg (Years 22-51)	50 yr avg (Years 52-101)
RUN90001	Round 9 baseline	156	118	135	147
RUN90002	Include planned blocks	157	109	139	150
RUN90003	60% access schedule	158	108	139	148
RUN90004	40% access schedule	157	108	138	151
RUN90005	Force harvest of "E" MPB stands	159	103	139	150
RUN90006	Maximize harvest	164	108	154	143
RUN90010	Maintain current AAC with 97,000 carryover	162	111	142	154
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	160	110	141	155
RUN90012	Maintain current AAC	162	111	142	155
RUN90013	Stepdown harvest in 21 years	160	110	141	155
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	164	110	142	156
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	164	103	144	158
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	163	97	151	157
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	163	100	149	155
RUN90018	Reduce average harvest age	140	114	140	140
RUN90020	Maximize harvest in first 21 years	158	118	146	146
RUN90021	Modified compartment sequence	167	111	143	156
RUN90021A	SHS Version 3	169	115	144	155
RUN90022	Preferred Forest Management Scenario	175	114	138	153

Table 4-27: Spatial TSA scenario pine average harvest age results.

TSA Scenario		Maximum Average Clearcut Age	Average Clearcut Age (years)		
			20 yr avg (years 2-21)	30 yr avg (Years 22-51)	50 yr avg (Years 52-101)
RUN90020	Maximize harvest in first 21 years	152	107	123	139
RUN90021	Modified compartment sequence	162	105	125	146
RUN90021A	SHS Version 3	153	107	124	142
RUN90022	Preferred Forest Management Scenario	173	108	123	142

Table 4-28: Spatial TSA scenario spruce average harvest age results.

TSA Scenario		Maximum Average Clearcut Age	Average Clearcut Age (years)		
			20 yr avg (years 2-21)	30 yr avg (Years 22-51)	50 yr avg (Years 52-101)
RUN90020	Maximize harvest in first 21 years	191	151	182	166
RUN90021	Modified compartment sequence	205	131	157	181
RUN90021A	SHS Version 3	206	148	183	185
RUN90022	Preferred Forest Management Scenario	243	135	166	182

4.8.4 Greenup Patch

Greenup patch area and frequency results from the preferred forest management scenario are presented in Figure 4-6 and Figure 4-7, respectively. In the current landbase and throughout the planning horizon, there were areas in greenup patches exceeding the maximum size of 500 ha for the Middle Ridges landscape management unit and 250 ha for other LMU's. This is due to the increased number of blocks identified in the classified landbase and the broad definition of greenup patch (30 years). The restrictive access schedule in the preferred forest management scenario promoted the harvest of highly susceptible pine, which were located in large patches. Depending on the patch shape, some of these patches may not "look" like solid 500+ ha patches. The operating ground rules in the C5 FMU restrict block sizes to 500 ha, therefore structure retention strategies will have to be developed to ensure opening areas are less than 500 ha in size in annual operating plans.

Greenup patches were modeled in spatial TSA scenarios only, and results for all scenarios are presented in Table 4-29. The definition of greenup patches varies between scenarios, therefore it is included in the third and fourth columns of these tables because it may affect the interpretation of the results (see Table 4-15 for the complete definition). Greenup patch goals were different for the Middle Ridges landscape management unit compared to all other LMU's combined, and therefore results are also divided into these two categories. Greenup patch results are shown as the percent of the greenup patch area outside of the patch size range for the current forest, the maximum proportion outside of the goal, and the average proportion for the first and second halves of the planning horizon.

In Round 9, there is a large increase in the proportion of area greater than the target, due to the increase in years that a stand can be included in a greenup patch (increased to 30 years from 10). There is also a large increase in the maximum proportion of greenup patch area exceeding the goal in later Round 9 scenarios, beginning in RUN90015 due to the access schedule and prioritization of highly susceptible pine for harvest.

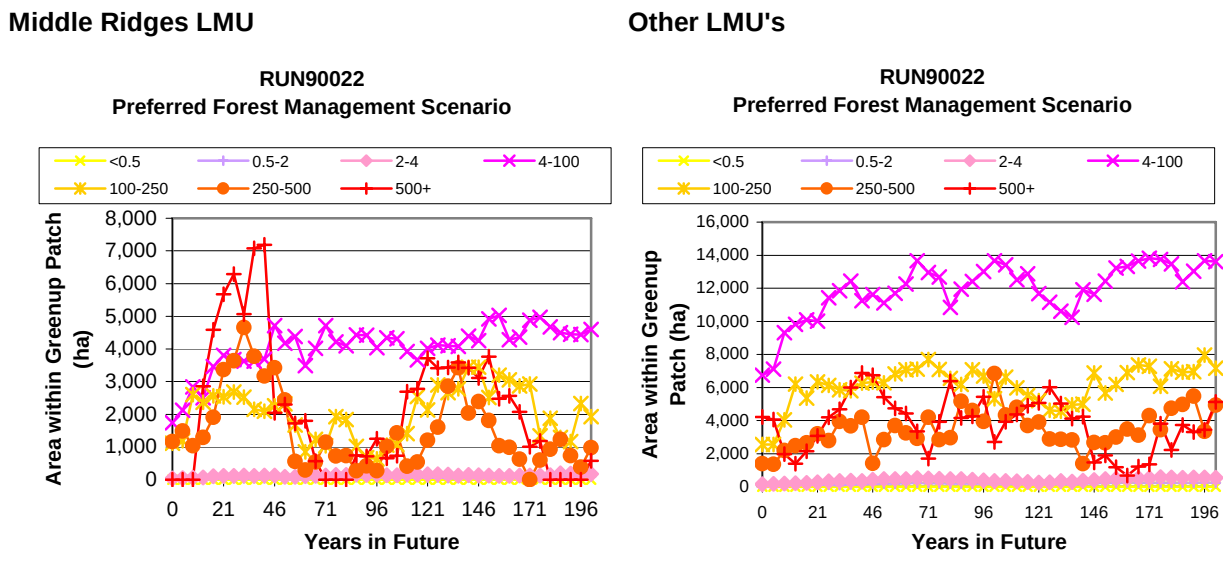


Figure 4-6: Greenup patch area from the preferred forest management scenario.

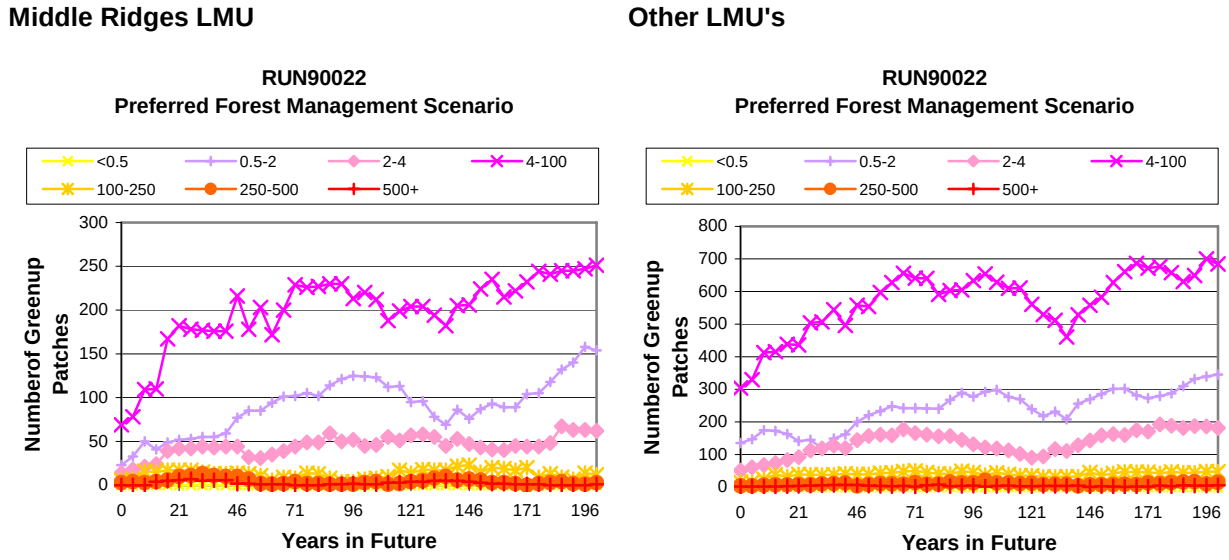


Figure 4-7: Greenup patch frequency from the preferred forest management scenario.

Table 4-29: Spatial TSA scenario greenup patch results.

TSA Scenario		Target Patch Size		Years in Green-up	Current Proportion of Area > Target		Max Proportion of Area > Target[1]		Average Proportion of Area > Target			
									Years 1-100[2]		Years 101-200[3]	
		MI LMU	Other LMU's		MI LMU	Other LMU's	MI LMU	Other LMU's	MI LMU	Other LMU's	MI LMU	Other LMU's
RUN21001	Round 2 baseline	1-500	1-250	10	18%	1%	18%	1%	2%	0%	0%	0%
RUN21002	Level 1 late seral	1-500	1-250	10	18%	1%	18%	1%	2%	0%	0%	0%
RUN21003	Level 2 late seral	1-500	1-250	10	18%	1%	18%	1%	2%	0%	0%	0%
RUN21004	Regen patches	1-500	1-250	10	18%	1%	18%	29%	6%	3%	4%	2%
RUN21006	Regen seral stage	1-500	1-250	10	18%	1%	18%	4%	5%	3%	3%	3%
RUN21007	Modified regen patches	1-500	1-250	10	18%	1%	18%	1%	2%	0%	0%	0%
RUN21008	Reduced regen patch weighting	1-500	1-250	10	18%	1%	18%	1%	2%	0%	0%	0%
RUN21009	No greenup and adjacency	-	-	0	18%	1%	18%	11%	9%	3%	8%	3%
RUN31002	Lost Creek fire blocks	1-500	1-250	10	16%	1%	16%	1%	2%	0%	0%	0%
RUN41001	Remove inaccessible stands	1-500	1-250	10	16%	1%	16%	1%	2%	0%	0%	0%
RUN41002	Inaccessible stands and ecological indicators	1-500	1-250	10	16%	1%	19%	17%	12%	5%	10%	3%
RUN51001	Remove isolated stands	1-500	1-250	10	16%	1%	16%	1%	2%	0%	0%	0%
RUN51002	Isolated stands and ecological indicators	1-500	1-250	10	16%	1%	22%	18%	13%	4%	11%	3%
RUN61001	SHS Version 1	>=2	>=2	10	2%	4%	10%	4%	7%	2%	6%	2%
RUN61003	SHS Version 2	>=2	>=2	10	2%	4%	2%	4%	0%	0%	0%	0%
RUN71001	Round 7 baseline	>=2	>=2	10	1%	1%	1%	1%	0%	0%	0%	0%
RUN71002	Force ecological indicators	>=2	>=2	10	1%	1%	1%	1%	0%	0%	0%	0%
RUN71003	Eco sensitivity #1	>=2	>=2	10	1%	1%	1%	1%	0%	0%	0%	0%
RUN71004	Eco sensitivity #2	>=2	>=2	10	1%	1%	1%	1%	0%	0%	0%	0%
RUN71005	Eco sensitivity #3	>=2	>=2	10	1%	1%	1%	1%	0%	0%	0%	0%
RUN90001	Round 9 baseline	0.5-500	0.5-250	30	37%	0%	37%	0%	6%	0%	0%	0%
RUN90002	Include planned blocks	0.5-500	0.5-250	30	37%	0%	37%	0%	7%	0%	0%	0%
RUN90003	60% access schedule	0.5-500	0.5-250	30	37%	0%	37%	0%	7%	0%	0%	0%
RUN90004	40% access schedule	0.5-500	0.5-250	30	37%	0%	37%	0%	7%	0%	0%	0%
RUN90005	Force harvest of "E" MPB stands	0.5-500	0.5-250	30	37%	0%	37%	0%	8%	0%	0%	0%
RUN90006	Maximize harvest	0.5-500	0.5-250	30	37%	0%	37%	0%	7%	0%	0%	0%
RUN90010	Maintain current AAC with 97,000 carryover	0.5-500	0.5-250	30	37%	0%	37%	0%	10%	0%	4%	0%
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	0.5-500	0.5-250	30	37%	0%	37%	0%	9%	0%	3%	0%
RUN90012	Maintain current AAC	0.5-500	0.5-250	30	37%	0%	37%	0%	10%	0%	4%	0%
RUN90013	Stepdown harvest in 21 years	0.5-500	0.5-250	30	37%	0%	37%	0%	10%	0%	3%	0%
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	0.5-500	0.5-250	30	37%	0%	37%	0%	10%	0%	3%	0%
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	0.5-500	0.5-250	30	37%	0%	37%	15%	15%	2%	4%	0%
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	0.5-500	0.5-250	30	37%	0%	37%	18%	22%	3%	16%	2%
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	0.5-500	0.5-250	30	37%	0%	37%	8%	14%	2%	2%	0%
RUN90018	Reduce average harvest age	0.5-500	0.5-250	30	37%	0%	39%	33%	27%	11%	16%	4%
RUN90020	Maximize harvest in first 21 years	0.5-500	0.5-250	30	37%	0%	39%	17%	25%	5%	6%	0%
RUN90021	Modified compartment sequence	0.5-500	0.5-250	30	37%	0%	44%	46%	31%	12%	19%	5%
RUN90021A	SHS Version 3	0.5-500	0.5-250	30	37%	0%	56%	60%	42%	23%	23%	9%
RUN90022	Preferred Forest Management Scenario	0.5-500	0.5-250	30	37%	0%	38%	44%	30%	18%	26%	18%

[1] Maximum proportion of area greater than goal across the entire planning horizon.

[2] Years 1-100 is years 1-100 for TSA Scenarios RUN21001 to RUN71005, and years 1-101 for TSA Scenarios RUN90001 to RUN90022.

[3] Years 101-200 is years 101-200 for TSA Scenarios RUN21001 to RUN71005, and years 102-200 for TSA Scenarios RUN90001 to RUN90022.

4.8.5 Area Lost to Mortality

Figure 4-8 shows the area lost to mortality by cover type for the preferred forest management scenario. Large areas reaching the maximum age on the managed landbase can indicate TSA assumptions used as inputs to the models are too restrictive, therefore preventing the harvest of older stands before they die. Typically, spatial TSA scenarios will have more area dying than Woodstock optimization scenarios due to the additional goals and access schedules.

Table 4-30 provides the sum of the area lost to mortality on the managed landbase for the first 100 years and last 100 years of the planning horizon for the non-spatial scenarios, and Table 4-31 provides the results from selected spatial TSA scenarios.

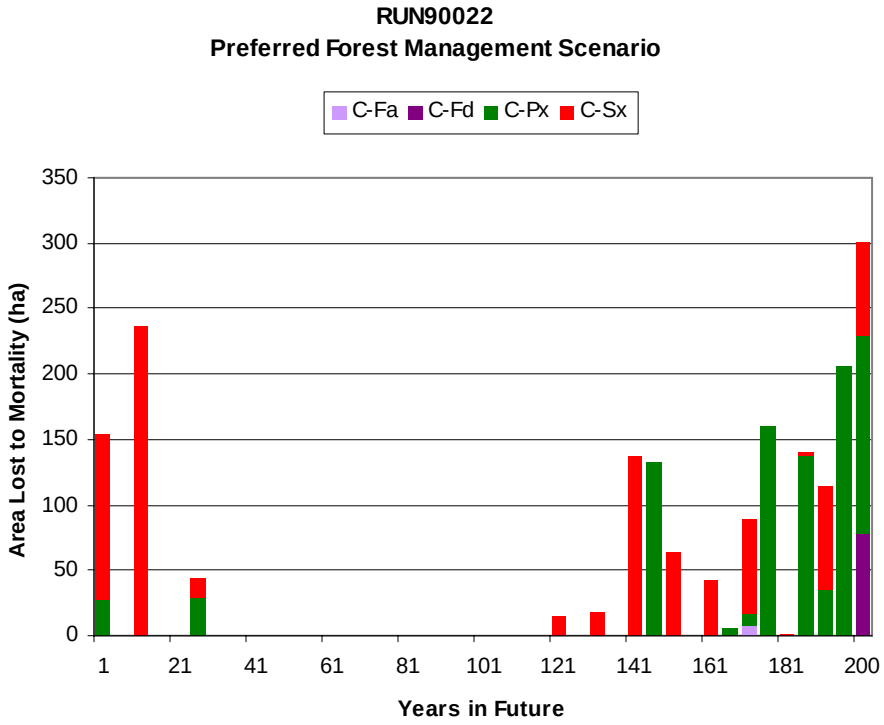


Figure 4-8: Area lost to mortality from the preferred forest management scenario.

Table 4-30: Non-spatial TSA scenario area lost to mortality results.

TSA Scenario		Sum of Area Lost to Mortality on Managed Landbase (ha)	
		Years 1-100	Years 101-200
RUN21	Round 2 unconstrained	-	-
RUN22	Decrease min harvest ages by 10 yrs	-	-
RUN23	Decrease C-Fd yields by 5%	-	-
RUN24	Decrease C-Fd yields by 10%	-	-
RUN25	Decrease min harvest ages for C-Sx	-	-
RUN32	Add Lost Creek Fire blocks	-	-
RUN41	Remove inaccessible stands	-	-
RUN51	Remove isolated stands	-	-
RUN81	Ecological indicators by subregion	-	155
RUN82	Ecological indicators by covertype	22	155
RUN83	Ecological indicators by subregion and covertype	3	155
RUN901	Round 9 unconstrained	-	155
RUN902	Ending gs >= avg	2,276	832
RUN903	ND gs last 50 yrs	-	155
RUN904	+- 10% variance in gs	626	155
RUN905	Include all treatments	-	155
RUN906	Remove pond buffers	20	1,136
RUN907	Future blocks to CD density	-	155
RUN908	Decrease min harvest ages by LMU	-	155
RUN909A	All historic and future blocks to CD density	-	155
RUN909B	All pre-91 historic blocks forested	-	155
RUN910	Force ecological indicators	20	1,136
RUN911	Force harvest of "E" MPB stands	20	983
RUN912	Defer harvest of non-pine stands	20	983
RUN913A	Maximize evenflow harvest	20	983
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	20	983
RUN914	Stepdown harvest in 20 years	20	1,007
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	20	1,086
RUN916	Stepdown harvest in 30 years	20	1,007
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	20	983
RUN918	Stepdown harvest in 40 years	20	992
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	20	983

Table 4-31: Spatial TSA scenario area lost to mortality results.

TSA Scenario		Sum of Area Lost to Mortality on Managed Landbase (ha)	
		Years 1-101	Years 102-200
RUN90021A	SHS Version 3	708	864
RUN90022	Preferred Forest Management Scenario	435	1,433

4.8.6 Growing Stock

Figure 4-9 shows the growing stock throughout the planning horizon for the preferred forest management scenario. Several growing stock results are presented, however only merchantable conifer growing stock was a goal in the TSA models and an indicator of the desired future forest. Merchantable growing stock is the standing volume of timber on the managed landbase where the stand meets the minimum harvest age. There was 3.5 million m³ of merchantable conifer volume, and 11.3 million m³ of managed conifer volume at the end of the planning horizon. The difference in growing stock volume, about 7.8 million m³, in stands that are just below the minimum harvest age because there is very little volume in younger stands.

For this forest, the growing stock decreased over the first rotation due to the large proportion of area in the mature and older seral stages being harvested and regenerated to young stands with low volume. In the preferred forest management scenario, there was a slight increase in growing stock over the first 10-20 years as existing stands continued to age and increased in volume.

It is extremely difficult to force an absolute non-declining ending growing stock in Patchworks, so the ending growing stock was monitored to ensure no severe decline at the end of the planning horizon, but some fluctuations were permitted. The merchantable growing stock is relatively even for the last 90 years of the planning horizon in the preferred forest management scenario.

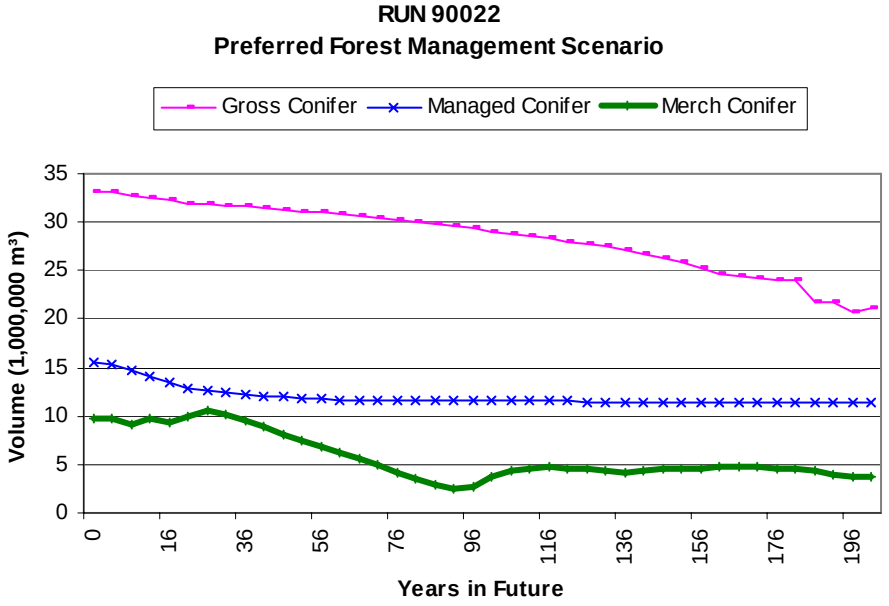


Figure 4-9: Conifer growing stock from the preferred forest management scenario.

Merchantable growing stock results are provided for selected non-spatial scenarios in Figure 4-10. The non-spatial scenarios RUN901- RUN904 were selected because they show the impact of including ending growing stock constraints. The unconstrained Woodstock scenario (RUN901) had a relatively stable growing stock near the end of the planning horizon that met the requirements of the Planning Standard. The addition of the non-declining growing stock constraint in RUN903 did not change the result. Two other growing stock constraints were tested (RUN902 and RUN904), but the results did not meet the

objectives of the desired future forest. Therefore the non-declining ending growing stock constraint was used in all subsequent non-spatial TSA scenarios.

In the spatial TSA scenarios, growing stock was controlled by a minimum goal of merchantable conifer growing stock throughout the planning horizon. Merchantable growing stock results are provided for selected spatial scenarios in Figure 4-11. The preferred forest management scenario (RUN90022) is shown with the following scenarios:

- two scenarios which represent the extremes in growing stock (RUN90006 and RUN90021A), and
- the scenario with the lowest harvest level (RUN71001), however the ending growing stock result was quite similar to the preferred forest management scenario.

Ending growing stock is related to the harvest level, but there are many factors that affect how much growing stock there will be in 200 years. RUN90006 had the overall highest harvest level, and consequently the lowest growing stock. The ending growing stock in this scenario still meets the Planning Standard requirement of stable over the last quarter of the planning horizon. RUN71002 had the lowest harvest level, but the growing stock over the last 40 years was quite similar to the preferred forest management scenario. This is due to the sequence of stands that were selected for harvest during the early part of the planning horizon. RUN90021A had a similar harvest level to the preferred forest management scenario, however it had the highest growing stock. This was again the result of the access schedule and the sequence of stands selected for harvest in the early years.

Table 4-32 and Table 4-33 provide conifer growing stock results from non-spatial and spatial TSA scenarios, respectively. Merchantable, managed and total conifer growing stock at the end of the planning horizon are shown as well the minimum merchantable and average merchantable over the last 50 years of the planning horizon. There was a wide range of growing stock levels in the Round 9 spatial TSA scenarios, from an average of 2.93 million m^3 to 5.81 million m^3, which is approximately a 100% increase. Although these tables provide a means of monitoring the growing stock levels, and assessing the relative differences between scenarios, it is the stability of growing stock over the last quarter of the planning horizon that is critical to the acceptance of the recommended scenario.

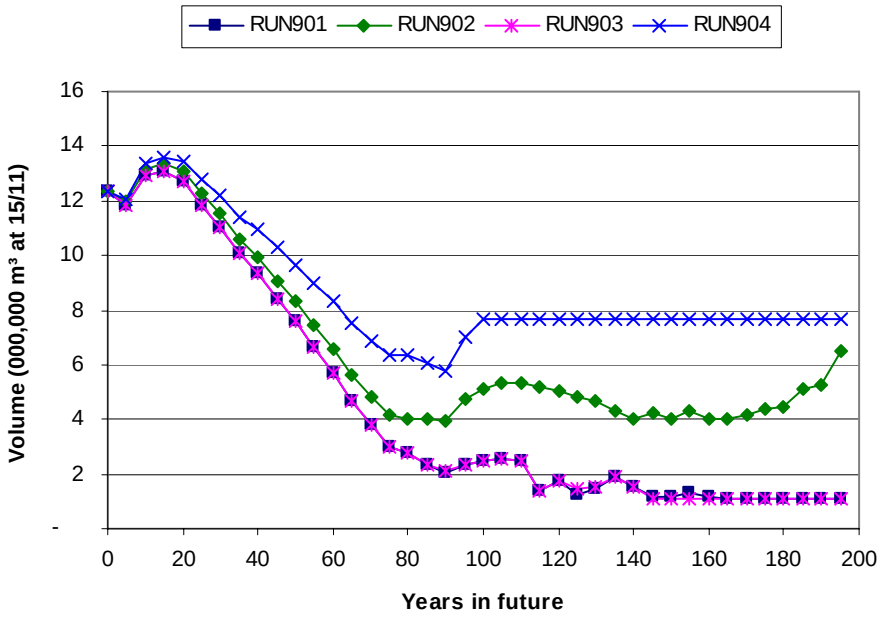


Figure 4-10: Merchantable conifer growing stock for selected non-spatial TSA scenarios.

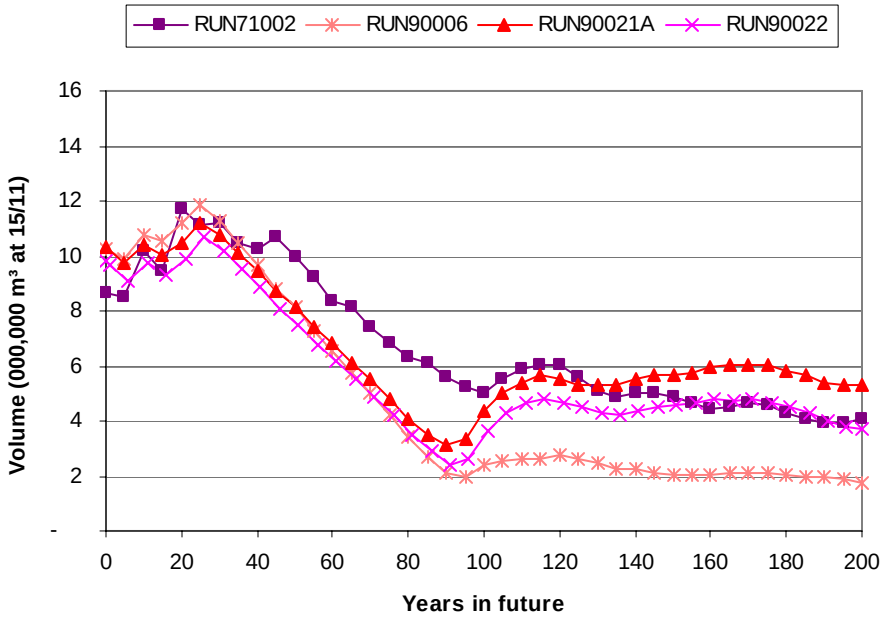


Figure 4-11: Merchantable conifer growing stock for selected spatial TSA scenarios.

Table 4-32: Non-spatial TSA scenario conifer growing stock results.

Conifer Growing Stock (000,000 m³ at 15/11)						
		Merchantable			Managed Landbase	Forested Landbase
TSA Scenario		Minimum	Ending	Average of Last 50 Years	Ending	Ending
RUN21	Round 2 unconstrained	1.02	1.02	1.04	11.97	22.48
RUN22	Decrease min harvest ages by 10 yrs	1.09	1.09	1.09	10.50	21.01
RUN23	Decrease C-Fd yields by 5%	1.02	1.02	1.03	11.90	22.35
RUN24	Decrease C-Fd yields by 10%	1.01	1.01	1.03	11.82	22.21
RUN25	Decrease min harvest ages for C-Sx	1.04	1.04	1.04	11.88	22.39
RUN32	Add Lost Creek Fire blocks	1.04	1.04	1.04	12.13	22.64
RUN41	Remove inaccessible stands	1.04	1.04	1.04	12.10	22.63
RUN51	Remove isolated stands	1.04	1.04	1.04	12.09	22.63
RUN81	Ecological indicators by subregion	4.74	4.74	5.10	11.96	22.60
RUN82	Ecological indicators by covertype	4.67	4.67	4.86	11.83	22.47
RUN83	Ecological indicators by subregion and covertype	4.91	4.99	5.14	12.00	22.64
RUN901	Round 9 unconstrained	1.13	1.13	1.16	8.84	19.23
RUN902	Ending gs >= avg	3.92	6.47	4.62	12.07	22.46
RUN903	ND gs last 50 yrs	1.13	1.13	1.13	8.84	19.23
RUN904	+- 10% variance in gs	5.80	7.64	7.64	13.33	23.71
RUN905	Include all treatments	1.11	1.11	1.11	9.17	19.56
RUN906	Remove pond buffers	1.09	1.10	1.10	9.18	19.57
RUN907	Future blocks to CD density	1.17	1.17	1.17	9.33	19.71
RUN908	Decrease min harvest ages by LMU	1.08	1.08	1.08	10.01	20.39
RUN909A	All historic and future blocks to CD density	1.17	1.17	1.17	9.17	18.16
RUN909B	All pre-91 historic blocks forested	1.16	1.16	1.16	9.13	19.52
RUN910	Force ecological indicators	5.20	5.20	5.20	11.59	21.97
RUN911	Force harvest of "E" MPB stands	3.93	3.93	3.93	12.13	22.52
RUN912	Defer harvest of non-pine stands	2.67	2.67	2.67	11.49	21.88
RUN913A	Maximize evenflow harvest	3.04	3.04	3.04	11.71	22.10
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	2.95	2.95	2.95	11.74	22.12
RUN914	Stepdown harvest in 20 years	1.48	4.46	4.46	13.35	23.74
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	1.48	4.48	4.48	13.35	23.73
RUN916	Stepdown harvest in 30 years	1.47	4.39	4.39	13.33	23.72
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	1.49	4.42	4.42	13.32	23.71
RUN918	Stepdown harvest in 40 years	1.47	4.31	4.31	13.30	23.68
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	1.48	4.33	4.33	13.31	23.70

Table 4-33: Spatial TSA scenario conifer growing stock results.

Conifer Growing Stock (000,000 m³ at 15/11)						
		Merchantable			Managed Landbase	Forested Landbase
TSA Scenario		Minimum	Ending	Avg Last 50 Years	Ending	Ending
RUN21001	Round 2 baseline	1.35	1.35	2.15	11.88	22.17
RUN21002	Level 1 late seral	2.69	2.90	2.93	11.27	21.56
RUN21003	Level 2 late seral	1.87	1.91	2.27	11.30	21.59
RUN21004	Regen patches	6.91	6.91	9.36	12.94	23.23
RUN21006	Regen seral stage	1.70	1.84	1.90	11.32	21.62
RUN21007	Modified regen patches	2.12	2.12	2.58	11.71	22.01
RUN21008	Reduced regen patch weighting	1.78	1.84	2.14	11.39	21.69
RUN21009	No greenup and adjacency	1.40	1.50	1.60	10.98	21.28
RUN31002	Lost Creek fire blocks	1.77	1.77	2.34	12.23	22.52
RUN41001	Remove inaccessible stands	1.41	1.43	1.84	11.87	22.17
RUN41002	Inaccessible stands and ecological indicators	1.66	1.77	1.91	11.15	21.46
RUN51001	Remove isolated stands	1.09	1.14	1.46	11.77	22.10
RUN51002	Isolated stands and ecological indicators	1.57	1.63	1.85	11.04	21.37
RUN61001	SHS Version 1	2.04	2.19	2.27	11.95	22.34
RUN61003	SHS Version 2	1.99	2.23	2.37	12.18	22.57
RUN71001	Round 7 baseline	2.52	2.56	2.70	12.20	22.30
RUN71002	Force ecological indicators	3.91	3.93	4.39	12.70	22.80
RUN71003	Eco sensitivity #1	3.40	3.44	3.88	12.31	22.41
RUN71004	Eco sensitivity #2	2.87	2.93	3.23	12.11	22.21
RUN71005	Eco sensitivity #3	2.67	2.75	2.99	12.07	22.17
RUN90001	Round 9 baseline	2.91	2.91	3.40	9.93	20.42
RUN90002	Include planned blocks	3.21	3.21	3.67	10.14	20.63
RUN90003	60% access schedule	3.12	3.12	3.59	10.07	20.56
RUN90004	40% access schedule	3.35	3.35	3.80	10.22	20.71
RUN90005	Force harvest of "E" MPB stands	3.40	3.40	3.84	10.23	20.71
RUN90006	Maximize harvest	1.87	1.87	2.02	9.41	19.90
RUN90010	Maintain current AAC with 97,000 carryover	2.59	2.74	2.94	10.23	20.72
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	3.80	3.91	4.29	10.88	21.37
RUN90012	Maintain current AAC	2.69	2.73	2.93	10.22	20.70
RUN90013	Stepdown harvest in 21 years	3.90	3.90	4.28	10.88	21.37
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	3.92	4.70	5.13	11.91	21.12
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	3.90	4.69	5.06	11.98	21.19
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	3.55	4.76	5.13	12.07	21.27
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	3.72	5.04	5.38	12.17	21.32
RUN90018	Reduce average harvest age	2.96	4.96	5.27	12.25	21.39
RUN90020	Maximize harvest in first 21 years	1.40	5.30	5.81	12.62	21.77
RUN90021	Modified compartment sequence	2.95	5.10	5.47	12.31	21.46
RUN90021A	SHS Version 3	3.10	5.32	5.78	12.51	21.61
RUN90022	Preferred Forest Management Scenario	2.40	3.78	4.47	11.33	21.10

4.8.7 Area of Pine

The area of pine in the managed landbase is a direct result of the area harvested of pine (see Section 4.8.2). Results from the preferred forest management scenario are presented in Figure 4-12 and Figure 4-13 for the area of mature and old pine and highly susceptible pine, respectively, on the managed landbase. The area of mature pine follows the same trend as merchantable growing stock; initially high due to the current age class of the forest, declining over time as harvesting removes the mature stands, and then recovery as second rotation of harvesting begins. The decline in area of mature pine towards the end of the planning horizon is due to the increase in area harvested of pine.

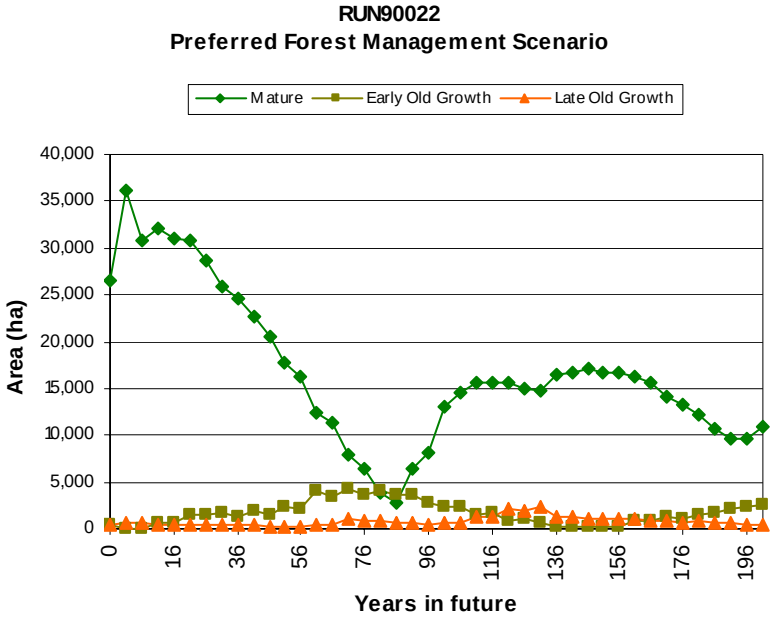


Figure 4-12: Area of pine by seral stage from the preferred forest management scenario.

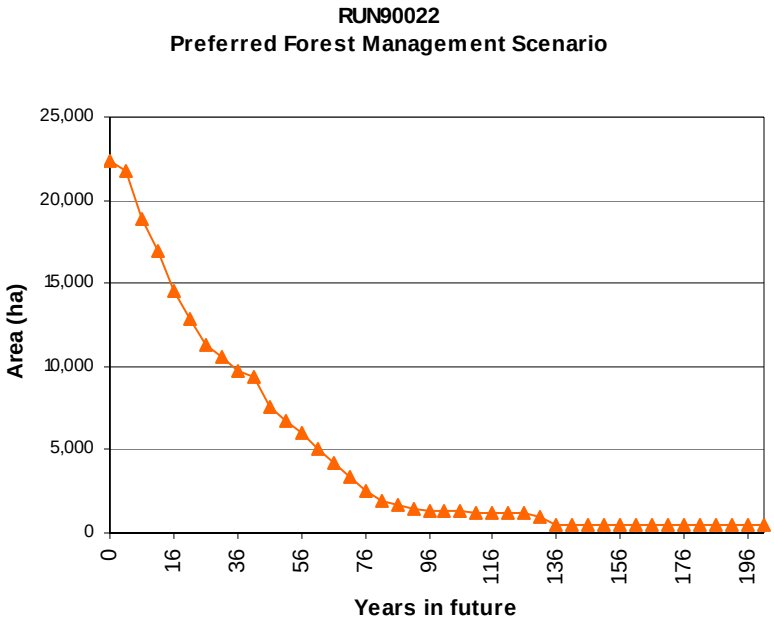


Figure 4-13: Area of highly susceptible pine from the preferred forest management scenario.

Table 4-34 and Table 4-35 provide the areas of pine in the late old growth and areas of highly susceptible pine on the managed landbase for non-spatial and spatial TSA scenarios, respectively. The areas in the current forest and at 20 and 50 years into the future are shown. For the preferred forest management scenario, 40% of the current area of highly susceptible stands was removed within the first 20 years, and another 15% over the next 30 years. It is not possible to harvest all the high and extreme hazard pine due to the other values and constraints applied in the TSA scenarios. There is also highly susceptible area on the unmanaged landbase that is not reported here.

Table 4-34: Non-spatial TSA scenario pine area results.

TSA Scenario		Late Seral Pine Area (ha) Years in Future			Area of Highly Susceptible Pine (ha) Years in Future		
		0	20	50	0	20	50
RUN21	Round 2 unconstrained	39,856	44,463	30,328			
RUN22	Decrease min harvest ages by 10 yrs	39,856	44,557	26,820			
RUN23	Decrease C-Fd yields by 5%	39,856	44,538	30,150			
RUN24	Decrease C-Fd yields by 10%	39,856	44,612	29,972			
RUN25	Decrease min harvest ages for C-Sx	39,856	46,181	31,502			
RUN32	Add Lost Creek Fire blocks	39,856	44,858	29,584			
RUN41	Remove inaccessible stands	39,758	44,766	29,520			
RUN51	Remove isolated stands	39,714	44,724	29,487			
RUN81	Ecological indicators by subregion	27,412	40,943	29,907			
RUN82	Ecological indicators by covertype	27,412	40,064	30,565			
RUN83	Ecological indicators by subregion and covertype	27,412	41,071	31,809			
RUN901	Round 9 unconstrained	27,777	41,027	22,880	22,661	21,911	17,570
RUN902	Ending gs >= avg	27,777	40,784	17,821	22,661	20,375	15,507
RUN903	ND gs last 50 yrs	27,777	41,025	22,883	22,661	21,884	18,600
RUN904	+- 10% variance in gs	27,777	41,461	31,265	22,661	21,429	20,626
RUN905	Include all treatments	27,777	41,728	24,470	22,661	19,804	11,032
RUN906	Remove pond buffers	27,777	41,886	24,948	22,661	19,889	12,011
RUN907	Future blocks to CD density	27,777	41,215	21,283	22,661	22,310	17,368
RUN908	Decrease min harvest ages by LMU	27,777	43,486	26,844	22,661	22,266	18,424
RUN909A	All historic and future blocks to CD density	27,777	42,091	21,462	22,661	21,982	17,879
RUN909B	All pre-91 historic blocks forested	27,777	41,940	21,667	22,661	21,960	18,214
RUN910	Force ecological indicators	27,777	41,647	28,399	22,661	18,096	10,502
RUN911	Force harvest of "E" MPB stands	27,777	41,578	30,230	22,661	15,757	9,981
RUN912	Defer harvest of non-pine stands	27,777	41,400	26,225	22,661	15,035	8,959
RUN913A	Maximize evenflow harvest	27,777	44,541	31,026	22,661	19,558	14,224
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	27,777	42,908	29,920	22,661	14,540	11,235
RUN914	Stepdown harvest in 20 years	27,777	40,409	24,827	22,661	18,964	10,651
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	27,777	31,641	22,988	22,661	5,940	5,687
RUN916	Stepdown harvest in 30 years	27,777	40,240	24,661	22,661	19,129	11,082
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	27,777	40,390	21,553	22,661	17,075	2,592
RUN918	Stepdown harvest in 40 years	27,777	39,617	24,453	22,661	19,143	10,173
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	27,777	39,186	20,678	22,661	18,647	1,032

Table 4-35: Spatial TSA scenario pine area results.

TSA Scenario		Pine Area in Late Seral Stages (ha) Years in Future			Area of Highly Susceptible Pine (ha)[1] Years in Future		
		0	20[2]	50[3]	0	20[2]	50[3]
RUN21001	Round 2 baseline	39,818	42,242	28,307			
RUN21002	Level 1 late seral	39,818	41,936	29,936			
RUN21003	Level 2 late seral	39,818	42,235	29,018			
RUN21004	Regen patches	39,818	49,181	46,537			
RUN21006	Regen seral stage	39,818	42,290	27,377			
RUN21007	Modified regen patches	39,818	42,877	29,166			
RUN21008	Reduced regen patch weighting	39,818	42,331	28,358			
RUN21009	No greenup and adjacency	39,818	40,303	25,677			
RUN31002	Lost Creek fire blocks	39,818	40,737	27,692			
RUN41001	Remove inaccessible stands	39,818	41,602	27,188			
RUN41002	Inaccessible stands and ecological indicators	39,720	39,918	25,532			
RUN51001	Remove isolated stands	39,677	41,185	26,613			
RUN51002	Isolated stands and ecological indicators	39,677	38,893	24,880			
RUN61001	SHS Version 1	39,678	40,661	27,323			
RUN61003	SHS Version 2	39,678	41,469	28,006			
RUN71001	Round 7 baseline	38,346	43,403	29,078			
RUN71002	Force ecological indicators	38,346	45,066	32,059			
RUN71003	Eco sensitivity #1	38,346	43,584	29,874			
RUN71004	Eco sensitivity #2	38,346	43,056	28,853			
RUN71005	Eco sensitivity #3	38,346	42,945	28,592			
RUN90001	Round 9 baseline	27,302	39,460	27,012	8,622	7,401	5,512
RUN90002	Include planned blocks	27,302	40,315	27,150	8,622	7,582	5,627
RUN90003	60% access schedule	27,302	39,943	26,992	8,622	7,416	5,305
RUN90004	40% access schedule	27,302	40,627	27,044	8,622	7,497	5,438
RUN90005	Force harvest of "E" MPB stands	27,302	37,681	24,763	8,622	667	667
RUN90006	Maximize harvest	27,302	38,861	25,802	8,622	7,246	5,344
RUN90010	Maintain current AAC with 97,000 carryover	27,302	40,401	26,007	8,622	7,470	5,402
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	27,302	40,123	27,416	8,622	7,249	5,459
RUN90012	Maintain current AAC	27,302	40,632	26,251	8,622	7,480	5,457
RUN90013	Stepdown harvest in 21 years	27,302	40,451	27,726	8,622	7,292	5,462
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	27,231	39,863	27,286	22,326	16,580	10,964
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	27,231	33,922	21,413	22,326	6,309	312
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	27,231	30,486	20,862	22,326	903	193
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	27,231	31,751	21,156	22,326	3,909	285
RUN90018	Reduce average harvest age	27,231	31,349	19,970	22,326	7,134	2,781
RUN90020	Maximize harvest in first 21 years	27,231	28,513	18,266	22,326	9,752	5,554
RUN90021	Modified compartment sequence	27,231	34,856	20,293	22,326	10,641	1,390
RUN90021A	SHS Version 3	27,507	32,464	19,210	22,326	10,422	1,901
RUN90022	Preferred Forest Management Scenario	27,350	32,917	20,312	22,326	12,905	6,738

[1] Highly susceptible pine included only extreme mountain pine beetle hazard class for RUN90001-RUN90013.
Highly susceptible pine included both high and extreme mountain pine beetle hazard class for RUN90014-RUN90022.

