Regional Forest Landscape Assessment

South Saskatchewan Region

Prepared for:

Forest Management Branch
Alberta Environment and Sustainable Resource Development

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EXECUTIVE SUMMARY

The South Saskatchewan Region is one of the seven land-use regions defined in Alberta's Land-use Framework. It spans the southern portion of the province and includes the Bow River, South Saskatchewan River, Old Man River, and Milk River watersheds. Parks and protected areas, which include the renowned Waterton Lakes National Park, cover 6% of the Region.

This Region contains less development of the forest and energy sectors than other regions. Only 2 of the 20 Forest Management Agreement Areas in the province are either entirely or partially located in the Region. Except for the western portion, agriculture is dominant through the Region, where the landscape has been under cultivation for many decades. Agricultural and grazing use has lead to the development of extensive networks of man-man ditches, dykes and reservoirs for the purposes of water catchment during the growing season.

The topography of the Region is diverse, from the Rocky Mountains in the west to the flat plains in the centre and east. The Region's climate and soil have resulted in the development of primarily coniferous forests in the western portion, gradating into parkland and grasslands to the east. The only significant variation from this pattern is the forested Cypress Hills in the south-eastern portion of the Region.

Forests are mostly above the mature stage of seral stage development, with 9% of the Region classified as mature, old or very old. In addition, the age class distribution shows 24% of the Region's forests in the age class 100 years or older. Forests are primarily coniferous with lodgepole pine being the dominant species. Where deciduous forests are found, they are primarily comprised of trembling aspen, and are typically found in the transition zone from foothills to grassland.

The forest is threatened by natural populations of several pests, but current mountain pine beetle outbreak is likely to be the most damaging, and likely to reduce the future volume of wood that can be extracted. Historical defoliators continue to persist in the Region, but to date, have not had the impact observed with the current mountain pine beetle infestation.

NOTICES AND DATA SOURCES

The information presented in this report is current as of the report date. For further information, please contact the Government of Alberta, Department of Environment and Sustainable Resource Development.

The source of data for each topic is referenced with the use of end notes. The full data list is presented in APPENDIX III with appropriate references included in each section. All data source references are identified by the format (1) where '1' represents the reference in a numerical sequence, listed in APPENDIX III . All initialisms used in the report are defined in the glossary. Maps included herein reflect a broad representation of each metric, and are not intended for operational use. For more detailed examination of map information, double click on the legend of any map. This will open a separate window where you may zoom into the map.

Where areas are presented, they are expressed as hectares and were calculated using the projection known as "NAD_1983_10TM_AEP_Forest" which is a Transverse Mercator projection using the1983 North American Datum. For this reason, some area estimates may not agreed with other published information. The presentation of area estimates to the nearest hectare may result in the tabulated sums of some tables to appear to not total correctly; however, this is simply due to rounding.

Information is compiled at the Land-use Framework regional level and as such represent broad estimates over the Region. Extrapolation or interpolation of results at other levels of resolution (e.g.: forest management unit, municipal district) are not appropriate without further analysis. The information which relies on forest inventory data is summarized only over the areas for which there is available forest inventory data and for which Alberta has provincial forest management responsibilities. This excludes all federal lands, First Nations and Metis settlement areas.

The Minister and the Crown provides this information without warranty or representation, as to any matter including but not limited to whether the data/information is correct, accurate or free from error, defect, danger or hazard and whether it is otherwise useful or suitable for any use the user may make of it.

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1. Administrative Boundaries

1.1 South Saskatchewan Region

The South Saskatchewan Region (1), one of seven land-use regions defined in Alberta's Land-use Framework (Alberta 2008), spans the southern portion of Alberta, running from the Alberta-British Columbia border to the Saskatchewan border (see Figure 1-1). The southwestern part of the Region contains Waterton Lakes National Park, and the northeastern portion contains Canadian Forces Base Suffield. The Region contains a variety of industrial, agriculture, and natural resource development as well as large areas of protected lands for the purposes of conservation.

The South Saskatchewan Region is the fourth largest of the seven regions, with an area of approximately 8,376,432 hectares.

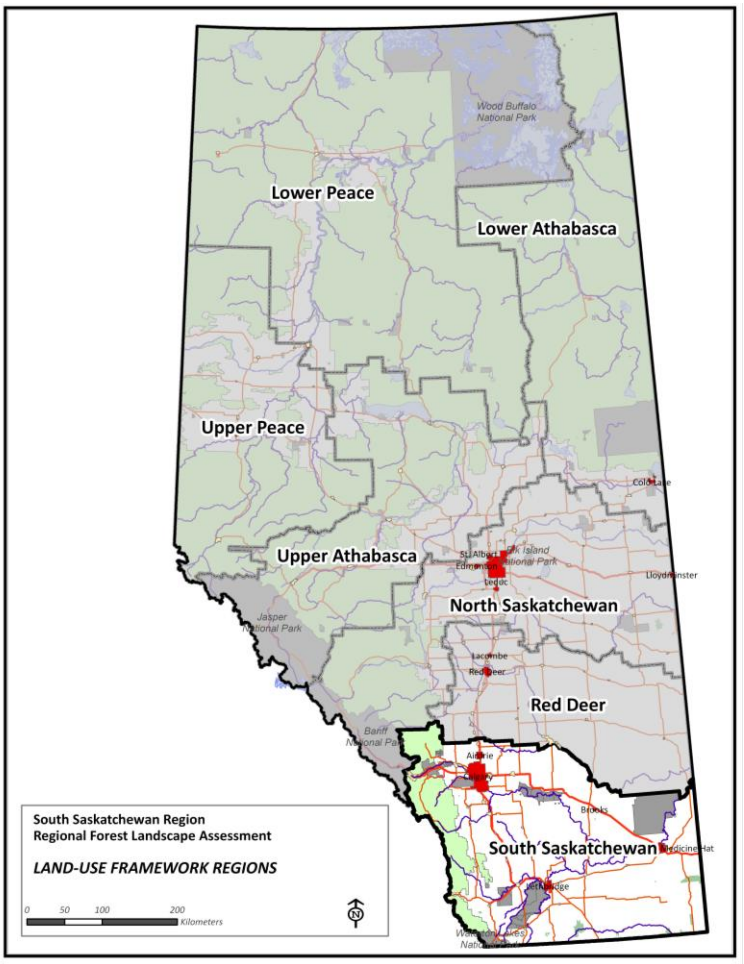


Figure 1-1 South Saskatchewan Region

1.2 Green / White Area

In 1948, the Province divided Alberta into two zones for the purposes of land use decision making. This resulted in the creation of the two areas commonly known as the Green and White Areas (2). The White Area consists primarily of private land holdings related to agricultural use. The Green Area is Crown land, and managed for natural resource development, recreation and conservation. Specifically excluded from the Green and White Areas are lands not administered by Alberta (e.g.: national parks, military installations and bases).

As summarized in Table 1-1, approximately 80% of the South Saskatchewan Region is White Area, 12% is Green Area and the remaining 8% are under federal administration. Note that while national parks are included in the Land-use Framework regions, they are not included in the Green / White Area designations (see Figure 1-2).

Table 1-1 Green / White Area summary

Area Name	Area (ha)	Percentage (%)
Green Area	1,002,826	12
White Area	6,718,291	80
Federal Land	655,314	8
Total	8,376,432	100

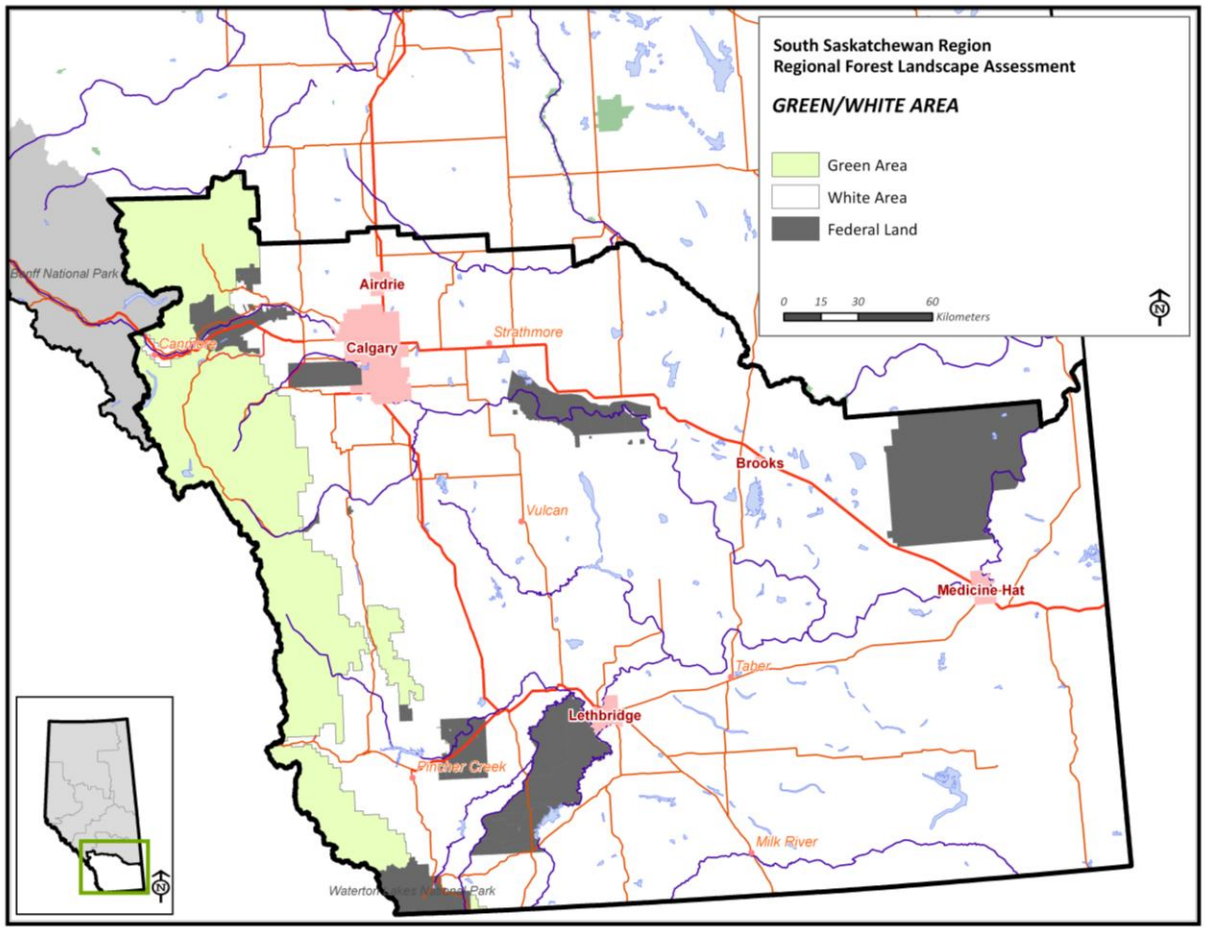


Figure 1-2 Green/White Area Distribution

1.3 Forest Management Agreement Areas

Three percent of the South Saskatchewan Region is covered by a Forest Management Agreement (FMA) (3). There are 2 FMA holders with timber allocations in the South Saskatchewan Region. FMA boundaries are not coincident with the land use framework region boundaries.

Table 1-2 lists the FMAs (in alphabetical order) which have lands inside the South Saskatchewan Region, the percentage of each FMA inside the Region, as well as the proportion of the South Saskatchewan Region which is covered by the respective FMA.

Figure 1-3 shows the location of the respective FMAs and their distribution within the South Saskatchewan Region.

Table 1-2 Forest Management Agreement Area summary

FMA Code	Company Name	Entire FMA	Portion of FMA located in South Saskatchewan		Proportion of South Saskatchewan occupied by FMA
		Area (ha)	Area (ha)	% of FMA	% of South Saskatchewan
SPRAY LAKES	Spray Lake Sawmills (1980) Ltd.	286,082	263,933	92	3
SUNPINE	Sundre Forest Products Inc.	553,458	10,762	2	0
Sub-total		839,540	274,695		3
No Forest Management Agreement Area			8,101,737		97
Total			8,376,432		100

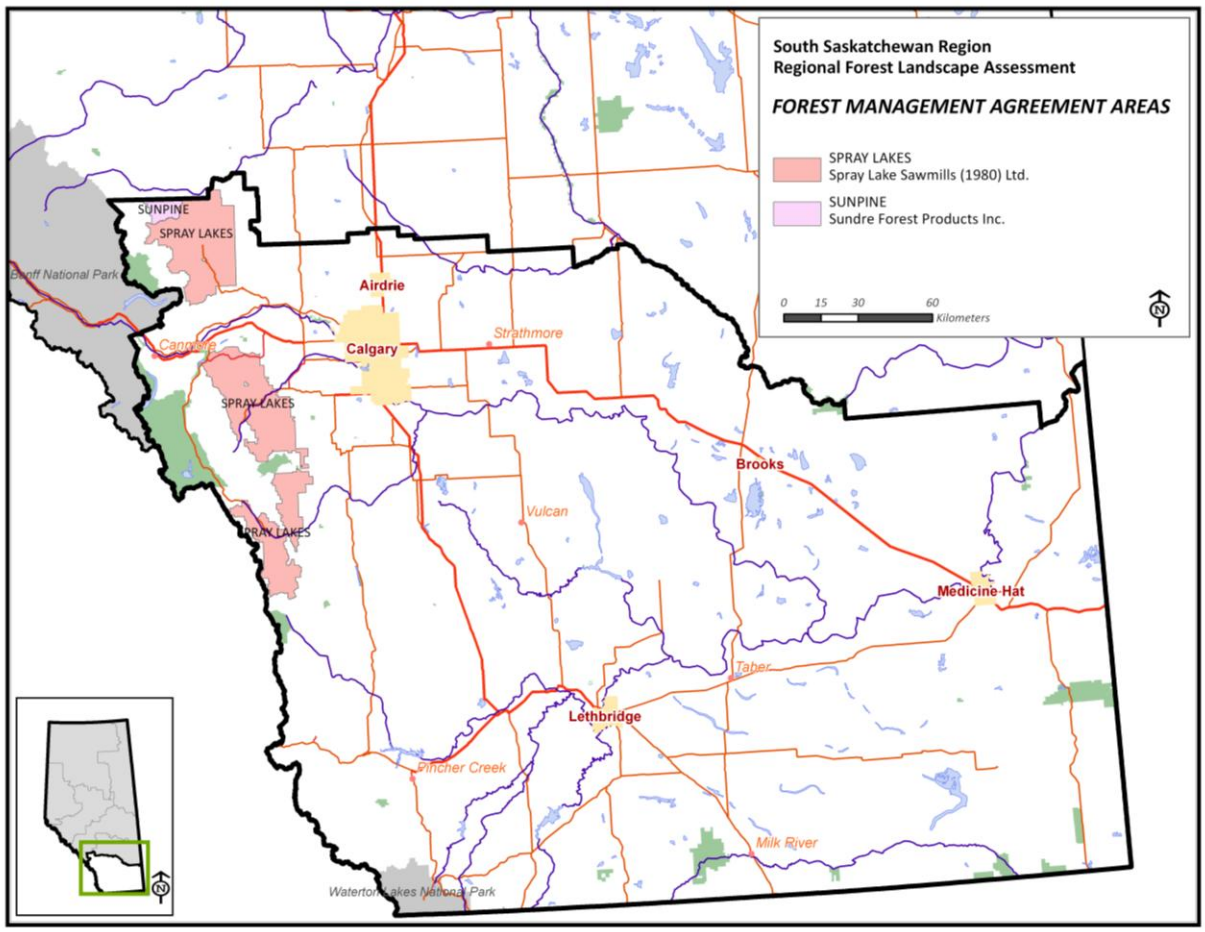


Figure 1-3 Forest Management Agreement Areas

1.4 Forest Management Units

The South Saskatchewan Region contains 11 Forest Management Units (FMU) (4), of which 4 are fully within inside the Region (Table 1-3). The largest FMU in the Region is CO2 which makes up 5% of the South Saskatchewan Region. Of the 11 FMUs, 7 are managed by the Crown, 1 contains both an FMA and other users, and 2 are managed under an FMA (see section 1.3).

Three of the largest Crown-managed units (CO2, BO1 and CO1) are located in the White Area. The largest FMU managed as an FMA is B10 (Spray Lakes (Cochrane)).

A map of the FMUs within the South Saskatchewan Region appears as Figure 1-4.

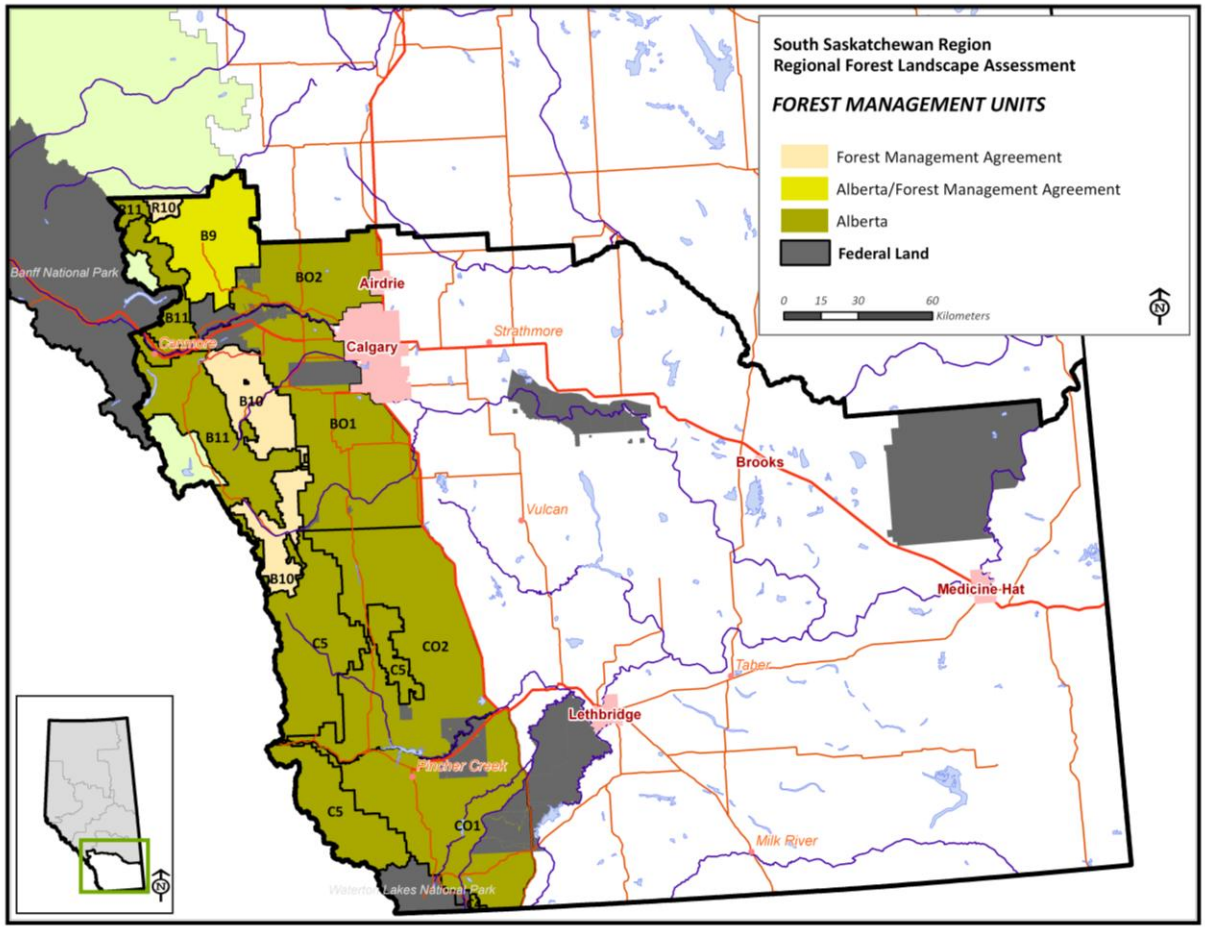


Figure 1-4 Forest Management Units

Table 1-3 List of Forest Management Units

FMU Name	Managed by	Entire FMU Area (ha)	Portion of FMU located in South Saskatchewan Area (ha)	% of FMU	Proportion of South Saskatchewan occupied by FMU % of South Saskatchewan
CO2	Crown	427,623	414,292	97	5
C5	Crown	351,490	351,490	100	4
BO1	Crown	386,669	332,075	86	4
CO1	Crown	375,609	301,606	80	4
B11	Crown	241,439	241,439	100	3
B10	FMA	163,553	163,553	100	2
BO2	Crown	546,554	161,127	29	2
B9	Crown & FMA	173,659	147,091	85	2
R11	Crown	521,547	12,741	2	0
R10	FMA	587,327	10,762	2	0
C4	Crown	2,619	2,619	100	0
Sub-total		3,778,088	2,138,795		26
No Forest Management Unit Area			6,237,637		74
Total			8,376,432		100

1.5 Natural Subregions

In Alberta, a landscape classification system referred to as the Natural Regions and Subregions of Alberta (5) is widely used for land management programs (e.g., parks and protected areas network, ecologically-based forest management tools). The system was originally developed in 1994 (Alberta 1994). A project to refine and update the classification was initiated in the fall of 2000 to take advantage of GIS technology and an increased knowledge of the ecology of the province. Subregion descriptions that follow are based on the 2006 documentation (Natural Regions Committee 2006)

Natural Regions contain similar landforms, hydrology, geology, soils, climate, plants and wildlife. The Natural Regions are further divided into subregions, on the basis of similar landscape patterns. The South Saskatchewan Region contains portions of 11 subregions. A summary of subregion distribution is in Table 1-4 (presented in order of prevalence in the South Saskatchewan Region) and a map showing the subregions in the South Saskatchewan Region appears as Figure 1-5.

Table 1-4 Natural Subregion Distribution

Natural Subregion	Area (ha)	Percentage (%)
Dry Mixedgrass	3,141,825	38
Mixedgrass	1,965,771	23
Foothills Fescue	1,258,283	15
Montane	620,733	7
Subalpine	528,625	6
Foothills Parkland	375,554	4
Alpine	155,065	2
Northern Fescue	152,687	2
Upper Foothills	77,676	1
Lower Foothills	59,851	1
Central Parkland	40,241	0
Total	8,376,311	100

The Dry Mixedgrass and Mixedgrass Subregions together occupy more than half of the South Saskatchewan Region accounting for 61% of the Region (Table 1-4). The Foothills Fescue Subregion is the next most prevalent, accounting for 15% of the Region. The remaining area lies within the Montane, Subalpine, Foothills Parkland, Alpine, Northern Fescue, Upper and Lower Foothills, and Central Parkland Subregions.

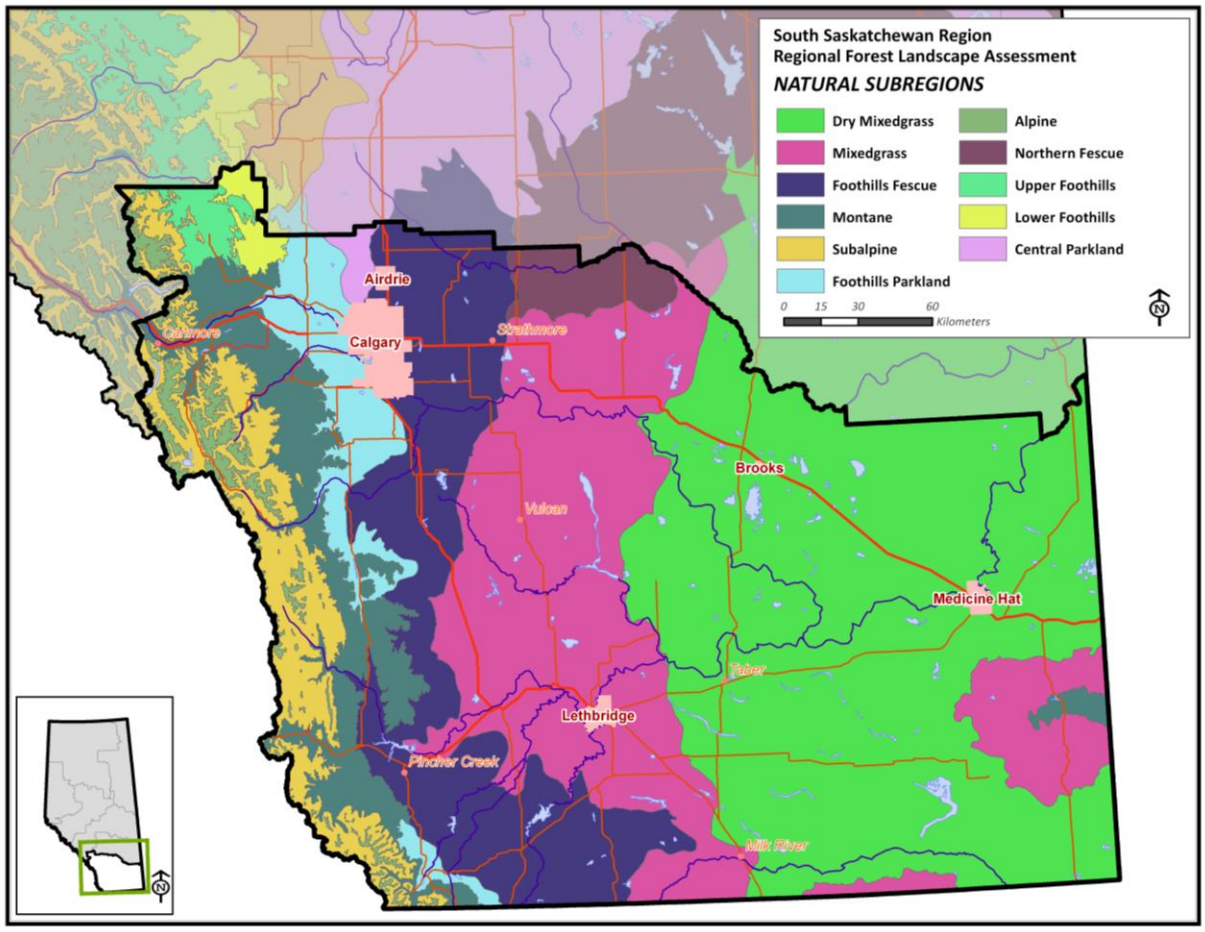


Figure 1-5 Alberta Natural Subregions

1.5.1 Dry Mixedgrass Natural Subregion

The Dry Mixedgrass Natural Subregion is the largest subregion making up 38% of the South Saskatchewan region. It is an expanse of level to gently undulating semi-arid prairie, broken in places by coulees, valleys, badlands and dune fields. The warm, dry climate supports grasses, shrubs and herbs that are adapted to summer droughts. The Subregion has a high degree of cultivation. The most prevalent soils are Brown Chernozemic and Solonetzic.

Summers are hot (high solar inputs) with high evaporation. Winters are long and cold with generally low snow cover.

Trees are generally absent except along rivers or in deep coulees where subsurface water is available.

1.5.2 Mixedgrass Natural Subregion

The Mixedgrass Natural Subregion is the second largest subregion (23%). It is a broad, fertile band of intensively cultivated prairie in south-central Alberta. The Subregion is mostly cultivated with only scattered remnant prairies. Extensive native rangelands do occur at higher elevations.

The climate is slight moister with somewhat cooler summers and milder winters than the neighbouring Dry Mixedgrass Natural Subregion to the east. Moisture deficiencies during the summer months may be limiting to crop production as irrigation is sometimes necessary. Soils tend to be Dark Brown Chernozemic.

Generally forest communities are rare. Communities of willow, buffalo berry, cottonwood or balsam poplar develop adjacent to rivers, in response to adequate water supplies throughout the growing season. Balsam poplar is dominant in the Cypress Hills, while other cottonwoods and balsam poplar occur along the Oldman River. Hybrids of cottonwoods and balsam poplar occur in the Lethbridge area.

1.5.3 Foothills Fescue Natural Subregion

The Foothills Fescue Natural Subregion is characterized by nearly level cultivated plains in the north and cool, high-elevation grassy uplands along the mountain flanks to the south. Black Chernozemic soils are typical on average sites, reflecting moister, cooler conditions and the incorporation of organic matter. Open water and wetlands are uncommon.

The climate here has the highest precipitation, warmest winters and shortest growing season of any of the grassland-based subregions. Proximity to the mountains and a greater incidence of Chinooks are responsible for these characteristics.

Vegetation is grass-dominated, with the prevalence of mountain rough fescue, Parry oat grass and bluebunch fescue separating this Subregion from other grassland-type subregions. Shrubby cinquefoil is also common, particularly on grazed sites. Along rivers, balsam poplar, aspen and cottonwood stands occur on lower terraces.

1.5.4 Montane Natural Subregion

The Montane Subregion sits below the Subalpine Subregion. Lodgepole pine, Douglas fir and aspen stands occur on eastern and northern aspects. Grasslands can occur on southern and western aspects at lower elevations. At higher elevations, closed mixedwood and coniferous forests (dominated by lodgepole pine) can be found.

The climate consists of mild summers, high summer precipitation, and frequent Chinook winds. Due to the frequent Chinooks, winters in the Montane are warmer (on average) than almost anywhere else in Alberta. The variable terrain produces dramatic differences in microclimate. North- and east-facing slopes tend to be cooler and moister as they receive less direct sunlight, and less precipitation as a result of protection from the prevailing westerly winds.

1.5.5 Subalpine Natural Subregion

The Subalpine Natural Subregion lies below the Alpine Subregion but above the Montane. Coniferous forests dominate this landscape, with lodgepole pine occurring in the lower elevation zones of the Subregion, and Engelmann spruce typically occurring in the upper elevation zones. Growth rates are typically slow as the climate is cool year round.

The substrate of the Subalpine is characterized by shallow morainal and residual materials over bedrock. Soil development has resulted in Eutric and Dystric Brunisols and Regosols. Where wetlands have developed, they are typically over Gleysols. The climate consists of short, cool, wet summers and long cold winters. However topography can play a large role in the creation of micro-climates for the purposes of vegetation growth. In valley bottoms and lower slopes, daytime temperatures in the summer are usually warmer than on upper slopes. However, cold air can pool in these bottom areas reducing the length of the growing season.

1.5.6 Foothills Parkland Natural Subregion

The Foothills Parkland Natural Subregion is the highest of the parkland-type subregions with elevations ranging from 1025 meters to about 1400 meters in the Porcupine Hills. Rolling to hilly landscapes are typical. Black Chernozems are the dominant soils under grasslands, reflecting high organic matter incorporation. Dark Gray Chernozems occur under forest cover. Open water and wetlands are uncommon.

