



Sundance Forest Industries Ltd.

Forest Management Plan 2007



27 April 2007





EXECUTIVE SUMMARY

Sundance Forest Industries Ltd. (Sundance) signed a Forest Management Agreement (FMA) with the Province of Alberta on January 14th, 1997. Sundance has served notice of the intent to exercise the option to renew the FMA at the conclusion of the first 10-year period in January 2007. Terms of the agreement were agreed to in December 2006. The new agreement will change the starting date of the company's cut control period to May 1st to align with the standard provincial timber year. Timber allocations proposed in this plan reflect the changed date.

In 1999, Sundance developed a Detailed Forest Management Plan (DFMP) to guide the activities of companies harvesting timber on the area included in the FMA area. The timber supply was re-analysed in 2002 and new annual allowable cuts were approved for Sundance and the imbedded disposition holders.

This Forest Management Plan (FMP) replaces the DFMP. It analyzes past and present uses of the forest and shows the forest resource management values, objectives, indicators and targets designed to meet a desired future forest state as defined by the company, public stakeholders and the Provincial Government. It provides a framework for the development of lower level plans and ground rules that will guide company activities over the next 20 years. It is effective from May 2007 until it is replaced.

This FMP represents a balanced approach considering the variety of objectives required to develop a Preferred Forest Management Strategy (PFMS) that is socially and environmentally responsible while being economically feasible. Analysis of the timber harvesting landbase showed that a mountain pine beetle infestation could have devastating effects on the timber available to sustain the existing operators. With this in mind, the decision was made to allow the scheduled harvest volume to fluctuate over time and to implement a 100% surge cut for the next 10 years. This is seen as an appropriate way to reduce the amount of susceptible pine and create breaks in the existing forest that may help to slow down mountain pine beetle migration. It will



also decrease the losses that would be associated with a possible large-scale infestation. The harvest levels proposed are:

Year	Harvest Level (m ³ /yr)	
	Conifer	Deciduous
2007-2016	841,666	60,041
2017-2026	418,763	60,029
2027-2206	420,776	54,739

Ongoing monitoring and reporting as described in this plan will allow the progress of Sundance and the other operators to be tracked. It will allow progress toward the targets to be measured and reported.

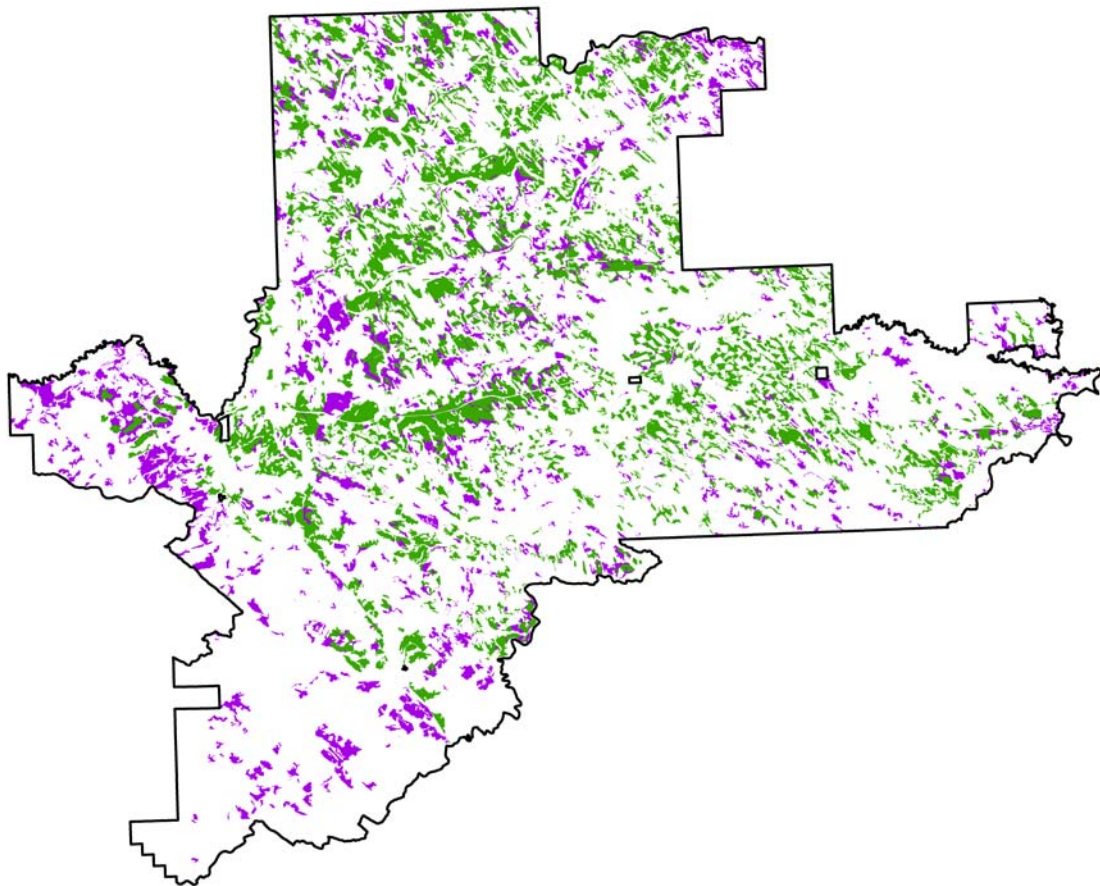
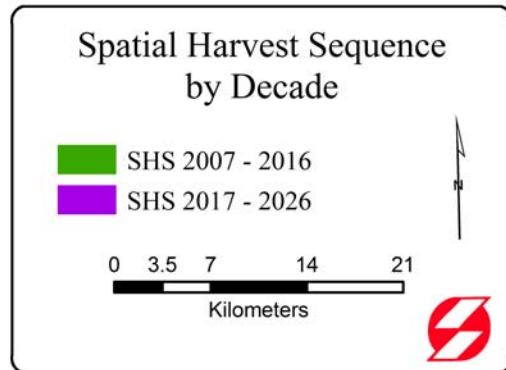
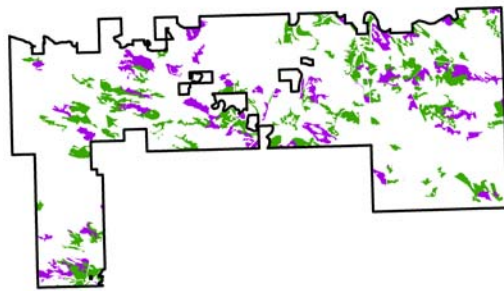




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1. Introduction

Sundance Forest Industries Ltd. (Sundance) signed a Forest Management Agreement (FMA) with the Province of Alberta on January 14th, 1997. The FMA states the desire of the Provincial Minister responsible for forest resources "to provide for the fullest possible economic utilization of timber from the forest management area and stable employment in local communities by maximizing the value of the timber resource base while maintaining a forest environment of high quality" (Government of Alberta, 1996). In support of the agreement, Sundance developed a Detailed Forest Management Plan (DFMP) to guide the activities of companies harvesting timber on the area included in the FMA.

This Forest Management Plan (FMP) replaces the DFMP. It analyzes past and present uses of the forest and shows the forest resource management values, objectives, indicators and targets designed to meet a desired future forest state as defined by the company, public stakeholders and the Provincial Government. It provides a framework for the development of lower level plans and policies that will guide company activities over the next 20 years. It is effective from May 2007 until it is replaced.

1.1 Management Philosophy

The FMP has been prepared using the Alberta Forest Management Planning Standard, (Version 4.1) released by Alberta in April 2006 (Alberta Sustainable Resource Development 2006b) as a guide. Although the standard was in a draft form when work started on the FMP, Sundance chose to use it as a guideline for the planning process, while incorporating the company's management philosophy. The management philosophy was developed as part of the 1999 DFMP with extensive input from the Sundance Public Advisory Committee (PAC). It states:



Sundance will provide for sustainable development of all resources within the Forest Management Agreement area and ensure that government regulations and policies are met or exceeded. The primary focus will be on timber management and efficient wood fibre utilization. Other important resource values including wildlife habitat, water quality and employment opportunities for area residents will also be maintained. The Company will modify operational practices where scientific data or research indicate change would be beneficial. Throughout the development and implementation of the DFMP, Sundance will maintain ongoing, two-way communication with the public and will cooperate with other users.

This philosophy has guided planning and operations during the past 10 years and will continue to do so during the term of this plan.

1.2 Plan Development Team

The Plan Development Team (PDT) was formed with staff from Sundance and Alberta. The mandate of the PDT was to reach agreement-in-principle on technical matters in a timely manner and to act as advisors to the public. Membership is shown in Table 1.1 below.

Table 1.1. Plan Development Team Membership

POSITION	ORGANIZATION
Woodlands Manager	Sundance Forest Industries Ltd.
Forestry Manager	Sundance Forest Industries Ltd.
Operations/Planning Forester	Sundance Forest Industries Ltd.
Forest Management Consultant	Sundance Forest Industries Ltd.
Growth & Yield Consultant	Sundance Forest Industries Ltd.
Timber Supply Analysis Consultant	Sundance Forest Industries Ltd.
Manager, Forest Planning Section	Forestry Division
Forester, Clearwater Area	Forestry Division
Forester, Forest Planning Section	Forestry Division
Area Wildlife Biologist, Southwest Region	Fish and Wildlife Division
Timber Supply Analyst	Forestry Division
Growth & Yield Analyst	Forestry Division

1.3 Public Advisory Committee

The Sundance Public Advisory Committee (PAC) was formed in 1997 to provide advice to Sundance on planning issues. Its primary purpose is to promote two-way communication between Sundance Forest Industries Ltd. and the public. It is an important mechanism for identifying issues to be considered by the company during plan preparation and implementation. Participants represent other organizations and report back to their memberships.

The Sundance PAC served as the public participation group for the purpose of developing this plan. Each section was reviewed by PAC members during the process.



1.4 Plan Development Process

Work on this Forest Management Plan began in the fall of 2004. A Terms of Reference was prepared by the Plan Development Team and was approved in May 2005. In July 2006, the PDT began meeting monthly to build and sustain some momentum in the planning process. As plan components were developed and agreement was reached at the Plan Development Team, those components were inserted into the draft document. Not all components were agreed to by the Plan Development Team members.

Final approval of the DFMP will take the form of an Approval Decision that presents the rationale for approving the plan, direction to Sundance deemed necessary by Alberta, to complete additional post approval work or modify proposed activities, and the allocation of approved annual allowable cuts.

1.5 Document Structure

This document has been developed in 5 sections:

- The Introduction describes the people and process used in plan development.
- The Planning Area Description places the Sundance FMA area within the context of the physical, biological and administrative units that affect both tree growth and company operations.
- Section 3 provides details on the values, objectives and targets prescribed in the Forest Management Planning Standard (Alberta Sustainable Resource Development 2006b) as they apply to the Sundance FMA area.
- The Preferred Forest Management Strategy (PFMS) incorporates the targets from Section 3 into a workable, spatially-explicit harvest sequence that will guide company operations for the next 10 years.
- Section 5 is a detailed explanation of how implementation of the PFMS will be monitored and reported over time.

Supporting documentation is provided in the Appendices, Development of the Landbase, Yield Curve Documentation and Timber Supply Analysis documents.



2. Planning Area Description

The Sundance landbase covers 264,787 hectares in West-central Alberta designated provincially as Forest Management Unit R13 and contained in Forest Management Agreement 9700032. The landbase is divided into the Erith Operating Area in the north and the Elk River Operating area in the south. The FMA area boundary is shown in Figure 2.1.

For planning purposes, each Operating Area has been subdivided into compartments ranging in size from 5,000 to 18,000 hectares. Compartment boundaries are generally rivers or heights of land, except along the outer edges of the FMA area, where township or section boundaries are often used. The Elk River Operating Area contains compartments 1 through 20, inclusive. Compartments 21 to 24 are within the Erith Operating Area. Operating Areas and Compartments are shown in Figure 2.2. Similar Compartments have been grouped for reporting results related to some of the targets established in this plan. Compartments 1 through 7 are in the Upper Foothills Natural Subregion south of the Brazeau River. The Pembina River is a significant landform that divides the remaining compartments into two groups; Compartments 8 through 18 and 19 through 24. For timber supply purposes, the entire landbase is managed as one sustained yield unit with coniferous and deciduous allocations based on forest growth throughout the FMA area.

The FMA area is within the Clearwater and Foothills Areas as defined by Alberta Sustainable Resource Development (ASRD) with the former being the “one window” for operational approvals.

Municipal authorities having responsibilities within the Sundance FMA area include both Yellowhead County and Clearwater County as shown in Figure 2.4.



Figure 2.1 Sundance FMA Area Boundary (R13)

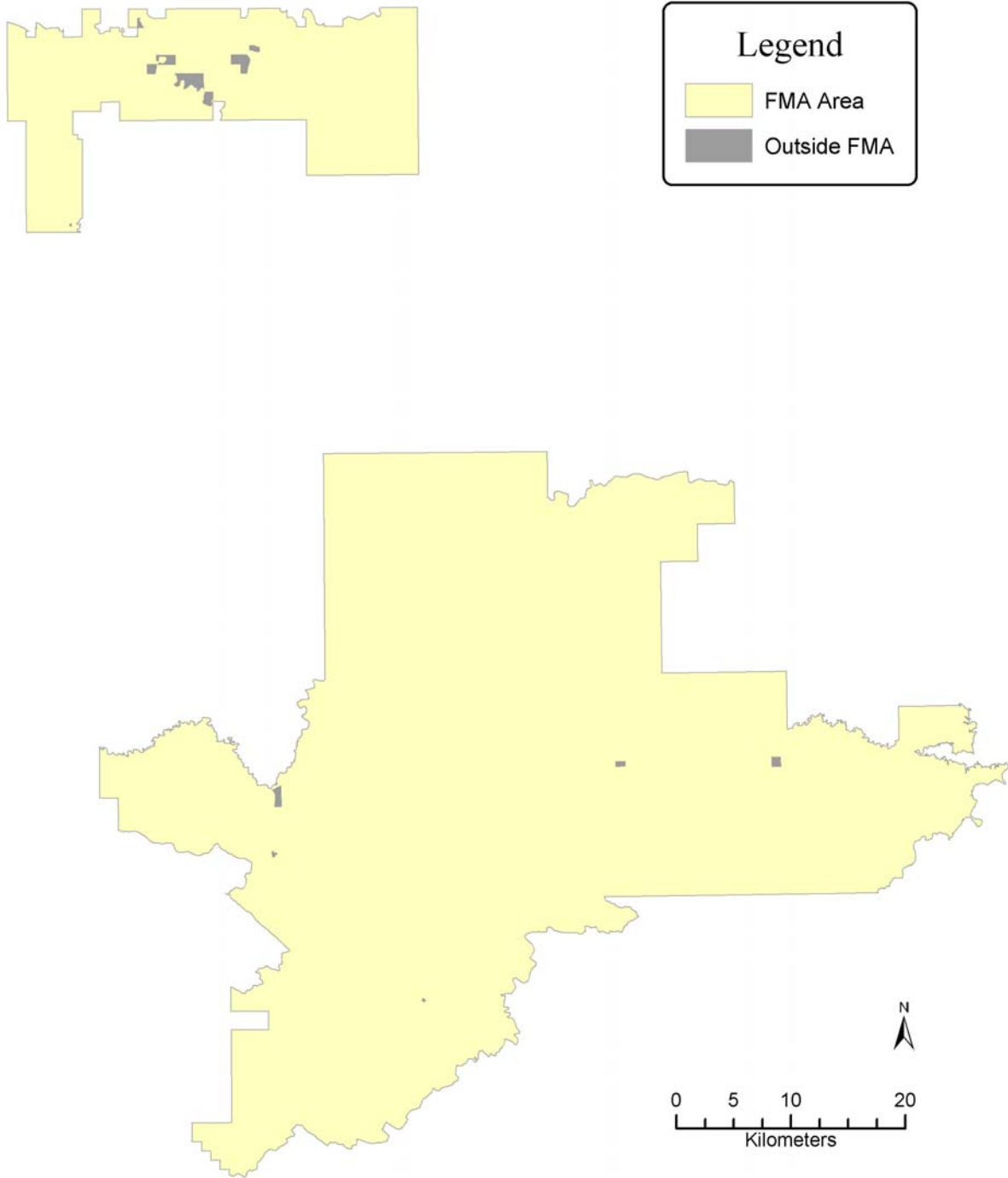




Figure 2.2 Compartment Boundaries

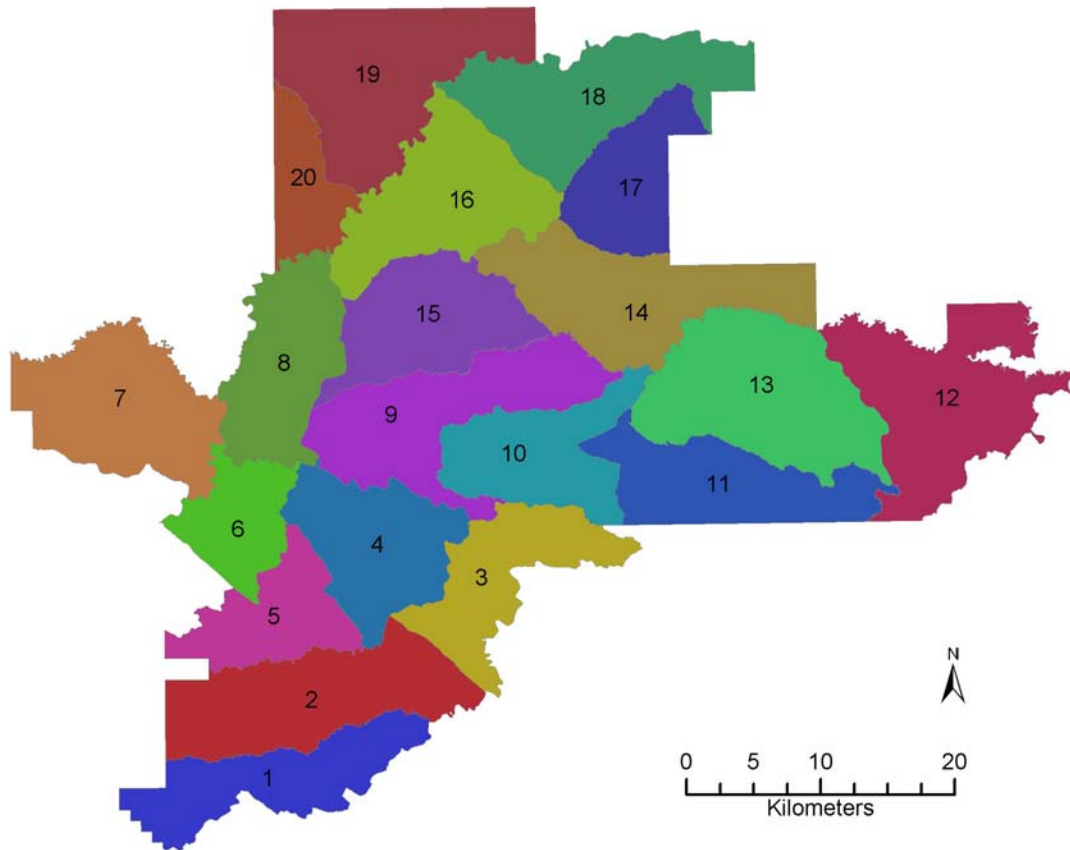




Figure 2.3 Forest Area Boundaries

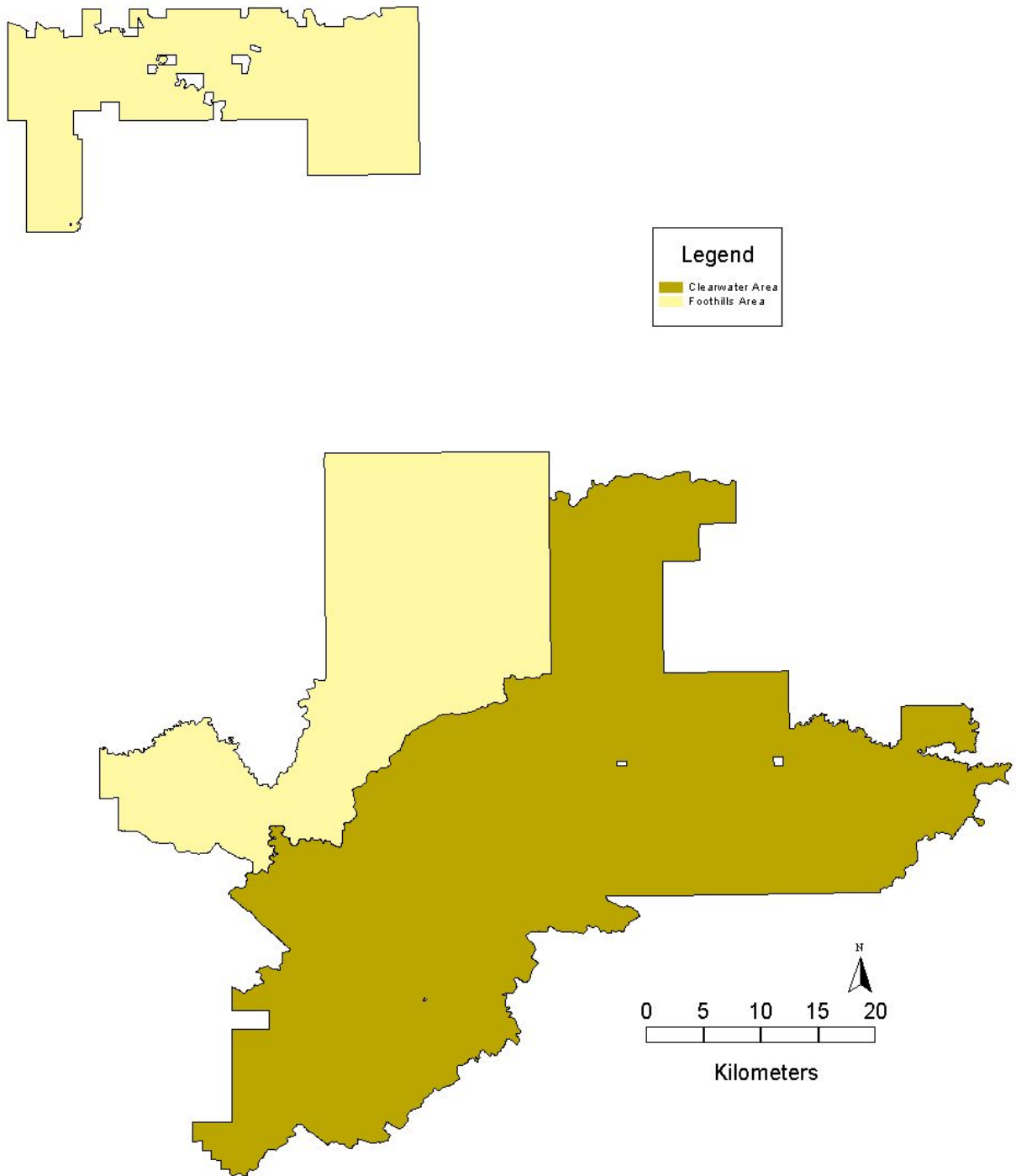
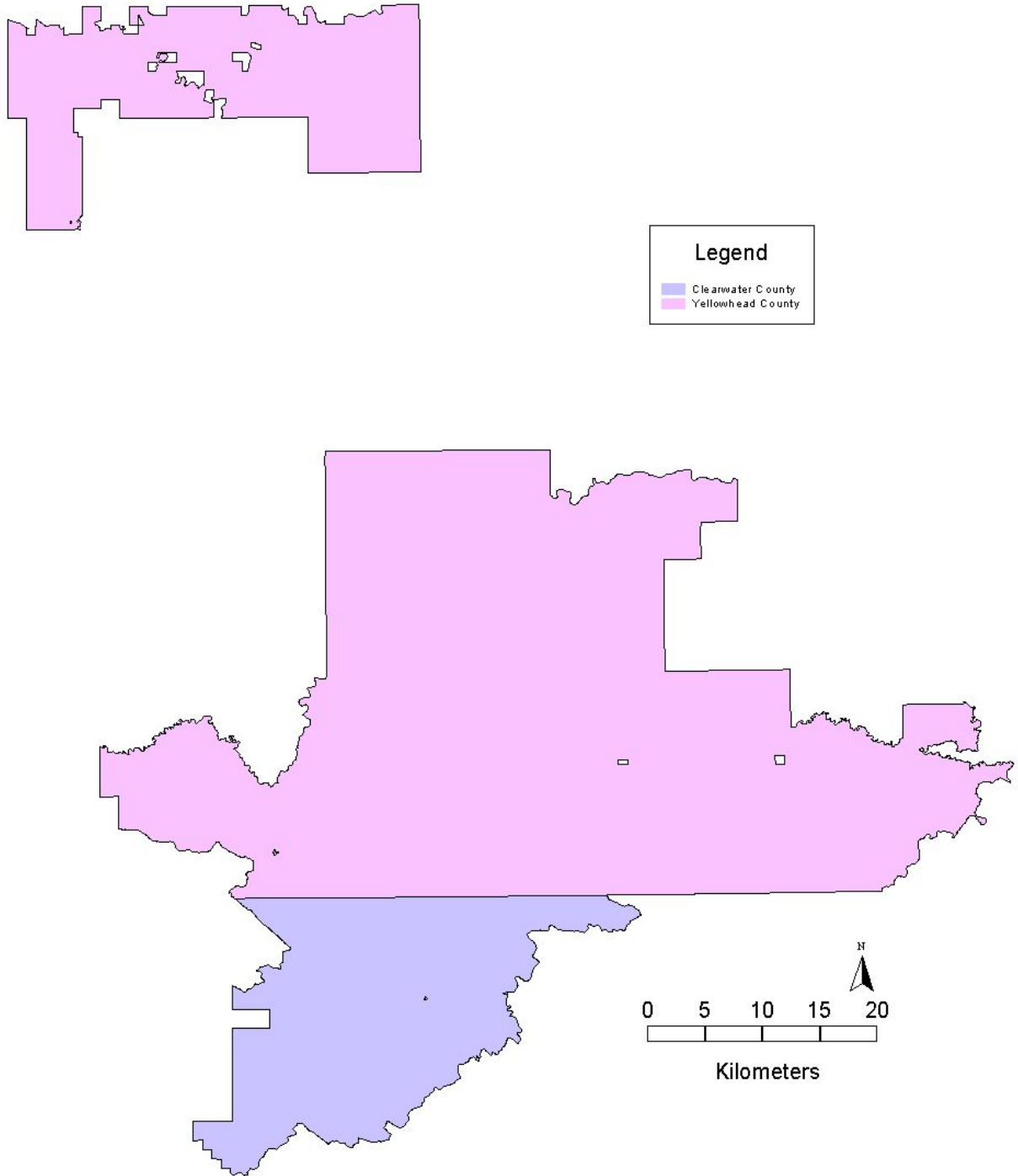




Figure 2.4 Municipal Boundaries





2.1 Biophysical Description

Various geological and biological processes have affected the Sundance landbase. Landforms in the area were produced by glaciers. The northwest to southeast orientation of ridges are due to the deflection of Cordilleran glaciers by the southward flowing Laurentide ice sheet. There are major areas of ridged and fluted till deposits which were probably formed by plastic flow of material at the base of glaciers. Vegetation patterns have been influenced by wildfires and the ability of plant and animal species to re-occupy disturbed areas.

2.2 Physical Land Classification

The Elk River Operating Area is mostly within the Wolf Lake Upland Subregion of the Western Alberta Plains Physiographic Region. This region is characterized by level to strongly sloping topography and includes local landforms varying from horizontal bogs to bedrock-controlled ridges. The area is underlain by the Paskapoo Formation of Paleocene age containing weakly consolidated beds of sandstone and siltstone, with interbedded layers of shale, coal and chert conglomerate. The surface material is dominantly till, glacial sediments, wind-blown and organic deposits. Soils are mainly Luvisolic or Brunisolic. Organic soils occur in poorly drained depressional and groundwater discharge areas (Kocaoglu, 1980).

Compartments 1, 2, 5 and 6 are within the Rocky Mountain Foothills Region. This region consists of a series of steep, approximately parallel ridges aligned in a northwestern to southeastern direction. The bedrock consists mainly of Cretaceous sandstones and shales covered by residual materials formed by alteration of the underlying bedrock. Till material is found only on the lower slopes of the valleys. Soils are mainly well drained Eluviated Eutric Brunisols with organic surface horizons and strongly expressed Ae horizons. The C horizon is usually sandy loam and includes bedrock fragments (Kocaoglu, 1985).

Compartments 8, 19, 20, 21, 22 and parts of 16 are within the Wolf Lake Benchland Ecodistrict of the Southern Alberta Uplands Physiographic Region. Topographic relief in this area is generally less than 30 metres with most of the variation in the landscape being caused by differences in surficial materials and their mode of deposition. The underlying bedrock is in the Brazeau and Paskapoo formations with parent materials of morainal, organic, fluvial, glaciolacustrine and glaciofluvial origin. The dominant soils are Brunisolic Gray and Orthic Gray Luvisols. Eutric and Dystric Brunisols are likely to be present in coarse fluvial or glaciofluvial deposits with Organic soils on the extensive wetlands (Bentz et al, 1986).

Compartments 23 and 24 are within the Edson Plain Ecodistrict of the Western Alberta Plains Physiographic Region. Underlying bedrock consists of calcareous sandstones, siltstones and mudstones with the dominant surficial material being glaciolacustrine deposits 6 to 12 metres thick. The area is generally flat, sloping toward the northeast. A dune field southwest of Edson contains poorly drained, stabilized parabolic sand dunes formed by winds blowing sand from the Marlboro delta area. Soils are mostly Orthic and Brunisolic Gray Luvisols with gleyed phases and gleysolic soils in depressional sites. Large areas have organic soils (Bentz et al, 1986).