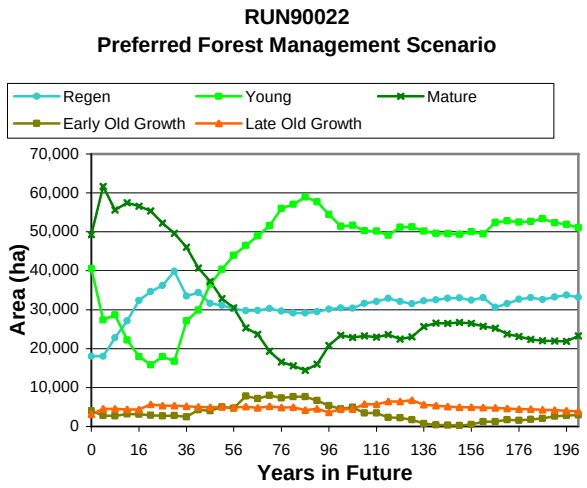
[2] 20 is 20 years in future for TSA Scenarios RUN21001 to RUN71005, and 21 years in future for TSA Scenarios RUN90001 to RUN90022.

[2] 50 is 50 years in future for TSA Scenarios RUN21001 to RUN71005, and 51 years in future for TSA Scenarios RUN90001 to RUN90022.

4.8.8 Seral Stage

Area by seral stage from the preferred forest management scenario is provided in Figure 4-14 for the both the managed and total forested landbases. The decline in early and late old growth area near the end of the planning horizon on the total forested landbase was a result of the stand break up and successional assumptions built into the TSA models.

Managed Landbase



Total Forested Landbase

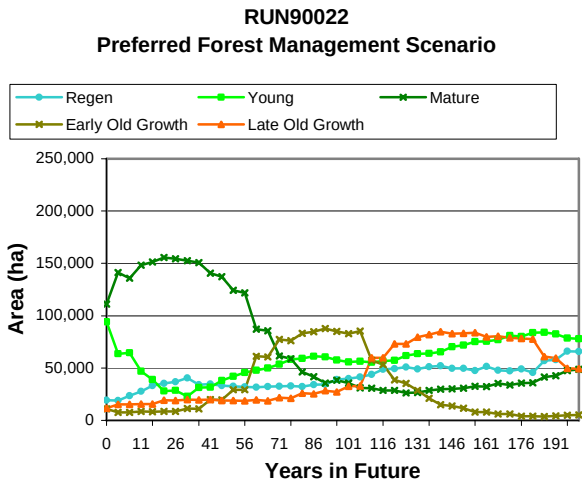


Figure 4-14: Area by seral stage from the preferred forest management scenario.

The area in hectares by seral stage at several points of time in the future from the preferred forest management scenario are provided in Table 4-36and Table 4-37 for the managed and total forested landbases respectively.

Table 4-36: Managed landbase area by seral stage from the preferred forest management scenario for selected periods.

Seral Stage	Managed Landbase Area (ha)[1] Years in Future					
	0	11	21	51	101	200
Regen	17,310	27,150	34,794	31,138	30,552	33,114
Young	40,417	22,014	15,499	40,273	51,428	50,979
Mature	49,277	57,443	55,330	32,799	23,838	23,619
Early OG	4,031	3,201	2,899	5,010	4,238	3,017
Late OG	3,150	4,369	5,655	4,958	4,121	3,449
Total	114,184	114,177	114,177	114,177	114,177	114,177

[1] Slight differences in total area are due to rounding in the TSA modelling tools.

Table 4-37: Gross landbase area by seral stage from the preferred forest management scenario for selected periods.

Seral Stage	Forested Landbase Area (ha)[1]					
	Years in Future					
	0	11	21	51	101	200
Regen	20,130	28,735	36,123	32,647	40,092	65,770
Young	93,963	46,719	28,161	42,823	55,730	77,703
Mature	111,113	148,267	155,583	124,196	37,024	49,165
Early OG	10,832	8,416	8,616	29,235	82,553	6,173
Late OG	11,658	15,524	19,177	18,760	32,262	48,850
Total	247,695	247,661	247,661	247,661	247,661	247,661

[1] Slight differences in total area are due to rounding in the TSA modelling tools.

Figure 4-15 presents the area by seral stage and C5 subregion from the preferred forest management scenario for both the managed and total forested landbases. Late seral goals were set in the TSA scenario by C5 subregion to ensure that seral stages were represented across the geographic range of the C5 FMU.

Table 4-38 and Table 4-39 provide the area in hectares by seral stage and C5 subregion for the managed and total forested landbases, respectively for selected periods from the preferred forest management scenario.

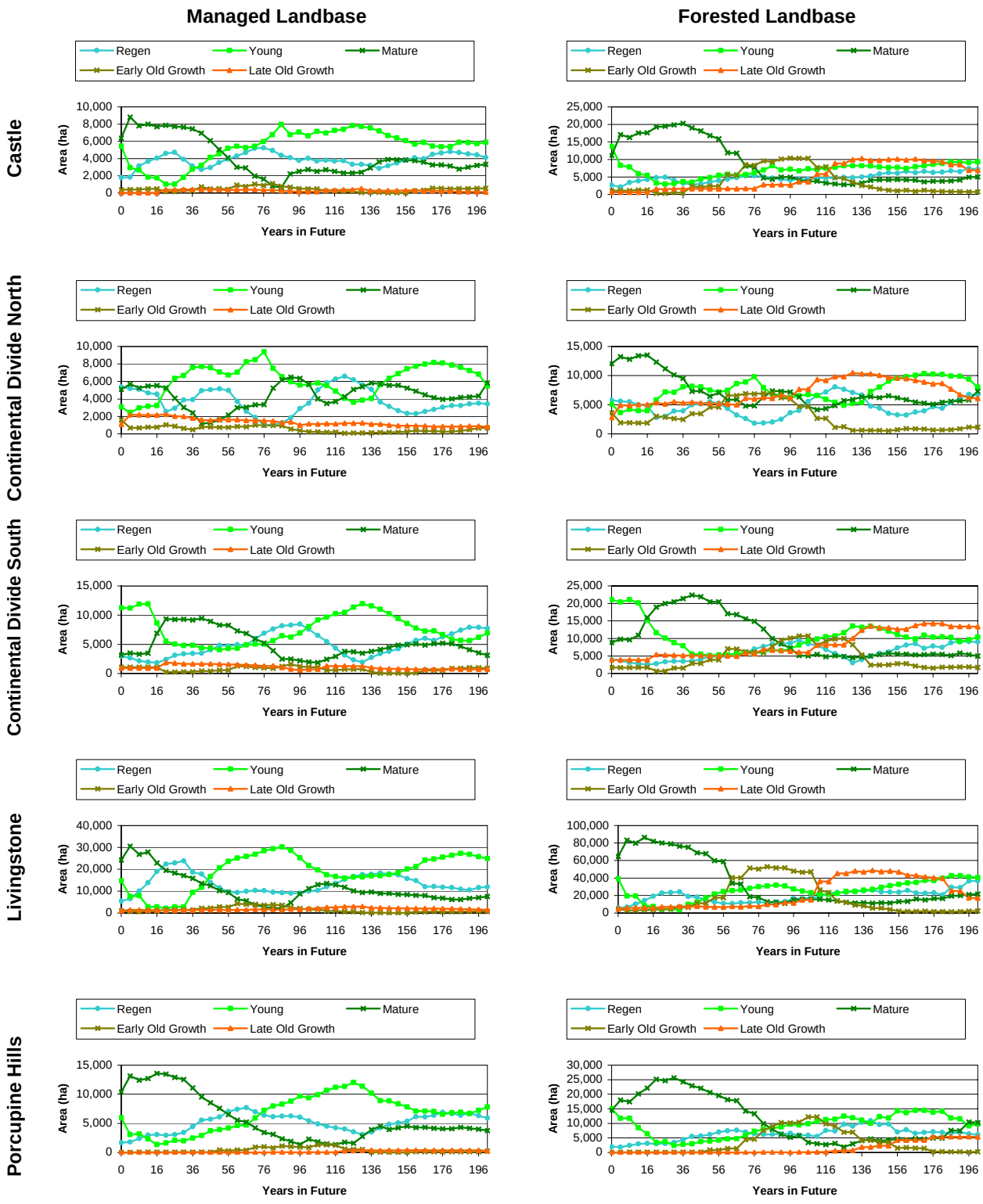


Figure 4-15: Area by seral stage and C5 subregion from the preferred forest management scenario.

Table 4-38: Managed landbase area by seral stage and C5 subregion from the preferred forest management scenario for selected periods.

C5 Subregion	Seral Stage	Managed Landbase Area (ha)[1] Years in Future					
		0	11	21	51	101	200
Castle	Regen	1,780	3,668	4,590	3,532	4,017	4,146
	Young	5,447	1,848	1,023	4,556	6,646	5,898
	Mature	6,386	7,992	7,871	5,047	2,721	3,324
	Early OG	389	492	159	505	476	548
	Late OG	29	29	387	390	171	114
	Total	14,031	14,030	14,030	14,030	14,030	14,030
Continental Divide North	Regen	5,377	4,679	2,541	5,171	3,523	3,419
	Young	3,077	3,153	5,163	7,064	5,640	5,476
	Mature	5,100	5,472	5,270	1,597	5,683	5,813
	Early OG	1,587	762	1,033	745	243	695
	Late OG	1,091	2,165	2,226	1,656	1,141	828
	Total	16,232	16,231	16,231	16,231	16,231	16,231
Continental Divide South	Regen	2,996	1,965	2,401	4,821	7,585	7,751
	Young	11,236	11,928	5,512	4,077	8,033	6,925
	Mature	3,139	3,477	9,347	8,317	1,938	3,108
	Early OG	1,060	1,060	229	564	1,077	859
	Late OG	928	928	1,870	1,580	726	716
	Total	19,360	19,359	19,359	19,359	19,359	19,359
Livingstone	Regen	5,472	13,862	22,324	11,504	10,001	11,879
	Young	14,714	2,752	2,179	20,673	21,732	24,841
	Mature	24,261	27,822	19,415	10,262	11,223	7,606
	Early OG	994	856	1,449	2,767	1,545	688
	Late OG	1,101	1,247	1,173	1,333	2,038	1,526
	Total	46,542	46,539	46,539	46,539	46,539	46,539
Porcupine Hills	Regen	1,685	2,976	2,938	6,110	5,427	5,918
	Young	5,943	2,333	1,623	3,904	9,377	7,839
	Mature	10,391	12,680	13,428	7,576	2,273	3,768
	Early OG	-	30	30	428	897	228
	Late OG	-	-	-	-	45	265
	Total	18,019	18,019	18,019	18,019	18,019	18,019

[1] Slight differences in total area are due to rounding in the TSA modelling tools.

Table 4-39: Gross landbase area by seral stage and C5 subregion from the preferred forest management scenario for selected periods.

C5 Subregion	Seral Stage	Forested Landbase Area (ha)[1]					
		Years in Future					
		0	11	21	51	101	200
Castle	Regen	2,627	3,859	4,755	3,563	4,424	7,206
	Young	13,707	5,916	3,249	4,813	6,739	9,299
	Mature	11,183	17,557	19,262	16,804	4,089	4,999
	Early OG	1,067	1,248	351	2,393	10,311	757
	Late OG	574	574	1,537	1,581	3,590	6,892
	Total	29,157	29,153	29,153	29,153	29,153	29,153
Continental Divide North	Regen	5,801	5,010	2,782	5,491	4,035	6,717
	Young	5,068	3,998	5,822	7,505	6,555	8,018
	Mature	12,050	13,385	12,343	6,473	6,357	7,312
	Early OG	3,619	1,894	3,050	4,589	4,707	1,166
	Late OG	2,792	5,040	5,330	5,270	7,674	6,114
	Total	29,331	29,328	29,328	29,328	29,328	29,328
Continental Divide South	Regen	4,009	2,760	2,810	4,863	9,487	8,981
	Young	21,084	20,174	11,607	5,142	8,145	10,367
	Mature	8,814	10,935	18,918	20,460	5,112	4,975
	Early OG	1,703	1,726	687	3,891	10,673	1,717
	Late OG	3,832	3,841	5,414	5,080	6,020	13,397
	Total	39,442	39,437	39,437	39,437	39,437	39,437
Livingstone	Regen	5,708	14,120	22,834	12,621	16,255	36,806
	Young	39,089	8,180	4,045	21,431	24,906	40,309
	Mature	64,520	86,322	79,938	59,872	15,713	21,670
	Early OG	4,429	3,495	4,476	17,449	46,454	2,265
	Late OG	4,460	6,070	6,895	6,815	14,859	17,138
	Total	118,205	118,188	118,188	118,188	118,188	118,188
Porcupine Hills	Regen	1,984	2,986	2,943	6,110	5,891	6,059
	Young	15,013	8,450	3,438	3,931	9,386	9,709
	Mature	14,546	20,067	25,122	20,587	5,752	10,210
	Early OG	14	52	52	912	10,408	268
	Late OG	-	-	-	14	118	5,309
	Total	31,558	31,555	31,555	31,555	31,555	31,555

[1] Slight differences in total area are due to rounding in the TSA modelling tools.

Figure 4-16 shows the area by seral stage for each cover type in the managed and total forested landbases respectively from the preferred forest management scenario. Area in seral stages by cover type was not a goal in the TSA modeling tool for the preferred forest management scenario, however these results are provided to show that old growth was comprised of many cover types.

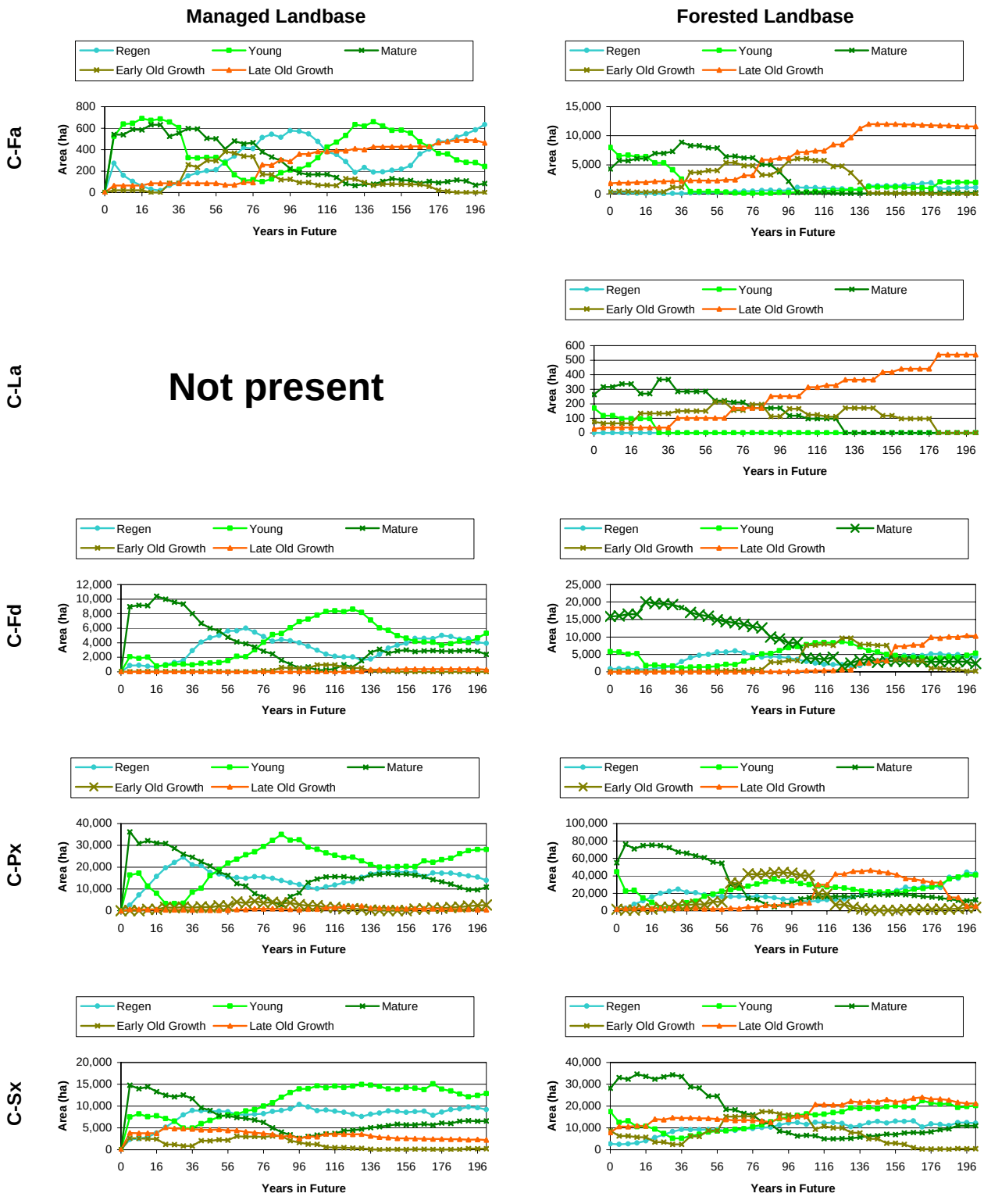


Figure 4-16: Area by seral stage and cover type from the preferred forest management scenario.

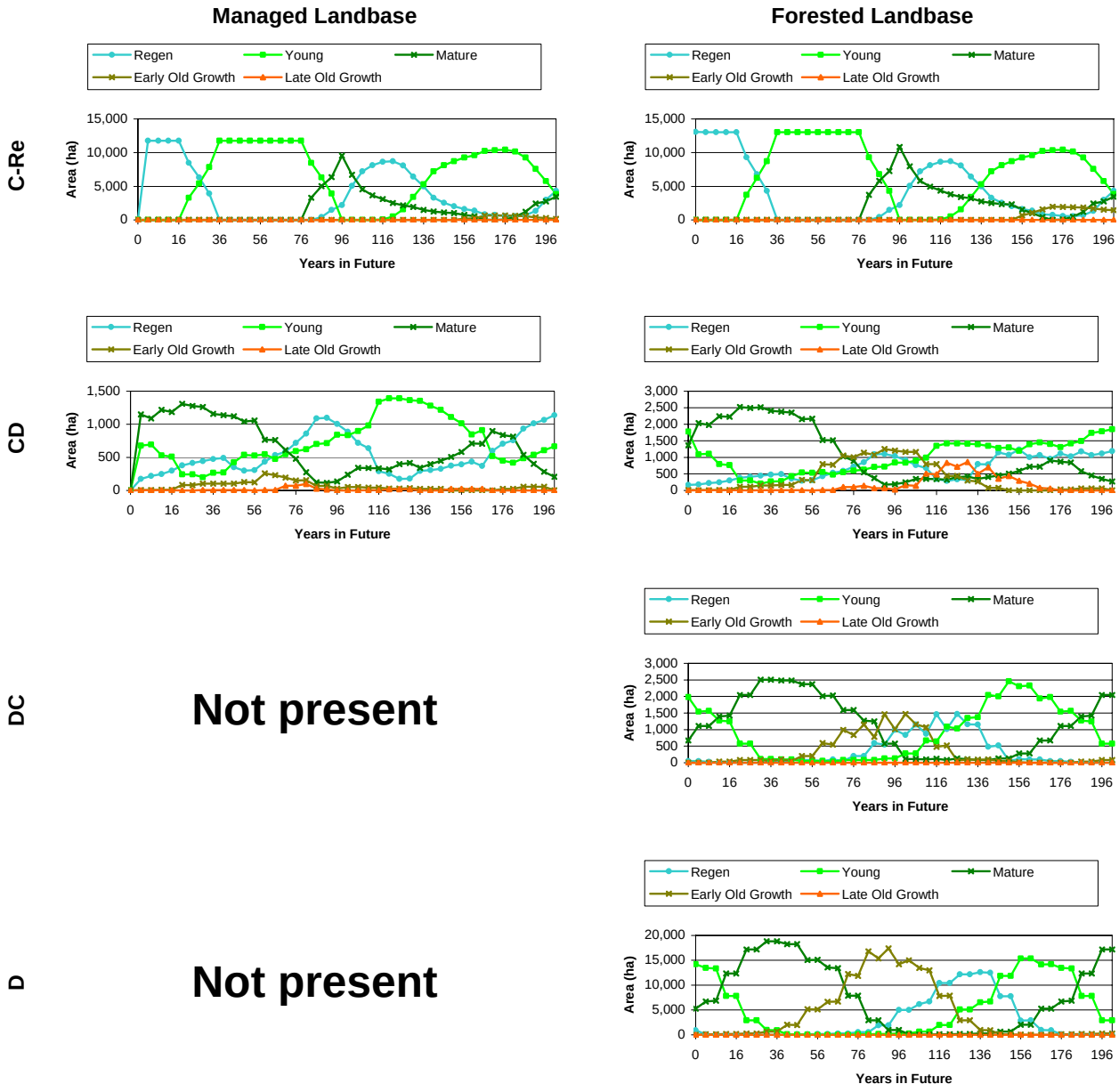


Figure 4-16: Area by seral stage and cover type from the preferred forest management scenario. (continued)

4.8.9 Late Seral

Timber harvesting was the only activity in the TSA models that could alter the amount of old forest in the future, and this activity was limited to the managed landbase. Goals were set in the preferred forest management scenario to ensure minimum amounts of old forest were present on the managed landbase at the end of the planning horizon.

Table 4-40 and Table 4-41 provide results for area of late old growth (L) seral stage on the managed landbase from non-spatial and spatial TSA scenarios, respectively. Five results are presented:

- The minimum area in the late old growth seral stage. This is the area in the period that had the smallest amount of area in the late old growth seral stage.
- The area of late old growth at the end of the planning horizon.
- The average area in the late old growth seral stage over the last;
    - 100 years;
    - 50 years; and
    - 20 years of the planning horizon.

Table 4-42 and Table 4-43 provide similar results for early old growth and late old growth (EL) seral stages for non-spatial and spatial TSA scenarios, respectively and Table 4-44 and Table 4-45 for the mature, early old growth and late old growth (MEL) seral stages for non-spatial and spatial TSA scenarios, respectively.

Although the area of late old growth at the end of the planning horizon was the primary calculation used to assess late seral areas, the change in area over the planning horizon was also important. It was desirable to have a relatively stable amount of area in the late seral areas throughout the last portion of the planning horizon, which was an indicator of sustainability. This was especially true if the area in the periods close to the end of the planning horizon were quite low, and the model artificially increased the areas at the very end, which was not considered sustainable.

These tables show that adding late seral goals was necessary to ensure there was area of old forest on the managed landbase at the end of the planning horizon (compare RUN910 to RUN903 and RUN21001 to RUN21002).

Due to the nested approached of the late seral goals, the model may increase the area of late old growth so that it contributed to two goals, thereby minimizing the additional area of early old growth required. This happened in some scenarios (*e.g.* in RUN71005, 90% of the early+late old growth (EL) area is also late old growth (L) area), however this was contrary to the intent of the nested target. The preferred forest management scenario had a more even distribution of area in the late seral, which was desirable.

Table 4-40: Non-spatial TSA scenario late old growth (L) area results.

TSA Scenario		Minimum L Area (ha)	Ending L Area (ha)	Average L Area (ha)		
				Last 100 years	Last 50 years	Last 20 years
RUN21	Round 2 unconstrained	0	0	0	0	0
RUN22	Decrease min harvest ages by 10 yrs	0	0	0	0	0
RUN23	Decrease C-Fd yields by 5%	0	0	0	0	0
RUN24	Decrease C-Fd yields by 10%	0	0	0	0	0
RUN25	Decrease min harvest ages for C-Sx	0	0	0	0	0
RUN32	Add Lost Creek Fire blocks	0	0	0	0	0
RUN41	Remove inaccessible stands	0	0	0	0	0
RUN51	Remove isolated stands	0	0	0	0	0
RUN81	Ecological indicators by subregion	3,324	15,943	13,514	12,450	13,589
RUN82	Ecological indicators by covertype	3,107	12,388	12,076	11,200	12,603
RUN83	Ecological indicators by subregion and covertype	1,868	13,468	12,775	12,217	13,381
RUN901	Round 9 unconstrained	0	7	90	119	105
RUN902	Ending gs >= avg	7	7	171	171	105
RUN903	ND gs last 50 yrs	0	7	90	119	105
RUN904	+- 10% variance in gs	7	7	566	775	188
RUN905	Include all treatments	0	7	145	219	105
RUN906	Remove pond buffers	76	528	954	1,041	1,053
RUN907	Future blocks to CD density	0	7	90	119	105
RUN908	Decrease min harvest ages by LMU	0	7	90	119	105
RUN909A	All historic and future blocks to CD density	0	7	90	119	105
RUN909B	All pre-91 historic blocks forested	0	7	90	119	105
RUN910	Force ecological indicators	3,327	15,458	13,593	12,621	13,814
RUN911	Force harvest of "E" MPB stands	3,327	14,917	13,370	12,487	13,575
RUN912	Defer harvest of non-pine stands	3,327	12,857	12,874	12,562	13,302
RUN913A	Maximize evenflow harvest	49	6,059	5,417	4,843	5,792
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	54	5,989	5,469	4,936	5,836
RUN914	Stepdown harvest in 20 years	183	2,000	3,644	4,435	4,215
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	265	2,045	3,686	4,467	4,232
RUN916	Stepdown harvest in 30 years	183	2,000	3,640	4,435	4,208
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	183	2,000	3,659	4,481	4,234
RUN918	Stepdown harvest in 40 years	183	2,000	3,675	4,431	4,237
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	183	2,261	3,759	4,431	4,305

Table 4-41: Spatial TSA scenario late old growth (L) area results.

TSA Scenario		Minimum L Area (ha)	Ending L Area (ha)	Average L Area (ha)		
				Last 100 years	Last 50 years	Last 20 years
RUN21001	Round 2 baseline	409	409	1,883	2,517	2,161
RUN21002	Level 1 late seral	4,220	9,655	10,598	10,295	11,241
RUN21003	Level 2 late seral	4,169	5,843	7,094	7,271	7,580
RUN21004	Regen patches	4,793	21,465	29,040	29,414	32,960
RUN21006	Regen seral stage	4,251	8,590	8,296	7,999	8,575
RUN21007	Modified regen patches	3,537	4,766	5,946	6,174	6,387
RUN21008	Reduced regen patch weighting	3,757	5,912	6,667	6,751	7,106
RUN21009	No greenup and adjacency	4,718	9,642	8,858	8,480	9,097
RUN31002	Lost Creek fire blocks	325	325	1,741	2,293	1,997
RUN41001	Remove inaccessible stands	311	311	1,107	1,367	1,233
RUN41002	Inaccessible stands and ecological indicators	4,875	8,169	8,506	8,489	8,906
RUN51001	Remove isolated stands	141	141	612	791	641
RUN51002	Isolated stands and ecological indicators	4,892	8,413	8,726	8,772	9,152
RUN61001	SHS Version 1	4,851	11,356	11,001	10,719	11,388
RUN61003	SHS Version 2	4,765	7,306	7,740	7,701	8,062
RUN71001	Round 7 baseline	4,828	10,089	9,788	9,544	10,058
RUN71002	Force ecological indicators	4,870	15,098	12,824	12,057	12,840
RUN71003	Eco sensitivity #1	4,870	16,414	13,079	11,805	12,951
RUN71004	Eco sensitivity #2	4,870	14,615	12,464	11,434	12,578
RUN71005	Eco sensitivity #3	4,841	13,484	11,983	11,212	12,162
RUN90001	Round 9 baseline	3,544	9,486	9,054	8,435	9,449
RUN90002	Include planned blocks	3,860	9,340	8,995	8,394	9,424
RUN90003	60% access schedule	3,981	9,745	9,481	8,975	9,883
RUN90004	40% access schedule	4,062	9,990	9,542	8,912	9,969
RUN90005	Force harvest of "E" MPB stands	3,895	10,802	10,088	9,476	10,426
RUN90006	Maximize harvest	206	1,104	1,109	966	1,253
RUN90010	Maintain current AAC with 97,000 carryover	1,314	1,316	1,637	1,795	1,655
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	3,290	4,373	5,523	5,805	5,961
RUN90012	Maintain current AAC	1,341	1,342	1,709	1,857	1,735
RUN90013	Stepdown harvest in 21 years	3,324	4,347	5,536	5,870	5,962
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	2,823	3,289	4,507	4,850	4,936
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	2,042	3,176	3,960	4,204	4,313
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	1,630	2,172	2,873	3,183	3,119
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	1,985	2,079	3,070	3,512	3,373
RUN90018	Reduce average harvest age	1,551	1,748	2,713	3,208	2,769
RUN90020	Maximize harvest in first 21 years	137	209	355	467	373
RUN90021	Modified compartment sequence	1,364	1,572	1,907	1,924	2,005
RUN90021A	SHS Version 3	1,133	1,133	1,719	2,000	1,823
RUN90022	Preferred Forest Management Scenario	3,299	3,449	4,621	5,261	4,767

Table 4-42: Non-spatial TSA scenario early+late old growth (EL) area results.

TSA Scenario		Minimum EL Area (ha)	Ending EL Area (ha)	Average EL Area (ha)		
				Last 100 years	Last 50 years	Last 20 years
RUN21	Round 2 unconstrained	0	0	0	0	0
RUN22	Decrease min harvest ages by 10 yrs	0	0	0	0	0
RUN23	Decrease C-Fd yields by 5%	0	0	0	0	0
RUN24	Decrease C-Fd yields by 10%	0	0	0	0	0
RUN25	Decrease min harvest ages for C-Sx	0	0	0	0	0
RUN32	Add Lost Creek Fire blocks	0	0	0	0	0
RUN41	Remove inaccessible stands	0	0	0	0	0
RUN51	Remove isolated stands	0	0	0	0	0
RUN81	Ecological indicators by subregion	6,341	20,041	19,557	19,941	20,634
RUN82	Ecological indicators by covertype	3,720	18,068	17,410	17,472	17,908
RUN83	Ecological indicators by subregion and covertype	4,092	17,808	18,527	18,180	18,232
RUN901	Round 9 unconstrained	0	7	111	66	12
RUN902	Ending gs >= avg	7	7	232	66	12
RUN903	ND gs last 50 yrs	0	7	111	66	12
RUN904	+- 10% variance in gs	7	7	1,011	66	12
RUN905	Include all treatments	78	207	632	238	212
RUN906	Remove pond buffers	252	801	1,819	1,265	932
RUN907	Future blocks to CD density	7	7	113	66	12
RUN908	Decrease min harvest ages by LMU	0	7	146	66	12
RUN909A	All historic and future blocks to CD density	0	8	111	67	13
RUN909B	All pre-91 historic blocks forested	0	8	111	67	13
RUN910	Force ecological indicators	6,385	20,972	19,830	20,190	21,171
RUN911	Force harvest of "E" MPB stands	6,466	18,829	19,325	19,158	19,033
RUN912	Defer harvest of non-pine stands	6,151	15,996	17,474	16,639	16,389
RUN913A	Maximize evenflow harvest	116	11,142	7,651	8,284	9,496
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	410	11,020	7,689	8,359	9,292
RUN914	Stepdown harvest in 20 years	1,452	7,084	7,005	7,008	7,021
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	1,459	7,000	7,000	7,000	7,000
RUN916	Stepdown harvest in 30 years	1,452	7,010	7,001	7,001	7,003
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	1,452	7,000	7,009	7,017	7,042
RUN918	Stepdown harvest in 40 years	1,452	7,000	7,003	7,000	7,000
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	1,452	7,000	7,003	7,005	7,014

Table 4-43: Spatial TSA scenario early+late old growth (EL) area results.

TSA Scenario		Minimum EL Area (ha)	Ending EL Area (ha)	Average EL Area (ha)		
				Last 100 years	Last 50 years	Last 20 years
RUN21001	Round 2 baseline	608	634	2,943	1,938	676
RUN21002	Level 1 late seral	6,694	10,998	14,162	13,377	12,159
RUN21003	Level 2 late seral	6,615	6,619	9,301	8,361	7,028
RUN21004	Regen patches	7,677	25,541	43,073	41,522	30,143
RUN21006	Regen seral stage	7,672	8,621	9,787	9,138	8,917
RUN21007	Modified regen patches	5,237	5,237	7,930	6,924	5,529
RUN21008	Reduced regen patch weighting	6,545	6,630	8,846	7,997	6,871
RUN21009	No greenup and adjacency	7,756	9,811	10,575	10,119	9,959
RUN31002	Lost Creek fire blocks	1,864	2,609	3,421	3,222	2,483
RUN41001	Remove inaccessible stands	1,616	2,579	2,527	2,796	2,366
RUN41002	Inaccessible stands and ecological indicators	7,866	10,421	10,696	10,468	10,583
RUN51001	Remove isolated stands	1,038	2,360	1,691	1,956	2,112
RUN51002	Isolated stands and ecological indicators	7,849	10,667	10,929	10,672	10,752
RUN61001	SHS Version 1	7,837	11,980	13,068	12,238	12,140
RUN61003	SHS Version 2	7,807	7,945	10,010	8,956	8,454
RUN71001	Round 7 baseline	7,807	11,195	12,090	11,371	11,414
RUN71002	Force ecological indicators	7,810	18,520	18,838	18,601	18,579
RUN71003	Eco sensitivity #1	7,810	18,205	18,306	18,303	18,342
RUN71004	Eco sensitivity #2	7,810	16,124	16,575	16,225	16,274
RUN71005	Eco sensitivity #3	7,810	14,898	15,563	15,034	15,068
RUN90001	Round 9 baseline	6,602	12,883	12,879	12,973	13,081
RUN90002	Include planned blocks	7,188	13,028	12,955	13,033	13,088
RUN90003	60% access schedule	7,188	13,452	13,280	13,306	13,469
RUN90004	40% access schedule	7,188	13,637	13,571	13,663	13,712
RUN90005	Force harvest of "E" MPB stands	7,188	15,206	14,437	14,758	15,310
RUN90006	Maximize harvest	2,171	3,002	2,741	2,881	2,888
RUN90010	Maintain current AAC with 97,000 carryover	2,252	4,163	3,550	3,695	4,082
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	7,188	9,936	9,761	9,901	9,922
RUN90012	Maintain current AAC	2,375	4,194	3,675	3,770	4,124
RUN90013	Stepdown harvest in 21 years	7,188	9,807	9,780	9,805	9,787
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	6,704	9,185	8,754	9,249	9,335
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	6,468	7,372	7,986	7,816	7,635
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	4,990	8,722	7,328	8,157	8,635
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	5,018	7,512	7,119	7,450	7,641
RUN90018	Reduce average harvest age	3,807	5,620	5,771	5,650	5,605
RUN90020	Maximize harvest in first 21 years	812	5,004	2,399	3,656	4,582
RUN90021	Modified compartment sequence	3,207	6,931	5,053	5,877	6,656
RUN90021A	SHS Version 3	3,121	7,363	4,978	5,407	6,689
RUN90022	Preferred Forest Management Scenario	4,769	6,466	6,584	6,094	6,499

Table 4-44: Non-spatial TSA scenario mature+old growth (MEL) area results.

TSA Scenario		Minimum MEL Area (ha)	Ending MEL Area (ha)	Average MEL Area (ha)		
				Last 100 years	Last 50 years	Last 20 years
RUN21	Round 2 unconstrained	19,354	21,571	24,603	23,563	23,312
RUN22	Decrease min harvest ages by 10 yrs	8,518	14,296	15,845	13,078	10,972
RUN23	Decrease C-Fd yields by 5%	19,387	21,567	24,605	23,500	23,245
RUN24	Decrease C-Fd yields by 10%	19,391	21,515	24,607	23,436	23,209
RUN25	Decrease min harvest ages for C-Sx	18,068	20,490	23,536	22,717	21,884
RUN32	Add Lost Creek Fire blocks	19,495	22,287	25,263	24,028	23,673
RUN41	Remove inaccessible stands	19,447	22,255	25,220	23,986	23,636
RUN51	Remove isolated stands	19,418	22,231	25,184	23,955	23,610
RUN81	Ecological indicators by subregion	39,902	42,518	40,601	40,195	40,633
RUN82	Ecological indicators by covertype	36,128	36,930	37,238	36,968	37,375
RUN83	Ecological indicators by subregion and covertype	36,280	38,285	38,570	37,791	37,919
RUN901	Round 9 unconstrained	7	7	4,960	1,146	81
RUN902	Ending gs >= avg	15,110	33,454	21,669	22,919	27,139
RUN903	ND gs last 50 yrs	7	7	4,979	1,191	81
RUN904	+- 10% variance in gs	29,962	32,443	36,038	34,332	31,875
RUN905	Include all treatments	1,870	1,870	7,041	3,413	2,510
RUN906	Remove pond buffers	2,441	2,441	8,180	4,377	3,181
RUN907	Future blocks to CD density	7	7	4,568	1,163	379
RUN908	Decrease min harvest ages by LMU	2,668	4,199	10,475	7,887	5,871
RUN909A	All historic and future blocks to CD density	8	8	4,995	1,054	94
RUN909B	All pre-91 historic blocks forested	8	8	4,984	1,076	93
RUN910	Force ecological indicators	40,079	40,079	41,257	40,294	40,079
RUN911	Force harvest of "E" MPB stands	40,079	42,619	41,670	40,783	40,755
RUN912	Defer harvest of non-pine stands	31,541	34,642	35,777	33,752	34,047
RUN913A	Maximize evenflow harvest	30,671	35,000	35,000	35,000	35,000
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	30,775	35,000	35,000	35,000	35,000
RUN914	Stepdown harvest in 20 years	21,528	36,221	39,969	38,349	36,677
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	21,504	38,048	39,894	38,255	36,998
RUN916	Stepdown harvest in 30 years	21,526	38,376	39,218	38,414	37,336
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	21,490	35,679	38,987	37,920	36,362
RUN918	Stepdown harvest in 40 years	21,528	39,012	38,349	38,222	37,132
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	21,401	38,793	38,187	37,652	37,067

Table 4-45: Spatial TSA scenario mature+old growth (MEL) area results.

TSA Scenario		Minimum MEL Area (ha)	Ending MEL Area (ha)	Average MEL Area (ha)		
				Last 100 years	Last 50 years	Last 20 years
RUN21001	Round 2 baseline	28,870	29,543	30,052	29,727	29,597
RUN21002	Level 1 late seral	34,019	34,019	38,105	37,129	35,787
RUN21003	Level 2 late seral	30,945	30,945	33,222	32,694	31,934
RUN21004	Regen patches	56,239	56,658	66,585	63,270	58,595
RUN21006	Regen seral stage	29,779	29,779	31,491	31,452	30,487
RUN21007	Modified regen patches	30,876	30,876	34,123	33,684	32,113
RUN21008	Reduced regen patch weighting	29,992	29,992	32,770	32,220	30,953
RUN21009	No greenup and adjacency	28,866	28,866	30,377	30,148	29,863
RUN31002	Lost Creek fire blocks	29,212	30,457	31,526	30,913	30,559
RUN41001	Remove inaccessible stands	26,771	27,719	29,074	28,757	28,215
RUN41002	Inaccessible stands and ecological indicators	29,745	29,745	31,563	31,031	30,563
RUN51001	Remove isolated stands	25,243	25,927	27,271	26,983	26,615
RUN51002	Isolated stands and ecological indicators	28,911	28,911	31,193	30,500	30,052
RUN61001	SHS Version 1	33,783	34,035	35,075	34,920	34,983
RUN61003	SHS Version 2	30,999	31,151	33,006	32,445	32,375
RUN71001	Round 7 baseline	35,140	36,272	35,864	36,063	36,487
RUN71002	Force ecological indicators	41,493	42,264	43,395	42,502	42,674
RUN71003	Eco sensitivity #1	40,517	41,862	42,153	41,620	42,104
RUN71004	Eco sensitivity #2	38,371	39,331	39,632	39,340	39,758
RUN71005	Eco sensitivity #3	37,267	38,295	38,430	38,214	38,704
RUN90001	Round 9 baseline	27,828	28,727	30,811	29,271	28,320
RUN90002	Include planned blocks	28,963	29,440	31,831	30,447	29,277
RUN90003	60% access schedule	29,108	29,941	31,917	30,564	29,561
RUN90004	40% access schedule	29,845	30,256	32,606	31,268	30,233
RUN90005	Force harvest of "E" MPB stands	31,496	32,081	33,353	32,125	31,718
RUN90006	Maximize harvest	13,318	13,318	17,857	16,178	14,062
RUN90010	Maintain current AAC with 97,000 carryover	22,207	22,781	23,584	22,896	22,485
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	29,752	30,434	32,057	31,092	30,050
RUN90012	Maintain current AAC	22,137	22,721	23,552	22,842	22,424
RUN90013	Stepdown harvest in 21 years	29,738	30,472	32,012	31,016	30,014
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	32,697	33,936	36,466	35,827	34,912
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	32,533	33,710	35,101	34,171	33,589
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	30,035	34,013	34,519	33,834	33,316
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	31,056	35,228	35,905	35,001	34,815
RUN90018	Reduce average harvest age	27,279	32,923	34,744	33,578	32,956
RUN90020	Maximize harvest in first 21 years	17,934	36,601	35,382	36,217	35,649
RUN90021	Modified compartment sequence	26,865	34,566	35,273	34,935	34,022
RUN90021A	SHS Version 3	27,389	35,604	35,521	35,297	34,870
RUN90022	Preferred Forest Management Scenario	25,428	30,085	30,827	29,863	28,992

4.8.10 Regen Seral Stage

Results for areas in the regen seral stage are presented in Table 4-46 and Table 4-47 from non-spatial and spatial TSA scenarios, respectively. The evenflow harvest management assumption had the effect of smoothing out the areas in the early seral stages through the planning horizon, therefore the differences between the maximum and average areas for the first and second half of the planning horizons are not extreme. The differences are even less in the spatial TSA scenarios.

Table 4-46: Non-spatial TSA scenario regen seral stage results.