This Subregion has the highest precipitation, warmest winters and shortest, coolest growing season of any of the parkland subregions. As with the Foothills Fescue Natural Subregion, proximity to the mountains and a greater incidence of Chinooks are responsible for these characteristics.

The driest south- and west-facing slopes are vegetated with fescue communities on well to rapidly drained Black Chernozems. Moist, moderately well drained northern slopes, seepage zones or low areas all support aspen forest with understories of snowberry, silverberry and a diverse array of herbs. Balsam poplar also occurs on moister sites and white spruce or Douglas fir are occasionally found. A distinctive characteristic of woodlands in the southern part of the Subregion is the springtime display of glacier lilies that bloom in early to mid-May.

1.5.7 Alpine Natural Subregion

The Alpine Natural Subregion consists of lands typically above tree line along the Rocky Mountains and other main ranges. The area typically does not support tree growth with the exception of dwarf conifer species situated either individually or in scattered clumps. These alpine areas are characterized by harsh climates (cold summers, short growing season, persistent snow cover and strong winds), poor soil development and in some cases permanent snowfields and glaciers.

1.5.8 Northern Fescue Natural Subregion

The Northern Fescue is represented by a mosaic of cultivated fields and moist native prairie. Typical landscapes consist of undulated to hummocky terrain. The limited occurrence of aspen and poplar on moist lowland sites differentiates this Subregion from the Central Parkland Subregion (it's north and eastern neighbour), where aspen groves are more frequent.

Dark Brown Chernozems on cultivated areas also help to distinguish this Subregion from the Central Parkland and Dry Mixedgrass. These Chernozems are typical on average sites and plains rough fescue is the dominant grass on lightly grazed native range.

1.5.9 Upper Foothills Natural Subregion

The Upper Foothills Natural Subregion primarily rests below the Subalpine Subregion, but also has pockets in the north-western area of the South Saskatchewan Region. The climate soils and vegetation patterns indicate that this is a transition zone between the drier, somewhat warmer conditions of the Lower Foothills Subregion and the cooler, wetter conditions of the Subalpine. Strongly rolling to steep terrain with thin glacial deposits and exposed bedrock are typical.

The bedrock is composed mainly of sandstones and mudstones of Tertiary and Upper Cretaceous origin and coal seams are common in the latter. Surface materials are usually glacial till veneers and blankets over bedrock, with some colluviums and exposed bedrock on the steeper slopes. Well to imperfectly drained Brunisolic Gray Luvisolic soils are typical throughout most of the area. Orthic Gray Luvisols are associated with moderately well drained sites and are usually associated with deciduous vegetation. Wetlands are a complex of Terric and Typic Mesisols along with Peaty and Orthic Gleysols.

Typical climate patterns indicate short wet summers and snowy cold winters. On average the Upper Foothills has a shorter growing season than the Lower Foothills and receives heavier summer and winter precipitation. It has the highest July precipitation of any of the subregions. These climatic conditions favour the occurrence of conifers over deciduous species because evergreen needles can begin photosynthesis early in the spring and continue late into the fall. The shorter growing season discourages maturation of twigs and buds of deciduous species.

Forests dominate this Subregion and are typically even-aged, wildfire-origin lodgepole pine stands often with an understory of black spruce. White spruce stands occur along river valleys and on lower slopes. Deciduous and mixedwood stands are restricted to southerly and westerly slopes where growing conditions are similar to lower elevations.

1.5.10Lower Foothills Natural Subregion

The Lower Foothills Natural Subregion makes up less than one percent of the South Saskatchewan Region. It occurs at lower elevations in the extreme north end of the South Saskatchewan Region. The typical elevation range is approximately 700-800 m in the north to approximately 1500 m in the southern and western areas of the subregion where it borders the Upper Foothills. The rolling, till-covered plateaus consist of closed canopy mixed stands of aspen, lodgepole pine, white spruce and balsam poplar.

The topography of the Lower Foothills consists of undulating to strongly rolling plateaus. Sandstone and siltstone of Tertiary origin underlie the southern part of the subregion with similar rock of Upper Cretaceous origin occurring in the northern parts of the subregion. Orthic Gray Luvisolic soils dominate, accompanied by Brunisolic subgroups at higher elevations. Most upland soils are well to imperfectly drained but there may be imperfectly to poorly drained Gleysolic soils (accompanied by seepage) in lower slope positions.

This Subregion is typical of Cordilleran climates, and continental influences are pronounced in the Lower Foothills, resulting in a decrease in both annual and winter precipitation and an increase in growing degree days when compared to conditions in the Upper Foothills Subregion. Precipitation is higher than in neighbouring subregions to the north and east.

The Lower Foothills Subregion has the most diverse forests in the province, in terms of stand types and occurrence of individual tree species. Aspen, balsam poplar, white birch, lodgepole pine, balsam fir and larch (tamarack) grow as pure stands or as mixtures on a wide variety of slopes and aspects. Pure deciduous stands are more common at lower elevations, and coniferous-dominated stands occur at higher elevations.

1.5.11 Central Parkland Natural Subregion

The Central Parkland covers a large portion of the central part of Alberta and is mostly under cultivation. However, only a very small portion of the Central Parkland Subregion occurs in the South Saskatchewan Region.

Undulating till plains and hummocky uplands are the dominant landforms. Lacustrine and fluvial deposits are common the northern part of the Subregion. Much of the native vegetation occurring on the till plains was replaced by croplands before it could ever be surveyed. Soil types in the Subregion indicate mostly closed aspen forest and plains rough fescue grasslands.

The climate in this part of the Central Parkland Natural Subregion (within the South Saskatchewan Region) will be similar to the neighbouring Dry Mixedwood Natural Subregion.

1.6 Municipal Districts/Counties

The South Saskatchewan contains many types of municipal jurisdictions (6):

- 18 Municipal Districts (MD);
- 3 Improvement District (ID);
- 1 Special Municipality;
- 5 cities
- 29 towns;
- 23 villages
- 99 hamlets; and
- 144 smaller populated centers.

A list of the registered municipal entities is presented in Table 1-5, which also includes the population of each of the registered areas according to the most recent census (7). Figure 1-6 shows the ID, MD and Special Municipality boundaries. Figure 1-7 shows the location of the 29 towns, 23 Villages, 99 hamlets and 144 smaller populated centers (e.g.: summer villages) in the South Saskatchewan Region. The population of these locations is rolled up into the MD to which they belong.

Note that all the MD and ID boundaries are coincident with the Region boundary; no MD or ID is split by the Region.

The Special Municipality of Crowsnest Pass includes the population for a number of amalgamated communities (Coleman, Blairmore, Bellevue Hillcrest, and Frank).

Table 1-5 Summary of Municipal Locations

Municipal Classification	Name	Population (2010)
Municipal District	Bighorn No. 8, M.D. of	1,454
	Cardston County	4,266
	Clearwater County	11,826
	Cypress County	6,729
	Foothills No. 31, M.D. of	19,736
	Forty Mile No. 8, County of	3,414
	Kneehill County	5,218
	Lethbridge, County of	3,319
	Mountain View County	12,570
	Newell, County of	7,101
	Pincher Creek No. 9, M.D. of	3,309
	Ranchland No. 66, M.D. of	86
	Rocky View County	34,597
	Taber, M.D. of	6,714
	Vulcan County	3,830
	Warner No. 5, County of	3,776
	Wheatland County	8,164
	Willow Creek No. 26, M.D. of	5,337
	Sub-total	141,446
Improvement District	I.D. No. 4 Waterton	160
	I.D. No. 9 Banff	938
	Kananaskis I.D.	429
	Sub-total	1,527
Special Municipality	Municipality of Crowsnest Pass	5,749
City	Airdrie	39,822
	Brooks	13,581
	Calgary	1,071,515
	Lethbridge	86,659
	Medicine Hat	61,097
	Sub-total	1,232,852
Town	Total (29 Towns)	107,407
Village	Total (23 Villages)	8,080
Total		1,497,061

A detailed list of individual towns and villages can be found in APPENDIX I .

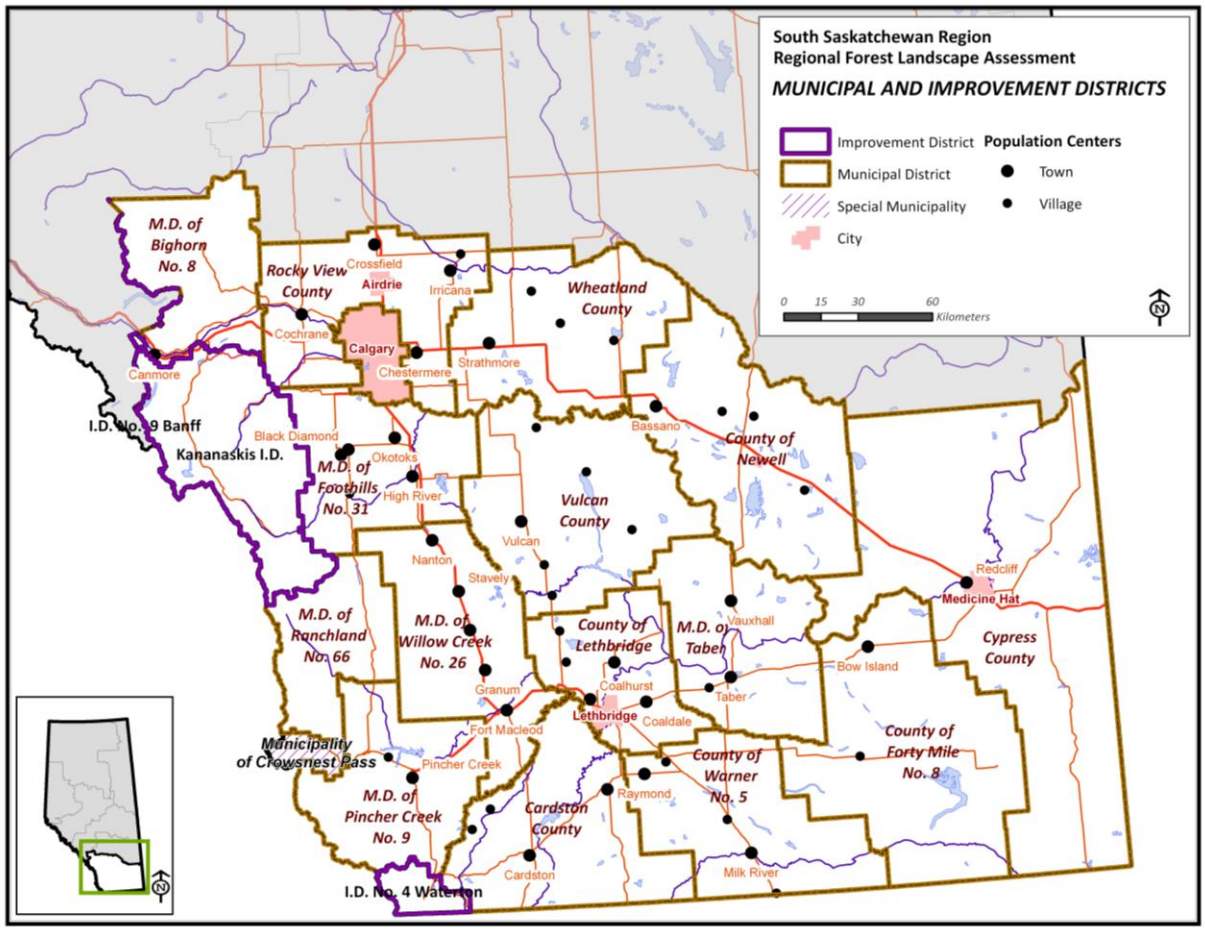


Figure 1-6 Municipal Jurisdictions

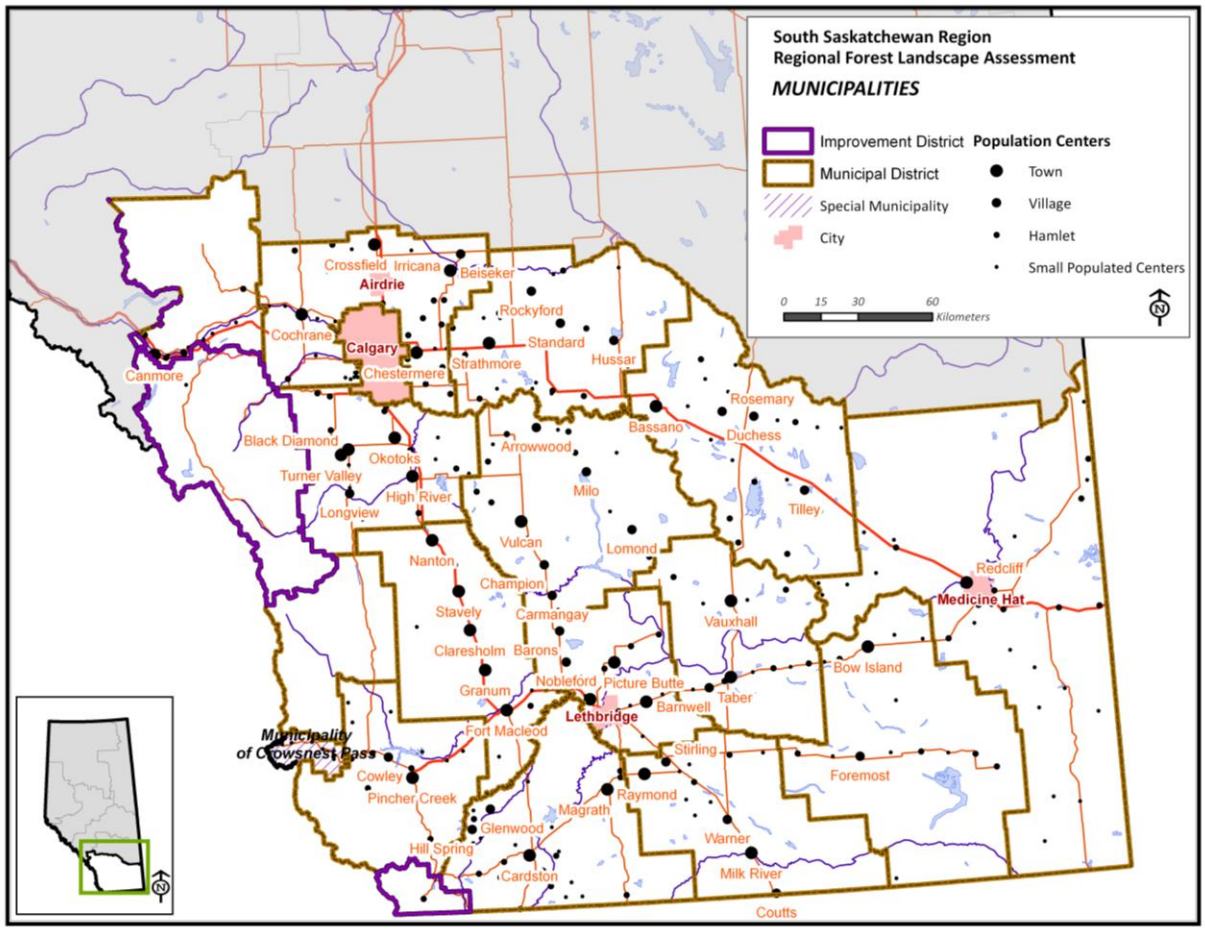


Figure 1-7 Towns and Other Populated Centers

1.7 Federal Government Lands

Federally managed lands in the South Saskatchewan Region include Waterton Lakes National Park (8) and Canadian Forces Base Suffield (9). Encompassing 49,847 hectares, Waterton Lakes National Park represent 1% of the Region (Table 1-6). Canadian Forces Base Suffield (north of Medicine Hat) is 266,532 hectares in size, making up 3% of the Region. First Nation lands are described in section 1.8.

Table 1-6 Summary of Federal Lands

	Federal Land located in South Saskatchewan		Proportion of South Saskatchewan occupied by Federal land
Area Name	Area (ha)	% of Fed.Land	% of South Saskatchewan
First Nations	337,214	52	4
Military	266,532	41	3
National Parks	49,847	8	1
Total	653,593	100	8

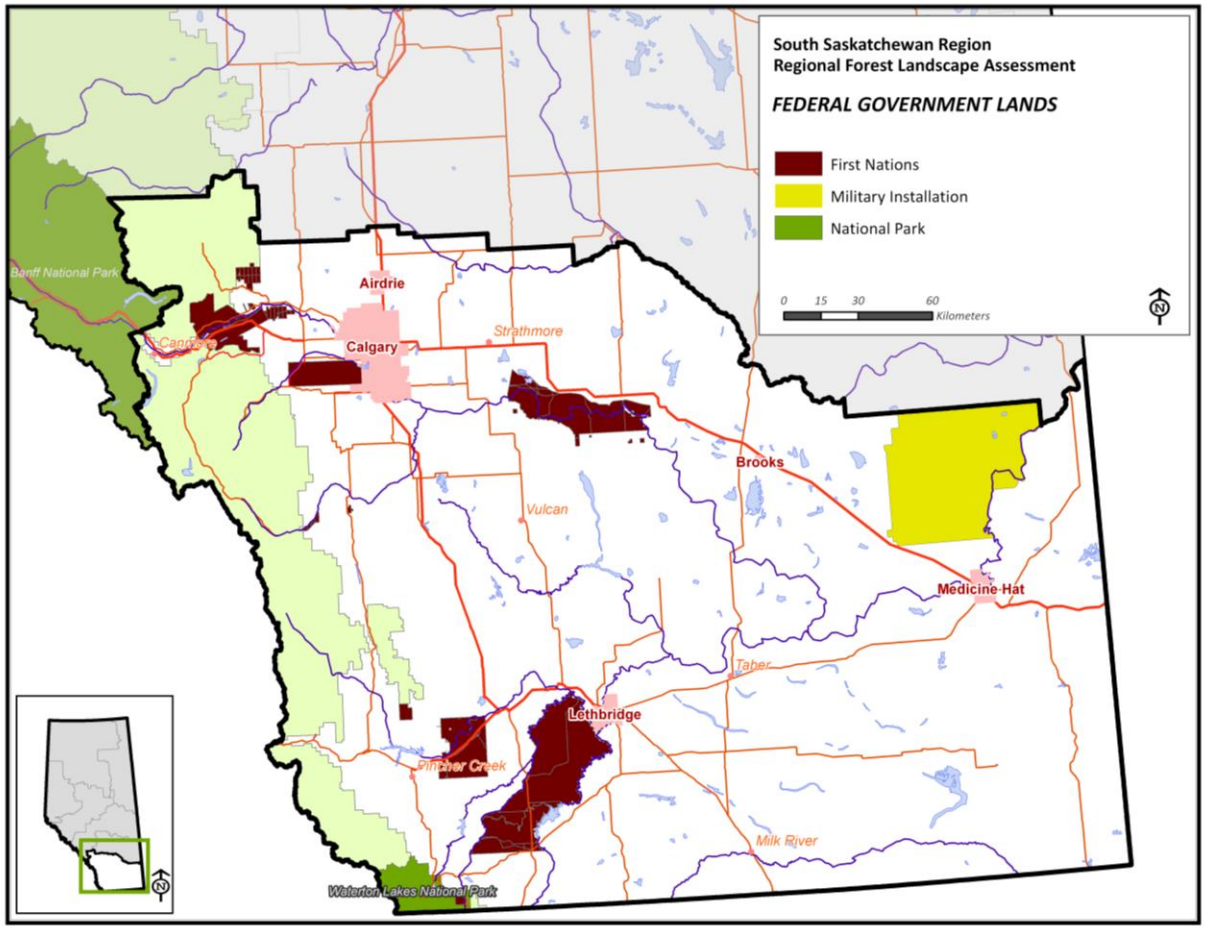


Figure 1-8 Federal Lands

1.8 First Nations

First Nation communities (10) cover 337,214 hectares of the South Saskatchewan Region. The geographic distribution of these communities appears in Figure 1-9.

Each First Nation is listed in Table 1-7, with its number of reservations. The population and source of population details are provided for each First Nation. A population survey was completed in 2011 by the Federal government, but some bands were not represented. In those cases, the 2009 census data from Alberta (Alberta 2010) was used.

First Nation lands total 337,214 hectares representing 4% of the South Saskatchewan Region. The largest single First Nation is Blood at 139,701 hectares, and is comprised of 2 separate reserves

All First Nation communities in the South Saskatchewan Region are part of Treaty 6.

Table 1-7 First Nation Communities

First Nation Name	Treaty Number	Area (ha)	Percentage of all First Nations (%)	Number of Reserves	Population	Population Source
Blood	6 (1876)	139,701	41	2	7,726	Alberta(2010)
Eden Valley	6 (1876)	1,710	1	1	587	Canada (n.d.)
Peigan Timber Limit "B"	6 (1876)	2,963	1	1	-	
Piikani Reserve [1]	6 (1876)	42,349	13	1	2,387	Alberta(2010)
Siksika	6 (1876)	71,876	21	1	3,772	Alberta(2010)
Stoney	6 (1876)	50,797	15	4	4,446	Alberta(2010)
Tsuu T'ina Nation	6 (1876)	27,819	8	1	1,443	Alberta(2010)
Total		337,214	100	11	20,361	

[1] formerly Peigan IR No. 147

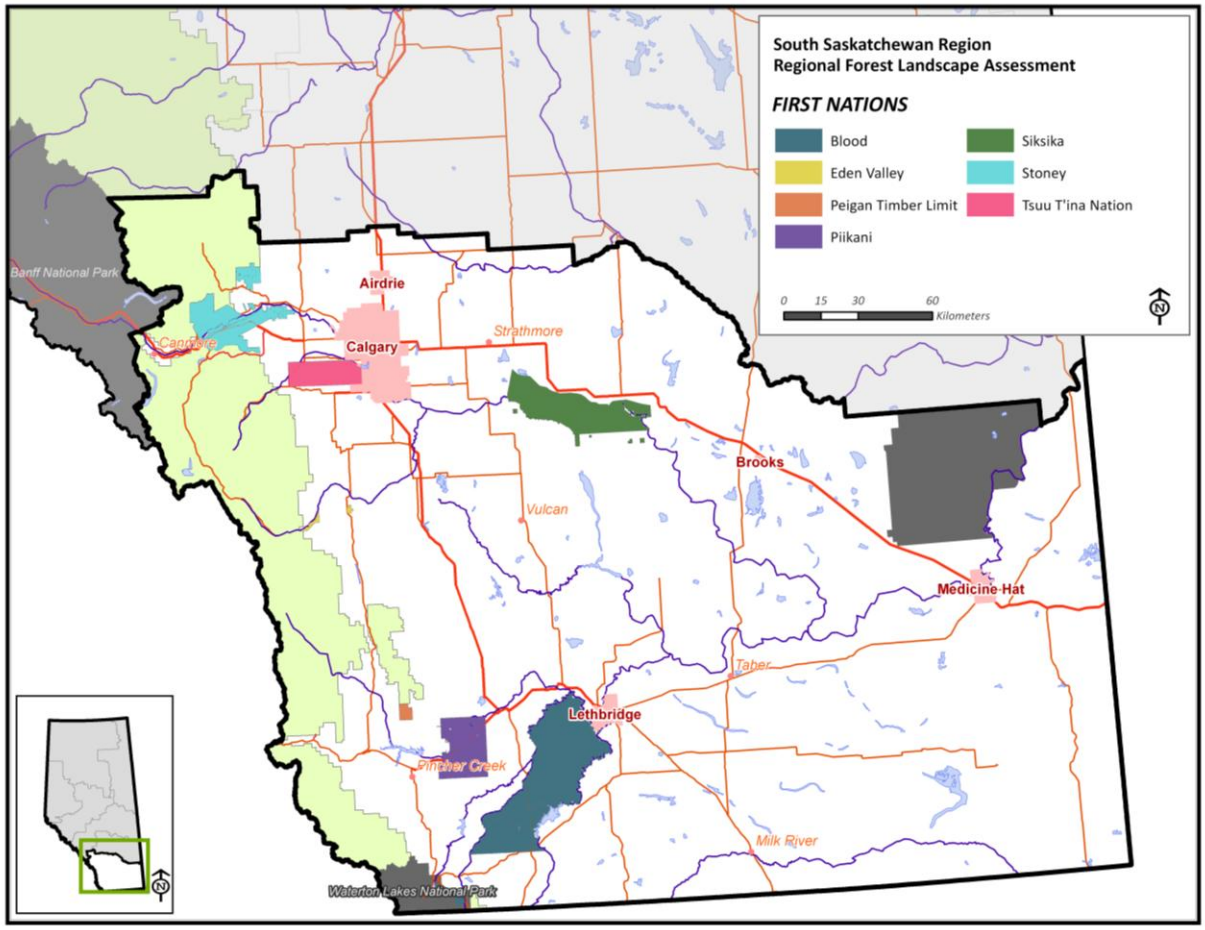


Figure 1-9 First Nations

1.9 Metis Settlements

There are no Metis settlements contained in the South Saskatchewan Region (11).

1.10 Parks and Protected Areas

There are many different designations of parks and protected areas in Alberta (13). These are defined in Table 1-8.

Table 1-8 Park and Protected Area Designations (14)

Type	Definition
Provincial Park	A Provincial Park represents areas which preserve natural heritage. They support outdoor recreation, heritage tourism, and natural heritage appreciation activities that depend upon, and are compatible with, environmental protection where natural, historical and cultural landscapes and features are protected under the Provincial Parks Act in Alberta.
Provincial Recreation Area	A Provincial Recreation Area represents the recreation areas in Alberta that support outdoor recreation and tourism and often provide access to lakes, reservoirs and adjacent Crown land. Recreation areas support a range of outdoor activities in natural, modified and man-made settings. They are managed with outdoor recreation as the primary objective.
Wilderness Area	Wilderness Areas are for preservation and protection of natural heritage providing opportunities for non-consumptive, nature-based outdoor recreation. No developments of any kind are permitted. Travel in wilderness areas is by foot only. Collection, destruction and removal of plant or animal material, fossils or other object of geological, ethnological, historical or scientific interest, are prohibited. Hunting, fishing and use of horses are not permitted.
Wildland Park	Wildland Parks exist to preserve and protect natural heritage and provide opportunities for backcountry recreation. Wildland parks are typically large, undeveloped natural landscapes that retain their primeval character. Trails and primitive backcountry campsites are provided in some wildland parks to minimize visitor impacts. Some wildland parks provide considerable opportunities for eco-tourism and adventure activities such as back packing, backcountry camping, wildlife viewing, mountain climbing and trail riding. Access and use of wilderness and wildland parks is not as restrictive as in wilderness areas.
Wilderness Park	Wilderness Parks and Wildland Parks have the same intent: to preserve and protect natural heritage and provide opportunities for backcountry recreation. The sole Wilderness Park in the Province has its own body of legislation (“Willmore Wilderness Park Act” of 1959)
Natural Area	A Natural Area represents natural and near-natural landscapes of regional and local importance for nature-based recreation and heritage appreciation. Natural areas are typically quite small; however, larger sites can be included. Most natural areas have no facilities and in those that do, facilities are minimal and consist mainly of parking areas and trails.
Ecological Reserve	An Ecological Reserve represents areas set aside for strict preservation of natural ecosystems, habitats and features, and associated biodiversity. These areas contain representative, rare and fragile landscapes, plants, animals and geologic features. Ecological reserves serve as outdoor laboratories and classrooms for scientific studies related to the natural environment. Public access is by foot only; public road and other facilities do not normally exist and will not be developed. Most ecological reserves are open to the public for low-impact activities such as photography and wildlife viewing.
Special Management Zone	A special management zone is a buffer around an existing feature that is used to protect the core feature of interest. These may or may not have access restrictions.
Crown Reservations	In some cases, areas of unique significance may not be named as a park, recreation area, wildland area or reserve. However the uniqueness of the site, or its proximity to a named park or protected area may result in the application of a protective (PNT) or consultative notation (CNT) within the Province’s land-use disposition system. A PNT or CNT designation implies that the Province must be informed of any potential industrial development within the area. The Province may then apply specific conditions in order to protect the integrity of the land.

The South Saskatchewan Region contains several of the park and protected area designations noted above. The largest feature is Waterton Lakes National Park which occupies approximately 1% (Table 1-9) of the Region. A total of 6% of the Region (473,279 ha) is under some form of protection. In addition, approximately 0.25% of the Region (37,782 ha) is under protective or consultative notations to allow Alberta to evaluate potential development near current parks or protected areas, or on other unique areas not yet designated under park or wilderness legislation. (see Table 1-10).

The location of parks and protected areas in the South Saskatchewan Region is presented in Figure 1-10.