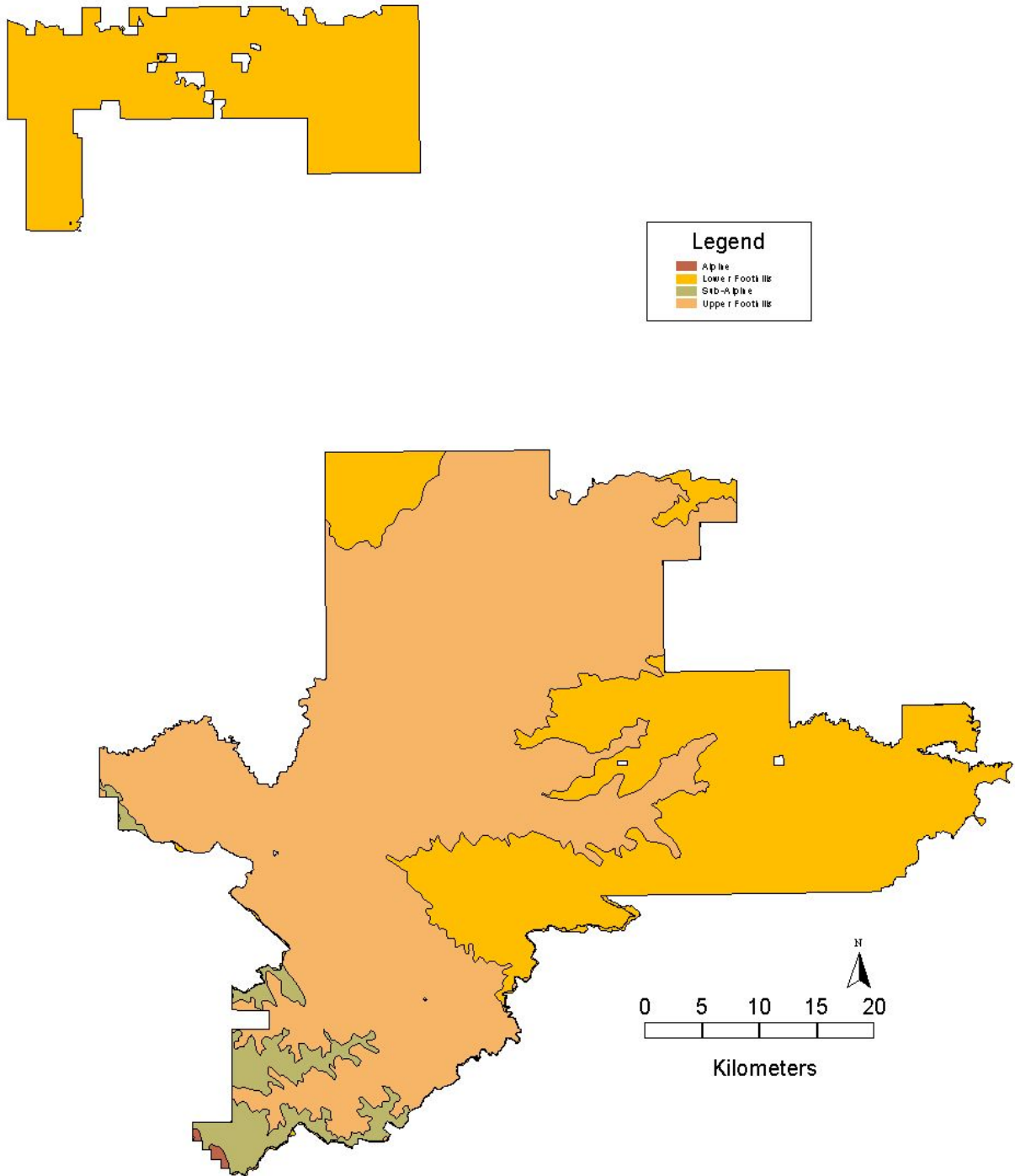


2.3 Ecological Classification

Parts of the Sundance FMA area are within the Upper Foothills, Lower Foothills, Subalpine and Alpine Natural Subregions as described in the “Field Guide to Ecosites of West-central Alberta” (Beckingham et al, 1996). The Natural Subregion boundaries were re-drawn for the entire province in 2005. For Sundance, the main impact was the change to the boundary between the Upper Foothills and Lower Foothills. This change altered silvicultural treatments, including seed sources, and regeneration survey parameters for some existing cutblocks. It also necessitated a review of temporary sample plots and permanent sample plots to ensure that Natural Subregion assignments were consistent with the new boundaries.



Figure 2.5 Natural Subregions





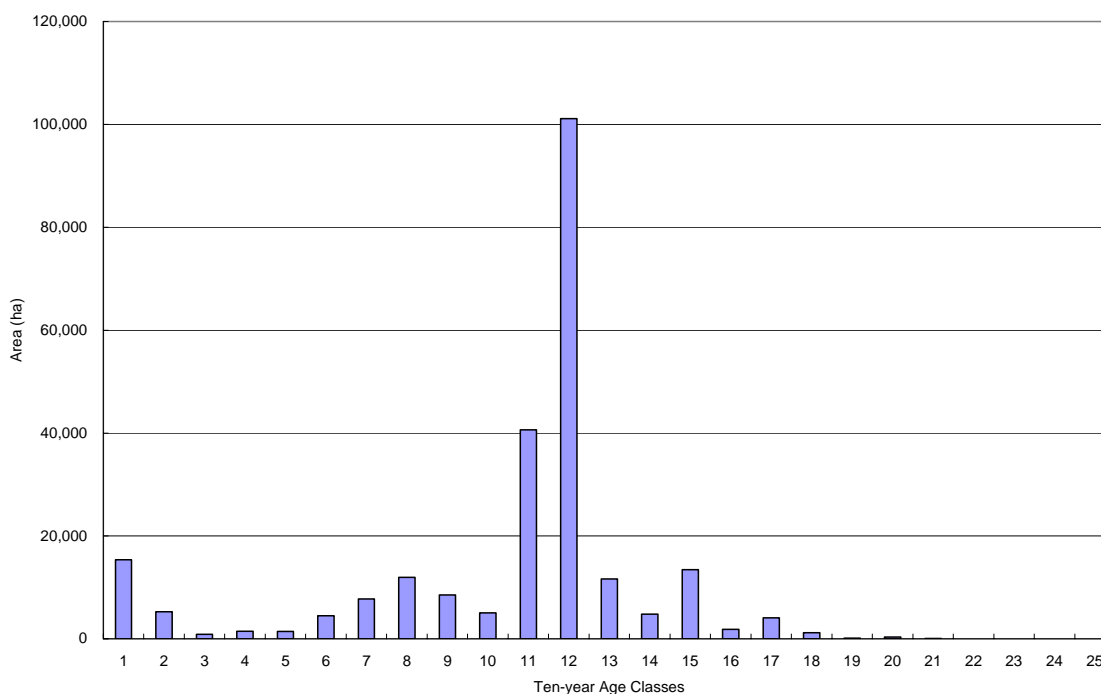
2.4 Cover Group Distribution

In order to complete a timber supply analysis, covertype labels used in the Alberta Vegetation Inventory were combined into yield strata. The process used is described in detail in the Yield Curve Documentation section of this plan. These nine strata were used to examine the distribution of tree species across the Sundance FMA area.

The Elk River Operating Area contains mostly pine forests with 56% of the area having lodgepole pine as the leading species. The next most prominent species is black spruce occurring on 17% of the area. Only about 3% of the Elk River Operating Area has deciduous forests with an additional 6% being mixedwood. The balance is conifer dominant. Compartments 1, 2, 5, 6, 7, 8, 15 and 16 on the western side of the operating area contain little or no deciduous forest.

The Erith Operating Area has a much more variable forest cover with 13% deciduous (aspen, poplar, birch), 26% black spruce and 19% lodgepole pine. Nearly 11 percent of the area contains larch forests that do not contribute to the annual allowable cut. Aspen and larch are distributed throughout the operating area with balsam poplar occurring in the major river valleys.

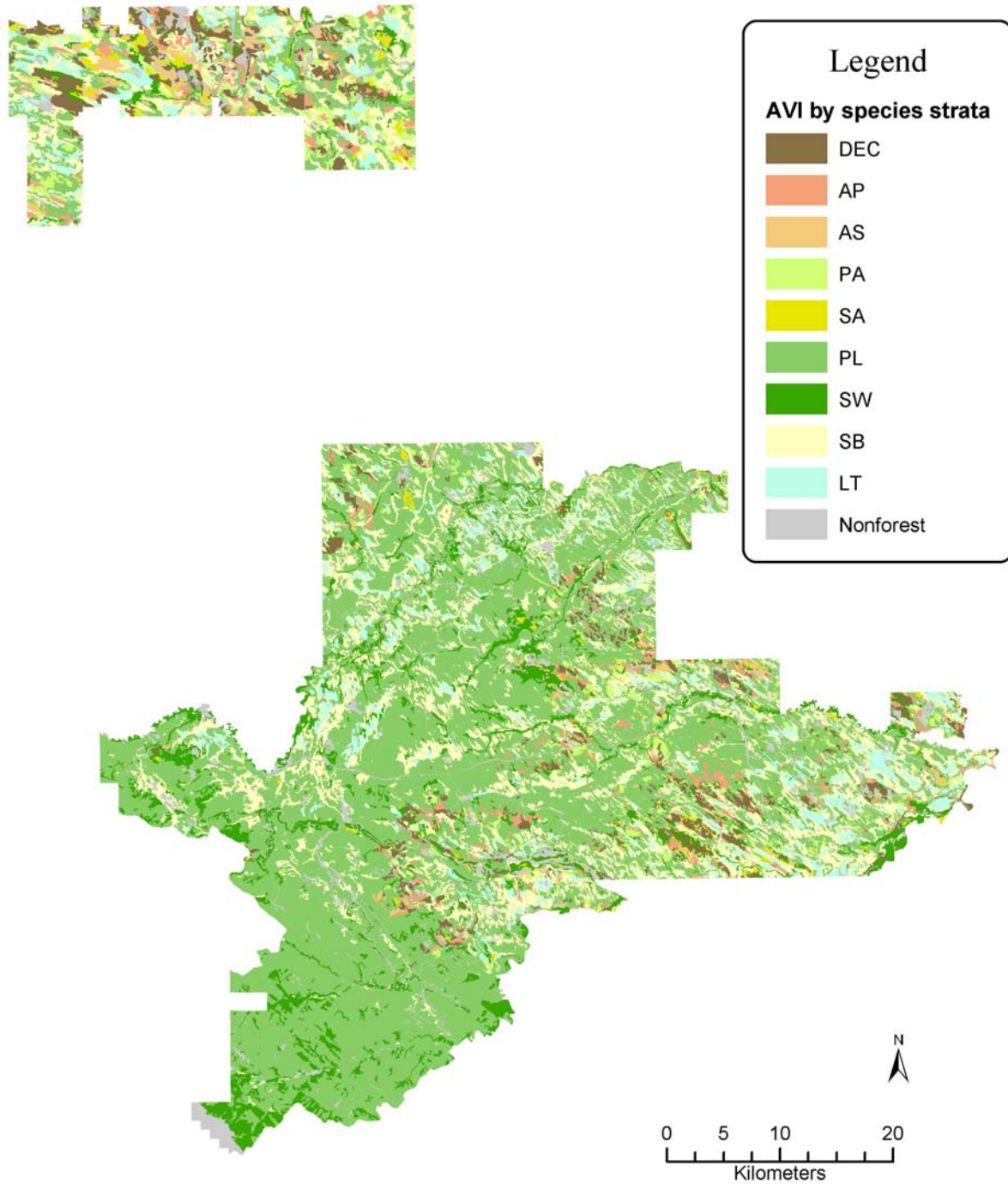
Figure 2.6 Age Class Distribution



As shown in Figure 2.6 above, nearly 42% of the forested landbase has forests that are 111 to 120 years old. The next most common age class is 101 to 110. In total, more than 58% of the forested landbase is between 101 and 120 years old.



Figure 2.7 Yield Strata



2.5 Hydrography

Alberta contains about two percent of Canada’s fresh water distributed among five major river systems, several thousand lakes and numerous wetlands (Alberta Environmental Protection, 1996). The Sundance FMA area is within two major river basins, the Peace-Athabasca-Slave



and the North Saskatchewan. The McLeod and Pembina Rivers are part of the Peace-Athabasca-Slave River Basin while the Brazeau and Blackstone rivers are in the North Saskatchewan Basin. Major watercourses are shown in Figure 2.8 on the following page.

The McLeod River flows through moderately to gently rolling terrain, with extensive poorly drained low-lying areas dominated by organic soils. Streams are generally slow moving and often flow through extensive poorly drained lowlands and muskeg. The extensive areas of poorly drained soils adjacent to stream channels increases the risk of flooding during major storms (Alberta Forestry, Lands & Wildlife, 1990). The Pembina River, Dismal Creek, the Owl and Elk rivers are within an area that is rated as having a moderate-high watershed sensitivity. Although surficial deposits are coarser and more stable than those in other areas, slope steepness and higher drainage densities increase the potential for erosion, water quality deterioration and stream channel damage (Resource Evaluation and Planning Division, 1986a).

The Brazeau River is rated as having a low watershed sensitivity. Although soils are glacio-lacustrine in origin and fine textured, erosion hazard is reduced by the relatively flat subdued topography. There is, however, potential for terrain damage resulting from summer land use activities due to the large area of organic wetlands. Overall, the watershed sensitivity of the Brazeau Reservoir area is low to moderate. The Brazeau Reservoir has a considerable effect on the timing and quality of water leaving the area via the Brazeau River. (Resource Evaluation and Planning Division, 1986a).

In the Brown Creek area, surficial deposits generally represent a moderate erosion hazard with slope steepness and relatively high drainage densities being the greatest concerns. Several current erosion problems exist, largely the result of inadequate erosion control along roads and other linear developments. (Resource Evaluation and Planning Division, 1986b).

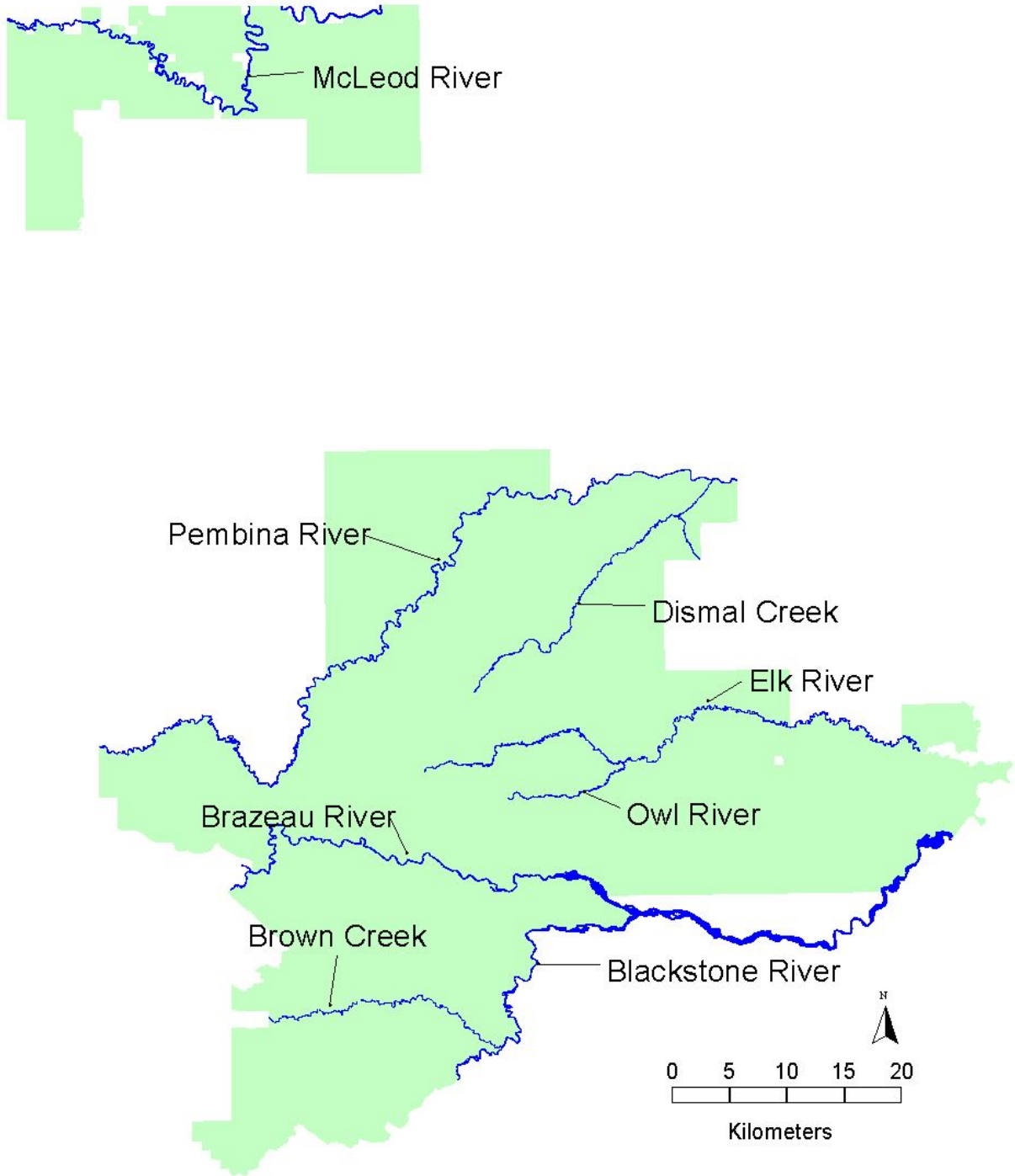
2.6 Fish and Wildlife Resources

The Sundance landbase is home to a variety of species of wildlife. Currently there are 7 amphibian, 2 reptile, 199 bird, 54 mammal and 27 fish species present on the forest management area. Details are shown in Appendix 1. There is a wide range of uses for the wildlife populations including hunting, guiding, fishing, trapping and wildlife viewing. It is important to manage the ecosystems that support these wildlife populations to ensure that these values can be sustained over time. Water quality will be preserved during forest operations which will ensure that fish habitat is maintained.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is a committee of experts that assesses and designates which wild species are in some danger of disappearing from Canada. Species are selected for assessment and are then given a status based on the likelihood of becoming extinct or extirpated. They may be assessed as endangered, threatened, special concern, data deficient, or not at risk. Currently, there are no species found within the Sundance FMA that are considered to be endangered. The peregrine falcon and cutthroat trout are designated as threatened species. The grizzly bear, wolverine, short eared owl, and the northern leopard frog are all considered as species of special concern.



Figure 2.8 Major Watercourses





The General Status of Alberta Wild Species 2000 assesses wildlife species provincially and provides a determination of their status. Wildlife can be ranked as at risk or may be at risk of extinction, sensitive to human activities or natural events, or as secure. The northern leopard frog, trumpeter swan and peregrine falcon are listed as a species at risk that are present on the Sundance FMA. The long-tailed weasel, northern long-eared bat, grizzly bear, wolverine, short eared owl, Canadian toad, and spoonhead sculpin are listed as species that may be at risk. There are also 3 amphibians, 2 reptiles, 26 birds, 4 mammals, and 2 fish species that are classified as sensitive.

Sundance will continue to communicate with trappers and guide outfitters to ensure that they are aware of upcoming operations in their areas of concern. Sundance will work with these individuals to try and accommodate any concerns they may have regarding operational plans. A representative of the Alberta Trapping Association is a member of the Sundance Public Advisory Committee. This will help to ensure that the trappers' interests are considered at each stage of forest management planning. Operational plans will continue to be referred to individual trappers affected by harvesting operations. Sundance will continue to work with the trappers to maintain the existing levels of trapping in the FMA.

2.7 Fire Regime Analysis

A fire regime analysis has been completed by the Foothills Model Forest within their study area which is located adjacent to the Sundance FMA area. The study area contains the same natural sub-regions as those that are found on the Sundance landbase. These natural sub-regions are Sub Alpine, Lower Foothills and Upper Foothills.

The natural sub-regions are a valuable means of stratifying the landscape. The differences between the rates of burning through time for each area suggest that fire is acting differentially at this scale. These differences can be related to climate, tree species dominance, and even historical lightning strikes. Natural sub-regions with higher fire cycles generally have cooler, wetter climates, and less lightning activity. (Andison, 2000)

With the study area of the Foothills Model Forest located so close to the Sundance FMA and being comprised of the same natural sub-regions, it is logical to assume that the fire regime will be very similar between the two locations. Therefore, Sundance has used the fire regime analysis from the Foothills Model Forest for the Sundance FMA.

The table below illustrates the fire cycle for the Sub Alpine, Lower Foothills and Upper Foothills portions of the Foothills Model Forest. The Sundance FMA would likely have a fire regime that is more comparable to the West Fraser FMA due to its closer proximity.

**Table 2.1 Fire Disturbance Areas and Cycles**

Period	West Fraser FMA Fires			ANC FMA Fires		
	Sub Alpine	Lower Foothills	Upper Foothills	Sub Alpine	Lower Foothills	Upper Foothills
1931-50	1	2	2	0	9	2
1911-30	16	11	8	14	12	22
1891-1910	23	11	22	7	21	42
1871-90	27	53	51	38	75	57
1851-70	4	55	36	16	53	38
1831-50	27	67	47	74	66	50
1811-30	5	6	0	15	36	20
Cycle (yrs)	110-140	65-75	80-90	80-90	50-60	60-70
Area (ha)	245,000	296,000	587,000	20,000	193,000	151,000

Source: Andison 2000.

Analyzing the fire cycle we can assess whether current harvesting practices are close to emulating natural disturbances. A harvest rotation age of 80 years is very close to the fire cycle for both the Lower and Upper Foothills. The fire cycle in the Sub Alpine is slightly higher at 110-140 years, however this is a fairly small portion of the Sundance landbase. Also, stands in this natural subregion have slower growth rates which will require a longer rotation age, so operationally it may be feasible to harvest these stands at older ages. Although this table does not show the spatial distribution or size of the disturbances, it does show that we are disturbing the landbase at an equivalent rate.

The size of disturbances within the forest can vary from 0.1 ha to greater than 10,000 ha. This makes it impossible to emulate with harvesting practices. For example, in the Upper Foothills 62% of young patches are less than 40 ha in size, compared to 0.7% greater than 10,000 ha (Andison 2001). Although the large patches are few in number, they tend to cover a very high area across the landbase due to their size. However, greater than 90% of the disturbed patches are from 0.1 to 599 hectares (Andison 2001). For forest management purposes this is the range that we should be trying to incorporate into our operational plans.

As fire travels across the landscape, not all areas are burned and there are residual islands left behind with varying degrees of mortality found within the island itself. In the Foothills Model Forest study area the amount of residual islands remaining after fire has disturbed the area ranges from 0-20% (Andison 2001).

Residual island remnants come in a wide range of sizes, shapes, types, and configurations. A residual island is considered to be at least four clustered trees. In west-central Alberta these islands can range from ten square meters to hundreds of hectares in larger disturbances. Although very large islands are responsible for most of the area in island remnants, the vast majority are small. 50% are less than 0.25 ha and 80% are smaller than 1 ha. (Andison 2003)

Using the Foothills Model Forest analyses as a guide, an attempt has been made in this FMP to create an opening patch distribution similar to a natural distribution. This is a negative exponential distribution where there are numerous smaller patches, with a few larger patches. Four targets were set for the timber supply analysis:



- 0% of opening patches under 2 ha for operational reasons
- second 79% of patches between 2 and 100 ha
- 16% of patches between 100 and 1,000 ha
- 5% of patches greater than 1,000 ha.

Previous management practices resulted in areas where the forest has been fragmented by many, relatively small cutblocks of similar size. The residual timber has been scheduled for harvest in some of these areas to create larger patches in the future forest. All patch targets were placed on the gross landbase. More detail on the patch size targets may be found in the Timber Supply Analysis Documentation section of this FMP.

2.8 History of Development (timber, oil & gas, mining)

Sundance has evolved from a small lumber and railway tie mill (Erith Tie Company Limited) established in the 1930's, to a new, dimension lumber mill producing 110 million board feet of lodgepole pine lumber on an annual basis. In February 1997, a new secondary manufacturing facility, registered as SunPlus Specialty Wood Products Ltd. (SunPlus) was opened on the Sundance site. The 60,000 square foot SunPlus plant re-manufactures lumber produced by Sundance and other companies into furniture, lumber and building components. Equipment has been upgraded including the installation of an automated chop saw line and stackers to allow the recovery of specific products from lower grades of lumber. SunPlus presently has an estimated annual throughput of over 80 million board feet. Providing support to this plant are two new specialty dry kilns capable of drying products for furniture grade components. A thermal oil plant, constructed in 2005, utilizes waste wood to heat the kilns and buildings.

The overall impact of Sundance operations on the Edson area economy is significant. Approximately 235 employees work at the site, with another 90 contract workers employed in logging and trucking operations and more than 100 part-time contractors involved in silvicultural applications, road construction and road maintenance. In addition, local businesses are contracted to supply goods and services as much as possible, resulting in the indirect employment of other area residents.

The inventory data show that the 1880's were particularly bad fire years in the eastern slopes of West Central Alberta. Nearly 48 percent of the forested land in the Sundance FMA area has a stand origin date of 1890, evidence that large areas burned in the years prior to that date. An additional 19% of the forest originated in 1900. This means that more than two-thirds of the forest was burned sometime in the late 19th century.

2.9 Timber harvesting

The southern portion of the FMA had small-scale logging taking place along the eastern edge between 1900 and World War II. In areas south of the Brazeau River, logging did not start until the 1920's due to limited access. Near the Pembina River, logging dates back to the 1930's when stands were selectively cut for ties and timbers for the local mines. When the quota system



was initiated in 1966, several quotas were issued in the former E1, E5, R3 and R4 Management Units.

Logging has been taking place in the Erith Operating Area since 1910. In 1966, the Quota system was implemented and quotas were issued to Svedberg Lumber, Erith Tie Company, North Road Lumber & Building Supplies and Medicine Lodge Timber Products. Recently, the area has been managed to maximize the utilization of both coniferous and deciduous timber. Quotas are currently held by Medicine Lodge Timber Products, Precision Forest Industries, Tall Pine Timber and Edson Community Harvesting Operations (ECHO).

A Miscellaneous Timber Use (MTU) program was originally established to provide coniferous and deciduous timber for local users, including small commercial operators and farmers. Most of the volume originally designated for the MTU program has since been allocated to the quota held by ECHO. The remaining MTU volume is now administered by EDFOR with Commercial Timber Permits issued to local sawmillers.

2.10 Resource Extraction Industries

Oil & gas development has been occurring in the Sundance FMA area since the 1950's. The northern portion of the FMA has established oil fields in the Fickle Lake and Ansell areas. Canadian Natural Resources Limited has a gas plant near Fickle Lake and the Talisman Gas Plant is located on the north FMA boundary. In the southern portion of the FMA, oil & gas activity is found scattered throughout the area, with the majority of the development near the Brazeau and Pembina gas plants and fields on the East side. Parts of the Robb-Hanlon and Peco fields are also in the FMA area. The landbase is crossed by numerous pipelines, which have a direct effect on company operations. Several major transmission lines run through the northern portion of the FMA.

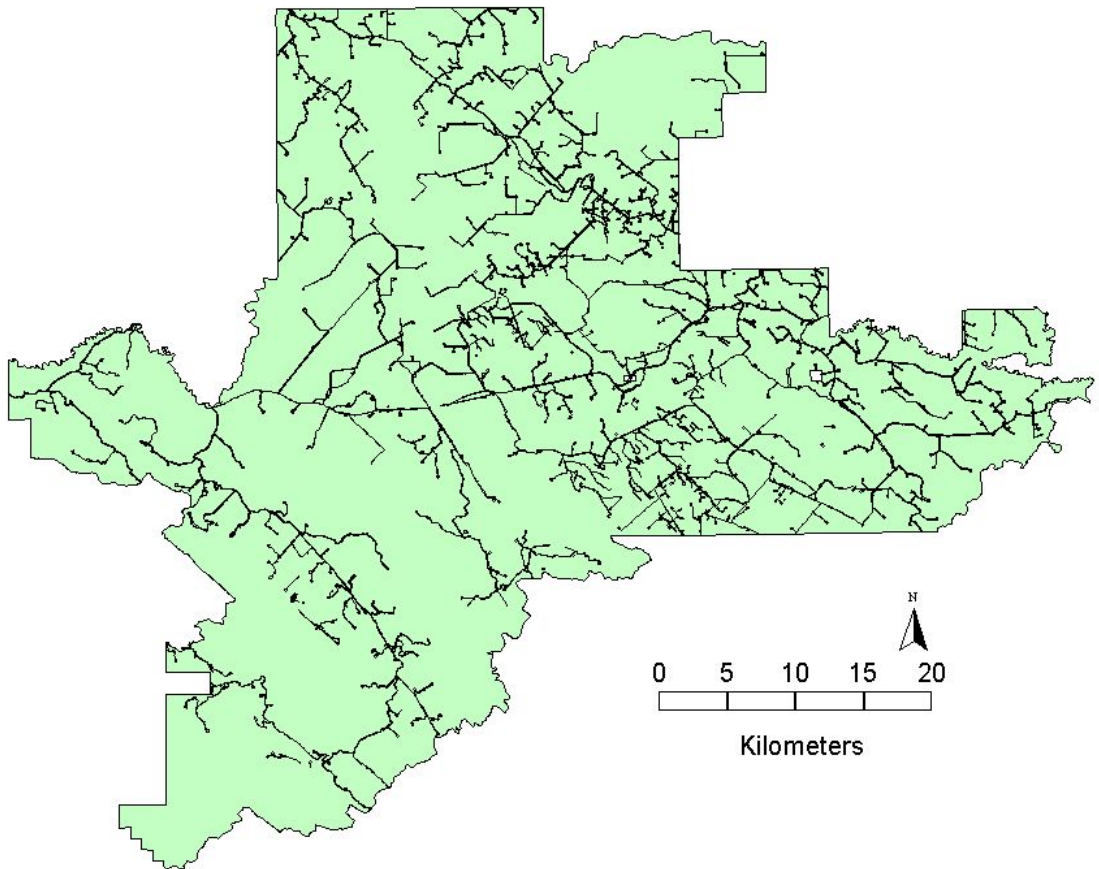
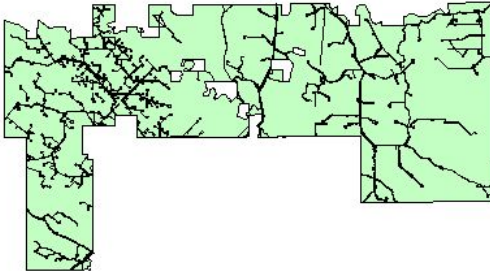
The petroleum industry is extremely important to the economy of Alberta. In order to access the sub-surface resources, land must be taken out of forest production. There have been 747 dispositions (LOC's) issued for roads covering 3,636 hectares. Of these, only 28 (485 hectares) are held by Sundance. There are also 1,045 wellsites present on the landbase with a total area of 2,312 hectares cleared. Sundance began tracking area and volume lost to mineral leases and oil and gas activities, including exploration, in January 1997. The GIS database is normally updated twice per year, more often if activity warrants. Figure 2.9 shows the extent of development for roads and wellsites.

Other known resources in the area are sulphur, coal and construction aggregates. The production of sulphur is directly linked to sour gas production and is not developed on its own. There are no known active coal fields within the FMA boundaries, although coal dispositions have been allocated. Gravel and sand deposits are present throughout the land base. They are normally developed in conjunction with other construction activities and road building with the material used relatively close to the extraction site.

Expansion of existing hydroelectric facilities or development of new ones could affect the amount of land available for timber production. There are no known plans at this time.



Figure 2.9 Roads and Wellsites





2.11 Planning History

Sundance signed a Forest Management Agreement with the Province of Alberta on 14 January 1997. This agreement allowed volume previously allocated to the company under several quotas to be transferred to a land-based tenure. The Preliminary Forest Management Plan, approved in September 1997, consolidated the existing quota volumes to establish an interim annual allowable cut for the company and the embedded disposition holders.

The Detailed Forest Management Plan (Sundance Forest Industries Ltd. 1999) was submitted in June 1999 and approved for implementation in January 2000, subject to additional sampling and an updated timber supply analysis being completed. The timber supply was re-analysed in 2002 (The Forestry Corp 2002) and new annual allowable cuts were approved for Sundance and the imbedded disposition holders.

Sundance has served notice of the intent to exercise the option to renew the Forest Management Agreement at the conclusion of the first 10-year period in January 2007. Terms of the agreement were agreed to in December 2006. The new agreement will change the starting date of the company's cut control period to May 1st to align with the standard provincial timber year. This Forest Management Plan will replace the existing DFMP on 1 May 2007.

2.12 Historical Resources

In 2002, Sundance co-operated with Weyerhaeuser, Ainsworth Lumber Co. Ltd. and Alberta Plywood to develop a management system that identifies historical resource issues and concerns in relation to company operations. The following year, a terrain-based predictive model was run to predict historical resource sensitivity across the Sundance FMA area. Annually, archaeologists review the cutblocks scheduled for harvest and conduct field assessments to determine the presence of historical resources. Twenty-six finds were catalogued in 2004 and 9 in 2005.

2.13 Trends

Since preparation of the DFMP in 1999, many changes have taken place.