TSA Scenario		Maximum Area in Regen (ha)	Average Area in Regen (ha)	
			Years 1-100	Years 101-200
RUN21	Round 2 unconstrained	38,251	30,304	33,465
RUN22	Decrease min harvest ages by 10 yrs	40,722	32,089	37,416
RUN23	Decrease C-Fd yields by 5%	38,527	30,330	33,459
RUN24	Decrease C-Fd yields by 10%	38,831	30,355	33,456
RUN25	Decrease min harvest ages for C-Sx	39,725	30,782	33,871
RUN32	Add Lost Creek Fire blocks	39,084	31,404	34,073
RUN41	Remove inaccessible stands	39,005	31,346	34,005
RUN51	Remove isolated stands	38,955	31,307	33,964
RUN81	Ecological indicators by subregion	32,171	26,193	29,518
RUN82	Ecological indicators by covertype	33,890	27,330	30,735
RUN83	Ecological indicators by subregion and covertype	32,055	26,901	30,405
RUN901	Round 9 unconstrained	51,894	37,004	46,349
RUN902	Ending gs >= avg	45,221	32,782	35,164
RUN903	ND gs last 50 yrs	51,579	36,988	46,363
RUN904	+- 10% variance in gs	41,761	30,141	31,790
RUN905	Include all treatments	49,941	36,340	45,172
RUN906	Remove pond buffers	49,568	35,935	44,803
RUN907	Future blocks to CD density	51,278	38,215	46,059
RUN908	Decrease min harvest ages by LMU	44,506	35,254	41,329
RUN909A	All historic and future blocks to CD density	51,391	38,562	47,612
RUN909B	All pre-91 historic blocks forested	51,593	38,467	47,647
RUN910	Force ecological indicators	32,284	26,474	30,747
RUN911	Force harvest of "E" MPB stands	32,547	26,098	29,442
RUN912	Defer harvest of non-pine stands	36,213	27,737	31,673
RUN913A	Maximize evenflow harvest	37,176	30,410	31,890
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	36,959	30,402	31,925
RUN914	Stepdown harvest in 20 years	51,074	33,393	29,961
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	49,444	33,387	29,937
RUN916	Stepdown harvest in 30 years	51,379	33,378	30,049
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	50,680	33,345	29,825
RUN918	Stepdown harvest in 40 years	49,895	33,400	30,092
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	49,433	33,273	29,895

Table 4-47: Spatial TSA scenario regen seral stage results.

TSA Scenario		Maximum Area in Regen (ha)	Average Area in Regen (ha)	
			Years 1-100[1]	Years 101-200[2]
RUN21001	Round 2 baseline	32,741	28,647	31,719
RUN21002	Level 1 late seral	32,541	25,901	29,751
RUN21003	Level 2 late seral	32,984	27,443	31,230
RUN21004	Regen patches	34,932	14,543	20,255
RUN21006	Regen seral stage	32,360	27,734	31,272
RUN21007	Modified regen patches	32,294	27,570	30,329
RUN21008	Reduced regen patch weighting	32,829	27,681	31,350
RUN21009	No greenup and adjacency	34,532	27,718	32,747
RUN31002	Lost Creek fire blocks	36,745	29,860	32,330
RUN41001	Remove inaccessible stands	37,050	30,428	33,771
RUN41002	Inaccessible stands and ecological indicators	35,419	28,774	32,927
RUN51001	Remove isolated stands	37,370	30,740	34,678
RUN51002	Isolated stands and ecological indicators	36,622	28,778	33,613
RUN61001	SHS Version 1	34,400	27,485	31,669
RUN61003	SHS Version 2	34,568	28,154	32,766
RUN71001	Round 7 baseline	34,959	27,649	32,067
RUN71002	Force ecological indicators	32,296	24,884	29,300
RUN71003	Eco sensitivity #1	33,101	25,357	29,759
RUN71004	Eco sensitivity #2	34,001	26,338	30,787
RUN71005	Eco sensitivity #3	34,244	26,723	31,198
RUN90001	Round 9 baseline	40,714	31,569	37,796
RUN90002	Include planned blocks	40,319	31,035	36,976
RUN90003	60% access schedule	40,628	31,150	37,314
RUN90004	40% access schedule	39,906	30,757	36,643
RUN90005	Force harvest of "E" MPB stands	40,055	30,949	36,629
RUN90006	Maximize harvest	46,784	35,437	44,050
RUN90010	Maintain current AAC with 97,000 carryover	42,879	33,485	40,571
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	38,847	31,271	36,621
RUN90012	Maintain current AAC	42,907	33,273	40,584
RUN90013	Stepdown harvest in 21 years	38,943	31,081	36,681
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	37,048	28,314	31,306
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	35,746	28,409	31,558
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	37,972	29,107	31,614
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	37,708	28,711	31,585
RUN90018	Reduce average harvest age	42,495	29,982	32,178
RUN90020	Maximize harvest in first 21 years	50,508	33,816	31,198
RUN90021	Modified compartment sequence	41,251	30,513	31,767
RUN90021A	SHS Version 3	41,190	30,948	31,942
RUN90022	Preferred Forest Management Scenario	38,456	29,864	32,323

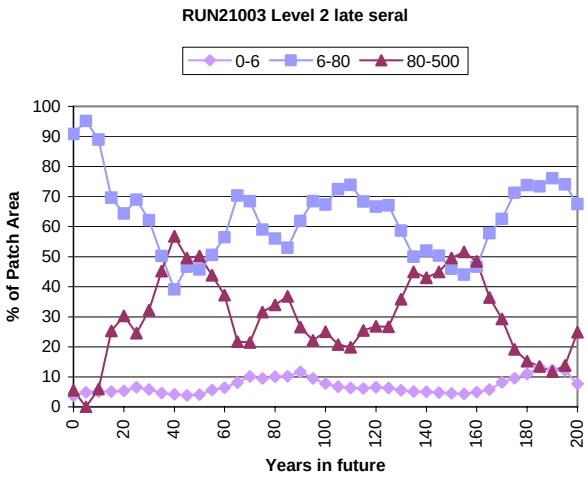
[1] Years 1-100 is years 1-100 for TSA Scenarios RUN21001 to RUN71005, and years 1-101 for TSA Scenarios RUN90001 to RUN90022.

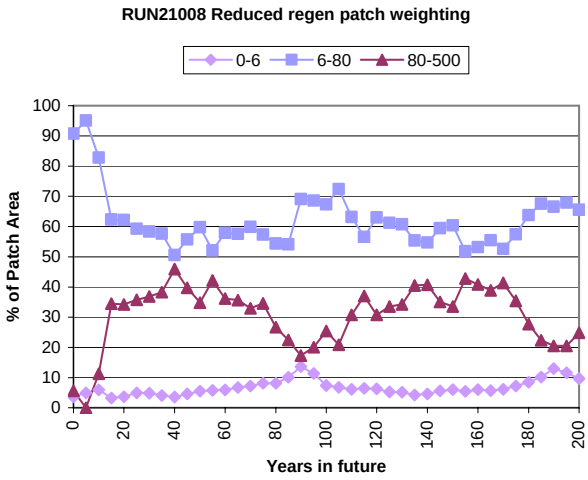
[2] Years 101-200 is years 101-200 for TSA Scenarios RUN21001 to RUN71005, and years 102-200 for TSA Scenarios RUN90001 to RUN90022.

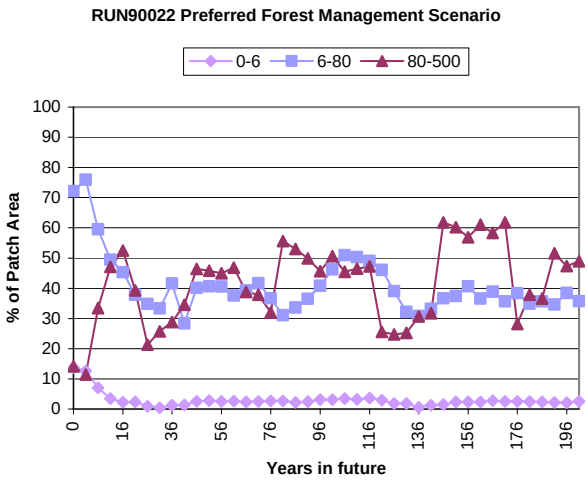
4.8.11 Regen Patch Size

Regen patch goals results are presented in Figure 4-17 for the Porcupine Hills and the four western-most C5 subregions for selected scenarios. The graphs present the proportion of the area in the regen seral stage within each patch size class that had a goal in the TSA scenarios. The fluctuations in the regen patch size distribution in the preferred forest management scenario are larger than the Round 2 scenarios, especially in the Porcupine Hills, which was a result of the restrictive access schedule used in the preferred forest management scenario.

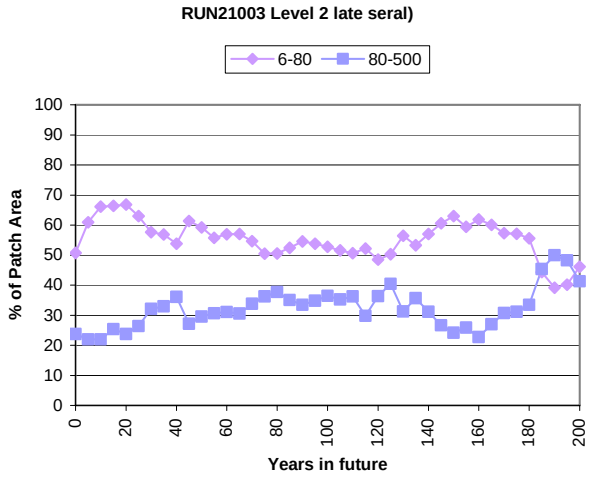
Porcupine Hills subregion

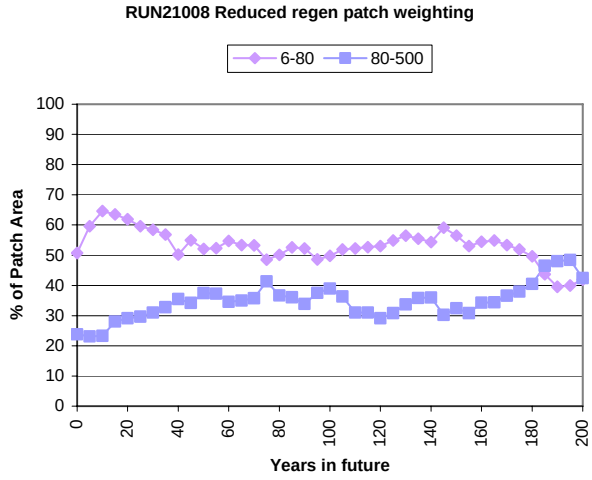






Other C5 subregions





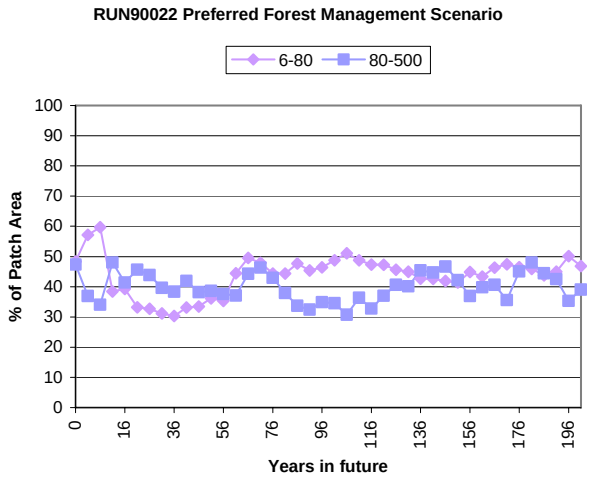


Figure 4-17: Regen patch sizes on the managed landbase for selected scenarios.

4.8.12 Interior Old Forest Patches

Interior old forest patches were assessed from three scenarios for 0, 11, 51 and 101 years into the future and results are presented only for the TSA scenario RUN90021A. The interior old forest analysis required additional processing, which was completed on a TSA scenario prior to the development of the preferred forest management scenario due to time constraints. RUN90021A was close to the preferred forest management scenario, and the differences from the PFMS were minor and won't affect the results of the interior old forest analysis. Several types of results are provided, including tables and maps. Maps showing the location of interior old forest at each time period are provided in Addendum IV.

In order to assess the amount of interior old forest, it is necessary to know the amount of all the old forest. Table 4-48 provides the area of old forest by cover type and selected years in the future for both the managed and total forested landbases. Table 4-49 provides similar results by C5 subregion. There is an increase in the area of old forest on the managed landbase in the first 50 years, with a slight decline in the second quarter of the planning horizon, however the composition of the old forest by cover type is quite different. As expected, the area of old forest on the forested landbase increases dramatically over the first 100 years. The maximum ages in this forest were quite high, which allowed stands to contribute to old forest for a long time.

Table 4-48: Old forest area from the preferred forest management scenario for selected periods.

Cover Type	Managed Landbase Area (ha)				Forested Landbase Area (ha)			
	Years in Future				Years in Future			
	0	11	51	101	0	11	51	101
C-Fa	86	86	384	452	2,189	2,323	6,324	13,244
C-La	-	-	-	-	103	103	253	419
C-Fd	-	30	30	489	14	44	154	3,381
C-Px	727	1,167	2,524	3,053	3,492	4,598	12,405	49,362
C-Sx	6,356	6,269	6,896	4,312	16,667	16,661	23,191	30,595
C-Re	-	-	-	-	-	-	-	-
CD	11	18	135	53	17	30	323	1,323
DC	-	-	-	-	-	31	197	1,470
D	-	-	-	-	8	152	5,148	15,020
Total	7,181	7,570	9,968	8,359	22,489	23,940	47,994	114,815

Table 4-49: Old forest area by C5 subregion from the preferred forest management scenario for selected periods.

C5 Subregion	Cover Type	Managed Landbase Area (ha) Years in Future				Forested Landbase Area (ha) Years in Future			
		0	11	51	101	0	11	51	101
Castle	C-Fa	3	3	47	40	518	518	1,709	3,800
	C-La	-	-	-	-	22	22	22	46
	C-Fd	-	-	-	-	-	-	8	128
	C-Px	22	22	278	378	22	22	597	4,180
	C-Sx	388	491	564	228	1,071	1,251	1,362	3,284
	C-Re	-	-	-	-	-	-	-	-
	CD	6	6	6	-	6	6	10	103
	DC	-	-	-	-	-	-	31	225
	D	-	-	-	-	-	1	234	2,133
	Total	418	521	895	646	1,640	1,822	3,974	13,900
Continental Divide North	C-Fa	25	25	127	156	371	503	1,395	2,172
	C-La	-	-	-	-	27	27	111	163
	C-Fd	-	-	-	-	-	-	-	-
	C-Px	166	298	198	237	571	771	1,565	3,210
	C-Sx	2,487	2,604	2,075	992	5,442	5,633	6,775	6,816
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	-	-	-	-	-	16
	DC	-	-	-	-	-	-	1	-
	D	-	-	-	-	-	-	12	4
	Total	2,679	2,928	2,401	1,385	6,411	6,934	9,859	12,381
Continental Divide South	C-Fa	59	59	145	167	1,179	1,181	2,812	6,491
	C-La	-	-	-	-	12	12	12	41
	C-Fd	-	-	-	-	-	-	1	1
	C-Px	6	6	187	647	34	34	1,069	4,822
	C-Sx	1,924	1,924	1,789	985	4,310	4,328	4,843	4,908
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	22	4	-	-	40	146
	DC	-	-	-	-	-	-	20	57
	D	-	-	-	-	-	12	174	227
	Total	1,988	1,988	2,144	1,802	5,535	5,567	8,971	16,693
Livingstone	C-Fa	-	-	65	89	121	121	407	780
	C-La	-	-	-	-	42	42	107	169
	C-Fd	-	-	-	7	-	-	101	1,021
	C-Px	533	841	1,631	1,484	2,865	3,770	8,944	36,709
	C-Sx	1,558	1,250	2,313	1,955	5,843	5,449	10,025	15,373
	C-Re	-	-	-	-	-	-	-	-
	CD	5	12	91	48	10	23	218	906
	DC	-	-	-	-	-	31	144	964
	D	-	-	-	-	8	130	4,318	5,390
	Total	2,095	2,103	4,100	3,584	8,889	9,565	24,264	61,313
Porcupine Hills	C-Fa	-	-	-	-	-	-	-	-
	C-La	-	-	-	-	-	-	-	-
	C-Fd	-	30	30	481	14	44	44	2,231
	C-Px	-	-	229	307	-	-	230	440
	C-Sx	-	-	155	153	-	-	187	214
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	15	-	-	-	55	152
	DC	-	-	-	-	-	-	-	224
	D	-	-	-	-	-	9	410	7,265
	Total	-	30	428	942	14	52	926	10,527

Table 4-50 presents interior old areas for selected time periods and Table 4-51 presents the percent area of the old forest that was considered interior. Table 4-52 and Table 4-53 provide similar results by C5 subregion.

There were very small changes over 100 years in the proportion of interior old forest on the total forested landbase, even though the amount of old forest increases substantially. This may be a result of the large amount of undisturbed and protected forest areas.

Table 4-50: Area in interior old forest patches from the preferred forest management scenario for selected periods.

Cover Type	Managed Landbase Interior Old Forest Area (ha)				Forested Landbase Interior Old Forest Area (ha)			
	Years in future				Years in future			
	0	11	51	101	0	11	51	101
C-Fa	52	53	268	271	1,035	1,113	3,388	6,421
C-La	-	-	-	-	62	62	127	191
C-Fd	-	29	29	300	9	39	119	1,876
C-Px	416	633	1,389	1,878	2,074	2,666	7,089	29,332
C-Sx	3,275	3,488	3,805	2,503	9,713	10,103	13,916	17,395
C-Re	-	-	-	-	-	-	-	-
CD	8	14	71	21	12	24	178	702
DC	-	-	-	-	-	8	74	678
D	-	-	-	-	0	54	2,510	7,482
Total	3,751	4,216	5,562	4,973	12,904	14,070	27,403	64,076

Table 4-51: Percent area in interior old forest patches from the preferred forest management scenario for selected periods.

Cover Type	Managed Landbase % Interior Old Forest Area[1]				Forested Landbase % Interior Old Forest Area[1]			
	Years in Future				Years in Future			
	0	11	51	101	0	11	51	101
C-Fa	60%	61%	70%	60%	47%	48%	54%	48%
C-La					60%	61%	50%	46%
C-Fd		97%	98%	61%	61%	89%	78%	55%
C-Px	57%	54%	55%	61%	59%	58%	57%	59%
C-Sx	52%	56%	55%	58%	58%	61%	60%	57%
C-Re								
CD	68%	77%	53%	41%	71%	81%	55%	53%
DC						25%	37%	46%
D					0%	35%	49%	50%
Total	52%	56%	56%	59%	57%	59%	57%	56%

[1] Percent areas have been calculated as the area of interior old forest patches divided by the area of old forest.

Table 4-52: Area in interior old forest patches by C5 subregion from the preferred forest management scenario for selected periods.

C5 Subregion	Cover Type	Managed Landbase Interior Old Forest Area (ha) Years in future				Forested Landbase Interior Old Forest Area (ha) Years in future			
		0	11	51	101	0	11	51	101
Castle	C-Fa	0	0	29	20	161	168	722	1,633
	C-La	-	-	-	-	15	15	15	25
	C-Fd	-	-	-	-	-	-	7	36
	C-Px	16	19	133	203	17	20	268	2,310
	C-Sx	295	387	414	136	727	869	911	1,685
	C-Re	-	-	-	-	-	-	-	-
	CD	5	6	4	-	5	6	4	53
	DC	-	-	-	-	-	-	17	86
	D	-	-	-	-	-	-	65	1,065
	Total	316	413	580	359	924	1,077	2,009	6,893
Continental Divide North	C-Fa	14	14	79	114	203	267	802	1,145
	C-La	-	-	-	-	17	18	55	90
	C-Fd	-	-	-	-	-	-	-	-
	C-Px	74	119	92	154	354	422	1,045	2,212
	C-Sx	971	1,201	910	635	2,798	3,149	4,068	4,834
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	-	-	-	-	-	9
	DC	-	-	-	-	-	-	-	-
	D	-	-	-	-	-	-	5	1
	Total	1,059	1,334	1,081	904	3,372	3,856	5,974	8,289
Continental Divide South	C-Fa	38	38	103	93	585	598	1,600	3,300
	C-La	-	-	-	-	7	7	7	23
	C-Fd	-	-	-	-	-	-	-	-
	C-Px	4	4	76	365	23	23	612	2,735
	C-Sx	1,207	1,275	1,208	546	2,854	2,977	3,455	2,703
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	10	1	-	-	16	47
	DC	-	-	-	-	-	-	5	17
	D	-	-	-	-	-	3	61	49
	Total	1,248	1,317	1,396	1,005	3,470	3,609	5,756	8,874
Livingstone	C-Fa	-	-	56	43	85	80	263	343
	C-La	-	-	-	-	23	23	51	54
	C-Fd	-	-	-	3	-	-	79	802
	C-Px	322	491	916	900	1,680	2,201	4,992	21,775
	C-Sx	802	625	1,159	1,098	3,333	3,109	5,364	8,081
	C-Re	-	-	-	-	-	-	-	-
	CD	3	8	46	21	7	17	116	524
	DC	-	-	-	-	-	8	52	480
	D	-	-	-	-	0	45	2,120	2,375
	Total	1,127	1,123	2,177	2,065	5,129	5,483	13,036	34,432
Porcupine Hills	C-Fa	-	-	-	-	-	-	-	-
	C-La	-	-	-	-	-	-	-	-
	C-Fd	-	29	29	297	9	39	33	1,038
	C-Px	-	-	173	255	-	-	173	300
	C-Sx	-	-	114	88	-	-	119	92
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	11	-	-	-	43	68
	DC	-	-	-	-	-	-	-	96
	D	-	-	-	-	-	5	261	3,993
	Total	-	29	327	640	9	44	628	5,587

Table 4-53: Percent area in interior old forest patches by C5 subregion from the preferred forest management scenario for selected periods.

C5 Subregion	Cover Type	Managed Landbase % Interior Old Forest Area[1] Years in Future				Forested Landbase % Interior Old Forest Area[1] Years in Future			
		0	11	51	101	0	11	51	101
Castle	C-Fa	7%	7%	63%	49%	31%	32%	42%	43%
	C-La					65%	65%	65%	53%
	C-Fd							92%	28%
	C-Px	75%	88%	48%	54%	74%	87%	45%	55%
	C-Sx	76%	79%	73%	59%	68%	69%	67%	51%
	C-Re								
	CD	72%	103%	64%		72%	103%	43%	52%
	DC							56%	38%
	D						0%	28%	50%
	Total	76%	79%	65%	55%	56%	59%	51%	50%
Continental Divide North	C-Fa	56%	56%	62%	73%	55%	53%	58%	53%
	C-La					63%	66%	49%	55%
	C-Fd								
	C-Px	45%	40%	47%	65%	62%	55%	67%	69%
	C-Sx	39%	46%	44%	64%	51%	56%	60%	71%
	C-Re								
	CD								55%
	DC							0%	
	D							39%	12%
	Total	40%	46%	45%	65%	53%	56%	61%	67%
Continental Divide South	C-Fa	64%	65%	71%	56%	50%	51%	57%	51%
	C-La					62%	62%	62%	56%
	C-Fd							0%	0%
	C-Px	64%	64%	40%	56%	68%	68%	57%	57%
	C-Sx	63%	66%	68%	55%	66%	69%	71%	55%
	C-Re								
	CD			43%	12%			40%	32%
	DC							24%	30%
	D						26%	35%	21%
	Total	63%	66%	65%	56%	63%	65%	64%	53%
Livingstone	C-Fa			87%	48%	71%	66%	65%	44%
	C-La					55%	55%	47%	32%
	C-Fd				44%			79%	78%
	C-Px	60%	58%	56%	61%	59%	58%	56%	59%
	C-Sx	51%	50%	50%	56%	57%	57%	54%	53%
	C-Re								
	CD	63%	63%	51%	43%	70%	75%	53%	58%
	DC						25%	36%	50%
	D					0%	35%	49%	44%
	Total	54%	53%	53%	58%	58%	57%	54%	56%
Porcupine Hills	C-Fa								
	C-La								
	C-Fd		97%	98%	62%	61%	89%	75%	47%
	C-Px			75%	83%			75%	68%
	C-Sx			73%	58%			64%	43%
	C-Re								
	CD			76%				77%	45%
	DC								43%
	D						62%	64%	55%
	Total		97%	76%	68%	61%	85%	68%	53%

[1] Percent areas have been calculated as the area of interior old forest patches divided by the area of old forest.

Table 4-54 presents the area of interior old forest in patches greater than or equal to 100 ha in size for the selected periods. Table 4-55 presents the percent area in these large old interior patches as a proportion of the amount of old forest. These results are also provided by C5 subregion in Table 4-56 and Table 4-57. The highest area and proportion of area in old and interior old forest was at year 101.

In 101 years, more of the interior old forest is in large patches over the first 100 years of the planning horizon than was present in the first 51 years.

Table 4-54: Area in interior old forest patches >= 100 hectares for selected periods.

Cover Type	Managed Landbase Interior Old Forest Patches >=100 ha Area (ha)				Forested Landbase Interior Old Forest Patches >=100 ha Area (ha)			
	Years in Future				Years in Future			
	0	11	51	101	0	11	51	101
C-Fa	9	12	157	159	439	481	1,587	3,704
C-La	-	-	-	-	39	51	101	96
C-Fd	-	-	-	66	-	-	-	721
C-Px	171	127	428	1,018	988	897	3,167	19,215
C-Sx	1,270	1,665	1,430	1,220	4,776	5,305	7,270	11,482
C-Re	-	-	-	-	-	-	-	-
CD	-	-	21	-	-	-	55	461
DC	-	-	-	-	-	-	44	362
D	-	-	-	-	-	-	569	3,585
Total	1,449	1,804	2,035	2,463	6,241	6,734	12,794	39,625

Table 4-55: Percent area in interior old forest patches >= 100 hectares for selected periods.

Cover Type	Managed Landbase % Area of Interior Old Forest Patches >=100 ha[1]				Forested Landbase % Area of Interior Old Forest Patches >=100 ha[1]			
	Years in Future				Years in Future			
	0	11	51	101	0	11	51	101
C-Fa	10%	13%	41%	35%	20%	21%	25%	28%
C-La					38%	50%	40%	23%
C-Fd		0%	0%	14%	0%	0%	0%	21%
C-Px	23%	11%	17%	33%	28%	20%	26%	39%
C-Sx	20%	27%	21%	28%	29%	32%	31%	38%
C-Re								
CD	0%	0%	15%	0%	0%	0%	17%	35%
DC						0%	23%	25%
D					0%	0%	11%	24%
Total	20%	24%	20%	29%	28%	28%	27%	35%

[1] Percent areas have been calculated as the area of interior old forest patches >= 100 ha divided by the area of old forest.

Table 4-56: Area by C5 subregion in interior old forest patches >= 100 hectares for selected periods.

C5 Subregion	Cover Type	Managed Landbase Interior Old Forest Patches >=100 ha Area (ha)				Forested Landbase Interior Old Forest Patches >=100 ha Area (ha)			
		Years in Future				Years in Future			
		0	11	51	101	0	11	51	101
Castle	C-Fa	-	-	-	13	23	37	49	830
	C-La	-	-	-	-	2	15	2	15
	C-Fd	-	-	-	-	-	-	-	6
	C-Px	-	-	-	-	-	-	-	986
	C-Sx	74	222	150	46	149	388	228	876
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	4	-	-	-	4	0
	DC	-	-	-	-	-	-	17	35
	D	-	-	-	-	-	-	3	358
	Total	74	222	154	59	175	440	303	3,107
Continental Divide North	C-Fa	8	11	52	83	138	156	598	840
	C-La	-	-	-	-	9	10	47	47
	C-Fd	-	-	-	-	-	-	-	-
	C-Px	16	16	18	88	166	168	780	1,845
	C-Sx	447	673	275	283	1,655	2,001	2,554	3,797
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	-	-	-	-	-	8
	DC	-	-	-	-	-	-	-	-
	D	-	-	-	-	-	-	-	-
	Total	471	701	345	454	1,968	2,334	3,979	6,538
Continental Divide South	C-Fa	0	1	49	52	197	208	734	1,834
	C-La	-	-	-	-	4	4	4	4
	C-Fd	-	-	-	-	-	-	-	-
	C-Px	-	-	-	190	17	17	165	1,751
	C-Sx	639	659	546	227	1,681	1,712	2,059	1,523
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	1	-	-	-	1	40
	DC	-	-	-	-	-	-	-	13
	D	-	-	-	-	-	-	-	3
	Total	639	659	596	469	1,899	1,941	2,963	5,168
Livingstone	C-Fa	-	-	56	11	81	80	206	200
	C-La	-	-	-	-	23	23	48	30
	C-Fd	-	-	-	-	-	-	-	578
	C-Px	154	111	410	529	805	713	2,222	14,420
	C-Sx	111	111	459	578	1,291	1,203	2,429	5,200
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	16	-	-	-	51	400
	DC	-	-	-	-	-	-	27	279
	D	-	-	-	-	-	-	566	1,179
	Total	265	222	941	1,118	2,199	2,019	5,549	22,286
Porcupine Hills	C-Fa	-	-	-	-	-	-	-	-
	C-La	-	-	-	-	-	-	-	-
	C-Fd	-	-	-	66	-	-	-	137
	C-Px	-	-	-	212	-	-	-	212
	C-Sx	-	-	-	85	-	-	-	85
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	-	-	-	-	-	12
	DC	-	-	-	-	-	-	-	35
	D	-	-	-	-	-	-	-	2,045
	Total	-	-	-	363	-	-	-	2,526

Table 4-57: Percent area by C5 subregion in interior old forest patches >= 100 hectares for selected periods.

C5 Subregion	Cover Type	Managed Landbase % Area of Interior Old Forest Patches >=100 ha[1]				Forested Landbase % Area of Interior Old Forest Patches >=100 ha[1]			
		Years in Future				Years in Future			
		0	11	51	101	0	11	51	101
Castle	C-Fa	0%	0%	0%	32%	5%	7%	3%	22%
	C-La					10%	65%	10%	32%
	C-Fd							0%	5%
	C-Px	0%	0%	0%	0%	0%	0%	0%	24%
	C-Sx	19%	45%	27%	20%	14%	31%	17%	27%
	C-Re								
	CD	0%	0%	64%		0%	0%	42%	0%
	DC							55%	16%
	D						0%	1%	17%
	Total	18%	43%	17%	9%	11%	24%	8%	22%
Continental Divide North	C-Fa	32%	44%	41%	53%	37%	31%	43%	39%
	C-La					35%	36%	42%	29%
	C-Fd								
	C-Px	10%	6%	9%	37%	29%	22%	50%	57%
	C-Sx	18%	26%	13%	29%	30%	36%	38%	56%
	C-Re								
	CD								51%
	DC							0%	
	D							0%	0%
	Total	18%	24%	14%	33%	31%	34%	40%	53%
Continental Divide South	C-Fa	1%	1%	34%	31%	17%	18%	26%	28%
	C-La					34%	34%	34%	10%
	C-Fd							0%	0%
	C-Px	0%	0%	0%	29%	49%	49%	15%	36%
	C-Sx	33%	34%	31%	23%	39%	40%	43%	31%
	C-Re								
	CD			3%	0%			1%	27%
	DC							0%	22%
	D						0%	0%	1%
	Total	32%	33%	28%	26%	34%	35%	33%	31%
Livingstone	C-Fa			86%	13%	67%	66%	51%	26%
	C-La					55%	55%	44%	18%
	C-Fd				0%			0%	57%
	C-Px	29%	13%	25%	36%	28%	19%	25%	39%
	C-Sx	7%	9%	20%	30%	22%	22%	24%	34%
	C-Re								
	CD	0%	0%	18%	0%	0%	0%	23%	44%
	DC						0%	19%	29%
	D					0%	0%	13%	22%
	Total	13%	11%	23%	31%	25%	21%	23%	36%
Porcupine Hills	C-Fa								
	C-La								
	C-Fd		0%	0%	14%	0%	0%	0%	6%
	C-Px			0%	69%			0%	48%
	C-Sx			0%	56%			0%	40%
	C-Re								
	CD			0%				0%	8%
	DC								16%
	D						0%	0%	28%
	Total		0%	0%	39%	0%	0%	0%	24%

[1] Percent areas have been calculated as the area of interior old forest patches >= 100 ha divided by the area of old forest.

Table 4-58 and Table 4-59 show the area and percent area of interior old forest patches greater than or equal to 40 ha in size for selected periods. Table 4-60 and Table 4-61 provide the same results by C5 subregion.

Table 4-58: Area in interior old forest patches >= 40 hectares for selected periods.

Cover Type	Managed Landbase Interior Old Forest Patches >=40 ha Area (ha)				Forested Landbase Interior Old Forest Patches >=40 ha Area (ha)			
	Years in Future				Years in Future			
	0	11	51	101	0	11	51	101
C-Fa	36	39	197	209	576	623	2,076	5,004
C-La	-	-	-	-	55	56	113	152
C-Fd	-	-	29	205	-	-	29	1,087
C-Px	280	210	698	1,336	1,436	1,327	4,429	23,647
C-Sx	2,050	2,300	2,173	1,680	6,609	7,026	9,683	13,807
C-Re	-	-	-	-	-	-	-	-
CD	-	-	35	-	-	-	88	530
DC	-	-	-	-	-	-	44	413
D	-	-	-	-	-	-	1,204	4,877
Total	2,365	2,549	3,132	3,430	8,675	9,032	17,667	49,518

Table 4-59: Percent area in interior old forest patches >= 40 hectares for selected periods.

Cover Type	Managed Landbase % Area of Interior Old Forest Patches >=40 ha[1]				Forested Landbase % Area of Interior Old Forest Patches >=40 ha[1]			
	Years in Future				Years in Future			
	0	11	51	101	0	11	51	101
C-Fa	41%	45%	51%	46%	26%	27%	33%	38%
C-La					53%	54%	45%	36%
C-Fd		0%	98%	42%	0%	0%	19%	32%
C-Px	38%	18%	28%	44%	41%	29%	36%	48%
C-Sx	32%	37%	32%	39%	40%	42%	42%	45%
C-Re								
CD	0%	0%	26%	0%	0%	0%	27%	40%
DC						0%	23%	28%
D					0%	0%	23%	32%
Total	33%	34%	31%	41%	39%	38%	37%	43%

[1] Percent areas have been calculated as the area of interior old forest patches >= 40 ha divided by the area of old forest.

Table 4-60: Area by C5 subregion in interior old forest patches >= 40 hectares for selected periods.

C5 Subregion	Cover Type	Managed Landbase Interior Old Forest Patches >=40 ha Area (ha)				Forested Landbase Interior Old Forest Patches >=40 ha Area (ha)			
		Years in Future				Years in Future			
		0	11	51	101	0	11	51	101
Castle	C-Fa	-	-	-	13	23	62	176	1,237
	C-La	-	-	-	-	15	15	15	18
	C-Fd	-	-	-	-	-	-	-	10
	C-Px	16	19	18	66	16	20	38	1,583
	C-Sx	193	245	227	67	383	484	499	1,178
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	4	-	-	-	4	3
	DC	-	-	-	-	-	-	17	35
	D	-	-	-	-	-	-	3	647
	Total	210	264	250	147	437	580	753	4,711
Continental Divide North	C-Fa	8	11	62	96	164	166	660	918
	C-La	-	-	-	-	13	14	47	82
	C-Fd	-	-	-	-	-	-	-	-
	C-Px	32	32	42	88	257	258	823	1,895
	C-Sx	600	820	431	374	1,991	2,345	3,052	4,042
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	-	-	-	-	-	8
	DC	-	-	-	-	-	-	-	-
	D	-	-	-	-	-	-	4	-
	Total	640	863	535	558	2,426	2,783	4,587	6,945
Continental Divide South	C-Fa	27	27	79	88	304	315	1,029	2,640
	C-La	-	-	-	-	4	4	4	22
	C-Fd	-	-	-	-	-	-	-	-
	C-Px	-	-	31	277	17	17	232	2,220
	C-Sx	875	954	827	385	2,137	2,271	2,595	2,122
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	1	-	-	-	1	40
	DC	-	-	-	-	-	-	-	13
	D	-	-	-	-	-	-	-	4
	Total	902	981	938	751	2,462	2,607	3,861	7,060
Livingstone	C-Fa	-	-	56	11	84	80	210	209
	C-La	-	-	-	-	23	23	48	30
	C-Fd	-	-	-	-	-	-	-	714
	C-Px	231	159	531	657	1,145	1,032	3,260	17,700
	C-Sx	382	282	635	769	2,098	1,927	3,483	6,378
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	30	-	-	-	84	462
	DC	-	-	-	-	-	-	27	326
	D	-	-	-	-	-	-	1,141	1,571
	Total	613	441	1,252	1,437	3,351	3,062	8,253	27,390
Porcupine Hills	C-Fa	-	-	-	-	-	-	-	-
	C-La	-	-	-	-	-	-	-	-
	C-Fd	-	-	29	205	-	-	29	364
	C-Px	-	-	76	248	-	-	76	249
	C-Sx	-	-	52	85	-	-	53	87
	C-Re	-	-	-	-	-	-	-	-
	CD	-	-	-	-	-	-	-	18
	DC	-	-	-	-	-	-	-	39
	D	-	-	-	-	-	-	55	2,655
	Total	-	-	157	537	-	-	213	3,412

Table 4-61: Percent area by C5 subregion in interior old forest patches >= 40 hectares for selected periods.

C5 Subregion	Cover Type	Managed Landbase % Area of Interior Old Forest Patches >=40 ha[1]				Forested Landbase % Area of Interior Old Forest Patches >=40 ha[1]			
		Years in Future				Years in Future			
		0	11	51	101	0	11	51	101
Castle	C-Fa	0%	0%	0%	32%	5%	12%	10%	33%
	C-La					65%	65%	65%	39%
	C-Fd							0%	7%
	C-Px	75%	88%	7%	18%	74%	87%	6%	38%
	C-Sx	50%	50%	40%	30%	36%	39%	37%	36%
	C-Re								
	CD	0%	0%	64%		0%	0%	42%	2%
	DC							55%	16%
	D						0%	1%	30%
	Total	50%	51%	28%	23%	27%	32%	19%	34%
Continental Divide North	C-Fa	32%	44%	49%	62%	44%	33%	47%	42%
	C-La					50%	53%	42%	50%
	C-Fd								
	C-Px	19%	11%	21%	37%	45%	33%	53%	59%
	C-Sx	24%	31%	21%	38%	37%	42%	45%	59%
	C-Re								
	CD								51%
	DC							0%	
	D							33%	0%
	Total	24%	29%	22%	40%	38%	40%	47%	56%
Continental Divide South	C-Fa	47%	47%	54%	53%	26%	27%	37%	41%
	C-La					34%	34%	35%	55%
	C-Fd							0%	0%
	C-Px	0%	0%	17%	43%	49%	49%	22%	46%
	C-Sx	45%	50%	46%	39%	50%	52%	54%	43%
	C-Re								
	CD			3%	0%			1%	27%
	DC							0%	22%
	D						0%	0%	2%
	Total	45%	49%	44%	42%	44%	47%	43%	42%
Livingstone	C-Fa			86%	13%	70%	66%	52%	27%
	C-La					55%	55%	44%	18%
	C-Fd				0%			0%	70%
	C-Px	43%	19%	33%	44%	40%	27%	36%	48%
	C-Sx	25%	23%	27%	39%	36%	35%	35%	41%
	C-Re								
	CD	0%	0%	33%	0%	0%	0%	38%	51%
	DC						0%	19%	34%
	D					0%	0%	26%	29%
	Total	29%	21%	31%	40%	38%	32%	34%	45%
Porcupine Hills	C-Fa								
	C-La								
	C-Fd		0%	98%	43%	0%	0%	66%	16%
	C-Px			33%	81%			33%	56%
	C-Sx			34%	56%			29%	41%
	C-Re								
	CD			0%				0%	12%
	DC								17%
	D						0%	14%	37%
	Total		0%	37%	57%	0%	0%	23%	32%

[1] Percent areas have been calculated as the area of interior old forest patches >= 40 ha divided by the area of old forest.

4.8.13 Spatial Harvest Sequence

The stands selected for harvest in the first 40 years of the planning horizon in selected spatial TSA scenarios were assessed to determine if they were operationally feasible. This was accomplished by printing 1:100 000 scale maps showing the selected stands by decade, and visually inspecting the pattern. Maps were also provided for RUN90021A for the forest planners to field check the harvest sequence. Modifications were made to this sequence in the preferred forest management scenario.

4.9 Comparison of Results

The purpose of this section is to compare results from multiple scenarios to determine the sensitivity and impacts of modeling assumptions, as well as the trade-offs between competing values. Issues that were assessed include:

- Harvest flow, carryover and harvest level;
- Average and minimum harvest age;
- Additional treatments;
- Regeneration assumptions;
- Douglas-fir piece size;
- Ecological indictors;
- Mountain pine beetle susceptibility;
- Managed landbase;
- Growing stock;
- Adjacency and greenup patch;
- Access schedule; and
- Spatial harvest sequence.

Issues were assessed in both modeling tools, however, Woodstock was preferred as it provided optimal solutions relatively quickly. Table 4-62 and Table 4-63 specify the primary purpose of each TSA scenario, for non-spatial and spatial TSA scenarios, respectively.

Selected results, e.g. harvest level, average harvest age, area of late old growth at the end of the planning horizon, are presented for each comparison. In addition, the percent differences from a baseline scenario were calculated.

The focus of the comparisons in this section was on the relative differences of the changes to management assumptions from the baseline, not the absolute values. Those relative differences were then applied to other scenarios, such as the preferred forest management scenario. Therefore, the sensitivity analyses may not include the preferred forest management scenario, however the percentages can be used to calculate the absolute differences from the final scenario.

The comparison scenarios were specifically selected for their relationship to a baseline and generally have very few, if any, other differences in the assumptions. Many of the sensitivity analysis were completed prior to the determination of the preferred forest management scenario. Many of the scenarios do not address all the issues that were incorporated into the preferred forest management scenario. Although results from different scenarios may be presented together, a valid comparison can be made only if all the model inputs, as provided in Addendum III, and the differences between the scenarios, are understood.

Table 4-62: Primary purpose of non-spatial TSA scenarios.