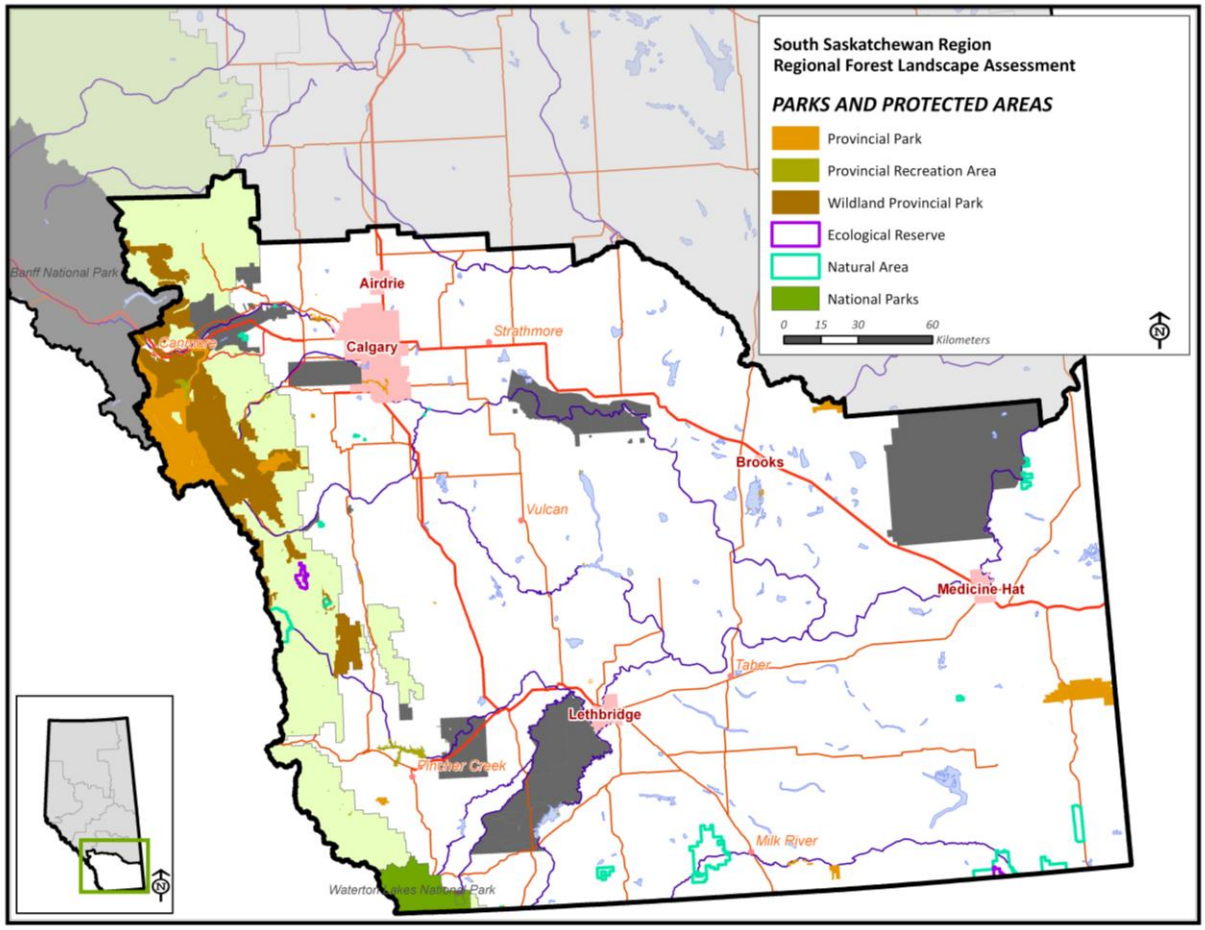


Figure 1-10 Parks and Protected Area

Table 1-9 Park and Protected Area Allocations

Classification	Type of Park/Protected Area	Number	Area in Region (ha)	Percentage of PPA (%)	Percentage of Region (%)
Parks	National Park	1	49,864	11	1
	Provincial Park	23	121,462	26	1
	Provincial Recreation Area	84	10,099	2	0
	Wildland Area	1	15,220	3	0
	Wildland Park	5	213,276	45	3
	Sub-total	114	409,921	87	5
Protected Areas	Natural Area	15	47,962	10	1
	Ecological Reserve	2	3,411	1	0
	Heritage Ranch	2	11,985	3	0
	Sub-total	19	63,358	13	1
Total		133	473,279	100	6

Table 1-10 Areas under Protective or Consultative Notation

Classification	Type of Park/Protected Area	Number	Area in Region (ha)	Percentage of Reservations (%)	Percentage of Region (%)
Parks	Provincial Park	2	37,691	100	0
	Provincial Recreation Area	6	174	0	0
	Sub-total	8	37,691	100	0
Protected Areas	Ecological Reserve	1	91	0	0
	Sub-total	1	91	0	0
Total		9	37,782	100	0

A detailed list of individual parks, recreation areas, wildland parks, natural areas and ecological reserves can be found in APPENDIX II .

1.11 Wildfire Management Areas

Wildfire management areas (15) are those areas which define wildfire management responsibilities. These areas are listed in Table 1-11 (sorted by the area within the South Saskatchewan Region) and mapped in Figure 1-11.

The two predominant wildfire management areas are Prairies and Southern Rockies, together occupying about 92% of the South Saskatchewan Region. A small portion of the Clearwater Wildfire Management Area makes up the balance of wildfire management areas inside the South Saskatchewan Region.

Table 1-11 Alberta Wildfire Management Areas

ESRD Region Name	Entire Region Area (ha)	Portion of ESRD Region located in South Saskatchewan Area (ha)	(%)	Proportion of South Saskatchewan occupied by ESRD Region (%)
Prairies	14,652,182	5,406,335	37	65
Southern Rockies	2,527,255	2,301,611	91	27
Clearwater	2,474,741	13,155	1	0
Sub-total	19,654,178	7,721,101		92
Area not managed by Alberta		655,331		8
Total		8,376,432		100

In terms of the influence of South Saskatchewan planning activities on the wildfire management areas, the majority of Southern Rockies Region is located in the South Saskatchewan Region.

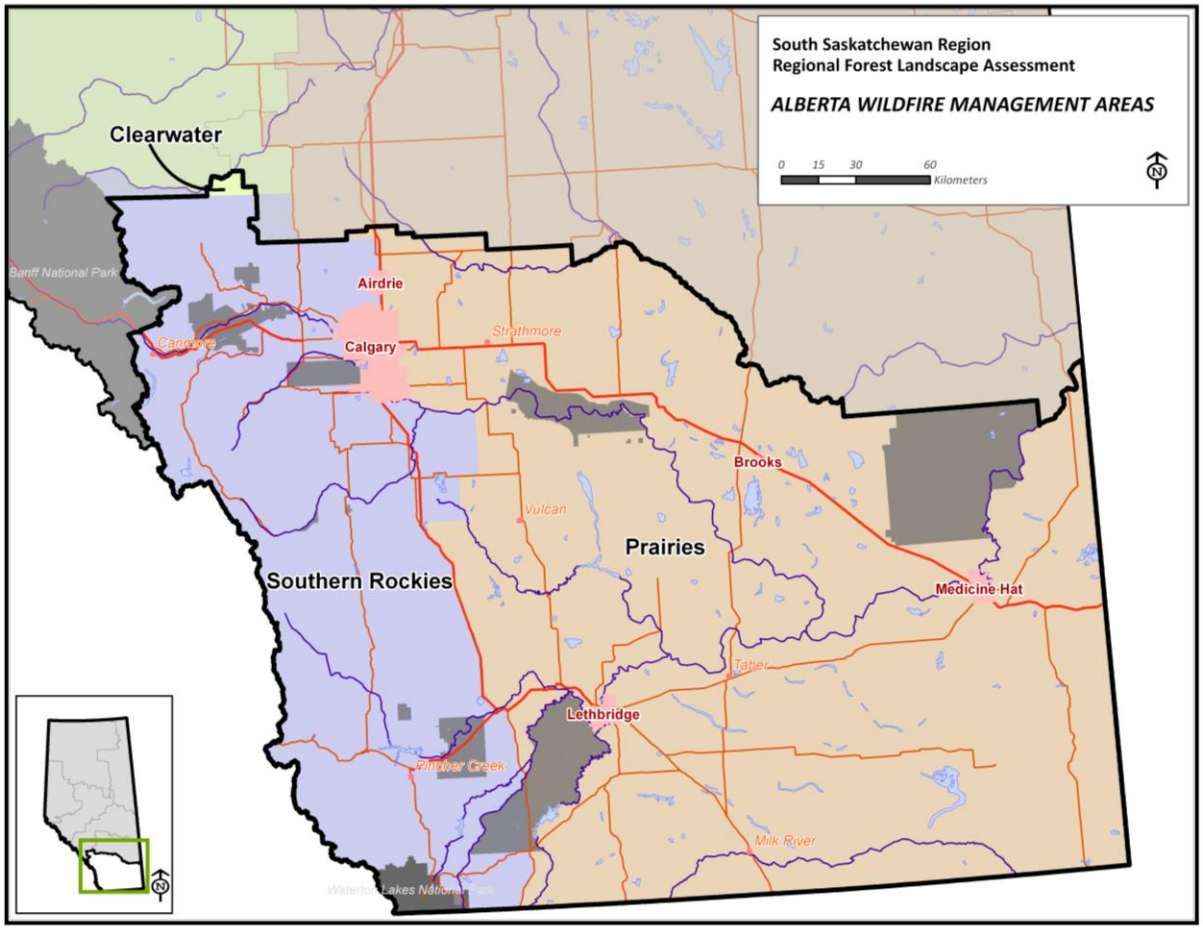


Figure 1-11 Alberta Wildfire Management Areas

2. Physical Conditions

2.1 Topography

The South Saskatchewan Region has a wide range of landscapes (16) as it extends from the Rocky Mountains easterly down to grassland plains. Several major river channels (e.g.:Crowsnest, Ghost, Bow) have created deeper valleys when they occur in the foothills, broadening out to shallow valleys as they flow east.

The highest elevation in the Region is 3,399 m, which is represented by Mount Joffre, located on the continental divide at the southern reach of Peter Lougheed Provincial Park. The lowest elevation is approximately 584 m where the South Saskatchewan River leaves the Region (and the Province), northeast of Medicine Hat. Figure 2-1 illustrates the general topography of the Region.

Important elements of topography for natural resource management are slope and aspect and their relationship with forest development. Those aspects are reviewed in the section regarding Natural Subregions (see section 1.5). However, slope is also an important factor in terms of defining machine operability as well as potential for erosion.

Four classes of slope percent were calculated based on generally accepted thresholds for operability:

0 – 30 percent	Operable
31 – 45 percent	Generally operable but may require special equipment or systems.
46 – 60 percent	Generally inoperable without special systems
60 + percent	Inoperable

There is very little inoperable area within the Green Area portion of this Region (Table 2-1), meaning that there should be very few constraints to mechanical operations.

Table 2-1 Slope Class Distribution

	Slope Class (percent)								Total	
	0 - 30%		31 - 45%		46 - 60%		60% +			
General Location	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)
Green Area	621,965	62	165,685	17	93,944	9	121,232	12	1,002,826	100
White Area	6,693,823	100	19,058	0	3,305	0	2,105	0	6,718,291	100
Federal Lands	626,196	96	10,130	2	7,365	1	11,624	2	655,314	100
Total	7,941,984	95	194,872	2	104,614	1	134,961	2	8,376,432	100

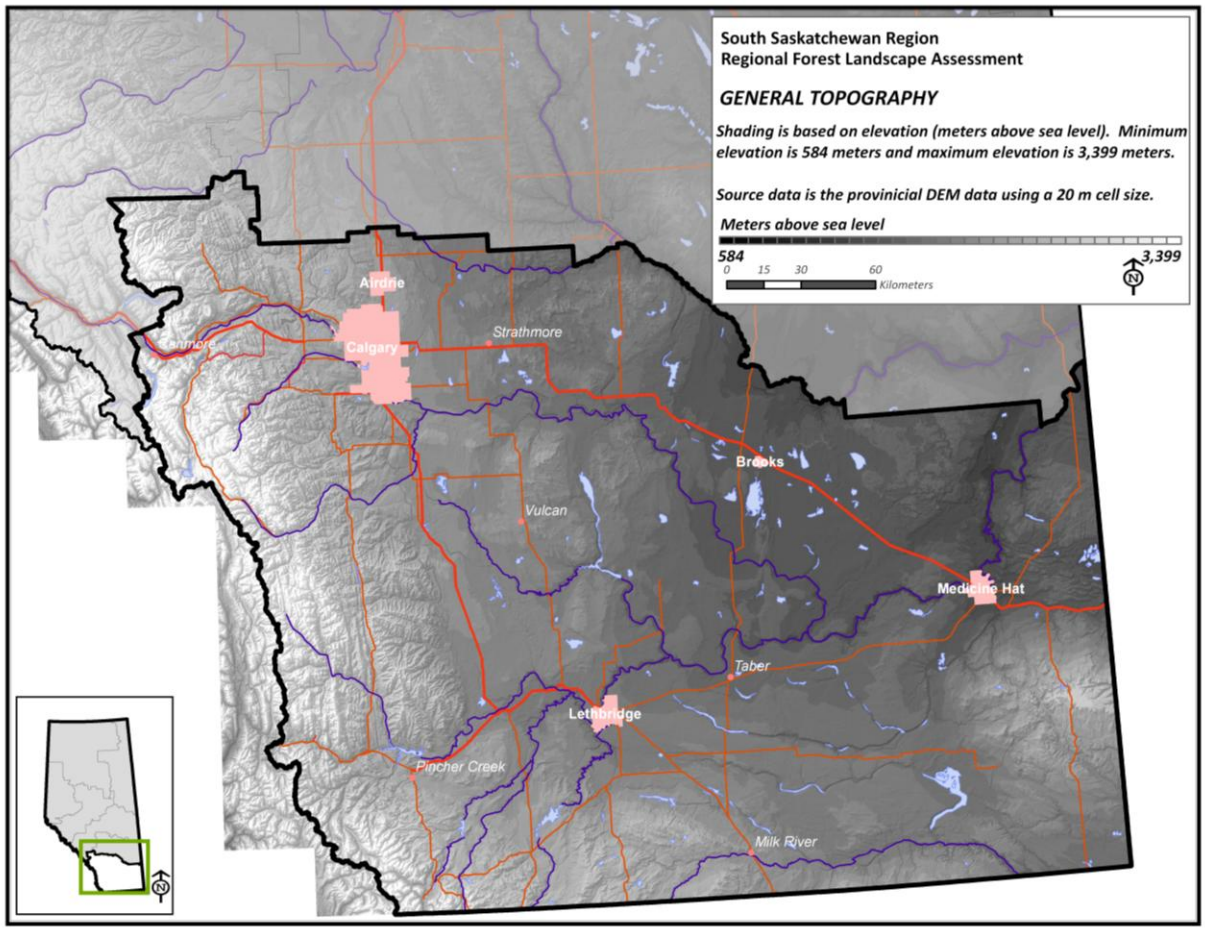


Figure 2-1 Topography

2.2 Soils and Landforms

A general description of soil orders present in the Province are described in the glossary (18). The dominant soil order is Chernozemic (17), which covers approximately 76% of the Region (Table 2-2). Chernozemic soils are commonly associated with agriculture. Luvisols, along with Brunisols (both common in the Green Zone) and Podzolic soils are the three soil orders for forest soils in Canada. Brunisolic soils are typically interpreted as a "transitional" soil between generally unweathered parent material (common to Regosols) and mature forest soils represented by the Podzolic or Luvisolic orders.

At only 10%, the presence of typical forest soils (Brunisols and Luvisols) is minor in the South Saskatchewan Region.

Figure 2-2 illustrates the distribution of soil orders in the Region.

Table 2-2 Soil Types

Soil Type			Area (ha)	Percentage (%)
Soil Order	Soil Group	Soil Subgroup		
Brunisolic	Dystric Brunisol	Eluviated Dystric Brunisol	25,049	0
Brunisolic	Eutric Brunisol	Eluviated Eutric Brunisol	11,239	0
Brunisolic	Eutric Brunisol	Orthic Eutric Brunisol	141,877	2
Sub-total			178,165	2
Chernozemic	Black Chernozem	Calcareous Black Chernozem	44,620	1
Chernozemic	Black Chernozem	Gleyed Black Chernozem	12,254	0
Chernozemic	Black Chernozem	Orthic Black Chernozem	1,658,109	20
Chernozemic	Black Chernozem	Rego Black Chernozem	13,630	0
Chernozemic	Brown Chernozem	Orthic Brown Chernozem	2,415,935	29
Chernozemic	Brown Chernozem	Solonetzic Brown Chernozem	144,946	2
Chernozemic	Dark Brown Chernozem	Orthic Dark Brown Chernozem	1,868,635	22
Chernozemic	Dark Brown Chernozem	Vertic Dark Brown Chernozem	60,443	1
Chernozemic	Dark Gray Chernozem	Orthic Dark Gray Chernozem	180,352	2
Sub-total			6,398,924	76
Gleysolic	Gleysol	Rego Gleysol	23,867	0
Luvisolic	Gray Luvisol	Brunisolic Gray Luvisol	41,390	0
Luvisolic	Gray Luvisol	Dark Gray Luvisol	34,303	0
Luvisolic	Gray Luvisol	Orthic Gray Luvisol	472,378	6
Luvisolic	Gray Luvisol	Podzolic Gray Luvisol	110,390	1
Sub-total			658,461	8
Regosolic	Regosol	Cumulic Regosol	18,730	0
Regosolic	Regosol	Orthic Regosol	270,909	3
Sub-total			289,639	3
Solonetzic	Solod	Brown Solod	224,101	3
Solonetzic	Solodized Solonetz	Brown Solodized Solonetz	264,193	3
Sub-total			488,294	6
No Significant Soil Development			339,081	4
Total			8,376,431	100

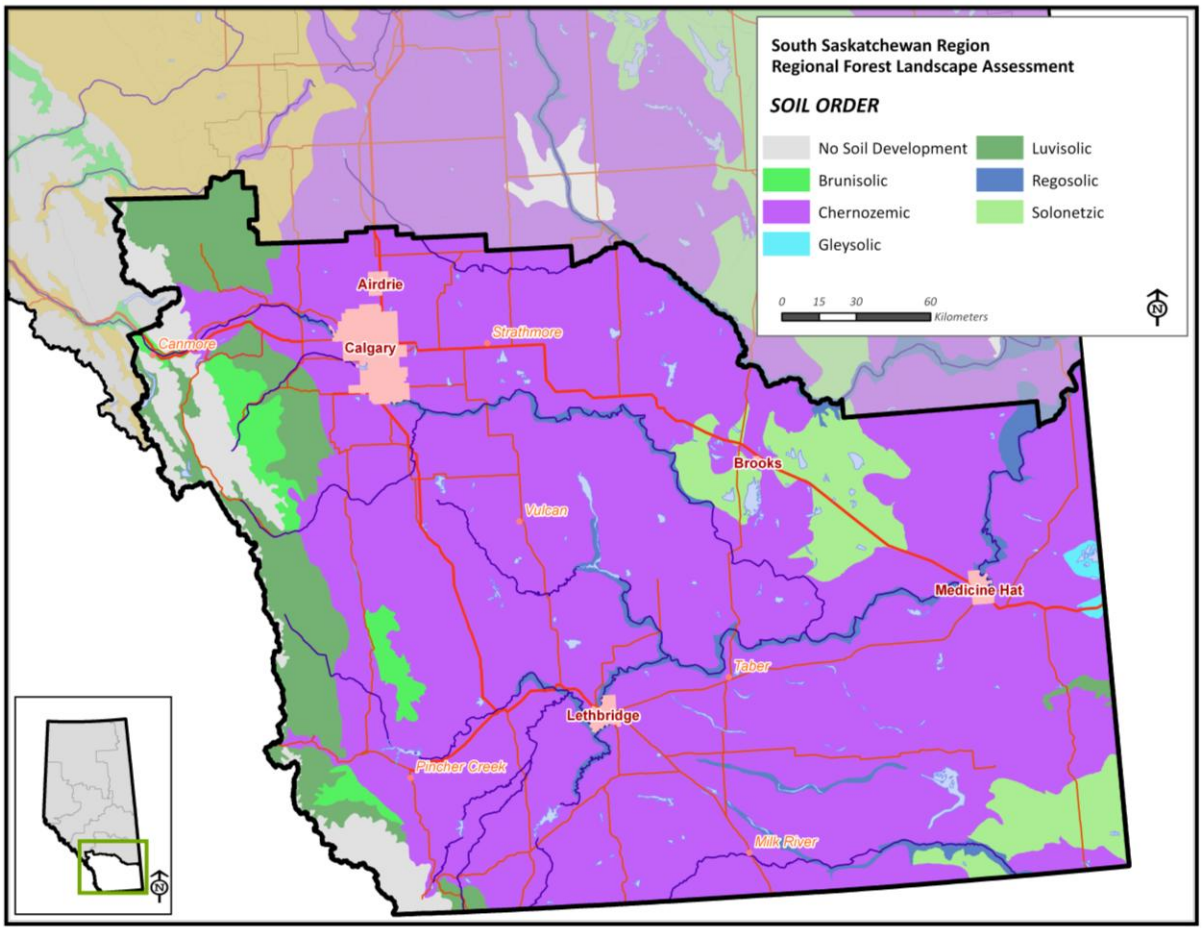


Figure 2-2 Soil Order

2.3 Hydrography

2.3.1 Water Basins

There are seven major drainage basins in the province (Figure 2-3).

The Land-use Framework regions are loosely based on these drainage boundaries. The South Saskatchewan Region (shown in ***red*** on Figure 2-3) includes the Bow River, Old Man River, South Saskatchewan River Sub-basins, and the Milk River Basin. The Region encompasses the entire southern portion of the province.

Figure 2-3 Major Water Basins

2.3.2 Rivers, Streams and Waterbodies

Hydrologic features (19) are mapped by Alberta and are classified according to their water status (e.g.: permanent, recurring). Many man-made features are identified by type (e.g.: canal, reservoir, quarry), but for the purposes of this summary are grouped together as one category labelled "Man-made features".

Table 2-3 summarizes the area of waterbodies in the South Saskatchewan Region within each of the Green and White Areas as well as Federal lands. Similarly, Table 2-4 details the length of rivers and streams by their class, for each of the Green and White Area and Federal lands. The summary of water features excludes wetlands as these are described separately in subsequent sections.

Table 2-3 Waterbody Classification

	Area of Waterbody Features (ha)			
Waterbody Class	**Green Area**	**White Area**	**Federal Lands**	**Total**
Major River	1,984	19,237	3,019	24,240
Lake (Permanent)	740	40,904	5,379	47,023
Lake (Recurring)	428	43,914	4,173	48,514
Oxbow (Permanent)	5	135	97	237
Oxbow (Recurring)	6	174	54	233
Man-made Features	3,816	46,534	108	50,458
Icefield	1,885	0	2	1,888
Total	8,864	150,898	12,832	172,594

Table 2-4 River/Stream Network Classification

	Length of River/Streams (km)			
River/Stream Class	**Green Area**	**White Area**	**Federal Lands**	**Total**
Stream (Permanent)	1,319	5,697	538	7,554
Stream (Recurring)	12,656	39,872	3,389	55,917
Stream (Indefinite)	5,229	7,382	1,471	14,082
Oxbow (Permanent)	2	26	3	31
Oxbow (Recurring)	10	111	3	124
Man-made Features	9	8,718	44	8,771
Total	19,225	61,805	5,448	86,478

Figure 2-4 shows the distribution of *permanent* water features in the South Saskatchewan Region. In addition, the significant rivers draining the Region are labeled. In total, there are 323 named lakes in the Region, of which the largest is Pakowki Lake (10,272 ha). The 10 most significant river and lakes are listed in Table 2-5.

Table 2-5 List of Significant Water Features[1]

Significant Water Features Lake Name	Area (ha)	River Name	Length (km)
Pakowki Lake	10,272	Bow River	512
Lake Newell	6,293	Oldman River	447
Bow River	6,286	Milk River	284
McGregor Lake	4,731	Little Bow River	264
South Saskatchewan River	4,701	South Saskatchewan River	242
Oldman River	4,475	Willow Creek	202
St. Mary Reservoir	3,169	Rosebud River	197
Tide Lake	2,595	Belly River	185
Travers Reservoir	2,235	Highwood River	172
Spray Lakes Reservoir	1,938	St. Mary River	165

[1] Area of the significant lakes, and length of the significant rivers, refer only to the portion within the South Saskatchewan Region

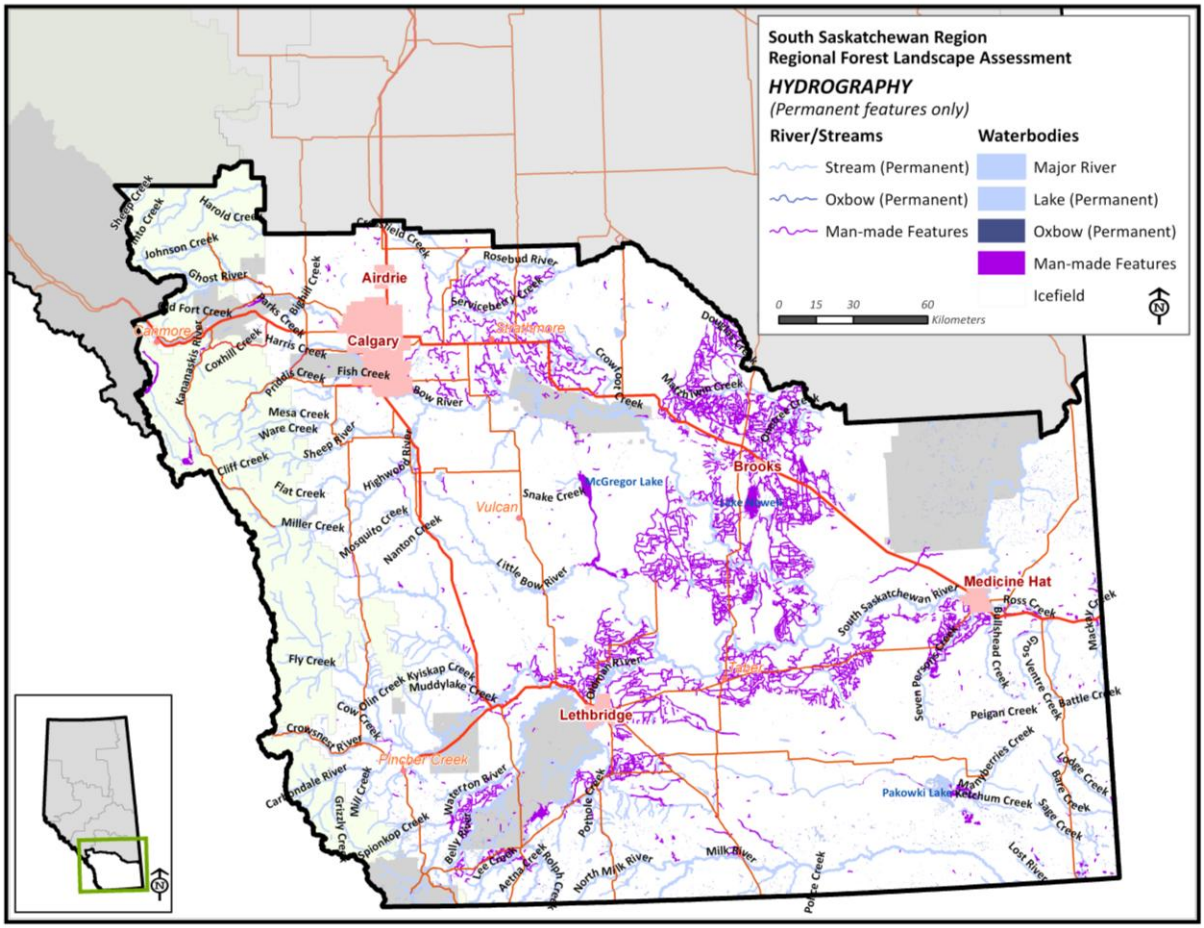


Figure 2-4 Permanent Waterbodies and Rivers

2.3.3 Wetlands

Wetlands are areas typically identified as bogs, fens or marshes and having little or no tree cover. Two sources of identification have identified wetlands in the Region:

- The AVI program (23) identifies wetlands by assigning a moisture regime of 'aquatic' and identifying the type of vegetation cover, which is typically herbaceous grass or forbs (Alberta 2005).
- The base mapping hydrography program (19) identifies wetlands as those areas of low lying terrain which have shallow water most of the year and varying heights of vegetative cover (Alberta 2006b)

The South Saskatchewan region contains approximately 92 hectares of wetland (Table 2-6). The majority of identified wetland is located near the town of Canmore and west of Calgary (Figure 2-5) on the Stony Reserve. Despite the lack of identified wetlands, there are significant numbers of ponds and ditches that are seasonally full of water. This is due to the large number of irrigation ditches, canals, ponds and reservoirs built by farmers to contain water during the growing season.

Table 2-6 Wetland Summary

	Area of Defined Wetland (ha)			
Wetland Classification	**Green Area**	**White Area**	**Federal Lands**	**Total**
AVI				
Herbaceous Forbs/Grasses	2	58	33	92
Hydrography				
Wetlands		5		
Total	2	63	33	92

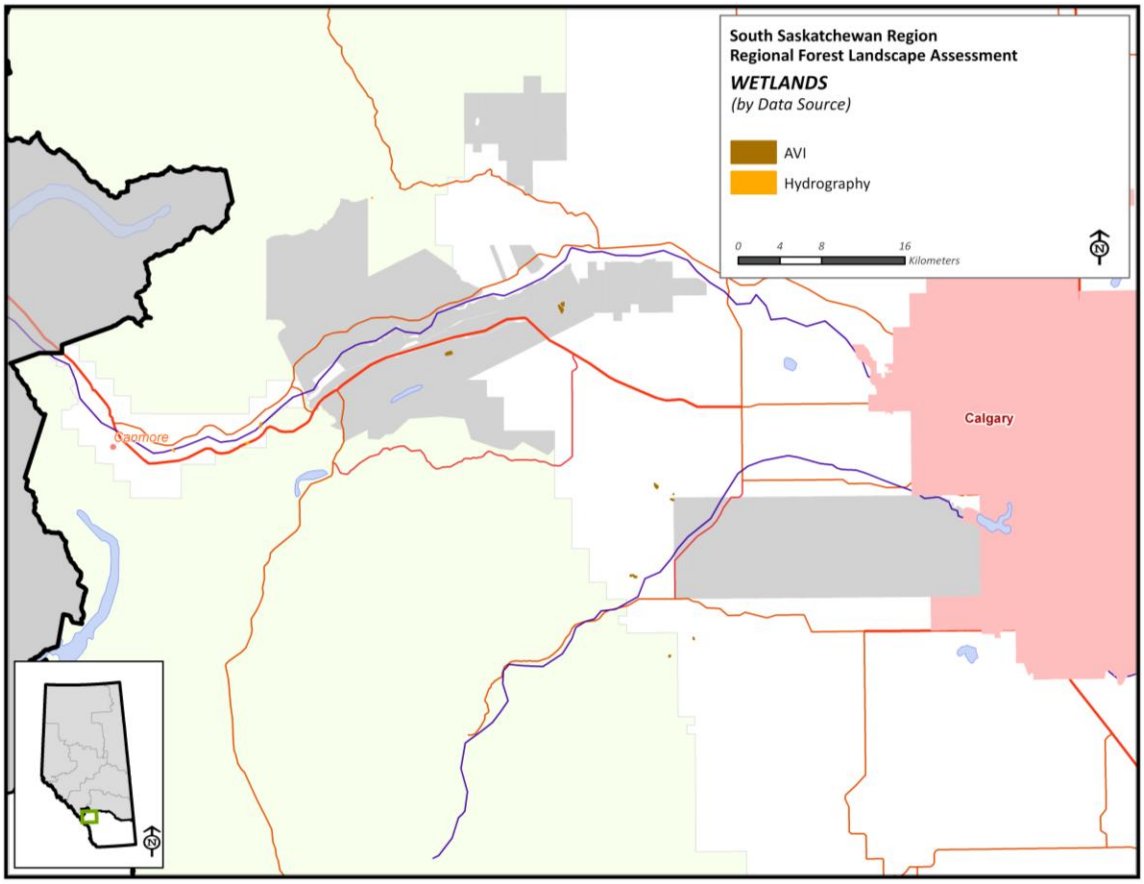


Figure 2-5 Wetlands

2.4 Climate

Alberta has a continental climate which is characterized by a large variation in temperature between summer and winter. A wide range of climatic conditions are present in the South Saskatchewan Region due to the variety of topography from the Rocky Mountains in the west, to the grassland plains in the east. Climatic data from 1971 to 2000 summarized by Agriculture Alberta and Environment Canada (21) have resulted in the mapping of general climatic trends over the province.