- Population levels of Mountain Pine Beetle have increased to epidemic proportions in British Columbia and have begun expanding into Alberta.
- Oil and gas development has expanded west of the Forestry Trunk Road and intensified in other parts of the FMA area resulting in lost landbase and increased timber salvage volumes.
- Research at the Foothills Model Forest has shown that while cutover areas increase food availability for grizzly bears, higher road densities increase mortality rates.



- Lumber and pulp markets have changed, resulting in product adjustments for all companies. Sundance lost a market for roundwood pulp as a result of market shifts, but has developed markets for shavings, for pins and fines and for roundwood posts.
- The Alberta Forest Management Planning Standard, approved in May 2006, has shifted the development of goals and objectives from an FMA-specific focus to a standardized format.
- Ground rules are being standardized using a provincial template (Alberta Sustainable Resource Development 2006a).

The combined effect of these trends has complicated the forest management planning over the past 10 years. Standardized analyses and objectives are required to be implemented with results monitored in an environment of increasing uncertainty. The potential impact of the mountain pine beetle is severe, but the timing and intensity of future infestations is unknown. Exploration and development by petroleum companies affects mandatory performance targets, yet forest companies have no control over either timing or location. This plan represents an attempt to balance provincial reporting requirements with local economic and environmental conditions to provide for sustainable forest-based industries on the Sundance FMA area for the foreseeable future.



3. Values, Objectives, Indicators and Targets

Following release of the National Forest Strategy in 1992, the Canadian Council of Forest Ministers (CCFM) consulted with a wide range of stakeholders to develop a series of criteria and indicators of sustainable forest management (Canadian Council of Forest Ministers, 1995). The framework was revised in 2003 to reflect Canadian values and scientific progress made since the first version (Canadian Council of Forest Ministers, 2003). The current six criteria are:

- Biological diversity.
- Ecosystem condition and productivity.
- Soil and water.
- Role in global ecological cycles.
- Economic and social benefits.
- Society's responsibility.

During preparation of the Sundance DFMP in 1999, consultation and discussion resulted in 22 resource management issues being identified as important to individual stakeholders and groups. The economic and social issues were combined into one section due to overlap in the background information and the goals and objectives. The final 21 issues were addressed individually by the Sundance Public Advisory Committee (PAC) and the Sundance Technical Committee. The result was series of 47 goals with associated objectives and strategies.

In order to align more closely with federal reporting requirements, the Alberta Forest Management Planning Standard has prescribed a standard set of objectives based on the 1996 Criteria and Indicators. These will replace the goals, objectives and strategies adopted in the last plan. The 27 objectives to be used for this Forest Management Plan are shown below, grouped by the CCFM criteria and elements:

**Biological Diversity***Ecosystem Diversity*

Maintain biodiversity by retaining the full range of cover types and seral stages.

Maintain biodiversity by avoiding landscape fragmentation.

Maintain biodiversity by minimizing access.

Maintain plant communities uncommon in DFA or province.

Maintain unique habitats provided by wildfire and blowdown events.

Retain ecological values and functions associated with riparian zones.

Retain stand level structure.

Maintain integrity of sensitive sites.

Maintain aquatic biodiversity by minimizing impacts of water crossings.

Species Diversity

Maintain habitat for identified high value species (i.e. economically valuable, socially valuable, species at risk, species of management concern).

Genetic Diversity

Retain “wild forest populations” for each tree species in each seed zone through establishment of in-situ reserves by the organization or in cooperation with Alberta.

Retain wild forest genetic resources through ex-situ conservation.

Integrate transboundary values and objectives into forest management.

Ecosystem Condition and Productivity

Meet reforestation targets on all harvested areas.

Limit conversion of forest Landbase to other uses.

Recognize lands affected by insects, disease or natural calamities.

Control non-native plant species (weeds).

Soil and Water

Minimize impact of roading and bared areas in forest operations.

Minimize incidence of soil erosion and slumping.

Limit impact of timber harvesting on water yield.

Minimize impact of operations in riparian areas.



Role in Global Ecological Cycles

Carbon Cycle

Although Provincial objectives related to this criteria and element have not been formally defined, in general, harvesting mature trees and replacing them with a younger, more vigorous forest will help to maintain the overall capacity of the forest on the Sundance FMA area to store carbon. Also, improved utilization beyond the sawlog standard in pulp, posts, shaving and pins and fines will lead to more carbon being captured and less being lost through burning or decomposition.

Economic and Social Benefits

Economic Benefits

Establish appropriate AACs.

Reduce wildfire threat potential by reducing fire behaviour, fire occurrence, threats to values at risk and enhancing fire suppression capability.

Distribution of Benefits

Integrate other uses and timber management activities.

Sustainability of Benefits

Maintain Long Run Sustained Yield Average.

Society's Responsibility

Aboriginal and Treaty Rights

Aboriginal Traditional Land Use and Forest-based Ecological Knowledge

Forest Community Well-being and Resilience

Fair and Effective Decision-making

Implement aboriginal involvement program.

Informed Decision-making

Implement public involvement program.

Each of the 27 objectives has one or more associated indicators and targets that will guide management of the forest resources in the Sundance FMA area over the next 20 years. They are described in detail in this section.



3.1 Maintain biodiversity by retaining the full range of cover types and seral stages .

3.1.1 Indicator - Area of old, mature and young forest by cover class.

Target

Over the 200-year planning horizon:

- a) Gross Landbase greater than 2% old forest, greater than 13% mature plus old forest, less than 46% young forest; and
- b) Net Landbase: greater than 0.3% old forest, greater than 5% mature plus old forest, less than 57% young forest.

Monitoring and Measurement

Regular updates to inventory.

Reporting

FMP: Tables of indicators (values and targets) at 0, 10 and 50, 100 and 200 years. Maps of indicators at 1, 10 years, 50 years.

Performance: Stewardship Report

Acceptable Variance

Area (ha) of old and mature forests shall be between 90% and 100% of target areas.

Area of young forest shall not exceed 110% of target area.

Response

Adjust strategies in subsequent FMP.

Target Selection

As shown in Table 3.1, only 0.73% of the gross forested landbase currently contains old growth forest. The area will increase significantly over time as the non-managed forests age. More than 6,700 hectares or 2.8% of the gross forested landbase within riparian buffers have been excluded from timber harvesting. These areas, along with steep slopes and land that has been subjectively deleted from the managed landbase will all continue to support forests and will continue to age, increasing the amount of old growth forest over time.



Table 3.1 Seral Stage Distribution by Yield Strata

Stratum	Regenerating		Young		Mature		Early Old Growth		Late Old Growth		Total Area
	Age	Area (ha)	Age	Area (ha)	Age	Area (ha)	Age	Area (ha)	Age	Area (ha)	
DEC	0-20	947	21-60	1,778	61-30	7,767	131-160	237	161-245	72	10,800
AP	0-25	966	26-80	765	81-140	4,764	141-180	0	181-400	0	6,495
AS	0-30	440	30-90	716	91-150	2,230	151-190	9	191-400	0	3,394
PA	0-25	1,373	26-70	1,572	71-140	5,321	141-180	74	181-400	0	8,340
SA	0-30	131	30-90	656	91-150	1,387	151-190	125	191-400	0	2,299
LT	0-40	26	41-100	8,153	101-200	6,022	201-250	0	251-400	0	14,201
PL	0-30	14,230	31-80	7,759	81-160	104,527	161-210	1,190	211-295	0	127,706
SB	0-40	110	41-100	6,043	101-200	39,851	201-250	17	251-295	0	46,021
SW	0-30	654	31-90	5,692	91-180	13,758	181-230	15	231-295	3	20,122
Total Area		18,876		33,134		185,627		1,668		75	239,379
% Area		7.89%		13.84%		77.55%		0.70%		0.03%	

Means of Achieving Objective and Target

The 2% target set in the timber supply analysis was not achievable, however, the amount of old growth on the gross landbase will increase over time. The spatial harvest sequence will ensure that progress toward the target is made during the next 10 years.



3.2 Maintain biodiversity by avoiding landscape fragmentation.

The increasing amount of petroleum exploration and development has led to heightened public awareness of landbase fragmentation issues. Books such as *Alternative Futures: Alberta's Forests at the Crossroads*, published by the Alberta Centre for Boreal Research (Schneider, 2002), have brought additional attention to the potential impacts of continued development. Attempts to address the issue on a regional basis have not been successful. The Northern East Slopes Sustainable Resource and Environmental Management Strategy, completed and submitted in 2003, has never been formally approved. The Chungo Creek Main Trunk Road Corridor Plan was coordinated by the Alberta Chamber of Resources working with other industry and government representatives for one small part of the Sundance FMA area west of the Forestry Trunk Road.

3.2.1 Indicator 1 - Range of patch sizes by subunit and entire DFA.

Target

A distribution of harvest area sizes that will result in a patch¹ size pattern over the 200 year planning horizon approximating patterns created by natural disturbance. The targets used in the timber supply analysis were derived from natural disturbance research at the Foothills Model Forest.

Table 3.2 Patch Size Targets used in Timber Supply Analysis

Monitoring and Measurement

Regular updates to inventory.

Reporting

FMP: Tables of area of forest in each patch size class by subunit a 0, 10, and 50 years (or end of first rotation). Maps of patch size classes at 0, 10 and 50 yrs (or end of first rotation).

Performance: 5-year Stewardship Report

Acceptable Variance

At the end of the 10-year FMP term the target distribution is achieved; or demonstrated progress to achieving target in one rotation where the pattern has deviated significantly from the target.

¹ Patch: a stand of forest in the same seral stage, and not split by a linear feature greater than 8m wide. Linear features in this definition include roads, pipelines, powerlines and rivers but does not include seismic lines.



Response

Adjust strategies in subsequent FMP.

Target Selection

A description of the patch size target selection is included in the Timber Supply Analysis documentation.

Means of Achieving Objective and Target

Spatial and temporal harvest planning.



3.2.2 Indicator 2 - Range of patch sizes by subunit and entire DFA.

Target

Area of old interior forest² of each cover class will not be less than 10% over the next 200 years.

Monitoring and Measurement

Regular updates to forest inventory

Reporting

FMP: Maps and tables of indicator at 0, 10 and 50 years.

Performance: Stewardship Report

Acceptable Variance

Target is achieved for at least 80% of the planning period with variance not exceeding 20% below target.

Response

Adjust strategies in subsequent FMP.

Target Selection

At the present time, there is very little old forest on the Sundance FMA area. This target is not achievable in the short term, but progress may be made towards it by creating larger cutblocks now and allowing larger areas of mature forest to become old forest over time. The timber supply analysis shows that the preferred forest management strategy will increase the amount of old interior forest over the next 50 years.

Means of Achieving Objective and Target

Spatial and temporal harvest planning.

² Interior forest: a forested area greater than 100 hectares in size located beyond edge effect buffer zone along the forest edge. For interior forest objective use a common age definitions for all cover classes to prevent breaking up patches that have a common origin date.



3.3 Maintain biodiversity by minimizing access

3.3.1 Indicator 1 - Open all-weather forestry road density by subunit.

Target

Less than 0.6 km/km² in high quality grizzly bear habitat and 1.2 km/km² in all remaining grizzly bear range.

Monitoring and Measurement

Regular updates to forest inventory.

Reporting

FMP: Table of road density by subunit at 0 and 10 years. Map of existing and proposed open and closed all weather roads. Report forestry roads and total (all users) roads.

Performance: Stewardship Report

Acceptable Variance

A variance not exceeding $\pm 20\%$ must be achieved.

Response

Adjust strategies in subsequent FMP.

Target Selection

The Draft Alberta Grizzly Bear Recovery Plan 2005-2010 (Alberta Grizzly Bear Recovery Team 2005) calls for 0.6 km/km² in high quality grizzly bear habitat and 1.2 km/km² in all remaining grizzly bear range.

Means of Achieving Objective and Target

Develop a strategy that coordinates access with other resource users, spatial/temporal sequencing of harvest, road closures and decommissioning. (SHS and long-term corridor access plan).

- Utilize existing access roads and rights-of-way wherever possible.
- Cooperate with other companies to develop and maintain shared roadways.
- Maintain contact with representatives of companies using and building roads within the Sundance FMA area.
- Coordinate the construction and maintenance of roadways with other industrial users as much as possible.



3.3.2 Indicator 2 - Open seasonal/temporary forestry road length.

Target

Less than 40 km of new Class IV road is built in each timber year.

Monitoring and Measurement

Road plan OGR 11.2

Reporting

AOP and Stewardship Report.

Acceptable Variance

A variance not exceeding +/- 20% must be achieved.

Response

Adjust strategies in subsequent AOPs.

Target Selection

The targets demonstrates an attempt to minimize the amount of all weather temporary road being built in any one year while still recognizing that access is required to move wood products from harvested areas.

Means of Achieving Objective and Target

The following actions will be taken to minimize access:

- Reclaim temporary roads as soon as they are no longer needed
- Build temporary roads to be used for summer access one year in advance.
- Reclaim interior block roads as soon as initial silvicultural treatments are complete.
- Minimize the amount of area within each cutblock that is developed as road.
- Check for erosion of reclaimed roadways.



3.4 Maintain plant communities uncommon in DFA or province.

3.4.1 Indicator - Occurrence of each uncommon plant community within DFA.

Target

90% of identified uncommon communities will be maintained.

Monitoring and Measurement

Regular updates to inventory.

Reporting

As uncommon plant communities are identified, they will be recorded in tables with descriptive list and targets. Map(s) displaying known locations of uncommon plant communities will also be developed.

Performance: Stewardship Report

Acceptable Variance

At the end of the 10-year FMP term, the target is achieved within 5%.

Response

Adjust strategies in subsequent AOPs.

Target Selection

There are no environmentally significant areas within the Sundance FMA area that are of national or international significance (Sweetgrass Consultants Ltd. 1997). The *Canadian Rocky Mountains Ecoregional Assessment*, prepared for the Nature Conservancy and the Nature Conservancy of Canada (Rumsey et al 2003) did not show any plant communities in Alberta as having a ranking of G1 or G2. However, a recently published list by Alberta Community Development (Allen 2006) shows one forest community, *Pinus contorta/Cornus stolonifera* woodland as having global significance. It is a riparian association restricted to alluvial terraces or benches with high water tables, globally ranked as G2G3, that could occur on the Sundance FMA area. Similarly, the *Elaeagnus commutata* riparian shrubland could also occur. All areas adjacent to permanent streams are excluded from harvesting, so occurrences of these communities would not likely be affected by harvesting operations, but planning and layout personnel will be trained to recognize them.



Aboriginal communities may have knowledge of uncommon plant associations. Sundance has recently been working with representatives of the O'Chiese band and will continue to do so.

Provincially, the communities shown in Table 3.3 below are considered uncommon:

Table 3.3. Uncommon Plant Communities in the Foothills Natural Region (Allen 2006)

CODE	SCIENTIFIC NAME	COMMON NAME	GROUP
CEAB000115	<i>Betula glandulosa</i> / <i>Festuca campestris</i>	bog birch / mountain rough fescue	S2S3 Shrubland
CEAB000031	<i>Carex limosa</i> / <i>Sphagnum jensenii</i>	mud sedge / pendant branch peat moss	S1 Herbaceous
CEGL001098	<i>Elaeagnus commutata</i>	riparian silverberry riparian shrubland	SU Shrubland G2Q
CEAB000117	<i>Festuca campestris</i> - <i>Deschampsia caespitosa</i>	mountain rough fescue -tufted hair grass	S1 Herbaceous
CEAB000118	<i>Festuca campestris</i> - <i>Leymus innovatus</i> (<i>Elymus innovatus</i>)	mountain rough fescue -hairy wild rye	S2S3 Herbaceous
CEAB000119	<i>Juncus filiformis</i> / <i>Sphagnum</i> spp.	thread rush / peat moss	S1S2 Herbaceous
CEAB000044	<i>Populus tremuloides</i> / <i>Rubus parviflorus</i> / <i>Aralia nudicaulis</i>	aspen / thimbleberry/wild sarsaparilla	S2S3 Forest/ Woodland

Means of Achieving Objective and Target

Coordinating with other resource users, spatial planning of harvest and road construction, OGR.



3.5 Maintain unique habitats provided by wildfire and blowdown events.

3.5.1 Indicator 1 - Area of unsalvaged burned forest.

Target

Live trees: Retain all unburned trees in green islands and retained patches recognizing timber condition, access, non-timber needs.

Burned trees – compartment scale: Retain greater than 10% of merchantable black trees in patches greater than 100 ha.

Burned trees – harvest area scale: Retain greater than 10% of merchantable black trees in patches 10-100 ha, and retain greater than 5% of merchantable black trees in small patches, single trees according to loggers' choice.

Monitoring and Measurement

Organization reports, air photo interpretation, ground surveys, post harvest assessments.

Reporting

FMP: Tables (with areas) and maps of natural disturbances within the last 10 years showing salvaged and unsalvaged areas.

Performance: Stewardship Report

Acceptable Variance

At the end of the 10-year FMP term the target is achieved or exceeded.

Response

Adjust strategies in subsequent AOPs.

Target Selection

Targets shown are based on "Fire Salvage Strategy: Forest Management Planning and Operations 2002". While the targets are generally acceptable, consistency with FireSmart objectives must also be ensured.



Means of Achieving Objective and Target

The objective and target will be attained through Annual Operating Plan amendments for disturbed areas less than 500 hectares in size and through the preparation of Salvage Plans for larger areas.



3.5.2 Indicator 2 - Area of unsalvaged blowdown.

Target

In areas of significant blowdown (i.e. over 10 hectares in size) 10% of the stems will be left unsalvaged.

Monitoring and Measurement

Inventory updates.

Reporting

Stewardship Report

Acceptable Variance

At the end of the 10-year FMP term the target is achieved or exceeded.

Response

Adjust strategies in subsequent AOPs.

Target Selection

The target selected balances the ecological value of retaining areas of blowdown with the economic need to clear fallen trees and return areas of blowdown to the timber harvesting landbase.

Means of Achieving Objective and Target

Salvage planning.



3.6 Retain ecological values and functions associated with riparian zones.

3.6.1 Indicator - Compliance with Operating Ground Rules.

Target

Consistent with Operating Ground Rules.

Monitoring and Measurement

Organization reports, air photo interpretation, ground surveys, post harvest assessments or other existing compliance monitoring systems.

Reporting

Performance: Stewardship Report

Acceptable Variance

No variance.

Response

Immediate remedial action and/or administrative penalty.

Target Selection

Operating Ground Rules.

Means of Achieving Objective and Target

Planning, TSA, Operating Ground Rules.



3.7 Retain stand level structure.

3.7.1 Indicator 1 - The percentage area of residual structure (living and dead) within a harvest area.

Target

An average of 1.5% of the volume harvested within each compartment group and the FMA area is retained as residual structure in patches. A wide range in variability in harvest area-level retention is desired as long as the target level is achieved. Non-merchantable single stems and non-merchantable clumps will also be left as structure, where appropriate.

Monitoring and Measurement

Retention areas are marked in the field prior to harvest and measured using GPS equipment. Post harvest assessments confirm that block and island boundaries have been maintained and that single stems and clumps remain, as planned. The average volume for the applicable yield strata will be applied to the measured area to estimate volume.

Reporting

The area of patches within to harvested cutblocks will be calculated, used to estimate volumes and reported in the Stewardship Report by compartment group and for the entire FMA.

Acceptable Variance

At the end of the 10-year FMP term, the target is achieved or exceeded.

Response

Adjust strategies in subsequent FMP.

Target Selection

At a landscape scale, the exclusion of forested areas (buffers, steep slopes, non-productive forests etc.) from the timber harvesting landbase has resulted in more than 30% of the FMA forested area being left unharvested. Within the timber producing landbase, 1.5% of the area will be retained in patches of various sizes to provide additional structure. Single stems and clumps will be non-merchantable to ensure that merchantable timber forming part of the annual allowable cut is all utilized.

Means of Achieving Objective and Target

Residual structure retention strategies will include 4 main components to be maintained where appropriate:



1. Patch Retention

In order to preserve conditions similar to those of an intact forest stand, patches of representative timber will be retained, where possible. These patches will provide small areas of undisturbed organic and litter layers as well as shrubs and other understory species and multiple canopy layers, if present. The potential for establishing and retaining patches will be examined during the preparation of the Final Harvest Plan.

The retention of patches will be considered where:

- suitable structure is available;
- there is evidence of high ungulate use of the area and hiding and/or thermal cover is required;
- a significant wildlife habitat feature requiring some buffer exists (e.g. mineral lick, springs frequented by wildlife, raptor nest);
- visual impacts of harvesting require mitigation to reduce sight distances or for aesthetic purposes.

Within a cutblock, patches will be less than 2 hectares in size. Any patch 2 hectares or larger will be designated as a reserve block and will be harvested on the second pass.

Patches will be marked prior to the commencement of harvest operations to ensure that they are retained. Care will be taken to protect the trees around the perimeter of patches from damage caused by harvesting or silvicultural operations.

2. Understory Protection

In cutblocks containing stands with a large number of immature trees, planning and operations will focus on a more dispersed pattern of structural retention by leaving some of the existing understory. The availability of a viable understory will be identified during preparation of a Final Harvest Plan. White spruce will be given priority for protection in the understory; however, other tree species may also be protected for specific purposes. Protected species will be recognized as acceptable species in fulfilling reforestation standards. Stands with trees that are healthy, vigorous, windfirm, have good form and are likely to grow to become merchantable by the second rotation cut, will be given highest priority for protection.

Although it is possible to preserve individual understory trees throughout a cutblock, the value for habitat purposes and the potential for survival are reduced. Small clumps of non-merchantable trees covering areas up to 0.25 hectares in size will be retained, where possible.

3. Snag Retention

Standing dead trees, especially large diameter deciduous ones, are important to cavity-dwelling species such as woodpeckers, bats and squirrels. Although these snags are also likely to be used as perches by prey species such as owls resulting in increased predation on small mammals, they provide habitat for many organisms and would likely be absent from managed stands.



One critical factor in determining the potential for snag retention is worker safety. Where possible, snags will be left in groups of 2 or more and they may be incorporated as part of an understory retention clump or a patch. Where worker safety may be compromised, particularly where hand-falling is utilized, snags will be removed.

Opportunities for snag retention will be identified during preparation of a Final Harvest Plan. Priority will be placed on retaining snags or potential snags under the following conditions:

- blocks containing stands with large standing dead deciduous trees
- all trees with evidence of an existing cavity
- snags or live trees that exhibit windfirm characteristics
- site conditions where worker safety would not be compromised.

Existing snags or large diameter deciduous trees may be cut off at 5 metres height to reduce the on-site hazards for future operations.

4. Debris Retention

Opportunities for debris retention will be identified during preparation of a Final Harvest Plan and the locations will be shown on Final Harvest Plan maps. The retention of debris piles will be considered where:

- stands to be harvested have limited understory making patch retention or understory protection infeasible;
- there is evidence of high populations of predatory species dependant on small mammals for food (e.g. marten, great gray owls); and
- suitable material is available.

Debris piles will be retained in selected cutblocks to provide hiding cover and food sources for wildlife. Piles will be located a minimum of one tree length and a maximum of 50 metres from forested areas. They will be of various shapes and will contain mostly coarse debris however tops on summer blocks should be included to provide cones for squirrels. If possible, a travel corridor for small mammals that connects the debris pile to another debris pile or to the adjacent forest will be retained.



3.7.2 Indicator 2 - Percentage of harvested area with downed woody debris³ equivalent to preharvest conditions.

Target

90% of harvest areas within each of three compartment groups will have downed woody debris retained on site. The groups to be used for reporting purposes are: Compartments 1 to 7, 8 to 18 and 19 to 24.

Monitoring and Measurement

Harvest operations are progressively monitored by Sundance operations staff. Once harvesting is complete in a cutblock Sundance operations staff evaluate the site to ensure that the area has been skid cleared as well as roadside debris piled. Downed woody debris can then be assessed within the cutblock knowing that there should be no further changes to the amount of remaining on site. During this phase, staff members will assess the amount of downed woody debris to ensure that it is equivalent to pre-harvest conditions.

The amount of downed woody debris within the planned cutblock will be assessed prior to harvesting. A classification of low, moderate or high will be qualitatively assessed and this will be noted in the Final Harvest Plan. Figure 3.1 to Figure 3.3 are included below to provide an indication of how to classify the amount of downed woody debris. Upon completion of harvesting and roadside piling within the block the amount of downed woody debris will be checked again to ensure that it is similar to pre-harvest conditions. For each cutblock, a *Sundance Forest Industries FMA 9700032 Block Inspection Form* is used by operations staff to provide a record of harvesting activities. This form will be filled out post-harvest and it will indicate if downed woody debris levels have the same classification as reported in the Final Harvest Plan.

Figure 3.1 Downed Woody Debris – Low Classification



³ Wood lying at an angle of less than 45 degrees from the ground and having a diameter greater than 7.6 cm.



Figure 3.2 Downed Woody Debris – Moderate Classification



Figure 3.3 Downed Woody Debris – High Classification



Reporting

The Stewardship Report will include the percent of harvested area that has downed woody debris levels equivalent to pre-harvest conditions.

Acceptable Variance

The target will be met or exceeded for this objective.

Response

Adjust strategies in subsequent FMP.

Target Selection

Assess preharvest downed woody debris condition by subunit or stand level average.



Means of Achieving Objective and Target

In order to ensure that downed woody debris remains on site and continues to provide structure and habitat value, no woody debris will be utilized for fibre. Additionally, operators will be instructed to leave an acceptable amount of large woody debris out of burn piles. It is expected that the amount of downed woody debris will increase following harvest due to breakage during skidding, the blowdown of snags and live trees, and retention of selected debris piles.



3.8 Maintain integrity of sensitive sites.

3.8.1 Indicator - Sensitive sites (e.g. mineral licks, major game trails) have been protected.

Target

Strategies to maintain consistent with provincial guidelines/OGR.

Monitoring and Measurement

Organization reports, air photo interpretation, ground surveys.

Reporting

Sensitive sites protected will be reported by Operating Area in the Stewardship Report.

Acceptable Variance

None.

Response

Adjust strategies in subsequent AOPs.

Target Selection

Sensitive sites will be identified using local knowledge (field recommendations/notations), ANHIC and Biodiversity/Species Observation Database (BSOD).

Means of Achieving Objective and Target

Standards for sensitive site protection have been developed in the provincial Operating Ground Rules, Section 7.7.4.



3.9 Maintain aquatic biodiversity by minimizing impacts of water crossings.

3.9.1 Indicator - Forestry water crossings are in compliance with the Code of Practice for Water Course Crossings.

Target

Designs meet standards of the Code of Practice for Water Course Crossings.

Monitoring and Measurement

Road Plan specifications are in the Operating Ground Rules, sections 11.2 and 11.4.

Reporting

Performance will be reported in the Stewardship Report.

In the AOP, the number of crossings will be reported by type and compliance status.

Acceptable Variance

None.

Response

Act immediately to eliminate problems and adjust strategies in subsequent AOPs.

Target Selection

Code of Practice for Water Course Crossings: Section 7-9 and Schedule 2.

Means of Achieving Objective and Target

Road construction, maintenance and reclamation activities will be conducted in compliance with the Code of Practice for Water Course Crossings and the Operating Ground Rules.



3.10 Maintain habitat for identified high value species (i.e. economically valuable, socially valuable, species at risk, species of management concern).

3.10.1 Indicator - Area of suitable habitat within the Sundance FMA area.

Target

Currently, the only identified high value species that has a model to determine the amount of habitat available, as well as required, is the grizzly bear. A minimum of 95% of grizzly bear habitat will be maintained compared to current levels.

Monitoring and Measurement

Sundance has been a partner with the Foothills Model Forest Grizzly Bear Project since 1999. During that time, there has been a tremendous amount of information gathered on grizzly bear habitat, movement patterns, food sources, association with roads and general health conditions of the bears in the study area. Information has also been collected on grizzly bear distribution according to topography, elevation, forest cover and previous disturbances. This information has been used to create a Resource Selection Function (RSF) which has been shown to be an important tool in predicting grizzly bear occurrence at both the watershed and landscape scale. The RSF model was used to determine the impact of the Preferred Forest Management Strategy on grizzly bear habitat. The analysis is included in Appendix III. The RSF model will guide how operational plans will be developed within areas that are known to be important to grizzly bear habitat.

Reporting

Tables of area (ha) of suitable grizzly bear habitat at 0 and 10 years and maps of suitable habitat at 0 and 10 years are included in Section 5.5.10. The current grizzly bear model is not capable of projecting habitat areas at 50, 100 or 200 years into the future.

Acceptable Variance

At the end of the 10-year FMP term, the target is achieved or exceeded.

Response

Adjust strategies in subsequent FMP.

Target Selection

The northern leopard frog, trumpeter swan and peregrine falcon are all listed as “species at risk” according to The General Status of Alberta Wild Species 2005 (Alberta Sustainable Resource



Development 2005). Currently, there is no model to determine the amount of habitat available or required for these species and therefore, a target cannot be set. The Operating Ground Rules will be followed when creating operational plans in areas where these species are known to be present to help ensure that any available habitat is protected accordingly.

There are a number of different species on the Sundance FMA that are classified as “may be at risk” or “sensitive” according to The General Status of Alberta Wild Species 2005. These species are not currently believed to be at risk but may require special management because they are naturally rare or are associated with deteriorating habitats. Sundance will continue to monitor the status of sensitive species on the FMA and define acceptable habitat limits if deemed necessary in the future. A list of these species can be found in Table 3.4 and Table 3.5 below.

The Barred Owl is classified as being sensitive to human activity according to The General Status of Alberta Wild Species 2005. However, the Barred Owl is considered to be an indicator species of old growth in certain regions (Olsen et. al 2006). For this reason its habitat requirements were considered during the development of this plan. The Barred Owl nests in deciduous or mixedwood stands, primarily in balsam poplar trees or snags that are greater than 34 cm dbh (Olsen et. al 2006). Only 14.2% of the Sundance landbase contains deciduous or mixedwood stands and even less area would actually provide the size of trees or snags required to provide this habitat.

During the term of this plan, harvest operations will be focused on stands that are susceptible to mountain pine beetle. For this reason, the types of stands required by the Barred Owl are not expected to be harvested in the next 10 years. Due to the relatively low level of high value habitat in the Sundance FMA for Barred Owls and the knowledge that these stands will not be targeted, the benefits of modeling would be limited.

Various species of birds that utilize old growth forest within the Sundance FMA are also important to consider over the term of this plan. At present, only 0.73% of the forested landbase is old growth while 77.6% is mature. Not all of the current mature forested landbase will be harvested before some of these stands become old growth as well. In addition, areas within the forested landbase that are removed from harvest for stream buffers and steep slopes will eventually move into the old growth seral stages. The result is that there will be an increase in the amount of old growth on the Sundance landbase which will provide more habitat for old growth-dependent bird species.

The Foothills Model Forest conducted a study of grizzly bear habitat using DNA sampling in 2004. The results of the study have shown that Compartments 1, 2 and 5, the southwestern portion of the Sundance FMA, are utilized the most by grizzly bears. Grizzly bear habitat considerations have been included in the spatial harvest sequence. Following the harvest sequence and minimizing road access, as defined in Objective 3, will contribute to the maintenance of suitable habitat for this species.

Increased access is becoming an issue in the southern portions of the Sundance FMA where grizzly bear populations have been found to be most abundant; however these road corridors are being developed by other users of the landbase and cannot be controlled by Sundance. Sundance



will continue to work with other industries to limit the amount of access in this area as much as possible.