TSA Scenario		Primary Purpose
RUN21	Round 2 unconstrained	Determined initial levels and baseline for comparison to other scenarios
RUN22	Decrease min harvest ages by 10 yrs	Determined impact on harvest level as a result of reducing minimum harvest ages by 10 years for all cover types
RUN23	Decrease C-Fd yields by 5%	Determined impact on harvest level as a result of reducing C-Fd yields by 5%
RUN24	Decrease C-Fd yields by 10%	Determined impact on harvest level as a result of reducing C-Fd yields by 10%
RUN25	Decrease min harvest ages for C-Sx	Determined impact on harvest level as a result of reducing minimum harvest ages by 20 years for C-Sx in 5 watersheds
RUN32	Add Lost Creek Fire blocks	Determined impact on harvest level as a result of treating salvage and regen blocks in the Lost Creek Fire appropriately
RUN41	Remove inaccessible stands	Determined impact on harvest level as a result of removing inaccessible stands from the managed landbase
RUN51	Remove isolated stands	Determined impact on harvest level as a result of removing isolated stands from the managed landbase
RUN81	Ecological indicators by subregion	Determined initial levels and baseline for comparison to other scenarios after adjustments to the management assumptions
RUN82	Ecological indicators by covertype	Determined impact on harvest level and ecological indicators as a result of setting goals by cover type
RUN83	Ecological indicators by subregion and covertype	Determined impact on harvest level and ecological indicators as a result of setting goals by cover type and C5 subregion
RUN901	Round 9 unconstrained	Determined initial levels and baseline for comparison to other scenarios after adjustments to the classified landbase
RUN902	Ending gs >= avg	Determined impact on harvest level and ending merchantable growing stock as a result of adding a constraint where ending merchantable growing stock was at least the average across the planning horizon
RUN903	ND gs last 50 yrs	Determined impact on harvest level and ending merchantable growing stock as a result of adding a constraint where merchantable growing stock did not decline for the last 50 years of the planning horizon
RUN904	+- 10% variance in gs	Determined impact on harvest level and ending merchantable growing stock as a result of adding a constraint where merchantable growing stock was within +-10% of the average across the entire planning horizon
RUN905	Include all treatments	Determined impact on harvest level as a result of adding partial cut treatments in the Syncline Ridge Ski Area and adjacent to Elkhorn Ranch, modifying the harvest strategy in highway wildlife corridors, and including FireSmart treatments
RUN906	Remove pond buffers	Determined impact on harvest level as a result of removing salamandar and toad habitat from the managed landbase
RUN907	Future blocks to CD density	Determined impact on harvest level as a result of assuming all future stands are regenerated to CD density

Table 4-62: Primary purpose of non-spatial TSA scenarios. (continued)

TSA Scenario		Primary Purpose
RUN908	Decrease min harvest ages by LMU	Determined impact on harvest level as a result of reducing minimum harvest ages by 10 years for C-Px and 20 years for C-Sx in 5 LMUs
RUN909A	All historic and future blocks to CD density	Determined impact on harvest level as a result of assuming all exsiting pre-91 blocks are regenerated back to forested cover types and all existing post-91 and future stands are regenerated to CD density
RUN909B	All pre-91 historic blocks forested	Determined impact on harvest level as a result of assuming all exsiting pre-91 blocks are regenerated back to forested cover types
RUN910	Force ecological indicators	Determined impact on harvest level and ecological indicators as a result of meeting all late seral and regen seral stage goals
RUN911	Force harvest of "E" MPB stands	Determined impact on harvest level and pine proportion of harvest area as a result of harvesting all extreme hazard class pine stands in the first 10 years of the planning horizon
RUN912	Defer harvest of non-pine stands	Determined impact on harvest level, pine proportion of harvest area and ecological indicators as a result of reducing the weighting on ecological indicator goals and defering the harvest of non-extreme hazard class stands in compartments where more than 5% of the managed landbase is in the extreme hazard class
RUN913A	Maximize evenflow harvest	Determined impact on harvest level and ecological indicators as a result of including 143,000 m3 of carryover volume and reducing the weighting of ecological indicator goals
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	Determined impact on harvest level and pine proportion of harvest area as a result of harvesting all highly susceptible pine stands in the first 20 years of the planning horizon
RUN914	Stepdown harvest in 20 years	Determined impact on harvest level as a result of harvesting 143,000 m3 of carryover volume in the first 5 years and setting the harvest level to be 90% of the current AAC for years 20-200 of the planning horizon
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	Determined impact on harvest level and pine proportion of harvest area as a result of harvesting 143,000 m3 of carryover volume in the first 5 years, setting the harvest level to be 90% of the current AAC for years 20-200 of the planning horizon and harvesting all highly susceptible pine stands in the first 20 years of the planning horizon
RUN916	Stepdown harvest in 30 years	Determined impact on harvest level as a result of harvesting 143,000 m3 of carryover volume in the first 5 years and setting the harvest level to be 90% of the current AAC for years 30-200 of the planning horizon
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	Determined impact on harvest level and pine proportion of harvest area as a result of harvesting 143,000 m3 of carryover volume in the first 5 years, setting the harvest level to be 90% of the current AAC for years 30-200 of the planning horizon and harvesting all highly susceptible pine stands in the first 20 years of the planning horizon
RUN918	Stepdown harvest in 40 years	Determined impact on harvest level as a result of harvesting 143,000 m3 of carryover volume in the first 5 years and setting the harvest level to be 90% of the current AAC for years 40-200 of the planning horizon
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	Determined impact on harvest level and pine proportion of harvest area as a result of harvesting 143,000 m3 of carryover volume in the first 5 years, setting the harvest level to be 90% of the current AAC for years 40-200 of the planning horizon and harvesting all highly susceptible pine stands in the first 20 years of the planning horizon

Table 4-63: Primary purpose of spatial TSA scenarios.

TSA Scenario		Primary Learning
RUN21001	Round 2 baseline	Determined initial levels and baseline for comparison to other scenarios when access schedule, block size, greenup and adjacency issues are included
RUN21002	Level 1 late seral	Determined impact on harvest level and late seral areas as a result of adding level 1 late seral goals
RUN21003	Level 2 late seral	Determined impact on harvest level and late seral areas as a result of adding level 2 late seral goals
RUN21004	Regen patches	Determined impact on harvest level and ecological indicators as a result of adding regen patch size goals
RUN21006	Regen seral stage	Determined impact on harvest level, late seral areas and regen seral stage areas as a result of adding regen seral stage goals
RUN21007	Modified regen patches	Determined impact on harvest level of modifying regen patch goals to be less restrictive.
RUN21008	Reduced regen patch weighting	Determined impact on harvest level and ecological indicators as a result of modifying regen patch size goals
RUN21009	No greenup and adjacency	Determined impact on harvest level as a result of including only access schedule spatial issue
RUN31002	Lost Creek fire blocks	Determined impact on harvest level as a result of treating salvage and regen blocks in the Lost Creek Fire appropriately
RUN41001	Remove inaccessible stands	Determined impact on harvest level as a result of removing inaccessible stands from the managed landbase
RUN41002	Inaccessible stands and ecological indicators	Determined impact on harvest level and ecological indicators as a result of removing inaccessible stands from the managed landbase and adding ecological goals
RUN51001	Remove isolated stands	Determined impact on harvest level as a result of removing isolated stands from the managed landbase
RUN51002	Isolated stands and ecological indicators	Determined impact on harvest level and ecological indicators as a result of removing isolated stands from the managed landbase and adding ecological goals
RUN61001	SHS Version 1	Determined impact on harvest level, ecological indicators and spatial harvest sequence as a result of addressing all issues relevant to the preferred forest management scenario
RUN61002	No harvest	Determined impact on ecological indicators as a result of not harvesting
RUN61003	SHS Version 2	Determined impact on harvest level, ecological indicators and spatial harvest sequence as a result of modifying the access schedule
RUN71001	Round 7 baseline	Determined impact on harvest level and ecological indicators as a result of updating the effective date and historic harvesting activities
RUN71002	Force ecological indicators	Determined impact on harvest level and ecological indicators as a result of meeting ecological indicator goals
RUN71003	Eco sensitivity #1	Determined impact on harvest level and ecological indicators as a result of almost meeting ecological indicator goals
RUN71004	Eco sensitivity #2	Determined impact on harvest level and ecological indicators as a result of balancing between ecological indicator goals and harvest levels
RUN71005	Eco sensitivity #3	Determined impact on harvest level and ecological indicators as a result of almost meeting harvest levels while setting ecological indicator goals
RUN90001	Round 9 baseline	Determined initial levels and baseline for comparison to other scenarios when access schedule, block size, greenup and adjacency issues and ecological indicators are included after adjustments to the classified landbase

Table 4-63: Primary purpose of spatial TSA scenarios. (continued)

TSA Scenario		Primary Learning
RUN90002	Include planned blocks	Determined impact on harvest level as a result of forcing the model to harvest planned blocks
RUN90003	60% access schedule	Determined impact on the harvest level as a result of an access schedule for the first 40 years that opened 60% of the compartments for harvest activities
RUN90004	40% access schedule	Determined impact on the harvest level as a result of an access schedule for the first 40 years that opened 40% of the compartments for harvest activities
RUN90005	Force harvest of "E" MPB stands	Determined impact on the harvest level as a result of prioritizing extreme hazard class pine stands and defering the harvest of non-extreme hazard stands in compartments where more than 5% of the area is classified as extreme hazard for the first 11 years
RUN90006	Maximize harvest	Determined impact on harvest level and ecological indicators as a result of removing ecological indicator goals
RUN90010	Maintain current AAC with 97,000 carryover	Determined impact on ecological indicators as a result of harvesting the current AAC for the entire planning horizon with an additional 97,000 m3 of carryover volume in the first 5 years
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	Determined impact on ecological indicators as a result of harvesting the current AAC for the first 21 years with an additional 97,000 m3 of carryover volume in the first 5 years, then harvesting 90% of the current AAC for years 22-200
RUN90012	Maintain current AAC	Determined impact on ecological indicators as a result of harvesting the current AAC for the entire planning horizon
RUN90013	Stepdown harvest in 21 years	Determined impact on ecological indicators as a result of harvesting the current AAC for the first 21 years then harvesting 90% of the current AAC for years 22-200
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	Determined impact on ecological indicators as a result of harvesting the current AAC for the first 21 years with an additional 143,000 m3 of carryover volume in the first 5 years, then harvesting 90% of the current AAC for years 22-200
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	Determined impact on pine proportion of harvest area and ecological indicators as a result of harvesting highly susceptible pine stands in the first 21 years
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	Determined impact on harvest level, pine proportion of harvest areas and ecological indicators as a result of harvesting highly susceptible pine stands in the first 21 years
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	Determined impact on pine proportion of harvest area and ecological indicators as a result of harvesting highly susceptible pine stands in the first 21 years and modifying the access schedule
RUN90018	Reduce average harvest age	Determined impact on pine proportion of harvest area and ecological indicators as a result of setting a maximum average harvest age goal
RUN90020	Maximize harvest in first 21 years	Determined impact on harvest level as a result of increasing the harvest level for the first 21 years to the maximum possible

Table 4-63: Primary purpose of spatial TSA scenarios. (continued)

TSA Scenario		Primary Learning
RUN90021	Modified compartment sequence	Determined impact on harvest level, ecological indicators, pine proportion of harvest area and spatial harvest sequence as a result of modifying the access schedule
RUN90021A	SHS Version 3	Determined impact on harvest level, ecological indicators, pine proportion of harvest area and spatial harvest sequence as a result of increasing the weighting of ecological indicators
RUN90022	Preferred Forest Management Scenario	Culmination of all previous learning to develop the preferred forest management scenario

4.9.1 Harvest Flow

The two harvest flow assumptions tested were:

- evenflow throughout the planning horizon, and
- an accelerated harvest level with a planned stepdown at some point in the future.

Comparisons for harvest flow scenarios are in Table 4-64. For all scenarios with a planned stepdown, the post-stepdown harvest levels were constrained at 10% below the current AAC level. Therefore, it is the level of the pre-stepdown harvest volume that was compared. Pre-stepdown harvest levels *could* be as high as 89% above the evenflow harvest level, however in the preferred forest management scenario it was limited to 20% above the current AAC to address other values.

The higher harvest levels consistently resulted in lower average harvest ages and ending late old growth areas.

The non-spatial stepdown scenario that was most similar to the preferred forest management scenario was RUN915. This scenario was compared to an evenflow scenario to determine if the accelerated harvest level was sustainable. The post-stepdown harvest level for RUN915 was within the 10% tolerance for sustainability set in the Planning Standard. The RUN915 pre-stepdown harvest level was much higher than the preferred forest management scenario. The conclusion was a post-stepdown harvest level of 157,000 m^3/yr can be maintained even with high harvest levels prior to the stepdown, and therefore the preferred forest management scenario harvest levels were sustainable.

Table 4-64: Harvest flow sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11)		Average Clearcut Age (years) 50-year Average (Years 51-100)	Area of Highly Suscptible Pine at Year 20 (ha)	Ending L Area (ha)
		Evenflow/ Pre-stepdown	Post-stepdown			
RUN913A	Maximize evenflow harvest	176,104		139	19,558	6,059
RUN914	Stepdown harvest in 20 years	332,893	157,428	126	18,964	2,000
RUN916	Stepdown harvest in 30 years	275,362	157,428	126	19,129	2,000
RUN918	Stepdown harvest in 40 years	246,313	157,428	126	19,143	2,000
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	175,684		140	14,540	5,989
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	327,717	157,428	127	5,940	2,045
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	271,545	157,428	128	17,075	2,000
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	244,443	157,428	129	18,647	2,261
RUN90018	Reduce average harvest age	218,205	157,102	140	7,134	1,748
RUN90020	Maximize harvest in first 21 years	295,003	157,371	146	9,752	209
Percent Difference from Baseline						
RUN913A	Maximize evenflow harvest			baseline		
RUN914	Stepdown harvest in 20 years	89%	-11%	-10%	-3%	-67%
RUN916	Stepdown harvest in 30 years	56%	-11%	-10%	-2%	-67%
RUN918	Stepdown harvest in 40 years	40%	-11%	-10%	-2%	-67%
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands			baseline		
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	87%	-10%	-10%	-59%	-66%
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	55%	-10%	-9%	17%	-67%
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	39%	-10%	-8%	28%	-62%
RUN90018	Reduce average harvest age			baseline		
RUN90020	Maximize harvest in first 21 years	35%	0%	5%	37%	-88%

4.9.2 Carryover

Carryover will not be approved until the end of this quadrant after April 30, 2006. It was expected that the volume undercut in the current quadrant will be 143,000 m³ (initially, the estimate was 97,000 m³). Table 4-65 shows the impact of including this carryover volume on evenflow/pre-stepdown conifer harvest level and ending late old growth area. No direct comparisons were available for non-spatial TSA scenarios. The three spatial TSA scenario comparisons show there was no impact on harvest level. The slight increases in harvest level were due to the nature of the Patchworks modeling tool. The difference in late old growth area can be large or small, depending on the stands selected for harvest by the model.

Table 4-65: Carryover volume sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m³/yr at 15/11)		Ending L Area (ha)
		Evenflow/ Pre-stepdown	Post-stepdown	
RUN90012	Maintain current AAC	174,918		1,342
RUN90010	Maintain current AAC with 97,000 carryover	174,917		1,316
RUN90013	Stepdown harvest in 21 years	174,923	157,398	4,347
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	174,924	157,397	4,373
RUN90013	Stepdown harvest in 21 years	174,923	157,398	4,347
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	174,917	157,397	3,289
Percent Difference from Baseline				
RUN90012	Maintain current AAC		baseline	
RUN90010	Maintain current AAC with 97,000 carryover	0%		-2%
RUN90013	Stepdown harvest in 21 years		baseline	
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	0%	0%	1%
RUN90013	Stepdown harvest in 21 years		baseline	
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	0%	0%	-24%

4.9.3 Harvest Level

For most of the scenarios analyzed, the harvest levels were set at the desired level relative to the current AAC. Two scenarios assessed how high the harvest level could be for this forest. Results of this comparison are in Table 4-66. Even these scenarios were constrained and were not truly the maximum possible, however the harvest levels were much higher than the proposed harvest levels in the preferred forest management scenario. High harvest levels were not desirable in the preferred forest management

scenario for two primary reasons; it adversely affected other values, and the Planning Standard limits the accelerated harvest level to a maximum of 25% above the sustainable evenflow level.

Table 4-66: Harvest level sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11)		Ending L Area (ha)
		Evenflow/ Pre-stepdown	Post-stepdown	
RUN90004	40% access schedule	162,989		9,990
RUN90006	Maximize harvest	185,284		1,104
RUN90018	Reduce average harvest age	218,205	157,102	1,748
RUN90020	Maximize harvest in first 21 years	295,003	157,371	209
Percent Difference from Baseline				
RUN90004	40% access schedule		baseline	
RUN90006	Maximize harvest	14%		-89%
RUN90018	Reduce average harvest age		baseline	
RUN90020	Maximize harvest in first 21 years	35%	0%	-88%

4.9.4 Average Harvest Age

Average harvest age was used as an indicator of the average age of the forest and high average harvest ages were not desirable considering the objective of reducing the risk of fire. Currently, there are large amounts of area in the 61-140 year old age classes, and most of the pine is between 61-100 years old, which would lead to a higher-than-desirable average harvest age. The extremely old areas on the current landbase are mostly spruce and a significant amount of area is currently older than 140 years.

One scenario, RUN90018, set a goal on the average harvest age to be less than or equal to 140 years, and results are provided in Table 4-67. This goal caused the model to make unrealistic and unexpected choices. The model either did not the harvest of older stands and let them reach the maximum age, or it combined the harvest of very old stands with very young stands to reduce the average. This goal was removed in all subsequent scenarios and other methods were employed to meet the objectives of the desired future forest.

Table 4-67: Average harvest age sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow/ Pre-stepdown	Conifer Harvest Level (m^3/yr at 15/11) Post-stepdown	Average Clearcut Age for Years 51-100 (years)	Area of Highly Suscptible Pine at Year 20 (ha)	Ending L Area (ha)
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	174,917	157,397	156	16,580	3,289
RUN90018	Reduce average harvest age	218,205	157,102	140	7,134	1,748
Percent Difference from Baseline						
RUN90014	Stepdown harvest in 21 years with 143,000 carryover			baseline		
RUN90018	Reduce average harvest age	25%	0%	-10%	-57%	-47%

4.9.5 Minimum Harvest Age

Minimum harvest ages were chosen as a proxy to ensure piece size distribution is favourable for sawmill economies and to address the perceived slower growing rates in forests at higher elevations in the C5 forest. Minimum harvest ages are provided in Table 4-13. A sensitivity analysis around the original minimum harvest age assumptions was completed in Woodstock and the results are presented in Table 4-68.

Decreasing the minimum harvest ages for all species resulted in a 7% increase to the conifer harvest level (RUN22), which is likely due to the current age class distribution where the mature forest can be harvested at younger ages before the yields peak and begin to decline.

The majority (60%) of spruce on the managed landbase is in the LMU's with the higher minimum harvest ages, so reducing the minimum age for spruce by 20 years in these areas had a small effect on the conifer harvest levels (RUN25). The minimum harvest ages for spruce were reduced from the original assumptions in the preferred forest management scenario as the Planning Team felt that these ages better reflected the piece size distributions within these areas.

Table 4-68: Minimum harvest age sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow
RUN21	Round 2 unconstrained	192,682
RUN22	Decrease min harvest ages by 10 yrs	205,215
RUN21	Round 2 unconstrained	192,682
RUN25	Decrease min harvest ages for C-Sx	195,367
Percent Difference from Baseline		
RUN21	Round 2 unconstrained	baseline
RUN22	Decrease min harvest ages by 10 yrs	7%
RUN21	Round 2 unconstrained	baseline
RUN25	Decrease min harvest ages for C-Sx	1%

4.9.6 Additional Treatments

Although initial TSA scenarios assumed all stands within the C5 FMU would be clearcut, in reality there will be other types of harvesting and management activities. When building TSA scenarios, it is typical to begin with simple harvest treatments, such as clearcutting, and then add more complex treatments. Clearcutting all stands generally gives the highest harvest levels and the comparison when adding other treatments is useful to assess harvesting options. In the C5 FMU, the other treatments were not considered options, however the impact on the harvest level of including these additional treatments was still assessed.

The addition of partial cut and burn treatments and restriction of clearcutting in the highway wildlife corridors reduced the conifer harvest levels by reducing the options available to the model (Table 4-69). All alternative treatments were included in the preferred forest management scenario, although how they are actually applied on the ground will depend on local conditions and objectives.

Table 4-69: Treatment sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow
RUN903	ND gs last 50 yrs	219,664
RUN905	Include all treatments	214,968
Percent Difference from Baseline		
RUN903	ND gs last 50 yrs	baseline
RUN905	Include all treatments	-2%

4.9.7 Regeneration Assumptions

The regeneration assumptions made in the preferred forest management scenario reflected the requirements outlined in the Planning Standard. These assumptions are very conservative, and it is likely

that they will be exceeded. Additional information could be collected to modify the modeling assumptions, however the cost of these surveys should be less than the benefit of increased harvest levels.

The results of several regeneration assumptions are provided in Table 4-70. The increase for either assuming future blocks are regenerated back to CD density, or that the pre-1991 blocks are forested is 3%.

Table 4-70: Regeneration assumptions sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow
RUN903	ND gs last 50 yrs	219,664
RUN907	Future blocks to CD density	226,649
RUN909A	All historic and future blocks to CD density	226,736
RUN909B	All pre-91 historic blocks forested	225,902
Percent Difference from Baseline		
RUN903	ND gs last 50 yrs	baseline
RUN907	Future blocks to CD density	3%
RUN909A	All historic and future blocks to CD density	3%
RUN909B	All pre-91 historic blocks forested	3%

4.9.8 Douglas-fir Piece Size

The utilization standard, which determines the merchantable tree size, includes bark volume. The 15/11 utilization used in this analysis may be a little low for Douglas-fir due to the thick bark common to this species. Only one set of yield curves was developed, therefore to approximate a higher utilization, yield curves were reduced by a percentage and the results are provided in Table 4-71. The percentage reduction was based on the expert opinion of the Planning Team. The decrease in harvest volumes is small due to the small percentage of Douglas-fir on the landscape in this FMU.

Table 4-71: Douglas-fir yield sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow
RUN21	Round 2 unconstrained	192,682
RUN23	Decrease C-Fd yields by 5%	191,720
RUN24	Decrease C-Fd yields by 10%	190,757
Percent Difference from Baseline		
RUN21	Round 2 unconstrained	baseline
RUN23	Decrease C-Fd yields by 5%	0%
RUN24	Decrease C-Fd yields by 10%	-1%

4.9.9 Ecological Indicators

Due to the importance placed on both harvest level and late seral areas, many comparisons were made related to the sustainability of both timber and late seral areas. Results of these comparisons are provided in Table 4-72. Although only the ending late old growth area was included in the summary table, all of the late seral indicators were used to assess the scenarios and gain an understanding of the dynamics of the managed forest.

The first sensitivity analysis (Round 8 scenarios) determined the impacts of using late seral level 1 targets based on C5 subregion, cover type and C5 subregion/cover type combined. The Planning Team wanted to assess the different impacts of distributing the late seral area across the geographical extent of the forest (C5 subregion) and of ensuring representation of all species (cover type). Using the cover type formulation, there was more flexibility and therefore the harvest level increased, however it was more desirable to have the late seral area spread across the C5 subregions in the preferred forest management scenario. This analysis was completed using the Woodstock mixed approach formulation.

Each ecological indicator goal was added to a new TSA scenario to help understand the impacts of each individual goal. This was done in Round 2 spatial TSA scenarios in which a relatively high weighting was set to force the model to achieve the seral stage and regen patch goals at the expense of the harvest levels. Ecological indicators include late old growth seral stage area (L), early+late old growth seral stage area (EL), mature+old growth seral stage area (MEL), regen seral stage area and regen patch goals. Adding late seral goals reduced the area in the early seral stages by reducing the area harvested. The maximum regen area goals were not very constraining on the forest and had little effect on the harvest levels. The original regen patch size goals had a large impact on harvest levels (RUN21004) and were therefore modified in all subsequent scenarios.

For the Rounds 4 and 5 scenarios, there was a balanced weighting between harvest level and ecological indicators, which resulted in large increases in late seral with a relatively small reduction in the harvest level.

In the Round 7 analysis, the only change between the spatial TSA scenarios was the relative weighting of the harvest level and level 1 late seral goals. Range of weighting from balanced (RUN71001) then increasing the relative weighting of the 15 late seral goals (RUN71003, RUN71004, RUN71005) to

RUN71002 where the weighting was so high, that the level 1 late seral goals were achieved at the expense of the harvest level.

These trade-off analyses gave the Planning Team the information to set the target for the desired future forest at 1/3 of the level 1 target areas for late old growth seral stage.

Table 4-72: Ecological indicator sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow	Ending Merchantable Growing Stock (000,000 m^3)	Area of Highly Susceptible Pine 20 Years in Future (ha)	Ending L Area (ha)
RUN81	Ecological indicators by subregion	153,299	4.74	0	15,943
RUN82	Ecological indicators by covertype	157,756	4.67	0	12,388
RUN83	Ecological indicators by subregion and covertype	154,489	4.99	0	13,468
RUN906	Remove pond buffers	212,179	1.10	19,889	528
RUN910	Force ecological indicators	159,335	5.20	18,096	15,458
RUN21001	Round 2 baseline	174,739	1.35	0	409
RUN21002	Level 1 late seral	164,943	2.90	0	9,655
RUN21003	Level 2 late seral	171,963	1.91	0	5,843
RUN21002	Level 1 late seral	164,943	2.90	0	9,655
RUN21006	Regen seral stage	174,615	1.84	0	8,590
RUN21004	Regen patches	83,088	6.91	0	21,465
RUN21007	Modified regen patches	169,908	2.12	0	4,766
RUN21008	Reduced regen patch weighting	172,874	1.84	0	5,912
RUN21009	No greenup and adjacency	177,320	1.50	0	9,642
RUN41001	Remove inaccessible stands	182,274	1.43	0	311
RUN41002	Inaccessible stands and ecological indicators	179,125	1.77	0	8,169
RUN51001	Remove isolated stands	184,393	1.14	0	141
RUN51002	Isolated stands and ecological indicators	179,865	1.63	0	8,413
RUN71001	Round 7 baseline	177,971	2.56	0	10,089
RUN71003	Eco sensitivity #1	165,362	3.44	0	16,414
RUN71004	Eco sensitivity #2	171,516	2.93	0	14,615
RUN71005	Eco sensitivity #3	173,793	2.75	0	13,484
RUN71002	Force ecological indicators	159,562	3.93	0	15,098

Table 4-72: Ecological indicator sensitivity analysis results. (continued)

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow	Ending Merchantable Growing Stock (000,000 m^3)	Area of Highly Susceptible Pine 20 Years in Future (ha)	Ending L Area (ha)
Percent Difference from Baseline					
RUN81	Ecological indicators by subregion		baseline		
RUN82	Ecological indicators by covertype	3%	-1%		-22%
RUN83	Ecological indicators by subregion and covertype	1%	5%		-16%
RUN906	Remove pond buffers		baseline		
RUN910	Force ecological indicators	-25%	374%	-9%	2827%
RUN21001	Round 2 baseline		baseline		
RUN21002	Level 1 late seral	-6%	114%		2262%
RUN21003	Level 2 late seral	-2%	41%		1330%
RUN21002	Level 1 late seral		baseline		
RUN21006	Regen seral stage	6%	-37%		-11%
RUN21004	Regen patches	-50%	139%		122%
RUN21007	Modified regen patches	3%	-27%		-51%
RUN21008	Reduced regen patch weighting	5%	-37%		-39%
RUN21009	No greenup and adjacency	8%	-48%		0%
RUN41001	Remove inaccessible stands		baseline		
RUN41002	Inaccessible stands and ecological indicators	-2%	24%		2526%
RUN51001	Remove isolated stands		baseline		
RUN51002	Isolated stands and ecological indicators	-2%	43%		5851%
RUN71001	Round 7 baseline		baseline		
RUN71003	Eco sensitivity #1	-7%	34%		63%
RUN71004	Eco sensitivity #2	-4%	14%		45%
RUN71005	Eco sensitivity #3	-2%	7%		34%
RUN71002	Force ecological indicators	-10%	53%		50%

4.9.10 Mountain Pine Beetle Susceptibility

The impact of forcing the models to harvest pine in the early part of the planning horizon on conifer harvest level, highly susceptible proportion of the harvest area, the ending merchantable growing stock, remaining area of highly susceptible pine stands, and ending late seral area is presented in Table 4-73. Generally, as highly susceptible pine stands were given priority for harvest, the harvest levels decreased, with variable results for the ending late old growth seral stage area. The ability of the model to actually prioritize pine for harvest was very closely related to the access schedule. The model could only schedule highly susceptible pine stand for harvest if the compartments they were in were open. The model would also harvest non-pine stands to meet the harvest level goal.

In the preferred forest management scenario, highly susceptible pine was prioritized for harvest, and the impacts on the other values was acceptable.

Table 4-73: Mountain pine beetle susceptibility sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow/ Pre-stepdown	Conifer Harvest Level (m^3/yr at 15/11) Post-stepdown	10-year Average Highly Susceptible Pine % of Pine Area Harvested	Ending Merchantable Growing Stock (000,000 m^3 at 15/11)	Area of Highly Susceptible Pine 20 Years in Future (ha)	Ending L Area (ha)
RUN910	Force ecological indicators	159,335		42%	5.20	18,096	15,458
RUN911	Force harvest of "E" MPB stands	156,146		64%	3.93	15,757	14,917
RUN912	Defer harvest of non-pine stands	166,739		69%	2.67	15,035	12,857
RUN913A	Maximize evenflow harvest	176,104		39%	3.04	19,558	6,059
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	175,684		86%	2.95	14,540	5,989
RUN914	Stepdown harvest in 20 years	332,893	157,428	31%	4.46	18,964	2,000
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	327,717	157,428	81%	4.48	5,940	2,045
RUN916	Stepdown harvest in 30 years	275,362	157,428	29%	4.39	19,129	2,000
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	271,545	157,428	47%	4.42	17,075	2,000
RUN918	Stepdown harvest in 40 years	246,313	157,428	28%	4.31	19,143	2,000
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	244,443	157,428	30%	4.33	18,647	2,261
RUN90004	40% access schedule	162,989		17%	3.35	7,497	9,990
RUN90005	Force harvest of "E" MPB stands	162,678		58%	3.40	667	10,802
RUN90013	Stepdown harvest in 21 years	174,923	157,398	19%	3.90	7,292	4,347
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	174,935	157,420	86%	4.69	6,309	3,176
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	185,187	157,279	97%	4.76	903	2,172
RUN90013	Stepdown harvest in 21 years	174,923	157,398	19%	3.90	7,292	4,347
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	176,501	157,355	88%	5.04	3,909	2,079

Table 4-73: Mountain pine beetle susceptibility sensitivity analysis results. (continued)

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow/ Pre-stepdown	Conifer Harvest Level (m^3/yr at 15/11) Post-stepdown	10-year Average Highly Susceptible Pine % of Pine Area Harvested	Ending Merchantable Growing Stock (000,000 m^3 at 15/11)	Area of Highly Susceptible Pine 20 Years in Future (ha)	Ending L Area (ha)
Percent Difference from Baseline							
RUN910	Force ecological indicators			baseline			
RUN911	Force harvest of "E" MPB stands	-2%		50%	-24%	-13%	-3%
RUN912	Defer harvest of non-pine stands	5%		63%	-49%	-17%	-17%
RUN913A	Maximize evenflow harvest			baseline			
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	0%		117%	-3%	-26%	-1%
RUN914	Stepdown harvest in 20 years			baseline			
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	-2%	0%	161%	1%	-69%	2%
RUN916	Stepdown harvest in 30 years			baseline			
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	-1%	0%	60%	1%	-11%	0%
RUN918	Stepdown harvest in 40 years			baseline			
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	-1%	0%	10%	1%	-3%	13%
RUN90004	40% access schedule			baseline			
RUN90005	Force harvest of "E" MPB stands	0%		238%	2%	-91%	8%
RUN90013	Stepdown harvest in 21 years			baseline			
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	0%	0%	354%	20%	-13%	-27%
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	6%	0%	413%	22%	-88%	-50%
RUN90013	Stepdown harvest in 21 years			baseline			
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	1%	0%	366%	29%	-46%	-52%

4.9.11 Managed Landbase

The managed landbase area was set by whether it was appropriate or feasible to harvest those areas or not. However, the impact of the changes in the managed landbase between rounds was assessed. The changes in the managed landbase area were small and had a proportional impact on harvest levels (Table 4-74).

Table 4-74: Managed landbase area sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow	Forest-level MAI (m^3/ha/yr)
RUN21	Round 2 unconstrained	192,682	1.67
RUN32	Add Lost Creek Fire blocks	195,579	1.66
RUN41	Remove inaccessible stands	195,194	1.66
RUN51	Remove isolated stands	194,955	1.66
RUN905	Include all treatments	214,968	1.78
RUN906	Remove pond buffers	212,179	1.76
RUN21001	Round 2 baseline	174,739	1.51
RUN31002	Lost Creek fire blocks	177,151	1.50
RUN41001	Remove inaccessible stands	182,274	1.55
RUN51001	Remove isolated stands	184,393	1.57
Percent Difference from Baseline			
RUN21	Round 2 unconstrained	baseline	
RUN32	Add Lost Creek Fire blocks	2%	0%
RUN41	Remove inaccessible stands	1%	0%
RUN51	Remove isolated stands	1%	0%
RUN905	Include all treatments	baseline	
RUN906	Remove pond buffers	-1%	-1%
RUN21001	Round 2 baseline	baseline	
RUN31002	Lost Creek fire blocks	1%	-1%
RUN41001	Remove inaccessible stands	4%	2%
RUN51001	Remove isolated stands	6%	4%

4.9.12 Merchantable Growing Stock

Three merchantable growing stock constraint formulations were tested, and the results are presented in Table 4-75. The Planning Standard required a stable merchantable growing stock for the last 50 years of the planning horizon.

The non-declining merchantable conifer growing stock for the last 50 years of the planning horizon constraint (RUN903) was selected because it created a forest closest to the desired future forest. For this scenario, the growing stock was stable over the last 50 years of the planning horizon. The two TSA scenarios with the highest ending growing stock levels also had higher-than-desired average harvest ages. The ending growing stock for RUN902 was increasing over the last 35 years of the planning horizon, which was also not desirable.

Table 4-75: Growing stock sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow	Average Clearcut Age for Years 51-100 (years)	Ending Merchantable Growing Stock (000,000 m^3 at 15/11)
RUN901	Round 9 unconstrained	219,668	121	1.13
RUN902	Ending gs >= avg	180,225	161	6.47
RUN903	ND gs last 50 yrs	219,664	121	1.13
RUN904	+- 10% variance in gs	167,800	154	7.64
Percent Difference from Baseline				
RUN901	Round 9 unconstrained		baseline	
RUN902	Ending gs >= avg	-18%	33%	472%
RUN903	ND gs last 50 yrs	0%	0%	0%
RUN904	+- 10% variance in gs	-24%	27%	576%

4.9.13 Adjacency

The impact of adding basic spatial goals such as adjacency to the TSA model was determined by comparing non-spatial (Woodstock) TSA scenarios with spatial (Patchworks) TSA scenarios. Table 4-76 compares the conifer harvest levels when spatial management assumptions were added. The version of Patchworks used in the Round 2 scenario was significantly different than the versions used in later rounds, which affected the interpretation of the results.

As spatial constraints are added, the harvest level decreased, and consequently the ending growing stock levels and late old growth areas increased. Three comparisons were made, each using a different baseline, and the relative differences were not consistent. The differences were explained by the amount of time the model was allowed to run, in addition to the version of the modeling tool used.

The RUN21001 from RUN21 showed a 9% reduction in conifer harvest levels when an access schedule and greenup patch goals were added. RUN61003 had slightly different access schedule and greenup patch definition, and included regen patch goals, which reduced the harvest level an additional 3%. However, RUN90001 did not include an access schedule, but had both greenup patch and regen patch goals, although they were defined slightly differently yet again, which reduced the harvest level by 22% .

Table 4-76: Adjacency sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow	10-year Average Highly Susceptible Pine % of Pine Area Harvested	Ending Merchantable Growing Stock (000,000 m^3 at 15/11)	Area of Highly Susceptible Pine 20 Years in Future (ha)	Ending L Area (ha)
RUN21	Round 2 unconstrained	192,682	0%	1.02	0	0
RUN21001	Round 2 baseline	174,739	0%	1.35	0	409
RUN51	Remove isolated stands	194,955	0%	1.04	0	0
RUN61003	SHS Version 2	172,323	0%	2.23	0	7,306
RUN905	Include all treatments	214,968	27%	1.11	19,804	7
RUN90001	Round 9 baseline	167,853	16%	2.91	7,401	9,486
Percent Difference from Baseline						
RUN21	Round 2 unconstrained			baseline		
RUN21001	Round 2 baseline	-9%		32%		large
RUN51	Remove isolated stands			baseline		
RUN61003	SHS Version 2	-12%		116%		large
RUN905	Include all treatments			baseline		
RUN90001	Round 9 baseline	-22%	-40%	162%	-63%	large

4.9.14 Greenup Patch

Adjacency is also very closely linked with greenup patch size definition. Table 4-77 provides an indication of the impacts, although many other inputs and assumptions varied between the TSA scenarios as well.

Table 4-77: Greenup patch sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11)		Average Proportion of Area > Target (Years 1-100)	
		Evenflow/ Pre-stepdown	Post-stepdown	Middle Ridges LMU	Other LMU's
RUN21001	Round 2 baseline	174,739		2%	0%
RUN61003	SHS Version 2	172,323		0%	0%
RUN90022	Preferred Forest Management Scenario	209,414	157,140	30%	18%
Percent Difference from Baseline					
RUN21001	Round 2 baseline		baseline		
RUN61003	SHS Version 2	-1%		-81%	96%
RUN90022	Preferred Forest Management Scenario	20%	-10%	1411%	8068%

4.9.15 Access Schedule

The specific compartments that were open in the access schedules impacted the stands available for harvest, which in turn affected the levels of all indicators. The impact of modifying the access schedule is presented in Table 4-78. If the access schedule was quite restrictive it meant that most of the area available to the model must be harvested to meet the goals, the model had little choice to select

alternatives. The pattern that was established in those first 60 years set the precedent for the harvest pattern throughout the rest of the planning horizon. Therefore the initial selection of open access control units at the beginning of the planning horizon was directly correlated with what was present on the landscape at the end of the planning horizon. For example, if the average age of the open compartments was fairly young, and compartments with many old stands were initially closed, then the model would have no choice but to increase the average harvest age. The access schedule was an input into the model and therefore careful consideration should be used when developing it. The Planning Team tested several access schedules before selecting the one used in the preferred forest management scenario.

Table 4-78: Access schedule sensitivity analysis results.

TSA Scenario		Conifer Harvest Level (m^3/yr at 15/11) Evenflow/ Pre-stepdown	Conifer Harvest Level (m^3/yr at 15/11) Post-stepdown	10-year Average Highly Susceptible Pine % of Pine Area Harvested	Average Clearcut Age for Years 51-100 (years)	Area of Highly Susceptible Pine 20 Years in Future (ha)	Ending L Area (ha)
RUN61001	SHS Version 1	172,985		0%	0	0	11,356
RUN61003	SHS Version 2	172,323		0%	0	0	7,306
RUN90001	Round 9 baseline	167,853		16%	147	7,401	9,486
RUN90002	Include planned blocks	164,375		16%	150	7,582	9,340
RUN90003	60% access schedule	165,591		17%	148	7,416	9,745
RUN90004	40% access schedule	162,989		17%	151	7,497	9,990
RUN90018	Reduce average harvest	218,205	157,102	70%	140	7,134	1,748
RUN90021	Modified compartment sequence	218,622	157,373	63%	156	10,641	1,572
RUN90021	Modified compartment	218,622	157,373	63%	156	10,641	1,572
RUN90021 A	SHS Version 3	218,607	157,392	56%	155	10,422	1,133
RUN90022	Preferred Forest Management Scenario	209,414	157,140	48%	153	12,905	3,449
Percent Difference from Baseline							
RUN61001	SHS Version 1			baseline			
RUN61003	SHS Version 2	0%					-36%
RUN90001	Round 9 baseline			baseline			
RUN90002	Include planned blocks	-2%		1%	2%	2%	-2%
RUN90003	60% access schedule	-1%		6%	1%	0%	3%
RUN90004	40% access schedule	-3%		8%	3%	1%	5%
RUN90018	Reduce average harvest age			baseline			
RUN90021	Modified compartment sequence	0%	0%	-11%	11%	49%	-10%
RUN90021	Modified compartment sequence			baseline			
RUN90021 A	SHS Version 3	0%	0%	-11%	0%	-2%	-28%
RUN90022	Preferred Forest Management Scenario	-4%	0%	-24%	-2%	21%	119%

4.9.16 Spatial Harvest Sequence

The assessment of the spatial harvest sequence involved review of large-scale maps to determine if the stands selected for harvest were operationally feasible. This assessment was subjective and involved both

the Planning Team and the quota holders. Some of the issues that were considered during the assessment were:

- Proximity of blocks to one another;
- Current and planned road access;
- Size and shape of blocks;
- Size, shape and age of forested patches in the managed landbase that were near blocks;
- Entire AVI stands selected for harvest;
- Location of highly susceptible pine stands; and
- Location of planned blocks.

5. Preferred Forest Management Scenario

5.1 Overview

RUN90022 best met the desired future forest as determined by the Planning Team and was therefore selected as the preferred forest management scenario. The preferred forest management scenario is spatially-explicit, with a recommended conifer harvest level and associated 20-year spatial harvest sequence.

A summary of the preferred forest management scenario inputs, assumptions and results are provided in this section. The results of the preferred forest management scenario became the targets required by the Planning Standard. In addition, other implementation targets requested by the Planning Team have been included. Finally, the 20-year spatial harvest sequence is provided.

Many issues, such as ground rules which specify stream buffering, block layout and roading, will be addressed under a separate planning process which is outside the scope of a detailed forest management plan. Treatments will be applied in stands based on the local conditions (e.g. Allison Chinook Forest Land Use Zone).

5.2 Description

Table 5-1 presents the assumptions used in the TSA model for the preferred forest management scenario.

Table 5-1: Assumptions used in the TSA model for the preferred forest management scenario.

TSA Section	Assumption	Description
Landbase	Round 9	Round 7 with additional historic block information, additional planned blocks, wildlife habitats and revised mountain pine beetle hazard ratings minus highly suitable wildlife habitat for harlequin duck, wolverine, long-toed salamandar and western toad.
Yields	Complete	Baseline yields with an added area-weighted average yield curve for regenerating blocks harvested post-1991. Also included proportionally reduced yield curves for thinning treatments (50% and 60% of baseline volumes).
Regen Delay		10 (Yield Curve 1 C-Fd) 5 (remaining yield curves)
Lifespan	Final	Lifespans by cover type in Table 4-12. Provided by SRD with separate lifespans for C-La and C-Fa.
Actions	All treatments	Clearcut, partial cut and burn. Minimum treatment ages in Table 4-13 (all treatments).
Transitions	Back to itself with wildlife restriction	Stands regenerate back to the pre-treatment yield curve. Only one clearcut harvest permitted in highway wildlife corridors. Rules in Table 4-14.
Access Schedule	Oct 20/05	Final sequence addressing access and mountain pine beetle issues.
Planned Treatments	All planned treatments identified in Round 9	Forced treatment schedule for planned blocks.
Targets	Harvest Volume	Maintain 120% of current evenflow conifer AAC for first 21 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon
	Carryover	Harvest 143,000 m^3 conifer volume for carryover in years 2-6
	Harvest Area	Harvest at least 850 ha of pine in first year, 900 ha/yr of pine in years 2-6, 850 ha/yr of pine in years 7-21, and 300 ha/yr pine in years 22-51.
	Greenup Patch	0.5-500 ha in Middle Ridges 0.5-250 ha outside of Middle Ridges
	Growing Stock	Minimum merchantable conifer growing stock of 2.89 million m^3.
	Pine Area	Zero area of highly susceptible stands.
	Late Seral Stages	Level 1 by C5 subregion (increased weighting) (Table 4-16)
	Regen Seral Stage	Maximum areas in regen seral stage by C5 subregion
	Regen Patch	Minimum and maximum regen patch size class distributions (Table 4-20).

The goals and resulting levels from the preferred forest management scenario are provided in Figure 5-1. Graphs have years in future on the x-axis and level on the y-axis. Goals may be a maximum, shown by a red line, and/or a minimum, shown by a blue line. The black line on the graphs is the resulting area/volume/proportion by period.

Figure 5-1 shows that not all the goals were achieved, for example, the area of late old growth is consistently below the minimum level shown in red. The actual levels for the next 10 years become the targets, and these indicators must be monitored, reported and any deviations addressed as described in the Planning Standard.

The weightings for all goals, with the exception of the harvest area of pine and area of highly susceptible pine, were consistent throughout the planning horizon.