Figures indicating the daily mean January temperature (°C); daily mean July temperature (°C); length of growing season (defined as the number of days where the daily temperature exceeds 5°C); and mean annual precipitation (mm) appear below as Figure 2-6, Figure 2-7, Figure 2-8 and Figure 2-9 (respectively).

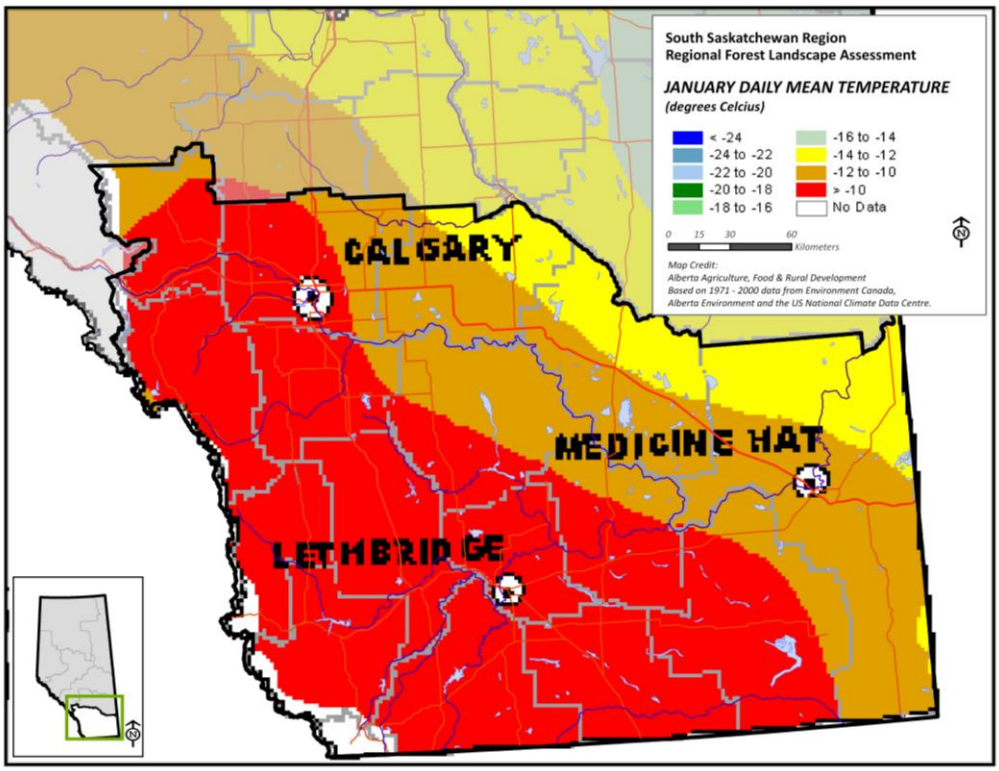


Figure 2-6 Daily Mean January Temperature

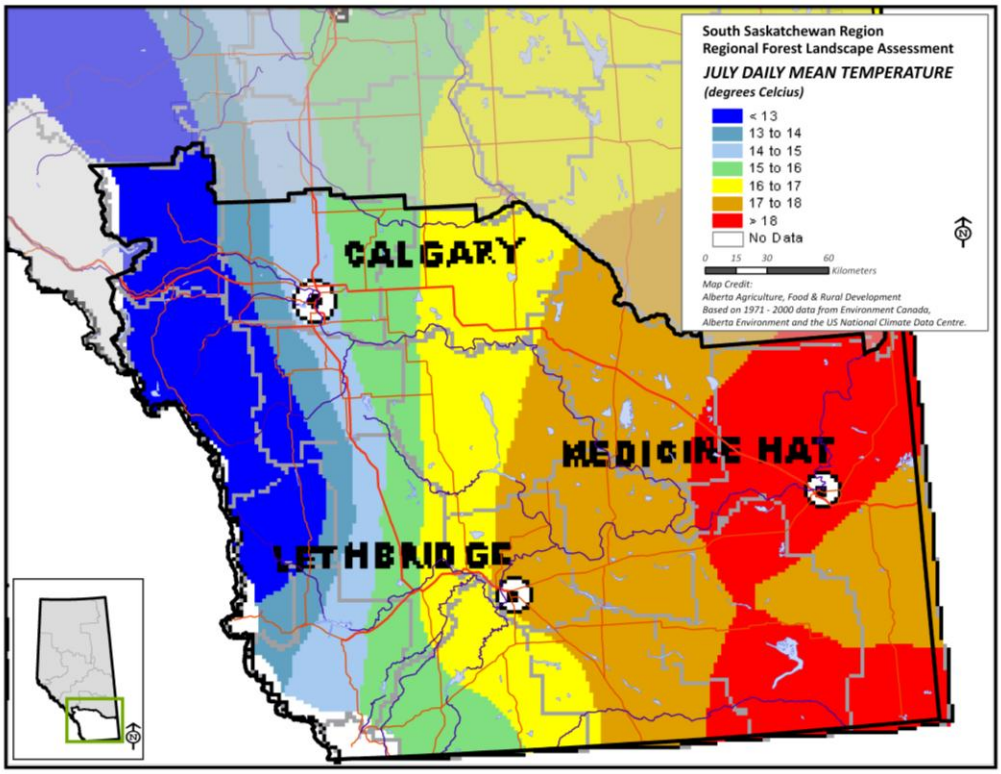


Figure 2-7 Daily Mean July Temperature

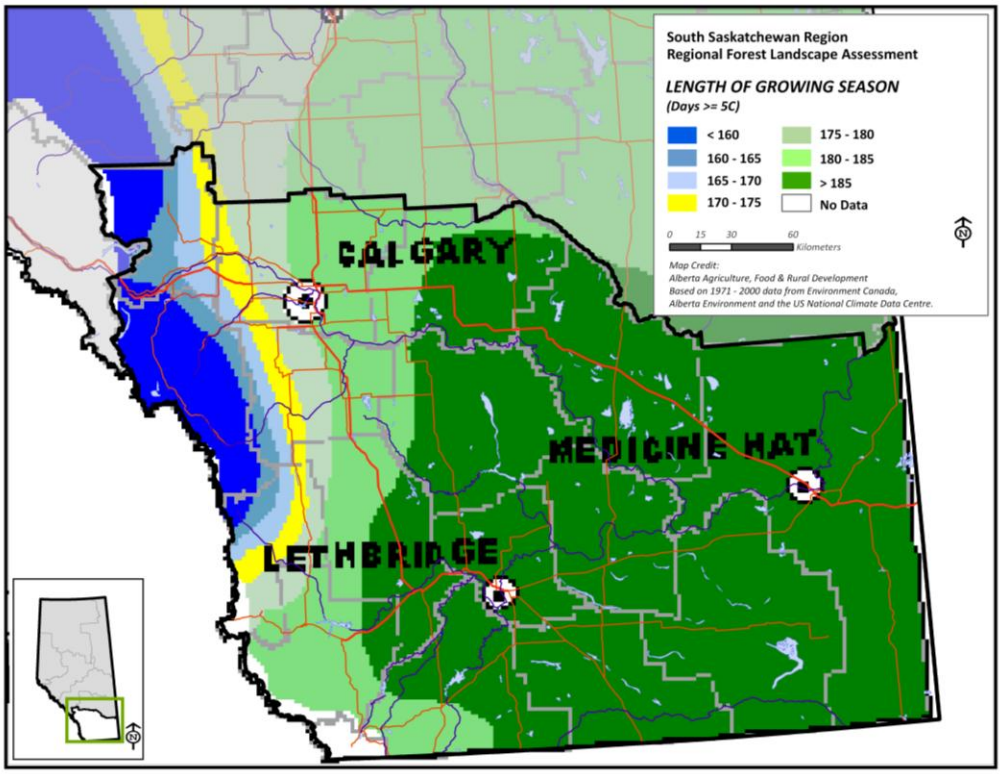


Figure 2-8 Length of Growing Season

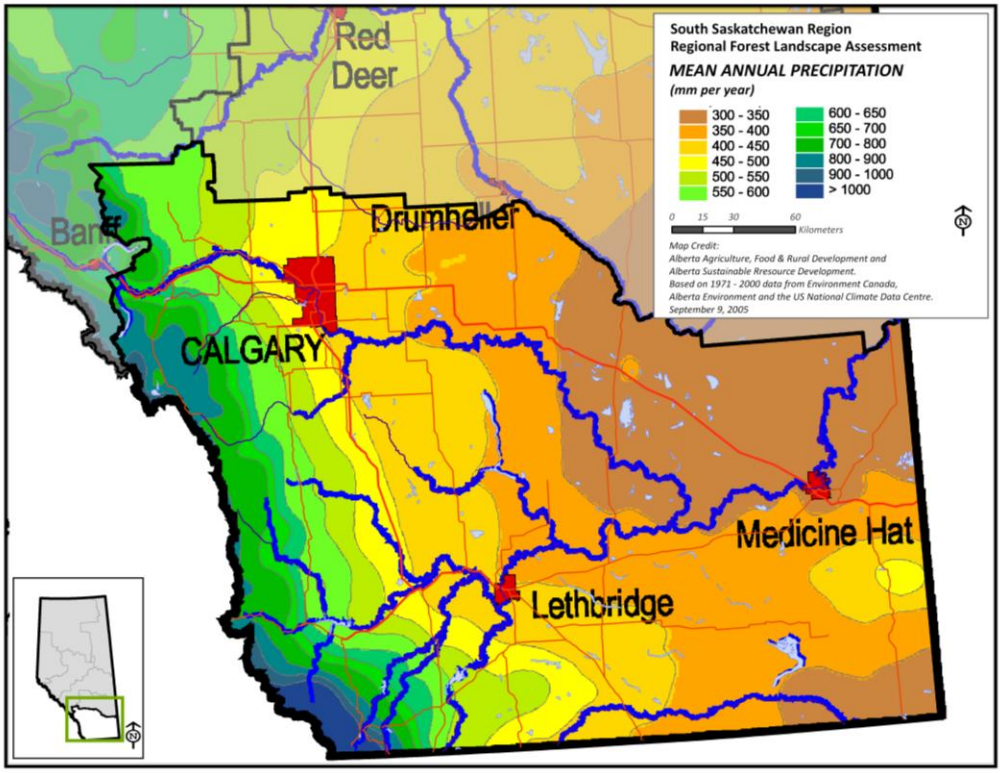


Figure 2-9 Mean Annual Precipitation

The provincial ecological classification identifies two ecoclimatic provinces present within the South Saskatchewan Region: Cordilleran and Grassland. The Cordilleran regime is typical in the Alpine, Subalpine and Montane Natural Subregions. The Grassland regime is largely in the eastern part of the South Saskatchewan Region which is occupied by the Mixedgrass and Dry Mixedgrass Subregions. The Foothills Fescue Subregion, which occupies 15% of the South Saskatchewan Region (Table 1-4) is considered a transitional zone between Grassland and Cordilleran ecoclimates.

In addition to temperature, length of growing season and precipitation shown above, three important factors affected reforestation success and tree growth have been summarized from the publication Natural Regions and Subregions of Alberta (Natural Regions Committee 2006).

Summer Moisture Index: The summer moisture index (SMI) is a measure of precipitation effectiveness during the growing season. It is calculated by dividing the number of growing degree days over 5°C by the amount of precipitation over the growing season (April through August). A high ratio indicates a greater likelihood that evaporation will exceed precipitation at some time during the growing season. For example, an SMI greater than 4 indicates dry to very dry climatic conditions, an SMI less than 3 indicates moist to wet climatic conditions with no moisture deficits during the growing season. An SMI between 3 and 4 indicates the likelihood of only moderate moisture deficits for short periods of the growing season.

Frost Free Days: The frost-free period is another indicator of temperature regimes that are favourable or unfavourable to plant growth. Factors contributing to short, erratic, frost-free periods are terrain variability and elevation. Rough terrain and higher elevations tend to reflect shorter and more unpredictable frost-free periods, likely due to variations in aspect and cold air drainage from high to low terrain. While general trends and averages are shown in the accompanying figure, the calculations of average frost-free periods are highly unreliable because of year-to-year variations in weather patterns and topographic variability.

Growing Season Precipitation: Growing season precipitation (GSP) is the portion of mean annual precipitation which falls from April to August. Higher proportions of precipitation during the growing season indicate continental climatic influences (where the bulk of the precipitation falls during the summer).

General patterns of summer moisture index, frost-free days and growing season precipitation are displayed in Figure 2-10.

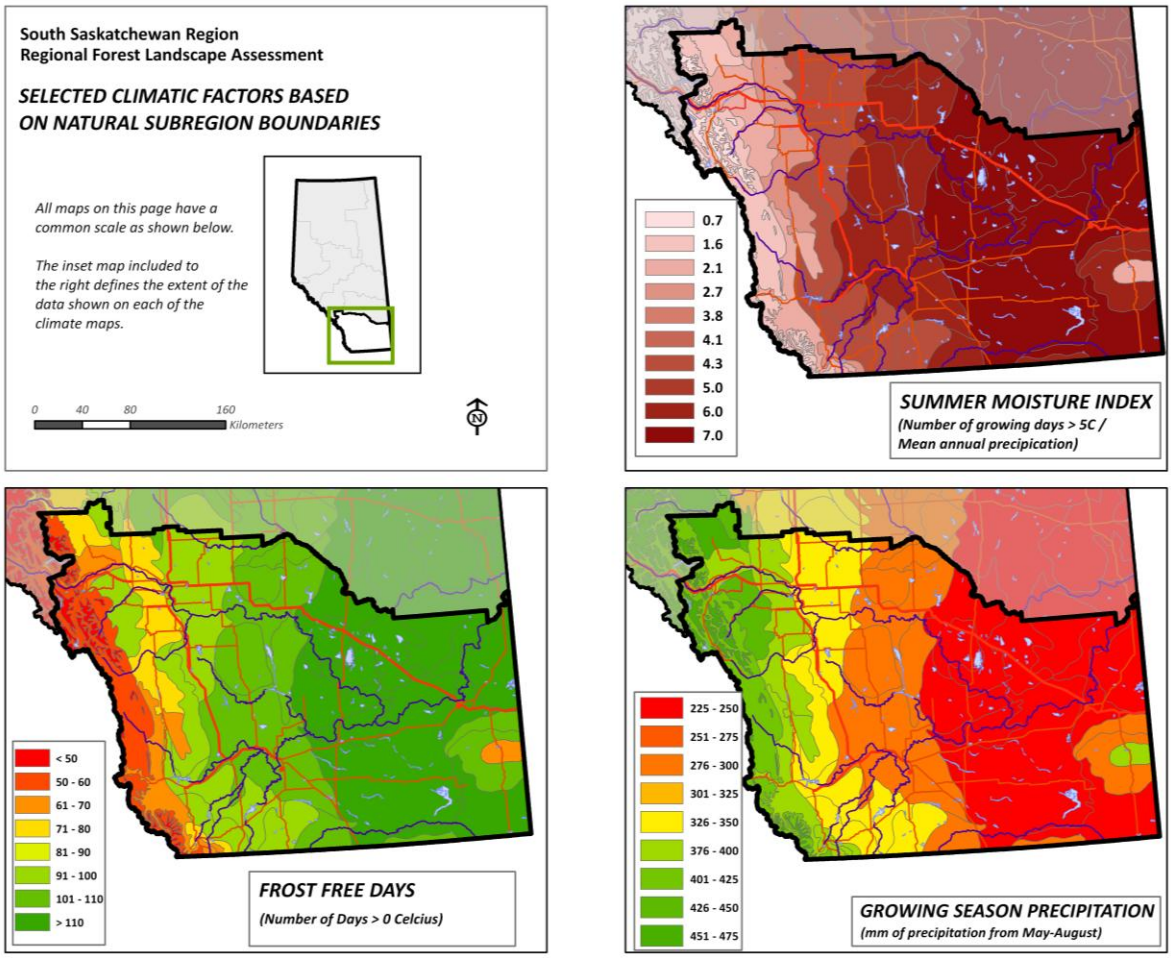


Figure 2-10 Climatic Factors Associated with Natural Subregions

3. Landscape Pattern and Structure

3.1 Source of Data

A review of landscape patterns based on vegetation is only possible where a detailed forest inventory exists. Digital Alberta Vegetation Inventory (AVI) data was compiled by ESRD using industry and Crown sources (23). This compiled data was used for the following assessments of species, stand type, age class, seral stage, patch distribution and interior forest calculation. Approximately 22% of the South Saskatchewan Region has detailed AVI data available. Figure 3-1 indicates the relative coverage of AVI detail across the South Saskatchewan Region and the source of that information. All AVI specifications data meet the minimum standard for vegetation classification as described in Alberta (2005).

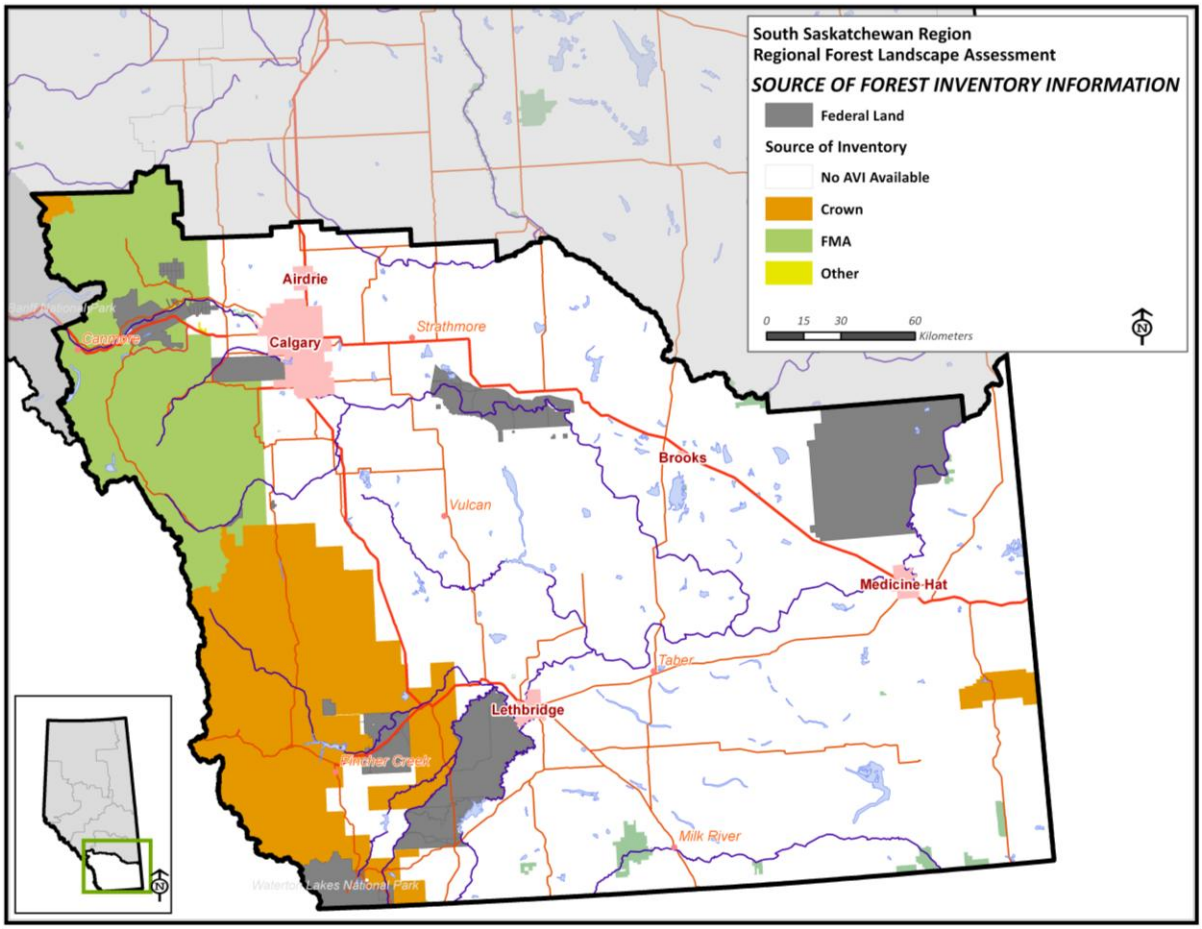


Figure 3-1 Source of AVI Information

The available inventory has been compiled over a number of years; hence the age of the inventory information varies across the Region (22). As indicated by Table 3-1, the prevalent age of the inventory is greater than 20 years, indicating that the inventory is approaching the need for an update. For the

purposes of this report, the inventory data has been updated with known depletions related to cutblock, wildfire and land use disturbances (up to and including 2011), but stand characteristics have not been modified to reflect changes in stand growth (density, height, species composition).

Note that the area identified as "No AVI Available" is comprised of Waterton National Park, Canadian Forces Base at Suffield, and other non-inventoried areas within the White Area, or selected portions of the Green Area where ESRD has no management responsibility (e.g.: Metis communities , First Nations).

Table 3-1 Age of AVI Information

Age of AVI (years)	Area (ha)	Percentage (%)
0 - 5 years	353,565	4
6 - 10 years	888	0
11 - 15 years	10,524	0
16 - 20 years	659,647	8
Greater than 20 years	868,366	10
Sub-total	1,892,989	23
No AVI Available	6,483,443	77
Total	8,376,432	100

Note also that for the purposes of this landscape assessment, the classifications of species, forest types, age class and seral stage, only the overstory detail was used and the understory was ignored. It is certainly understood that individual FMA holders may use other business rules for classifying such attributes for their planning and yield estimation, but these overall landscape assessments are based only on the overstory characteristics.

3.2 Forest Species

Forest species (23) refers to the general commercial tree species in Alberta and does not include species such as willow or alder as they are typically more shrub-form in Alberta. In this assessment, the selected species was the leading overstory tree species as identified in the forest inventory. Note there are two classes of "undifferentiated" species. The class "Hardwood - undiff" refers to stands that could be aspen or poplar – the differentiation was not possible at the time of the forest inventory interpretation. "Pine - undiff" represents areas where lodgepole pine and other pine species are indistinguishable either because of hybridization between the two species, or simply due to inability to differentiate tree form on the imagery used for interpretation.

Coniferous species are dominant, generally due to the cooler growing conditions for tree growth in this Region. Lodgepole pine is the most common species, but high-elevation pines are also found (e.g.: white-bark pine, limber pine). Trembling aspen is the most common deciduous species and is found mostly on the transition landscape from foothills to plains.

The category "Undeclared species" refers to regenerating wildfires or harvest areas for which a leading tree species has not yet been established or declared.

Table 3-2 Leading Species Distribution

Leading Tree Species Common Name	Latin Name	Area (ha)
Coniferous		
White spruce	*Picea glauca*	129,199
Engelmann spruce	*Picea engelmannii*	124,123
Black spruce	*Picea mariana*	1,576
Pine - undiff	*Pinus sp.*	60,361
Lodgepole pine	*Pinus contorta*	345,720
White-bark pine	*Pinus albicaulis*	1,052
Limber pine	*Pinus flexilis*	417
Balsam fir	*Abies balsamea*	933
Alpine fir	*Abies lasiocarpa*	34,981
Douglas fir	*Pseudotsuga menziesii*	50,206
Alpine larch	*Larix lyallii*	1,779
Tamarack	*Larix laricina*	29
Sub-total: Coniferous		750,378
Deciduous		
Hardwood - undiff	*Populus sp.*	798
Trembling aspen	*Populus tremuloides*	148,321
Balsam poplar	*Populus balsamifera*	15,975
Paper birch	*Betula papyrifera*	94
Sub-total: Deciduous		165,188
Regeneration		
Undeclared species		21,737
Sub-total: Regeneration		21,737
Sub-Total Forested Land		937,302
Not Forested		879,414
No Inventory Data		6,559,716
Total		8,376,432

The general trend for species geographic distribution is evident in Figure 3-2. Coniferous species are most prevalent in the west with a trend to hardwoods easterly across the Region. The large area of "Not Forested" in the south central part of the Region is primarily agricultural land.

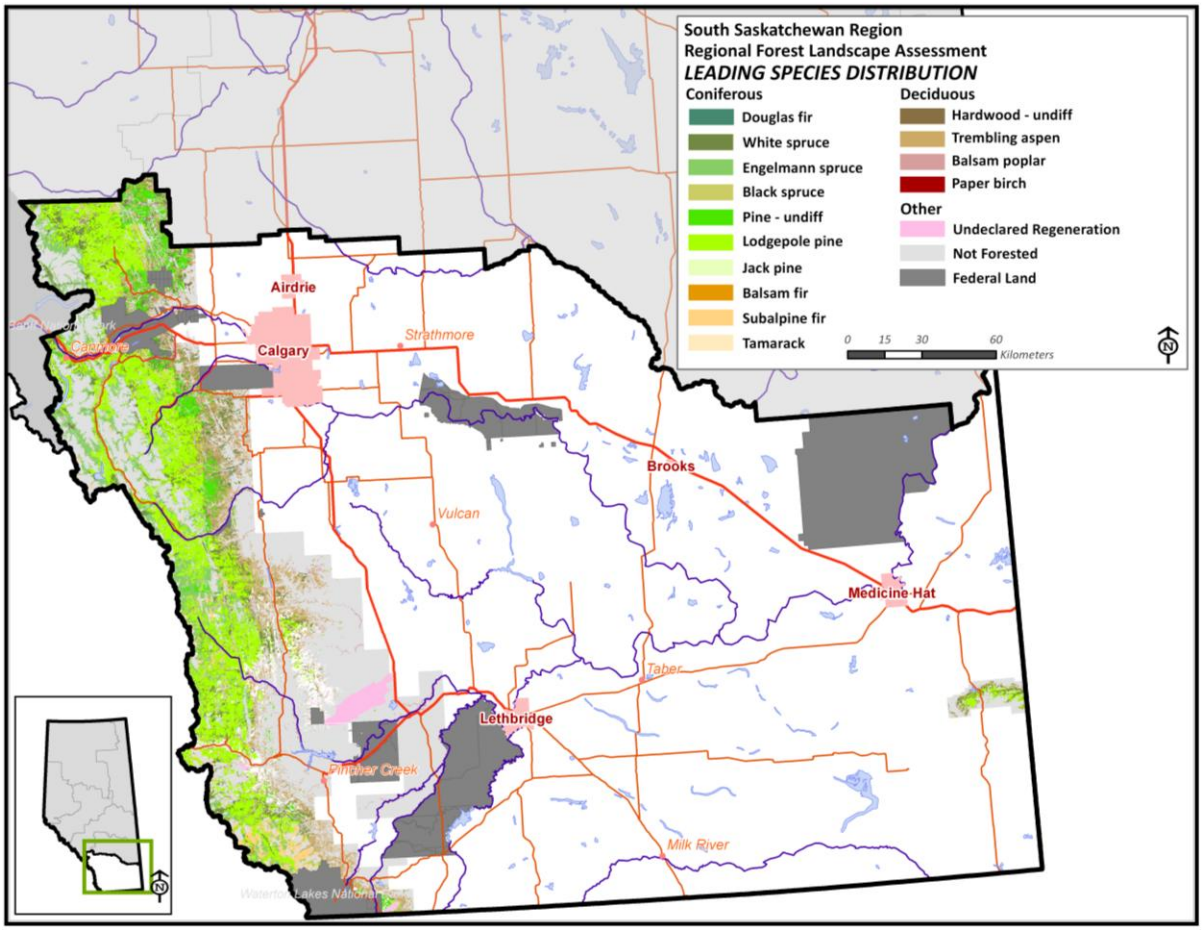


Figure 3-2 Leading Tree Species

3.3 Forest Cover Types

Cover type groupings (23) are based on the provincial strata defined in the yield projection guidelines of the Forest Planning Standard (Alberta 2006). Strata are hierarchical, based first on broad cover group (Deciduous, Deciduous-Coniferous, Coniferous-Deciduous , Coniferous) and then by leading coniferous species (except in the case of pure deciduous). There are 10 primary forest cover types defined in the Planning Standard and all 10 cover types are represented in the inventoried area of the South Saskatchewan Region.

The Region is dominated by primarily coniferous stand types (Table 3-3), with 9% of Region covered by Douglas fir, spruce and pine forest strata. These types are most common in the western part of the Region where the foothills lead into more steep slopes and cooler environments. Deciduous stands are significant in the Region (2%) and are generally found in the foothills to grassland transition zones of the Region.

Figure 3-3 shows the spatial distribution of cover types across the South Saskatchewan Region.