Table 3.4 Alberta “May be at Risk” Species

Common Name	Scientific Name	COSEWIC	AB Status Rank (2005)
Mammals			
Canada Lynx	<i>Lynx canadensis</i>	Not at Risk	Sensitive
Cougar	<i>Felis concolor</i>		Sensitive
Fisher	<i>Martes pennanti</i>		Sensitive
Water Vole	<i>Microtus richardsoni</i>		Sensitive
Birds			
American Bittern	<i>Botaurus lentiginosus</i>		Sensitive
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Not at risk	Sensitive
Barred Owl	<i>Strix varia</i>		Sensitive
Black-backed Woodpecker	<i>Picoides arcticus</i>		Sensitive
Black-throated Green Warbler	<i>Dendroica virens</i>		Sensitive
Brewer's Sparrow	<i>Spizella brewerii</i>		Sensitive
Broad-winged Hawk	<i>Buteo platypterus</i>		Sensitive
Canada Warbler	<i>Wilsonia canadensis</i>		Sensitive
Cape May Warbler	<i>Dendroica tigrina</i>		Sensitive
Common Nighthawk	<i>Chordeiles minor</i>		Sensitive
Golden Eagle	<i>Aquila chrysaetos</i>	Not at risk	Sensitive
Great Blue Heron	<i>Ardea herodias</i>		Sensitive
Great Grey Owl	<i>Strix nebulosa</i>	Not at risk	Sensitive
Harlequin Duck	<i>Histrionicus histrionicus</i>		Sensitive
Horned Grebe	<i>Podiceps auritus</i>		Sensitive
Northern Goshawk	<i>Accipiter gentilis</i>	Not at risk	Sensitive
Northern Pygmy Owl	<i>Glaucidium gnoma</i>		Sensitive
Osprey	<i>Pandion haliaetus</i>		sensitive
Pied-billed Grebe	<i>Podilymbus podiceps</i>		sensitive
Pileated Woodpecker	<i>Dryocopus pileatus</i>		sensitive
Sandhill Crane	<i>Grus canadensis</i>		Sensitive
Sharp-tailed Grouse	<i>Tympanuchus phasianellus</i>		Sensitive
Swainson's Hawk	<i>Buteo swainsoni</i>		Sensitive
Western Grebe	<i>Aechmophorus occidentalis</i>		Sensitive
Western Tanager	<i>Piranga ludivicianus</i>		Sensitive
White-winged Scoter	<i>Melanitta fusca</i>		sensitive
Amphibians			
Long-toed Salamander	<i>Ambystoma macrodactylum</i>		Sensitive
Western Toad	<i>Bufo boreas</i>		Sensitive
Columbia Spotted Frog	<i>Rana luteiventris</i>	Not at risk	Sensitive
Reptiles			
Wandering Garter Snake	<i>Thamnophis elegans</i>		Sensitive
Red Side Garter Snake	<i>Thamnophis sirtalis</i>		Sensitive
Fish			
Arctic Grayling	<i>Thymallus arcticus</i>		Sensitive
Bull Trout	<i>Salvelinus confluentus</i>		Sensitive

**Table 3.5 Alberta “Sensitive” Species**

Common Name	Scientific Name	COSEWIC	AB Status Rank (2005)
Mammals			
Grizzly Bear	<i>Ursus arctos</i>	Special Concern	may be at risk
Long-tailed Weasel	<i>Mustela frenata</i>	Not at Risk	may be at risk
Northern long-eared Bat	<i>Myotis septentrionalis</i>		may be at risk
Wolverine	<i>Gulo gulo</i>	Special Concern	may be at risk
Birds			
Short Eared Owl	<i>Asio flammeus</i>	Special Concern	May be at Risk
Amphibians			
Canadian Toad	<i>Bufo hemiophrys</i>		may be at risk
Fish			
Spoonhead Sculpin	<i>Cottus ricei</i>	Not at risk	May be at risk

The peregrine falcon and cutthroat trout are designated as threatened species according to The Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The grizzly bear, wolverine, short eared owl, and the northern leopard frog are all considered as species of special concern. There is currently no model to determine the amount of habitat available or required for these species with the exception of the grizzly bear. Sundance will continue to monitor the status of these species on the FMA and define acceptable habitat limits or develop habitat models if deemed necessary in the future.

Means of Achieving Objective and Target

Grizzly bear habitat considerations have been included in the spatial harvest sequence. Following the harvest sequence and minimizing road access, as defined in Objective 3, will contribute to the maintenance of suitable habitat for this species.



3.11 Retain “wild forest populations” for each tree species in each seed zone through establishment of in-situ reserves by the organization with an approved controlled parentage program or in cooperation with Alberta.

3.11.1 Indicator - Number and area (ha) of in-situ genetic conservation areas.

Target

Number of genetic conservation areas for each seed zone conforming with Section 20 of the Standards for Tree Improvement in Alberta.

Monitoring and Measurement

AVI updates, ground or air checks to confirm status. FMP planning and stewardship reporting.

Reporting

The FMP will include a table showing number of genetic conservation areas required in each seed zone and the number provided in the Sundance FMA area and maps showing locations of genetic conservation areas.

Performance will be reported in the Stewardship Report.

Acceptable Variance

At the end of the 10-year FMP term the target is achieved or exceeded.

Response

Adjust strategies in subsequent FMP.

Target Selection

Sundance does not have a controlled parentage program and therefore has no target for this objective at this point in time.

Means of Achieving Objective and Target

Not applicable.



3.12 Retain wild forest genetic resources through ex-situ conservation.

3.12.1 Indicator - Number of provenances and genetic lines in ex-situ gene banks and trials.

Target

Active *ex situ* conservation programs for all Controlled Parentage Program plan species and other species in cooperation with Alberta. Sundance does not have a Controlled Parentage Program, therefore there is no target.

Monitoring and Measurement

Conservation activities identified in FMP as per Standards for Tree Improvement in Alberta.

Reporting

Five year reporting/cooperation with Alberta.

Acceptable Variance

Confirmed program plan.

Response

Organization/Alberta/cooperatives.

Target Selection

In cooperation with Alberta and in accordance with the Standards for Tree Improvement in Alberta (Sections 17 & 29). Sundance does not have a Controlled Parentage Program, therefore no target has been selected.

Means of Achieving Objective and Target

Standards for Tree Improvement in Alberta and government/industry genetic cooperatives.



3.13 Integrate transboundary values and objectives into forest management.

3.13.1 Indicator - Stakeholder consultation.

Target

Ongoing consultation with relevant protected areas agencies.

Monitoring and Measurement

Documentation of consultation processes.

Reporting

Performance: Stewardship Report.

Acceptable Variance

None

Response

Adjust strategies in subsequent FMP.

Target Selection

Link to consultation objective in planning standard or other existing consultation processes.

Means of Achieving Objective and Target

Groups and businesses using the Forest Land Use Zone have previously been identified. In order to integrate planning with other stakeholders, the following actions will be taken:

- Provide opportunities for public input into the design of harvest plans for areas adjacent to the Forest Land Use Zone.
- Assist Alberta in controlling fires, insects or diseases within the Forest Land Use Zone, if required.
- Control fires, insects and diseases within the Sundance FMA area that may potentially affect the Forest Land Use Zone.
- Consult with Parks Canada when planning begins in the west part of Compartment 1.



3.14 Meet reforestation targets on all harvested areas.

3.14.1 Indicator 1 - Annual % of Satisfactorily Restocked regeneration surveys.

Target

The timber supply analysis assumes that all harvested areas will be satisfactorily restocked.

Monitoring and Measurement

Regeneration surveys.

Reporting

ARIS, AOP, Stewardship Report.

Acceptable Variance

None

Response

Alberta adjusts AACs.

Target Selection

ARIS or equivalent reports.

Means of Achieving Objective and Target

Silviculture program.

- Treat all cutblocks within 2 years of harvest.
- Monitor the establishment and growth of seedlings in cutblocks.
- Provide additional treatments as required.
- Promote regeneration from on-site sources from seed or suckering where appropriate.
- Produce planting stock from seed collected according to the provenance guidelines.
- Treat cutblocks prior to harvest and/or after harvest using herbicides or manual methods as appropriate and as required.
- Re-establish areas formerly occupied by open canopy covertypes to closed canopy covertypes.
- Conduct intensive management activities where appropriate.



3.14.2 Indicator 2 - Cumulative % of reforested areas that meet reforestation targets.

Target

100%

Monitoring and Measurement

Sundance has cooperated with the Alberta divisions of West Fraser Mills Ltd. and Alberta Newsprint Company to develop Alternative Regeneration Standards for the Sundance FMA area. The standards include specific requirements for monitoring, measuring and reporting on the performance of cutover areas.

Reporting

AOP and Stewardship Report.

Acceptable Variance

None

Response

Alberta adjusts AACs.

Target Selection

FMA-specific regeneration targets were developed and approved for the Sundance FMA area as part of the Alternative Regeneration Standards.

Means of Achieving Objective and Target

The silviculture program will ensure that this objective and target are met.



3.15 Limit conversion of productive forest landbase to other uses.

3.15.1 Indicator - Amount of change in forest landbase.

Target

A program to maintain the forest landbase.

Monitoring and Measurement

Inventory and land use systems.

Reporting

Stewardship Report.

Acceptable Variance

Report actual

Response

Adjust net landbase projections in next TSA.

Target Selection

Forest inventory and land use data.

Means of Achieving Objective and Target

Maintain current forest cover inventory and land use updates.

- Work with Alberta and industrial users to minimize the amount of land withdrawn from forest production.
- Reforest seismic lines within cutblocks at the same time as the cutblock is reforested unless traditional use has been identified.
- Return reclaimed dispositions to productive forest land as soon as possible after they are released.
- Record and report timber losses due to the activities of other industries annually.



3.16 Recognize lands affected by insects, disease or natural calamities.

3.16.1 Indicator - Amount of area affected.

Target

Area (ha) affected by significant outbreaks, infestations, natural calamities.

Monitoring and Measurement

Annual insect and disease surveys are conducted by Alberta and fires are photographed. Information will be obtained from the local Forest Health Officer(s) and/or forest protection staff.

Reporting

AOP and Stewardship Report.

Acceptable Variance

Report actuals

Response

Although an infestation has not yet been confirmed, this FMP has been prepared with the intent of minimizing the impact of mountain pine beetles on the Sundance FMA area. Susceptibility models have been run to determine the area most likely to be infected. Allowable cut increases are proposed with the intent of removing the most susceptible areas prior to a mountain pine beetle invasion. A discussion of the factors considered is included in the Timber Supply Analysis section.

Target Selection

There is no specific target for this objective. The results of forest health surveys and inventory updates will be compiled and reported.

Means of Achieving Objective and Target

Sundance has implemented a pine strategy to address the imminent threat of mountain pine beetle. In order to minimize the impact, the following procedures will be implemented:

- Inform staff and contractors of the insect and disease reporting procedure.
- Inspect trees for signs of insects during preliminary planning.
- Incorporate strategies for minimizing the effects of an infestation into operational plans.
- Communicate with Alberta regarding disease issues.



- Monitor regenerating cutblocks for evidence of disease.



3.17 Control non-native plant species (weeds).

3.17.1 Indicator - Noxious weed program.

Target

A noxious weed program is in place and implemented.

Monitoring and Measurement

Field inventories.

Reporting

Inspections summarized in Stewardship Report.

Acceptable Variance

Report actuals.

Response

Improve weed program.

Target Selection

Field inventories.

Means of Achieving Objective and Target

Sundance has been cooperating with Alberta and other companies to control noxious weeds along main roads within the Sundance FMA area. In addition to this work, the following actions will be taken:

- Only certified seed will be used for seeding reclaimed areas.
- Corrective action/control will be taken on infested areas.
- Construction equipment that has been working outside the FMA area will be required to be clean prior to commencing work.
- Cooperate with Alberta to inform other users of the potential impact of weeds.
- Areas of infestation will be reported to Alberta.



3.18 Minimize impact of roading and bared areas in forest operations.

3.18.1 Indicator - Compliance with Operating Ground Rules.

Target

Less than 5% of the area within cutblocks has been mechanically stripped of topsoil and lesser vegetation.

Monitoring and Measurement

Field inspection reports and audits.

Reporting

The cleared area as a percentage of block area will be included in the Stewardship Report. Areas used as landings or containing brush piles are not considered to be bared unless they have been mechanically stripped of topsoil and lesser vegetation.

Acceptable Variance

None

Response

Immediate remedial action to correct.

Target Selection

Direction from Alberta.

Means of Achieving Objective and Target

Effective planning and supervision of operations will help to ensure that the objective and targets are met. In addition, the following actions will be taken:

- All temporary roads will be reclaimed by decompacting the roadbed and replacing the topsoil.
- Debris piles will be burned on interior block road rights-of-way where appropriate.
- Where debris piles are burned within a cutblock, the burned area will be planted with an acceptable tree species.
- Work with FERIC to evaluate growth response of seedlings on reclaimed roadways.



3.19 Minimize incidence of soil erosion and slumping.

3.19.1 Indicator - Incidence of soil erosion and slumping.

Target

Complete compliance.

Monitoring and Measurement

Field inspection reports and audits.

Reporting

Inspection reporting.

Acceptable Variance

None

Response

Immediate remedial action to correct.

Target Selection

Direction from Alberta.

Means of Achieving Objective and Target

Effective planning and supervision of operations and adherence to relevant Operating Ground Rules will allow the objectives and targets to be met. In addition:

- Plan roadway routes to minimize the number of stream crossings and reduce the potential for runoff from the road to enter waterways.
- Install crossing structures that are appropriate for the waterway being crossed and the season of use.
- Regularly inspect existing crossings to ensure that water flow is maintained and erosion is not occurring.



3.20 Limit impact of timber harvesting on water yield.

3.20.1 Indicator - Forecast impact of timber harvesting on water yield.

Target

Zero Water Act penalties, complete compliance with FMP.

Monitoring and Measurement

Report on area (ha) harvested compared with planned harvest area.

Reporting

Stewardship Report

Acceptable Variance

Report actuals

Response

Adjust harvest pattern if problems arise.

Target Selection

Water Strategy and local needs.

Means of Achieving Objective and Target

Adherence to the spatial harvest sequence and relevant Operating Ground Rules.



3.21 Minimize impact of operations in riparian areas.

3.21.1 Indicator - Riparian buffers will be maintained as outlined in Operating Ground Rules unless a variance has been approved by Alberta for specified reasons.

Target

Complete compliance.

Monitoring and Measurement

Final Harvest Plans, Block Inspection Forms.

Reporting

Areas to be harvested within buffers will be shown in Final Harvest Plans.

Acceptable Variance

None

Response

Immediate correction and/or administrative penalty.

Target Selection

Direction from Alberta.

Means of Achieving Objective and Target

Effective planning and supervision of operations will help to ensure that the impact of operations in riparian areas is minimized.



3.22 Establish appropriate AACs.

3.22.1 Indicator - Process and standards described in Annex 1 is followed and standards are met.

Target

Complete compliance.

Monitoring and Measurement

Multiple means: TPRS, ARIS, AOPs, Stewardship Reports, field inspection reports.

All salvage volumes charged on dispositions within the Sundance FMA area will be recorded as part of the Annual Allowable Cut.

Reporting

Progressive and continuous, as required by provincial regulations.

Delivered salvage volumes will be recorded, by disposition, and reported in the Stewardship Report.

Acceptable Variance

Issue specific.

Response

Adjust AAC using most current and relevant information.

Target Selection

Consultation in planning process.

Means of Achieving Objective and Target

Effective implementation of planning process.

Salvage

An effective, spatial process is currently in place for receiving landbase withdrawal applications, digitizing the boundaries and calculating timber volumes lost. The data and methodology have been audited on several occasions by Alberta and found to be acceptable. The current process will be maintained.



All applications for withdrawal of lands from the Sundance FMA area are reviewed by Sundance staff members. Once consent for withdrawal has been issued, the application is digitized and an invoice is prepared based on the current provincial Timber Damage Assessment tables. Details of the each individual disposition, including the consent date, disposition area and volume charged are reported quarterly as part of the Timber Return. The Sundance GIS system is updated at least annually with the newly digitized dispositions and associated information from the provincial Land Status Automated System.

Volumes purchased by Sundance as salvage are recorded by disposition, using the conversion of the receiving mill. Where the timber from a new disposition is taken by one of the imbedded quota holders, the volume delivered is charged against the appropriate quota license.



3.23 Reduce wildfire threat potential by reducing fire behaviour, fire occurrence, threats to values at risk and enhancing fire suppression capability.

3.23.1 Indicator 1 - Percentage reduction in Fire Behaviour Potential area (ha) within the FireSmart Community Zone.

Target

Reduce area (ha) in the extreme and high Fire Behaviour Potential rating categories by 10% within the FireSmart Community Zone around the Hamlet of Marlboro.

Monitoring and Measurement

AOPs, Compartment Assessments.

Reporting

The FMP includes maps and tables of indicator at 0 and 10 years.

Performance will be reported in the Stewardship Report.

Acceptable Variance

The target will be met or exceeded for this objective.

Response

Adjust harvest sequence.

Target Selection

Although there are no communities within the Sundance FMA area, the FireSmart Community Zone for the hamlet of Marlboro does extend into the FMA area. Sundance will work with Alberta to determine what measures would best help to protect the community from wildfire based on a wildfire threat assessment.

Means of Achieving Objective and Target

Sundance will continue to participate on the regional FireSmart Committee to help protect communities near the Sundance FMA and to incorporate fuel management considerations into harvest and landscape planning.



3.23.2 Indicator 2 - Percentage reduction in Fire Behaviour Potential area (ha) across the FMA area now and over the planning horizon.

Target

Reduce the area (ha) in the extreme and high Fire Behaviour Potential rating categories by 10% across the FMA area.

Monitoring and Measurement

AOPs, Compartment Assessments.

Reporting

Performance will be reported in the Stewardship Report.

Acceptable Variance

The target will be met or exceeded for this objective.

Response

Adjust harvest sequence.

Target Selection

Planning process, wildfire threat assessment.

Means of Achieving Objective and Target

- Spatial harvest sequence, thinning, partial harvest techniques.
- Maintain a current Fire Control Plan.
- Incorporate fuel management considerations into harvest and landscape planning.



3.24 Integrate other uses and timber management activities.

3.24.1 Indicator - Extent of various uses.

Target

Minimize the impact of harvesting, roadbuilding and silvicultural activities on other uses.

Monitoring and Measurement

AOPs, Compartment Assessments.

Reporting

Stewardship Report.

Acceptable Variance

Issue specific.

Response

Adjust activities.

Target Selection

Consultation and cooperation.

Means of Achieving Objective and Target

Effective implementation of plans.

- Conduct harvesting operations in the vicinity of recreational facilities during periods of low use.
- Communicate with the operators of recreation and tourism businesses.
- Identify trails and campsites used by guides and outfitters.
- Advise guides and outfitters when operational planning is initiated.
- Incorporate the concerns of guides and outfitters into operational plans where possible.
- Encourage trappers to provide input into Sundance planning through the trapping representative of the Public Advisory Committee.
- Refer operational plans to individual trappers potentially affected by harvesting operations.



3.25 Maintain Long Run Sustained Yield Average.

3.25.1 Indicator - Regenerated stand yield compared to natural stand yield.

Target

No net decrease from natural stand productivity.

Monitoring and Measurement

The Alternative Regeneration Standards developed for the Sundance FMA area contain specific requirements for monitoring, measuring and reporting the performance of cutover areas.

Reporting

Timber Supply Analysis, Stewardship Report.

Acceptable Variance

Report Actual.

Response

Adjust AAC using most current and relevant information.

Target Selection

The Alternative Regeneration Standards set targets that will demonstrate that productivity is being maintained.

Means of Achieving Objective and Target

Effective implementation of silviculture plans will allow the target to be met.



3.26 Implement public involvement program.

3.26.1 Indicator - Meet Alberta's current expectations for aboriginal consultation.

Target

Consult at the community level with designated representatives of affected aboriginal communities during FMP, GDP and FHP development.

Monitoring and Measurement

Records will be maintained of contacts and input of affected aboriginal communities into the development of plans including information presented and responses

Reporting

Aboriginal consultation activities are reported in the Stewardship Report while site-specific consultations are detailed in Final Harvest Plans, where applicable.

Acceptable Variance

None, unless otherwise agreed to by Alberta.

Response

Adjust activities.

Target Selection

The Terms of Reference for Sundance Forest Management Planning describes the public involvement activities. The Government of Alberta's First Nations Consultation Guidelines on Land Management and Resource Development (AAND 2006) describes aboriginal consultation requirements.

Means of Achieving Objective and Target

Effective implementation of the aboriginal consultation program will be achieved by:

- Implementing and monitoring the Terms of Reference for Sundance Forest Management Planning
- Maintaining a corporate presence in affected communities.
- Involving stakeholders in site-specific planning.
- Maintaining records of aboriginal contacts.
- Offering employment to qualified individuals.



-
- Providing approved planning documents for posting on the Sustainable Resource Development website.
 - Documenting concerns/input and changes made.



3.27 Implement public involvement program.

3.27.1 Indicator - Meet expectations of Section 5 of CSA Z809-02.

Target

Public involvement will be carried out as indicated in the Terms of Reference for Sundance Forest Management Planning, approved 18 May 2005.

Monitoring and Measurement

Records will be maintained of public contacts and public input into the development of plans.

Reporting

Public involvement activities are reported in the Stewardship Report while site-specific consultations are detailed in Final Harvest Plans, where applicable.

Acceptable Variance

None, unless otherwise agreed to by Alberta.

Response

Adjust activities.

Target Selection

The Terms of Reference for Sundance Forest Management Planning describes the public involvement activities.

Means of Achieving Objective and Target

Effective implementation of public involvement program will be achieved by:

- Implementing and monitoring the Terms of Reference for Sundance Forest Management Planning.
- Maintaining a corporate presence in affected communities.
- Involving stakeholders in site-specific planning.
- Maintaining records of public contacts.
- Providing public education.
- Providing approved planning documents for posting on the Sustainable Resource Development website.



4. Timber Supply Analysis

The existing approved timber supply was determined in 2002 as an update to the 1999 Detailed Forest Management Plan. Since that time, there have been significant changes in the approach to forest management planning in response to increased external pressures. Where the focus in the past has been on harvesting small openings in the forest, companies are now expected to create large cutblocks that will provide interior forest at a future date. Where previous plans have scheduled harvest activities across the entire landscape, operations are now prioritized in pine stands to minimize the potential impact of a mountain pine beetle infestation. This Forest Management Plan represents a balanced approach considering the variety of objectives required to develop a Preferred Forest Management Strategy (PFMS) that is socially and environmentally responsible while being economically feasible.

A detailed description of the steps taken to develop the Preferred Forest Management Strategy (PFMS) is included in the Timber Supply Analysis Documentation component of this plan. Prior to the creation of the PFMS, a large number of sensitivity analyses were completed. Issues that were explored included harvest flow constraints, volume commitments, mountain pine beetle susceptible stand harvest targeting, and spatial harvest constraints.

4.1 Timber Supply Runs

Aspatial timber supply runs were conducted progressively to explore the impact of individual constraints, however several basic assumptions were constant throughout the analysis.

4.1.1 Assumptions

A number of assumptions and criteria were used consistently in all of the timber supply runs while various targets were tested and analysed:

- For this Forest Management Plan, the planning horizon was 200 years, that is, from 2007 to 2206.



- All harvested areas were assumed to regenerate as fully stocked stands in the same yield stratum with the exception of black spruce. Black spruce was assumed to regenerate to lodgepole pine.
- Productivity losses have not been explicitly included in the modeling. The AAC will be recalculated if the harvest level or managed landbase is reduced by more than 2.5% from the current level.
- The regeneration lags were calculated during the blocks classification process and were applied to the yield curves as shown in Table 4.1. The regeneration lag was included by shifting the yield curves in the future by the length of the regeneration lag.

Table 4.1 Regeneration lags by broad cover group.

Broad Cover Group	Non-rounded	Rounded
	Regeneration Lag (years)	Regeneration Lag (years)
C, CD, DC	2.95	3
D	1.76	2

- The seral stages used were based on the SRD provincial seral stages for the Lower Foothills natural sub-region. Where a Sundance yield stratum had multiple provincial strata associated with it, the dominant provincial stratum was selected. In cases where the minimum harvest age was lower than the minimum age for the Young to Mature seral stage, the age of the young to mature transition was lowered to the minimum harvest age of the strata. Finally, the maximum age of the late old growth seral stage was set to the lifespan of the strata.

Table 4.2 Seral Stages

Strata	Regenerating		Young		Mature		Early Old Growth		Late Old Growth	
	Min (yrs)	Max (yrs)	Min (yrs)	Max (yrs)	Min (yrs)	Max (yrs)	Min (yrs)	Max (yrs)	Min (yrs)	Max* (yrs)
DEC	0	20	21	70	71	130	131	160	161	245
AP	0	25	26	80	81	140	141	180	180	400
AS	0	30	31	90	91	150	151	190	191	400
PA	0	25	26	80	81	140	141	180	181	400
SA	0	30	31	90	91	150	151	190	191	400
LT	0	40	41	100	101	200	201	250	251	400
PL	0	30	31	80	81	160	161	210	211	295
SB	0	40	41	100	101	200	201	250	251	295
Sw	0	30	31	90	91	180	181	230	231	295

* Based on Oct 4, 2006 Succession rules lifespan

- The final succession rule set were based on the 1997 Sundance DFMP.

**Table 4.3. Succession rules used in the PFMS.**

Pre-Succession Strata			Post-Succession Strata	
Cover Group	Yield		Yield	
	Strata	Age (years)	Strata	Age (years)
D	DEC	245	DEC	0
DC	AP	400	AP	0
	AS	400	DEC	0
CD	PA	400	PA	0
	SA	400	SA	0
CD	LT	400	LT	0
	PL	295	PL	0
	SB	295	SB	0
	SW	295	SW	0
NF	X	400	X	0

- The minimum harvest ages used in this FMP can be seen in Table 4.4.

Table 4.4. Sundance TSA minimum harvest ages for clearcutting.

Broad Cover		
Group	Yield Strata	Age (years)
Natural		
D	DEC	61
DC	AP	81
	AS	101
CD	PA	71
	SA	101
C	PL	81
	SB	111
	SW	101
Regenerating		
D	DEC	56
DC	AP	76
	AS	96
CD	PA	66
	SA	96
C	PL	76
	SB	106
	SW	96

- There were a total of 5 Opening patch goals placed on the model as shown in Table 4.5. Deciduous stands contribute to opening patches for 10 years and other broad cover groups contributed to Opening Patches for 20 years.

**Table 4.5. Opening patch goals placed on the TSA.**

Patch Size	Objective*	Modelling Target	
		Minimum	Maximum
0 - 2 ha	0%	0%	0%
2 - 100 ha	76%	76%	76%
100 - 1000 ha	19%	19%	19%
1000 + ha	5%	5%	5%

* Percent of area

- An old patch goal, meant to aggregate the patches on the forest was also used. The goal was that 100% of the Old area on the forest was aggregated into patches greater than 120 ha in size. These patches could be made up on managed or unmanaged areas. The 120 ha size was decided upon to be a proxy for the 100 ha interior old patch referred to in the Planning Standard (version 4.1). The proxy was used to permit integration of old patch goals in the forecasting and tradeoffs within the PFMS.

4.1.2 Decisions

Timber supply runs were completed to test the sensitivity of the objectives to various constraints. As each separate analysis was completed, a decision was made on the parameters to be used. The decisions made are as follows:

- Maximize coniferous harvest over the length of the planning horizon.
- Use both natural and managed yield curves.
- Even flow coniferous volume over the planning horizon.
- Leave deciduous volume unconstrained.
- Non-declining operable growing stock for both coniferous and deciduous over the last 50 years.
- Maintain volume allocations for imbedded dispositions in the Erith Operating Area for 20 years.
- Include a 2% old growth target.
- Remove all pine stands ranked as highly susceptible to mountain pine beetle (using the Sundance ranking) within 10 years.
- Include a 100% surge cut for 10 years.
- Include blocks that are already planned in the sequence.
- Include opening patch targets.
- Include old patch targets.
- Include roading costs.

The detailed results and discussion around the decisions made are included in the Timber Supply Analysis Documentation section of this plan.



4.2 Preferred Forest Management Strategy

The Preferred Forest Management Strategy (PFMS) was developed using the knowledge gained through the timber supply runs described above. It addresses the operational aspects of issues identified during plan development to develop a spatial harvest sequence which balances biological, social and economic factors.

The PFMS has 6 general areas with set targets: harvest volume, growing stock, mountain pine beetle, old growth, patches, and roads. There are complex relationships between each of these different targets, therefore none of the targets can be analyzed individually.

4.2.1 Harvest Volume

The harvest volume varies throughout the planning horizon (Table 4.6). The first 10 years of the planning horizon includes a 100% coniferous surge cut. This surge cut was included to reduce the amount of suitable MPB habitat that on the landbase. It will also decrease the losses that would be associated with a possible large-scale MPB infestation. The currently-approved harvest level for the Sundance FMA area is 435,997 m³ per year.

Table 4.6. Harvest volume by period in the planning horizon from the Sundance PFMS.

Year	Harvest Level (m ³ /yr)	
	Conifer	Deciduous
2007-2016	841,666	60,041
2017-2026	418,763	60,029
2027-2206	420,776	54,739

A commitment to retention of 1.5% of the available merchantable volume for structure within harvested areas has been made in this plan (Section 3.7.1). This volume will be measured and reported as production.

Table 4.7 Utilization used to determine Harvest Level in PFMS

Disposition Number	Coniferous				Deciduous			
	Top D.I.B. (cm)	Butt D.O.B (cm)	Minimum Length (m)	Stump Height (cm)	Top D.I.B. (cm)	Butt D.O.B (cm)	Minimum Length (m)	Stump Height (cm)
CTQR130003	11	15	3.84	15	n/a	n/a	n/a	15
CTQR130001	11	15	3.84	15	n/a	n/a	n/a	15
CTQR130002	11	15	3.84	15	n/a	n/a	n/a	15
R13 CTP	11	15	3.84	15	10	15	2.49	15
CTQR130004	11	15	3.84	15	n/a	n/a	n/a	15
FMA 9700032	11	15	3.84	15	10	15	2.49	15



4.2.2 Growing Stock

Growing stock represents the volume on the landbase. There is an initial decrease over the first 60 years in coniferous growing stock of all types, after which the volume generally levels out for the remainder of the planning horizon. The forested and managed deciduous growing stock stays fairly constant throughout the planning horizon, though the operable growing stock decreases over the first 60 years then stabilizes over the planning horizon (Figure 4.1).

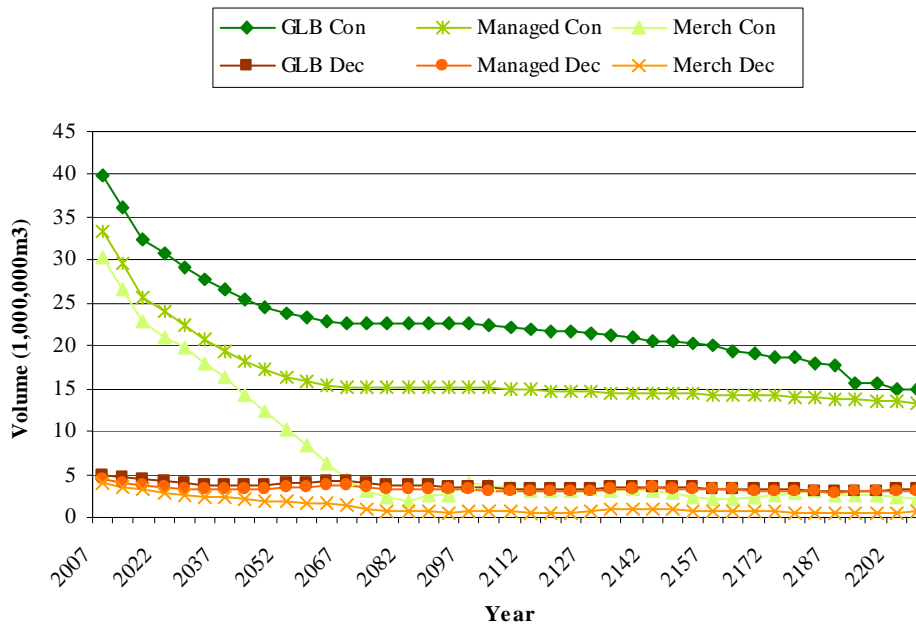


Figure 4.1. Growing stock by type on the landbase from the Sundance PFMS.