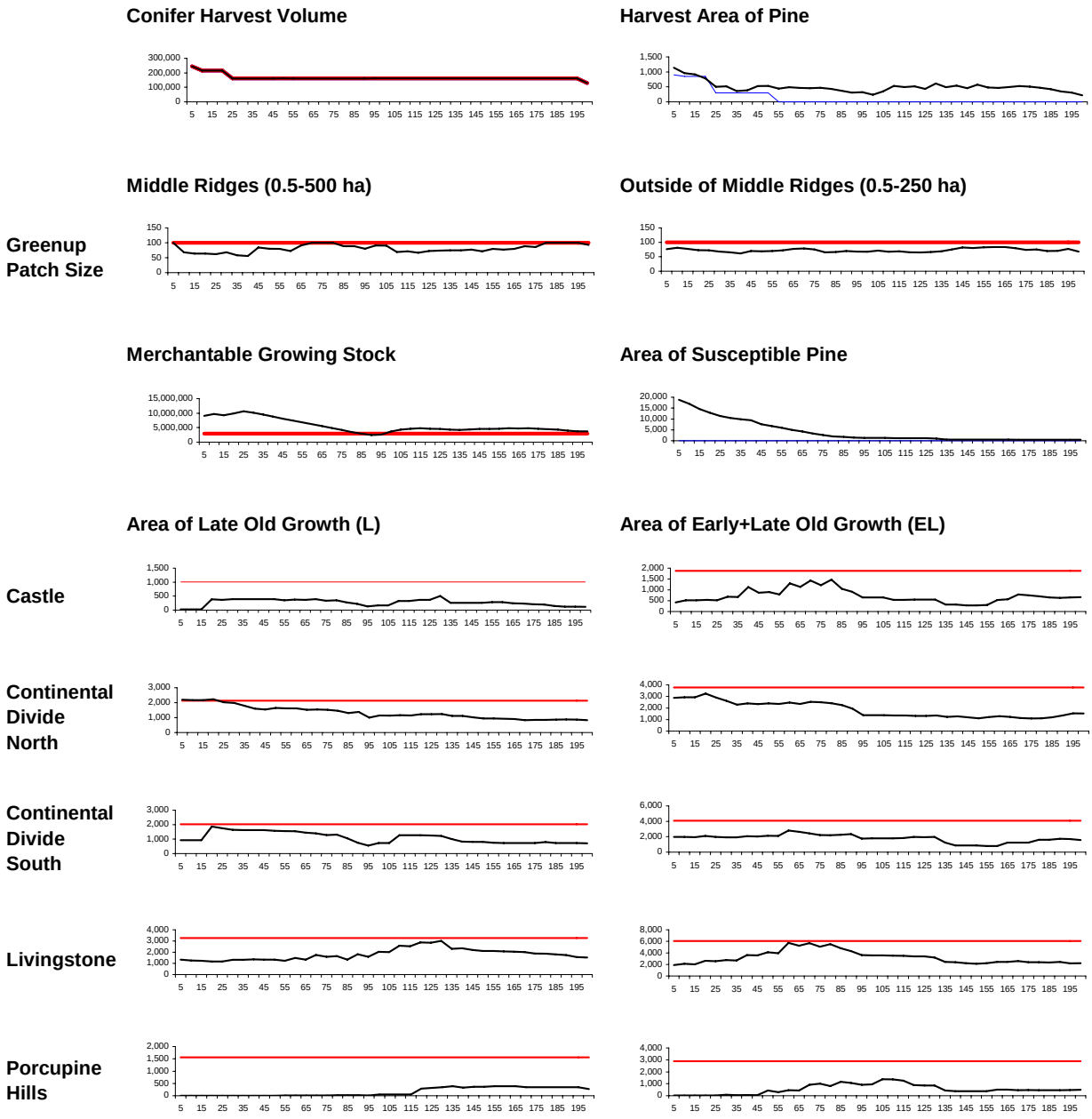


Figure 5-1: Active goals in the preferred forest management scenario TSA model.

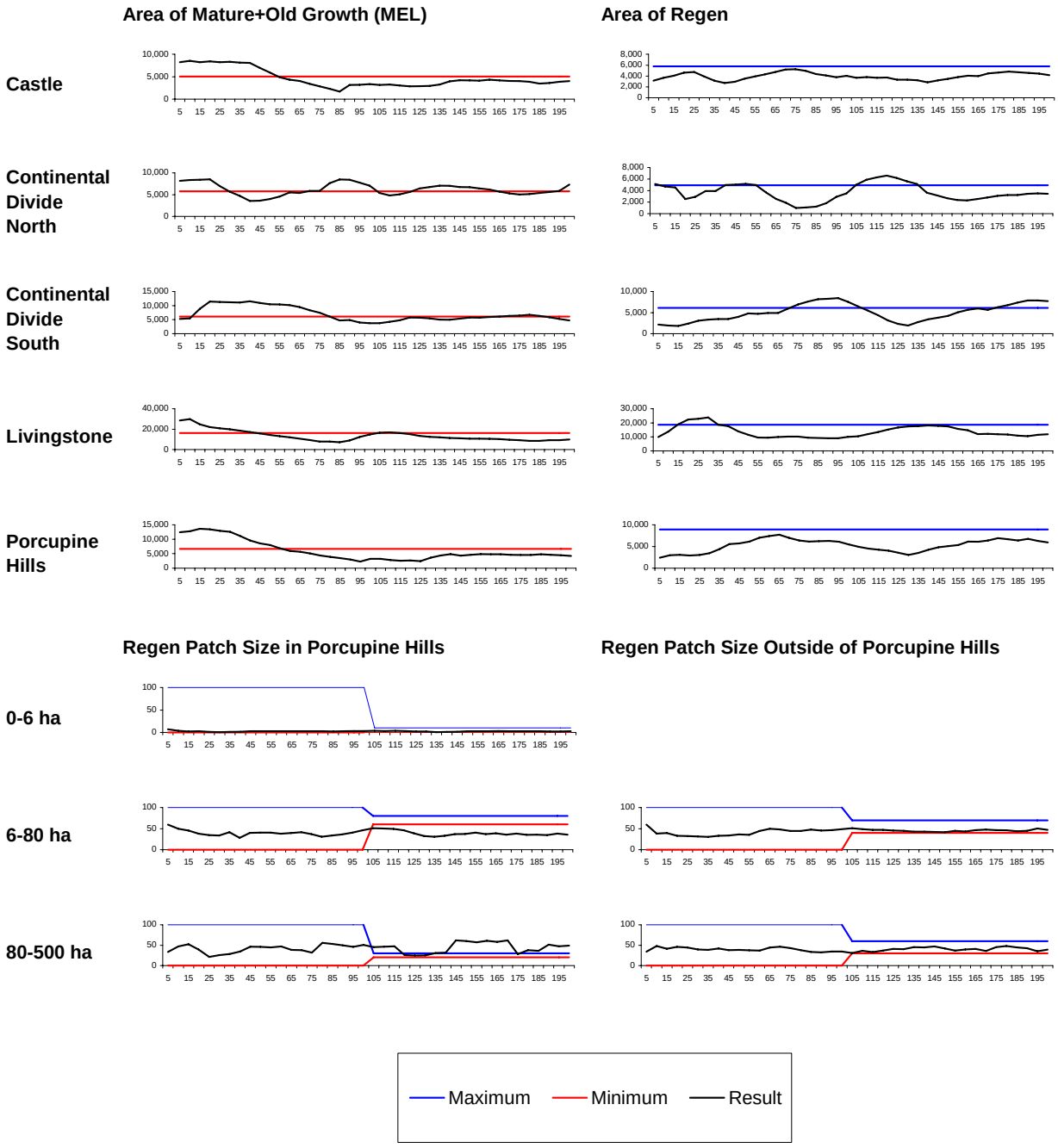


Figure 5-1: Active goals in the preferred forest management scenario TSA model. (continued)

Results from the preferred forest management scenario presented in the previous section are grouped together in Figure 5-2. The results of the assumptions made in the preferred forest management scenario are evident in the graphical representation.

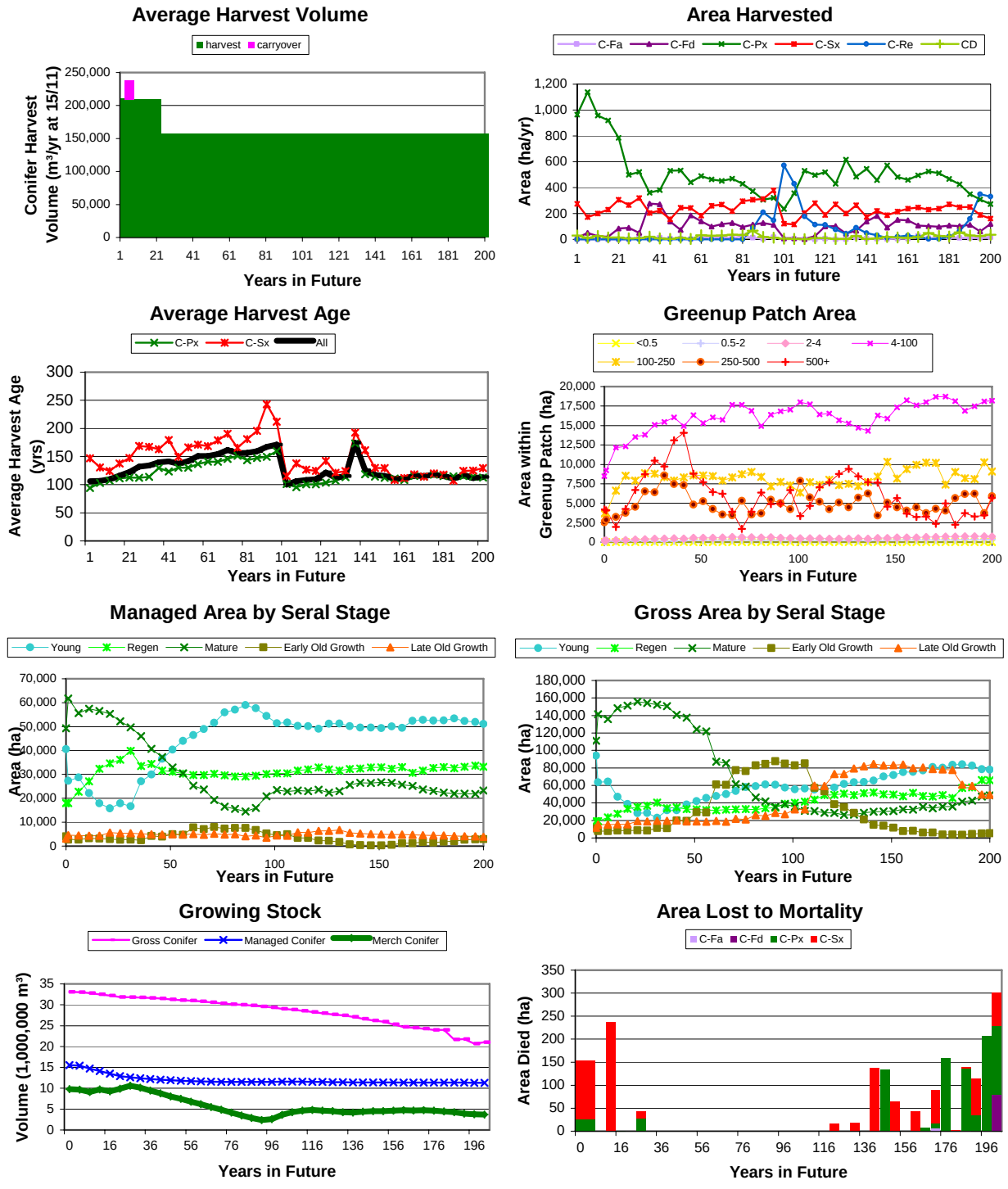


Figure 5-2: Preferred forest management scenario TSA results.

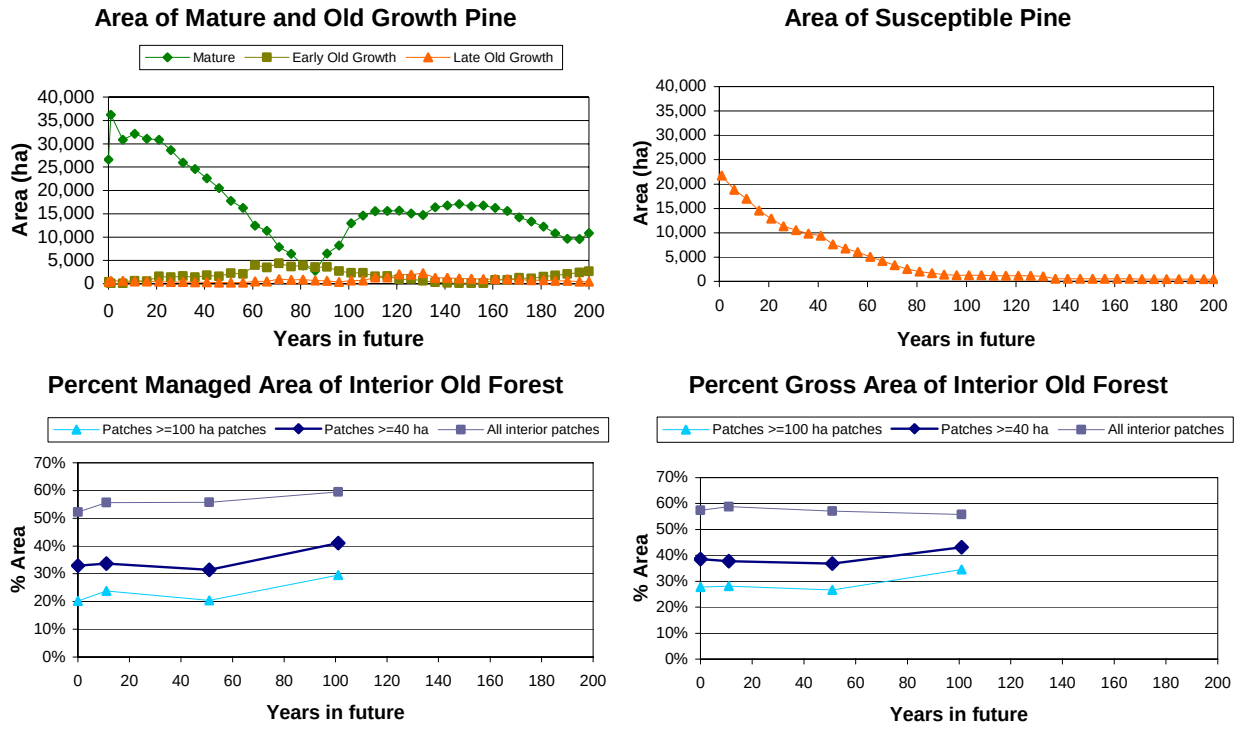


Figure 5-2: Preferred forest management scenario TSA results. (continued)

Only conifer harvest volume was modeled, and the annual allowable cut that will be the outcome of this plan will only address conifer volume. The average harvest volume was higher for the first 21 years of the planning horizon, then the harvest level stepped down to a stable, sustainable level. In addition to the AAC, 143,000 m³ of carryover volume was harvested in the first five years of the spatial harvest sequence.

More pine area than any other cover type was harvested by the model for the first 21 years of the planning horizon as a result of the mountain pine beetle strategy followed in this plan. After 21 years, the harvest area by cover type had small fluctuations, but generally represented the proportion of those cover types that exist on the landscape. In about 100 years, there was a large amount of the regen cover type harvested, which was the second harvest of the stands that have been harvested over the last 15 years.

The average harvest age increased for the first rotation, with the average harvest age for spruce well above the average. This was the result of the mountain pine beetle strategy that prioritized pine in the first two decades.

The area in greenup patches increased over the first 41 years due to harvesting activities. After 41 years, relatively the same amount of area was harvested every year.

The area by seral stage on the managed landbase showed a shift towards the younger seral stages as a result of harvesting activities. On the gross landbase, where harvesting will not occur, stands continued to age into the old growth seral stages. Eventually, stands reached the maximum age, and transitioned into younger stands, thus the reduction of late old growth seral area over the last 20 years of the planning horizon.

The merchantable growing stock was relatively stable over the last 90 years of the planning horizon, with a small decline at the very end, which was an artifact of the modeling tools used.

It is inevitable to lose some area on the managed landbase to mortality, and there was less than 2% of the managed landbase, or 2,033 ha lost to mortality in the preferred forest management scenario. Some of this area was within the first few decades and were stands that were not available to the model for harvest. The majority of the area lost to mortality was closer to the end of the planning horizon, where the evenflow harvest assumption prevented the model from utilizing the volume in these stands as harvest.

The area of mature and old growth pine remained high for the first 25 years, and then declines. The minimum area of mature and old growth pine occurs at 86 years, about the same time as the lowest growing stock and highest average harvest age. This point in time at 86 years into the planning horizon is the limiting factor to the harvest level, which means that the merchantable volume is the most constrained in this period, and if the amount of merchantable volume could be increased, it would have the largest impact on the harvest level. After 86 years, the area of mature and old growth quickly recovers and remains somewhat stable.

The area of susceptible pine on the managed landbase slowly decreased over the first rotation until there was very little left.

The proportion of interior old forest, in all size classes was stable for the first 51 years of the planning horizon.

5.3 Selection

The preferred forest management scenario met almost all of the criteria of the desired future forest (Table 5-2). The targets for indicators that were not met are highlighted by red text. It was impossible to meet all of the criteria of the desired future forest and the preferred forest management scenario was the best balance between all the values and objectives, in the opinion of the Planning Team.

For this analysis, the maximum evenflow harvest level was very close to the current AAC and the post-stepdown harvest level was set at 90% of the current harvest level (see TSA scenario results in section 4.9.1 Harvest Flow). However, if the pre-stepdown harvest levels are compared, the maximum harvest level was much higher than the 120% set in the preferred forest management scenario (up to 333,000 m^3/yr). It could be concluded that reducing the pre-stepdown harvest level increased the post-stepdown harvest level if desired, and therefore the planned stepdown harvest was sustainable as defined by the Planning Team.

Table 5-2: Preferred forest management results compared to the desired future forest.

Indicator	Desired Future Forest	Preferred Forest Management Scenario
Harvest Volume	120% of the current AAC for the first 20 years of the planning horizon, then planned stepdown to 90% of the current AAC.	120% of the current AAC for the first 20 years of the planning horizon, then planned stepdown to 90% of the current AAC.
	LRSY (205, 365 m^3/yr at 15/11).	Post-stepdown harvest level was much lower (157,140 m^3/yr at 15/11).
	Maximum 10% drop in post-stepdown harvest level from comparable evenflow harvest level.	10% drop in post-stepdown harvest level from comparable evenflow harvest level.
Pine Harvest Area	Remove 75% of susceptible stands over a 20-year period.	Harvested 41% ((21,761-12,905)/21,761) of the area of highly susceptible pine on the managed landbase during the first 20 years of the planning horizon.
Average Harvest Age	Below 150 years for C-Fa, 140 years for C-Px and 20 years for C-Sx.	Average harvest ages were above the maximum desired in 16 periods, primarily 40-95 years in the future.
Merchantable Growing Stock	Non-declining in last 50 years.	Merchantable growing stock declined in the last 30 years from 4.77 million m^3 at 15/11 to 3.78 m^3 at 15/11at the end of the planning horizon.
	Ending merchantable growing stock level at least 10 times the annual conifer harvest level.	Ending merchantable growing stock of 3.78 million m^3 at 15/11 is equivalent to 24 years of harvest.
	Minimum merchantable growing stock level at least 90% of ending growing stock level.	Minimum merchantable growing stock of 2.39 million m^3 at 15/11 was 63% of ending merchantable growing stock level.
Late Seral	Minimum level of late old growth 1/3 of level 1 target area (1/3 of 9,548 ha is 3,183 ha).	Ending late old growth seral stage area of 3,449 ha.
Access Schedule	Operationally feasible and minimize adverse effects on other values.	The Planning Team's assessment of the access schedule determined that it was operationally feasible and minimized adverse effects on other values.

Red text are indicators that did not meet the desired future forest targets.

The preferred forest management scenario was selected over all the other TSA scenarios analyzed. In some cases, other scenarios better met certain targets of the desired future forest, but were unacceptable when other indicators were considered. A list of the TSA scenarios that were close to meeting the criteria of the desired future forest, and the primary reason they were not considered for the preferred forest management scenario is in Table 5-3. Non-spatial scenarios do not meet the requirements of the preferred forest management strategy, therefore only spatial TSA scenarios are included in this table.

Table 5-3: Reasons for not selecting TSA scenarios as the preferred forest management scenario.

TSA Scenario	Reason for not Selecting TSA Scenario as PFMS
RUN90014	Did not harvest enough pine in first 20 years. Too much highly susceptible pine left in years 20 and 50. Unacceptable access schedule that was not operationally feasible.
RUN90017	Not enough ending late old growth seral stage area. Unacceptable access schedule that was not operationally feasible.
RUN90018	Harvest level too high (125% of current AAC). Not enough ending late old growth seral stage area. Unacceptable access schedule that was not operationally feasible.
RUN90021	Harvest level too high (125% of current AAC). Not enough ending late old growth seral stage area. Unacceptable access schedule that was not operationally feasible.
RUN90021A	Harvest level too high (125% of current AAC). Unacceptable access schedule that was not operationally feasible. Unacceptable spatial harvest sequence.

5.4 Results

Detailed results requested by the Planning Team are provided in the following tables and figures:

- Conifer harvest volume by C5 subregion and period for the entire planning horizon (Table 5-4);
- Conifer harvest volume and area by adjusted compartment for first four decades (Table 5-5);
- Average harvest age by cover type and period for the entire planning horizon (Table 5-6 and Figure 5-3);
- Area harvested by 10-year age class and period for each yield curve for the entire planning horizon (Table 5-6 to Table 5-15);
- Total conifer growing stock on the managed landbase by C5 subregion and period (Table 5-16 and Figure 5-4);
- Merchantable conifer growing stock on the managed landbase by C5 subregion and period (Table 5-17 and Figure 5-5);

Table 5-4: Conifer harvest volume by C5 subregion and period.

Years in future	Conifer Harvest Volume (m³/yr at 15/11) by C5 Subregion					Total
	Castle	Continental Divide North	Continental Divide South	Livingstone	Porcupine Hills	
1	9,755	278	8,191	173,002	18,652	209,878
2-6[1]	52,807	14,972	6,311	136,535	27,352	237,977
7-11	36,007	-	7,490	141,602	24,285	209,383
12-16	15,751	-	2,528	180,966	10,154	209,399
17-21	21,139	-	22,568	152,374	13,322	209,403
22-26	7,188	56,929	25,283	45,336	22,159	156,895
27-31	9,999	43,930	46,342	40,497	16,129	156,897
32-36	9,708	33,634	6,854	50,415	56,283	156,895
37-41	4,167	35,351	5,606	56,331	55,446	156,900
42-46	44,766	2,159	27,481	46,332	35,982	156,719
47-51	36,521	4,005	32,654	62,650	21,587	157,417
52-56	35,633	4,772	23,534	46,591	46,194	156,723
57-61	21,824	3,552	35,791	62,829	32,712	156,707
62-66	24,884	5,398	46,196	58,408	21,837	156,722
67-71	24,184	4,623	43,572	58,317	26,038	156,734
72-76	23,503	2,210	40,643	59,532	30,731	156,619
77-81	22,202	5,185	53,734	37,112	38,457	156,690
82-86	24,308	9,194	49,644	44,762	28,784	156,691
87-91	16,714	19,587	35,583	48,318	36,490	156,691
92-96	11,140	34,235	33,357	47,746	30,950	157,428
97-101	28,468	25,745	12,921	86,819	3,338	157,290
102-106	17,310	58,801	4,488	68,921	7,777	157,296
107-111	19,979	30,612	3,906	85,320	17,538	157,356
112-116	19,731	20,197	6,327	94,418	16,679	157,351
117-121	15,146	21,711	5,017	97,700	17,738	157,312
122-126	7,032	14,916	18,407	97,679	19,277	157,311
127-131	18,652	8,745	17,033	98,965	13,920	157,315
132-136	17,955	9,516	38,889	70,824	20,245	157,428
137-141	10,517	10,349	21,532	82,653	32,278	157,329
142-146	21,031	15,496	17,576	64,850	38,394	157,347
147-151	31,696	6,310	21,553	74,053	23,710	157,323
152-156	24,821	12,765	34,018	54,011	31,744	157,359
157-161	20,038	16,056	31,780	57,739	31,758	157,370
162-166	23,526	22,836	32,768	53,195	25,059	157,385
167-171	24,780	14,059	29,173	55,786	33,524	157,323
172-176	14,798	21,119	40,793	53,975	26,678	157,362
177-181	20,058	20,446	36,738	53,815	26,331	157,388
182-186	27,629	13,276	45,505	46,211	24,772	157,393
187-191	15,049	14,736	40,629	50,515	36,424	157,353
192-196	19,361	12,411	29,377	79,234	17,010	157,392
197-200	17,083	11,286	33,897	66,214	28,901	157,381

[1] Carryover volume of 143,000 m³ is included.

Table 5-5: Volume and area harvested by compartment.

Adjusted Compartment	Volume Harvested (m^3 at 15/11) Years in Future				Area Harvested (ha) Years in Future			
	2-11[1]	12-21	22-31	32-41	2-11[1]	12-21	22-31	32-41
BC	44,882	86,918	-	-	292	556	-	-
BCR	-	-	-	24,445	-	-	-	114
BMC	63,130	22,839	42,322	34,971	385	128	175	149
BMI1	-	-	5,729	4,839	-	-	26	30
BMI2	149,550	49,980	-	-	730	232	-	-
BML	-	-	14,841	5,395	-	-	92	36
CPC	59,214	-	23,826	-	366	-	154	-
CWG1	-	23,166	2,557	-	-	163	15	-
CWG2	22,094	91,132	-	-	114	549	-	-
CWM	2,350	11,681	-	-	17	82	-	-
CWU1	-	-	141,046	-	-	-	838	-
CWU2	-	-	160,208	-	-	-	943	-
CWU3	-	-	60,352	-	-	-	416	-
CWW	-	-	-	62,322	-	-	-	328
FCR	-	-	14,761	231	-	-	75	1
HEC1	72,657	-	48,750	73,406	428	-	265	438
HEC2	44,834	-	-	-	243	-	-	-
HED1	-	-	-	72,984	-	-	-	546
HED2	-	-	30,887	-	-	-	206	-
HER1	-	-	42,128	-	-	-	315	-
HER2	-	-	44,625	-	-	-	270	-
HEU1	-	-	90,763	28,369	-	-	460	172
HEU2	1,517	-	250,869	170,889	7	-	1,369	928
HOS	-	-	40,841	-	-	-	159	-
IRC1	183,863	24,907	4,015	-	1,164	146	20	-
LIL	11,642	228,893	-	-	62	1,343	-	-
MIC1	128,729	-	141,155	207,065	762	-	880	1,231
MIC2	168,052	32,426	3,255	8,082	1,000	176	23	51
MID1	63,671	-	-	-	371	-	-	-
MID2	60,986	73,883	-	-	340	384	-	-
MIL	4,801	250,804	-	-	23	1,364	-	-
MIR1	39,745	159,115	-	-	217	879	-	-
MIR2	-	185,836	-	-	-	1,031	-	-
MIR3	107,356	231,185	-	-	650	1,311	-	-
MIU1	-	-	63,525	49,376	-	-	349	264
MIU2	-	244,223	-	-	-	1,323	-	-
MIU3	237,289	-	-	-	1,237	-	-	-
NLL	252,062	-	-	-	1,385	-	-	-
NWC	170,006	24,384	-	-	964	128	-	-
PBC1	14,446	-	-	-	87	-	-	-
PLO1	-	-	-	7,467	-	-	-	47
PLO2	54,372	-	-	-	357	-	-	-
PLO3	7,612	-	-	258,918	55	-	-	1,438
PTC1	173,808	84,270	141,490	111,339	1,089	536	653	547
PTC2	4,848	-	50,712	93,663	35	-	298	563
PTC3	4,132	-	-	89,500	24	-	-	519
PWC	-	33,576	-	-	-	182	-	-
SAW1	-	21	95,160	170,608	-	0	537	890
SAW2	31,669	242,585	-	-	212	1,371	0	-
SFRM	-	536	-	-	-	3	-	-
SOLC	51,546	-	45,862	89,769	291	-	325	516
Total	2,230,864	2,102,360	1,559,680	1,563,637	12,907	11,886	8,864	8,807

[1] Carryover volume of 143,000 m^3 in years 2-6 is included.

Table 5-6: Average harvest age by cover type and period.

Years in future	Cover Type						All
	C-Fa	C-Fd	C-Px	C-Sx	C-Re	CD	
1	131	111	94	147	0	115	106
2-6[1]	119	109	103	131	0	101	107
7-11	0	103	107	124	0	99	110
12-16	126	108	111	138	0	114	116
17-21	111	121	113	148	0	114	122
22-26	97	135	112	169	0	129	132
27-31	152	130	114	167	0	115	134
32-36	139	137	130	163	0	125	140
37-41	138	136	124	179	0	128	141
42-46	153	150	130	150	0	143	137
47-51	151	145	130	166	0	137	142
52-56	157	158	137	171	0	171	151
57-61	155	162	141	169	0	142	151
62-66	132	160	140	179	0	145	154
67-71	170	162	146	190	0	141	162
72-76	150	161	151	165	0	147	156
77-81	145	152	144	181	0	127	156
82-86	142	157	147	196	93	156	160
87-91	200	144	149	243	96	146	167
92-96	164	161	160	212	98	175	171
97-101	92	100	101	115	96	93	100
102-106	136	96	95	138	106	96	106
107-111	0	101	100	127	112	103	109
112-116	107	99	101	125	114	110	110
117-121	137	183	103	142	118	105	122
122-126	93	103	107	121	121	109	112
127-131	100	96	113	124	124	101	115
132-136	177	190	173	193	129	135	175
137-141	205	102	119	161	137	105	126
142-146	98	106	114	130	140	113	117
147-151	98	106	112	129	147	115	116
152-156	104	105	111	108	157	106	110
157-161	101	110	108	112	149	107	111
162-166	106	110	116	118	158	110	116
167-171	160	118	114	114	169	113	115
172-176	106	115	118	120	164	103	118
177-181	98	113	115	118	125	103	115
182-186	104	109	115	107	107	106	111
187-191	104	108	115	125	114	108	116
192-196	122	116	114	125	101	110	112
197-200	152	116	113	130	102	130	114

[1] Carryover volume of 143,000 m^3 is included.

Red numbers are above the desired average harvest age.

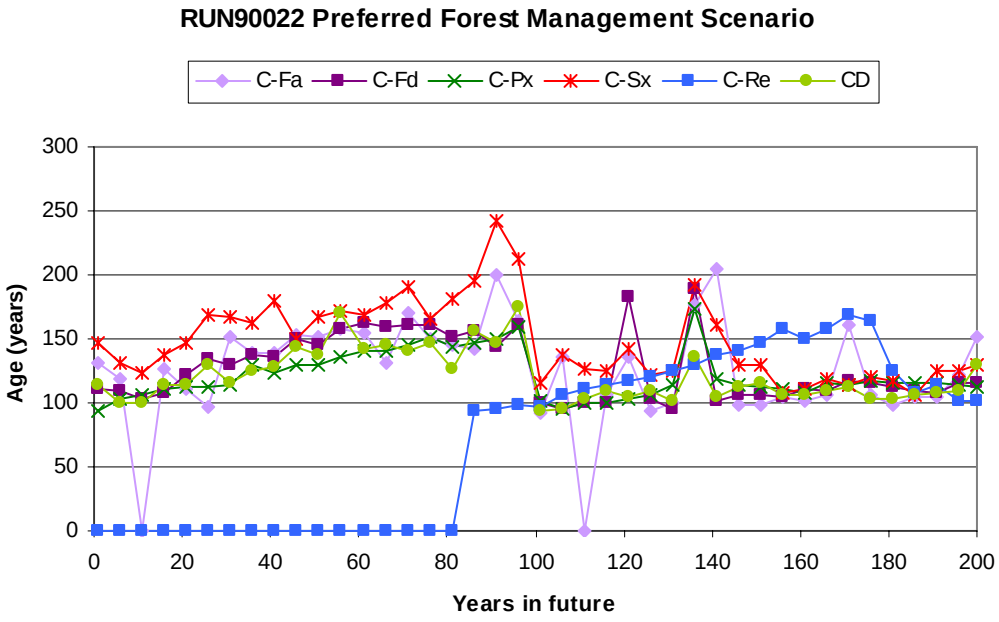


Figure 5-3: Average harvest age by cover type.

Table 5-7: Area harvested by 10-year age class and period for yield curve 1 C-Fd-All.

Yield Curve 1 C-Fd-All																		
	Avg Area Harvested by 10-year Age Class (ha/yr)																	
Years in Future	86-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241+	Total
1			1	1														3
2-6[1]			27	8	13		1											50
7-11		2	22															24
12-16			6	14														20
17-21		5	10	36		28		4										84
22-26				4	17	50	15		5									90
27-31			4		29	1	13				2							50
32-36				30	23	89	133	1										277
37-41		5	2	67	6	73	27	90		3								271
42-46					1	43	19	67	8	1								138
47-51					9	8	25	18	12									72
52-56					1	30	47	29	52	20	2						5	186
57-61					0	9	5	32	25	67	2							140
62-66					1	13	24	11	11	27	11							99
67-71		2				1	10	6	74	14	12							118
72-76		5	7		1	7	11	1	54	33	9							127
77-81		8	15	2		5		19	3	23		19						95
82-86		11	12	10				12	8	27	21	14						114
87-91		20	5	28	11				35		9	2	18					128
92-96		0	16	30					9	4	12	13	10	18				112
97-101		7		2	1													10
102-106		10																10
107-111			4															4
112-116		11	15															26
117-121		23	3											76				101
122-126		44	55	2	1												1	104
127-131		37	8															46
132-136		9	3		12		0	0						5	4	13	20	68
137-141		60	70	9														139
142-146		17	145	8	7			5										181
147-151		19	35	32	4													91
152-156		53	60	34	5													152
157-161		49	32	21	25	20												148
162-166		34	27	30	10	6												107
167-171		6	37	12	15	33												102
172-176		24	20	19	2	17	13	1										98
177-181		17	52	10	4	17	6											106
182-186		54	6	16	13	6	7											103
187-191		57	18	11	4		22											112
192-196		17	21	2	2	1	12	3	4									61
197-200		12	38	13	20			9			4							96

Table 5-8: Area harvested by 10-year age class and period for yield curve 2 C-Pl-All-M.

Yield Curve 2 C-Pl-All-M																	
	Avg Area Harvested by 10-year Age Class (ha/yr)																
Years in Future	86-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241+	Total
1		14	3															17
2-6[1]	11	135	93	7	11	1												258
7-11		159	61	24		5												249
12-16	1	57	133	63		9	48	10										321
17-21		12	121	127	29	2	10								16			316
22-26	0	63	10	12	11	3	1											100
27-31		147	25	39	45	21	1											278
32-36		5	16	22	10	6	4	6										69
37-41			5	28	66	8	5											112
42-46			2	98	19	33	16	2	8									178
47-51				85	55	61	8		4									213
52-56				9	69	81	47	11										216
57-61		1			78	62	46	15	0									202
62-66					8	126	41	19	5									199
67-71		2	1		1	114	61	24	9								1	214
72-76		1	5	20		42	57	33	16	1								175
77-81		17	13	3	26	10	71	59	16	18	1							236
82-86		1	17	13			28	23	32	5	6			4	9			139
87-91			11	11	2		6	27	4	3				9	13			86
92-96			1	12	1			39	6	15	24			4	8	1		110
97-101		56													4			60
102-106		92	1															93
107-111		137	39															175
112-116		68	101	0		15												184
117-121		100	63	8														171
122-126		27	95	24											8			153
127-131		58	81	49	19													207
132-136		5	44	23	21				2	1		12	3	44	9	1		166
137-141		36	66	24	37	20								11				194
142-146		47	36	15	34	7			8									147
147-151		77	47	15	15	15	3											171
152-156		95	66	21	18	4	2										6	212
157-161		72	33	16	16	4	2										1	144
162-166		68	38	60	9	31												205
167-171		74	102	13	2	7	12	15								6		231
172-176		74	47	39	27	6	12	23										228
177-181		72	70	23	10		28	4	2	2								211
182-186		59	45	15	15	4	12										2	152
187-191		36	33	16	20	5	5	10										124
192-196		42	15	38	17	7	4			6								129
197-200		21	17	21	22	2	0			6								89

Table 5-9: Area harvested by 10-year age class and period for yield curve 3 C-Pl-AB-SA.

Yield Curve 3 C-Pl-AB-SA																	
	Avg Area Harvested by 10-year Age Class (ha/yr)																
Years in Future	86-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241+	Total
1		26					4											30
2-6[1]		73	17	53		21	2						1					167
7-11		19	86	20	3	20	3						1				0	153
12-16		15	61	12	17	5	8											118
17-21			12	69	5	7	9	2										103
22-26		9	7	18		3	1	4	3							0	2	48
27-31		14	17	9	5	2	2	1							1	1	4	55
32-36		1	13	30	13	1			4									62
37-41			2	4	46	31	15											99
42-46			0	1	9	16	4	1	0						1		10	41
47-51		1		18	6	34	4	9	0									72
52-56				2	5	12	15	2	2	1								39
57-61			1		2	14	17	0	1								2	36
62-66			2		7	8	13	2									4	35
67-71				3	2	18	6	8	5	0								43
72-76				0		0	7	2	1								24	34
77-81		6	18	5	2		8	1	6									45
82-86		2	30	39	6		2	8	0					3	3			93
87-91			8	45	30			1	0	0		0	1	5	4			95
92-96		5		19	32	7		1	2	2	2	5	2		16	0		91
97-101		34		3	5	8										5		55
102-106		41	10	2														53
107-111		58	14														2	74
112-116		29	36	2	6													73
117-121		24	18	38			1										3	84
122-126		5	43	19	4													71
127-131		9	43	23	3												3	81
132-136		8	3	2	12		3	12					3	16	31		4	93
137-141		6	15	20	25	19		10									1	97
142-146		21	15	3	16	6											2	63
147-151		25	9	33	5	3	4											77
152-156		9	12	9	3	3	7											42
157-161		20	11	17	12	3	3	0										66
162-166		14	5	10	5	2	1										1	39
167-171		12	11	10	10	2			2									47
172-176		6	3	13	5	6	2		2									36
177-181		19	17	4		4	8											52
182-186		24	12	3		10	2	0		1							0	53
187-191		13	27	1	1	3	1	2										48
192-196		26	12	2			5		2									48
197-200		15	4		5	2	0	0										27

Table 5-10: Area harvested by 10-year age class and period for yield curve 4 C-Pl-CD-SA.

Yield Curve 4 C-Pl-CD-SA																		
	Avg Area Harvested by 10-year Age Class (ha/yr)																	
Years in Future	86-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241+	Total
1		88		3	1	9	2						2					105
2-6[1]	1	419	38	85	8	56	21				7						1	637
7-11	1	88	304	8	20	55	36						8			5	10	534
12-16	28	76	233	17	34	16	57	4										464
17-21		9	35	113	4	63	40	1										264
22-26	41	99	41	53	56	16	16	8	20							1		352
27-31		36	12	15	78	9	12	18	7								2	189
32-36		1	36	11	88	31	9	3	29	14		0	2			0	6	230
37-41			8	72	30	35	11	6	7	0							1	170
42-46				89	84	85	7	41									4	310
47-51				31	62	69	51	14	13	7								247
52-56				2	14	63	76	18	5	5							1	185
57-61					48	72	95	3	0	16	11						7	253
62-66			2		6	94	49	70	6	2							2	231
67-71						60	68	39	13			8	2				3	195
72-76				8		28	131	30	53	3		2	4				2	260
77-81		0	2	3	9	4	62	31	24	7	1			3			1	149
82-86		0		15	3		23	50	11	15	5			12	7			140
87-91			1	8	13		4	64	11	7	1		7	4	2		3	125
92-96				6	22			38	12	15	14	2	3	2	1	7		120
97-101	7	115							5									127
102-106		171	39															210
107-111		166	88			5				7		15						281
112-116		140	90	5		0	4										0	239
117-121		70	139	40			12										2	263
122-126		17	120	62	8												0	206
127-131		55	111	77	47		6							30			2	328
132-136		1	19	30	22			0	1	5		0	61	22	27	26	10	225
137-141		41	33	89	31	53											7	255
142-146		57	34	49	54	40	6		9									247
147-151		40	125	26	33	60	29							11				324
152-156		62	90	15	22	1	30							9				228
157-161		125	29	31	29	17	15	2										249
162-166		80	41	20	22	57	12	9									10	251
167-171		53	72	31	28	35	17	6	2								4	247
172-176		48	35	36	48	26	40	5	0								8	247
177-181		38	57	30	21	3	46	5	2	0							2	205
182-186		42	86	16	14	15	31	13	0	2							2	220
187-191		37	27	53	9	15	22	9		3	1							177
192-196		33	21	17	24	6	23	5	2		1							132
197-200		44	11	17	9	9	4		7	1								102

Table 5-11: Area harvested by 10-year age class and period for yield curve 5 C-Sx-All-M.

Yield Curve 5 C-Sx-All-M																		
	Avg Area Harvested by 10-year Age Class (ha/yr)																	
Years in Future	86-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241+	Total
1					1													1
2-6[1]		11	10	10	10		21		1						5			67
7-11		3	22	7	4	3	11											50
12-16			6	20	4	3		4		5					1		2	44
17-21				6	45	1	6	18		4			7		9	4		101
22-26		4	3	4	14	10	23	5		2							11	75
27-31		2	3	16	17	26	26	11	2	5							1	109
32-36			2	7	5	20	23	5	3	2	1	1					1	70
37-41			2	8	8	22	21	11	2	0								76
42-46			7	17	0	11	16	8	7	2	4	3						74
47-51				12		4	21	13	14	2	4						1	72
52-56				15	7	4	18	16	3	12	17	2					14	107
57-61					19	13	9	9	2	14		6					1	73
62-66					3	33	19	16	16	2	2		7	2			1	100
67-71		1	9	3		29	14	13	5	0	18	9						101
72-76		1	2	8	10	3	44	2	5	4		1	4					83
77-81		2	5	10	3	1	50	43	17	6	1	13						150
82-86		4	10	2	11	4	34	8	8	10	2			1	0		4	97
87-91		0	13	12	13	1		25		4		0				4		73
92-96			1	2			0	8	3	14	7	2	3	5			1	46
97-101		11				4												15
102-106		2		2									6					10
107-111		17	14								6							38
112-116		5	13											24				42
117-121		17	19	3		1												41
122-126		38	55	3	1						15							112
127-131		17	25	10	7			4										63
132-136		4	1	1						2		10	6	2	6	10	26	68
137-141		10	21	15	8	0												54
142-146		12	26	8	3													50
147-151		37	31	17	7	1												92
152-156		26	31	16	23	4											3	102
157-161		34	19	5	11	3	1	7										80
162-166		28	21	15	7	2	0											74
167-171		22	38	11	6	4		5										86
172-176		22	14	7	4	0	20	12	2									82
177-181		44	19	12	1		9	1										86
182-186		58	25	10	9	1	0	4										107
187-191		18	41	8	8	3												77
192-196		8	9	2	7	2	1			3	4							37
197-200		10	12	2	4	2	4		0		0							35

Table 5-12: Area harvested by 10-year age class and period for yield curve 6 C-Sx-AB-SA.

Yield Curve 6 C-Sx-AB-SA																	
	Avg Area Harvested by 10-year Age Class (ha/yr)																
Years in Future	86-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241+	Total
1		11		8	1	6	5		1				4			6	4	46
2-6[1]		5	10	9	18	6	2	0							0		7	57
7-11		14	15	3	5	24											5	65
12-16		2	14	2	14	8	3	11	6						5		2	69
17-21				16	11	15	6	6		5					14		4	77
22-26		1		1	4	18	8		12								23	67
27-31		2		12	3	5	34		21				8				56	141
32-36			7	7	2	5	11	2									28	62
37-41		1	3	2	14	4	31								12		42	108
42-46		0	0	1	0	7	11	0	14	0		0					3	39
47-51				6	4	9	10	9	22	4	3	1	14				17	97
52-56					2	3	12	8	5	11	0	2				2	17	61
57-61		7	5		4	6	11	2		5	1	3					25	68
62-66		24	15	2	4	3	5	9			6					1	55	124
67-71		1	15	7	2	9	10	1			2	2					67	114
72-76		3		13		3	3	3	1				1			3	38	67
77-81			7	12	9	2	5	5	0	2			1	1			59	104
82-86			7	50	14	3	4			3	2			1		1	80	164
87-91			0	13	6							17	2	1			148	187
92-96				1	44	34		1		1	0	17		15			104	217
97-101		30				34												64
102-106		18				26	1										3	47
107-111		15	14			63											8	101
112-116		52	12	7		14	16										5	105
117-121		16	29	2		18	3	3									26	97
122-126		7	29	1	11	22	16	2									8	96
127-131		7	14	27	1	10											14	73
132-136		2	2	6	4			13	2	22	0		3	0		3	23	81
137-141		7	20	5	6	0		5									38	81
142-146		24	19	2		1	5										21	71
147-151		31	2	8		1											13	55
152-156		27	8	2	25													63
157-161		65	12	5	2	7	2	2									4	99
162-166		61	7	17		23		0									9	117
167-171		42	14	7	7	5	11										5	90
172-176		32	21		5	21	18		3								2	102
177-181		45	21	5	2	11	26					8					2	120
182-186		53	22	8	1	11	4											99
187-191		27	53	4		3	24	1	0								18	131
192-196		27	14	2	22	8		30	21									124
197-200		14	9	3	2	10			26						5		3	72

Table 5-13: Area harvested by 10-year age class and period for yield curve 7 C-Sx-CD-SA.