Table 3-3 Forest Cover Type Summary

Description	Code	Area (ha)
Forested Land		
Douglas fir pure or leading	C-Fd	49,001
Pine pure or leading	C-P	398,419
Black spruce pure or leading	C-Sb	3,368
White spruce pure or leading	C-Sw	281,835
Pine/Hardwood	CD-P	9,486
Black spruce/Hardwood	CD-Sb	16
White spruce/Hardwood	CD-Sw	8,694
Hardwood/Pine	DC-P	7,298
Hardwood/Spruce	DC-S	12,901
Deciduous	D	144,548
Regeneration (undeclared strata)		54,822
Sub-total		970,388
Not Forested		879,414
No Inventory Data		6,526,630
Total		8,376,432

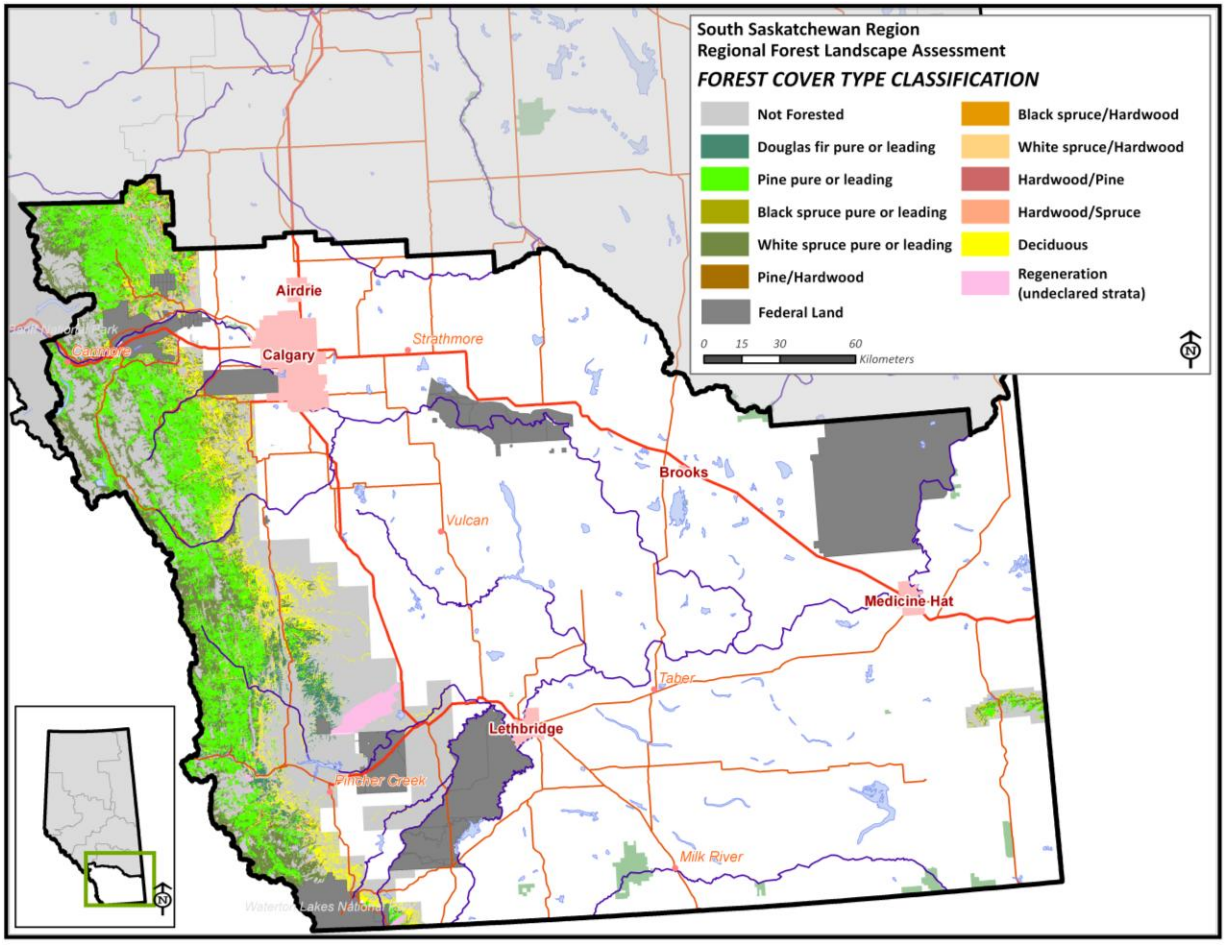


Figure 3-3 Forest Cover Type Distribution

3.4 Forest Age Classes

The age class distribution (23) over the forested landscape of the Region is shown in Table 3-4. The majority of the forest would be considered mature, with a full 24% of the distribution representing age classes 100 years of age or greater. The second largest grouping of ages is the amalgamation of the 70-79 and 80-89 classes, which represent 12% of the Region.

An overview map of the distribution of age classes appears as Figure 3-5 and a graphical representation appears as Figure 3-4.

Table 3-4 Age Class Distribution

Age Class (years)	Area (ha)
Forested Land	
0 - 9	19,397
10 - 19	17,364
20 - 29	11,943
30 - 39	6,704
40 - 49	14,019
50 - 59	17,639
60 - 69	28,736
70 - 79	102,620
80 - 89	96,952
90 - 99	146,751
100 - 109	113,362
110 - 119	106,034
120 - 129	94,309
130 - 139	61,902
140 - 149	24,164
150 - 159	29,023
160 - 169	8,522
170 - 179	8,026
180 - 189	3,346
190 - 199	6,598
200 +	19,891
Sub-total	937,302
Not Forested	879,414
No Inventory Data	6,559,716
Total	8,376,432

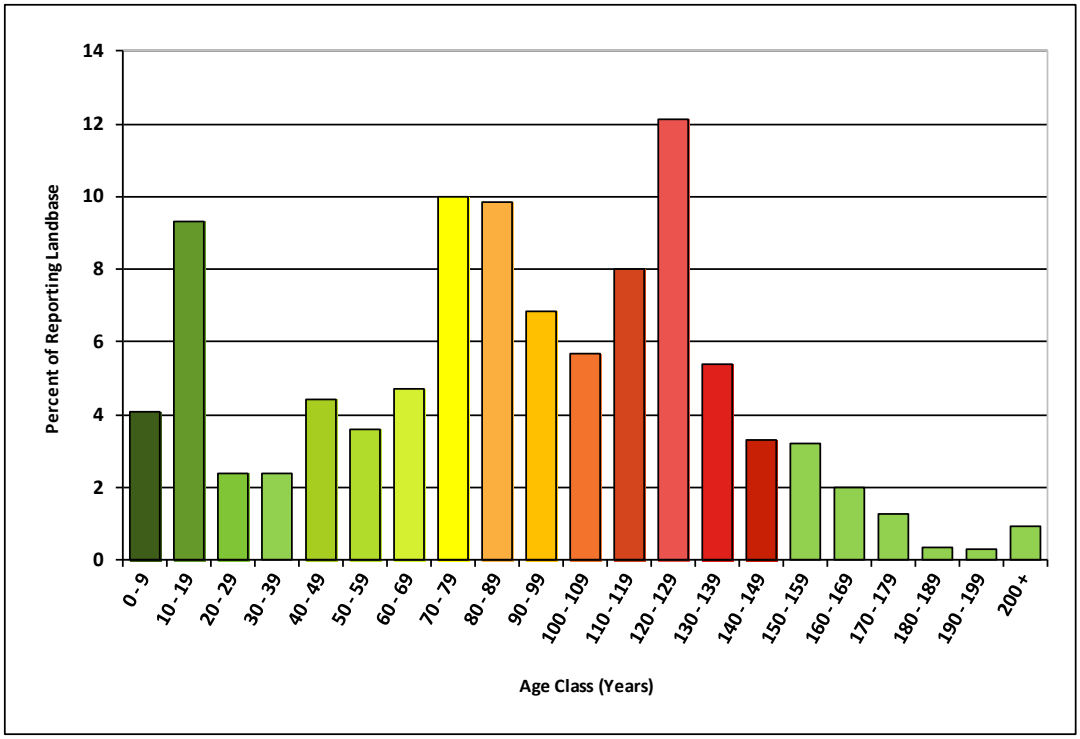


Figure 3-4 Distribution of Age Classes

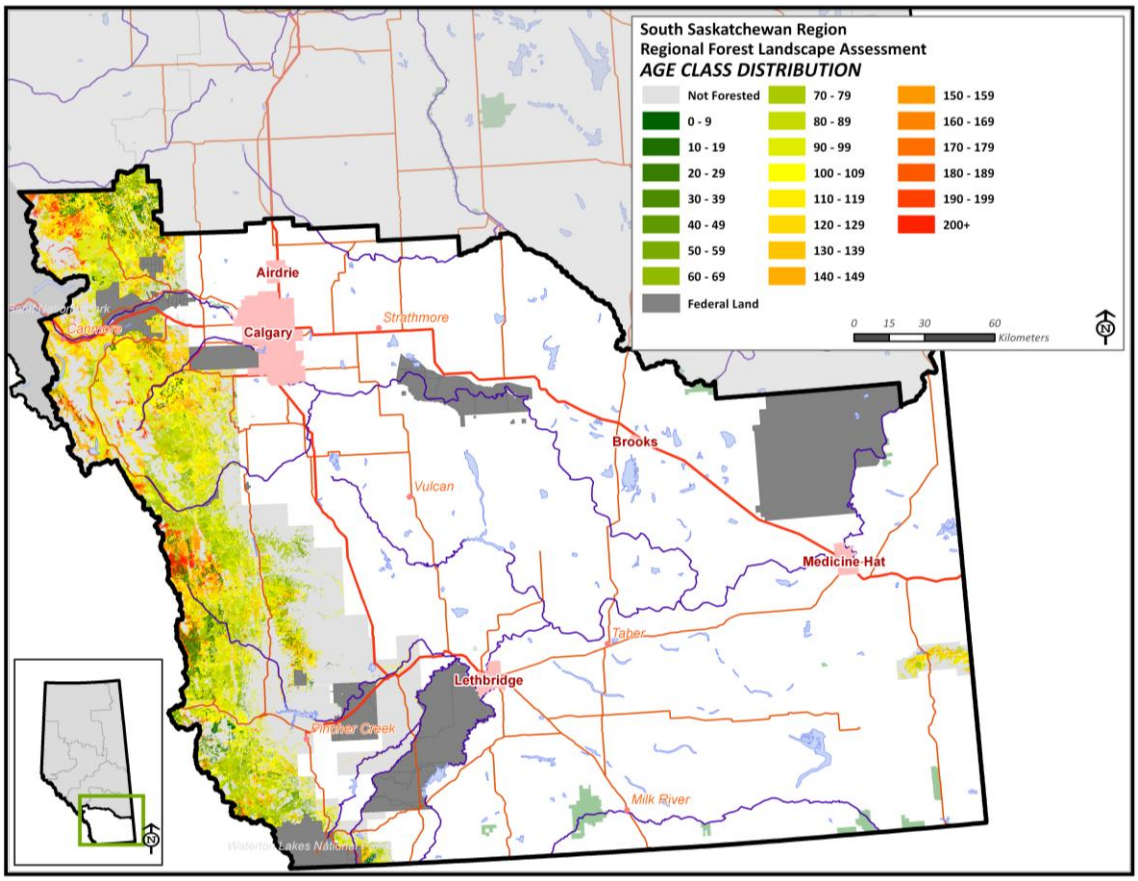


Figure 3-5 Age Class Distribution

3.5 Seral Stages

Seral stages refer to stages in forest succession that are characterized by plant community conditions. For the purposes of this report, seral stages are defined by stand age.

Seral stage classes across the inventoried area of the South Saskatchewan Region (23) are represented mostly by Mature forest (Table 3-5). The Young class is made up primarily of regenerating harvest areas and wildfires and occupies approximately less than 1% of the forest land base. Old and Very Old growth forest comprises approximately 3% of the Region.

Table 3-5 Distribution of Seral Stage

Seral Stage	Definition	Area (ha)
Forested Land		
Young	Stand age < 20 years	36,761
Immature	Stand age 20 to 79 years	181,661
Mature	Stand age 80 to 119 years	463,099
Old	Stand age 120 to 179 years	225,945
Very Old	Stand age >= 180 years	29,835
Sub-total		937,302
Not Forested		879,414
No Inventory Data		6,559,716
Total		8,376,432

The spatial distribution of seral stage is shown in Figure 3-6.

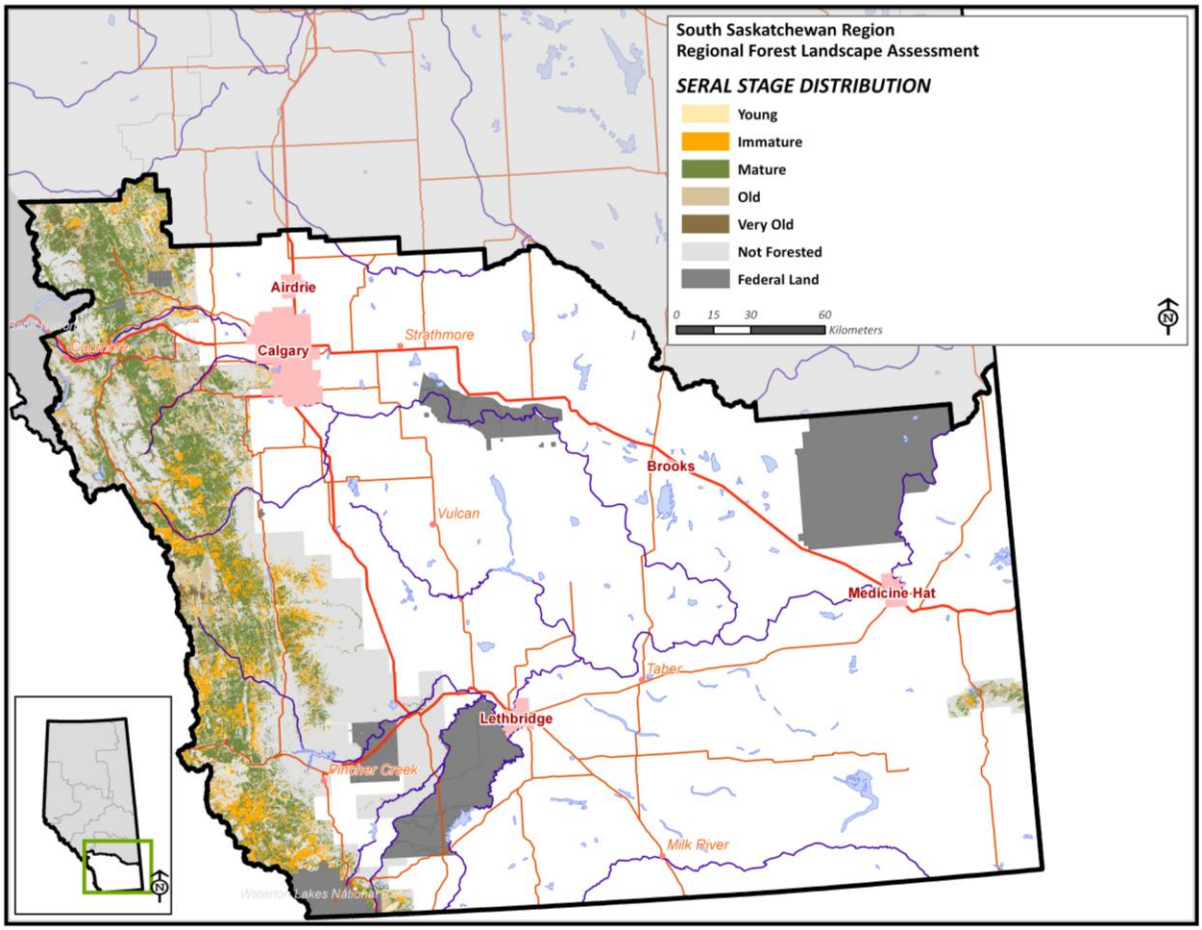


Figure 3-6 Seral Stage

3.6 Forest Patches

3.6.1 Patch Distribution of Young Stands

Patches are forest stands of the same seral stage (23) and not split by any linear feature greater than 8 meters wide. Contiguous patches where the seral stage was classified as "Young" (less than 20 years of age) were classified into 4 patch-size categories. Those results appear as Table 3-6 and Figure 3-7.

Table 3-6 Patch Distribution of Young Seral Stage

Patch Size Class (ha)	Number of Patches	Area (ha)
0 - 19	2,322	13,302
20 - 99	458	16,925
100 - 249	24	3,691
250 +	6	2,876

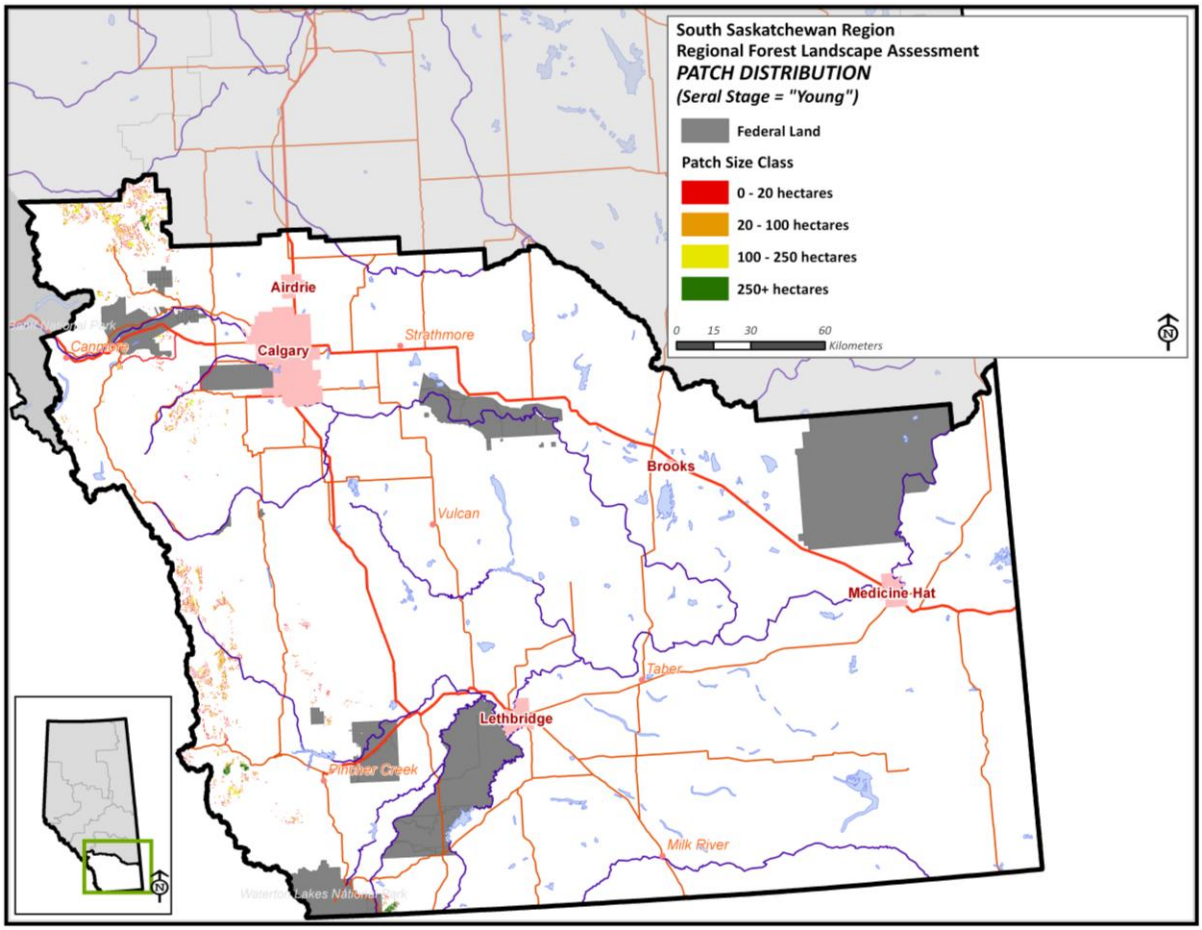


Figure 3-7 Patch Size Distribution of Young Stands

3.6.2 Interior Forest

Interior forest is one of two Forest Management Planning (FMP) reporting requirements that monitors the effect of forest fragmentation and resulting impacts on forest biodiversity. Interior forest is defined as forested areas greater than 100 hectares in size that are located beyond a defined edge-effect buffer zone. The edge-effect buffer zone is applied in two cases:

- along any stand edge which shares a common boundary with a linear disturbance greater than 8 meters in width; or
- stand edge along which the seral stage changes (note that the seral stage definitions used in the interior forest assessment are identical to the definitions presented in Table 3-5)..

The edge-effect buffer zone is calculated as:

- 60 meters where the adjacent area is non-forested, or forested but less than 40 years old; and
- 30 meters where the adjacent forest stand is less than or equal to 40 years old but not mature forest.

There is no edge effect applied where adjacent stands are at least mature forest. Using these rules, the resulting interior forest was determined for the South Saskatchewan Region. The area summary is displayed in Table 3-7, and a map of the interior forest appears as Figure 3-8.

Table 3-7 Interior Forest by Seral Stage

Seral Stage	Number of Patches greater than 100 ha	Area of Patches > 100 ha (ha)
Young	0	0
Mature	476	254,325
Old	270	102,392
Very Old	41	11,134

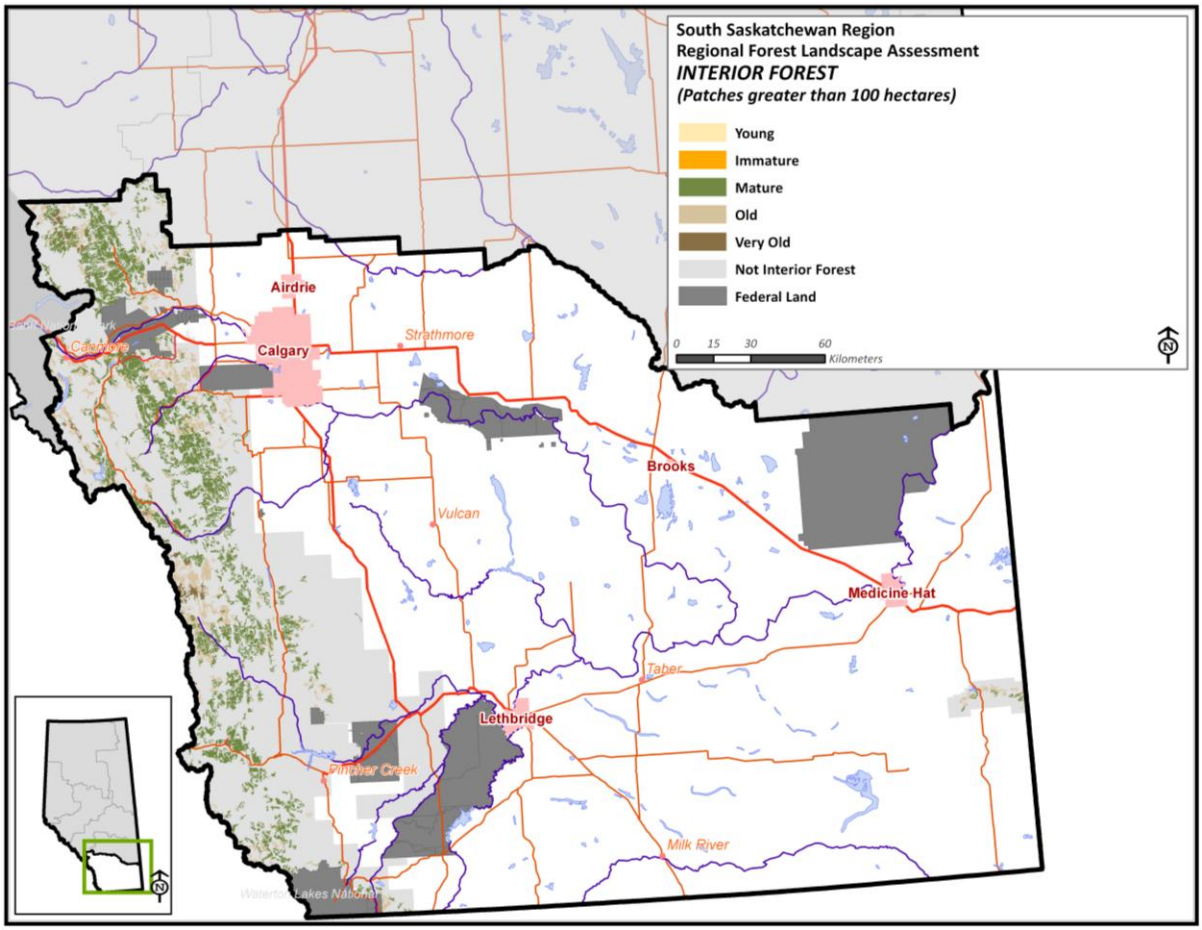


Figure 3-8 Interior Forest by Seral Stage

4. Landscape Disturbance and Succession

4.1 Inherent Disturbance Regime

The natural disturbance regime in the South Saskatchewan consists of wildfire and natural pests, with wildfire being the dominant natural factor shaping the composition and distribution of species (Rowe et al. 1973). Wildfire disturbance is the primary process introducing variability in the forest mosaic (Andison 1999).

The dominant landscape disturbances are now through anthropogenic, or man-caused, events such as increased area taken up by access and settlements as well as development of the forest and energy industries. In addition, regulation and policy to limit the impact of natural disturbances (for example: wildfire control, wildfire prevention and insect suppression programs) have contributed to a landscape shaped primarily by man's activities.

4.2 Insects and Diseases

Insect surveys conducted by ESRD, Forest Management Branch, Forest Health Section indicate that the most prevalent insect pests in this Region are:

- Mountain pine beetle (*Dendroctonus ponderosae*);
- Hardwood defoliators:
    - Large aspen tortrix (*Choristoneura conflicta*);
    - Tent caterpillar (*Malacosoma disstria*);

4.2.1 Mountain Pine Beetle

The mountain pine beetle is the most destructive pest of mature pine forests in North America. Mature and over-mature pine under some sort of stress are the preferred host, but as populations increase, smaller-sized and healthy trees can all be attacked. Outbreaks continue as long as a food source is available. The beetle kills trees by clogging and destroying the conductive tissue of the tree. Its larvae feed in the phloem of the tree, disrupting the flow of water and nutrients. In addition, the larvae introduce a blue-stain fungus which prevents the tree from using it's pitch to repel the attacking beetles.

Figure 4-1 shows the historical spread of mountain pine beetle into the South Saskatchewan Region since annual surveys were undertaken in 2006 (24).

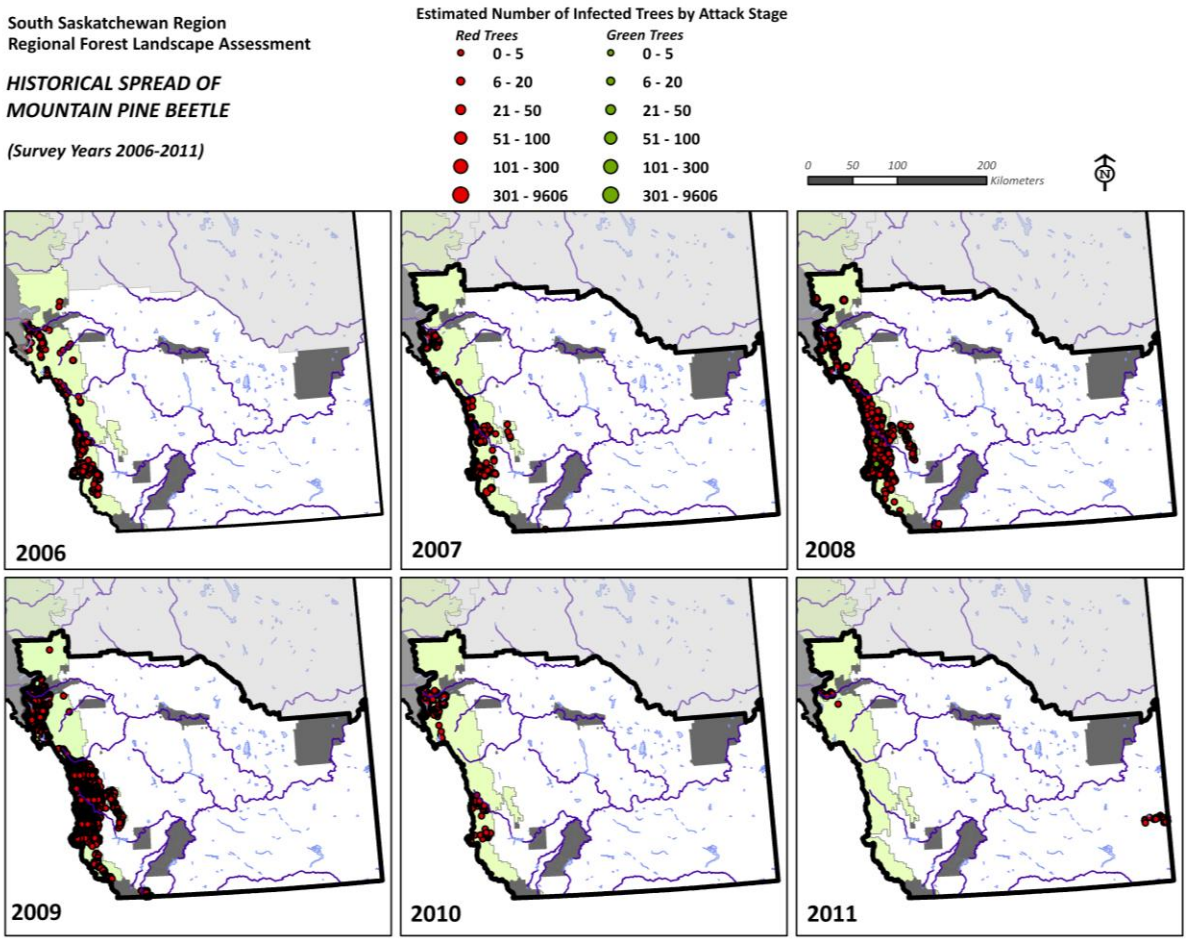


Figure 4-1 Historical Spread of Mountain Pine Beetle

Mountain pine beetle populations fell sharply in southern Alberta in 2011, as a result of aggressive control efforts and cold winter temperatures. Risk of in-flights of beetles from British Columbia remains high to moderate for this Region. The presence of large volumes of susceptible pine, coupled with potential impact to critical watersheds makes this area a high priority for future surveys and beetle control efforts in the coming year (49).

4.2.2 Hardwood Defoliators

Table 4-1 summarizes the total area of hardwood defoliation as surveyed by ESRD between 1999 and 2011 (inclusive) (25).

The hardwood defoliator agent causing the most damage in this Region is large aspen tortrix which accounts for 86% of the total area impacted by hardwood defoliators. The majority of the historical infestations are of light severity. Of the three main defoliator agents, typically only one of the species is the dominant defoliator at a given time.

Other hardwood defoliators (gypsy moth, satin moth, spearmarked black moth, aspen leafroller) are present in the province and potentially in the South Saskatchewan Region, but no surveys have detected any populations worth noting.

Table 4-1 Summary of Hardwood Defoliation Agents

Insect Pest - Hardwood Defoliators		Severity of Impact						Total	
		Light		Moderate		Severe			
Common Name	Latin Name	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)
Large aspen tortrix	*Choristoneura conflictana*	217,898	53	119,460	29	18,905	5	356,262	86
Forest tent caterpillar	*Malacosoma disstria*	19,980	5	542	0	840	0	21,362	5
Willow drought[2]		6,604	2	26,092	6	2,950	1	35,646	9
Total[1]		244,482	59	146,093	35	22,695	5	413,270	100

[1] Sum of infestation survey records 1999 to 2011 inclusive

[2] See also Willow Die-back in section 4.2.4

Figure 4-2 is an overview of the history of the presence of hardwood defoliator outbreaks impacting forests in the South Saskatchewan Region. As these defoliators tend to occur in cycles, only the last 8 years of infestation are mapped. A detail summary of the most important of these insect species (large aspen tortrix and tent caterpillar) and willow drought is presented in following sections.