4.2.3 Mountain Pine Beetle Susceptibility

Mountain pine beetle (MPB) has been a large component of this FMP. Mountain pine beetle poses a threat to all pine trees in Alberta and possibly across the entire boreal forest. Therefore, the reduction of biological, social and economic risks from MPB are important. The largest effect Sundance can have on mountain pine beetle is by reducing the habitat for, and losses from MPB. Alberta is attempting to reduce the amount of highly susceptible stands by 75% over the next 20 years but. This is not possible on the Sundance FMA area as 72% of the operable forest contains pine stands.

SRD Rank

SRD has a ranking system that classifies stands by their ability to produce viable populations of MPB's in one year. The system takes into account three components, climate factor, compartment risk, and stand susceptibility index. Figure 4.2 shows the SRD ranking of these stands through time. There is very little Rank 1 area on the landbase, but the area that does exist is harvested rapidly. Also, there is a constant reduction in rank 2 and 3 areas for the first 60 years, with the largest decrease associated with the surge cut in the first 10 years. There is a very large amount of area in rank 1 and 2 stands harvested at the beginning of the planning horizon.

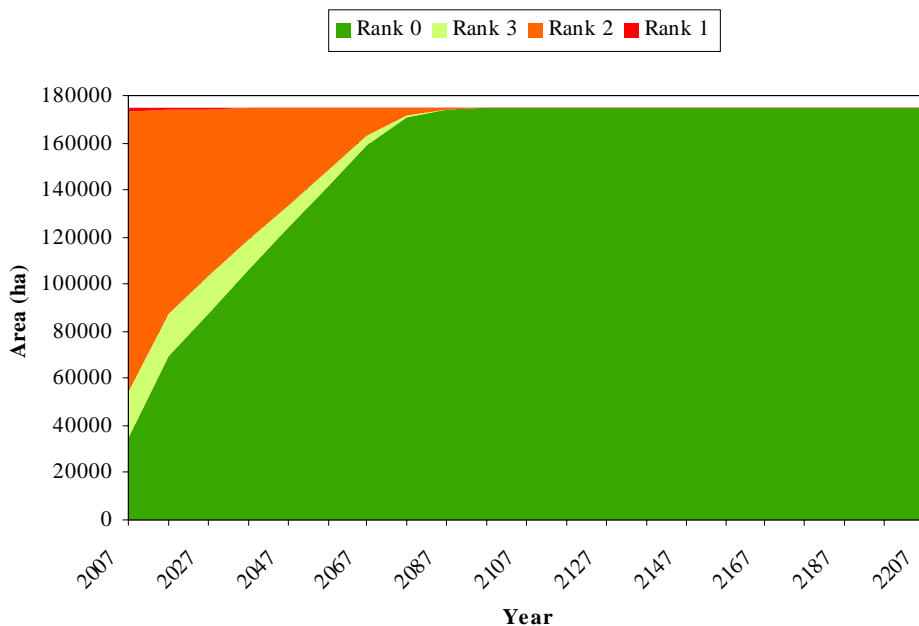


Figure 4.2. Area of SRD ranked pine on the managed landbase from Sundance PFMS.

Sundance Rank

Due to the very large amount of area that is ranked under the SRD ranking Sundance used their own ranking, which is largely a subset of the government ranking, to prioritize stands with high biological and economical risk. Forest areas where the AVI label shows 90 percent pine and a height of 20 meters were included in the Sundance ranking. These stands are largely removed within the first 20 years of the planning horizon (Figure 4.3).

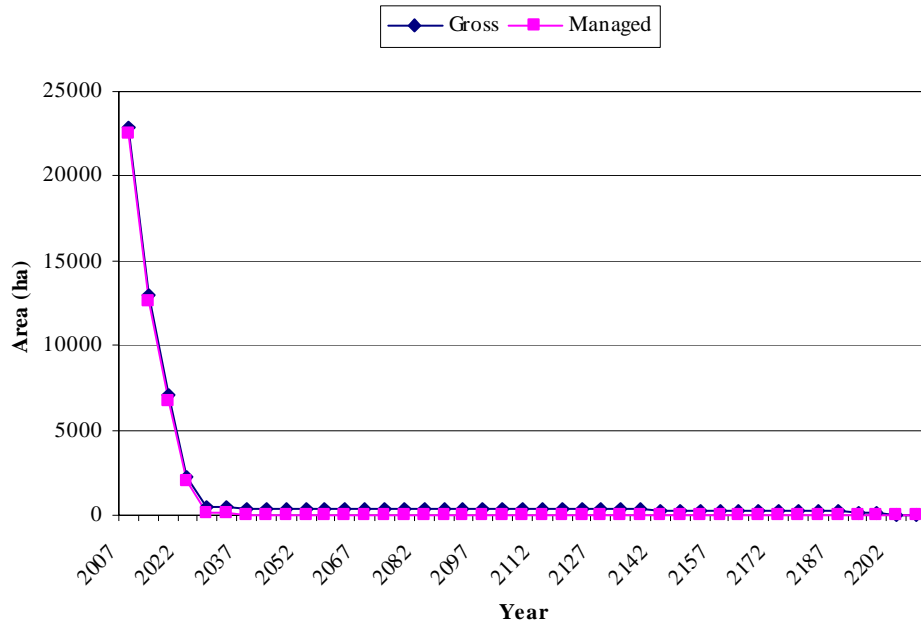


Figure 4.3. Area of Sundance ranked pine on the landbase from Sundance PFMS.



4.2.4 Age Class

The age class distribution of the forest changes throughout the planning horizon, though the trends on the gross and managed landbase differ (Figure 4.4 and Figure 4.5). The managed landbase has an initial increase in the amount of younger age class on the landbase. Through time, this changes to a more regulated forest state than the current mature dominated age class structure. The gross landbase is the combination of the managed landbase, which moved to a younger age class structure and the remainder of the forested landbase, which moved to an older age class structure through time.

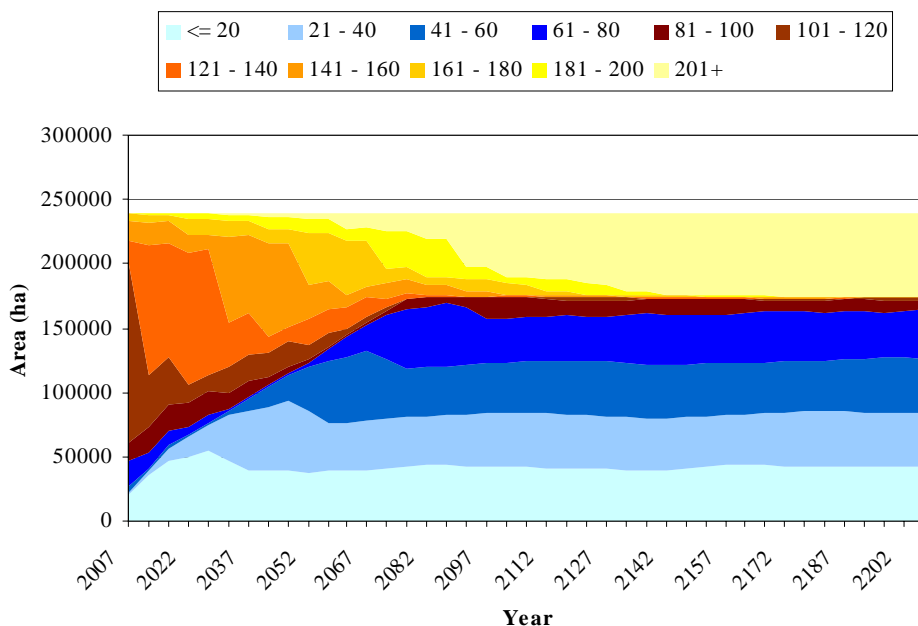


Figure 4.4. Area by age class on the gross landbase from the Sundance PFMS.

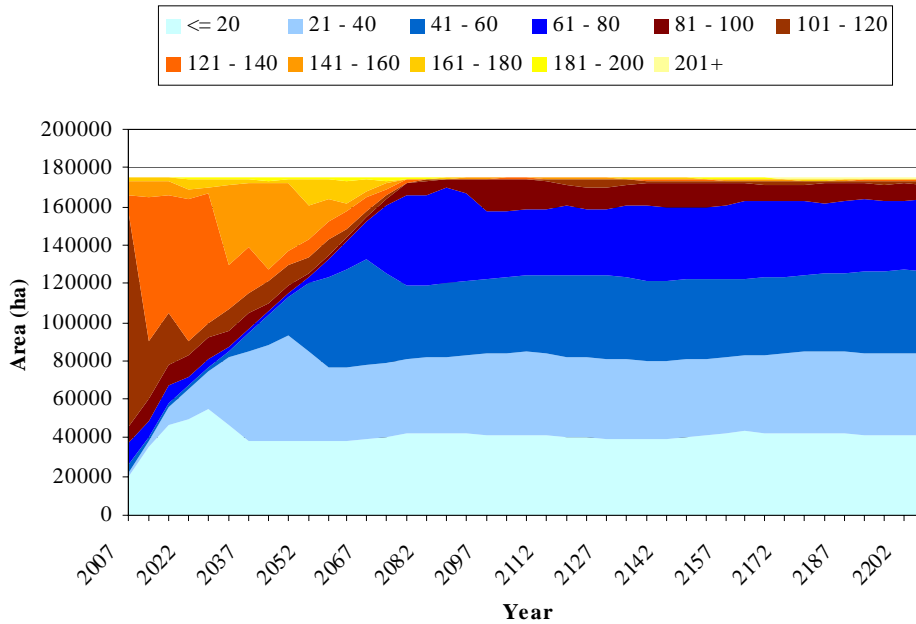


Figure 4.5. Area by age class on the managed landbase from the Sundance PFMS.

4.2.5 Seral Stage

The seral stage distribution on the gross and managed landbase follow similar trends as the age class distributions, Figure 4.6 and Figure 4.7 respectively. The amount of regenerating area on the gross landbase increases then generally stabilizes; the same general trend is followed by the young seral stage. The area of mature on the gross landbase decreases throughout the first part of the planning horizon and stabilizes towards the end of the planning horizon. The area of early old growth increases from the beginning to middle of the planning horizon and then decreases towards the end of the planning horizon. The area of late old growth increases throughout the planning horizon with a slight decrease towards the end of the planning horizon.

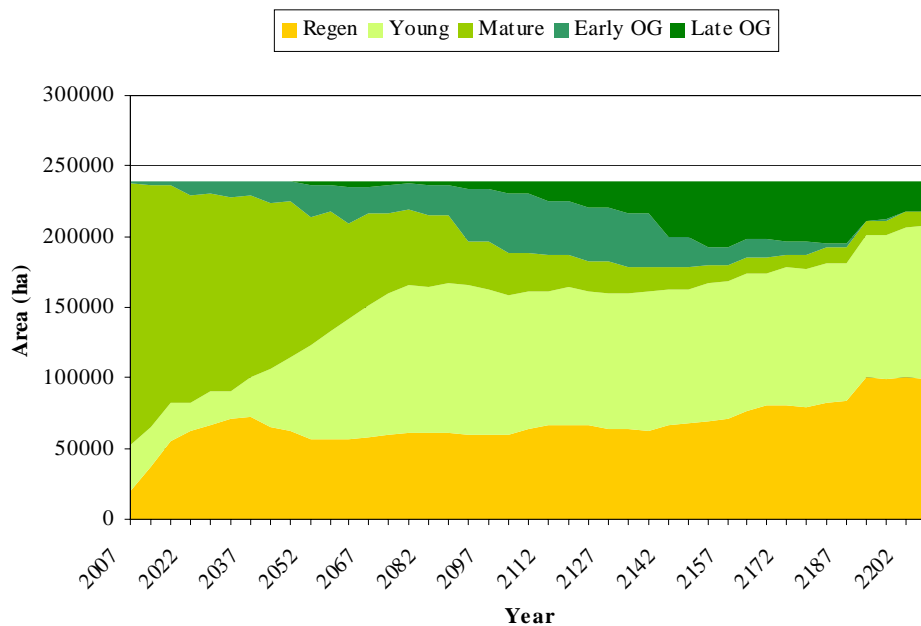


Figure 4.6. Area by seral stage on the gross landbase from the Sundance PFMS.

The managed landbase seral stage distribution differs from the gross landbase. Both the regeneration and young seral stages increase early in the planning horizon, then stabilize. The area of mature decreases early in the planning horizon then stabilizes. The area of early and late old growth increases in the first ½ of the planning horizon then decreases for the remainder of the planning horizon.

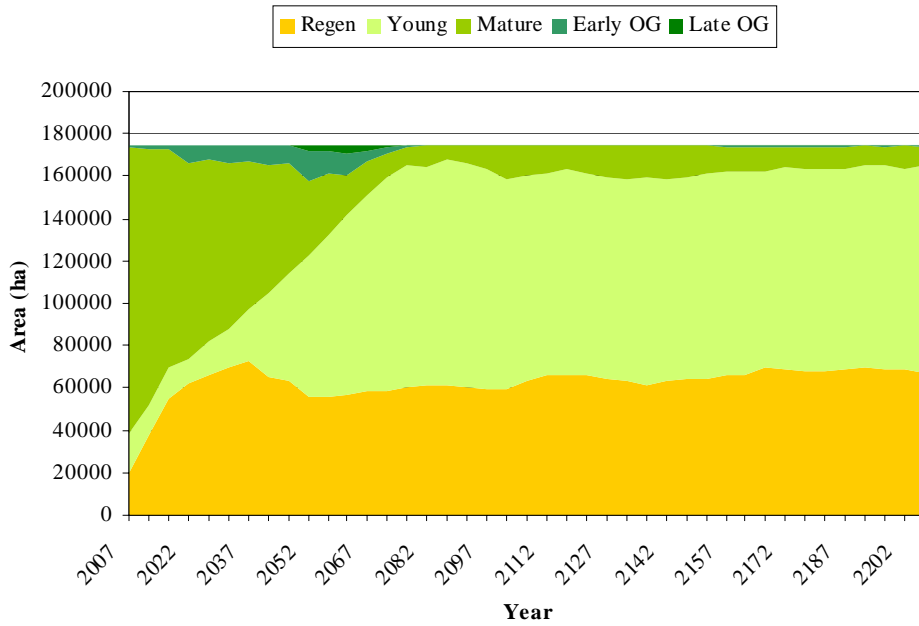


Figure 4.7. Area by seral stage on the managed landbase from the Sundance PFMS.

Old refers to the combination of early and late old growth seral stages. On the gross landbase, the area increase throughout the first ¾ of the way through the planning horizon, then decreases towards the end of the planning horizon (Figure 4.8). The majority of this old comes from black spruce and larch.

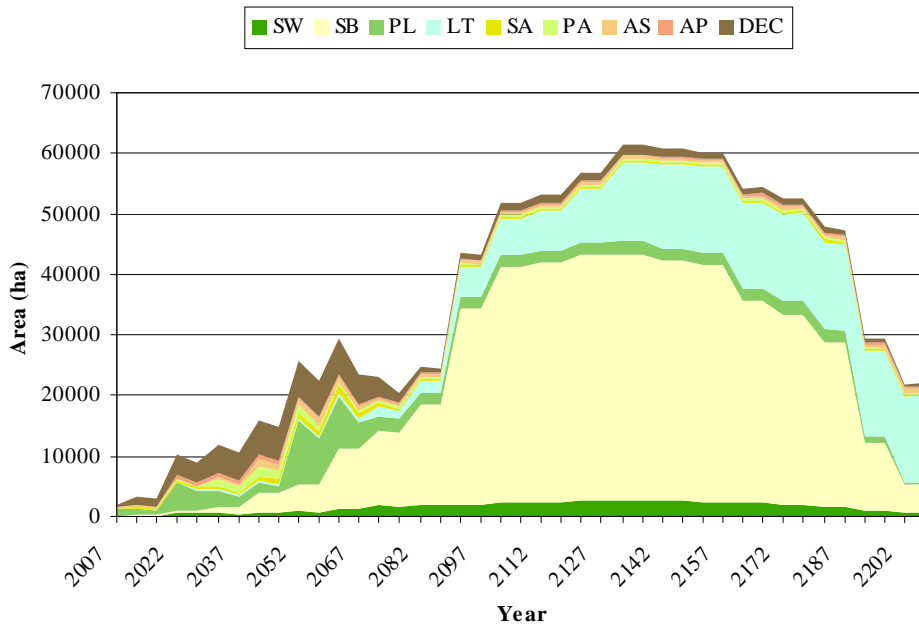


Figure 4.8. Old growth area on the gross landbase from the Sundance PFMS.

The old growth area target placed on the managed landbase was 2% (Figure 4.9). This target was not met throughout the planning horizon as the old classification system and inclusion of the



mountain pine beetle strategy created a decline from year 65 into the future. Considering intent of current provincial directive related to MPB and the need to reduce the amount of mature pine on the landscape, it was decided that though an old growth target would be set, it would not be an overriding objective.

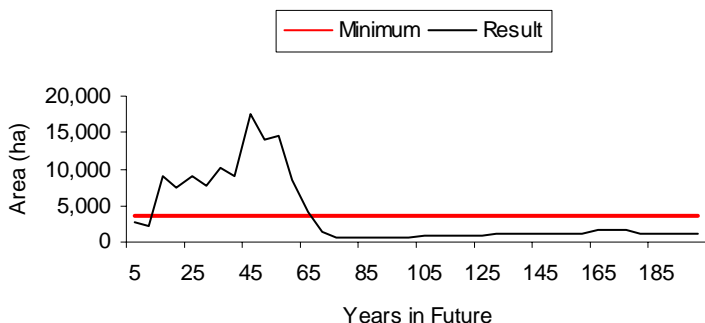


Figure 4.9. Target old growth area on the managed landbase from the Sundance PFMS.

The managed landbase old growth area is made up of a variety of species strata at the beginning of the planning horizon (Figure 4.10). Towards the end of the planning horizon, the old growth representation of deciduous increases.

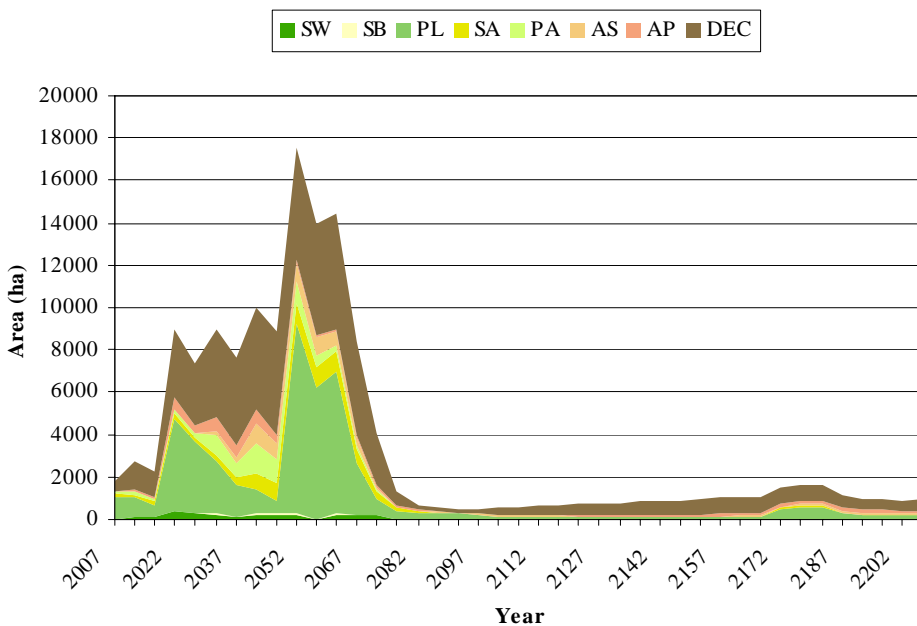


Figure 4.10. Old growth area on the managed landbase from the Sundance PFMS.

4.2.6 Old Patches

There is a target on the PFMS to have 60% of the old forest area in patches greater than 120 ha (Figure 4.13). Over time, this target is met.

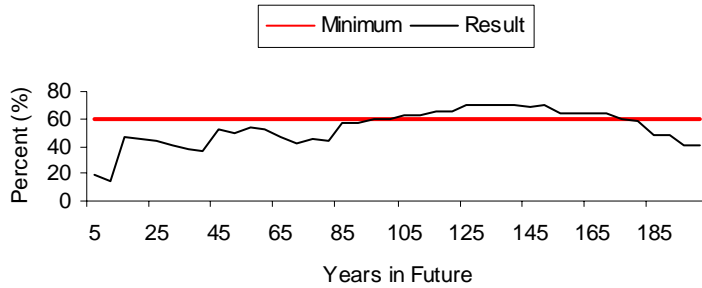


Figure 4.11. Target of interior old growth area on the landbase from the Sundance PFMS.

Old large forest patches are becoming an increasingly important part of forest management planning. It is recognized that many species require large forest patches as a habitat requirement. The planning standard includes an interior core patch target of 100 ha or greater. The Patchworks model uses old patches of greater than 120 ha as a proxy for the 100 ha interior forest target. The 120 size is used to account for edge effects. The area by strata in patches greater than 120 ha on the gross landbase can be seen in Figure 4.12. The old patches on the gross landbase by size class can be seen in Figure 4.13.

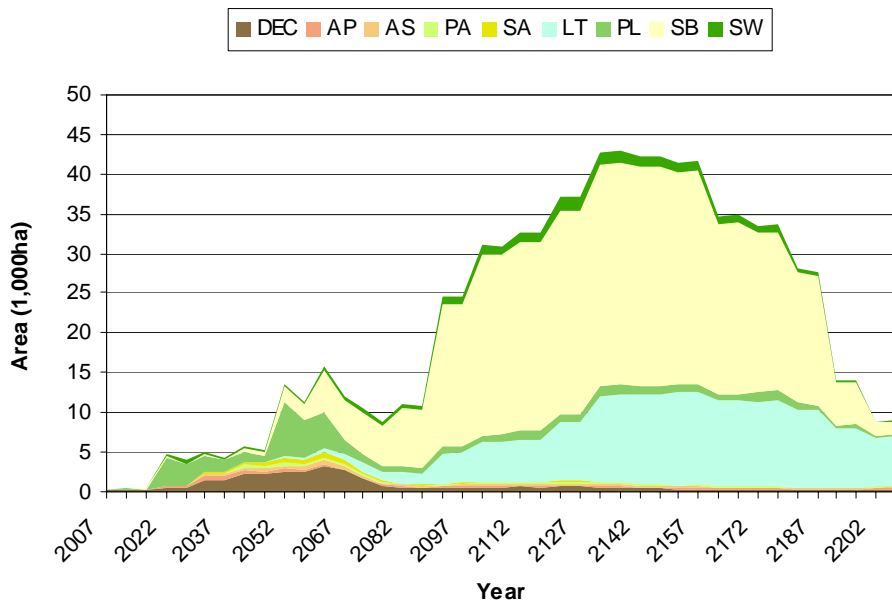


Figure 4.12. Old patches greater than 120 ha by strata on the landbase from the PFMS.

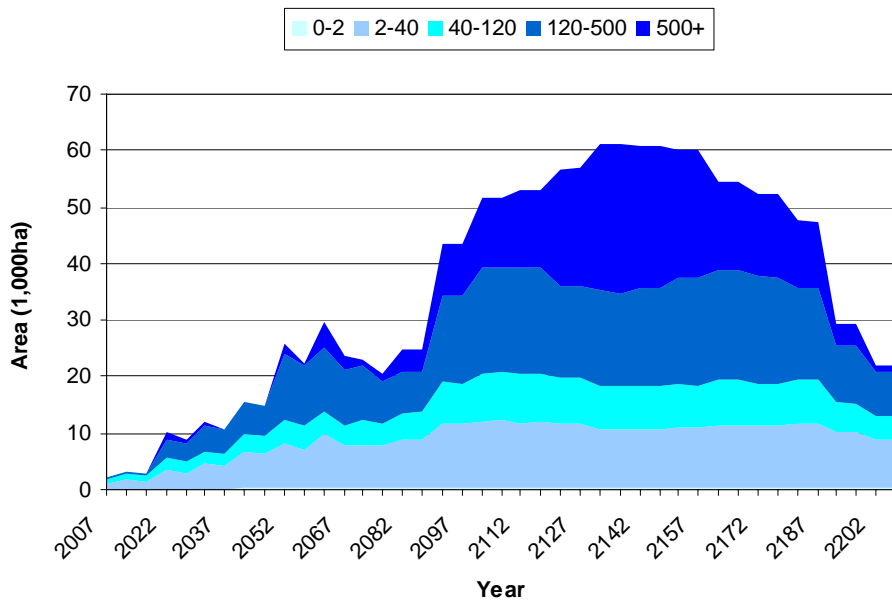


Figure 4.13. Old patches by size class from the Sundance PFMS.



4.2.7 Watershed Effects

Hydrologic assessment of a proposed harvest plan by Sundance Forest Industries indicated maximum increases in annual water yield of 27.2% to 36.4% can be expected. These increases were considered to exceed the range of natural variability for average to slightly above average water yield (i.e. 2-5 year events). Most increases of these magnitudes occurred in the south block-low elevation zone of the FMA where water flows are lower than in the south-block high elevation zone and the north block. Both of these areas are characterized by higher water yields. Water yield increases in these two zones were moderate to small, ranging from 2.2% to 21.1%, which were considered to fall within the range of natural variability for the region.

Long term average water yield for the Embarras River, Rat Creek and Brown Creek were used as representative watersheds in the Wrenss simulations as a base to express percent changes in water yield. Annual and monthly precipitation data from the region (Edson, Nordegg Ranger Station) were used for input into the WRENSS simulations, which were run for 100 years on an annual time step, starting in 2006.

The large increases in water yield were attributed to the high levels of harvesting in some watersheds where 30% or more of watersheds were harvested (30%-47%). Lower levels of harvesting in other watersheds produced increases in annual water yield $\leq 20\%$ that were considered acceptable.

The large increases in water yield can be reduced by rescheduling and reducing in the level of harvesting. However this may not be acceptable as the proposed harvest schedule incorporate strategies to minimize the impacts and spread of anticipated mountain pine infestations by harvesting a large component of mature pine stands in watersheds. Changes in water yield similar to those in these simulations or greater could occur if the stands were attacked and destroyed by mountain pine beetles (Love 1955; Troendle and Nankervis 2000; Unil et al 2006; Forest Practices Board 2007).



4.3 Silviculture

Sundance is committed to reforesting all lands cut over by the company and to achieving the regenerated yield projections as shown in the timber supply analysis. Silvicultural activities are prescribed to return forest cover to all harvested areas in a cost-effective manner while ensuring that the company's legislated obligations are met. Pre-harvest assessments of all proposed cutblocks are conducted to evaluate site conditions and other factors that could potentially affect future silvicultural treatments. Post-harvest site visits and surveys are completed to assess the need for additional treatments.

Although this section provides an indication of the company's commitment to activities that will be taken to achieve growth standards over time, silviculture is a complex, adaptive process. Site-specific conditions, pathogens or the results of new research may indicate a need to change targets and/or activities in the future. Key to management of the risks associated with silvicultural uncertainty is the implementation of Alternative Regeneration Standards that will provide for the collection and analysis of data and allow corrective action to be taken, if required.

4.3.1 Alternative Regeneration Standards

Sundance has worked cooperatively with the Alberta divisions of West Fraser Mills and ANC Timber Ltd. since 2005 to develop new regeneration standards for the 6 FMA areas managed by the participating companies. The primary objective of the work is to link regeneration standards to the yield projections used in determination of the annual allowable cuts for the FMA. The Stage 1 – First Approximation document containing standards for 6 FMA areas and the non-FMA portions of FMU's S20 and R10 was submitted on December 29th, 2006. It describes the concepts that were used to develop preliminary harvest age targets, regeneration standards and targets as well as a regeneration survey system. As the standard evolves, the current version will be posted on the SRD website at www.srd.gov.ab.ca.

The Alternative Regeneration Standards are different from standards that have been used in the past in that they are both stratum-specific and FMA-specific. Also, the standard that is being measured is mean annual increment (MAI) rather than simply stocking and species composition with a competition assessment for individual trees. The desired average MAI for a stratum may be achieved by various combinations of stocking, density and top height and will include a range of results from surveys of different openings. Where immature trees are present in an understory or opening, they may be left and would then contribute to achieving regeneration targets.

The increased complexity associated with treatment, monitoring and measurement of individual openings against 8 different standards presents an immediate challenge for silviculture practitioners. Target densities will vary for different strata as well as within an individual stratum depending on top height, stocking and species composition. Regeneration delay will be measured and used for future yield projections. The current definition of broad cover groups (C, CD, DC, D) may change as more data are collected and models are refined. Silviculture practitioners will need to assess each opening individually and prescribe treatments based on



their own knowledge and experience while considering other factors such as the long term yield implications of regeneration delay.

The success of the timber supply analysis included in this FMP is dependent on demonstrating that the predicted results are being achieved. The process, however, is adaptive. Stage 1 of the Alternative Regeneration Standards has provided a rationale and a methodology for measurement of the relevant attributes of regenerating openings. These measurements will provide data for the development and validation of regeneration and recruitment models. Results will be used to improve and support silviculture strategies and yield curves developed for future management plans.

4.3.2 Generalized Silviculture Regimes

Eight yield strata have been included in this timber supply analysis. Each has associated pre-harvest and post-harvest considerations that need to be overcome to achieve regeneration success. These considerations are described in Table 4.10 and Table 4.11 below.

The yield trajectories used in this timber supply analysis assume that all strata regenerate back to themselves with the exception of black spruce. Some slivers and pockets of black spruce may occur within larger pine openings and the small amount of this stratum that is harvested will be reforested as pine.

The Sundance FMA area does not have allocations based on what have been historically called “incidental” volumes. Most of the imbedded disposition holders have conifer volumes with any deciduous generated being charged to Sundance. The single exception is a small coniferous volume allocated to the Edson Community Timber Program. Both coniferous and deciduous volumes have been calculated for each of the yield strata used in the timber supply analysis. Data collected and models developed as part of the Alternative Regeneration Standards will be used to confirm that these volumes are being maintained. Results will be included in the Stewardship Report.

Sundance maintains an inventory of pine seed sufficient to produce about 9 million seedlings. The company has historically planted about 1.2 million seedlings annually. All seed zones harvested by the company are represented. Pine seed will be collected from these seed zones once harvesting has been scheduled within it.

Spruce cone crops are intermittent, making the inventory of seeds variable. The limited amount of spruce seedlings planted yearly (45,000 to 200,000) means that the seed requirement is relatively low. In spite of currently having sufficient seed on hand to produce 1.5 million seedlings, the spruce cone crop is assessed annually to determine if collection of additional seeds is feasible.