Yield Curve 7 C-Sx-CD-SA																		
	Avg Area Harvested by 10-year Age Class (ha/yr)																	
Years in Future	86-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241+	Total
1		2			4		2											9
2-6[1]		17		6	18	5	1	1							0			48
7-11		8	14	2	9	51	1											85
12-16			30		4	7	37	35	2	2								118
17-21			3	48	0	6	38	29							4			129
22-26		18		1			16	1	56						11		20	123
27-31		9			1	0	39	9	8		3				3	4	4	81
32-36		1	2	2	8	9	16	26		9						0	1	76
37-41			8	3	4	2	9	3	9	8						5	1	52
42-46			0	0	0	11	8	1	13	11		0					1	47
47-51				9	0	16	11	1	18	2	11		13					81
52-56					3	9	19	11		32	0						2	75
57-61			0		14	15	9	5	1	9		1					5	59
62-66			5		3	15	4	3	7	3	5		0				2	46
67-71			1	1		37	16	4	2		2						9	71
72-76			32	1	4	18	4	4	0	0		12					0	77
77-81				2	9		49	5				1					0	67
82-86			1	11	1		15	3		6	0		1				22	60
87-91					9	1		7	1		5			3	4		28	58
92-96					15	22	3	7	16	1	8	4	19	1	7	5	25	133
97-101		13				30												43
102-106		24				21	13										5	63
107-111		28	15			4	17											64
112-116		77	23	1		13	2	12									4	133
117-121		26	24	2		2	0										2	55
122-126		19	26	11			7											64
127-131		17	23	23	1													65
132-136		4	14	8	12				27	15	2	5	0		8	0	31	128
137-141		7	10	17	5	2											2	44
142-146		34	32	22	5	0			9								3	106
147-151		25	5	1	5		0										7	44
152-156		36	12	1	3		4											56
157-161		31	16	5	2	9	1										1	66
162-166		23	9	21		28												82
167-171		24	11	8	5	10	4										1	62
172-176		19	16	7	4	9	14											69
177-181		33	16	5	5	5	9	9										82
182-186		16	9	16	1	2	8	1										54
187-191		6	11	2	7	3	0	14	8								3	53
192-196		13	14	2	1	4		3	2									39
197-200		9	9	11		2			3								1	35

Table 5-14: Area harvested by 10-year age class and period for yield curve 8.

Yield Curve 8 CD																	
	Avg Area Harvested by 10-year Age Class (ha/yr)																
Years in Future	86-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241+	Total
1		3				1	2											6
2-6[1]		9	1	0	2													12
7-11		8	17		2													27
12-16		3	1	8	1		2											15
17-21		11		1			2							1				15
22-26					6			1										7
27-31			5			4												9
32-36		3		2	9	7												21
37-41			2	0	0	0	5											8
42-46					0	0	3											3
47-51					2	3	8	0	0	0								13
52-56							2	1							1			4
57-61				1	2	3	18	7										32
62-66						7	16	5			0							27
67-71					2	10	9	7										29
72-76					1	8	18	0	5	3								35
77-81		13	0	1	0	1	11	3	4									34
82-86		1	8	2	3	5	9	16	5	5			3	10	1			67
87-91			5	2			6			2				3				18
92-96					1			2	3		2	1		3				13
97-101		5																5
102-106		2	2															3
107-111			3															3
112-116		3	5										1					9
117-121			10															10
122-126			1	2														3
127-131		2	1	1														4
132-136			2	15	2			3				1		3	1			27
137-141		2		1	1													5
142-146		3	0			4												7
147-151		2	0	10		6												19
152-156		7	2	2		0	2											14
157-161		4	3	5														11
162-166		5	10	0				4										19
167-171		18	17	9										5				49
172-176		15	6	3	2		0											26
177-181		11	8		1	2												23
182-186		22	19	4	3		0	5										53
187-191		18	3	3	1		5											30
192-196		8	8	4	3	3												26
197-200		4	13	1					6	4								29

Table 5-15: Area harvested by 10-year age class and period for yield curve R regen.

Yield Curve R Regen																	
	Avg Area Harvested by 10-year Age Class (ha/yr)																
Years in Future	86-90	91-100	101-110	111-120	121-130	131-140	141-150	151-160	161-170	171-180	181-190	191-200	201-210	211-220	221-230	231-240	241+	Total
1																		-
2-6[1]																		-
7-11																		-
12-16																		-
17-21																		-
22-26																		-
27-31																		-
32-36																		-
37-41																		-
42-46																		-
47-51																		-
52-56																		-
57-61																		-
62-66																		-
67-71																		-
72-76																		-
77-81																		-
82-86		85																85
87-91		197	13															210
92-96		91	57															148
97-101		315	203	54														572
102-106		33	227	170														430
107-111			44	103	31													178
112-116				95	19													114
117-121				53	54	5												112
122-126					74	3												77
127-131					28	12	2											42
132-136					42	45	3											90
137-141						22	26											48
142-146							32											32
147-151							1	10										11
152-156								11	9									20
157-161								29										29
162-166									17	2								19
167-171									3	0								3
172-176									4									4
177-181		13								8	0							22
182-186		54									9							63
187-191		118	9									33						159
192-196		297	24									5	23					349
197-200		224	20									1	20					265

Table 5-16: Total conifer growing stock on the managed landbase by C5 subregion and period.

Years in future	Total Conifer Growing Stock (000,000 m³/yr at 15/11) by C5 Subregion					Total
	Castle	Continental Divide North	Continental Divide South	Livingstone	Porcupine Hills	
0	2.07	1.59	2.37	6.85	2.70	15.58
1	2.07	1.60	2.39	6.71	2.69	15.47
6	1.86	1.60	2.48	6.20	2.63	14.77
11	1.73	1.67	2.55	5.62	2.58	14.16
16	1.71	1.75	2.65	4.84	2.60	13.55
21	1.66	1.84	2.64	4.24	2.59	12.97
26	1.69	1.63	2.61	4.22	2.54	12.69
31	1.71	1.48	2.46	4.29	2.52	12.46
36	1.74	1.39	2.51	4.34	2.29	12.27
41	1.79	1.30	2.56	4.38	2.07	12.10
46	1.64	1.39	2.51	4.48	1.95	11.97
51	1.53	1.47	2.43	4.50	1.92	11.85
56	1.42	1.56	2.39	4.61	1.77	11.75
61	1.39	1.66	2.30	4.64	1.70	11.68
66	1.35	1.74	2.15	4.69	1.69	11.62
71	1.33	1.83	2.02	4.74	1.68	11.59
76	1.31	1.92	1.90	4.79	1.64	11.57
81	1.30	1.99	1.73	4.96	1.57	11.56
86	1.29	2.04	1.60	5.08	1.56	11.57
91	1.32	2.02	1.54	5.19	1.51	11.58
96	1.38	1.93	1.51	5.29	1.49	11.59
101	1.35	1.87	1.59	5.18	1.61	11.60
106	1.38	1.65	1.73	5.14	1.72	11.61
111	1.38	1.57	1.87	5.00	1.78	11.60
116	1.39	1.54	2.00	4.81	1.84	11.58
121	1.42	1.52	2.13	4.60	1.88	11.55
126	1.50	1.54	2.19	4.39	1.92	11.53
131	1.51	1.59	2.24	4.18	1.98	11.50
136	1.52	1.65	2.17	4.12	2.00	11.47
141	1.58	1.70	2.18	4.03	1.96	11.45
146	1.57	1.72	2.22	4.04	1.89	11.44
151	1.51	1.79	2.23	4.02	1.88	11.44
156	1.48	1.82	2.18	4.12	1.83	11.43
161	1.47	1.84	2.14	4.19	1.78	11.42
166	1.44	1.81	2.09	4.29	1.77	11.41
171	1.41	1.82	2.06	4.39	1.72	11.40
176	1.43	1.80	1.96	4.48	1.70	11.38
181	1.43	1.79	1.89	4.57	1.69	11.38
186	1.39	1.81	1.78	4.70	1.69	11.37
191	1.41	1.83	1.69	4.81	1.63	11.37
196	1.41	1.85	1.67	4.74	1.67	11.34
200	1.43	1.88	1.63	4.74	1.65	11.33

Table 5-17: Merchantable conifer growing stock on the managed landbase by C5 subregion and period.

Years in future	Merchantable Conifer Growing Stock (000,000 m³/yr at 15/11) by C5 Subregion					Total
	Castle	Continental Divide North	Continental Divide South	Livingstone	Porcupine Hills	
0	1.34	0.79	0.92	4.94	1.84	9.82
1	1.34	0.79	0.91	4.80	1.84	9.68
6	1.21	0.74	0.89	4.40	1.87	9.11
11	1.34	0.84	0.86	4.51	2.21	9.76
16	1.32	0.91	0.87	3.86	2.35	9.31
21	1.39	1.17	1.13	3.82	2.40	9.92
26	1.54	0.94	2.14	3.71	2.32	10.66
31	1.52	0.79	1.97	3.61	2.29	10.19
36	1.48	0.63	1.97	3.39	2.02	9.50
41	1.49	0.49	1.99	3.13	1.75	8.85
46	1.26	0.48	1.89	2.91	1.57	8.11
51	1.08	0.47	1.88	2.60	1.46	7.49
56	0.90	0.44	1.82	2.41	1.23	6.79
61	0.79	0.43	1.73	2.15	1.10	6.20
66	0.66	0.39	1.54	1.89	1.03	5.52
71	0.58	0.38	1.42	1.60	0.92	4.90
76	0.49	0.41	1.23	1.29	0.79	4.20
81	0.37	0.46	0.96	1.09	0.61	3.50
86	0.25	0.45	0.72	0.95	0.52	2.90
91	0.18	0.42	0.57	0.82	0.41	2.40
96	0.31	0.56	0.53	0.93	0.30	2.63
101	0.43	0.74	0.56	1.56	0.39	3.67
106	0.52	0.57	0.56	2.17	0.47	4.29
111	0.50	0.56	0.57	2.56	0.44	4.63
116	0.50	0.50	0.68	2.70	0.46	4.83
121	0.48	0.47	0.80	2.45	0.44	4.63
126	0.50	0.40	0.93	2.17	0.52	4.53
131	0.45	0.39	0.88	1.88	0.70	4.29
136	0.46	0.38	0.73	1.80	0.84	4.21
141	0.62	0.53	0.75	1.67	0.81	4.39
146	0.71	0.58	0.82	1.63	0.80	4.53
151	0.67	0.65	0.83	1.53	0.89	4.56
156	0.67	0.73	0.83	1.54	0.85	4.62
161	0.69	0.76	0.92	1.58	0.82	4.77
166	0.68	0.72	0.95	1.55	0.83	4.73
171	0.66	0.73	1.04	1.52	0.82	4.77
176	0.71	0.67	1.07	1.39	0.83	4.67
181	0.69	0.58	1.12	1.30	0.81	4.50
186	0.62	0.54	1.07	1.25	0.84	4.32
191	0.57	0.48	0.93	1.21	0.78	3.98
196	0.58	0.43	0.85	1.17	0.75	3.78
200	0.62	0.43	0.75	1.25	0.66	3.70

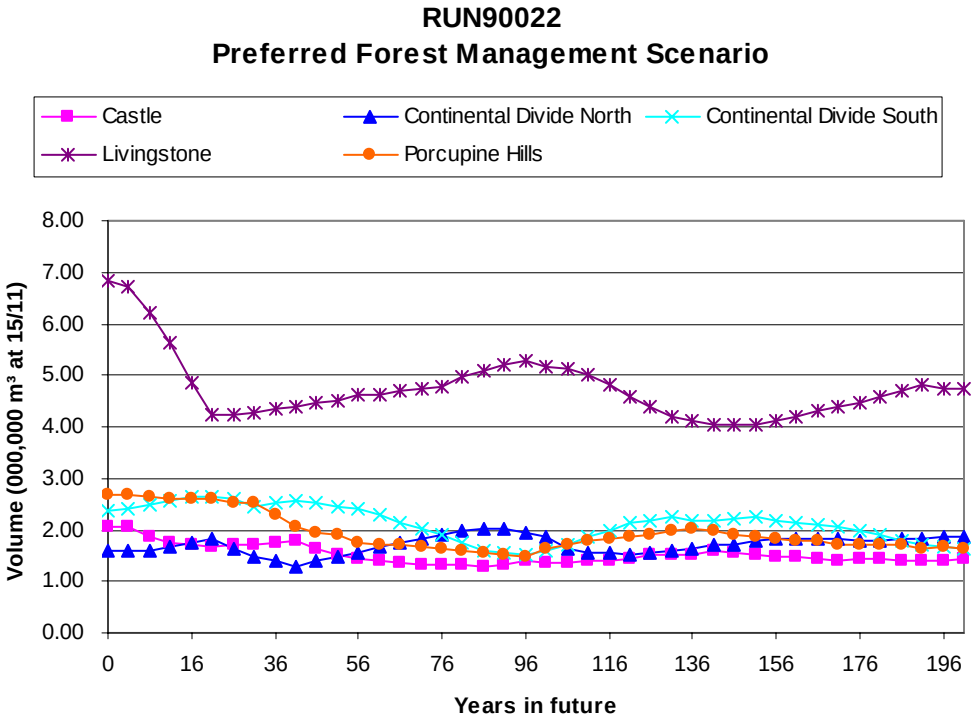


Figure 5-4: Total conifer growing stock on the managed landbase by C5 subregion.

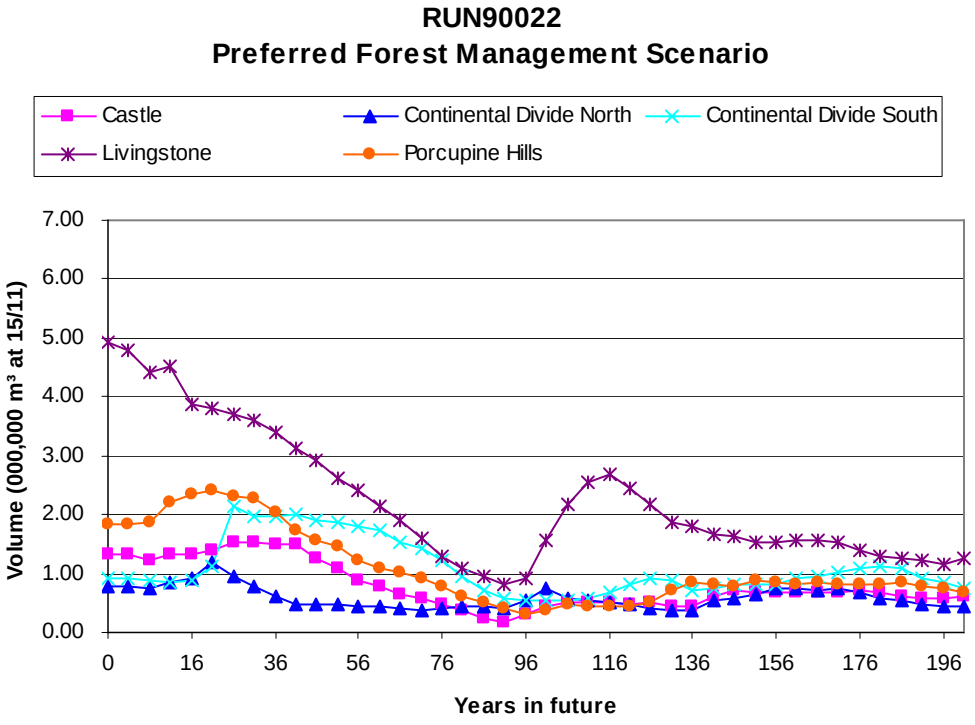


Figure 5-5: Merchantable conifer growing stock on the managed landbase by C5 subregion.

Although the Planning Standard only requires a 20-year spatial harvest sequence, for long term planning, the following results are summarized by decade for the first 40 years of the spatial harvest sequence:

- Average harvest volume by cover type (Table 5-18);
- Average harvest area by cover type (Table 5-19);
- Average harvest volume by cover type and C5 subregion (Table 5-20);
- Average harvest area by cover type and C5 subregion (Table 5-21);
- Average harvest volume and area by special management zone (Table 5-22); and
- Average harvest volume and area by elk habitat type (Table 5-23).

A shapefile of the classified landbase, including the 40-year harvest sequence is provided on the DVD in Addendum VII. The data dictionary for the shapefile is in Addendum VI.

Table 5-18: 40-year SHS harvest volume by cover type.

Years in Future	Cover Type					Total
	C-Fa	C-Fd	C-Px	C-Sx	CD	
Volume Harvested (m³ at 15/11)						
2-11[1]	684	55,133	1,796,390	354,890	23,768	2,230,864
12-21	1,543	86,409	1,479,540	515,330	19,537	2,102,360
22-31	9,311	109,896	888,587	542,064	9,821	1,559,680
32-41	16,370	473,783	657,351	396,604	19,530	1,563,637
Percent Volume Harvested (%)						
2-11[1]	0%	2%	81%	16%	1%	100%
12-21	0%	4%	70%	25%	1%	100%
22-31	1%	7%	57%	35%	1%	100%
32-41	1%	30%	42%	25%	1%	100%

[1] Carryover volume of 143,000 m³ in years 2-6 is included.

Table 5-19: 40-year SHS harvest area by cover type.

Years in Future	Cover Type					Total
	C-Fa	C-Fd	C-Px	C-Sx	CD	
Area Harvested (ha)						
2-11[1]	3	360	10,207	1,812	189	12,571
12-21	8	504	8,306	2,611	149	11,577
22-31	51	684	4,970	2,851	78	8,633
32-41	87	2,666	3,615	2,069	140	8,578
Percent Area Harvested (%)						
2-11[1]	0%	3%	81%	14%	2%	100%
12-21	0%	4%	72%	23%	1%	100%
22-31	1%	8%	58%	33%	1%	100%
32-41	1%	31%	42%	24%	2%	100%

[1] Carryover volume of 143,000 m³ in years 2-6 is included.

Table 5-20: 40-year SHS harvest volume by cover type and C5 subregion.

C5 Subregion	Years in Future	Cover Type					Total
		C-Fa	C-Fd	C-Px	C-Sx	CD	
Castle	**Volume Harvested (m³ at 15/11)**						
	2-11[1]	684	11,554	323,442	101,011	4,735	441,425
	12-21	734	17,613	120,029	46,105	698	185,180
	22-31	725	183	39,521	45,844		86,273
	32-41		13,044	16,351	38,745	1,512	69,651
	Percent Volume Harvested (%)						
	2-11[1]	0%	3%	73%	23%	1%	100%
	12-21	0%	10%	65%	25%	0%	100%
	22-31	1%	0%	46%	53%		100%
	32-41		19%	23%	56%	2%	100%
Continental Divide North	**Volume Harvested (m³ at 15/11)**						
	2-11[1]			74,028	147		74,175
	12-21						0
	22-31	8,548		315,702	179,118	2,870	506,237
	32-41	9,435	20,888	208,870	106,095	358	345,647
	Percent Volume Harvested (%)						
	2-11[1]			100%	0%		100%
	12-21						
	22-31	2%		62%	35%	1%	100%
	32-41	3%	6%	60%	31%	0%	100%
Continental Divide South	**Volume Harvested (m³ at 15/11)**						
	2-11[1]		4,822	51,671	12,171	615	69,279
	12-21			82,157	43,822		125,979
	22-31	39	1,451	229,955	123,033	5,080	359,558
	32-41	6,616		13,935	42,002		62,553
	Percent Volume Harvested (%)						
	2-11[1]		7%	75%	18%	1%	100%
	12-21			65%	35%		100%
	22-31	0%	0%	64%	34%	1%	100%
	32-41	11%		22%	67%		100%
Livingstone	**Volume Harvested (m³ at 15/11)**						
	2-11[1]		10,842	1,146,708	210,801	18,418	1,386,769
	12-21	808	36,978	1,205,718	411,012	18,839	1,673,355
	22-31		1,145	294,259	118,135	1,870	415,409
	32-41	318	9,427	363,164	137,786	14,204	524,899
	Percent Volume Harvested (%)						
	2-11[1]		1%	83%	15%	1%	100%
	12-21	0%	2%	72%	25%	1%	100%
	22-31		0%	71%	28%	0%	100%
	32-41	0%	2%	69%	26%	3%	100%
Porcupine Hills	**Volume Harvested (m³ at 15/11)**						
	2-11[1]		27,916	200,542	30,760		259,217
	12-21		31,819	71,637	14,390		117,845
	22-31		107,117	9,151	75,935		192,202
	32-41		430,423	55,031	71,977	3,456	560,887
	Percent Volume Harvested (%)						
	2-11[1]		11%	77%	12%		100%
	12-21		27%	61%	12%		100%
	22-31		56%	5%	40%		100%
	32-41		77%	10%	13%	1%	100%

[1] Carryover volume of 143,000 m³ in years 2-6 is included.

Table 5-21: 40-year SHS harvest area by cover type and C5 subregion.

C5 Subregion	Years in Future	Cover Type					Total
		C-Fa	C-Fd	C-Px	C-Sx	CD	
Castle	**Area Harvested (ha)**						
	2-11[1]	3	96	1,995	375	36	2,505
	12-21	4	103	728	196	5	1,036
	22-31	4	1	246	173		425
	32-41		73	97	139	12	321
	Percent Area Harvested (%)						
	2-11[1]	0%	4%	80%	15%	1%	100%
	12-21	0%	10%	70%	19%	1%	100%
	22-31	1%	0%	58%	41%		100%
	32-41		23%	30%	43%	4%	100%
Continental Divide North	**Area Harvested (ha)**						
	2-11[1]			423	1		424
	12-21						0
	22-31	47		1,526	1,204	23	2,799
	32-41	51	118	1,052	806	3	2,030
	Percent Area Harvested (%)						
	2-11[1]			100%	0%		100%
	12-21						
	22-31	2%		55%	43%	1%	100%
	32-41	3%	6%	52%	40%	0%	100%
Continental Divide South	**Area Harvested (ha)**						
	2-11[1]		29	282	48	5	364
	12-21			541	232		773
	22-31	0	9	1,427	637	36	2,108
	32-41	35		86	200		321
	Percent Area Harvested (%)						
	2-11[1]		8%	78%	13%	1%	100%
	12-21			70%	30%		100%
	22-31	0%	0%	68%	30%	2%	100%
	32-41	11%		27%	62%		100%
Livingstone	**Area Harvested (ha)**						
	2-11[1]		64	6,192	1,270	148	7,675
	12-21	4	212	6,578	2,131	143	9,069
	22-31		74	1,715	567	19	2,375
	32-41	2	55	2,045	670	102	2,873
	Percent Area Harvested (%)						
	2-11[1]		1%	81%	17%	2%	100%
	12-21	0%	2%	73%	23%	2%	100%
	22-31		3%	72%	24%	1%	100%
	32-41	0%	2%	71%	23%	4%	100%
Porcupine Hills	**Area Harvested (ha)**						
	2-11[1]		171	1,315	118		1,604
	12-21		189	459	52		700
	22-31		601	57	269		927
	32-41		2,420	335	254	24	3,032
	Percent Area Harvested (%)						
	2-11[1]		11%	82%	7%		100%
	12-21		27%	66%	7%		100%
	22-31		65%	6%	29%		100%
	32-41		80%	11%	8%	1%	100%

[1] Carryover volume of 143,000 m³ in years 2-6 is included.

Table 5-22: 40-year SHS harvest volume and area by special management zone.

Years in Future	Special Management Zone					Total
	Adjacent to Elkhorn Ranch	Syncline Ski Area	Highway Wildlife Corridors	400m Pond Buffers outside of Highway Wildlife Corridors	400m Pond Buffers within Highway Wildlife Corridors	
Volume Harvested (m³ at 15/11)						
2-11[1]	4,106		192,331	5,843	6,372	208,652
12-21			16,336			16,336
22-31	30,721	20,997	30,220	3,340	3,021	88,300
32-41	25,260	9,319	71,865			106,444
Area Harvested (ha)						
2-11[1]	35		1,054	40	44	1,172
12-21			76			76
22-31	234	157	162	17	14	583
32-41	170	58	406			635

[1] Carryover volume of 143,000 m³ in years 2-6 is included.

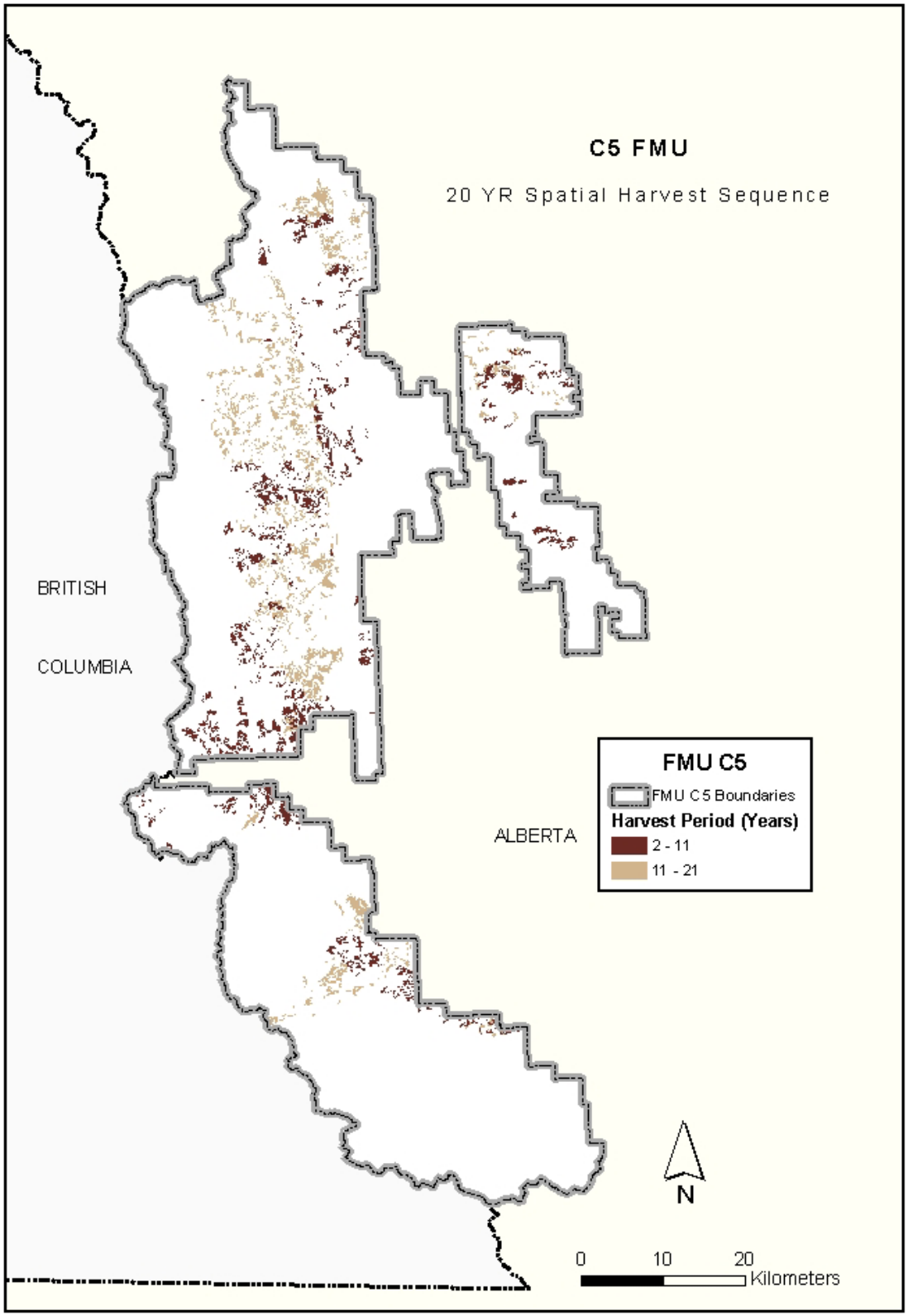
Table 5-23: 40-year SHS harvest volume and area by elk habitat type.

Years in Future	Elk Habitat Type				Total
	Calving	Winter Habitat	Migration Area	Calving + Winter Habitat	
Volume Harvested (m³ at 15/11)					
2-11[1]	327,180	47,157	498,545	-	872,882
12-21	205,512	-	526,392	-	731,905
22-31	304,044	33,468	173,294	-	510,806
32-41	236,879	206,257	90,421	-	533,557
Area Harvested (ha)					
2-11[1]	2,028	293	2,726	-	5,048
12-21	1,200	-	2,927	-	4,126
22-31	1,683	196	1,057	-	2,936
32-41	1,272	1,165	529	-	2,966

[1] Carryover volume of 143,000 m³ in years 2-6 is included.

5.5 20-year Harvest Sequence

The preferred forest management scenario 20-year spatial harvest sequence is presented by harvest decade in Figure 5-6 and by cover type in Figure 5-7. The harvest sequence has been identified for two 10-year periods (2006-2015 and 2016-2025). Although only the first 10 years of the spatial harvest sequence will be implemented under this plan, a longer time period was considered to ensure long-term sustainability of the forest management actions in short-term and ease the transition to the next planning period.



Note: Harvest period 2-11 corresponds to May 1, 2006 to April 30, 2016.
Harvest period 11-21 corresponds to May 1, 2016 to April 30, 2026.

Figure 5-6: Map of the 20-year spatial harvest sequence by harvest period.

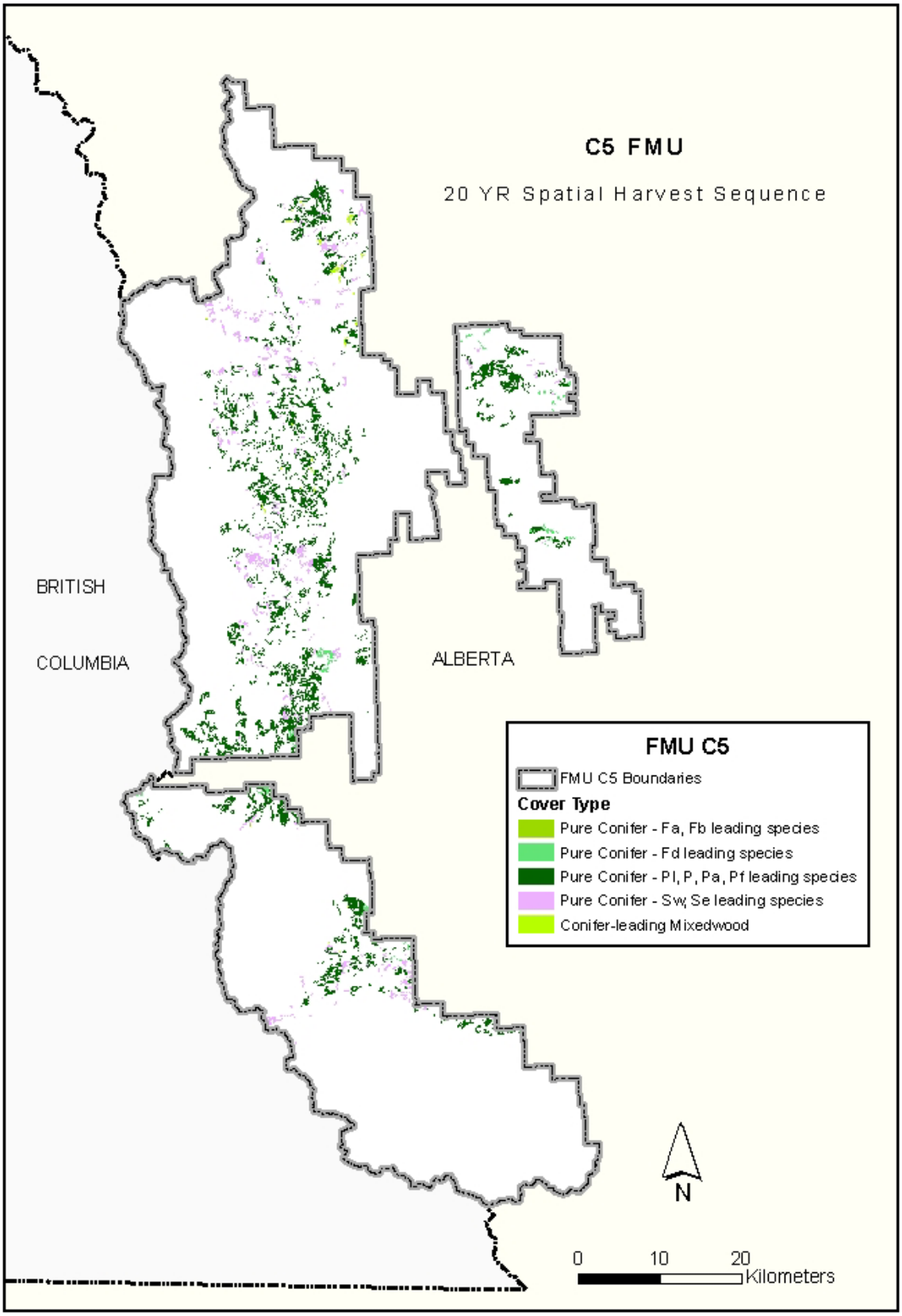


Figure 5-7: Map of the 20-year spatial harvest sequence by cover type.

6. References

Forest Management Branch. 2003. *Landscape Assessment.* Alberta Sustainable Resource Development, Public Lands and Forests Division, Forest Management Branch. Digital (on CD).

Forest Management Branch. 2005a. *Alberta Forest Management Planning Standard*. Version 3 - June 2005. Alberta Sustainable Resource Development, Public Lands and Forests Division, Forest Management Branch. 107 pp.

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Trees Consulting Inc. 2004. *Crowsnest Landscape Fire Assessment: Crowsnest, Alberta.* Prepared by Trees Consulting Inc. October 13, 2004.

Watertight Solutions Ltd. 2006. *Hydrological Effects of the Preferred Forest Management Scenario in the C5 Forest Management Unit.*

Addendum I RFP Checklist

This addendum contains the RFP checklist which validates this submission meets the requirements of the Planning Standard.

Alberta Forest Management Planning Standard (Version 3 - June 2005)

"A listing of the individual Alberta Forest Management Planning standards constitutes a checklist. Adherence to this list shall be used to demonstrate a RFP's due diligence and accuracy of the submission."

Annex 1: Timber Supply Analysis and Growth & Yield

Standard	Submitted to SRD (Y/N)	Initials of RFP Submitting	Initials of RFP Preparing	Modification of Standard Approved by SRD Prior to Submission	Comments	Location of Supporting Documentation
1.0 General Standards						
1.1 All submissions related to TSA requiring Alberta's approval are validated by a RFP.	Y	BM	BM		This submission is the May 12, 2006 Development of the Preferred Forest Management Scenario. It includes one digital copy of relevant data on DVD in the appendices. This checklist relating to the Forecasting and Harvest Planning Standards validates this submission.	RPF checklist
1.2 All submissions meet Alberta's requirements.	Y	BM	BM		The May 12, 2006 Development of the Preferred Forest Management Scenario submission meets the Forecasting and Harvest Planning Standards outlined in Annex 1: Timber Supply Analysis and Growth & Yield of the Alberta Forest Management Planning Standard, Version 3 - June 2005.	Entire submission
5.0 Forecasting Standards						
5.1 The TSA for the preferred forest management scenario generates maps showing the future forest condition at appropriate strategic and operational scales.	Y	BM	BM		A landbase shapefile and stand listing provides information about the areas harvested and future forest condition.	Digital information on DVD

Standard	Submitted to SRD (Y/N)	Initials of RFP Submitting	Initials of RFP Preparing	Modification of Standard Approved by SRD Prior to Submission	Comments	Location of Supporting Documentation
5.2 The model(s) used in forecasting, the landbase description, and the yield projections used for the forecasts submitted for approval, have been approved by Alberta.	Y	BM	BM		Woodstock and Patchworks were the TSA tools used in forecasting. The landbase classification and yield projections were submitted separately for approval.	Verbal acceptance of Patchworks and Woodstock as the TSA tools.
5.3 A complete digital copy of the model formulation and a description of the process used to create the input files for each forecast is available to Alberta on request.	Y	BM	BM			Model components for the preferred forest management scenario on DVD.
5.4 The submission includes a detailed explanation of the decision-making process used to select the preferred scenario.	Y	BM	BM		Decisions were provided by the Planning Team.	Sections 4.5 and 5.3.
5.5 The submission includes a description of the forecasts completed (see standard 5.4 above) and the rationale used in the review and analysis of each scenario.	Y	BM	BM	ii. (tree size, silviculture and haul distance) and v. were not relevant to this plan.	i. Road corridors and wildfire threat were addressed separately. iii. There were no concerns with yield projections. iv. Sensitivity analysis met conditions for accelerated harvest.	i. Section 5 ii. Section 5.4 iv. Section 4.9.1.
5.5.1 The reasons for any changes in the timber supply between the preferred scenario and the existing approved timber supply has been explained in the documentation.	Y	BM	BM		Comparison to existing and previous annual allowable cuts. Also desired future forest is different from previous.	Sections 1.3 and 4.5.
5.5.2 Information required on the preferred scenario has been submitted to Alberta.	Y	BM	BM		Results reported by TSA modeling tools and other analyses (for example, interior old forest).	Model results on DVD.

Standard	Submitted to SRD (Y/N)	Initials of RFP Submitting	Initials of RFP Preparing	Modification of Standard Approved by SRD Prior to Submission	Comments	Location of Supporting Documentation
5.6 The Spatial Harvest Sequence (SHS) has been selected considering key issues.	Y	BM	BM	ii. Understorey was not relevant to this plan.	i. The allocation of stands to individual timber operators was completed separately. iii. The access schedule was provided by the Planning Team.	Section 4.7.7 and Addendum V.
5.7 Mandatory assumptions have been applied in the preferred scenario.	Y	BM	BM			Assumptions listed in Section 5.2.
5.8 The submission includes documentation explaining each managed assumption in the preferred scenario.	Y	BM	BM			Assumptions listed in Section 5.2.
5.8.1 Strata transitions (i.e., changes in yield stratum after an area is harvested) have been supported with evidence from performance analyses of past silvicultural treatments. The submission includes firm commitments to conduct the silviculture treatments necessary to provide sufficient assurance that the transitions proposed are practical and reasonable.	Y	BM	BM		Strata transisions were provided by the Planning Team.	There were no strata transitions as a result of harvesting (Section 4.7.5).
5.8.2 Silviculture regimes have been developed for all FMP strata.					Addressed in the FMP document.	
5.8.3 Landbase assignments for coniferous and deciduous timber have been established.	Y	BM	BM		Landbase assignment rules were provided by the Planning Team.	Coniferous landbase consisted of pure conifer and conifer-leading mixedwood stands (Section 2.2).

Standard	Submitted to SRD (Y/N)	Initials of RFP Submitting	Initials of RFP Preparing	Modification of Standard Approved by SRD Prior to Submission	Comments	Location of Supporting Documentation
5.8.4 Coniferous understorey management is based on data acceptable to Alberta.	N/A			Coniferous understory management was not relevant to this plan.		
5.8.5 Green-up constraints acceptable to Alberta have been applied.	Y	BM	BM		Green-up constraints were provided by Planning Team.	Section 4.7.8.4.
5.8.6 Allowances for natural disturbance events have been addressed.					Past events were addressed in the landbase classification.	
5.8.7 A process, acceptable to Alberta, has been developed to account for, accurately report and allocate timber drain.	N/A			No reductions were incorporated for losses to road, decking and processing areas.	Strategies to reduce timber losses to other land uses are addressed in the FMP. Historical land use activities were addresses in the landbase classification.	
5.8.8 A strategic plan for forest management access throughout the DFA is completed.					Addressed in the FMP.	
5.8.8.1 A proposed road corridor plan describing the permanent road network needed to access the total net landbase and implement the spatial harvest design has been completed.					Addressed in the FMP.	
5.8.8.2 All forestry access limitations have been considered and explained.	Y	BM	BM		Access schedule provided by the Planning Team.	Section 4.7.7.
5.8.9 Productivity losses from road, decking and processing areas on reforested areas have been applied.					No reductions were incorporated into the TSA to account for losses to road, decking and processing areas. Addressed in the FMP.	

Standard	Submitted to SRD (Y/N)	Initials of RFP Submitting	Initials of RFP Preparing	Modification of Standard Approved by SRD Prior to Submission	Comments	Location of Supporting Documentation
5.8.10 Timber operability and economic limitations have been reported.	Y	BM	BM		Piece size was not predicted. Minimum harvest ages were established by the Planning Team.	Minimum harvest ages in Section 4.7.5.
5.8.11 Strategies to address biodiversity and species of special management concern have been established.	Y	BM	BM		An average of 3% volume was removed from the yield curves to account for stand structure retention. Specific strategies were addressed in the FMP.	Section 4.7.3.
5.8.12 Strategies to address forest protection issues have been established.					Addressed in the FMP.	
5.8.13 Predictions for water yield and strategies to manage riparian issues have been established.					Addressed in Hydrological Effects of the Preferred Forest Management Scenario in the C5 Forest Management Unit submission.	
5.8.14 Visual quality strategies have been established.					Addressed in the FMP.	
5.8.15 The requirements of the Standards for Tree Improvement in Alberta have been addressed.	N/A			Tree improvement was not considered in this plan.		
Future Forest Condition						
5.9 A data set (file) has been provided containing the post-harvest forest condition for the preferred forest management strategy, for 0, 10, 20 and 50 years for each FMU and/or sustained yield unit.	Y	BM	BM			Stand listing of future forest condition provided on DVD.

Standard	Submitted to SRD (Y/N)	Initials of RFP Submitting	Initials of RFP Preparing	Modification of Standard Approved by SRD Prior to Submission	Comments	Location of Supporting Documentation
Harvest Schedule (i.e. definitive stand list)						
5.10 A data set (file) has been provided containing the harvest schedule for 70 years for the preferred forest management strategy, for each FMU and/or sustained yield unit, compartment and period.	Y	BM	BM			Stand listing of 200-year harvest schedule provided on DVD.
5.11 Table 1 has been completed for all forest operators and included in the FMP.					Addressed in the FMP.	
6.0 Harvest Planning Standards						
6.1 A mapped spatial harvest sequence (hard copy and data file) showing the inventory cover types scheduled for harvest in the first two 10-year periods of the planning horizon has been submitted.	Y	BM	BM			Map in Section 5.5. Harvest schedule provided on DVD.
6.2 A Strata Description Table (SDT) describing the areas in each compartment of the age-classes in each yield strata scheduled for harvest in the first two 10-year periods of the planning horizon has been submitted. (See standard 5.5.2)	Y	BM	BM			Section 5.4.
6.3 The SHS reflects the net landbase strata profile.	Y	BM	BM	The strata profiles of the SHS reflects the desired future forest.		Section 5.4.
6.4 The spatial harvest sequence has been developed to comply with the planning and operational implementation conditions.	Y	BM	BM		The SHS was reviewed by the Planning Team for feasibility of operational implementation.	