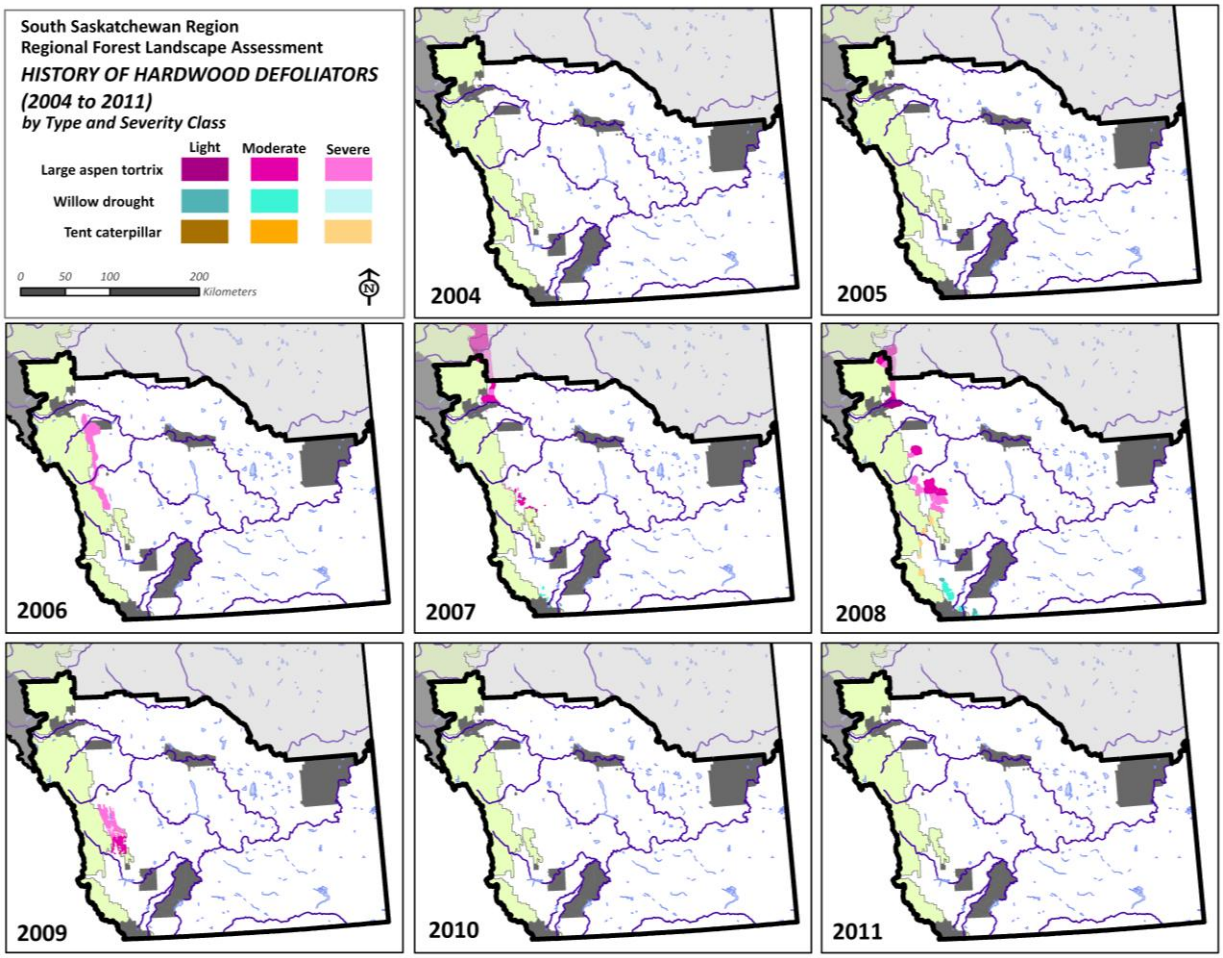


Figure 4-2 History of Hardwood Defoliation Outbreaks (2004-2011)

Large Aspen Tortrix

The large aspen tortrix occurs across Canada and is one of the most serious pests of trembling aspen. Aspen is the preferred host, but the tortrix will also feed on willow, balsam poplar and white birch. Outbreaks may last 3-4 years. Damage is predominantly caused by the later larval stages which may also feed on buds. Massive defoliation can reduce growth increment but rarely results in tree mortality.

Infestations of large aspen tortrix in the South Saskatchewan do not account for a significant part of provincial infestation. This indicates that regionally, the tortrix is less prevalent here than in the other surveyed land-use framework Regions.

Bruce Spanworm

Though found in the Province of Alberta, no recent records of Bruce spanworm have occurred in the South Saskatchewan Region.

Tent Caterpillar

The tent caterpillar occurs across Canada and is considered the most serious defoliator of hardwoods. While aspen is the preferred host, the tent caterpillar will attack almost any hardwood species during outbreaks. Outbreaks generally last 2-4 years and may reoccur every 8-10 years. Infestation cause branch dieback and reduce growth increment. Several years of severe defoliation may cause mortality, particularly where trees may have additional stress factors.

There has been no significant tent caterpillar outbreak since the last major infestation which ran from 2007 to 2008. Incidence of tent caterpillar outbreaks in the South Saskatchewan Region would be considered low, relative to the impact of other hardwood defoliators.

Given the potential greater damage to forest growth caused by tent caterpillar, there have been trials to assess bacterial control mechanisms. No such mechanism has been implemented in an operational setting.

4.2.3 Spruce Budworm

Though found in the Province of Alberta, there have been no spruce budworm (*Choristoneura fumiferana*) outbreaks documented in the South Saskatchewan Region (26). However, locations of Western Spruce Budworm (*Choristoneura occidentalis*) have been surveyed in 2010 and 2012 (see section 4.2.4). Western Spruce Budworm typically targets Douglas fir, and other true firs; to a lesser degree it can impact spruces.

4.2.4 Other Forest Health Agents

Other agents such as soil moisture, weather events and other minor insect attacks can impact the health of the forest. ESRD (48) has reported localized blowdown, with one area totalling 8,579 hectares. Figure 4-6 shows the areas affected by other forest health agents. Hail damage was detected over an estimated 914 ha. Red belt, which is a general term describing tree kill by adverse weather, was over 343 hectares. North of Crowsnest Pass, incidences of West Spruce Budworm (*Choristoneura occidentalis*) were detected in 2010 (2,893 ha) and 2012 (6,914 ha).

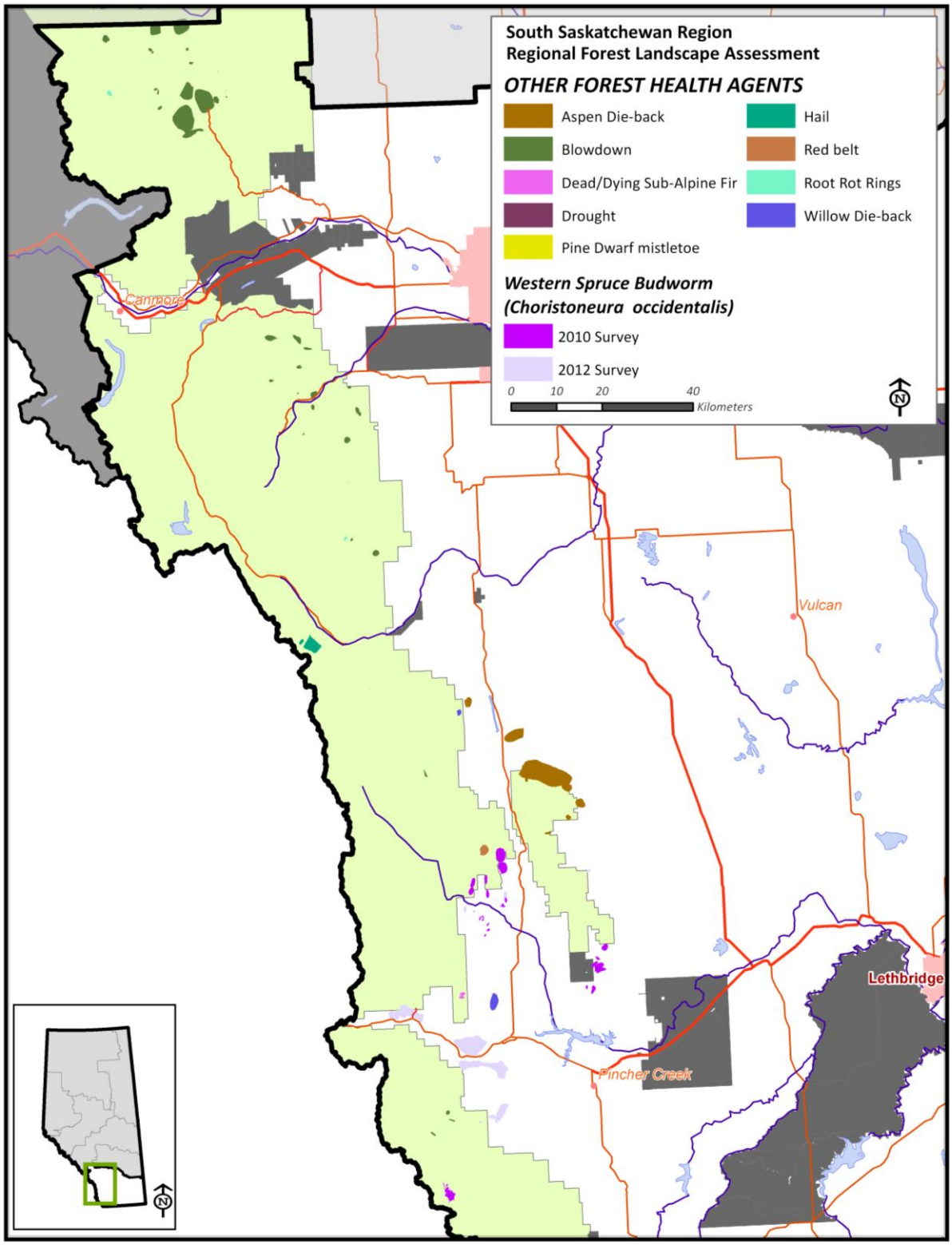


Figure 4-3 Other Forest Health Agents

4.3 Invasive Plant Species

An invasive species has been defined as "a species, subspecies or lower taxon, introduced outside its natural past or present distribution ... whose introduction and/or spread threaten biological diversity" (United Nations Environment Program 1992). Invasive plant species are monitored by Agriculture Alberta as well as Public Lands and Forestry Divisions of Environment and Sustainable Development (27). Alberta classifies invasive plants into two categories (Alberta 2008a):

Prohibited Noxious	A noxious plant (including seeds) that must be destroyed by the landowner or person who occupies the land. Destroy means to kill all growing parts or to render reproductive mechanisms non-viable.
Noxious	A noxious plant (including seeds) that must be controlled by the landowner or person who occupies the land. Control means that the action may destroy the plant, but at best, must inhibit its growth or spread.

Additionally, plants can be identified as "Nuisance". These have no legislative controls but are identified as potential problem species. The Weed Control Regulations of 2010 also allow municipalities to declare additional plant species as prohibited or noxious and impose the current regulations on those species.

Any areas that receive reclamation activities are potential problem sites for invasive species as commercial seed mixes can contain seeds from noxious plants. There are 2,040 sites of observed invasive species in the South Saskatchewan region. At each site, it is possible that multiple invasive species are present. Sample sites are visited by municipal and provincial inspectors on a regular basis. Table 4-2 shows the invasive plants status for the Region by class (prohibited, noxious, nuisance).

No problem weeds were surveyed on only 1% of the sites visited. The occurrence of prohibited noxious plants is low, at 3 %. Incidences of noxious plants are the highest category at 94% of all observed invasive plants, with the most common problem species being Oxeye Daisy and Canada Thistle.

Figure 4-4 shows the distribution of invasive plants in the Region. The majority of occurrences are in the Green Area, likely as a result of tighter controls on seed spread in the agricultural areas of the White Area.

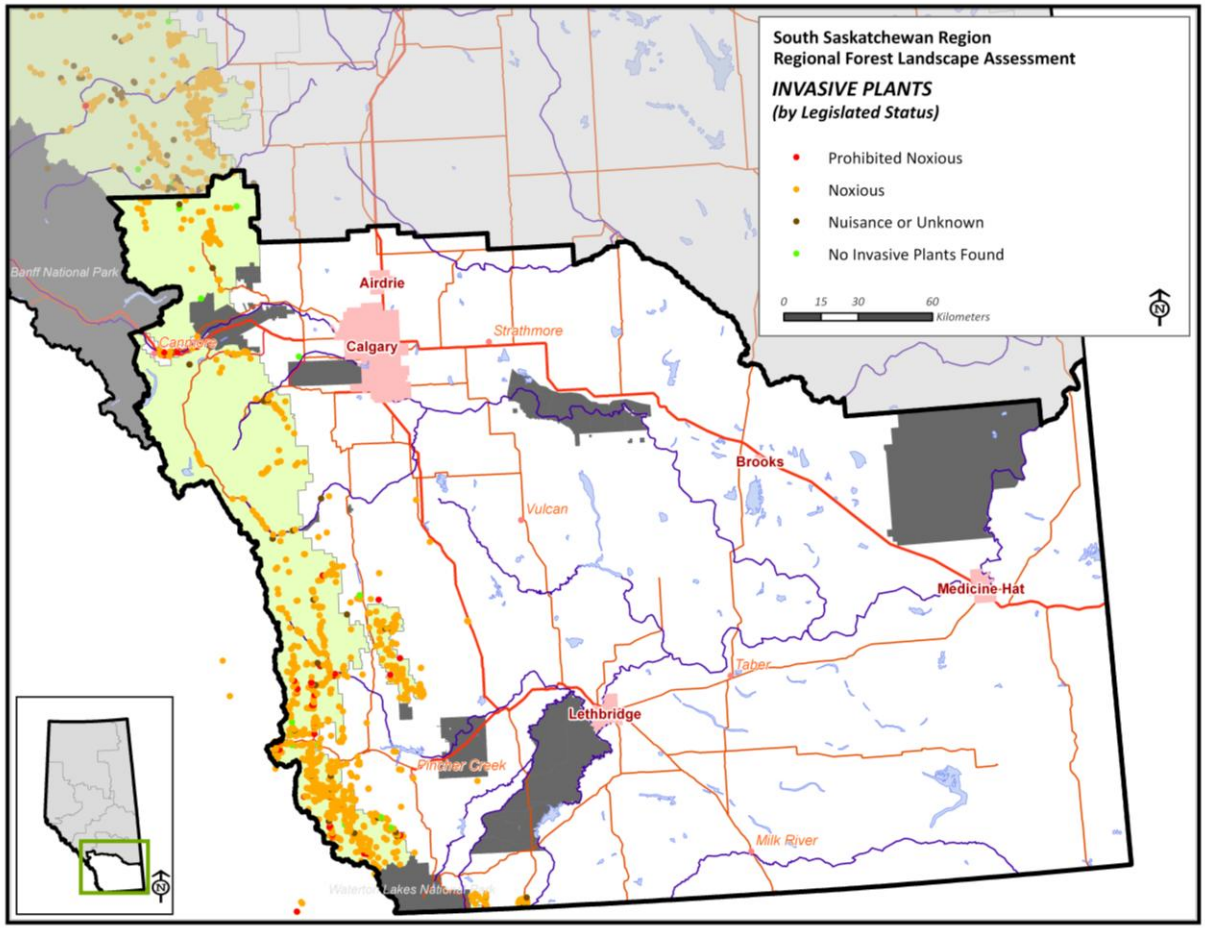


Figure 4-4 Invasive Plant Distribution

Table 4-2 Ranking of Invasive Plant Species

Classification and Weed Name	Incidence of Observed Weeds	Percentage of All Obs. (%)
No Weeds Found		
None	21	1
Sub-total No Weeds Found	21	1
Prohibited Noxious		
Knapweed	12	0
Meadow Hawkweed	4	0
Orange Hawkweed	42	1
Spotted Hnapweed	35	1
Sub-total Prohibited	93	3
Noxious		
Black Henbane	3	0
Bluebur	2	0
Blueweed	350	11
Burdock	3	0
Canada Thistle	448	14
Common Burdock	54	2
Common Mullein	162	5
Common Tansy	37	1
Common Toadflax	19	1
Creeping Bellflower	2	0
Dandelion	7	0
Downy Brome	5	0
Field Scabious	17	1
Foxtail Barley	2	0
Hoary cress	1	0
Hound's tongue	191	6
Hound's tongue/Downy Brome	2	0
Leafy Spurge	24	1
Narrow-leaved Hawk's Beard	8	0
Oxeye Daisy	787	24
Perennial Sow Thistle	25	1
Prostrate Knotweed	1	0
Scentless Chamomile	72	2
Stickseed	1	0
Stork's Bill	1	0
Tall Buttercup	424	13
Toadflax	372	11
White Cockle	2	0
Yellow Hawkweed	9	0
Yellow Toadflax	35	1
Sub-total Noxious	3066	94
Nuisance/Unknown Status		
Bladder Campion	25	1
Bull Thistle	13	0
Flixweed	4	0
Goats Beard	4	0
Stinkweed	1	0
Wild Caraway	21	1
Sub-total Nuisance	68	2
Total	3248	100

4.4 Forest Succession

Forest succession is the composition of vegetation communities, on a site, over time. The process of succession results in different structural components (e.g.: density by species, understory composition, snags or other dead materials) at various time periods. Many of these structural components can undergo a somewhat predictable pattern of change as stands age. The discussion of successional factors and patterns presented here are a compilation of information from Boreal Centre (2002), Song (2002), Daishowa-Marubeni (2008). The report compiled by the Boreal Centre includes a considerable list of papers devoted to the subject of succession in the boreal mixedwood.

Moisture regime has the greatest influence on forest succession (Boreal Centre 2002). In the boreal mixedwood of Alberta, moist sites are characterized by stands of black spruce and larch, medium sites by aspen and white spruce and dry sites by pine (Boreal Centre 2002, Daishowa-Marubeni 2008). Succession on moist and dry sites indicates that the original black spruce (moist sites) and pine (dry sites) tend to be generally replaced with the same stand type after fire, though often with some component of aspen. In cases where black spruce occurs as an understory to pine, the trajectory may result in a continued mixed-coniferous stand and not a pure pine stand, particularly in the absence of a fire event.

Following fire, aspen regenerates aggressively on medium sites through root suckering and is virtually always present in regenerating stands (Boreal Centre 2002). The introduction of white spruce on medium sites is more variable for a number of reasons (e.g.: variable seed production on neighbouring seed trees, distance from seed sources). Because of this variability in white spruce regeneration, several stand development pathways are possible on medium sites. Where ever white spruce seed is available along with a suitable seed bed, an even-aged mixed stand of white spruce and aspen can be expected. Because aspen is shade intolerant, it will typically not regenerate under a closed canopy. This leads to the conversion of these mixed stands to pure white spruce in approximately 100 years.

When white spruce seed is available, but the seedbed may not be suitable for quick germination, the stand will initially generate to aspen and spruce will incrementally enter the site. This condition leads to an uneven-aged mixed wood stand which will also eventually become a pure white spruce stand, but over a considerably longer time than under the even-age scenario.

The transition of stands to the mature stage is triggered by closure of the canopy. Self-thinning of the trees begins at this stage, but stand gaps are not yet prominent features. Mature stands tend to have the lowest level of structural diversity (Boreal Centre 2002)

The transition from mature to old stands is gradual. Key changes include canopy breakup and release of understory vegetation, emergence of secondary canopy species and accumulation of snags and downed logs (Stelfox 1995). Overall, structural diversity is highest in old stands and is reflected in high species richness of both plants and animals (Stelfox 1995).

4.5 Wildfire History

Disturbances by wildfire have been tracked and recorded by ESRD since devolution of natural resource management to Alberta in the 1930s (29). The wildfire records summarized in the following tables and figures represent all wildfires, regardless of their origin (lightning or man-caused).

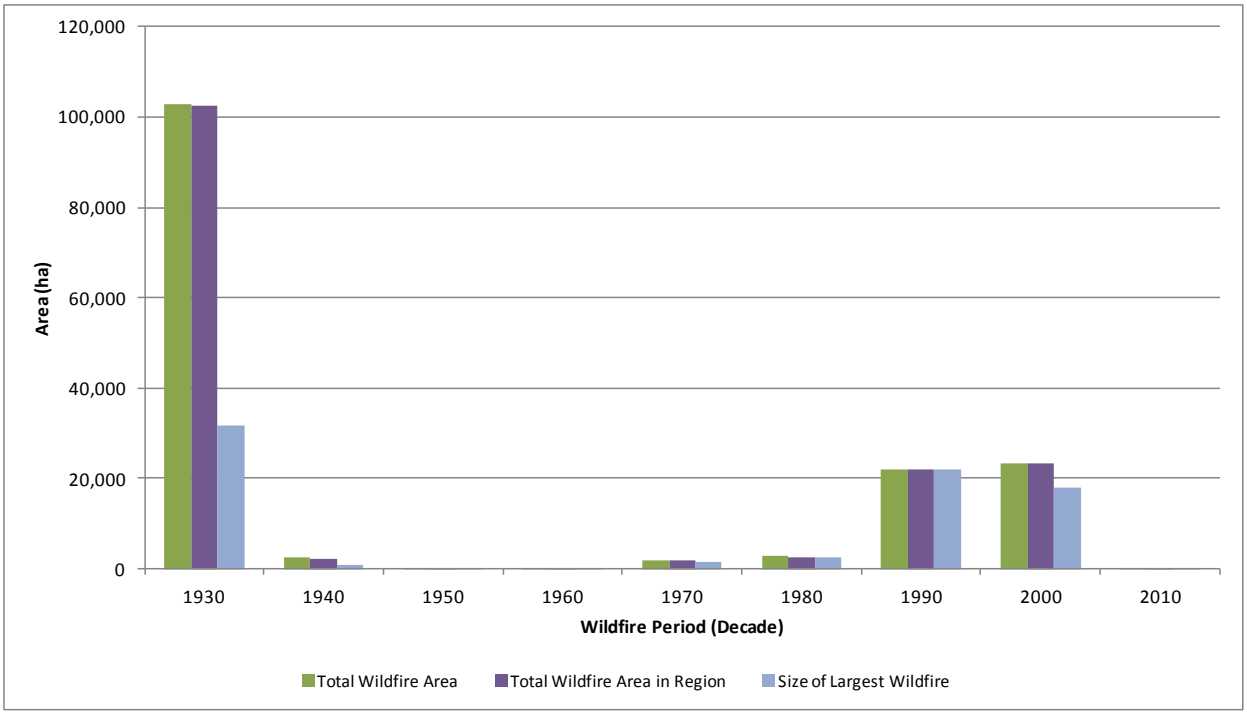
Summary statistics of the Region's wildfire history are reported in Table 4-3. The areas reported in Table 4-3 include only burned area and do not include residual islands that may not have burned during a wildfire event. The reporting period is by decade with the labelled wildfire date representing the start of the decadal period (i.e.: period '1930' represents 1930-1939 inclusive). The number of wildfires by decade is highly variable, as are the total area burned, average wildfire size and size of largest wildfire (Table 4-3, Figure 4-5). Generally, the median wildfire size is on a downtrend if one discounts the Granum fire of 1997. This Region has historically had a low incidence of wildfire events; however, the number of wildfires has increased over the past two decades. Despite this fact, the percent of the Region burned each decade (Table 4-3) remains very low.

Table 4-3 Wildfire Statistics by Decade

Wildfire Period	Number of Wildfires	Total Wildfire Area (ha)	Wildfire Area in South Saskatchewan (ha)	Average Wildfiire Size (ha)	Median Wildfire Size (ha)	Size of Maximum Wildfire (ha)	Area Burned as percentage of Region[1] (%)
1930	14	102,695	102,605	7,335	3,469	31,716	1
1940	4	2,637	2,032	659	640	777	0
1950	1	156	156	156	156	156	0
1960	3	325	325	81	44	223	0
1970	4	1,866	1,866	466	150	1,525	0
1980	2	2,877	2,671	1,438	1,438	2,528	0
1990	1	21,964	21,964	21,964	21,964	21,964	0
2000	34	23,408	23,405	600	10	18,042	0
2010[2]	8	263	263	33	6	159	0

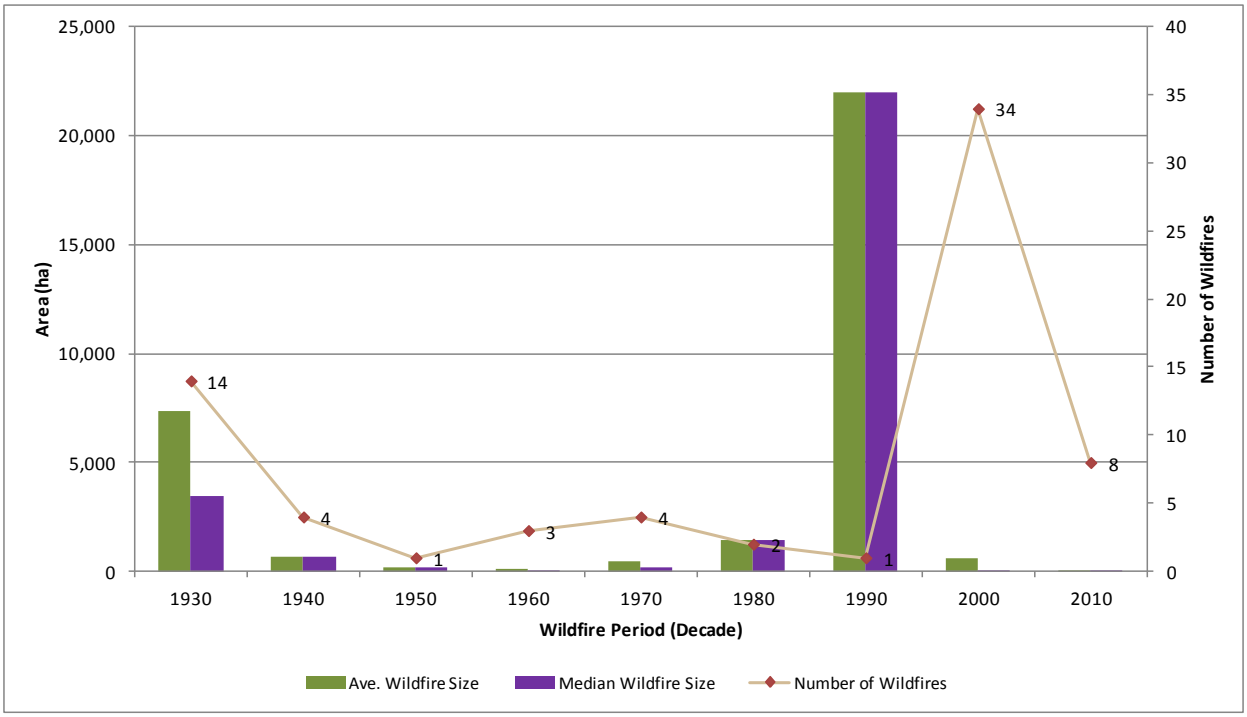
[1] Note that the area used for percent calculation is only the Region's Green and White Area.

[2] The 2010 'decade' includes only 2 years of data.



(NB: The 2010 'decade' includes only 2 years of data)

Figure 4-5 Wildfire Size Statistics by Decade



(NB: The 2010 'decade' includes only 2 years of data)

Figure 4-6 Average and Median Wildfire Size by Decade

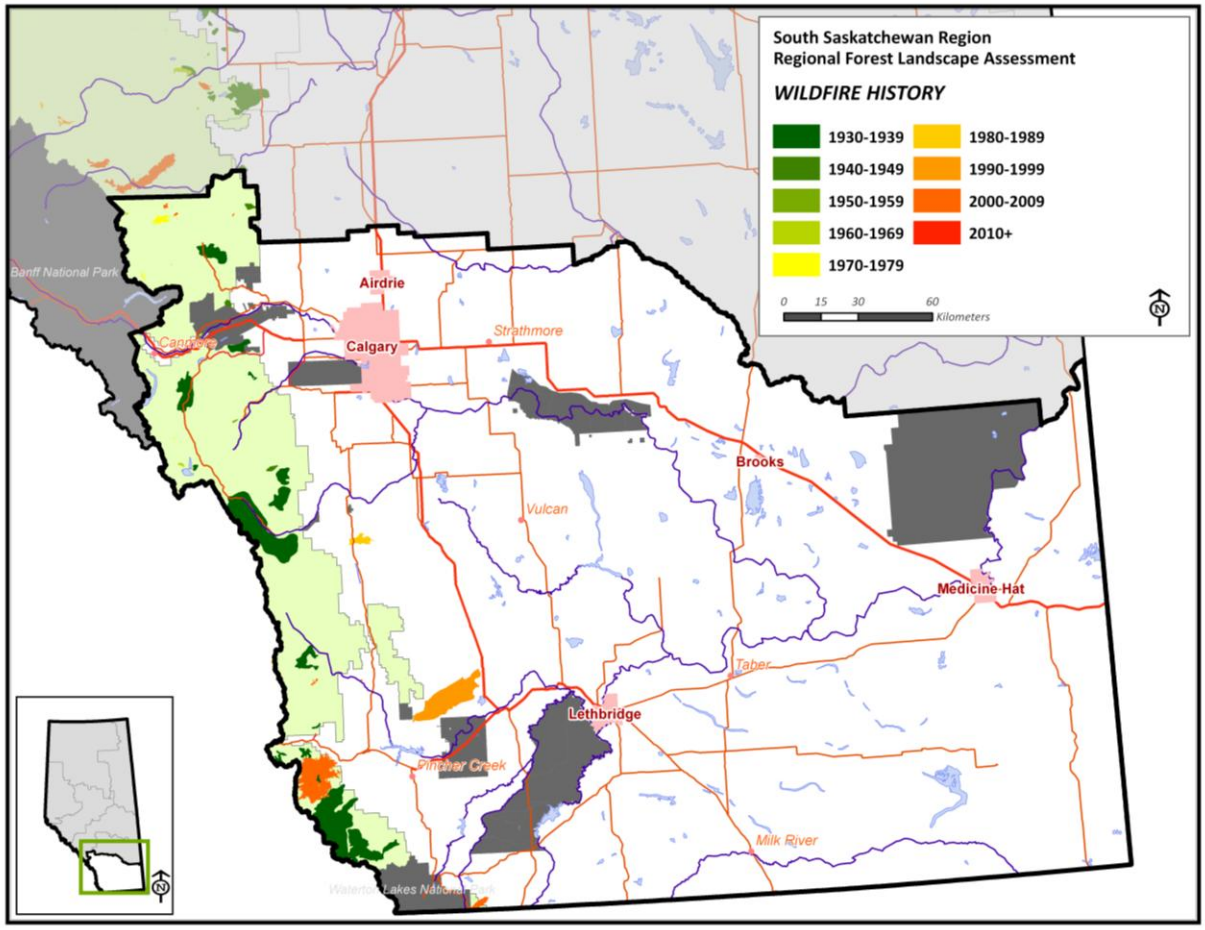


Figure 4-7 Wildfire Distribution by Decade

4.6 Timber Harvesting

Timber harvesting has been a component of anthropogenic disturbances in the South Saskatchewan since the beginning of the province. From the time of the transfer of resource management from the Federal government to the provincial government in 1930 (Alberta 1930) until approximately the mid-1950's, forest harvesting was generally for local or regional use. Two FMA holders now operate in the Region. The primary manufacturing is at Spray Lakes Sawmills who operate a dimension sawmill and pressure treated production facility in Cochrane. A summary of total harvest area and number of harvest areas by decade is displayed in Table 4-4.