**Table 4.8 Seed Availability**

Seed Zone	Pine Available	Spruce Available	Action Required
LF1.5	No	No	Sundance has not harvested within this zone. Pine seed will be collected if harvesting starts.
LF2.1	Yes	Yes	Ongoing monitoring of inventory and collection, as required.
LF2.2	Yes	Yes	Ongoing monitoring of inventory and collection, as required.
UF1.4	Yes	Yes	Ongoing monitoring of inventory and collection, as required.
UF2.4	Yes	No	Ongoing monitoring of pine inventory and collection, as required. The area is predominantly pine and a need for spruce seed is not anticipated.
SA1.2	No	No	Sundance has not harvested within this zone. Pine seed will be collected if harvesting starts.

In view of the rapid progress currently being made on the development of regeneration and recruitment models and the commitment to complete the second approximation by 2010, the generalized silviculture regimes included in this plan are general. They describe, in general terms, the treatments that may be applied to openings within each of the 8 strata included in the timber supply analysis. More detail regarding average stratum standards and block-level targets may be found in *Alternative Regeneration Standards: Stage 1 – First Approximation* (West Fraser Mills, ANC Timber & Sundance Forest Industries, 2006). These standards and targets will continue to evolve with the implementation of the alternative standards and the development of new and refined models. The current assumptions are shown in Table 4.9.

Table 4.9 Generalized Silviculture Regimes

Post-harvest Yield Stratum	Planting Densities*		Seeding Intensities		Stand Tending	LFN	Average Densities**	
	Species	Trees/ha	Species	kg/ha			Conifer	Deciduous
I Deciduous	-	-	-	-	Mechanical	deciduous coniferous	n/a	4,785
II Hardwood/Pine	PI	100 - 2,200	n/a	n/a	Mechanical Chemical	deciduous	1,037	3,346
III Hardwood/Spruce	Sw	100 - 2,200	n/a	n/a	Mechanical Chemical	deciduous coniferous	475	2,492
IV Sw/Hardwood	Sw	100 - 2,200	n/a	n/a	Mechanical Chemical	deciduous coniferous	773	476
V Pine/Hardwood	PI	100 - 2,200	n/a	n/a	Mechanical Chemical	deciduous	1,191	1,071
VII White Spruce	Sw	100 - 2,200	n/a	n/a	Mechanical Chemical	deciduous	806	n/a
VIII Pine	PI	100 - 2,200	n/a	n/a	Mechanical Chemical	coniferous deciduous	2,552	n/a

* Planting densities vary depending on planting strategy employed e.g. fill plant or direct plant and include sufficient numbers to account for anticipated mortality.

** Average densities are the average number of breast height trees per hectare for the stratum at block age 14 as per the *Alternative Regeneration Standards* (West Fraser Mills, ANC Timber & Sundance Forest Industries, 2006) and are subject to change. Densities for "incidental" species will be developed through ARS.

Note: all strata may have pine or spruce seedlings planted on reclaimed road rights-of-way.



Table 4.10 Pre-harvest Considerations

Pre-harvest Yield Strata	Typical Strata Characteristics	Response to Strata Characteristics
I Deciduous	Early successional species suited to regenerating from roots and stumps. Small volume of coniferous fibre present in yield curves.	Leave harvested areas to regenerate naturally. Expected to be replaced through the growth of suppressed understory trees and seeding from adjacent areas.
II Hardwood/Pine	Sites typically nutrient rich resulting in competition from trees, shrubs & herbs. Deciduous competition.	Mechanical site preparation to provide an elevated planting site free from immediate competition. Planting of pine. Chemical and/or mechanical tending on portions of cutover area to allow pine seedlings to become established or released. Maintain a deciduous dominant stand.
III Hardwood/Spruce	Sites typically nutrient rich resulting in competition from trees, shrubs & herbs. Deciduous competition.	Mechanical site preparation to provide an elevated planting site free from immediate competition. Planting of white spruce. Chemical and/or mechanical tending on portions of cutover area to allow spruce seedlings to become established or released. Maintain a deciduous dominant stand.
IV Sw/Hardwood	Sites typically nutrient rich resulting in competition from trees, shrubs & herbs. Deciduous competition.	Mechanical site preparation to provide an elevated planting site free from immediate competition. Planting of white spruce. Chemical and/or mechanical tending on portions of cutover area to allow spruce seedlings to become established or released. Maintain a coniferous dominant stand.
V Pine/Hardwood	Sites typically nutrient rich resulting in competition from trees, shrubs & herbs. Deciduous competition.	Mechanical site preparation to provide an elevated planting site free from immediate competition. Planting of pine. Chemical and/or mechanical tending on portions of cutover area to allow pine seedlings to become established or released. Maintain a coniferous dominant stand.
VI Sb/Hardwood	Not used in the Timber Supply Analysis	
VII White Spruce	Intermittent cone crop. Immature trees in understory. Sites typically nutrient rich resulting in competition from shrubs & herbs. Deciduous competition. Small volume of deciduous fibre present in yield curves.	Check for cone production annually. Collect during years of good production. Where possible, understory trees will be maintained and planting densities may be reduced. Mechanical site preparation to provide an elevated planting site free from immediate competition. Planting of white spruce. Chemical tending to allow spruce seedlings to become established or released. Mechanical tending may be required to control chemical resistant species. Expected to be replaced through suckering and/or seeding from adjacent areas.
VIII Pine	Early successional species suited to growing on open sites. Some sites may be nutrient rich resulting in competition from shrubs & herbs. Some sites may be low and wet resulting in cool micro-sites. Regeneration from on-site sources may result in densities that are too high. Deciduous competition. Small volume of deciduous fibre present in yield curves.	Mechanical preparation of site to create appropriate seedbed conditions for natural regeneration from existing cones. Mechanical site preparation to provide an elevated planting site free from immediate competition. Planting of pine. Mechanical site preparation to provide an elevated planting site. Planting of pine. Pre-commercial mechanical thinning to reduce intra-species competition. Chemical tending to allow pine seedlings to become established or released. Mechanical tending may be required to control chemical resistant species. Expected to be replaced through suckering and/or seeding from adjacent areas.
IX Black Spruce	Lower productivity sites at the edges of pine stands.	Mechanical site preparation to provide an elevated planting site. Planting of pine.
X Douglas Fir	Not used in the Timber Supply Analysis	



Table 4.11 Post-harvest Considerations

	Post-harvest Yield Strata	Typical Strata Characteristics	Response to Strata Characteristics
I	Deciduous	Browsing by ungulates.	Regeneration surveys and targeted monitoring. Fill plant with white spruce if required.
II	Hardwood/Pine	Deciduous competition.	Mechanical or chemical tending to reduce deciduous competition and allow pine seedlings to become established/released. Fill planting of pine, if required.
III	Hardwood/Spruce	Deciduous competition.	Mechanical or chemical tending to reduce deciduous competition and allow spruce seedlings to become established/released. Fill planting of white spruce, if required.
IV	Sw/Hardwood	Deciduous competition.	Mechanical or chemical tending to reduce deciduous competition and allow spruce seedlings to become established/released. Fill planting of white spruce, if required.
V	Pine/Hardwood	Deciduous competition.	Mechanical or chemical tending to reduce deciduous competition and allow pine seedlings to become established/released. Fill planting of pine, if required.
VII	White Spruce	Deciduous competition.	Chemical tending to reduce deciduous competition and allow spruce seedlings to become established/released. Fill planting of white spruce, if required.
VIII	Pine	Regeneration from on-site sources may result in densities that are too high. Deciduous competition.	Thinning before block age 14 to reduce intra-species competition. Chemical tending to reduce deciduous competition and allow pine seedlings to become established/released. Fill planting of pine, if required.



5. Plan Implementation and Performance Monitoring

Implementation of this Forest Management Plan will require cooperation from all the imbedded disposition holders. The Spatial Harvest Sequence as developed in the Preferred Forest Management Strategy will guide the location of harvesting operations over the next 10 years, until a new timber supply analysis is completed. The objectives and targets developed in this forest management plan will affect operational planning. The Alternative Regeneration Standards developed for the Sundance FMA area will help companies to show that their reforestation efforts have been successful. Results of all these activities will be compiled and presented in a five year Stewardship Report to allow an interim assessment of performance to be completed.

5.1 Allocation of the Annual Allowable Cut

The Timber Supply Update completed in 2002 changed the annual allowable cuts for the operators in Forest Management Unit (FMU) R13 as shown in Table 5.1 below. Subsequently, a new quota was issued to the Edson Community Harvesting Organization (ECHO) in 2005. Allocation for this new quota was complicated by the fact that part of the volume was fixed (7,062 m³) and part was not. In order to allocate the proposed increase appropriately, the ECHO volume has been broken down into two components in Table 5.2 with the same percentage used in Table 5.3 and Table 5.4.

**Table 5.1 Historical Allocations for FMU R13 as established on January 14, 2002**

Company Name	Disposition Number	Coniferous AAC		Deciduous AAC		Effective Date
		Basis for Cut	m ³ /year	Basis for Cut	m ³ /year	
Tall Pine Timber	E5-CTQ03	0.16% of FMU AAC	687	n/a	0	01-May-02
Precision Forest Industries	E1-CTQ06	0.46% of FMU AAC	1,976	n/a	0	01-May-02
Medicine Lodge Timber Products	E1-CTQ15	1.92% of FMU AAC	8,246	n/a	0	01-May-02
E1 Community Timber Program	E1 CTP	2.26% of FMU AAC	9,220	11.85% of FMU AAC	5,762	01-May-02
E5 Community Timber Program	E5 CTP	Fixed Volume	7,062	n/a	0	01-May-02
Sundance Forest Industries	FMA 9700032	Balance of FMU AAC	402,266	Balance of FMU AAC	42,859	14-Jan-02

Table 5.2 Historical Allocations for FMU R13 as established on May 1, 2005

Company Name	Disposition Number	Coniferous AAC		Deciduous AAC		Effective Date
		Basis for Cut	m ³ /year	Basis for Cut	m ³ /year	
Tall Pine Timber	CTQR130003	0.16% of FMU AAC	687	n/a	0	01-May-02
Precision Forest Industries	CTQR130001	0.46% of FMU AAC	1,976	n/a	0	01-May-02
Medicine Lodge Timber Products	CTQR130002	1.92% of FMU AAC	8,246	n/a	0	01-May-02
E1 Community Timber Program	R13 CTP	1.21% of FMU AAC	5,204	11.85% of FMU AAC	5,762	01-May-05
Edson Community Harvesting Org.	CTQR130004	0.94% of FMU AAC	4,016	n/a	0	01-May-05
Edson Community Harvesting Org.	CTQR130004	Fixed Volume	7,062	n/a	0	01-May-05
Sundance Forest Industries	FMA 9700032	Balance of FMU AAC	402,266	Balance of FMU AAC	42,859	14-Jan-02

Table 5.3 Proposed Allocations for FMU R13 1 May 2007 to 30 April 2017

Company Name	Disposition Number	Coniferous AAC		Deciduous AAC		Effective Date
		Basis for Cut	m ³ /year	Basis for Cut	m ³ /year	
Tall Pine Timber	CTQR130003	0.16% of FMU AAC	1,347	n/a	0	01-May-07
Precision Forest Industries	CTQR130001	0.46% of FMU AAC	3,872	n/a	0	01-May-07
Medicine Lodge Timber Products	CTQR130002	1.92% of FMU AAC	16,160	n/a	0	01-May-07
E1 Community Timber Program	R13 CTP	1.21% of FMU AAC	10,184	11.85% of FMU AAC	7,115	01-May-07
Edson Community Harvesting Org.	CTQR130004	0.94% of FMU AAC	7,912	n/a	0	01-May-07
Edson Community Harvesting Org.	CTQR130004	Fixed Volume	7,062	n/a	0	01-May-07
Sundance Forest Industries	FMA 9700032	Balance of FMU AAC	795,130	Balance of FMU AAC	52,926	01-May-07

Table 5.4 Proposed Allocations for FMU R13 1 May 2017 to 30 April 2027

Company Name	Disposition Number	Coniferous AAC		Deciduous AAC		Effective Date
		Basis for Cut	m ³ /year	Basis for Cut	m ³ /year	
Tall Pine Timber	CTQR130003	0.16% of FMU AAC	670	n/a	0	01-May-17
Precision Forest Industries	CTQR130001	0.46% of FMU AAC	1,926	n/a	0	01-May-17
Medicine Lodge Timber Products	CTQR130002	1.92% of FMU AAC	8,040	n/a	0	01-May-17
E1 Community Timber Program	R13 CTP	1.21% of FMU AAC	5,067	11.85% of FMU AAC	7,113	01-May-17
Edson Community Harvesting Org.	CTQR130004	0.94% of FMU AAC	3,936	n/a	0	01-May-17
Edson Community Harvesting Org.	CTQR130004	Fixed Volume	7,062	n/a	0	01-May-17
Sundance Forest Industries	FMA 9700032	Balance of FMU AAC	392,061	Balance of FMU AAC	52,916	01-May-17

These allocations assume the utilization standards as shown in Table 5.5.

Table 5.5 Operational Utilization

Disposition Number	Coniferous				Deciduous				Coniferous AAC (m ³)	Deciduous AAC (m ³)
	Top D.I.B. (cm)	Butt D.O.B. (cm)	Minimum Length (m)	Stump Height (cm)	Top D.I.B. (cm)	Butt D.O.B. (cm)	Minimum Length (m)	Stump Height (cm)		
CTQR130003	11	15	3.84	15	n/a	n/a	n/a	15	1,347	0
CTQR130001	11	15	3.84	15	n/a	n/a	n/a	15	3,872	0
CTQR130002	11	15	3.84	15	n/a	n/a	n/a	15	16,160	0
R13 CTP	11	15	3.84	15	10	15	2.49	15	10,184	7,115
CTQR130004	11	15	3.84	15	n/a	n/a	n/a	15	14,974	0
FMA 9700032	11	15	3.84	15	10	15	2.49	15	795,130	52,926



5.2 Allocation of the Quadrant Allowable Cuts

Although the Sundance Forest Management Agreement was signed on 14 January 1997 with the company's quadrant beginning on that date, the imbedded dispositions have continued to use the standard timber year of May 1st to April 30th. The new Forest Management Agreement, as negotiated but not yet signed, will bring the Sundance reporting year in line with the other operators. As a result, Sundance will have one very short quadrant, from 14 January 2007 to 30 April 2007 to allow the adjustment to the new year.

Table 5.6 Coniferous Production from FMU R13

Disposition Number	Cut Control Period	Quadrant Cut (m ³)	Quadrant Production	Carryover	New Quadrant Cut (m ³)
CTQR130003*	May/02 - Apr/07	3,490	2,172	1,318	8,051
CTQR130001**	May/02 - Apr/07	10,718	11,452	-734	18,624
CTQR130002*	May/02 - Apr/07	51,030	49,629	1,401	82,201
R13 CTP***	May/02 - Apr/07	58,929	49,076	9,853	60,774
CTQR130004*	May/02 - Apr/07	22,156	15,703	6,453	81,321
FMA 9700032*	Jan/02 - Jan/07	1,992,718	2,047,147	-54,429	1,956,901
FMA 9700032***	Jan/07 - Apr/07	1,956,901	143,660	0	3,975,649

* Audited only to 30 April 2006

** Audited Quadrant Production

*** Unaudited

Table 5.7 Deciduous Production from FMU R13

Disposition Number	Cut Control Period	Quadrant Cut (m ³)	Quadrant Production	Carryover	New Quadrant Cut (m ³)
R13 CTP***	May/02 - Apr/07	28,810	11,232	17,578	53,152
FMA 9700032*	Jan/02 - Jan/07	205,402	225,406	-20,004	194,291
FMA 9700032***	Jan/07 - Apr/07	194,291	69	0	264,631

* Audited only to 30 April 2006

*** Unaudited

5.3 Operational Planning

The General Development Plan (GDP) is completed annually by each operator to show the upcoming five years of proposed operational activities. These proposed operations must be consistent with the preferred forest management strategy identified within the forest management plan. This ensures that the spatial harvest sequence is followed.

The Spatial Harvest Sequence (SHS) will direct operations over the next 20 years as the basis for harvest planning. Upon approval of the SHS, Sundance will begin work on completing Final Harvest Plans (FHPs). At that time, any changes that are required will be made to the SHS to ensure that it can be carried out with no operational problems. Variances from the SHS will be tracked and reported.



A pre-harvest assessment (PHA) form will be completed for each block that is proposed in the FHP. This form will provide site specific information about each of the blocks within the plan. The components of each of these blocks will address FMA specific values, objectives, indicators and targets. Addressing these issues in the site level plans will allow Sundance to meet the sustainable forest management principles that have been identified in the forest management plan.

The Annual Operating Plan (AOP) provides more detail as to which operations will be conducted in the upcoming harvest season.

5.4 Operating Ground Rules

Once the Forest Management Plan is approved, a new set of ground rules will be developed consistent with management plan objectives. These ground rules will also describe the preparation of planning documents that are required to guide harvesting and reforestation operations. The new ground rules will be developed in consultation with Alberta Sustainable Resource Development (ASRD) following the Operating Ground Rules Framework for Renewal.

5.5 Target Reporting

As described in Section 3 of this plan, a series of targets have been developed to indicate progress relative to the objectives and indicators prescribed in the provincial Forest Management Planning Standard (Alberta Sustainable Resource Development 2006b). A summary of the indicators and the associated targets is shown in Table 5.8 along with the current status and assumptions. More detailed reporting descriptions are listed, by objective, later in this Section.



Table 5.8 Target Reporting

Indicator	Current Status	Target	Assumptions	Reporting
1 Area of old, mature and young forest by cover class	Gross Landbase: 1% old forest 78% mature plus old forest 13% young forest	200 Year Target Gross Landbase: greater than 2% old forest greater than 13% mature plus old forest less than 46% young forest 10 Year Target Gross Landbase: greater than 1% old forest greater than 60% mature plus old forest less than 15% young forest	Seral stages as defined in the timber supply analysis. Less than 1% of the gross landbase contained old forest in 2005.	Tables of indicators (values and targets) at 0, 10 and 50, 100 and 200 years. Maps of indicators at 0, 10 years, 50 years. Stewardship Report.
	Net Landbase: 1% old forest 78% mature plus old forest 10% young forest	200 Year Target Net Landbase: greater than 0.3% old forest greater than 5% mature plus old forest less than 57% young forest 10 Year Target Net Landbase: greater than 1% old forest greater than 60% mature plus old forest less than 11% young forest	Seral stages as defined in the timber supply analysis. Less than 1% of the net landbase contained old forest in 2005.	Tables of indicators (values and targets) at 0, 10 and 50, 100 and 200 years. Maps of indicators at 0, 10 years, 50 years. Stewardship Report.
2(1) Range of patch sizes by subunit and entire DFA.	Patch sizes:	A distribution of harvest area sizes that will result in a patch size pattern over the 200 year planning horizon approximating patterns created by natural disturbance.		Tables of area of forest in each patch size class by subunit at 0, 10, and 50 years. Maps of patch size classes at 0, 10 and 50 yrs. Stewardship Report
2(2) Range of patch sizes by subunit and entire DFA.	Area of old interior forest	Area of old interior forest of each cover class will not be less than 10% over the next 200 years.		Maps and tables of indicator at 0, 10 and 50 years. Stewardship Report
3(1) Open all-weather forestry road density by subunit.	Sundance LOC's on landbase.	Less than 0.6 km/km ² in high quality grizzly bear habitat and 1.2 km/km ² in all remaining grizzly bear range.	Sundance has no plans to construct major new roads at this point in time. Roads built by other companies are approved by Alberta.	Table of road density by subunit at 0 and 10 years. Map of existing and proposed open and closed all weather roads. Stewardship Report
3(2) Open seasonal/temporary forestry road length.	New indicator	Less than 40 km of new Class IV road is built in each timber year.		AOP and Stewardship Report.
4 Occurrence of each uncommon plant community within DFA.	New indicator	90% of identified uncommon communities will be maintained.	None identified as of landbase date.	As uncommon plant communities are identified, they will be recorded in tables with descriptive list and targets. Map(s) displaying known locations of uncommon plant communities will also be developed.
5(1) Area of unsalvaged burned forest.	New indicator	Live trees: Retain all unburned trees in green islands and retained patches recognizing timber condition, access, non-timber needs.		Stewardship Report.
	New indicator	Burned trees – compartment scale: Retain greater than 10% of merchantable black trees in patches greater than 100 ha.		Stewardship Report.
	New indicator	Burned trees – harvest area scale: Retain greater than 10% of merchantable black trees in patches 10-100 ha, and retain greater than 5% of merchantable black trees in small patches, single trees according to loggers' choice.		Stewardship Report.
5(2) Area of unsalvaged blowdown.	New indicator	In areas of significant blowdown (i.e. over 10 hectares in size) 10% of the stems will be left unsalvaged.	None identified as of landbase date.	Stewardship Report.
6 Compliance with Operating Ground Rules.	New indicator	Consistent with Operating Ground Rules.	Sundance 2001 Ground Rules will remain in effect until new OGRs are negotiated.	Stewardship Report.
7(1) The percentage area of residual structure (living and dead) within a harvest area.	Indicator is not new, but data were not previously compiled or reported.	An average of 1.5% of the volume within a harvested area is retained as residual structure in patches. A wide range in variability in harvest area-level retention is desired as long as the target level is achieved.	Blocks included in approved FHPs prior to approval of this FMP will have retention areas reported as per the previous FMP.	The area of patches within to harvested cutblocks will be calculated, used to estimate volumes and reported in the Stewardship Report by compartment group and for the entire FMA.
7(2) Percentage of harvested area with downed woody debris equivalent to preharvest conditions.	New indicator	90% of harvest areas within each of three compartment groups will have downed woody debris retained on site. The groups to be used for reporting purposes are: Compartments 1 to 7, 8 to 18 and 19 to 24.		The Stewardship Report will include the percent of harvested area that has downed woody debris levels equivalent to pre-harvest conditions.
8 Sensitive sites (e.g. mineral licks, major game trails) have been protected.	Strategies in place.	Strategies to maintain consistent with provincial guidelines/OGR.	New Operating Ground Rules have not yet been negotiated.	Sensitive sites protected will be reported by Operating Area in the Stewardship Report.
9 Forestry water crossings are in compliance with the Code of Practice for Water Course Crossings.	No penalties to date.	Designs meet standards of the Code of Practice for Water Course Crossings.		In the AOP, stream crossings will be reported by number, type and reclamation status. Stewardship Report.



Indicator	Current Status	Target	Assumptions	Reporting
10	Area of suitable habitat within the Sundance FMA area.	New indicator	Currently, the only identified high value species that has a model to determine the amount of habitat available, as well as required, is the grizzly bear. A minimum of 95% of grizzly bear habitat will be maintained compared to current levels.	Tables of area of suitable grizzly bear habitat at 0 and 10 years and maps of suitable habitat at 0 and 10 years. Stewardship Report.
11	Number and area (ha) of in-situ genetic conservation areas.	Provincial responsibility.	Number of genetic conservation areas for each seed zone conforming with Section 20 of the Standards for Tree Improvement in Alberta.	Sundance does not have a controlled parentage program and has no plans to establish genetic conservation areas. Stewardship Report.
12	Number of provenances and genetic lines in ex-situ gene banks and trials.	n/a	Active <i>ex situ</i> conservation programs for all Controlled Parentage Program plan species and other species in cooperation with Alberta. Sundance does not have a Controlled Parentage Program, therefore there is no target.	Stewardship Report.
13	Stakeholder consultation.		Ongoing consultation with relevant protected areas agencies.	Stewardship Report.
14(1)	Annual % of Satisfactorily Restocked regeneration surveys.	New indicator	The timber supply analysis assumes that all harvested areas will be satisfactorily restocked.	ARIS, AOP, Stewardship Report.
14(2)	Cumulative % of reforested areas that meet reforestation targets.	New indicator	100%	AOP and Stewardship Report.
15	Amount of change in forest landbase.	Program in place.	A program to maintain the forest landbase.	Stewardship Report.
16	Amount of area affected by insects, disease or natural calamities.	No significant infestations at this point.	Area (ha) affected by significant outbreaks, infestations, natural calamities	AOP and Stewardship Report.
17	Noxious weed program.	Program in place.	A noxious weed program is in place and implemented.	Stewardship Report.
18	Compliance with Operating Ground Rules.	Less than 5%.	Less than 5% of the area within cutblocks has been mechanically stripped of topsoil and lesser vegetation.	Areas used as landings or containing brush piles are not considered to be bared unless they have been mechanically stripped of topsoil and lesser vegetation. Inspection reporting
19	Incidence of soil erosion and slumping.		Complete compliance.	Inspection reporting
20	Forecast impact of timber harvesting on water yield.	New indicator	Zero Water Act penalties, complete compliance with FMP.	Report on area (ha) harvested compared with planned harvest area. Stewardship Report.
21	Riparian buffers will be maintained as outlined in Operating Ground Rules unless a variance has been approved by Alberta for specified reasons	New indicator	Complete compliance.	Blocks included in FHPs previously approved will be harvested as per the appropriate FHP. Final Harvest Plans.
22	Process and standards described in Annex 1 is followed and standards are met.	New indicator	Complete compliance.	Progressive and continuous. Stewardship Report.
23(1)	Percentage reduction in Fire Behaviour Potential area (ha) within the FireSmart Community Zone.	New indicator	Reduce area (ha) in the extreme and high Fire Behaviour Potential rating categories by 10% within the FireSmart Community Zone around the Hamlet of Marlboro within the next 10 years.	The FMP includes a table of the indicator at 10 years. Stewardship Report.
23(2)	Percentage reduction in Fire Behaviour Potential area (ha) across the FMA area now and over the planning horizon.	New indicator	Reduce the area (ha) in the extreme and high Fire Behaviour Potential rating categories by 10% across the FMA area.	Stewardship Report.
24	Extent of various uses.		Minimize the impact of harvesting, roadbuilding and silvicultural activities on other uses.	Stewardship Report.
25	Regenerated stand yield compared to natural stand yield.	New indicator	No net decrease from natural stand productivity.	Stewardship Report.
26	Meet Alberta's current expectations for aboriginal consultation.	New indicator	Consult at the community level with designated representatives of affected aboriginal communities during FMP, GDP and FHP development.	Stewardship Report.
27	Meet expectations of Section 5 of CSA Z809-02.	New indicator	Public involvement will be carried out as indicated in the Terms of Reference for Sundance Forest Management Planning, approved 18 May 2005.	Stewardship Report.



5.5.1 Maintain biodiversity by retaining the full range of cover types and seral stages.

Target

Over the 200-year planning horizon:

- a) Gross Landbase greater than 2% old forest, greater than 13% mature plus old forest, less than 46% young forest; and
- b) Net Landbase: greater than 0.3% old forest, greater than 5% mature plus old forest, less than 57% young forest.

During the next 10 years:

- a) Gross Landbase greater than 1% old forest, greater than 60% mature plus old forest, less than 15% young forest; and
- b) Net Landbase: greater than 1% old forest, greater than 60% mature plus old forest, less than 11% young forest.

Reporting

Table 5.9 Gross Landbase Area (ha) of Seral Stages by Yield Stratum at Year 0

Stratum	Seral Stage				
	Regenerating	Young	Mature	Early Old Growth	Late Old Growth
DEC	891	1,182	8,282	324	132
AP	976	685	4,838	0	0
AS	435	548	2,362	50	0
PA	1,419	1,376	5,393	101	0
SA	42	660	1,450	152	0
LT	3	8,160	6,039	0	0
PL	15,881	7,560	103,348	1,181	0
SB	54	6,096	39,824	17	0
SW	522	5,742	13,904	15	3

Table 5.10 Gross Landbase Area (ha) of Seral Stages by Yield Stratum at Year 10

Stratum	Seral Stage				
	Regenerating	Young	Mature	Early Old Growth	Late Old Growth
DEC	1,291	1,309	6,906	1,020	285
AP	1,294	744	4,407	53	0
AS	685	271	2,405	32	0
PA	3,043	1,424	3,692	131	0
SA	281	290	1,523	210	0
LT	3	7,769	6,361	69	0
PL	46,599	5,621	75,081	690	1
SB	54	5,375	40,278	263	0
SW	1,903	4,166	14,000	118	0

**Table 5.11 Gross Landbase Area (ha) of Seral Stages by Yield Stratum at Year 50**

Stratum	Seral Stage				
	Regenerating	Young	Mature	Early Old Growth	Late Old Growth
DEC	81	2,491	2,262	2,849	3,129
AP	1,442	4,213	507	337	0
AS	733	938	630	1,093	0
PA	1,793	4,098	1,661	726	12
SA	67	390	660	1,008	179
LT	0	3	13,872	326	0
PL	42,373	60,944	17,095	7,453	148
SB	0	77	41,410	4,444	17
SW	9,482	3,283	6,727	694	0

Table 5.12 Gross Landbase Area (ha) of Seral Stages by Yield Stratum at Year 100

Stratum	Seral Stage				
	Regenerating	Young	Mature	Early Old Growth	Late Old Growth
DEC	2,104	6,698	829	397	784
AP	2,421	3,548	262	16	252
AS	381	2,332	284	71	326
PA	2,944	3,609	1,439	93	204
SA	348	1,508	138	89	221
LT	0	0	8,163	5,712	326
PL	54,334	64,041	10,110	488	1,478
SB	17	0	4,386	34,706	4,402
SW	773	15,739	1,486	1,496	693

Table 5.13 Gross Landbase Area (ha) of Seral Stages by Yield Stratum at Year 200

Stratum	Seral Stage				
	Regenerating	Young	Mature	Early Old Growth	Late Old Growth
DEC	1,310	6,882	2,032	249	339
AP	3,058	2,810	260	16	356
AS	652	2,058	228	31	425
PA	2,567	4,735	677	0	310
SA	506	1,254	230	0	312
LT	0	0	0	3	14,199
PL	59,227	65,551	5,095	255	332
SB	29,145	9,963	17	16	4,360
SW	2,541	16,005	827	25	788

**Table 5.14 Managed Landbase Area (ha) of Seral Stages by Yield Stratum at Year 0**

Stratum	Seral Stage				
	Regenerating	Young	Mature	Early Old Growth	Late Old Growth
DEC	889	1,087	7,566	297	132
AP	972	655	4,615	0	0
AS	433	491	2,051	50	0
PA	1,416	1,308	5,160	100	0
SA	42	569	1,265	115	0
PL	15,777	7,293	101,703	1,056	0
SB	54	1,723	715	0	0
SW	517	5,013	11,910	15	3

Table 5.15 Managed Landbase Area (ha) of Seral Stages by Yield Stratum at Year 10

Stratum	Seral Stage				
	Regenerating	Young	Mature	Early Old Growth	Late Old Growth
DEC	1,289	1,251	6,247	924	260
AP	1,291	714	4,184	53	0
AS	683	233	2,077	32	0
PA	3,040	1,370	3,455	119	0
SA	281	234	1,309	167	0
PL	46,496	5,387	73,407	561	1
SB	54	1,679	715	23	0
SW	1,898	3,621	11,854	86	0

Table 5.16 Managed Landbase Area (ha) of Seral Stages by Yield Stratum at Year 50

Stratum	Seral Stage				
	Regenerating	Young	Mature	Early Old Growth	Late Old Growth
DEC	81	2,489	2,083	2,559	2,760
AP	1,442	4,209	447	143	0
AS	733	936	547	810	0
PA	1,793	4,095	1,555	542	0
SA	67	390	561	837	136
PL	42,373	60,840	16,489	6,147	23
SB	0	64	2,344	41	0
SW	9,482	3,278	4,697	2	0


Table 5.17 Managed Landbase Area(ha) of Seral Stages by Yield Stratum at Year 100

Stratum	Seral Stage				
	Regenerating	Young	Mature	Early Old Growth	Late Old Growth
DEC	2,079	6,698	822	306	66
AP	2,421	3,548	243	0	29
AS	381	2,332	267	31	16
PA	2,944	3,609	1,427	0	5
SA	348	1,508	124	12	0
PL	54,334	64,041	9,859	29	47
SB	0	0	12	0	0
SW	773	15,739	937	10	1