Standard	Submitted to SRD (Y/N)	Initials of RFP Submitting	Initials of RFP Preparing	Modification of Standard Approved by SRD Prior to Submission	Comments	Location of Supporting Documentation
6.5 Variances from the SHS and SDT have been totalled and reported for all operational plans addressed in the current FMP at the time of operational planning (i.e., preparing the harvest design for an area as per the Timber Harvest Planning and Operating Ground Rules).	N/A			Variances will be reported after FMP is approved and implemented.		
6.6 Reported variances from the SHS/SDT have been used to modify the timber supply analysis.	N/A			Variances will be reported after FMP is approved and implemented.		

Addendum II Ecological Indicators Target Development

This addendum contains three files provided by SRD (Chris Shank and John Stadt, biologists) outlining the targets and justification for ecological indicators.

C-5 Target Setting Assumptions used by John Stadt and Chris Shank

9 March 2004

C-5 Seral Stage Target Setting Assumptions

- AVI underestimates the area of forest in early and late old seral stages. Photo interpretation is less accurate in aging older stands than younger stands due to the decreasing relationship between height and age after stands mature. We assumed that AVI was relatively accurate in aging regeneration, young and mature stands.
- Seral stage targets on the gross land base are calculated as percentages of the gross forested landbase (gross land base with non forested areas deleted).
- **Representation** of seral stages in the full range of ecosystems types is an important principle.
  Issue: Note that the net landbase proportion of the gross forested landbase is 43% for the Castle, 39% for Continental Divide South, 44% for the Livingstone, 57% for Continental Divide North, and 82% for the Porcupine. Because of the relatively low proportion of the net landbase the concern exists that ecosystem representation will not be achieved unless separate targets are set for the net landbase.
  Strategy: Therefore, mature, early and late old growth should occur in equal proportions on the net land base as they occur on the gross forested landbase. This principle forms the basis for Target 1 for mature, early old, and late old in each subregion. For the purpose of a sensitivity analysis we have also provided a Target 2 for each of these seral stages in which the net landbase contributes proportionately 1/3 less to the overall seral target (with the balance being made up on the [passive] landbase). There is no biological rationale to do this as there is no indication that natural disturbance frequencies vary between the active (net) and [passive] landbases. However, if it can be shown that a certain proportion of the [passive] landbase has the same ecological characteristics as the active (net) landbase, this strategy employing Target 2 could be justified.
- **Seral stage targets** for certain seral stages in each subregion are divided into interim and 200 year targets where the current landbase condition does not meet the desired future forest condition. The interim target is set below the current inventory condition to allow for some flexibility in harvest in the short term (note that AVI may be wrong and that target condition may exist in fact on the landbase – see first bullet above). However, over the long term the desired future forest condition, as expressed by the 200-year target, must be achieved. The 200-year target should be achieved as early in the planning cycle as possible (i.e. achieving the 200-year target should not be delayed to the last few years of the cycle).
- **Early+Late old growth targets and mature+old targets** were based on a number of considerations including:
  - BC Biodiversity Guidebook targets for old and old+mature seral (SBS (NDT3) for Castle and Livingstone, ESSF (NDT 3) for Continental Divide North and South, and IDF for Porcupine) modified by differing definitions of old seral (140 for SBS vs 150-200 depending on cover type).
  - Current seral stage distribution on the gross forested and net landbases.
  - Assumption that the southern Rocky Mountain east slopes have a higher disturbance frequency than similar ecosystems in BC.
  - Assumption that the Continental Divide North is slightly wetter and hence has a lower disturbance frequency relative to the Continental Divide South.
- **Late old-growth forest targets** are based on ½ of the early-late old target. This proportion was selected due to the relatively small proportion of the total age range of old contributed by the early old

stage (for most cover types the early-old stage last for approximately 50 years before becoming late old) and the shape of the age curve (see agecls10bylmu.xls).

- **Regeneration targets** were set for the net landbase only as it is assumed that only harvesting will create early seral. As no harvesting occurs outside of the net landbase it does not seem relevant to set gross forested landbase targets for regeneration.
- **Regeneration targets** were based on targets set for early seral forests in the BC Biodiversity Guidebook for similar ecosystem units (SBS for Castle and Livingstone and ESSF (NDT3) for the two Continental Divide subregions, IDF for Porcupine Subregion). The BC numbers were adjusted downward for two reasons:
    1. the BC numbers apply to the gross forested landbase and we were applying these targets to the net landbase only (which in the 4 subregions other than Porcupine is between 39 and 57 percent of the gross forested landbase).
    2. Differing definitions of early seral versus regeneration seral stage. Early seral stage in BC are forests younger than 40 years whereas Regeneration seral stage are forests younger than 25 to 30 years depending on cover type.

Patch Size Distribution Target Setting

- Livingstone, Continental Divide North, Castle, Continental Divide South subregions were amalgamated for the purpose of patch size distribution to increase flexibility in achieving a desired distribution. We also did not have sufficient data to be able to differentiate between continental divide and middle ridge subregions despite our expectation that more small and few large patches would naturally be created in the continental divide subregions.
- Patch size targets are only be set for the regeneration seral stage. The distribution of patch sizes in the remaining seral stages should be monitored and reported to assess whether skewing of patch size distribution of these seral stages is occurring through time.
- The initially proposed 5 categories of patch size classes was reduced to 4. Classes 2 and 3 were grouped together creating a 6-80 ha size class category. The rationale for this grouping is as follows:
    - The separation of size classes 2 and 3 at 40 hectares does not have any ecological significance. Patches smaller and greater than 40 hectares both function as clearcuts. A more important distinction between clearcuts is the structure retention within the openings, however this factor is not dealt with in this objective.
    - The most ecologically significant skewing of patch size distribution caused by traditional forest management is the fragmentation of the landscape by not allowing the creation of large (>500 ha) patches through fire or harvesting. Therefore, this patch size distribution objective should focus on the creation of these larger patches and not create unnecessary differentiation of smaller patch size classes.
- **Patch size targets** for the 3 size classes was based on the following factors:
    - The current distribution of patch sizes on the landscape. The Lost Creek fire was factored out of this consideration as it skewed the patch size distribution dramatically away from what can conceivably be created through forest management.
    - The BC Biodiversity Guidebook recommendations for patch size distributions for NDT4 (for the Porcupine subregion) and NDT 2 (for the rest of the FMA) forests. It was determined that NDT3 patch size distributions would not occur due to the constrained nature of the Southern Rockies forest ecosystem and that NDT2 distributions were more appropriate.

- Social factors which include the heavy use of the area for recreation, the high visual values of the area, and the importance of the area in affecting water flows to adjacent regions.

- **Less than 6 ha patch size class targets:**
  - No <6 ha patch size target was set for the Continental Divide-Livingstone-Castle area. The smallest size class (<6 ha) may not be needed as the factors that naturally create small patches on the landscape are not precluded or prevented by traditional forest management. These factors include windthrow events, insect and other disease outbreaks, and small fires (including all those put out through protection measures).
  - A target was set for <6 ha size class in the Porcupine due to the non-stand replacing nature of natural disturbances in this ecosystem and importance of gap-phase dynamics here. **Silvicultural issues may be significant in this subregion and may result in this target being revised.**
- **Targets to be achieved** by the end of the 10-year DFMP period.
- **Report the patch size distribution** (classes describe above) for each subregion and the 2 amalgamated subregions (Continental Divide-Livingstone-Castle and Porcupine) by seral stage for 0, 10, 20 and 50 years.

Appendix 3

Area of the **Gross Landbase** in 5 Subregions in four seral stages

	Subregion				
Seral Stage	**Castle**	**Continental Divide South**	**Livingstone**	**Continental Divide North**	**Porcupine**
Regeneration	(25%) Target = <100%	(27%) Target = <100%	(2%) Target = <100%	(19%) Target = <100%	(5%) Target = <100%
Mature + Old Forest	(53%) Target = >35%	(31%) Target = >30% and >35% by 200 yr	(81%) Target = >35%	(67%) Target = >35%	(59%) Target = >30%
Early + Late Old Forest	(5%) Target = >4% and >13% at 200 yr	(11%) Target = >10% and >20% at 200 yr	(8%) Target = >7% and >13% at 200 yr	(24%) Target = >23%	(0%) Target = >0 and 13% at 200 yr
Late Old Forest	(1.7%) Target = >1% and 7% at 200 yr	(8%) Target = >7% and 10% at 200 yr	(6%) Target = >5% and 7% at 200 yr	(17%) Target = >13%	(0.0%) Target = >0 and >7% at yr 200

Area of the **Net Landbase** in 5 Subregions in four seral stages

	Subregion				
Seral Stage	**Castle**	**Continental Divide South**	**Livingstone**	**Continental Divide North**	**Porcupine**
Regeneration	(7.7%) Target = <40%	(8.1%) Target = <30%	(3.8%) Target = <40%	(8.1%) Target = <30%	(6.1%) Target = <40%
Mature + Old Forest	(64.2%) Target1 = >35% Target 2 = >23%	(30.6%) Target 1 = >30% Target2 =>23%	(74.4%) Target1 = 35% Target 2 = 23%	(51.2%) Target 1 = 35% Target 2 = 23%	(55.6%) Target 1 = 30% Target 2 = 20%
Early + Late Old Forest	(2.8%) Target1 + > 0% and 13% at 200 yr Target 2 = >0% and > 9% at year 200	(10.4%) Target 1 = >5% and 20% at 200 yr Target 2 = >3% and > 13% at year 200	(5.0%) Target 1 = >2% and >13% at 200 yr Target 2 = >0% and > 9% at year 200	(18.2%) Target1 = >10% and > 23% at 200 Yr Target 2 = >7% and > 15% at year 200	(0.1%) Target 1 = >0% and >13% at year 200 Target 2 = >0% and > 9% at year 200
Late Old Forest	(0.2%) Target 1 = >0% and > 7% at year 200 Target 2 = >0% and > 4% at year 200	(4.8%) Target 1 = >2% and > 10% at year 200 Target 2 = >1% and > 7% at year 200	(3.4%) Target 1 = >1% and > 7% at year 200 Target 2 = >0% and > 4% at year 200	(14.3%) Target 1 = >8% and > 13% at year 200 Target 2 = >6% and > 9% at year 200	(0.0%) Target 1 = >0% and > 7% at year 200 Target 2 = >0% and > 4% at year 200

Rationale for targets: Late old forest is the primary value-at-risk.

This approach ensures that if there is an oversupply in the VAR, it counts toward the lower level target
Columns do not add to 100% because Young Forest not included.

Parenthetical values = current inventory

	%Total Landbase Operational	% Forested Landbase That is Operational
Castle	29%	43%
CDN	45%	57%
CDS	30%	39%
Livingston	34%	44%
Porcupine Hills	67%	82%
Total	37%	49%

Appendix 4

Minimum proportion of early and late old forest on the Gross Landbase in "interior forest" for each cover group and Subregion

Cover Group	**Castle**	**ContinentalDivideSouth**	**Livingstone**	**ContinentalDivideNorth**	**Porcupine**
CD	NT	NT	40% eph	NT	NT
C-Fa	NT	NT	25% eph	40% eph	NT
C-Pl	40% (>30%)	40% eph	40% (>30%)	40% eph	*
C-Sx	40% (>30%)	40% (>30%)	40% (>30%)	40% (>30%)	*

Minimum proportion of early and late old forest on the Net Landbase in "interior forest" for each cover group and Subregion

Cover Group	**Castle**	**Continental DivideSouth**	**Livingstone**	**Continental DivideNorth**	**Porcupine**
CD	NT	NT	40 eph	NT	NT
C-Fa	NT	NT	NT	NT	NT
C-Pl	40% eph	30%* eph	40% (>30%)	40*	*
C-Sx	40% (>30%)	40% (>30%)	40% (>30%)	40 (>30%)	*

eph: end of planning horizon. Target to be achieved by the end of the planning horizon. Where "eph" not noted target value is a minimum mean to be achieved throughout the planning horizon (mean can be exceeded).

(>30%) Bracketed percentage is minimum threshold proportion of interior old forest at any point in the planning period.

* not enough old growth forecast in interior forest analysis to set a target (i.e. old forest targets not being met in model). Need to assess whether seral stage target weighting needs to be increased to ensure old forest targets are met.

40%* - target set, however old forest availability as shown by interior forest analysis is very low (i.e. old forest targets not being met in model). Need to assess whether seral stage target weighting needs to be increased to ensure old forest targets are met.

30%* - target set, however old forest availability as shown by interior forest analysis is very low (i.e. old forest targets not being met in model). Need to assess whether seral stage target weighting needs to be increased to ensure old forest targets are met. Once seral stage targets for this cover group are achieved, interior forest target should be raised to 40% eph.

Appendix 5: Targets for patch sizes (in revised form

Castle, CDN,CDS,Livingston Combined				
	<6 ha	**6-80 ha**	**80 - 500 ha**	**>500 ha**
% Area in Regeneration Size Patches	No Target	50 - 70%	30 - 40%	10 - 20%

Porcupine Hills				
	<6 ha	**6-80 ha**	**80 - 500 ha**	**>500 ha**
% Area in Regeneration Size Patches	0 - 10%*	60 - 80%	20 - 30%	0%

* need silviculture advice on these figures

Figures refer to percentage of area in patches of each size range
Targets are to be met at end of 10 year period

Addendum III TSA Scenario Descriptions

This addendum contains tables of TSA scenario descriptions and all input parameters.

Woodstock TSA Scenario Description											
TSA Scenario		**Description**	**Reference Scenario[1]**	**Landbase**	**Yield Curves**	**Lifespan**	**Actions**	**Transitions**	**Planned Treatments**	**Objective**	**Constraints**
RUN21	Round 2 unconstrained	Baseline scenario with Round 2 landbase, natural stand yield curves, clearcut actions and back-to-itself (CD density) transitions and only one constraint of maximum evenflow conifer harvest volume	baseline	Round 2	Baseline	Baseline	Baseline	Baseline	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume
RUN22	Decrease min harvest ages by 10 yrs	Decreased minimum harvest ages for all yield classes in all watershed sub-basins by 10 years	RUN21	Round 2	Baseline	Baseline	Decrease 10	Baseline	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume
RUN23	Decrease C-Fd yields by 5%	Decreased C-Fd yield curve by 5% to approximate increase in utilization.	RUN21	Round 2	5% Reduction for C-Fd	Baseline	Baseline	Baseline	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume
RUN24	Decrease C-Fd yields by 10%	Decreased C-Fd yield curve by 10% to approximate increase in utilization.	RUN21	Round 2	10% Reduction for C-Fd	Baseline	Baseline	Baseline	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume
RUN25	Decrease min harvest ages for C-Sx	Decreased minimum harvest ages for C-Sx yield classes in 5 age-restricted watersheds from 150 years to 130 years	RUN21	Round 2	Baseline	Baseline	Decrease C-Sx	Baseline	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume
RUN32	Add Lost Creek Fire blocks	Added salvage and regen blocks burnt in the Lost Creek Fire to the managed landbase	RUN21	Round 3	Baseline	Baseline	Baseline	Baseline	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yield Curves	Lifespan	Actions	Transitions	Planned Treatments	Objective	Constraints
RUN41	Remove inaccessible stands	Removed inaccessible stands from the managed landbase	RUN32	Round 4	Baseline	Baseline	Baseline	Baseline	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume
RUN51	Remove isolated stands	Removed isolated stands from the managed landbase	RUN32	Round 5	Baseline	Baseline	Baseline	Baseline	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume
RUN81	Ecological indicators by subregion	Baseline scenario to test late seral goals. Set by C5 subregion (not covertype)	baseline	Round 2	Modified Regen Delay	Final	Modified baseline	Back to itself	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume, Goal of level 1 minimum areas of late seral (L, EL, MEL) by C5 subregion
RUN82	Ecological indicators by covertype	Set late seral goals by covertype (not C5 subregion)	RUN81	Round 2	Modified Regen Delay	Final	Modified baseline	Back to itself	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume, Goal of level 1 minimum areas of late seral (L, EL, MEL) by cover type
RUN83	Ecological indicators by subregion and covertype	Set late seral goals by C5 subregion and covertype	RUN81	Round 2	Modified Regen Delay	Final	Modified baseline	Back to itself	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume, Goal of level 1 minimum areas of late seral (L, EL, MEL) by C5 subregion and cover type
RUN901	Round 9 unconstrained	Baseline scenario with Round 9 landbase, natural stand yield curves, clearcut actions and back-to-itself (cover type and density) transitions and only one constraint of maximum evenflow conifer harvest volume	baseline	Round 9	Complete	Final	Modified baseline	Back to itself	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yield Curves	Lifespan	Actions	Transitions	Planned Treatments	Objective	Constraints
RUN902	Ending gs >= avg	Added growing stock constraint where ending merchantable growing stock >= average across the entire planning horizon	RUN901	Round 9	Complete	Final	Modified baseline	Back to itself	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume, ending merchantable conifer growing stock >= average merchantable conifer growing stock across the planning horizon
RUN903	ND gs last 50 yrs	Added growing stock constraint where merchantable growing stock did not decline for last 50 years of planning horizon	RUN901	Round 9	Complete	Final	Modified baseline	Back to itself	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume, Non-declining merchantable conifer growing stock for last 50 years
RUN904	+- 10% variance in gs	Added growing stock constraint where merchantable growing stock was within +- 10% of the average across the entire planning horizon	RUN901	Round 9	Complete	Final	Modified baseline	Back to itself	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume, Maximum 10% variation in merchantable conifer growing stock over the last 100 years and non-declining for last 10 years of planning horizon
RUN905	Include all treatments	Included partial cut in Syncline Ridge Ski Area and adjacent to Elkhorn Ranch, modified harvest strategy in wildlife highway corridors and FireSmart treatments	RUN903	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume	Evenflow conifer harvest volume, Non-declining merchantable conifer growing stock for last 50 years

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yield Curves	Lifespan	Actions	Transitions	Planned Treatments	Objective	Constraints
RUN906	Remove pond buffers	Excluded areas within 400 m of ponds with salamandar/western toad habitat	RUN905	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume	Evenflow conifer harvest volume, Non-declining merchantable conifer growing stock for last 50 years
RUN907	Future blocks to CD density	Regenerated all future blocks back to the CD density yield curve (if available)	RUN903	Round 9	Complete	Final	Modified baseline	CD density	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume, Non-declining merchantable conifer growing stock for last 50 years
RUN908	Decrease min harvest ages by LMU	Decreased minimum harvest ages for C-Px and C-Sx yield classes by 10 years in 5 age restricted LMU's	RUN903	Round 9	Interim C-Re	Final	Reduced ages	Back to itself	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume, Non-declining merchantable conifer growing stock for last 50 years
RUN909A	All historic and future blocks to CD density	Assumed all pre-91 blocks are regenerating back to forested covertypes (C-Re), and all post-91 and future blocks regenerated back to the CD density yield curve (if available)	RUN903	Modified Round 9	Complete	Final	Modified baseline	CD density	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume, Non-declining merchantable conifer growing stock for last 50 years
RUN909B	All pre-91 historic blocks forested	Assumed all pre-91 blocks are regenerating back to forested covertypes (C-Re)	RUN903	Modified Round 9	Complete	Final	Modified baseline	Back to itself	n/a	Maximize conifer harvest volume	Evenflow conifer harvest volume, Non-declining merchantable conifer growing stock for last 50 years
RUN910	Force ecological indicators	Forced ecological indicators (both late seral and regen modelling targets)	RUN906	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume minus penalty for deviating from ecological goals	Evenflow conifer harvest volume, Non-declining merchantable conifer growing stock for last 50 years, Goal of level 1 minimum areas of late seral (L, EL, MEL) by C5 subregion

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yield Curves	Lifespan	Actions	Transitions	Planned Treatments	Objective	Constraints
RUN911	Force harvest of "E" MPB stands	Forced harvest of extreme mountain pine beetle hazard pine stands within the first 10 years of the planning horizon	RUN910	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume minus penalty for deviating from ecological goals	Evenflow conifer harvest volume, Non-declining merchantable conifer growing stock for last 50 years, Harvest all extreme hazard mountain pine beetle stands in first 10 years, Goal of level 1 minimum areas of late seral (L, EL, MEL) by C5 subregion
RUN912	Defer harvest of non-pine stands	Relaxed the ecological indicator modeling targets and deferred harvest of non-extreme mountain pine beetle hazard pine stands in those compartments with > 5% of the area within extreme hazard	RUN911	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume minus penalty for deviating from ecological goals	Evenflow conifer harvest volume, Non-declining merchantable conifer growing stock for last 50 years, Harvest all extreme hazard mountain pine beetle stands in first 10 years, Goal of deferring harvest of non-pine stands in compartments with >5% area in extreme mountain pine beetle hazard rating for the first 10 years, Goal of level 1 minimum areas of late seral (L, EL,. MEL) by C5 subregion (relaxed)

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yield Curves	Lifespan	Actions	Transitions	Planned Treatments	Objective	Constraints
RUN913A	Maximize evenflow harvest	Included 143,000 m^3 of carryover volume to be harvested within the first 5 years and reduced late seral modeling target levels	RUN906	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume minus penalty for deviating from ecological goals	Evenflow conifer harvest volume, Harvest 143,000 m^3 conifer volume for carryover in first 5 years, Non-declining merchantable conifer growing stock for last 50 years, Goal of minimum 2,000 ha L, 7,000 ha EL, and 35,000 MEL
RUN913B	Maximize evenflow harvest and force "E" and "H" MPB stands	Forced harvest of high and extreme mountain pine beetle hazard pine stands within the first 20 years of the planning horizon	RUN913A	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume minus penalty for deviating from ecological goals	Evenflow conifer harvest volume, Harvest 143,000 m^3 conifer volume for carryover in first 5 years, Harvest all extreme hazard mountain pine beetle stands in first 20 years, Non-declining merchantable conifer growing stock for last 50 years, Goal of minimum 2,000 ha L, 7,000 ha EL, and 35,000 MEL

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yield Curves	Lifespan	Actions	Transitions	Planned Treatments	Objective	Constraints
RUN914	Stepdown harvest in 20 years	Maximized harvest level for first 20 years, included 143,000 m³ of carryover volume to be harvested within the first 5 years and planned stepdown of harvest level to 90% of the current AAC	RUN913A	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume minus penalty for deviating from ecological goals	Evenflow conifer harvest volume for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon, Harvest 143,000 m³ conifer volume for carryover in first 5 years, Non-declining merchantable conifer growing stock for last 50 years, Goal of minimum 2,000 ha L, 7,000 ha EL, and 35,000 MEL
RUN915	Stepdown harvest in 20 years and force "E" and "H" MPB stands	Forced harvest of high and extreme mountain pine beetle hazard pine stands within the first 20 years of the planning horizon	RUN914	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume minus penalty for deviating from ecological goals	Evenflow conifer harvest volume for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon, Harvest 143,000 m³ conifer volume for carryover in first 5 years, Harvest all extreme hazard mountain pine beetle stands in first 20 years, Non-declining merchantable conifer growing stock for last 50 years, Goal of minimum 2,000 ha L, 7,000 ha EL, and 35,000 MEL

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yield Curves	Lifespan	Actions	Transitions	Planned Treatments	Objective	Constraints
RUN916	Stepdown harvest in 30 years	Maximized harvest level for first 30 years, included 143,000 m³ of carryover volume to be harvested within the first 5 years and planned stepdown of harvest level to 90% of the current AAC	RUN913A	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume minus penalty for deviating from ecological goals	Evenflow conifer harvest volume for first 30 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon, Harvest 143,000 m³ conifer volume for carryover in first 5 years, Non-declining merchantable conifer growing stock for last 50 years, Goal of minimum 2,000 ha L, 7,000 ha EL, and 35,000 MEL
RUN917	Stepdown harvest in 30 years and force "E" and "H" MPB stands	Forced harvest of high and extreme mountain pine beetle hazard pine stands within the first 30 years of the planning horizon	RUN916	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume minus penalty for deviating from ecological goals	Evenflow conifer harvest volume for first 30 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon, Harvest 143,000 m³ conifer volume for carryover in first 5 years, Harvest all extreme hazard mountain pine beetle stands in first 20 years, Non-declining merchantable conifer growing stock for last 50 years, Goal of minimum 2,000 ha L, 7,000 ha EL, and 35,000 MEL

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yield Curves	Lifespan	Actions	Transitions	Planned Treatments	Objective	Constraints
RUN918	Stepdown harvest in 40 years	Maximized harvest level for first 40 years, included 143,000 m³ of carryover volume to be harvested within the first 5 years and planned stepdown of harvest level to 90% of the current AAC	RUN913A	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume minus penalty for deviating from ecological goals	Evenflow conifer harvest volume for first 40 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon, Harvest 143,000 m³ conifer volume for carryover in first 5 years, Non-declining merchantable conifer growing stock for last 50 years, Goal of minimum 2,000 ha L, 7,000 ha EL, and 35,000 MEL
RUN919	Stepdown harvest in 40 years and force "E" and "H" MPB stands	Forced harvest of high and extreme mountain pine beetle hazard pine stands within the first 40 years of the planning horizon	RUN917	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Force FireSmart actions to occur within first 5 years	Maximize conifer harvest volume minus penalty for deviating from ecological goals	Evenflow conifer harvest volume for first 40 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon, Harvest 143,000 m³ conifer volume for carryover in first 5 years, Harvest all extreme hazard mountain pine beetle stands in first 20 years, Non-declining merchantable conifer growing stock for last 50 years, Goal of minimum 2,000 ha L, 7,000 ha EL, and 35,000 MEL

[1] The reference scenario is the TSA scenario that this one is based on. Typically, there only one input change from the reference scenario, however all inputs between the two scenarios should

Patchworks TSA Scenario Description

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yields	Lifespan	Actions	Transitions	Access Schedule	Planned Treatments
RUN21001	Round 2 baseline	Baseline scenario which incorporated Round 2 landbase, planned treatments, Mar 14/04 access schedule and original min and max block size, greenup and adjacency modeling targets	baseline	Round 2	Baseline	Baseline	Baseline	Baseline	Mar 14/04	All planned treatments identified in Round 2
RUN21002	Level 1 late seral	Added level 1 late seral modeling targets	RUN21001	Round 2	Baseline	Baseline	Baseline	Baseline	Mar 14/04	n/a
RUN21003	Level 2 late seral	Added level 2 late seral modeling targets	RUN21001	Round 2	Baseline	Baseline	Baseline	Baseline	Mar 14/04	n/a
RUN21004	Regen patches	Added original regen patch modeling targets	RUN21006	Round 2	Baseline	Baseline	Baseline	Baseline	Mar 14/04	n/a
RUN21006	Regen seral stage	Added regen seral stage modeling targets	RUN21002	Round 2	Baseline	Baseline	Baseline	Baseline	Mar 14/04	n/a
RUN21007	Modified regen patches	Added modified regen patch modeling targets	RUN21006	Round 2	Baseline	Baseline	Baseline	Baseline	Mar 14/04	n/a
RUN21008	Reduced regen patch weighting	Reduced the weighting for regen patch modeling targets	RUN21007	Round 2	Baseline	Baseline	Baseline	Baseline	Mar 14/04	n/a
RUN21009	No greenup and adjacency	Removed min and max block size, greenup and adjacency modeling targets	RUN21008	Round 2	Baseline	Baseline	Baseline	Baseline	Mar 14/04	n/a

TSA Scenario		Modeling Targets				Ecological Indicators			
		Harvest Level	Carryover	Greenup Patch	Growing Stock	Late Seral	Regen Seral Stage	Regen Patch	Mountain Pine Beetle
RUN21001	Round 2 baseline	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	n/a	n/a	n/a	n/a
RUN21002	Level 1 late seral	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	Level 1	n/a	n/a	n/a
RUN21003	Level 2 late seral	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	Level 2	n/a	n/a	n/a
RUN21004	Regen patches	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions	n/a
RUN21006	Regen seral stage	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	n/a	n/a
RUN21007	Modified regen patches	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets)	n/a
RUN21008	Reduced regen patch weighting	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN21009	No greenup and adjacency	Maximum evenflow conifer harvest volume	n/a	n/a	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yields	Lifespan	Actions	Transitions	Access Schedule	Planned Treatments
RUN31002	Lost Creek fire blocks	Used Mar 17/04 access schedule	RUN21001	Round 3	Baseline	Baseline	Baseline	Baseline	Mar 17/04	All planned treatments identified in Round 2
RUN41001	Remove inaccessible stands	Inadvertantly used Round 3 landbase, therefore same inputs as RUN31002	RUN31002	Round 3	Baseline	Baseline	Baseline	Baseline	Mar 17/04	All planned treatments identified in Round 2
RUN41002	Inaccessible stands and ecological indicators	Removed inaccessible stands from the managed landbase and added level 2 late seral modeling targets, regen seral stage modeling targets, modified regen patch modeling targets with reduced weighting	RUN41001	Round 4	Baseline	Baseline	Baseline	Baseline	Mar 17/04	All planned treatments identified in Round 2
RUN51001	Remove isolated stands	Removed isolated stands from the managed landbase	RUN31002	Round 5	Baseline	Baseline	Decrease C-Sx	Baseline	Mar 17/04	All planned treatments identified in Round 2
RUN51002	Isolated stands and ecological indicators	Added level 2 late seral modeling targets, regen seral stage modeling targets, modified regen patch modeling targets with reduced weighting	RUN51001	Round 5	Baseline	Baseline	Decrease C-Sx	Baseline	Mar 17/04	All planned treatments identified in Round 2
RUN61001	SHS Version 1	Used Round 6 landbase, level 1 late seral modeling targets, added 2 ha min block size target and adjacency, decreased min. harvest ages for C-Sx in 5 age-restricted watersheds from 150 to 130 yrs	RUN51002	Round 6	Baseline	Baseline	Decrease C-Sx	Baseline	Mar 17/04	All planned treatments identified in Round 2
RUN61002	No harvest	No harvest	baseline	Round 6	Baseline	Baseline	Decrease C-Sx	Baseline	n/a	n/a

TSA Scenario		Modeling Targets				Ecological Indicators			
		Harvest Level	Carryover	Greenup Patch	Growing Stock	Late Seral	Regen Seral Stage	Regen Patch	Mountain Pine Beetle
RUN31002	Lost Creek fire blocks	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	n/a	n/a	n/a	n/a
RUN41001	Remove inaccessible stands	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	n/a	n/a	n/a	n/a
RUN41002	Inaccessible stands and ecological indicators	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN51001	Remove isolated stands	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	n/a	n/a	n/a	n/a
RUN51002	Isolated stands and ecological indicators	Maximum evenflow conifer harvest volume	n/a	Original	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN61001	SHS Version 1	Maximum evenflow conifer harvest volume	n/a	Modified	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN61002	No harvest	n/a	n/a	n/a	Minimum merchantable conifer growing stock	n/a	n/a	n/a	n/a

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yields	Lifespan	Actions	Transitions	Access Schedule	Planned Treatments
RUN61003	SHS Version 2	Modified the SHS	RUN61001	Round 6	Baseline	Baseline	Decrease C-Sx	Baseline	Mar 17/04	All planned treatments identified in Round 2
RUN71001	Round 7 baseline	Baseline scenario which used Round 7 landbase and the RUN61003 balanced weighting between the harvest level and ecological indicators, no planned blocks	baseline	Round 7	Baseline	Baseline	Decrease C-Sx	Baseline	Mar 17/04	n/a
RUN71002	Force ecological indicators	Forced ecological indicators to determine impact on harvest level	RUN71002	Round 7	Baseline	Baseline	Decrease C-Sx	Baseline	Mar 17/04	n/a
RUN71003	Eco sensitivity #1	Weighted ecological indicators moderately high to determine impact on harvest level	RUN71002	Round 7	Baseline	Baseline	Decrease C-Sx	Baseline	Mar 17/04	n/a
RUN71004	Eco sensitivity #2	Weighted ecological indicators moderately to determine impact on harvest level	RUN71002	Round 7	Baseline	Baseline	Decrease C-Sx	Baseline	Mar 17/04	n/a

TSA Scenario		Modeling Targets				Ecological Indicators			
		Harvest Level	Carryover	Greenup Patch	Growing Stock	Late Seral	Regen Seral Stage	Regen Patch	Mountain Pine Beetle
RUN61003	SHS Version 2	Maximum evenflow conifer harvest volume	n/a	n/a	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN71001	Round 7 baseline	Maximum evenflow conifer harvest volume	n/a	n/a	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN71002	Force ecological indicators	Maximum evenflow conifer harvest volume (very reduced relative weighting)	n/a	n/a	Minimum merchantable conifer growing stock	Level 1 (very high weighting to achieve minimum levels)	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN71003	Eco sensitivity #1	Maximum evenflow conifer harvest volume (moderately reduced relative weighting)	n/a	n/a	Minimum merchantable conifer growing stock	Level 1 (moderately high weighting to achieve minimum levels)	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN71004	Eco sensitivity #2	Maximum evenflow conifer harvest volume (somewhat reduced relative weighting)	n/a	n/a	Minimum merchantable conifer growing stock	Level 1 (moderately weighting to somewhat achieve minimum levels)	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yields	Lifespan	Actions	Transitions	Access Schedule	Planned Treatments
RUN71005	Eco sensitivity #3	Weighted ecological indicators to balance with harvest level to determine impact on harvest level	RUN71002	Round 7	Baseline	Baseline	Decrease C-Sx	Baseline	Mar 17/04	n/a
RUN90001	Round 9 baseline	Baseline scenario which incorporated Round 9 landbase, all harvest treatments, min and max block size, greenup, adjacency, level 1 late seral, regen seral stage and regen patch modeling targets	baseline	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	n/a	n/a
RUN90002	Include planned blocks	Forced planned harvest treatments	RUN90001	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	n/a	All planned treatments identified in Round 9
RUN90003	60% access schedule	Included access scheduling for first 40 years that has approximately 60% of the area available for harvest in any given period	RUN90002	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Oct 13/04 (60%)	All planned treatments identified in Round 9
RUN90004	40% access schedule	Included access scheduling for first 40 years that has approximately 40% of the area available for harvest in any given period	RUN90002	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Oct 13/04 (40%)	All planned treatments identified in Round 9

TSA Scenario		Modeling Targets				Ecological Indicators			Mountain Pine Beetle
		Harvest Level	Carryover	Greenup Patch	Growing Stock	Late Seral	Regen Seral Stage	Regen Patch	
RUN71005	Eco sensitivity #3	Maximum evenflow conifer harvest volume (slightly reduced relative weighting)	n/a	n/a	Minimum merchantable conifer growing stock	Level 1 (somewhat high weighting to achieve minimum levels)	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN90001	Round 9 baseline	Maximum evenflow conifer harvest volume	n/a	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN90002	Include planned blocks	Maximum evenflow conifer harvest volume	n/a	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN90003	60% compartment sequence	Maximum evenflow conifer harvest volume	n/a	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN90004	40% compartment sequence	Maximum evenflow conifer harvest volume	n/a	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yields	Lifespan	Actions	Transitions	Access Schedule	Planned Treatments
RUN90005	Force harvest of "E" MPB stands	Forced harvest of extreme hazard mountain pine beetle stands and deferred harvest of non-extreme mountain pine beetle hazard stands in compartments where >5% of the area is classified as extreme hazard for the first 11 years	RUN90004	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	n/a	n/a
RUN90006	Maximize harvest	Removed ecological indicator modeling targets	RUN90004	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Oct 13/04 (40%)	All planned treatments identified in Round 9
RUN90010	Maintain current AAC with 97,000 carryover	Included 97,000 m³ carryover to be harvested in the years 2-6	RUN90012	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Oct 13/04 (40%)	All planned treatments identified in Round 9
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	Included 97,000 m³ carryover to be harvested in the years 2-6	RUN90013	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Oct 13/04 (40%)	All planned treatments identified in Round 9
RUN90012	Maintain current AAC	Forced current AAC for the entire planning horizon	RUN90004	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Oct 13/04 (40%)	All planned treatments identified in Round 9

TSA Scenario		Modeling Targets				Ecological Indicators			
		Harvest Level	Carryover	Greenup Patch	Growing Stock	Late Seral	Regen Seral Stage	Regen Patch	Mountain Pine Beetle
RUN90005	Force harvest of "E" MPB stands	Maximum evenflow conifer harvest volume	n/a	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	E MPB
RUN90006	Maximize harvest	Maximum evenflow conifer harvest volume	n/a	Final	Minimum merchantable conifer growing stock	n/a	n/a	n/a	n/a
RUN90010	Maintain current AAC with 97,000 carryover	Maintain current evenflow conifer AAC for entire planning horizon	Harvest 97,000 m^3 conifer volume for carryover in years 2-6	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN90011	Stepdown harvest in 21 years with 97,000 carryover	Maintain current evenflow conifer AAC for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon	Harvest 97,000 m^3 conifer volume for carryover in years 2-6	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN90012	Maintain current AAC	Maintain current evenflow conifer AAC for entire planning horizon	n/a	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yields	Lifespan	Actions	Transitions	Access Schedule	Planned Treatments
RUN90013	Stepdown harvest in 21 years	Forced current AAC for the first 21 years, then planned stepdown to 90% of the current AAC for rest of planning horizon	RUN90004	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Oct 13/04 (40%)	All planned treatments identified in Round 9
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	Included 143,000 m^3 carryover to be harvested in the years 2-6	RUN90013	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Oct 13/04 (40%)	All planned treatments identified in Round 9
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	Forced harvest of extreme hazard mountain pine beetle stands within the first 21 years	RUN90013	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	n/a	All planned treatments identified in Round 9
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	Increased harvest level for first 11 years and forced harvest of extreme hazard mountain pine beetle stands within the first 11 years	RUN90015	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	n/a	All planned treatments identified in Round 9
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	Forced harvest of extreme hazard mountain pine beetle stands within the first 21 years using Jun 1/05 access schedule	RUN90013	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Jun 1/05	All planned treatments identified in Round 9

TSA Scenario		Modeling Targets				Ecological Indicators			Mountain Pine Beetle
		Harvest Level	Carryover	Greenup Patch	Growing Stock	Late Seral	Regen Seral Stage	Regen Patch	
RUN90013	Stepdown harvest in 21 years	Maintain current evenflow conifer AAC for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon	n/a	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN90014	Stepdown harvest in 21 years with 143,000 carryover	Maintain current evenflow conifer AAC for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon	Harvest 143,000 m^3 conifer volume for carryover in years 2-6	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN90015	Force harvest of "E" and "H" MPB stands in 21 years with seq 1	Maintain current evenflow conifer AAC for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon	n/a	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	HE MPB, MEL Pine
RUN90016	Force harvest of "E" and "H" MPB stands in 11 years	Maintain 210,000 m^3/yr evenflow conifer harvest for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon	n/a	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	HE MPB, MEL Pine
RUN90017	Force harvest of "E" and "H" MPB stands in 21 years with seq 2	Maintain current evenflow conifer AAC for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon	Harvest 143,000 m^3 conifer volume for carryover in years 2-6	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	HE MPB, MEL Pine

TSA Scenario		Description	Reference Scenario[1]	Landbase	Yields	Lifespan	Actions	Transitions	Access Schedule	Planned Treatments
RUN90018	Reduce average harvest age	Increased harvest level to 125% of current AAC for first 20 years and force harvest of extreme hazard mountain pine beetle stands within the first 21 years using June 1/05 access schedule	RUN90014	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Jun 1/05	All planned treatments identified in Round 9
RUN90020	Maximize harvest in first 21 years	Maximized harvest in first 21 years	RUN90018	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Jun 6/05	All planned treatments identified in Round 9
RUN90021	Modified compartment sequence	Used Jun 7/05 access schedule	RUN90018	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Jun 7/05	All planned treatments identified in Round 9
RUN90021A	SHS Version 3	Increased weighting on all ecological indicators	RUN90021	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Jun 7/05	All planned treatments identified in Round 9
RUN90022	Preferred Forest Management Scenario	Balanced weighting for all modeling targets	RUN90021A	Round 9	Complete	Final	All treatments	Back to itself with wildlife restriction	Oct 20/05	All planned treatments identified in Round 9

[1] The reference scenario is the TSA scenario that this one is based on. Typically, there only one input change from the reference scenario, however all inputs between the two scenarios

TSA Scenario		Modeling Targets				Ecological Indicators			
		Harvest Level	Carryover	Greenup Patch	Growing Stock	Late Seral	Regen Seral Stage	Regen Patch	Mountain Pine Beetle
RUN90018	Reduce average harvest age	Maintain 125% of current evenflow conifer AAC for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon	Harvest 143,000 m^3 conifer volume for carryover in years 2-6	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	HE MPB, MEL Pine
RUN90020	Maximize harvest in first 21 years	Maintain 90% of RUN915 maximum evenflow conifer AAC for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon	Harvest 143,000 m^3 conifer volume for carryover in years 2-6	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	n/a
RUN90021	Modified compartment sequence	Maintain 125% of current evenflow conifer AAC for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon	Harvest 143,000 m^3 conifer volume for carryover in years 2-6	Final	Minimum merchantable conifer growing stock	Level 1	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	HE MPB throughout planning horizon, MEL Pine for first 60 years
RUN90021A	SHS Version 3	Maintain 125% of current evenflow conifer AAC for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon	Harvest 143,000 m^3 conifer volume for carryover in years 2-6	Final	Minimum merchantable conifer growing stock	Level 1 (increased weighting)	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	HE MPB throughout planning horizon, MEL Pine for first 60 years
RUN90022	Preferred Forest Management Scenario	Maintain 120% of current evenflow conifer AAC for first 20 years then stepdown to evenflow conifer harvest volume at 90% of the current AAC for rest of planning horizon	Harvest 143,000 m^3 conifer volume for carryover in years 2-6	Final	Minimum merchantable conifer growing stock	Level 1 (increased weighting)	Maximum areas in regen seral stage by C5 subregion	Minimum and maximum regen patch size class distributions (modified targets and relaxed weighting)	HE MPB throughout planning horizon, MEL Pine for first 50 years

Landbase Definitions

Landbase Type	TSA Start Year	Description of landbase	Managed Landbase Area (ha)
Round 2	2003	Initial landbase for TSA. Includes only the operable conifer landbase area as defined by the initial net landbase parameters (deletions for land status, steep slopes, burned areas in recent fires, access, buffers, and productivity).	115,664
Round 3	2003	Round 2 landbase plus salvage and regenerated blocks in the Lost Creek fire.	117,923
Round 4	2003	Round 3 landbase minus inaccessible stands.	117,699
Round 5	2003	Round 3 landbase minus isolated stands.	117,551
Round 6	2003	Round 5 landbase.	117,551
Round 7	2005	Round 6 landbase with updated with harvesting activity between May 1, 2003 and May 1, 2005.	118,181
Round 9	2005	Round 7 with additional historic block information, additional planned blocks, wildlife habitats and revised mountain pine beetle hazard ratings minus highly suitable wildlife habitat for harlequin duck, wolverine and western toad/long-toed salamandars.	114,184
Modified Round 9	2005	Round 9 with pre-1991 blocks assigned the C-Re cover type.	114,184

Yield Definitions

Yield	Description of yield curves	Regen Delay (years)
Baseline	Yield curves for natural stands are documented in *FMU C5 Forest Management Plan Growth and Yield* (Forest Management Branch 2004). Natural stand yield curves are also used for managed stands.	5
5% Reduction for C-Fd	Baseline yields with C-Fd yield curve reduced by 5% for yield curve 1 (C-Fd-All)	5
10% Reduction for C-Fd	Baseline yields with C-Fd yield curve reduced by 10% for yield curve 1 (C-Fd-All)	5
Modified Regen Delay	Same as Baseline	10 (Yield Curve 1 C-Fd) 5 (remaining yield curves)
Complete	Baseline yields with an added area-weighted average yield curve for regenerating blocks harvested post-91. Also included proportionally reduced yield curves for thinning treatments (50% and 60% of baseline volumes).	10 (Yield Curve 1 C-Fd) 5 (remaining yield curves)

Lifespan Definitions

Lifespan	Description of lifespan
Baseline	Initial lifespans for cover groups provided by SRD (including combined C-La/Fa cover group).
Final	Same as baseline with separate lifespans for C-La and C-Fa.