Much of the early harvesting in the Region was the result of historic species preference (coniferous removed from mixedwood stands or product preference based on tree size (for example, sawlogs versus other products). In many cases, these activities would not result in complete removal of the stand (a clearcut). However, the area summaries presented in Table 4-4 do not account for partial stand removal; rather, they assume complete removal. In that respect, the area summaries may slightly over estimate the area of harvesting. Recent management activities such as green retention or shelterwood operations resulting from the implementation of specific forest management strategies, also result in partial clearings over full clearcuts.

For the purposes of this report and for spatial mapping, the source data for this metric was spatial harvest area boundaries (30, 31) and forest inventory information (23). Harvest area boundaries represent the boundary of a specific harvest activity and carry their associated year of harvest; inventory information (which is stand based, rather than block based) may or may represent a single harvest activity, and in many cases, may not have a year of harvest. In many cases, the harvest activity is evident on the inventory photography, but the actual date of the activity was not traceable.

The information presented in Table 4-4 represents all the known harvest area in the Region based on both harvest boundary and inventory datasets. The number of actual harvest events is difficult to assess as the inventory data (in many cases) does not distinguish individual harvest boundaries. The count provided in Table 4-4 is a best approximation based on the information available.

Table 4-4 Summary of Harvesting by Decade

	Total Harvested Area		Number of Harvest Areas		Average Harvest /Year [1]
Year of Harvest	(ha)	(%)	Count	(%)	(ha)
1950-1959	58	0	8	0	29
1960-1969	3,330	5	320	6	370
1970-1979	5,110	7	499	10	511
1980-1989	7,997	12	735	15	800
1990-1999	16,497	24	1,410	28	1,650
2000-2009	17,333	25	970	19	1,733
2010 [2]	1,331	2	71	1	666
Unclassified	16,897	25	1,046	21	
Total	68,553	100	5,059	100	

[1] The Average harvest per year is based on the number of reported years in each decade.

[2] The 2010 decade contains only 1 year of data

The amount of area being harvested annually has been increasing steadily as shown in Table 4-4 and Figure 4-8. However, much of the harvesting activity from the 1950's and 1960's may not be included in this summary as historic information is not available.

An overview map of all harvesting activity by decade is shown in Figure 4-9.

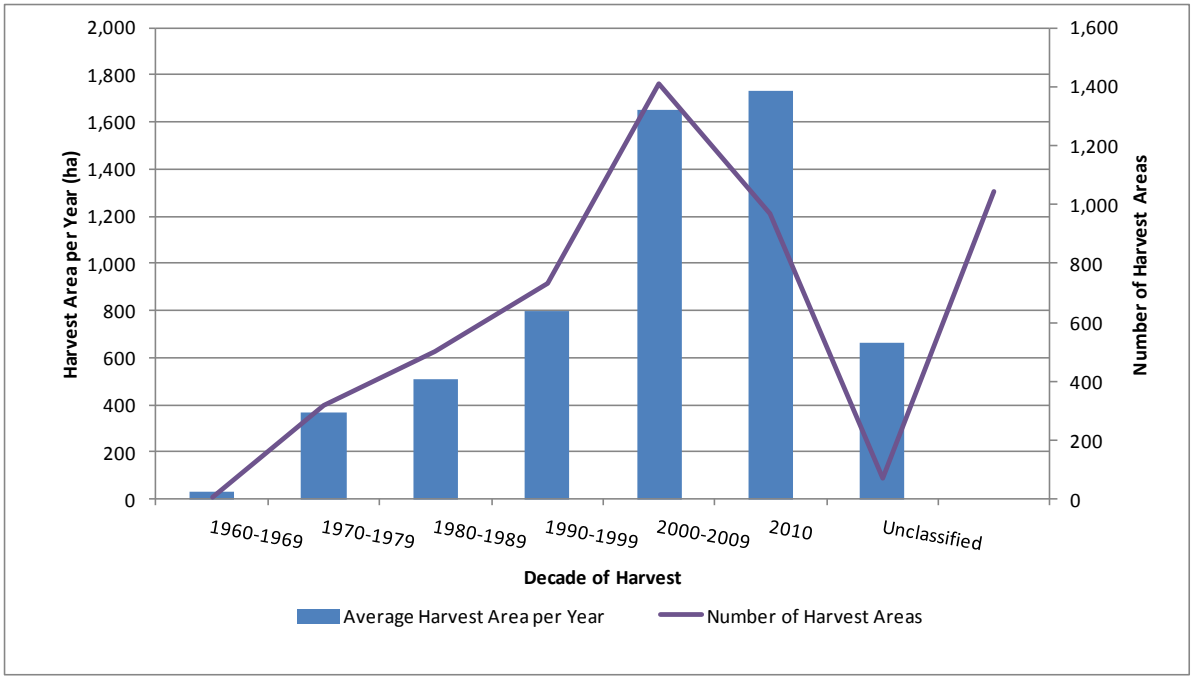


Figure 4-8 Average Annual Area and Count of Harvesting Activity

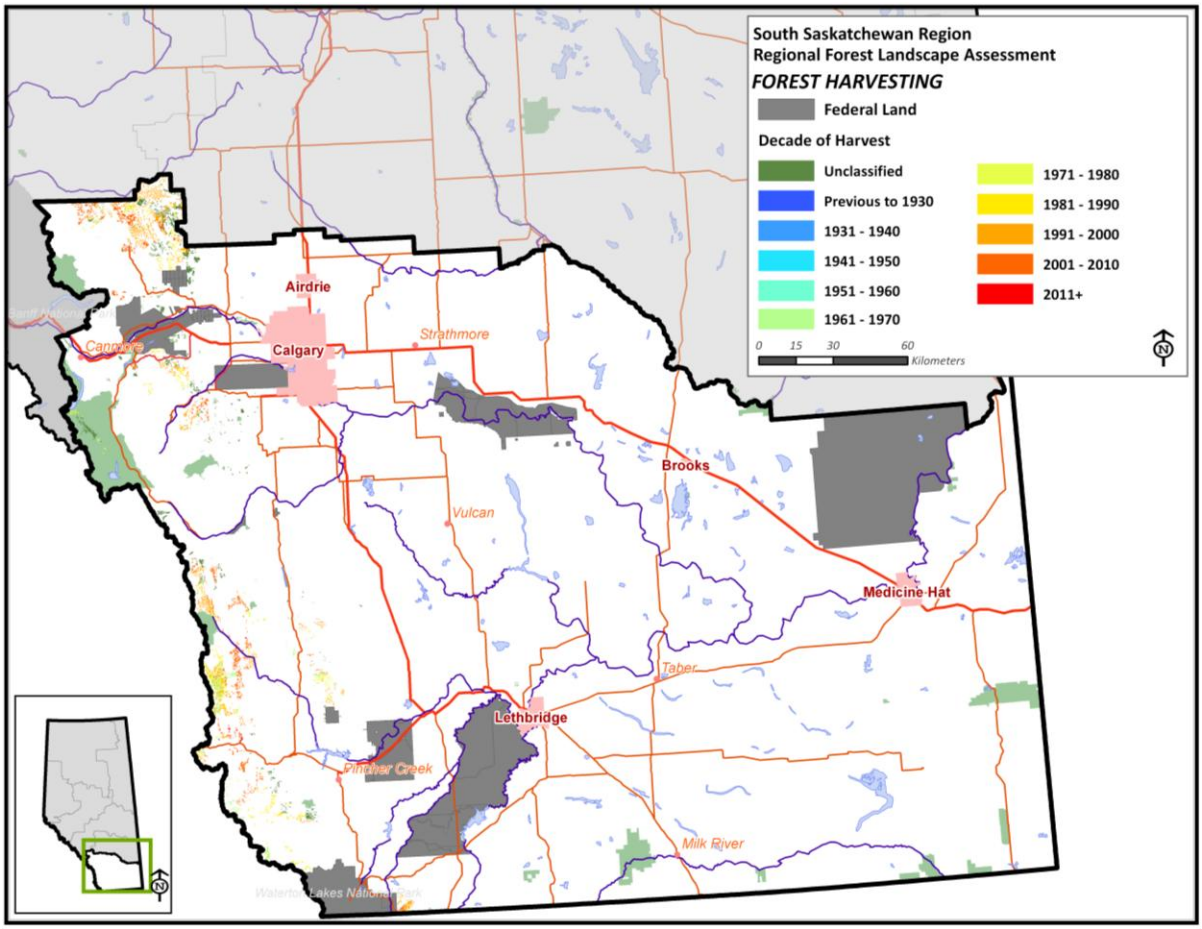


Figure 4-9 Harvest Area by Decade

4.7 Access

There is a well-developed network of roads in the South Saskatchewan Region (32). The White Area road development is coincident with agricultural and cultural (e.g.: towns, villages) expansion. In the Green Area, resource exploration and extraction (e.g.: forestry, oil and gas, coal) have been the main driver of road development.

Figure 4-10 shows the major transportation routes in the Region, including the railroad access. In this map, note that only major paved and all-season gravel roads are displayed. The main transportation corridors are:

- Trans-Canada Highway: Highway 1 running northwest-southeast from Canmore, east through Calgary and Medicine Hat, to the Saskatchewan border. The Trans-Canada Highway is a major corridor for truck transport of goods.
- Highway 2: running south through Calgary to the US border
- Highway 3: running east - west from Medicine Hat through Crowsnest Pass to the BC border.
- Highway 22: running south from Calgary to Crowsnest Pass. This is the main corridor accessing the Green zone in this Region.

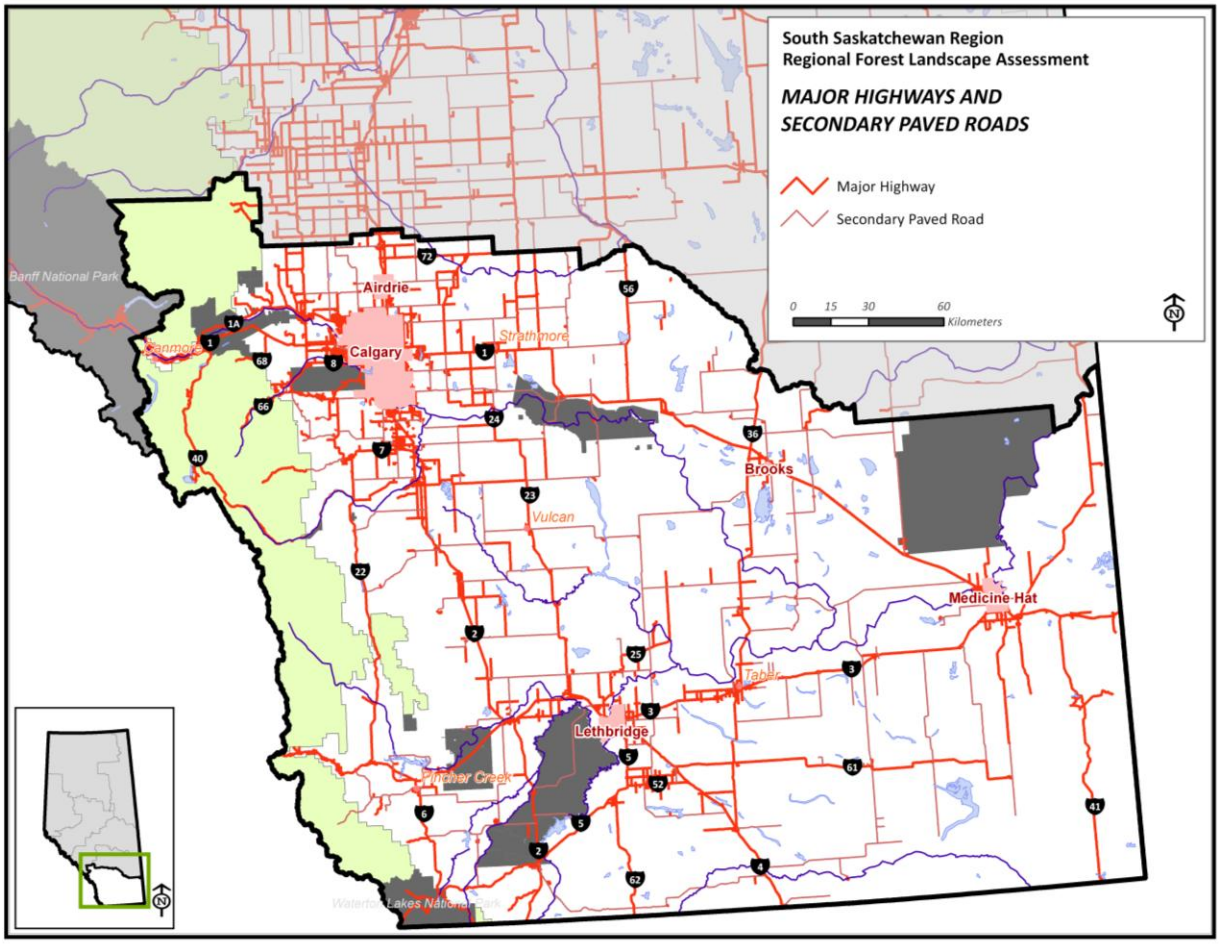


Figure 4-10 Major Transportation Access

Table 4-5 summarizes the length of road by road class within each of the Green Area, White Area and Federal lands. At only 1,076 kilometers, road development in the Green Zone. There is more road development in the White Area and this would be expected primarily due to agricultural activities.

Table 4-5 Length of Road by Class and Location

Road Classification	Length of Roads (km)			
	Green Area	White Area	Federal Lands	Total
Major Highway	276	10,188	166	10,631
Secondary Paved Road	23	3,260	7	3,290
Gravel Road	774	23,989	1,511	26,275
Winter Road / Unclassified	2	309		311
Trail suitable for Vehicle Access		1		1
Total Roads	1,076	37,747	1,685	40,507
Railway	0	2,023	9	2,032

A map of all road classes (plus railway access) is shown in Figure 4-11.

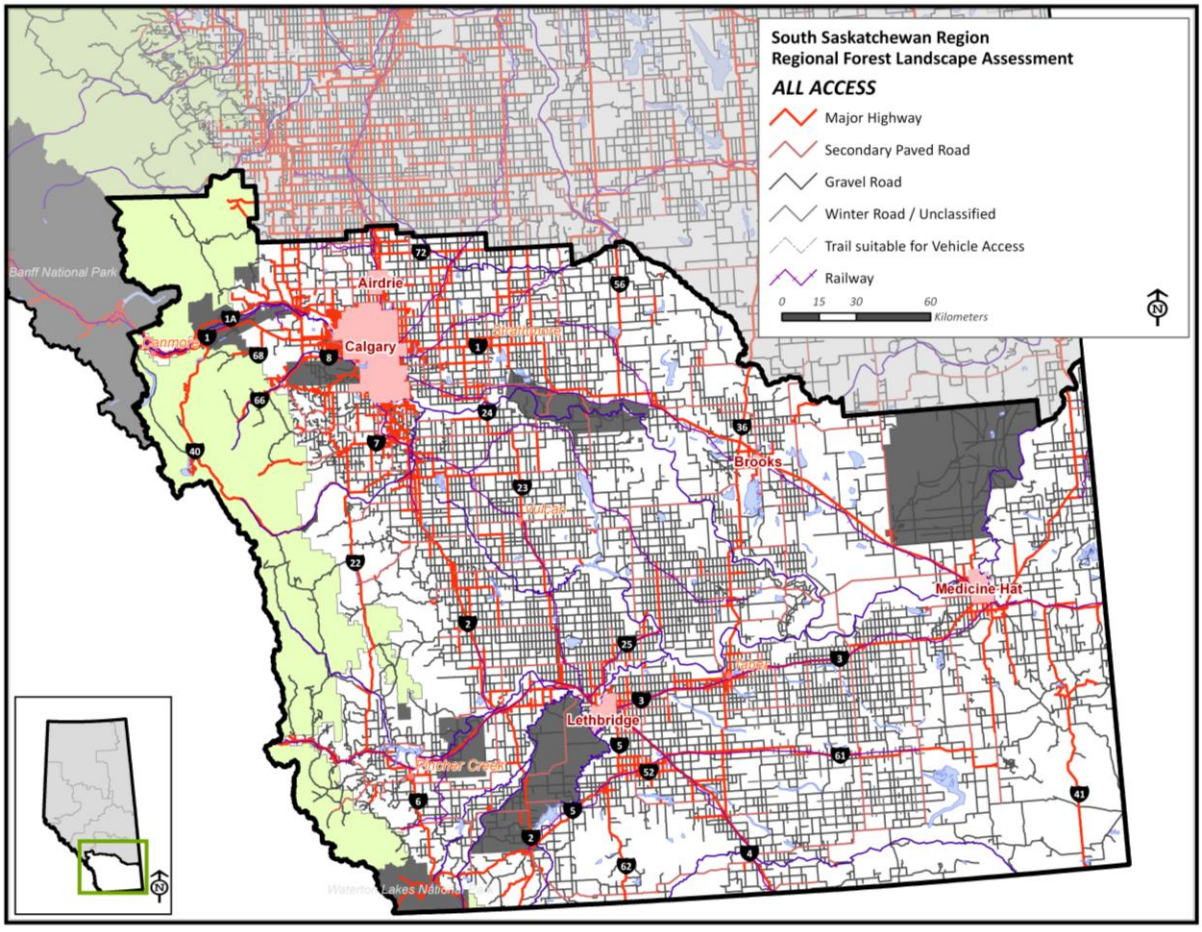


Figure 4-11 All Road Access by Road Class

4.8 Industrial Development

The energy sector accounts for the majority of disposed surface dispositions in this Region (33). As indicated in Table 4-6, the highest percentages of dispositions have been issued to these types: License of Occupation, Pipeline Agreement, and Mineral Surface Lease. A License of Occupation typically is for all season road access to specific areas. Pipelines connect well sites, so naturally there are a high proportion of pipeline dispositions located in the Region A Mineral Surface Lease can be issued for a number of energy industry facilities; the most common feature in this Region are oil or gas well sites.

Table 4-6 Land-use Dispositions

			Distribution		
Description	Type	Number of Dispositions	Area (ha)	Percentage of All Dispositions (%)	Area as Percentage of Region[1] (%)
Easement	EZE	1,251	6,183	9	0
Licence of Occupation	LOC	3,839	21,753	32	0
Mineral Surface Lease	MSL	12,948	17,522	26	0
Pipeline Installation Lease	PIL	433	233	0	0
Pipeline Agreement	PLA	8,379	20,202	29	0
Rural Electrification Agreement	REA	311	1,303	2	0
Right of Entry Agreement	ROE	605	1,468	2	0
Vegetation Control Easement	VCE	9	11	0	0
Total		27,775	68,675	100	1

[1] Note that the area used for percentage calculation is only the Region's Green and White Area.

Figure 4-12 shows the dense development of well sites and pipelines, most predominantly in the west and northeast and southeast parts of the Region. Despite the dense network, the total area occupied by industrial dispositions is 68,675 hectares or only 1% of the Region's area for which dispositions are allocated. The percent area occupied by disposed land is based *only* on the Green and White Areas of the Region (see section 1.2).

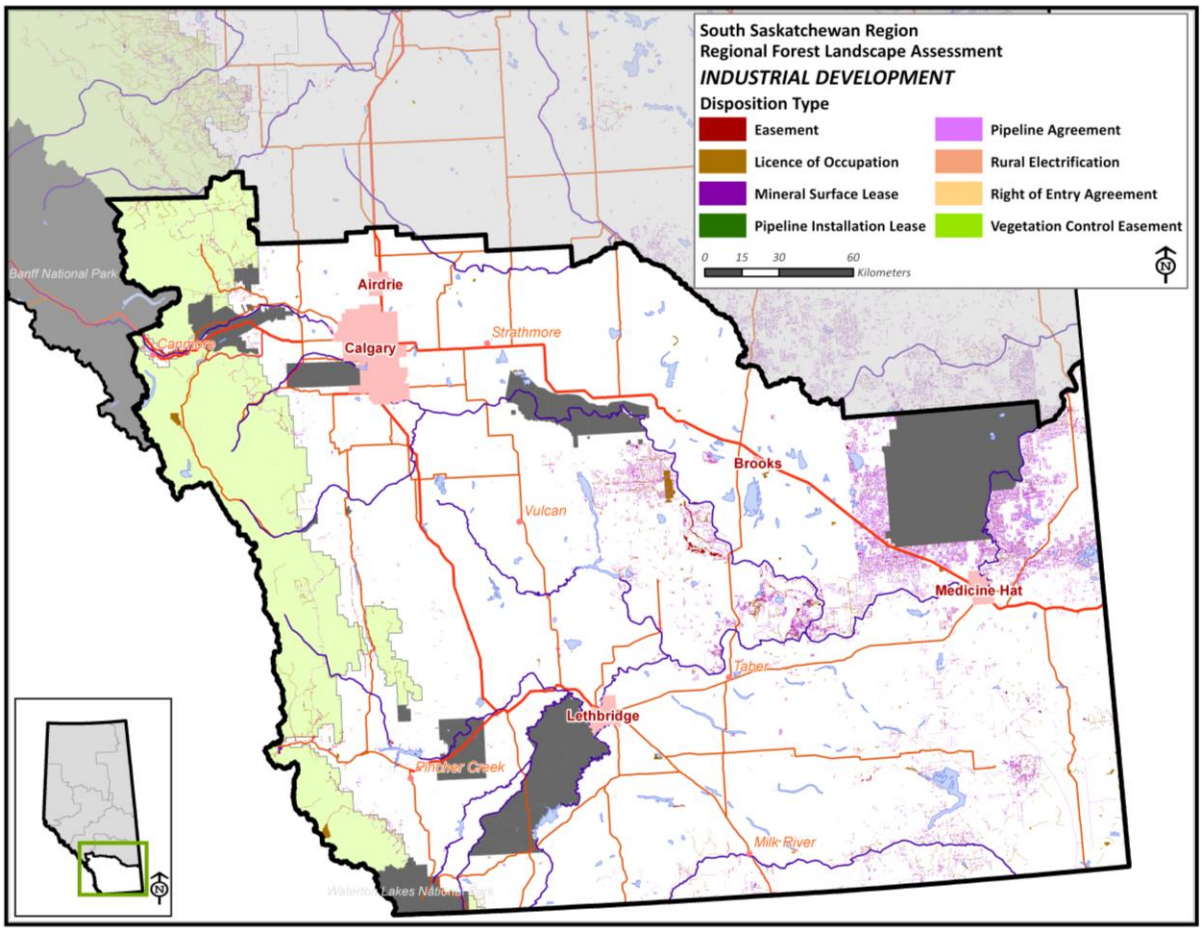


Figure 4-12 Industrial Development under Permit and License

4.9 Monitoring Sites

Permanent monitoring plots have been established throughout the South Saskatchewan Region under a variety of programs. For the purposes of this discussion, 'monitoring programs' are those for which a commitment has been made for ongoing, repeated measurements over time, on a series of established plots. A description of the main types of monitoring systems and programs follows the data summary presented in Table 4-7.

Note that Table 4-7 has values for both the number of installations and the number of plots. A single installation can be comprised of many plots, or it can be a single plot, depending on the type of program under which the plots were established.

In addition, Table 4-7 lists a variety of programs to which the ESRD installations belong. There is no program distinction for either the Alberta Biodiversity Monitoring Institute or Other Agency plots as this information is not available.

Table 4-7 Monitoring Installations

Monitor Plot Classification	Green Area		White Area		Federal Lands		Total	
	No. Installations	No. Plots	No. Installations	No. Plots	No. Installations	No. Plots	No. Installations	No. Plots
ESRD Permanent Sample Plots								
Permanent Sample Plots	72	72					72	72
Reforestation Monitor Plots	37	1,570	14	680			51	2,250
Stand Dynamics Plots	24	24					24	24
Other PSP (Special Projects)	11	11					11	11
Alberta Biodiversity Monitoring Institute								
ABMI Sample Grid	25	25	156	156	17	17	198	198
Other Agency Permanent Sample Plots								
ISP Registered	34	34					34	34
Total	203	1,736	170	836	17	17	390	2,589

The distribution of monitoring sites across the South Saskatchewan Region is displayed in Figure 4-13.

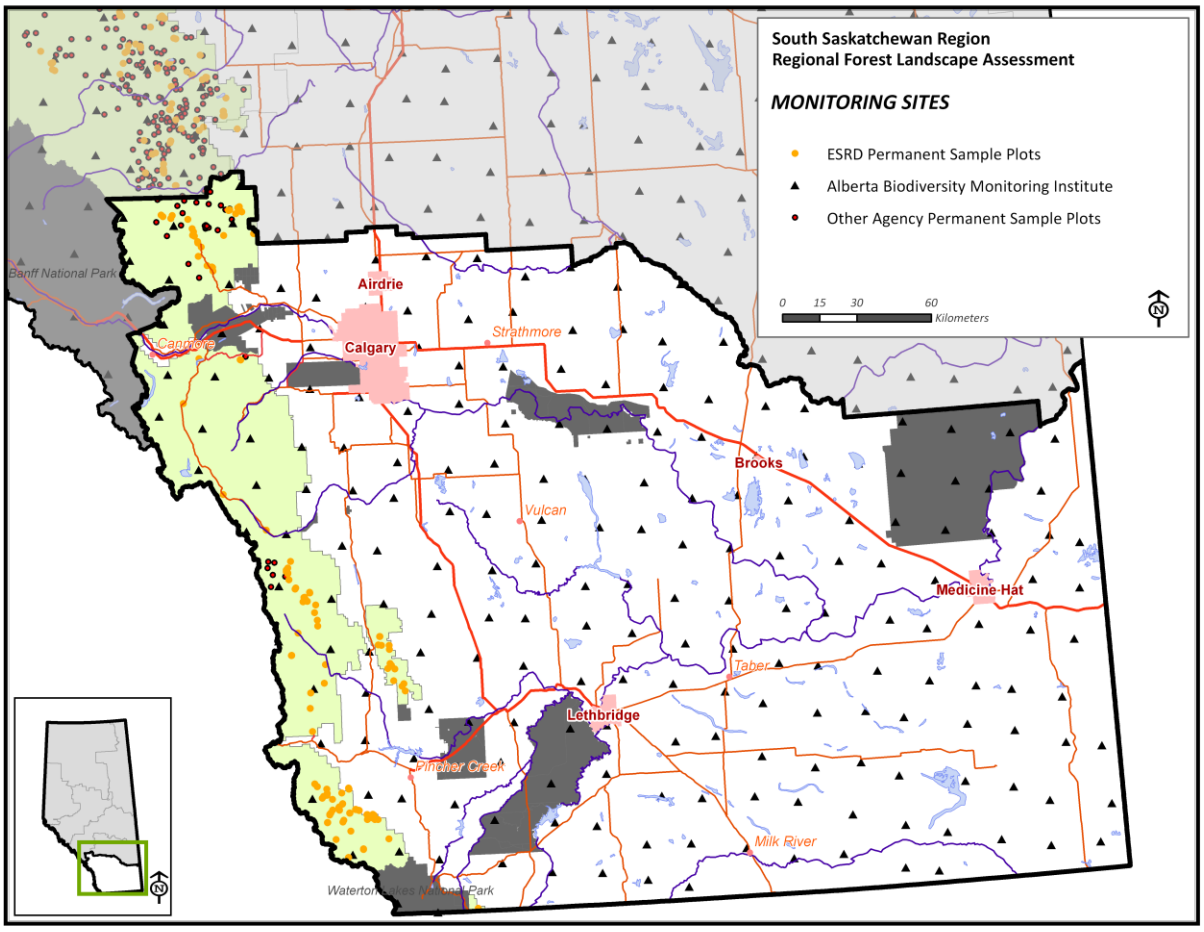


Figure 4-13 Location of Permanent Monitoring Sites

4.9.1 ESRD Permanent Sample Plots

ESRD has been actively managing a variety of programs which involve the use of permanent sample plots (PSP) since the early 1960's (35).

Protection and Registration.

Locations of all installations are registered with the Public Lands, Land Status Automated System (LSAS). Most registrations are designated as Protective Notation (PNT), Consultative Notation (CNT) or Disposition Reservation (DRS). In these cases, any proponent of industrial activity near a PSP must consult with the Department prior to any development to assess potential impact to the sample plot. The Department may give permission for the activity to proceed, but in return it may request compensation to re-establish the plot post-disturbance.

Permanent Monitoring Programs

Permanent Sample Plots	Permanent sample plots have been established since 1960, primarily in mature stand types representative of the most common forests in Alberta. Initially, their purpose was to provide volume estimates for the purpose of yield curve construction. Two sample designs are in place. The initial design involves an installation comprised of four plots. A later design (approximately 1980) revised the PSP installation to be a single plot. The re-measurement cycle for an installation is either 5 or 10 years, depending on stand age.
Reforestation Monitor Plots	Reforestation monitor plots were first established in the early 1980s for the purpose of monitoring the initial stand development (from initial planting to approximately 8-10 years old). An installation is typically made up of 40 plots, distributed over a grid on newly reforested cutblocks. The measurement cycle is annual or bi-annual.
Stand Dynamics Plots	Stand Dynamics plots are similar in nature to the Reforestation Monitor Plots, however their target dynamic is the stand age after the successful establishment of a new forest to the juvenile stand development stage. Re-measurement schedule is approximately 2 years.
Other PSP (Special Projects)	There are a variety of special projects for which additional permanent sample plots have been installed. Some examples are to monitor stand development: (a) in response to mountain pine beetle infestation; (b) following specific wildfire events, or (c) in response to a local or regional forest growth issue (e.g.: spruce budworm, blowdown event).

4.9.2 Alberta Biodiversity Monitoring Institute

The Alberta Biodiversity Monitoring Institute (ABMI) conducts monitoring of more than 2,000 species and habitats to support decision making about biodiversity in the province. The network of plots (36) is based on a 20km by 20km grid, following the protocol for the Canadian National Forest Inventory (NFI) (Canada 2004).

Protection and Registration.

Locations of all installations are predetermined as per the protocol for the NFI. However, the exact plot locations on the ground are not publicly accessible to maintain an unbiased measure of biodiversity and the human footprint across the province (map locations are within 5.5 km of the actual survey location). Locations are not registered with the Public Lands LSAS system as these points do not require protection of any kind.