Table 5.18 Managed Landbase Area (ha) of Seral Stages by Yield Stratum at Year 200

Stratum	Seral Stage				
	Regenerating	Young	Mature	Early Old Growth	Late Old Growth
DEC	1,199	6,581	1,662	249	279
AP	3,058	2,810	260	16	99
AS	652	2,058	228	31	56
PA	2,567	4,735	677	0	6
SA	506	1,254	230	0	0
PL	57,745	65,293	5,095	175	11
SB	0	0	0	3	0
SW	1,300	15,313	827	20	0



Figure 5.1 Seral Stage Distribution at Year 0 (Gross Landbase)

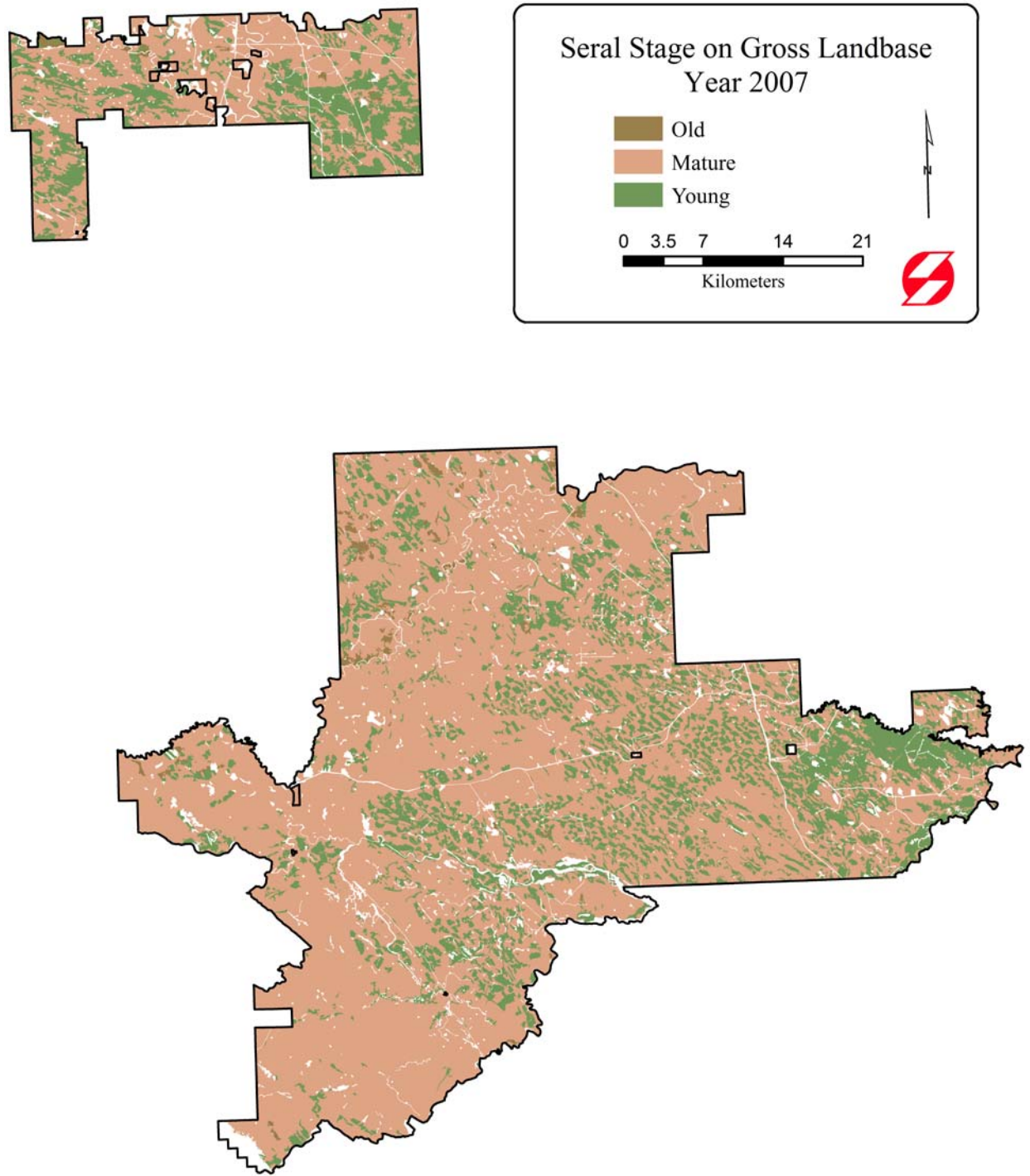




Figure 5.2 Seral Stage Distribution at Year 0 (Managed Landbase)

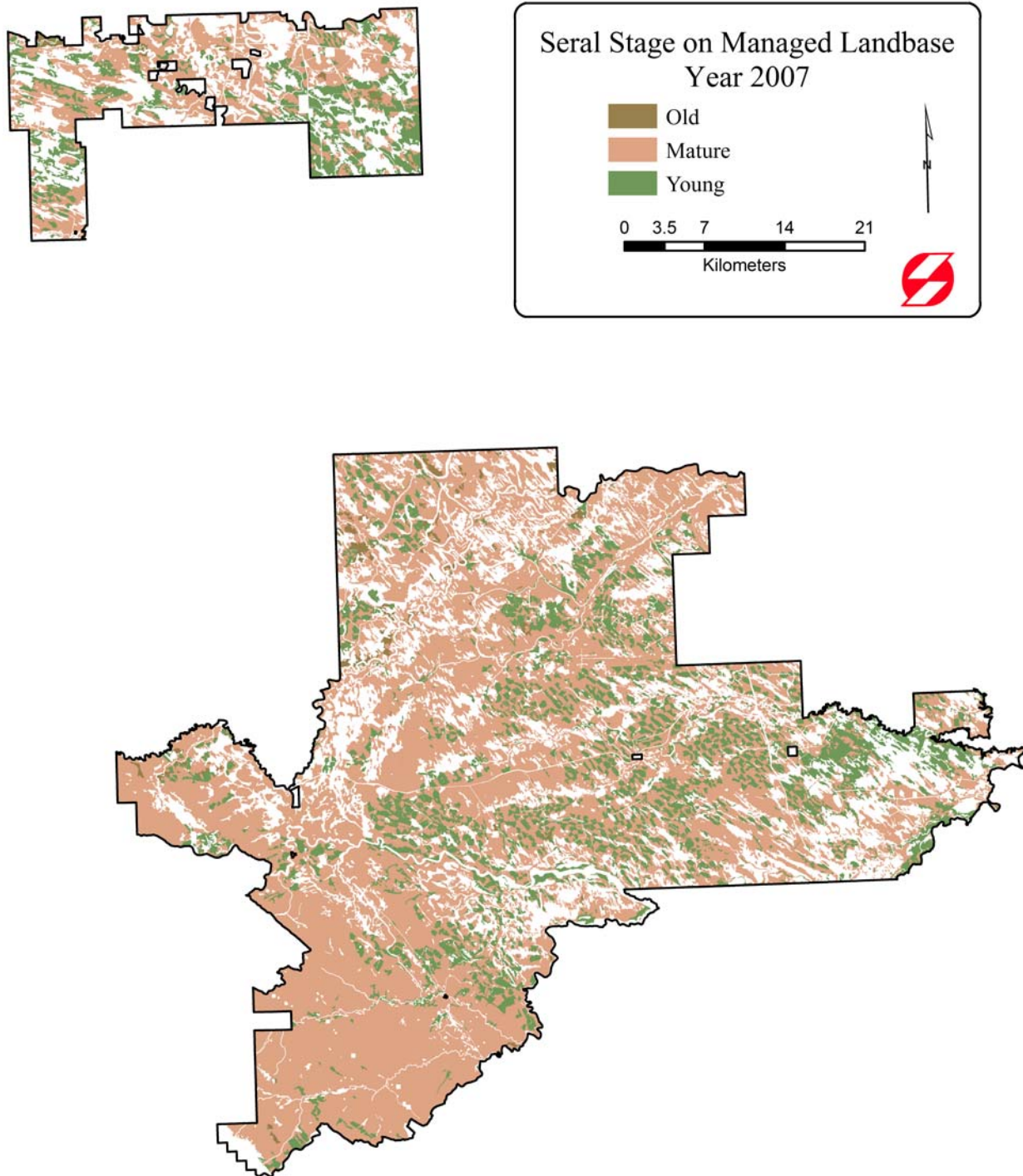




Figure 5.3 Seral Stage Distribution at Year 10 (Gross Landbase)

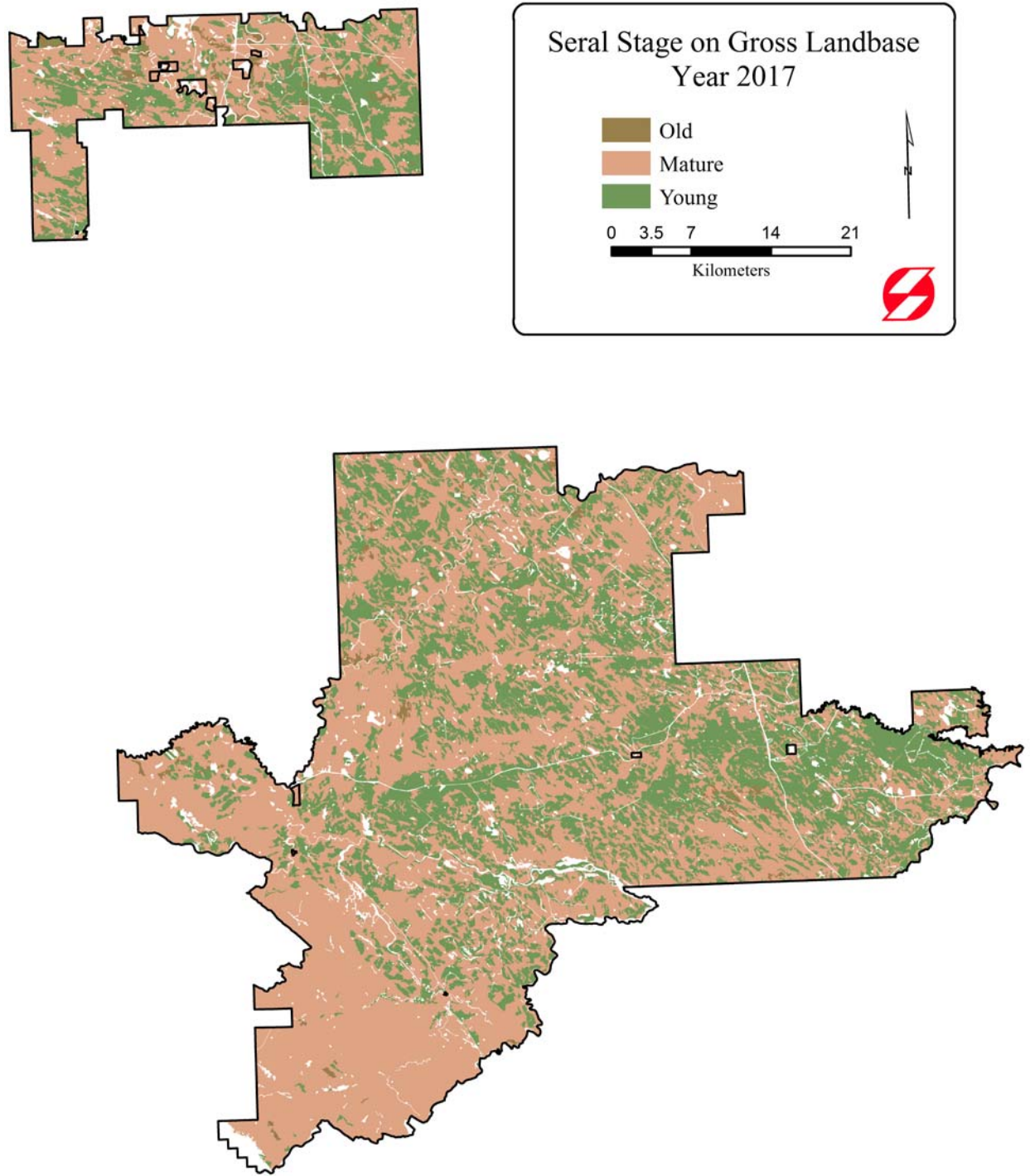




Figure 5.4 Seral Stage Distribution at Year 10 (Managed Landbase)

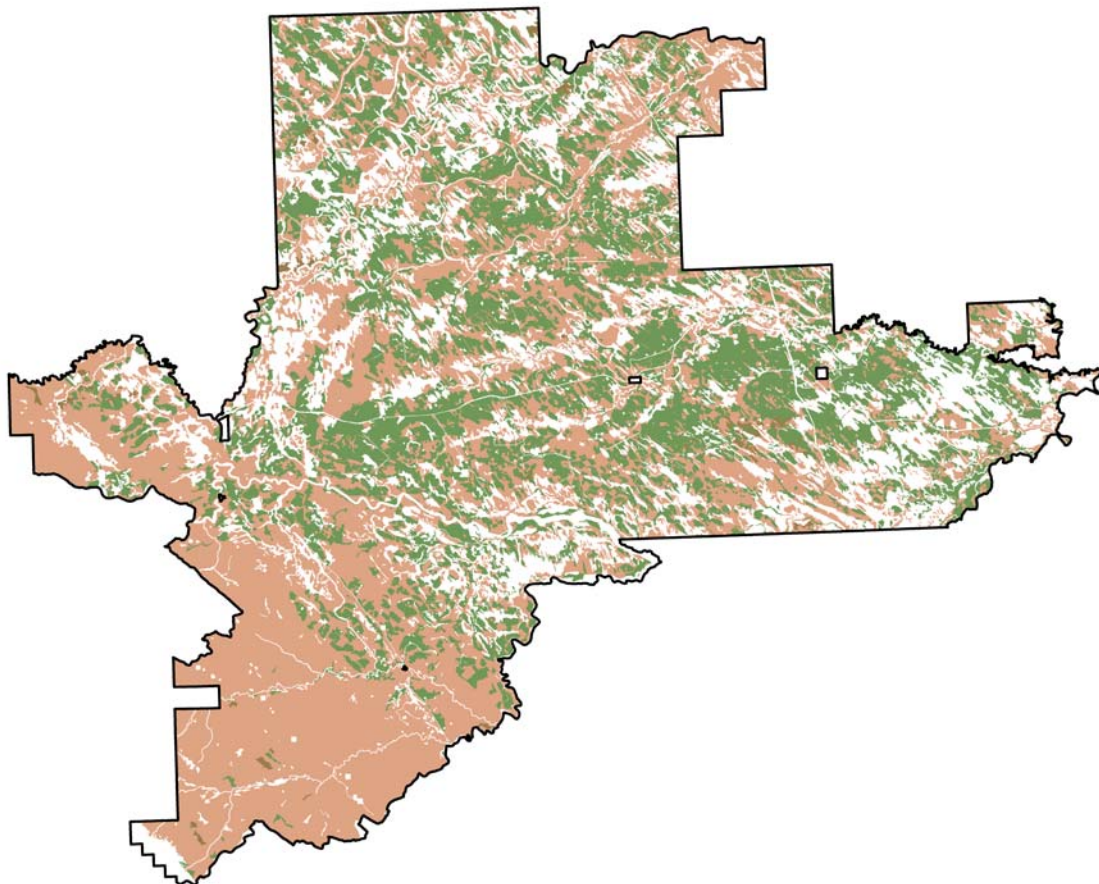
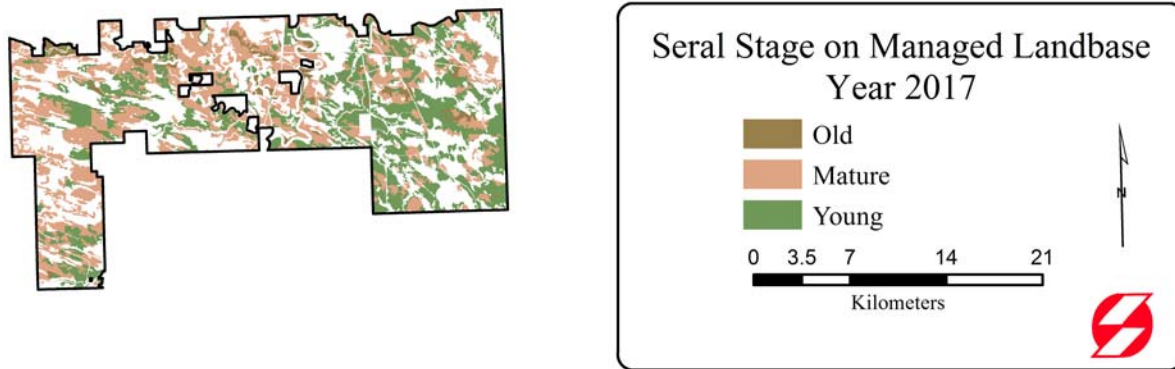


Figure 5.5 Seral Stage Distribution at Year 50

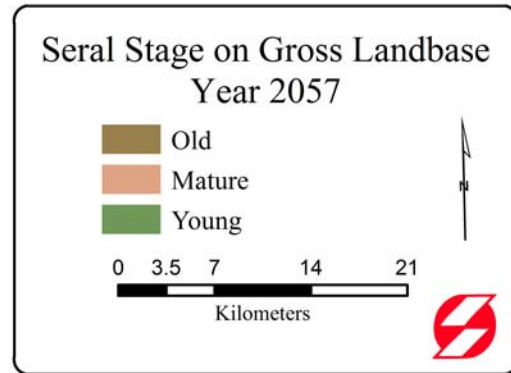
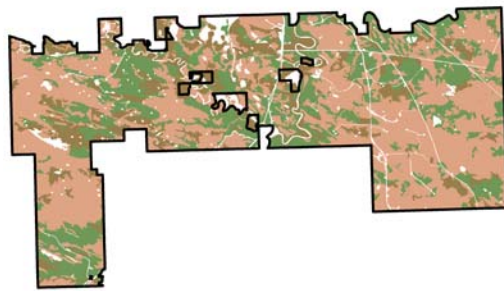
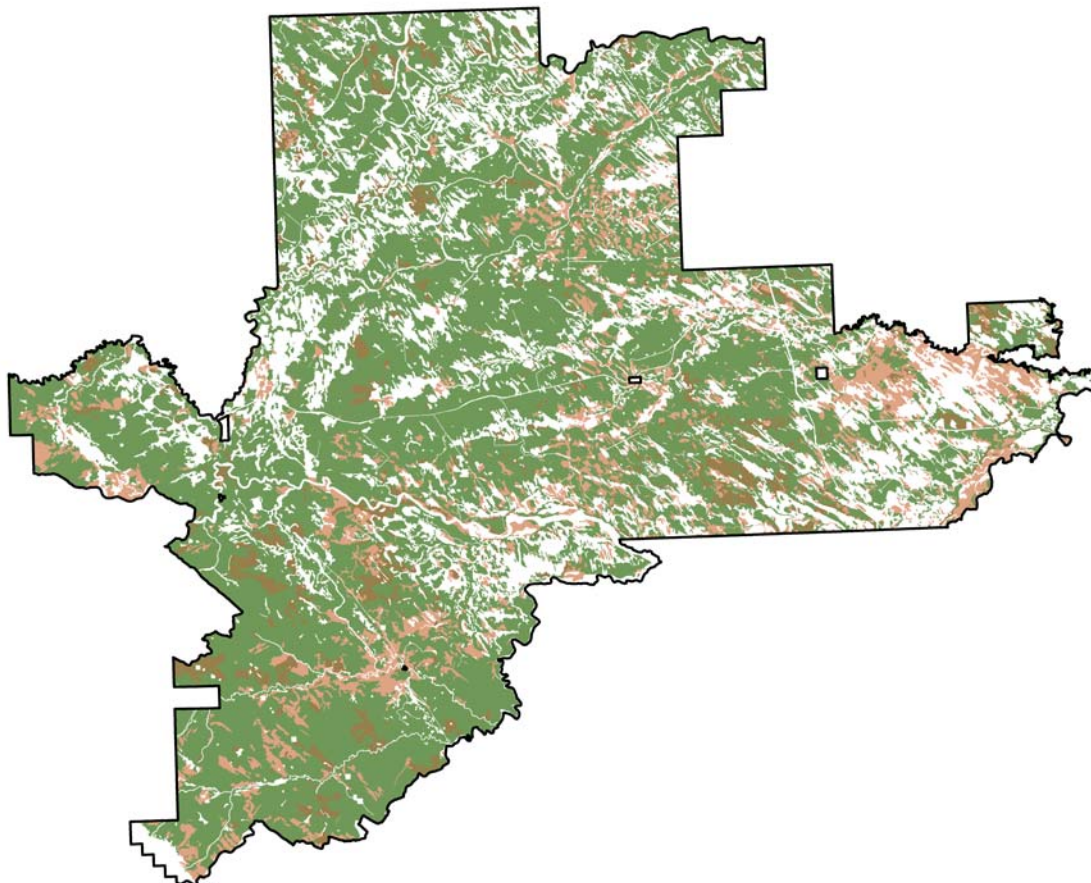




Figure 5.6 Seral Stage Distribution at Year 50 (Managed Landbase)



Performance will be reported in the Stewardship Report.



5.5.2 Maintain biodiversity by avoiding landscape fragmentation.

Target

A distribution of harvest area sizes that will result in a patch size pattern over the 200 year planning horizon approximating patterns created by natural disturbance.

Reporting

Table 5.19 Patch Size Class by Subunit at Year 0

Compartment- ments	Patch Size (ha)					
	0-10	10-40	40-80	80-250	250-500	500+
1-7	189	1,532	612	704	0	0
8-18	1,151	6,886	2,770	3,138	311	0
19-24	142	1,138	769	336	0	0
Total	1,481	9,555	4,151	4,178	311	0
%	7.53%	48.56%	21.10%	21.23%	1.58%	0.00%

Table 5.20 Patch Size Class by Subunit at Year 10

Compartment- ments	Patch Size (ha)					
	0-10	10-40	40-80	80-250	250-500	500+
1-7	391	1,945	1,662	1,722	496	0
8-18	2,074	7,090	5,252	6,973	4,232	6,926
19-24	344	2,198	2,561	2,952	1,059	0
Total	2,809	11,234	9,475	11,647	5,786	6,926
%	5.87%	23.46%	19.79%	24.33%	12.09%	14.47%

Table 5.21 Patch Size Class by Subunit at Year 50

Compartment- ments	Patch Size (ha)					
	0-10	10-40	40-80	80-250	250-500	500+
1-7	1,126	2,474	1,732	3,453	1,571	9,463
8-18	3,585	6,251	2,805	2,261	673	0
19-24	523	1,515	442	672	0	0
Total	5,235	10,240	4,979	6,386	2,244	9,463
%	13.58%	26.57%	12.92%	16.57%	5.82%	24.55%



Figure 5.7 Patch Size Distribution at Year 0

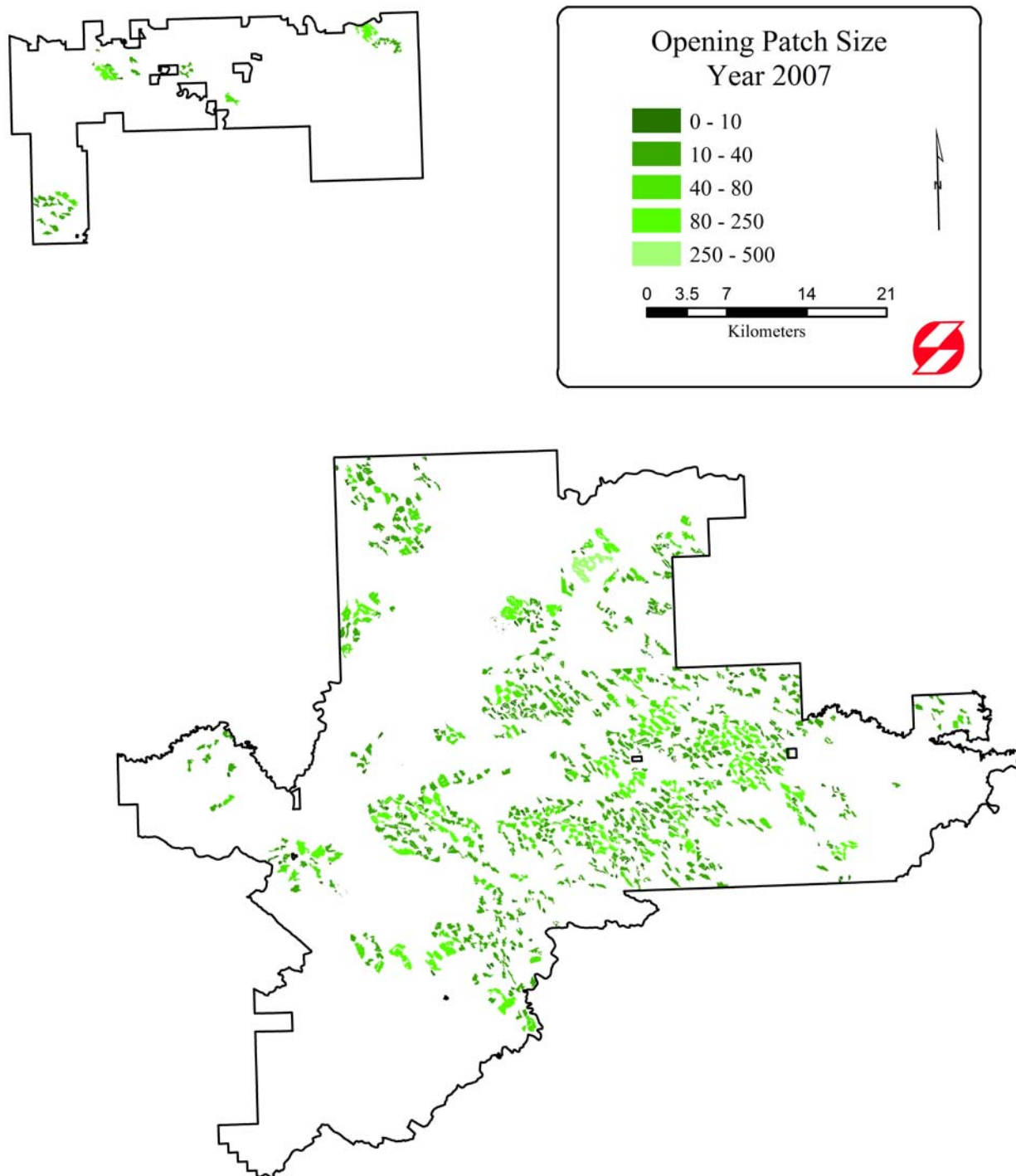




Figure 5.8 Patch Size Distribution at Year 10

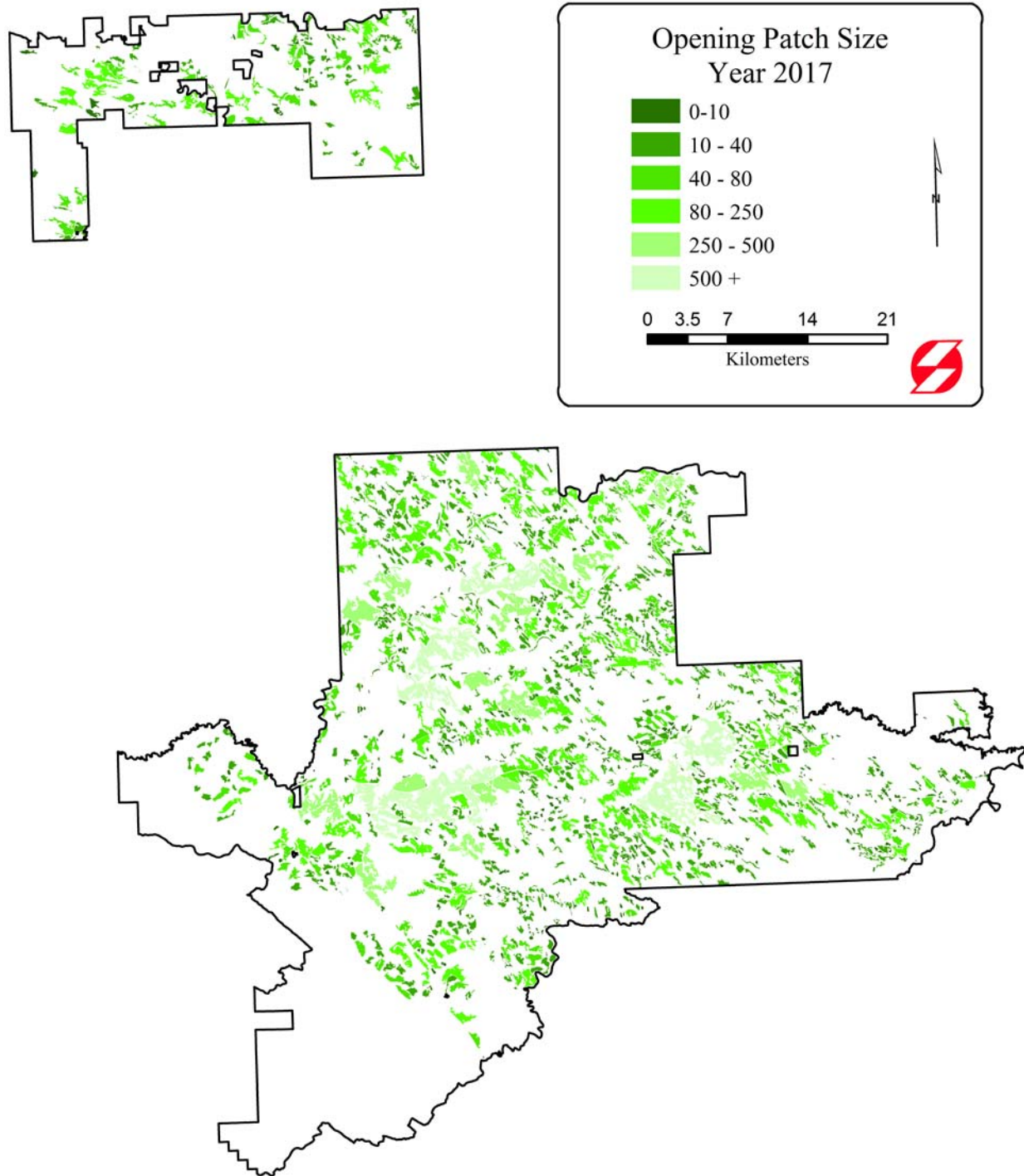
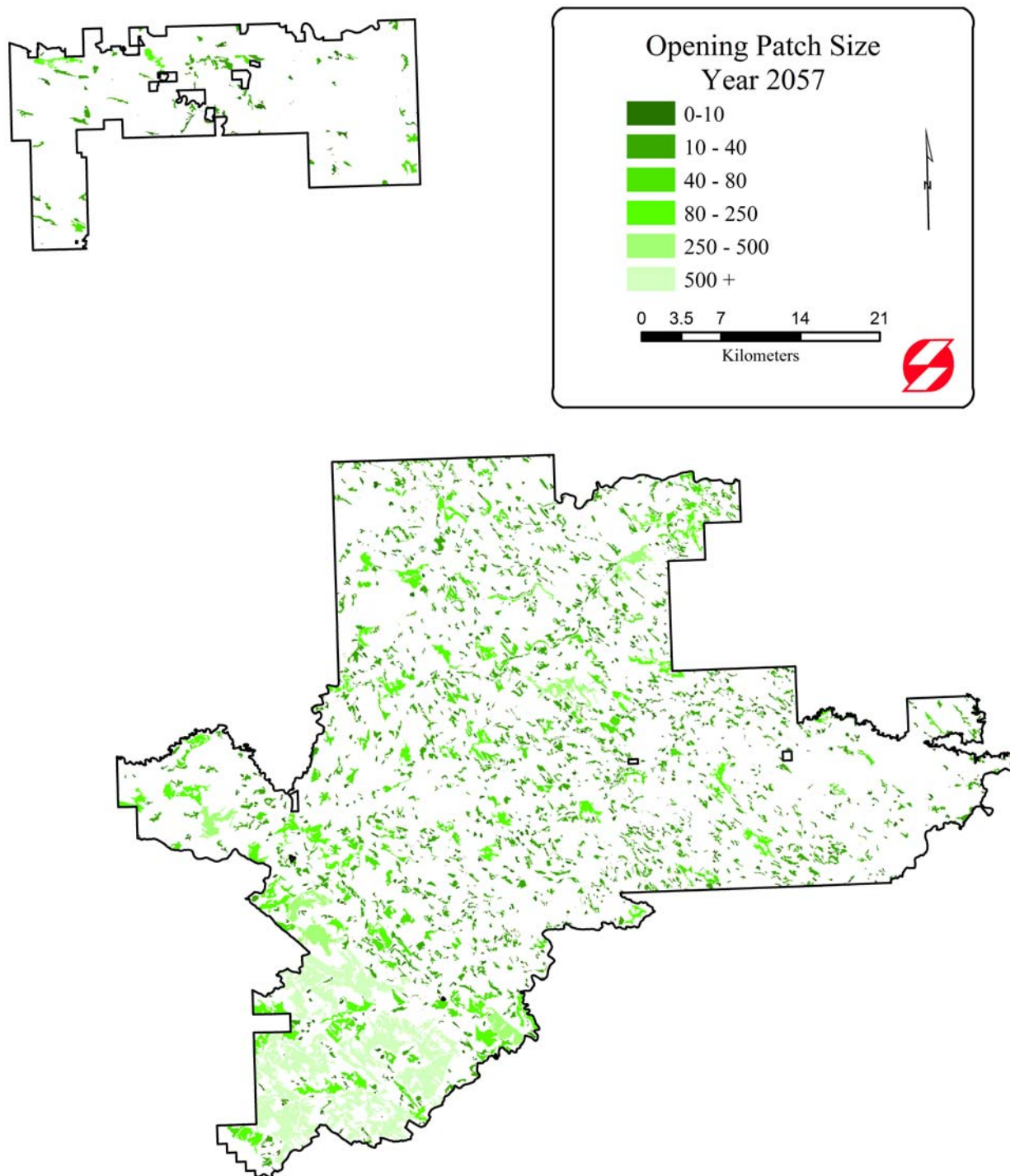




Figure 5.9 Patch Size Distribution at Year 50



Performance will be reported in the Stewardship Report.