Treatment Definitions

Treatment Group	Treatment	Cover Type	Administrative Units	Minimum Harvest Operability (years)
Baseline	Clearcut	C-Px	Watersheds UOL, DUT, RAC, CAR, UCA	111
			Other Watersheds	91
		C-Sx, C-Fa	Watersheds UOL, DUT, RAC, CAR, UCA	151
			Other Watersheds	91
		C-Fd, CD	All Watersheds	91
Decrease 10	Clearcut	C-Px	Watersheds UOL, DUT, RAC, CAR, UCA	101
			Other Watersheds	81
		C-Sx, C-Fa	Watersheds UOL, DUT, RAC, CAR, UCA	141
			Other Watersheds	81
		C-Fd, CD	All Watersheds	81
Decrease C-Sx	Clearcut	C-Px	Watersheds UOL, DUT, RAC, CAR, UCA	111
			Other Watersheds	91
		C-Sx, C-Fa	Watersheds UOL, DUT, RAC, CAR, UCA	131
			Other Watersheds	91
		C-Fd, CD	All Watersheds	91
Modified baseline	Clearcut	C-Px	LMU's A, C, CWC, F, HE	111
			Other LMU's	91
		C-Sx, C-Fa	LMU's A, C, CWC, F, HE	131
			Other LMU's	91
		C-Fd, CD	All LMU's	91
Reduced Ages	Clearcut	C-Px	LMU's A, C, CWC, F, HE	101
			Other LMU's	91
		C-Sx, C-Fa	LMU's A, C, CWC, F, HE	121
			Other LMU's	91
		C-Fd, CD	All LMU's	91
All treatments[3]	Clearcut	C-Px[1]	LMU's A, C, CWC, F, HE	111
			Other LMU's	91
		C-Px[2]	All LMU's	81
		C-Sx, C-Fa	LMU's A, C, CWC, F, HE	131
			Other LMU's	91
		C-Fd, CD	All LMU's	91
		C-Re	All LMU's	106
	Partial Harvest	C-Px	LMU's A, C, CWC, F, HE	111
			Other LMU's	91
		C-Sx, C-Fa	LMU's A, C, CWC, F, HE	131
			Other LMU's	91
		C-Fd, CD	All LMU's	91
		C-Re	All LMU's	106
	Burn	All	All LMU's	none

[1]Unclassified mountain pine beetle hazard

[2]High and extreme hazard for mountain pine beetle

[3] Used in the preferred forest management scenario.

Transitions Definitions

Transition	Treatment Group	Treatment	Cover Type	Crown Class	Age (years)	Restrictions
Baseline	Baseline Decrease 10 Decrease C-Sx Modified Baseline	Clearcut	no change	C+D	-5 all cover types	
Back to itself	Modified Baseline Reduced Ages	Clearcut	no change	no change	-10 C-Fd -5 all other cover types	
CD Density	Modified Baseline	Clearcut	no change	no change	-10 C-Fd -5 all other cover types	
Back to itself with wildlife restriction[1]	Modified Baseline	Clearcut	no change	no change	-10 C-Fd -5 all other cover types	Only one harvest in highway wildlife corridors
	All Treatments	Clearcut	no change	no change	-10 C-Fd -5 all other cover types	Only one harvest in highway wildlife corridors
		Partial Cut	no change	no change	no change	Eligible for clearcut after 40 years, then another partial cut
		Burn	no change	no change	-10 C-Fd -5 all other cover types	Eligible for partial cut, then clearcut, then another partial cut

[1] Used in the preferred forest management scenario

Access Schedule Definitions

Access Schedule	Description of Access Schedule	Years of Restricted Access
Mar 14/04	Coarse access schedule developed for 20-year periods.	60
Mar 17/04	More detailed access schedule developed for 10-year periods.	60
Oct 13/04 (60%)	Access schedule developed to open approximately 60% of the area within each period.	40
Oct 13/04 (40%)	Access schedule developed to open approximately 40% of the area within each period.	40
Jun 1/05	Access schedule focussing on opening compartments with large areas of high and extreme mountain pine beetle hazard stands	40
Jun 6/05	Modified access schedule focussing on opening compartments with large areas of high and extreme mountain pine beetle hazard stands	60
Jun 7/05	Interim sequence addressing all access, operator spheres and mountain pine beetle issues.	60
Oct 20/05	Final sequence addressing all access, operator spheres and mountain pine beetle issues.	60

Addendum IV Interior Old Forest Patch Results

This addendum contains maps depicting the interior old forest patches > 100 ha and > 40 ha at 0, 11, 51 and 101 years into the future from the preferred forest management scenario.

Addendum V Access Schedule

This addendum contains maps depicting the access schedule (open compartments) for the first 40 years of the preferred forest management scenario.

Blocks could be scheduled for harvest in periods that are colored green, and are prevented from being scheduled for harvest in periods that are colored red. The dark red represents areas of planned blocks where scheduled treatments are forced.

Addendum VI Data Dictionary

The data dictionary provided in this appendix applies to the classified landbase shapefile used in the preferred forest management scenario (lb_rd9f_pwkey.shp). Fields in this shapefile identify those stands that comprise both the 20-and 40-year harvest sequences.

Dataset Name: LB_RD9F_PWKEY_051128

Description: Table describing TSA_LB_RD9F_DBF

Column Name	Order	Type	Width	Decimal	Description	
					Value	**Definition**
PWKEY_	2	Character	126	0	Patchworks unique key	
PWKEY_B	3	Character	126	0	Patchworks landbase 9 unique key	
PWKEY_A	4	Character	18	0	Unique link key	
UKEY_BLK1A	5	Integer	0	0	Unique link to TSA_LB_BLK1a	
UKEY9	6	Integer	0	0	Land base 9 link key	
POLY_NUM	7	LOB	126	0	AVI Polygon Number	
FMU_SUB	8	Character	2	0	3 discrete FMU areas	
					CA	Castle
					LI	Livingstone
					PO	Porcupine Hills
FMU_SUBR	9	Character	2	0	FMU Subregion code	
					CA	Castle
					CN	Continental Divide North
					CS	Continental Divide South
					LI	Livingstone
					PO	Porcupine Hills
SUBR_NAME	10	Character	25	0	FMU Subregion names	
					.	Castle
						Continental Divide North
						Continental Divide South
						Livingstone
						Porcupine Hills
NSR	11	Integer	5	0	Natural Subregion codes	
					14	Foothills Parkland
					18	Foothills Fescue
					7	Alpine
					8	Sub-Alpine
					9	Montane
NSRNAME	12	Character	20	0	Natural Subregion names	
					.	Alpine
						Foothills Fescue
						Foothills Parkland
						Montane
						Subalpine
IRP_CODE	13	Character	3	0	Integrated Resource Plan area code	
					CNC	Crowsnest Corridor
					CRV	Castle River
					KAN	Kananaskis Country
					LPH	Livingstone- Porcupine Hills
IRP_NAME	14	Character	30	0	Integrated Resource Plan area name	
					.	CASTLE RIVER
						CROWSNEST CORRIDOR
						KANANASKIS COUNTRY
						LIVINGSTONE- PORCUPINE HILLS
						CASTLE RIVER
ESIPZONE	15	Integer	0	0	ESIP zone code	
					0	no assigned ESIP zone
					1	Prime Protection
					2	Critical Wildlife
					3	Special Use
					4	General Management/ General Recreation

Column Name	Order	Type	Width	Decimal	Description	
					Value	**Definition**
					5	Multiple Use
					7	Agriculture
					8	Facility
PA_NAME	16	Character	40	0	Order-in-Council Protected area name	
					.	Beehive
						Black Creek Heritage Rangeland
						Bob Creek Wildland
						Don Getty Wildland
						Mt. Livingstone
						Plateau Mountain
						Upper Bob Creek
						West Castle Wetlands
PA_TYPE	17	Character	9	0	Order-in-Council Protected area type	
					ER	Ecological Reserve
					NA	Natural Area
					WPP	Wildland Provincial Park
PA_STATUS	18	Character	5	0	Order-in-Council Protected area status	
					OC	Order-in-Council
PRA_NAME	19	Character	40	0	Provincial Recreation Area name	
					.	Allison Day Use/X-Country Staging
						Beaver Mines Lake PRA
						Castle Falls PRA
						Castle River Bridge PRA
						Chinook PRA
						Dutch Creek PRA
						Honeymoon Creek
						Indian Graves
						Livinstone Falls PRA
						Lynx Creek PRA
						Oldman River North PRA
						Racehorse PRA
						Syncline
						Synline X-Country Recreation Trail
FRA_NAME	20	Character	80	0	Forest Recreation Area name	
					.	Allison Day Use/Cross Country Ski Staging Forest Recreation Area
						Syncline Cross-Country Skiing Forest Recreation Trail
LMU_AB	21	Character	3	0	Land Management Unit code	
					A	Alpine High Rock
					B	Beaver
					C	Carbondale
					CH	Chapel Rock
					CP	Crowsnest Pass
					CWC	Castle/West Castle
					E	East Ranchlands
					F	Flathead
					HE	Head Water Valleys
					HO	Horseshoe Parkland
					IR	Ironstone
					LI	Livingstone Valley
					MI	Middle Ridges
					N	North Livingstone
					P	Porcupine Hills
					SA	Saddle Mountain
					SE	Spread Eagle
					SFR	South Front Range
					SOF	South Fescue
					SOL	South Livingstone

Column Name	Order	Type	Width	Decimal	Description	
					Value	**Definition**
					W	Whaleback
LMU_NAME	22	Character	18	0	Land Management Unit name	
					.	Alpine High Rock
						Beaver
						Carbondale
						Castle/West Castle
						Chapel Rock
						Crowsnest Pass
						East Ranchlands
						Flathead
						Head Water Valleys
						Horseshoe Parkland
						Ironstone
						Livingstone Valley
						Middle Ridges
						North Livingstone
						Porcupine Hills
						Saddle Mountain
						South Fescue
						South Front Range
						South Livingstone
						Spread Eagle
						Whaleback
ALLOTMENT	23	Character	20	0	Grazing allotment name	
					.	ALLISON-MCGILLVARY
						BEAVER CREEK
						BLAIRMORE-GOLD
						BOBS CREEK
						BURKE CREEK
						BURLES
						BYRON CREEK
						CATARACT CREEK
						CHAFFEN CREEK
						CHIMNEY ROCK
						CONRAD
						EAST TROUT
						EWING
						GAP
						HARDWICK COULEE
						HIGHWOOD
						JACKSON CREEK
						JIM-HEATH
						LANGFORD-RILEY
						LEWIS
						LOOKOUT BUTTE
						LOWER LIVINGSTONE
						LOWER SPRING
						LYONS CREEK
						MACLEOD
						MEAD
						MICHAEL COULEE
						MILL CREEK
						MUDDYPOND
						NORTH CASTLE RIVER
						OLIN CREEK
						OUTER GAP
						OWL AND HUNTER
						PEKISKO
						ROCK-CONNELLY
						SAVANNA CREEK

Column Name	Order	Type	Width	Decimal	Description
					Value / **Definition**
					. SECTION SIX SHARPLES CREEK SHEPPARD-STIMSON SOUTH CASTLE RIVER SOUTHEND STAR CREEK STREETER TIMBER-FALLS TODD CREEK UPPER LIVINGSTONE UPPER SPRING WALDRON LEASE WEBBER CREEK WEST TROUT WILLOW CREEK YORK CREEK
VQO	24	Character	2	0	Visual Quality Objective code M Modification MM Maximum modification PR Partial Retention
OWNERSHIP	25	Character	1	0	Freehold and Mixed Ownership quarter sections F Freehold (entire quarter section) M Mixed ownership
COMPART	26	Character	45	0	Compartment name (Base) . Alpine High Rock - Crowsnest River Alpine High Rock - Dutch Creek Alpine High Rock - Racehorse Creek Alpine High Rock - Upper Oldman Beaver - Beaver Mines Lake Beaver - Carbondale Beaver - Crowsnest River Beaver - Middle Castle Beaver - Mill Creek Beaver - Pincher Creek Carbondale - Carbondale River Castle/West Castle - Gardiner Creek Castle/West Castle - Middle Castle Castle/West Castle - Upper Castle Castle/West Castle - West Castle Chapel Rock - Crowsnest River Crowsnest Pass - Crowsnest River East Ranchlands - Meadow Creek East Ranchlands - Trout Creek Flathead - Cardondale River Flathead - Crowsnest River Head Water Valleys - Crowsnest River Head Water Valleys - Dutch Creek Head Water Valleys - Racehorse Creek Head Water Valleys - Upper Oldman Horseshoe Parkland - Stimson Creek Horseshoe Parkland - Willow Creek Ironstone - Carbondale River Ironstone - Crowsnest River Ironstone - Hillcrest Livingstone Valley - Livingstone Middle Ridges - Crowsnest River Middle Ridges - Dutch Creek Middle Ridges - Livingstone Middle Ridges - Racehorse Creek

Column Name	Order	Type	Width	Decimal	Description	
					Value	**Definition**
					.	Middle Ridges - Upper Oldman
						North Livingstone - Livingstone
						North Livingstone - Lower Oldman
						North Livingstone - Willow Creek
						Porcupine Hills - Beaver Creek
						Porcupine Hills - Lower Oldman
						Porcupine Hills - Trout Creek
						Porcupine Hills - Willow Creek
						Saddle Mountain - Willow Creek
						South Fescue - Lower Oldman
						South Front Range - Drywood Creek
						South Front Range - Middle Castle
						South Front Range - Mill Creek
						South Front Range - Pincher Creek
						South Front Range - Upper Castle
						South Livingstone - Crowsnest River
						Spread Eagle - Drywood Creek
						Spread Eagle - Pincher Creek
						Whaleback - Lower Oldman
						Whaleback - Willow Creek
COMP_CODE	27	Character	4	0	Compartment code (Base)	
					ACR	Alpine High Rock - Crowsnest River
					ADC	Alpine High Rock - Dutch Creek
					ARC	Alpine High Rock - Racehorse Creek
					AUO	Alpine High Rock - Upper Oldman
					BC	Beaver - Carbondale
					BCR	Beaver - Crowsnest River
					BMC	Beaver - Mill Creek
					BMI	Beaver - Middle Castle
					BML	Beaver - Beaver Mines Lake
					BPC	Beaver - Pincher Creek
					CCR	Carbondale - Carbondale River
					CHR	Chapel Rock - Crowsnest River
					CPC	Crowsnest Pass - Crowsnest River
					CWG	Castle/West Castle - Gardiner Creek
					CWM	Castle/West Castle - Middle Castle
					CWU	Castle/West Castle - Upper Castle
					CWW	Castle/West Castle - West Castle
					EMC	East Ranchlands - Meadow Creek
					ETC	East Ranchlands - Trout Creek
					FCA	Flathead - Cardondale River
					FCR	Flathead - Crowsnest River
					HEC	Head Water Valleys - Crowsnest River
					HED	Head Water Valleys - Dutch Creek
					HER	Head Water Valleys - Racehorse Creek
					HEU	Head Water Valleys - Upper Oldman
					HOS	Horseshoe Parkland - Stimson Creek
					HOW	Horseshoe Parkland - Willow Creek
					IRA	Ironstone - Carbondale River
					IRC	Ironstone - Crowsnest River
					IRH	Ironstone - Hillcrest
					LIL	Livingstone Valley - Livingstone
					MIC	Middle Ridges - Crowsnest River
					MID	Middle Ridges - Dutch Creek
					MIL	Middle Ridges - Livingstone
					MIR	Middle Ridges - Racehorse Creek
					MIU	Middle Ridges - Upper Oldman
					NLL	North Livingstone - Livingstone
					NLO	North Livingstone - Lower Oldman
					NWC	North Livingstone - Willow Creek

Column Name	Order	Type	Width	Decimal	Description	
					Value	**Definition**
					PBC	Porcupine Hills - Beaver Creek
					PLO	Porcupine Hills - Lower Oldman
					PTC	Porcupine Hills - Trout Creek
					PWC	Porcupine Hills - Willow Creek
					SAW	Saddle Mountain - Willow Creek
					SED	Spread Eagle - Drywood Creek
					SEP	Spread Eagle - Pincher Creek
					SFRC	South Front Range - Middle Castle
					SFRD	South Front Range - Drywood Creek
					SFRM	South Front Range - Mill Creek
					SFRP	South Front Range - Pincher Creek
					SFRU	South Front Range - Upper Castle
					SOFO	South Fescue - Lower Oldman
					SOLC	South Livingstone - Crowsnest River
					WLO	Whaleback - Lower Oldman
					WWC	Whaleback - Willow Creek
ADJ_COMPCO	28	Character	6	0	Compartment code (Adjusted)	
					BC	Beaver - Carbondale
					BCR	Beaver - Crowsnest River
					BMC	Beaver - Mill Creek
					BMI1	Beaver - Middle Castle
					BMI2	
					BML	Beaver - Beaver Mines Lake
					BPC	Beaver - Pincher Creek
					CCR1	Carbondale - Carbondale River 1
					CCR2	Carbondale - Carbondale River 2
					CPC	Crowsnest Pass - Crowsnest River
					CWG1	Castle/West Castle - Gardiner Creek 1
					CWG2	Castle/West Castle - Gardiner Creek 2
					CWM	Castle/West Castle - Middle Castle
					CWU1	Castle/West Castle - Upper Castle 1
					CWU2	Castle/West Castle - Upper Castle 2
					CWU3	Castle/West Castle - Upper Castle 3
					CWW	Castle/West Castle - West Castle
					FCR	Flathead - Crowsnest River
					HEC1	Head Water Valleys - Crowsnest River 1
					HEC2	Head Water Valleys - Crowsnest River 2
					HED1	Head Water Valleys - Dutch Creek 1
					HED2	Head Water Valleys - Dutch Creek 2
					HER1	Head Water Valleys - Racehorse Creek 1
					HER2	Head Water Valleys - Racehorse Creek 2
					HEU1	Head Water Valleys - Upper Oldman 1
					HEU2	Head Water Valleys - Upper Oldman 2
					HOS	Horseshoe Parkland - Stimson Creek
					IRA	Ironstone - Carbondale River
					IRC1	Ironstone - Crowsnest River 1
					IRC2	Ironstone - Crowsnest River 2
					IRH	Ironstone - Hillcrest
					LIL	Livingstone Valley - Livingstone
					MIC1	Middle Ridges - Crowsnest River 1
					MIC2	Middle Ridges - Crowsnest River 2
					MID1	Middle Ridges - Dutch Creek 1
					MID2	Middle Ridges - Dutch Creek 2
					MIL	Middle Ridges - Livingstone
					MIR1	Middle Ridges - Racehorse Creek 1
					MIR2	Middle Ridges - Racehorse Creek 2
					MIR3	Middle Ridges - Racehorse Creek 3
					MIU1	Middle Ridges - Upper Oldman 1
					MIU2	Middle Ridges - Upper Oldman 2
					MIU3	Middle Ridges - Upper Oldman 3

Column Name	Order	Type	Width	Decimal	Description
					Value / **Definition**
					NLL — North Livingstone - Livingstone
					NLO — North Livingstone - Lower Oldman
					NWC — North Livingstone - Willow Creek
					PBC1 — Porcupine Hills - Beaver Creek 1
					PBC2 — Porcupine Hills - Beaver Creek 2
					PLO1 — Porcupine Hills - Lower Oldman 1
					PLO2 — Porcupine Hills - Lower Oldman 2
					PLO3 — Porcupine Hills - Lower Oldman 3
					PTC1 — Porcupine Hills - Trout Creek 1
					PTC2 — Porcupine Hills - Trout Creek 2
					PTC3 — Porcupine Hills - Trout Creek 3
					PWC — Porcupine Hills - Willow Creek
					SAW1 — Saddle Mountain - Willow Creek 1
					SAW2 — Saddle Mountain - Willow Creek 2
					SED — Spread Eagle - Drywood Creek
					SFRD — South Front Range - Middle Castle
					SFRM — South Front Range - Mill Creek
					SOLC — South Livingstone - Crowsnest River
					WLO — Whaleback - Lower Oldman
					WWC — Whaleback - Willow Creek
NEW_COMPS	29	Character	16	0	New Access Control Units
					Not Within New Access Control Units
					Blue1 — Second Decade Access
					Blue2
					Blue3
					Blue4
					Blue5
					Blue6
					Blue7
					Green1 — 20 Year Deferral
					Green2
					Green3
					Green4
					Red1 — First Decade Access
					Red2
					Red3
					Red4
					Red5
					Red6
					Red7
					Red8
					Red9
LIC16	30	Character	4	0	License 16 area
					Outside of License 16
					LIC1 — Within License 16
BASIN_CODE	31	Character	4	0	Watershed sub-basin code
					BEA — Beaver Creek
					CAR — Carbondale
					CARL — Carbondale - Lynx Creek
					CRO — Crowsnest River
					CRON — Crowsnest River - North York Creek
					CROY — Crowsnest River - York Creek
					DRY — Drywood Creek
					DUT — Dutch Creek
					HIG — Highwood River
					LIV — Livingstone
					LOW — Lower Oldman
					MEA — Meadow Creek
					MID — Middle Castle

Column Name	Order	Type	Width	Decimal	Description	
					Value	**Definition**
					MIL	Mill Creek
					PEK	Pekisko Creek
					PIN	Pincher Creek
					RAC	Racehorse Creek
					STI	Stimson Creek
					TRO	Trout Creek
					UCA	Upper Castle
					UOL	Upper Oldman
					WIL	Willow Creek
ADD_SUB_WS	32	Character	8	0	Sub Watershed	
					LYNX	Lynx Creek watershed
					N-YORK	North York watershed
					STAR	Star watershed
					S-YORK	South York watershed
WILDLIFE_C	33	Character	20	0	Wildlife Corridor	
					.	Wildlife Corridor
HWY_CORR	34	Character	16	0	Highway Corridor	
					.	Hwy 22 Corridor
						Hwy 3 Corridor
SPC_MGT	35	Character	50	0	Special Management Areas	
					Castle ski hill	Castle ski hill
					Comp surrounding Elkhorn Ranch	Comp surrounding Elkhorn Ranch
					Elkhorn Ranch	Adjacent to the Elkhorn Ranch
					TWP10-3 two sections	TWP10-3 two sections
CUTLINEBUF	36	Integer	0	0	Cutlines (buffered 3m)	
					0	Outside cutline buffer
					100	Inside cutline buffer
ROADBUF	37	Integer	0	0	Road buffers (3m/8m)	
					0	Outside road buffer
					16	16m road buffer
					6	6 m Road buffer
HYDPBUF	38	Integer	0	0	Lake buffers (100m on lakes > 4 ha)	
					0	Outside hydro poly buffer
					100	Inside hydro poly buffer
HYDLBUF	39	Integer	0	0	Stream buffers	
					0	Outside hydro line buffer
					100	Inside hydro line buffer
PIPEBUF	40	Integer	0	0	Pipelines (buffered 10m)	
					0	Outside pipeline buffer
					100	Inside pipeline buffer
WETLANDSBU	41	Integer	0	0	Wetland buffer (30m)	
					0	Outside pond buffer
					1	In Buffer
					100	Inside pond buffer
SLOPE45	42	Integer	5	0	Slopes >45% and > 1 ha	
					0	N/A
					1	>45% for 1 ha
RANDOMBUF	43	Character	1	0	Random camp buffer (100m)	
					Y	In random camp buffer
HARDMAX	44	Integer	5	0	Harliquin Duck Habitat Code	
					0	Unclassified

Column Name	Order	Type	Width	Decimal	Description
					Value / **Definition**
					1 — Very low suitability
					2 — Low suitability
					3 — Moderate suitability
					4 — High Suitability
WOLVMAX	45	Integer	5	0	Wolverine Habitat Code
					0 — Unclassified
					1 — Very low suitability
					2 — Low suitability
					3 — Moderate suitability
					4 — High Suitability
ELKMAX	46	Integer	5	0	Elk Habitat Code
					0 — Other
					1 — Calving
					2 — Winter Habitat
					3 — Migration Area
					4 — Calving & winter habitat
MPBMAX	47	Integer	5	0	MPB Hazard Code
					0 — Unclassified
					3 — High
					4 — Extreme
C5WATER_B4	48	Integer	5	0	C5 Water Bodies with protection buffer
					0 — Outside buffer
					100 — Inside buffer
YC_REDUC	49	Integer	5	0	Yield curve reduction
					. — 0
					50
FIRENUMBER	50	Character	12	0	PFFC Fire number
BURNCODE	51	Character	6	0	Burn code
					B — Completely burnt
					I — Not Burnt (green island)
					PB — Partially burnt
BLK_TYPE	52	Character	16	0	Watershed study blocks
					N-YORK — North York watershed
					N-YORK Planned — North York watershed planned block
					STAR — Star watershed
					STAR Planned — Star watershed planned block
					S-YORK — South York watershed
BLK_SOURCE	53	Character	8	0	Block Source
BLOCK_SRC	54	Character	50	0	Block Source
Z_YR_PER	55	Integer	5	0	Harvest Year in Periods
BLOCK_SRC_	56	Character	6	0	Block Source
BLOCK_ID	57	Character	25	0	Block ID
ARIS_ID	58	Character	16	0	Aris opening number
R_STATUS	59	Character	3	0	Status
					NSR — Not Satisfactorily Restocked
PBLK_NO	60	Character	10	0	Pre-block number
Z_YEAR	61	Integer	5	0	Harvest Year
FSMART_ID	62	Character	7	0	Firesmart ID
FS_PRESCRI	63	Integer	5	0	Firesmart prescription code
					0 — No Prescription
					1 — Standard thinning
					10 — Harvest

Column Name	Order	Type	Width	Decimal	Description
					Value / **Definition**
					11 Burn 2 Harvest/Cluster thinning 3 4 Harvest/burn 5 Cluster thinning 6 Harvest 8 Harvest/burn 9
FS_TREAT	64	Character	25	0	Firesmart prescription name . burn cluster thinning harvest harvest /cluster thinning harvest/cluster thinning standard thinning water course buffer
FS_SRC	65	Character	50	0	Firesmart source file
BLK_SRC_HR	66	Character	8	0	Hardwire Block Information Not Within Hardwire block HARDWIRE Hardwire Block PLAN Planned Block
BLK_STATUS	67	Character	8	0	Block status . EXIST PLAN
Z_YR_TSA	68	Integer	5	0	Harvest Year for TSA
MOIST_REG	69	Character	1	0	Moisture Regime Code a aquatic d dry m mesic w wet
DENSITY	70	Character	1	0	Stand density (overstory) A 6-30% B 31-50% C 51-70% D 70% +
HEIGHT	71	Integer	0	0	Stand height (m)
SP1	72	Character	2	0	Species 1 Code Aw Trembing aspen Fa Alpine fir Fb Balsam fir Fd Douglas-fir La Alpine larch P Pine Pa Whitebark pine Pb Balsam poplar Pf Limber pine Pl Lodgepole pine Se Engelmann spruce Sw White spruce
SP1_PER	73	Integer	0	0	Species 1 Percent
SP2	74	Character	2	0	Species 2 Code
SP2_PER	75	Integer	0	0	Species 2 Percent
SP3	76	Character	2	0	Species 3 Code
SP3_PER	77	Integer	0	0	Species 3 Percent
STRUC	78	Character	1	0	Structure Code

Column Name	Order	Type	Width	Decimal	Description
					Value **Definition**
					H Horizontal (Homogeneous stand w/ scattered pockets)
					M Multi-layer canopy (2 storey)
STRUC_VAL	79	Integer	0	0	Structure Percent /10
ORIGIN	80	Integer	0	0	Stand origin (years)
TPR	81	Character	1	0	Timber Productivity Rating
					F Fair
					G Good
					M Medium
					U Unproductive
INITIALS	82	Character	2	0	Interpreter Initials (overstory)
NFL	83	Character	2	0	Non Forest Land Code
					HF Herbaceous forbes
					HG Herbaceous grassland
					SC Closed shrub
					SO Open shrub
NFL_PER	84	Integer	0	0	Non Forest Land Crown Percent
NAT_NON	85	Character	3	0	Naturally NonForest Code
					NMC Cutbank
					NMR Rock/Barren
					NMS Sand
					NWF Flooded
					NWI Permanent ice/snow, Seasonal thaw
					NWL Lakes
					NWR River
ANTH_VEG	86	Character	3	0	Anthropogenic Vegetated Code
					CA Annual crops (farmland)
					CIP Pipelines, powerlines, etc. seeded to grass
					CIW Geophysical, wellsites seeded to grass
					CP Perennial forage crops
					CPR Rough parture (>10% woody cover)
ANTH_NON	87	Character	3	0	Anthropogenic Non Vegetated Code
					AIF Farmyards
					AIG Gravel/borrow pits
					AIH Permanent right-of-way
					AII Industrial sites, sewage lagoons
					AIM Surface mines
					ASR Ribbon development
MOD1	88	Character	2	0	Modifier 1 Code
					BU Burn
					CC Clearcut, Partialcut
					CL Clearing
					DI Disease
					DT Discolored/ dead tops
					GR Grazing development (domestic)
					IK Insect kill
					SN Snags
					ST Scattered timber
					TH Thinned
					WE Weather (ex. redbelt)
					WF Windfall
MOD1_EXT	89	Integer	0	0	Modifier 1 Extent
					0 1
					1 1 to 25% loss of crown closure or area affected
					2 26 to 50%
					3 51 to 75%

Column Name	Order	Type	Width	Decimal	Description
					Value **Definition**
					4 76 to 94%
					5 Entire
MOD1_YR	90	Integer	0	0	Modifier 1 Year
DATA	91	Character	1	0	Data Reference
DATA_YR	92	Integer	0	0	Data Reference Year
UMOIST_REG	93	Character	1	0	US - Moisture Regime
UDENSITY	94	Character	1	0	US - Density
UHEIGHT	95	Integer	0	0	US - Height (m)
USP1	96	Character	2	0	US - Species 1 Code
USP1_PER	97	Integer	0	0	US - Species 1 Percent
USP2	98	Character	2	0	US - Species 2 Code
USP2_PER	99	Integer	0	0	US - Species 2 Percent
USP3	100	Character	2	0	US - Species 3 Code
USP3_PER	101	Integer	0	0	US - Species 3 Percent
USP4	102	Character	2	0	US - Species 4 Code
USP4_PER	103	Integer	0	0	US - Species 4 Percent
USP5	104	Character	2	0	US - Species 5 Code
USP5_PER	105	Integer	0	0	US - Species 5 Percent
USTRUC	106	Character	1	0	US - Structure Code
USTRUC_VAL	107	Integer	0	0	US - Structure Percent
UORIGIN	108	Integer	0	0	US - Year of Origin
UTPR	109	Character	1	0	US - Timber Productivity Rating
UINITIALS2	110	Character	2	0	Understory Initials
UNFL	111	Character	2	0	US - NonForested Land
UNFL_PER	112	Integer	0	0	US - NonForest Percent Cover
UNAT_NON	113	Character	3	0	US - Naturally NonForest Code
UANTH_VEG	114	Character	3	0	US - Anthropogenic Vegetated Code
UANTH_NON	115	Character	3	0	US - Anthropogenic Non Vegetated Code
UMOD1	116	Character	2	0	US - Modifier 1 Code
UMOD1_EXT	117	Integer	0	0	US - Modifier 1 Extent
UMOD1_YR	118	Integer	0	0	US - Modifier 1 Year
UMOD2	119	Character	2	0	US - Modifier 2 Code
UMOD2_EXT	120	Integer	0	0	US - Modifier 2 Extent
UMOD2_YR	121	Integer	0	0	US - Modifier 2 Year
UDATA	122	Character	1	0	US - Data Reference
UDATA_YR	123	Integer	0	0	US - Data Reference Year
TOT_CONIFE	124	Integer	0	0	Total coniferous percent /10
TOT_DECID	125	Integer	0	0	Total deciduous percent /10
UTOT_CONIF	126	Integer	0	0	US - Total coniferous percent /10
UTOT_DECID	127	Integer	0	0	US - Total deciduous percent /10
UPD_TYPE	128	Character	2	0	Inventory update feature type
					CC Clearcut
					GR Grazing/ range improvement
UPD_ORG	129	Integer	5	0	Inventory update origin
COV_GRP	130	Character	4	0	Broad cover group based on crown cover
					C 80-100% coniferous

Column Name	Order	Type	Width	Decimal	Description
					Value / **Definition**
					CD — 50-79% coniferous
					D — 0-20% coniferous
					DC — 21-49% coniferous
UCOV_GRP	131	Character	2	0	Understory cover group
					N/A
					C — Coniferous
					CD — Coniferous leading deciduous mixedwood
					D — Deciduous
					DC — Deciduous leading coniferous mixedwood
UPDT_TYPE	132	Character	2	0	Modifier aggregation
					CC — Clearcut
					GR — Grazing
FIRE_STAND	133	Character	8	0	Burn Status
					buf150 — Within 150m of fire
					burnt — Completely burnt stand
					Green — Fire Island (green)
					partial — partially burnt
LBTYPE	134	Character	3	0	Landbase type
					N/A
					CCC — Clearcut conifer
					CCD — Clearcut deciduous
					HO — Horizontal overstory
					HU — Horizontal understory
					R — Regular
C5_COVTYPE	135	Character	7	0	Species group, on cover group and leading species
					ANF — Anthropogenicly non-forested
					CD — Coniferous leading deciduous mixedwood
					C-Fa — Coniferous - Alpine fir leading
					C-Fd — Coniferous - Douglas-fire leading
					C-La — Coniferous - Alpine larch leading
					C-Px — Coniferous - Pine leading
					C-Re — Regenerating post '91 cutblock
					C-Sx — Coniferous - Spruce leading
					D — Deciduous
					DC — Deciduous leading coniferous mixedwood
					NNF — Naturally non-forested
PL_PLSE	136	Character	6	0	Pine & Englemann Spruce areas
					N/A
					PL_P — Pine Englemann spruce stand
STAND_AGE	137	Integer	5	0	Age of stand (2005 - origin)
F_AGECLS	138	Integer	5	0	Final Age of the stand in 5 yr periods
AGECLS10	139	Integer	5	0	Age in 10 year age class
F_YC	140	Character	2	0	Final Yield Curve assignment for TSA
					1 — C-Fd-All
					2 — C-Pl-All-M
					3 — C-Pl-AB-SA
					4 — C-Pl-CD-SA
					5 — C-Sx-All-M
					6 — C-Sx-AB-SA
					7 — C-Sx-CD-SA
					8 — CD-All
					9 — D/DC-All
					N — Non-forested
					R — Regeneration
F_LBASE	141	Integer	5	0	Final Landbase type
					0 — N/A
					1 — Conifer landbase

Column Name	Order	Type	Width	Decimal	Description
					Value / **Definition**
					2 — Deciduous landbase
					4 — CC conifer
					5 — CC deciduous
AREA	142	LOB	126	0	Area of the Polygon in m2
AREAHA	143	FloatingPt	13	5	Area of the Polygon in ha
F_AREA	144	Number	13	5	Final area accounting for horiz. stand struc.
H_AREA	145	FloatingPt	13	5	Difference between areaha and f_area
D_HSI	146	Character	4	0	Habitat Suitability Index
					N/A
					D — Harlequin duck
					M — Long-toed salamander and western toad
					V — Wolverine
D_ISOL	147	Character	1	0	Isolation deletion
					N/A
					L — Isolated
D_NONFOR	148	Character	1	0	Non-forested land
					Forested
					X — Non-forested
D_TPR	149	Character	1	0	TPR deletion
					N/A
					U — Unproductive
D_SUBJ	150	Character	2	0	Subjective deletion
					No subjective deletion
					J1 — Larch deletion
					J2 — Whitebark or limber pine deletion
					J3 — Poor site pine deletion
					J4
					J5 — A or B density Douglas-fir or Douglas-fir with deciduous understory
					J6 — Black spruce deletion
D_BUF	151	Character	1	0	Buffer deletion type
					N/A
					E — Random camping site
					H — Hydrography buffer deletion
					W — Wetlands buffer
D_SLOPE	152	Character	1	0	Slope deletion
					N/A
					S — >45% for 1 ha
D_STATUS	153	Character	1	0	Land status deletion
					N/A
					F — Private lands (Freehold)
					P — Protected areas
					R — Recreation areas
					Z — ESIP Zone 1
D_BURN	154	Character	1	0	Areas removed due to recent fire
					Not burnt
					B — Burnt
D_ACCESS	155	Character	1	0	Access deletion type
					N/A
					A — Access (Roads)
					C — Cutlines (Seismic)
					O — Pipelines
F_DEL	156	Character	1	0	Polygon Deletion Code
					A — Access (roads)
					B — Burned area (not including CC)

Column Name	Order	Type	Width	Decimal	Description
					Value / **Definition**
					C — Cutlines (Seismic)
					D — Harlequin duck
					E — Random camping sites
					F — Private lands (Freehold)
					H — Hydrography buffer deletion
					J — Subjective
					L — Isolation
					M — Long-toed salamander and western toad
					N — None
					O — Pipelines
					P — Protected areas
					R — Recreation areas
					S — Slope >= 45% and > 1ha
					U — Unproductive
					V — Wolverine
					W — Wetlands buffer
					X — Non-forested
					Z — ESIP Zone 1
F_PROD	157	Character	1	0	Stand Productive Class
					N — Non-productive stands
					Y — Productive stands
F_COVGRP	158	Character	2	0	Final Cover Group Assignment
					ANF — Anthropogenicly non-forested
					C — Coniferous
					CD — Coniferous leading deciduous mixedwood
					D — Deciduous
					NNF — Naturally non-forested
ACT_PAS	159	Character	1	0	Active or Passive landbase
					A — Active
					P — Passive
MANAGEDLB	160	Character	4	0	Managed Landbase
					M — Managed
					U — Unmanaged
THEME1	161	Character	2	0	Woodstock theme - FMU Subregion
					CA — Castle
					CN — Continental Divide North
					CS — Continental Divide South
					LI — Livingstone
					PO — Porcupine Hills
THEME2	162	Character	3	0	Woodstock theme - Land Management Unit
					CH — Chapel Rock
					HE — Head Water Valleys
					MI — Middle Ridges
THEME3	163	Character	4	0	Woodstock theme - Compartment
					ACR — Alpine High Rock - Crowsnest River
THEME4	164	Character	3	0	Woodstock theme - Watershed Subbasin
					BEA — Beaver Creek
THEME5	165	Character	1	0	Woodstock theme - Deletion
					N — No deletion
					X — Non-forested
THEME6	166	Character	15	0	Woodstock theme - Mountain Pine Beetle Hazard
					E — Extreme
					H — High
					N — Not Applicable
THEME7	167	Character	2	0	Woodstock theme - Status
					DE — Delay State

Column Name	Order	Type	Width	Decimal	Description
					Value / **Definition**
					ST — Natural, Managed stands younger than regen delay (5 or 10 years) unthinned stands and managed stands after regen delay
					UB — Managed stands with unknown regen status
THEME8	168	Character	2	0	Woodstock theme - Yield Class
					1 — C-Fd-All
					2 — C-Pl-All-M
					3 — C-Pl-AB-SA
					4 — C-Pl-CD-SA
					5 — C-Sx-All-M
					6 — C-Sx-AB-SA
					7 — C-Sx-CD-SA
					8 — CD-All
					9 — D/DC-All
					N — Not assigned
					R — Regenerating Cutblock
THEME9	169	Character	5	0	Woodstock theme - Cover Type
					ANF — Anthropogenicly non-forested
					CD — Conifer-leading Mixedwood
					C-Fa — Pure Conifer - Fa, Fb leading species
					C-Fd — Pure Conifer - Fd leading species
					C-La — Pure Conifer - La, Lt, Lw leading species
					C-Px — Pure Conifer - Pl, P, Pa, Pf leading species
					C-Re — Regenerating Cutblock
					C-Sx — Pure Conifer - Sw, Se leading species
					D — Pure Deciduous
					DC — Deciduous-leading Mixedwood
					NNF — Naturally non-forested
THEME10	170	Character	15	0	Woodstock theme - Special Management Zone
					ADJRANCH — Adjacent to the Elkhorn Ranch
					FIRESMARTB — Firesmart planned burn
					FIRESMARTC — Firesmart planned Clearcut
					HWYANDPOND — Both in the highway and pond buffer zone
					HWYCORR — Highway wildlife corridor
					HWYFRSMRTB — Firesmart planned burn in highway corridor
					HWYFRSMRTC — Firesmart planned Clearcut in highway corridor
					HWYFRSMRTP — Firesmart planned Partialcut in highway corridor
					PONDBUFFER — Pond buffers for Long Toed Salamander
					RANCH — Adjacent to the Elkhorn Ranch
					SKIHILL — Syncline Ski area
					T10R3 — Two sections in Twp 10 Rge 3
					X — No special management zone
TSAAGE_YRS	171	Integer	5	0	Age for TSA calculations
TSAAGE_PER	172	Integer	5	0	Age in periods for TSA
AGE_AREA	173	Integer	0	0	Age * Area
C5_SERAL	174	Character	3	0	Seral stages based on cover type and age
					None Defined
					E — Early old growth
					L — Late old growth
					M — Mature
					R — Regeneration

Column Name	Order	Type	Width	Decimal	Description
					Value / **Definition**
					Y — Young
CURR_AVAIL	175	Character	4	0	Stand Availability
					N — Not available
					Y — Available
PLN_TREAT	176	Character	12	0	Planned treatment
					. — BURN
					CLEARCUT
					PARTIALCUT
PLN_DELTA	177	Integer	5	0	Harvest year from current
PW_COMPART	178	Character	12	0	Patchworks compartment
CON_VOL	179	Number	15	4	Coniferous volume (15/11) without structural retention
DEC_VOL	180	Number	15	4	Deciduous volume (15/11) without structural retention
PROP_DELTA	181	Integer	5	0	Harvest year from current
PROP_TREAT	182	Character	12	0	Proposed Treatment
					BURN — Prescribed Burn
					CLEARCUT — Clearcut
					PARTIALCUT — Partialcut
HAR_CONVOL	183	Integer	5	0	Coniferous harvest volume (15/11) without structural reten
HAR_DECVOL	184	Integer	5	0	Deciduous harvest volume (15/11) without structural retent
QUOTA_DEC1	185	Character	12	0	Decade 1 quota sphere
QUOTA_DEC2	186	Character	12	0	Decade 2 quota sphere
F_TPR	187	Character	1	0	Final TPR
					— N/A
					F — Fair
					G — Good
					M — Medium
					U — Unproductive
					X — Undefined
LEAD_SP	188	Character	2	0	TSA Leading Species
					AW — Aspen
					FA — Alpine fir
					FB — Balsam fir
					FD — Douglas-fir
					LA — Tamarack
					P — Pine
					PA — Whitebark pine
					PB — Balsam poplar
					PF — Limber pine
					PL — Lodgepole pine
					SE — Englemann spruce
					SW — White spruce
					X — Non-forested

Addendum VII Digital Data

This appendix includes a DVD with the following files:

- Classified landbase shapefile which identifies the 40-year harvest sequence from the preferred forest management scenario,
- Adjusted compartment shapefile,
- Interior old forest shapefiles at 0, 11, 51 and 101 years into the future from RUN91021A,
- Data dictionary for shapefiles,
- Woodstock model used to build the preferred forest management scenario,
- Patchworks model for the preferred forest management scenario,
- Results of all TSA scenarios,
- Access control unit availability maps for first 41 years,
- Interior old forest patch maps (1:300,000) at 0, 11, 51 and 101 years for patches > 100 and > 40 ha in size, and
- Final report (Word/Excel and pdf formats).

NOTE: Only one copy of the digital data was submitted to SRD, as per the Planning Standard.

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