**Target**

Area of old interior forest of each cover class will not be less than 10% of each cover class over the next 200 years.

Reporting**Table 5.22 Distribution of Old Forest Patches at Year 0**

Compartment-	Patch Size (ha)					Interior Old	
	0-2	3-40	41-120	121-500	500+	Area (ha)	%
1-7	0	184	86	0	0	0	0%
8-18	7	150	102	0	0	0	0%
19-24	17	728	412	286	0	286	20%
Total	24	1,063	599	286	0	286	15%

Table 5.23 Distribution of Old Forest Patches at Year 10

Compartment-	Patch Size (ha)					Interior Old	
	0-2	3-40	41-120	121-500	500+	Area (ha)	%
1-7	1	205	134	0	0	0	0%
8-18	19	376	286	0	0	0	0%
19-24	17	930	613	286	0	286	15%
Total	37	1,511	1,033	286	0	286	10%

Table 5.24 Distribution of Old Forest Patches at Year 50

Compartment-	Patch Size (ha)					Interior Old	
	0-2	3-40	41-120	121-500	500+	Area (ha)	%
1-7	97	1,347	605	3,611	0	3,611	64%
8-18	264	3,560	1,147	2,401	298	2,699	35%
19-24	84	1,710	2,355	4,520	328	4,848	54%
Total	444	6,617	4,107	10,532	625	11,158	50%



Figure 5.10 Old Interior Forest at Year 0

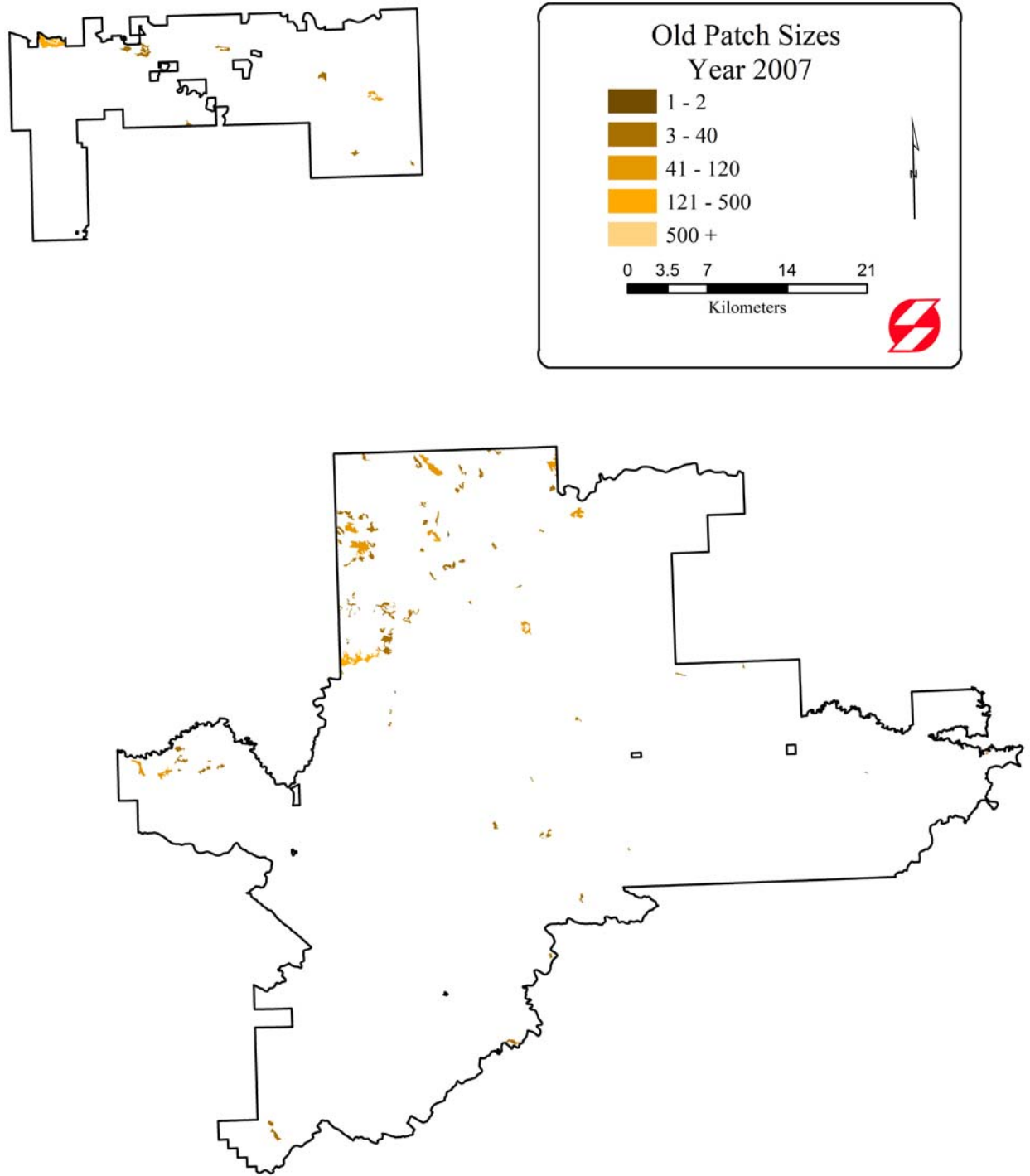




Figure 5.11 Old Interior Forest at Year 10

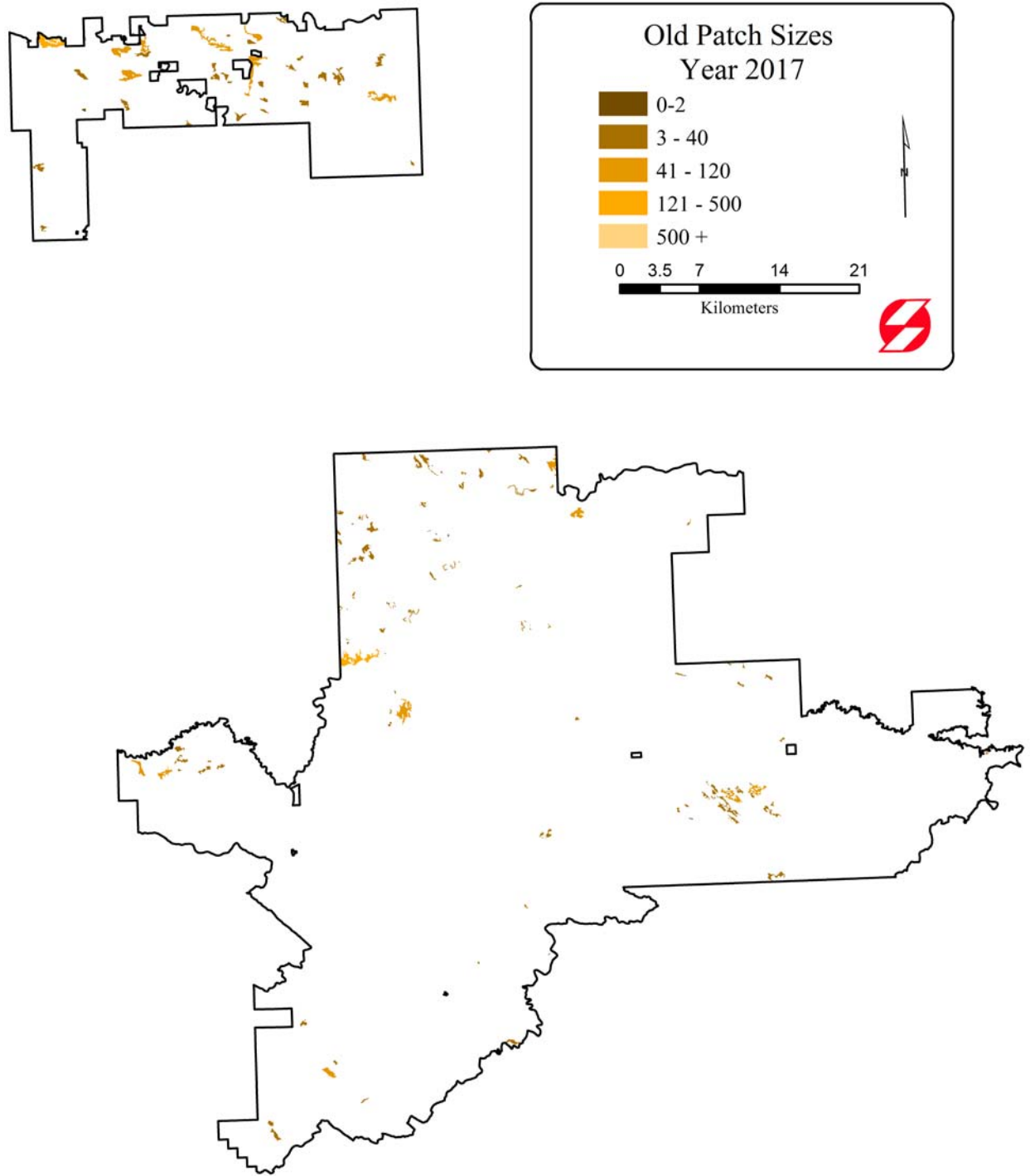
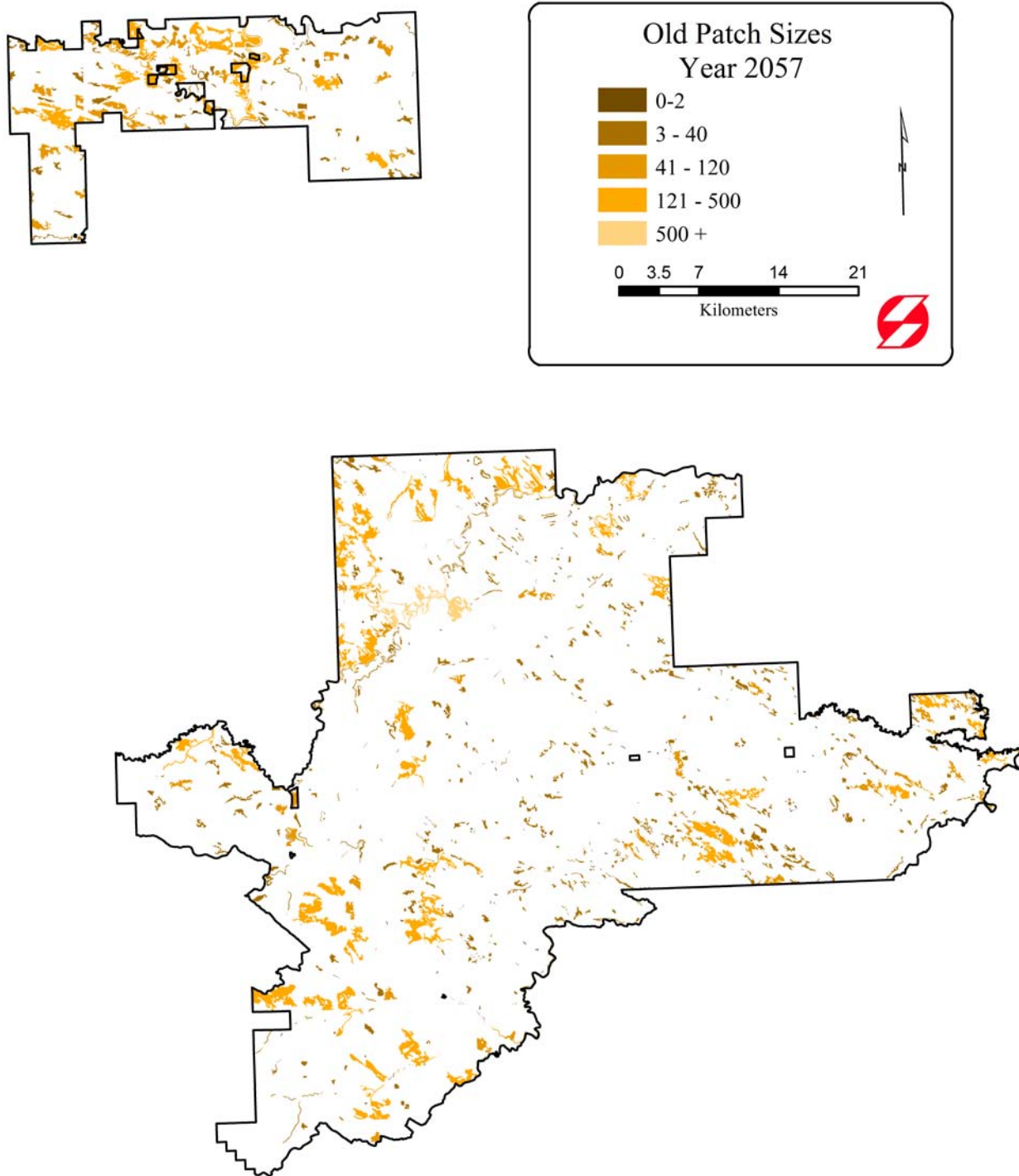




Figure 5.12 Old Interior Forest at Year 50



Performance will be reported in the Stewardship Report.



5.5.3 Maintain biodiversity by minimizing access

Target

Less than 0.6 km/km² in high quality grizzly bear habitat and 1.2 km/km² in all remaining grizzly bear range..

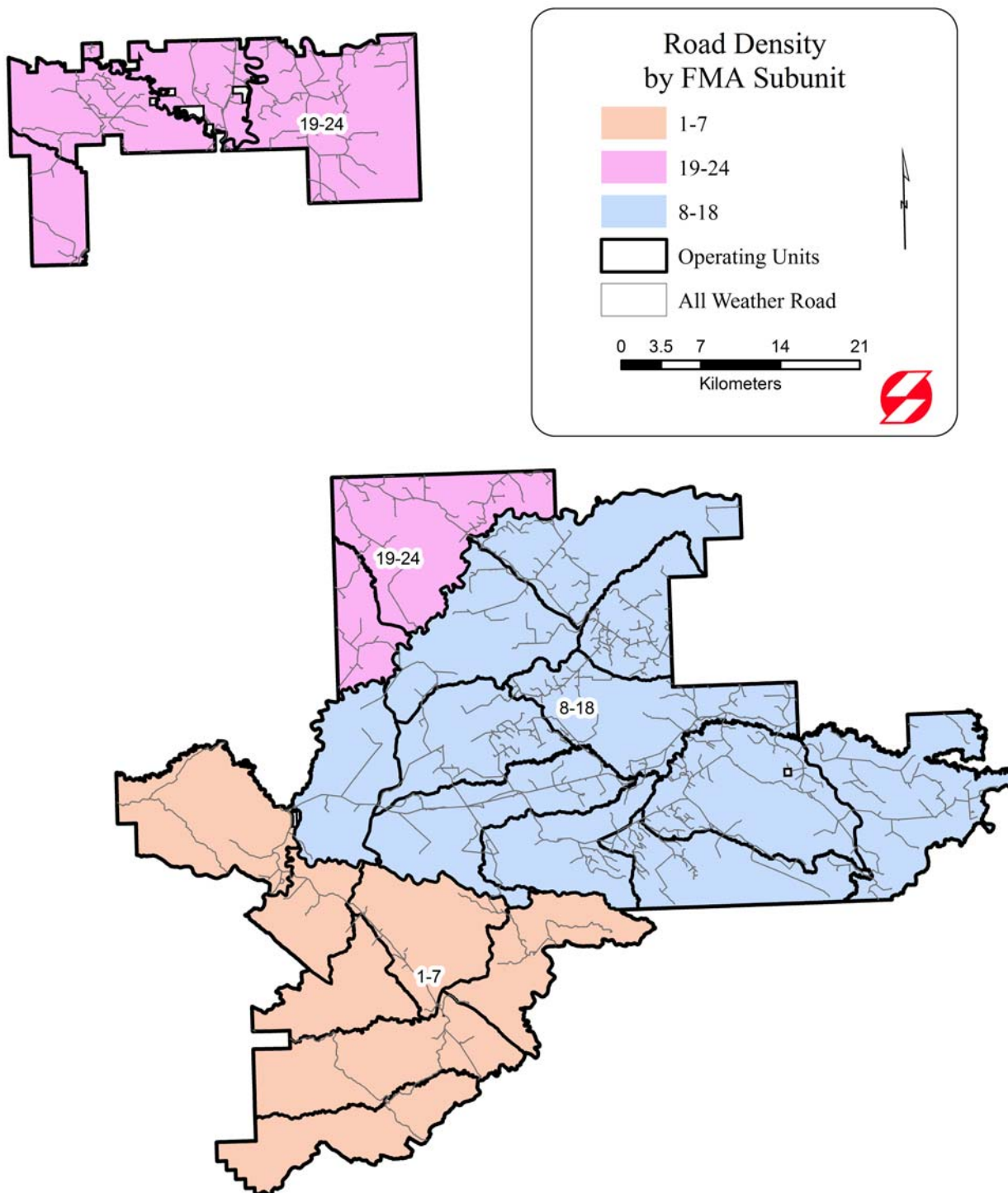
Reporting

Table 5.25 Road Density by Subunit

Compart- ments	Road Length (km)	Subunit Area (km ²)	Density (km/km ²)
1-7	254	706	0.36
8-18	968	1,343	0.72
19-24	496	610	0.81
Total	1,718	2,659	0.65



Figure 5.13 Existing All Weather Roads



Performance will be reported in the Stewardship Report.

***Target***

Less than 40 km of new Class IV road is built in each timber year.

Reporting

AOP and Stewardship Report.

5.5.4 Maintain plant communities uncommon in DFA or province.***Target***

90% of identified uncommon communities will be maintained.

Reporting

As uncommon plant communities are identified, they will be recorded in tables with descriptive list and targets. Map(s) displaying known locations of uncommon plant communities will also be developed.

Performance will be reported in the Stewardship Report.

5.5.5 Maintain unique habitats provided by wildfire and blowdown events.***Target***

Live trees: Retain all unburned trees in green islands and retained patches recognizing timber condition, access, non-timber needs.

Burned trees – compartment scale: Retain greater than 10% of merchantable black trees in patches greater than 100 ha.

Burned trees – harvest area scale: Retain greater than 10% of merchantable black trees in patches 10-100 ha, and retain greater than 5% of merchantable black trees in small patches, single trees according to loggers' choice.

Reporting

FMP: Tables (with areas) and maps of natural disturbances within the last 10 years showing salvaged and unsalvaged areas.

Performance will be reported in the Stewardship Report.

Target

In areas of significant blowdown (i.e. over 10 hectares in size) 10% of the stems will be left unsalvaged.



Reporting

Performance will be reported in the Stewardship Report.

5.5.6 Retain ecological values and functions associated with riparian zones.

Target

Consistent with Operating Ground Rules.

Reporting

Performance will be reported in the Stewardship Report.

5.5.7 Retain stand level structure.

Target

An average of 1.5% of the volume harvested within each compartment group and the FMA area is retained as residual structure in patches. A wide range in variability in harvest area-level retention is desired as long as the target level is achieved. Non-merchantable single stems and non-merchantable clumps will also be left as structure, where appropriate.

Reporting

The area of patches within to harvested cutblocks will be calculated, used to estimate volumes and reported in the Stewardship Report by compartment group and for the entire FMA.

Target

90% of harvest areas within each of three compartment groups will have downed woody debris retained on site. The groups to be used for reporting purposes are: Compartments 1 to 7, 8 to 18 and 19 to 24.

Reporting

The Stewardship Report will include the percent of harvested area that has downed woody debris levels equivalent to pre-harvest conditions.

5.5.8 Maintain integrity of sensitive sites.

Target

Strategies to maintain consistent with provincial guidelines/OGR.

**Reporting**

Sensitive sites protected will be reported by Operating Area in the Stewardship Report.

5.5.9 Maintain aquatic biodiversity by minimizing impacts of water crossings.

Target

Designs meet standards of the Code of Practice for Water Course Crossings.

Reporting

Performance will be reported in the Stewardship Report

5.5.10 Maintain habitat for identified high value species (i.e. economically valuable, socially valuable, species at risk, species of management concern).

Target

Currently, the only identified high value species that has a model to determine the amount of habitat available, as well as required, is the grizzly bear. A minimum of 95% of grizzly bear habitat will be maintained compared to current levels.

Reporting

Table 5.26 below shows the area in pixels of suitable grizzly bear habitat at 0 and 10 years by Resource Selection Function (RSF) value. Maps of suitable habitat at 0 and 10 years are shown in Figure 5.14 and Figure 5.15.

Table 5.26 Change in Grizzly Bear Habitat RSF Values

RSF Value	Number of Pixels	
	Year 0	Year 10
1 (low)	1,226,139	1,170,379
2	1,003,563	1,047,534
3	600,067	603,134
4	120,783	116,760
5 (high)	26,227	34,970
Mean	595,355	594,555

The spatial harvest sequence reduces the mean RSF value by 0.13% and is within the target.



Figure 5.14 Current Distribution of RSF Values

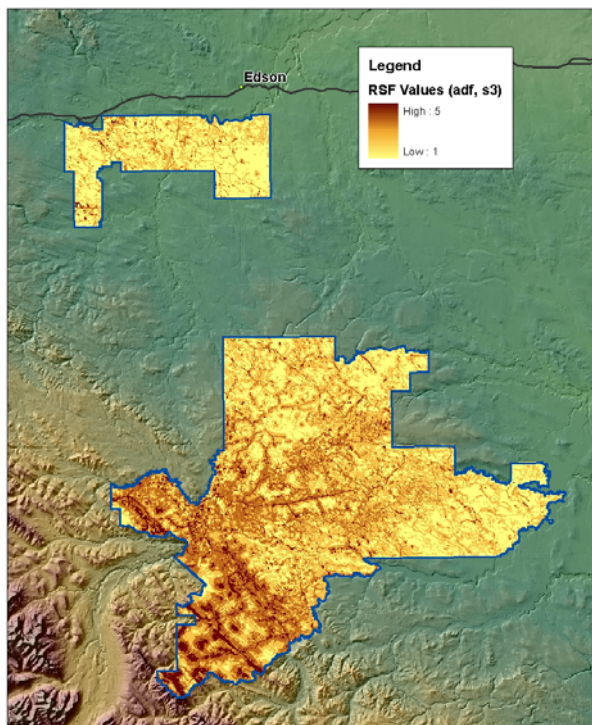
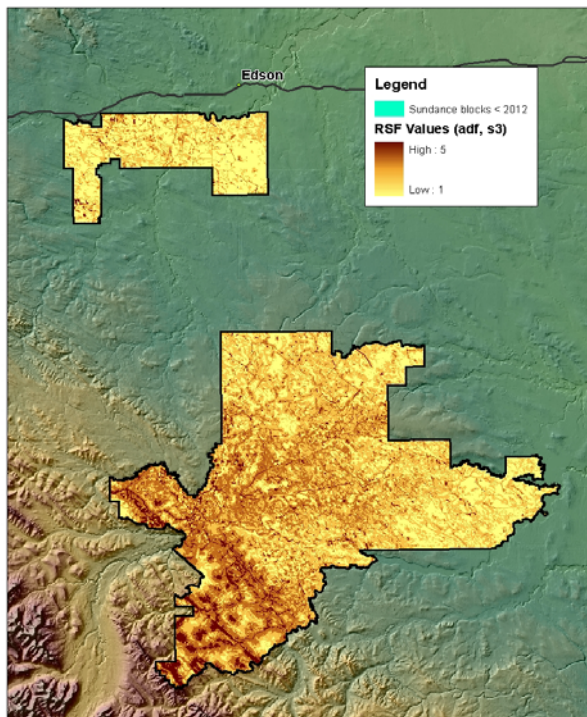


Figure 5.15 RSF Values for 0 to 10 years Post-harvest





5.5.11 Retain “wild forest populations” for each tree species in each seed zone through establishment of in-situ reserves by the organization or in cooperation with Alberta.

Target

Number of genetic conservation areas for each seed zone conforming with Section 20 of the Standards for Tree Improvement in Alberta.

Reporting

Performance will be reported in the Stewardship Report.

5.5.12 Retain wild forest genetic resources through ex-situ conservation.

Target

Active *ex situ* conservation programs for all Controlled Parentage Program plan species and other species in cooperation with Alberta. Sundance does not have a Controlled Parentage Program, therefore there is no target.

Reporting

Five year reporting/cooperation with Alberta.

5.5.13 Integrate transboundary values and objectives into forest management.

Target

Ongoing consultation with relevant protected areas agencies.

Reporting

Performance will be reported in the Stewardship Report.

5.5.14 Meet reforestation targets on all harvested areas.

Target

The timber supply analysis assumes that all harvested areas will be satisfactorily restocked.

Reporting

ARIS, AOP, Stewardship Report.

***Target***

100% of harvested areas are satisfactorily restocked.

Reporting

AOP and Stewardship Report.

5.5.15 Limit conversion of forest Landbase to other uses.***Target***

A program to maintain the forest landbase.

Reporting

Stewardship Report.

5.5.16 Recognize lands affected by insects, disease or natural calamities.***Target***

Area (ha) affected by significant outbreaks, infestations, natural calamities.

Reporting

Areas known to be affected will be reported in the AOP and the Stewardship Report.

5.5.17 Control non-native plant species (weeds).***Target***

A noxious weed program is in place and implemented.

Reporting

Inspections summarized in Stewardship Report.

5.5.18 Minimize impact of roading and bared areas in forest operations.***Target***

Less than 5% of the area within cutblocks has been mechanically stripped of topsoil and lesser vegetation.

***Reporting***

The cleared area as a percentage of block area will be included in the Stewardship Report. Areas used as landings or containing brush piles are not considered to be bared unless they have been mechanically stripped of topsoil and lesser vegetation.

5.5.19 Minimize incidence of soil erosion and slumping.***Target***

Complete compliance.

Reporting

Inspection reporting.

5.5.20 Limit impact of timber harvesting on water yield.***Target***

Zero Water Act penalties, complete compliance with FMP.

Reporting

Stewardship Report

5.5.21 Minimize impact of operations in riparian areas.***Target***

Complete compliance.

Reporting

Areas to be harvested within buffers will be shown in Final Harvest Plans.

5.5.22 Establish appropriate AACs.***Target***

Complete compliance.

Reporting

Progressive and continuous, as required by provincial regulation.

Delivered salvage volumes will be recorded, by disposition, and reported in the Stewardship Report.



5.5.23 To reduce wildfire threat potential by reducing fire behaviour, fire occurrence, threats to values at risk and enhancing fire suppression capability.

Target

Reduce area (ha) in the extreme and high Fire Behaviour Potential rating categories by 10% within the FireSmart Community Zone around the Hamlet of Marlboro.

Reporting

Table 5.27 Area in the Marlboro Community Zone by FBP class.

FBP	Area 2005 (ha)	Area 2027 (ha)
C-2	533	533
C-3	95	77
D-1	840	711
M-1	898	841
NF	103	103
O1b	0	186
S1	19	19
S2	12	31
UN	486	486
WA	68	68

Target

Reduce the area (ha) in the extreme and high Fire Behaviour Potential rating categories by 10% across the FMA area.

Reporting

Performance will be reported in the Stewardship Report.

5.5.24 Integrate other uses and timber management activities.

Target

Minimize the impact of harvesting, roadbuilding and silvicultural activities on other uses.

Reporting

Stewardship Report.

5.5.25 Maintain Long Run Sustained Yield Average.

Target

No net decrease from natural stand productivity.

***Reporting***

The Alternative Regeneration Standards developed for the Sundance FMA area contain specific requirements for monitoring, measuring and reporting the performance of cutover areas.

Timber Supply Analysis, Stewardship Report.

5.5.26 Implement aboriginal involvement program.***Target***

Consult at the community level with designated representatives of affected aboriginal communities during FMP and GDP development.

Reporting

Aboriginal consultation activities are reported in the Stewardship Report while site-specific consultations are detailed in Final Harvest Plans, where applicable.

5.5.27 Implement public involvement program.***Target***

Public involvement will be carried out as indicated in the Terms of Reference for Sundance Forest Management Planning, approved 18 May 2005.

Reporting

Public involvement activities are reported in the Stewardship Report while site-specific consultations are detailed in Final Harvest Plans, where applicable.

5.6 Public Participation

A key component to implementation of this plan is the Sundance Public Advisory Committee (PAC). The committee reviews long range and operational plans and provides input on the direction being taken by Sundance. PAC members represent a range of interests and provide valuable direction and advice to Sundance on an ongoing basis.



6. Conclusion

The Alberta Forest Management Planning Standard (Alberta Sustainable Resource Development 2006b) changed the requirements for forest management planning in the province of Alberta substantially. As one of the first companies to prepare and submit an FMP using the new standard, some challenges were experienced along the way. Interpretations of submission requirements were evolving and precedents were being set as staff changes occurred. This dynamic state of affairs was compounded by the impending threat of a mountain pine beetle infestation. In spite of these challenges, a sincere effort was made during preparation of this plan to address and balance conflicting objectives.

Ongoing monitoring and reporting will allow the progress of Sundance Forest Industries Ltd. and the other operators to be tracked. It will allow progress toward the targets to be measured and reported.



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