Monitoring Program

A total of 1,656 plots are located across the province, of which 198 fall in the South Saskatchewan Region. Due to the systematic layout of the plots, they theoretically are distributed across the Region, in the same proportion as the allocation of Green Area, White Area and Federal land. Locations will be visited once every 5 years, at which time, a variety of terrestrial and aquatic surveys are completed.

4.9.3 Other Agency Permanent Sample Plots

Many other agencies establish and monitor sample plots on an ongoing basis. Many FMA holders maintain PSP programs in addition to other forest growth and yield cooperatives (37).

Protection and Registration.

Locations of most permanent sample plots established by other agencies are registered with the Public Lands, Land Status Automated System as Industrial Sample Plots (ISPs). This designation is similar to the Protective or Consultative Notation of the ESRD plots, but applies to non-government holdings. ISP registration alerts other land users that monitoring plots are in place and if disturbed without permission of the owner, compensation may be required.

Monitoring Program

The PSPs in this class are established for a wide variety of purposes. Some compliment the provincial PSP program and are used for the development of local yield curves; others are collaborative installations established by growth and yield cooperatives. Re-measurement schedules depend on the purpose of the installation.

5. Land Use

5.1 Timber Allocations

Annual allowable cut (AAC) levels are calculated by FMU (section 1.4) and are set or approved by Alberta (38). Table 5-1 lists the FMUs located in the South Saskatchewan Region, along with AAC levels prorated by the proportion of the FMU area located inside the South Saskatchewan Region. Prorating AAC levels was done only for the purpose of comparing relative timber allocations between the various Land-use Framework regions. The values presented here represent the proportion of AAC calculated as at the time of publication of this report. For currently approved AAC information, please contact the Government of Alberta.

Table 5-1 only lists FMUs for which AAC levels have been calculated and published. The map presented in Figure 5-1 shows all the FMUs located in the Region, highlighting those which have AAC levels calculated.

Table 5-1 Current AAC Levels Prorated by FMU Area

FMU		Entire FMU	Portion of FMU located in South Saskatchewan		Proportion of South Saskatchewan occupied by FMU	Annual Allowable Cut (m^3/year) (Prorated to FMU Area)		
Name	Managed by	Area (ha)	Area (ha)	% of FMU	% of South Saskatchewan	Coniferous	Deciduous	Total
B10	FMA	163,553	163,553	100	2	144,944	0	144,944
B9	Crown & FMA	173,659	147,091	85	2	146,580	45,465	192,045
C4	Crown	2,619	2,619	100	0	1,536	0	1,536
C5	Crown	351,490	351,490	100	4	209,414	0	209,414
R10	FMA	587,327	10,762	2	0	25,850	2,886	28,736
Sub-total		1,278,648	675,514		8	528,325	48,351	576,675
No Allowable Harvest Calculated			7,700,918		92	0	0	0
Total			8,376,432		100	528,325	48,351	576,675

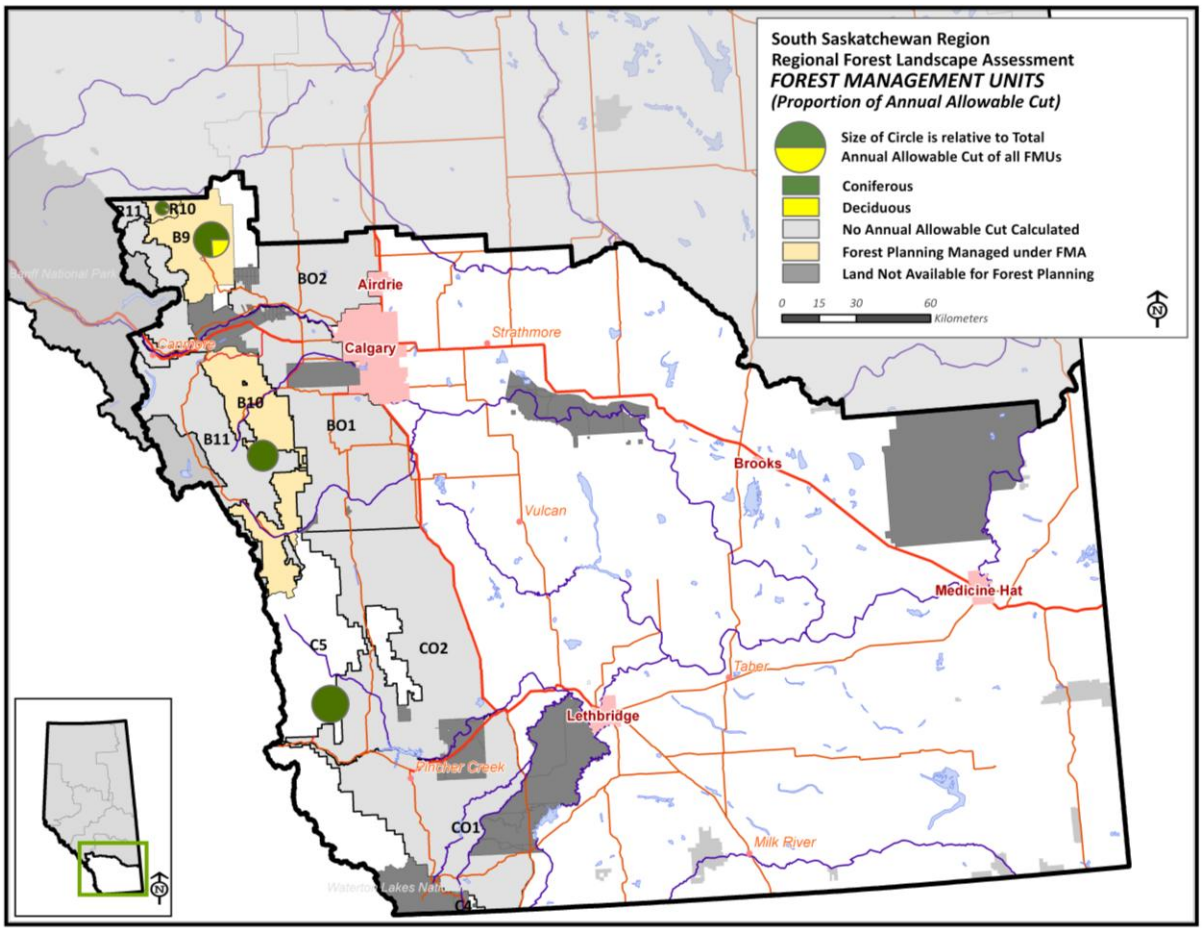


Figure 5-1 FMUs indicating Prorated AACs

5.2 Trapping

The fur trade in Western Canada is often credited with driving the European occupation of modern day Canada (Foster 2007). Permitting and licensing of trappers was introduced by the Alberta Game Act in 1920 and the establishment of Registered Fur Management Areas (RFMA) for furbearer management came about in the early 1940s. The current Wildlife Act (Alberta 2000) regulates open seasons and areas, methods and reporting requirements. Eight Fur Management Zones are used to establish trapping seasons and quotas for some species (fisher, lynx, otter, and wolverine).

The South Saskatchewan Region contains by 46 registered fur management areas (39) (or traplines) totalling 1,028,535 ha or approximately 12 % of the Region (Figure 5-2). The majority of the traplines are in the western portion of the Region, along the Rocky Mountains, with a couple along the southwest border of CFB Suffield and one around Twin Lakes Heritage Rangeland (in the extreme south). The average size of an individual trapline is 20,167 ha, with the largest at 43,068 ha (along the BC border, north of Crowsnest Pass).

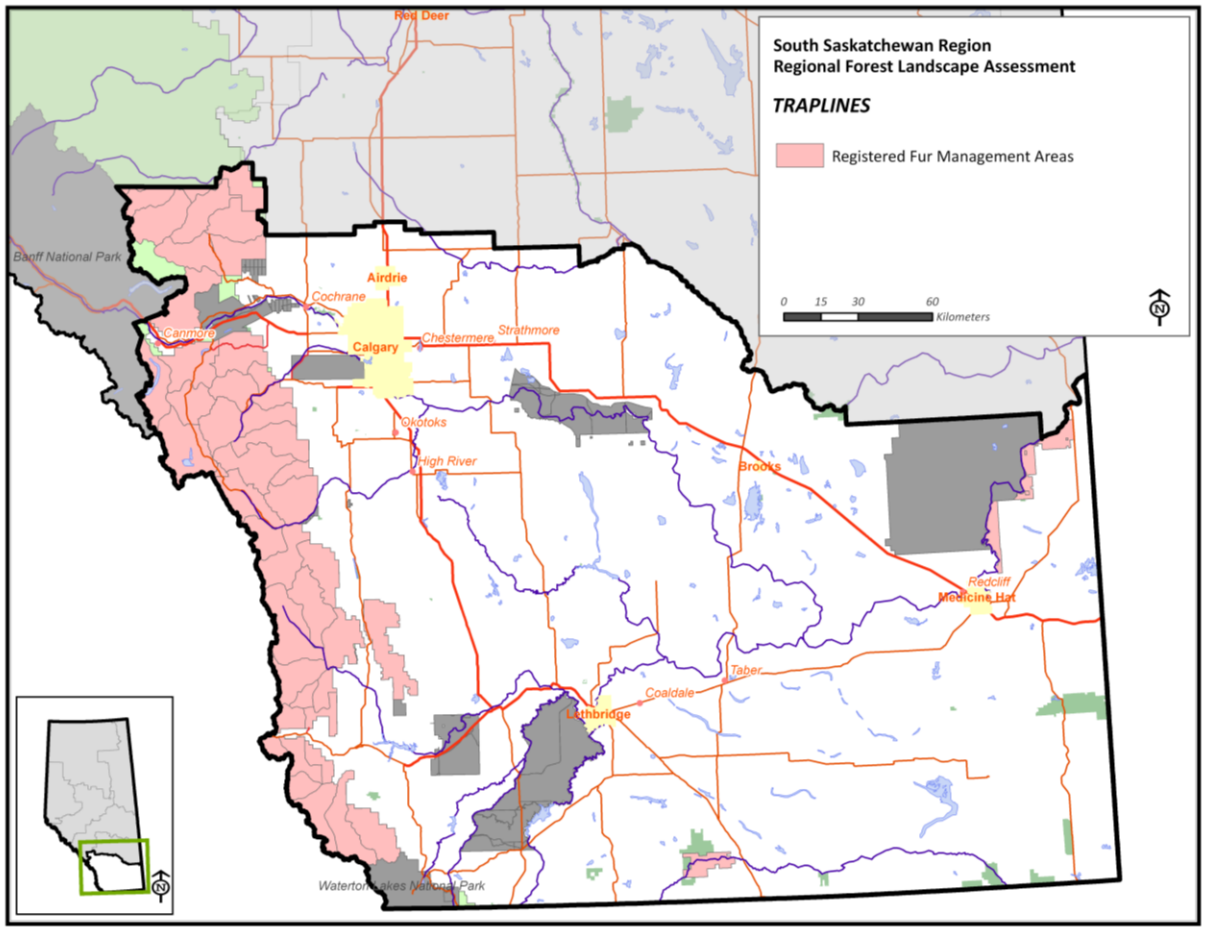


Figure 5-2 Registered Fur Management Areas

5.3 Grazing

Approximately 3.3 million hectares of grazing land is used by livestock producers in Alberta. Various levels of grazing permits are issued based on size, type of forage and landscape. Table 5-2 describes the types of grazing allocations in Alberta (41). Table 5-3 summarizes the area by grazing types across the South Saskatchewan Region (40).

The majority of the grazing dispositions are located in the White Area (Figure 5-3) with only a few allocations stretching into the Green Area.

Table 5-2 Types of Grazing Allocations

Forest Grazing Licence	Long term license (up to 10 years). Renewable. Licensee cannot control public access. Predominantly issued in forested areas where access for other activities (e.g.: recreation, forest harvesting) need to be accommodated.
Grazing Lease	A long term (up to 20 years) authorization to individuals, corporations or associations. Renewable. Access can be controlled with the exception for

	timber harvesting.
Grazing Permit	Short term permits issues on an annual basis and often on land that is fragmented and perhaps periodically wet.
Provincial Grazing Reserve	Not disposed, these are public areas managed by Public Lands for the purpose of providing summer pasture for farmers and ranchers. Access is not restricted for recreational opportunities. Managed by local associations.

Table 5-3 Grazing Dispositions

Type of Disposition	Code	Number	Area in Region (ha)	Percentage of Grazing (%)	Percentage of Region (%)
Forestry Grazing Licence	FGL	3	583	0	0
Grazing Lease	GRL	1,607	1,066,139	91	13
Grazing Permit	GRP	74	7,056	1	0
Provincial Grazing Reserve	GRR	8	103,051	9	1
Total		1,692	1,176,829	100	14

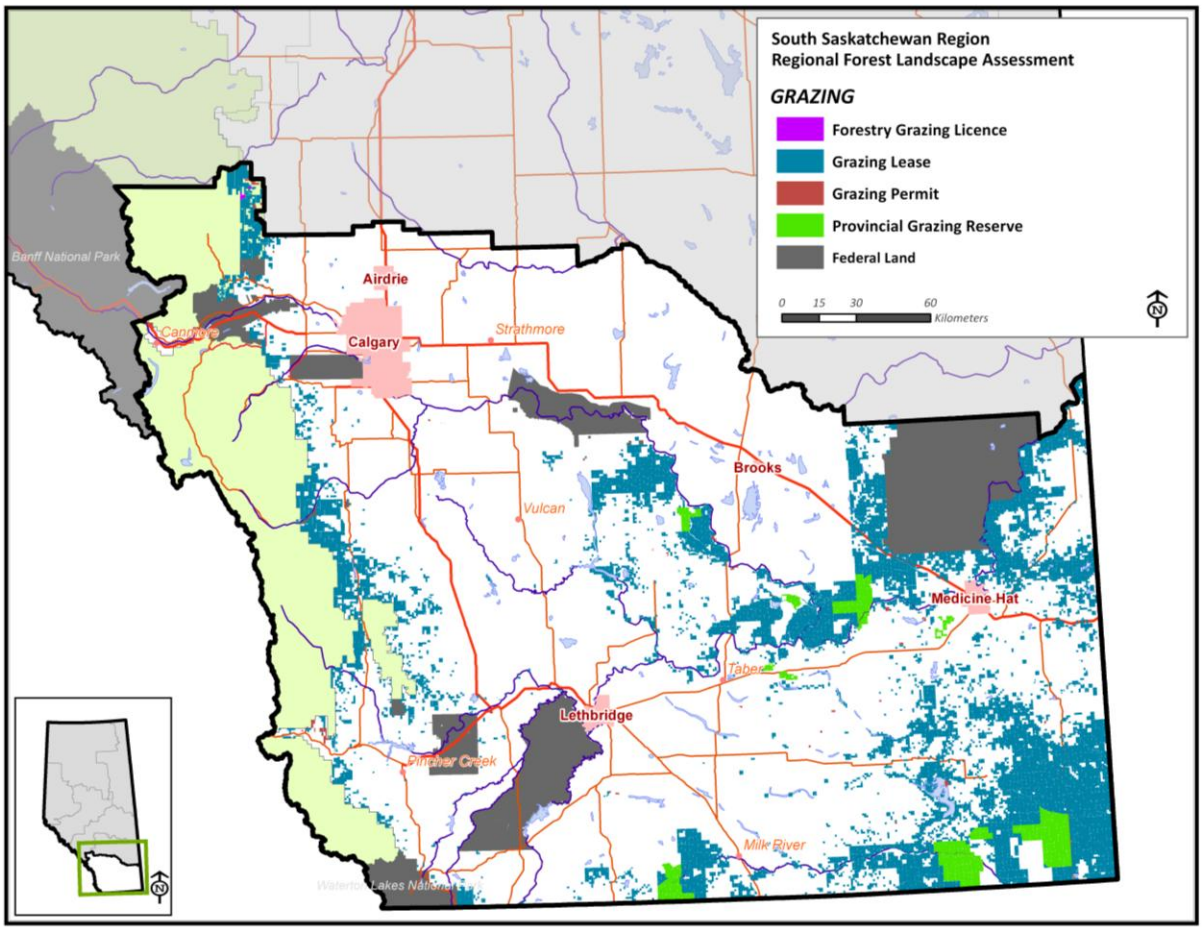


Figure 5-3 Grazing Dispositions

5.4 Guiding and Outfitting

Guides and outfitters are licensed in the province of Alberta and pay annual user fees for their allocations.

In the 1970s, the Alberta government limited bighorn sheep allocations for non-residents to conserve the resource. Up to this time, no restrictions had been placed on big game species. The Professional Outfitters Association of Alberta (POAA) was established in the late 1980's to encourage unity and consensus within the industry. Prior to this a number of organizations had existed. Since 1997, the Alberta Professional Outfitters Society (APOS) has been responsible for managing the outfitting industry on behalf of the government of Alberta.

5.5 Recreation and Tourism

The footills and Rocky Mountains are the primary recreation destinations in the Region; encompassing Kananaskis Country in the north, south to Crowsnest Pass and eventually to Waterton Lakes National Park, which is adjacent to the larger Glacier National Park in Montana. Virtually all recreation opportunities can be found there.

Public Recreation areas along the eastern slopes offer recreational opportunities often not permitted in the mountain parks such as OHV and snowmobiling, in addition to hiking and skiing trails, and wildlife viewing.

Camping and day use areas are available across the Region, many in provincial parks or provincial recreation areas. Figure 5-4 shows the distribution of public recreation areas across the Region. Facilities run by municipalities or towns or private organizations are not included in the analysis.

Public land use zones (43) are listed in Table 5-4. They were created to potentially avoid land use conflicts, often between human and wildlife but also between different user groups.

Table 5-4 Public Land Use Zones

Public Land Use Zone	Area (ha)	Camping	Hiking	OHV	Snowmobile	Equestrian	Cross-country ski	Fishing	Hunting	Purpose
Allison/Chinook	479	X	X		X	X	X	X	X	Separate areas for motorized and non-motorized recreational activities.
Castle Special	100,171	X	X		X	X	X	X	X	Restrict motorized access to certain areas, and protect
Cataract Creek Snow Vehicle	46,324	X	X		X		X	X	X	Provide snowmobiling opportunities in the Cataract Creek area.
Dormer/Sheep	10,616	X	X		X	X	X	X	X	Provide year-round access for non-motorized and equestrian use. Access for OHV on designated trails. Motorized boats NOT permitted.
Ghost	125,099	X	X		X	X	X	X	X	Minimize conflicts between stakeholders and other resource values in the Ghost-Waiparous area.
The Kananaskis Country	112,762	X	X			X	X	X	X	Prevent conflicts between mororized and non-motorized recreational activities.
McLean Creek Off-Highway Vehicle	20,175	X	X	X	X	X	X	X	X	Provide an area for off-highway vehicle (OHV) use.
Panther Corners	1,873	X	X			X	X	X	X	Provide a year-round network of trails for non-motorized and equestrian use. No motorized access.
Sibbald Snow Vehicle	9,723	X	X		X	X	X	X	X	
Willow Creek	4,733	X [1]	X		X [2]	X	X	X	X	Reduce environmental impacts associated with random camping
Total	431,955									

[1] random camping only permitted in designated nodes.

[2] ony snow vehicles with a weight not exceeding 363 kg (800 lbs) are permitted.

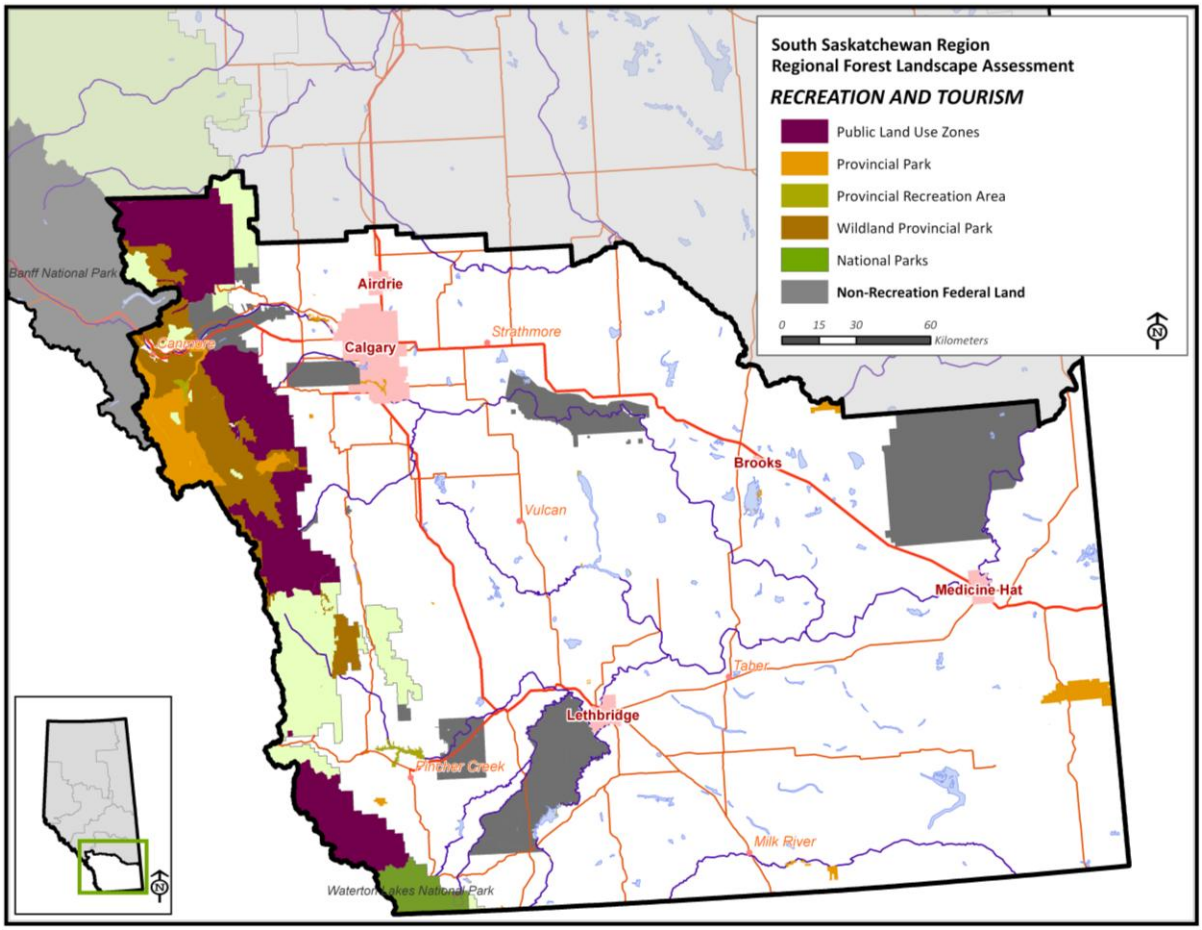


Figure 5-4 Recreation and Tourism Opportunities

5.6 Cultural and Historical Resources

The Listing of Historic Resources (44) identifies lands that contain or are believed to contain historic resources, including primarily archaeological and paleontological sites, Aboriginal traditional use sites of a historic resource nature, and historic structures (Figure 5-5). The listing provides industry and other developers with advance notification of possible historic resource concerns. The listing is constantly being updated as new resources are found and updates are published semi-annually.

Each land parcel in the listing is assigned a Historic Resource Value (HRV) ranging from 1 to 5, reflecting their relative importance:

- HRV 1: includes lands designated as Provincial Historic Resources under the Alberta Historical Resources Act, and may identify World Heritage Sites.
- HRV 2: designated as a Municipal or Registered Historic Resource
- HRV 3: contains a significant historic resource that will likely require avoidance
- HRV 4: contains a historic resource that may require avoidance
- HRV 5: believed to contain a historic resource

Table 5-5 outlines the area covered as well as percent area of the historical resources in the Region. A total of 29% (2,407,521 hectares) of the South Saskatchewan Region is covered by features of historical or cultural significance. Archaeological and Paleontological sites are the most plentiful, occupying 60% and 33% respectively (of the listing's total area). There are 11,238 hectares identified as HRV 1; these are spread across the Region.

Table 5-5 Categories and Relative Importance Value (HRV)

	Relative Importance Ranking (HRV)											
	1		2		3		4		5		Total	
Category	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Archaeological	2,251	0		-	32,741	1	187,013	8	1,220,416	51	1,442,421	60
Archaeological, Historical	163	0	1,446	0		-	281	0	5,330	0	7,220	0
Archaeological, Natural				-		-		-	58,490	2	58,490	2
Cultural				-		-	22,951	1		-	22,951	1
Cultural, Historical				-		-	17	0		-	17	0
Geological	65	0			203	0					268	0
Geological, Archaeological	97	0							364	0	461	0
Geological, Historical	694	0									694	0
Geological, Palaeontological	263	0									263	0
Historical	2,430	0	1,962	0	4,622	0	426	0		-	9,440	0
Historical, Archaeological	16	0		-	65	0		-	134	0	215	0
Natural	35	0							69,507	3	69,542	3
Palaeontological	5,225	0		-	64,553	3	35,172	1	690,589	29	795,539	33
Total	11,238	0	3,407	0	102,184	4	245,861	10	2,044,831	85	2,407,521	100

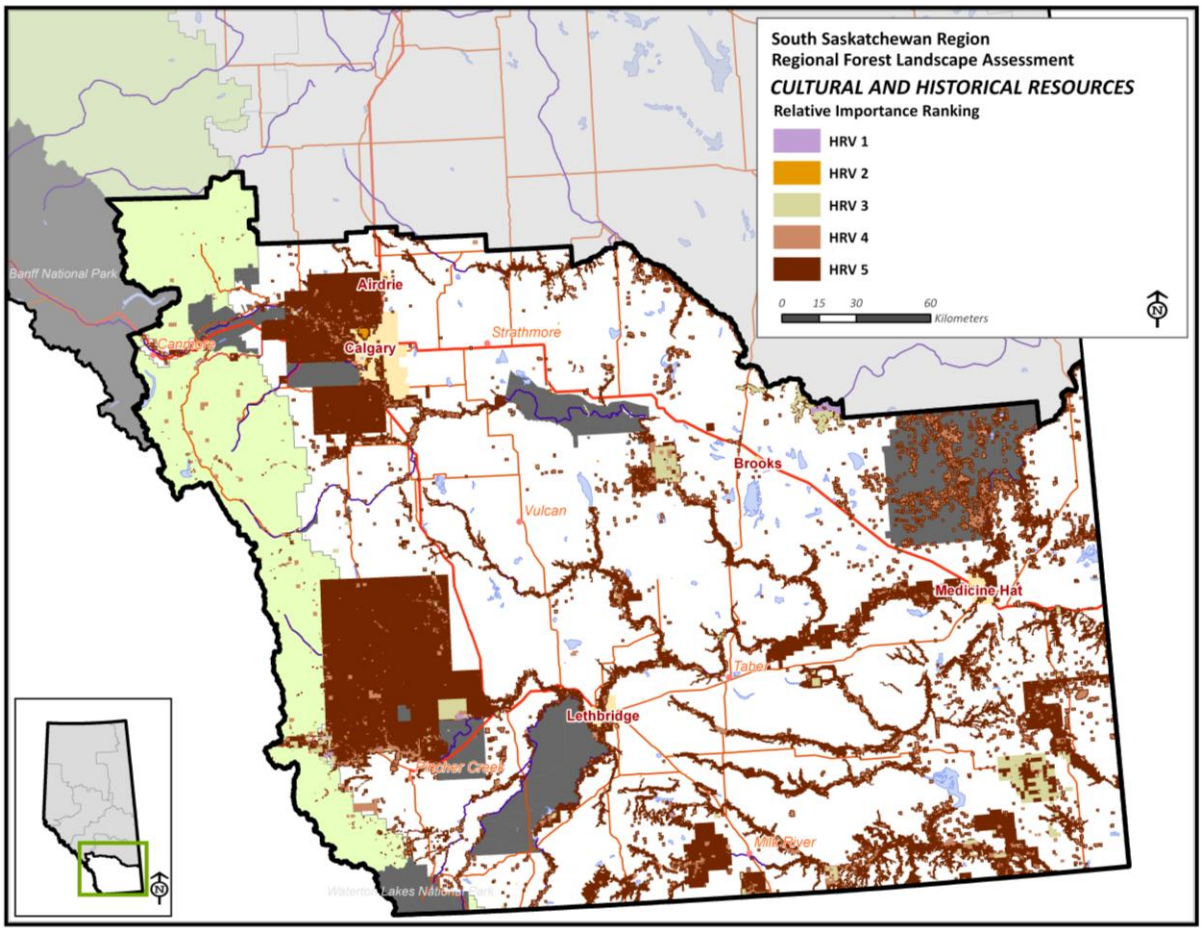


Figure 5-5 Areas of Historic Resource Value

5.7 Visual Resources

Numerous high value visual areas are known to exist in the Region but no formal inventory has been compiled. They mainly occur along travel corridors and within recreational areas. Kananaskis Country, west of Calgary provides users of the park with scenic vistas and landscapes. Waterton Lakes National Park is known for its beautiful scenery associated with mountainous terrain. River valleys in this region range from deep cut banks through the badland area to slow winding rivers across the prairies.

The region supports a great deal of canoeing routes on rivers such as the Bow River, Crowsnest River, and Milk River affording views through the canyons and across the prairies.

5.8 Fish and Wildlife Resources

5.8.1 Management Zones

Fish and Wildlife management and regulation is divided into zones across the province. Table 5-6 outlines the size of each Management zone (45) within the South Saskatchewan region. Figure 5-6 shows the distribution of those districts.

Table 5-6 Fish and Wildlife Districts

Fish and Wildlife District Name	Entire District Area (ha)	Portion of District in South Saskatchewan Area (ha)	Portion of District in South Saskatchewan %	Proportion of South Saskatchewan occupied by District %
Blairmore	327,158	327,134	100	4
Brooks	829,248	626,291	76	7
Calgary	84,835	84,835	100	1
Canmore	410,909	410,925	100	5
Cardston	491,730	491,730	100	6
Claresholm	544,888	544,888	100	7
Cochrane	437,855	437,855	100	5
Foremost	788,068	788,068	100	9
High River	519,046	519,046	100	6
Lethbridge	1,196,412	1,196,412	100	14
Medicine Hat	1,319,763	1,319,761	100	16
Pincher Creek	285,588	285,588	100	3
Strathmore	704,944	704,853	100	8
Vulcan	589,169	589,169	100	7
Sub-total	8,529,614	8,326,556		99
No Fish and Wildlife District		49,876		1
Total		8,376,432		100

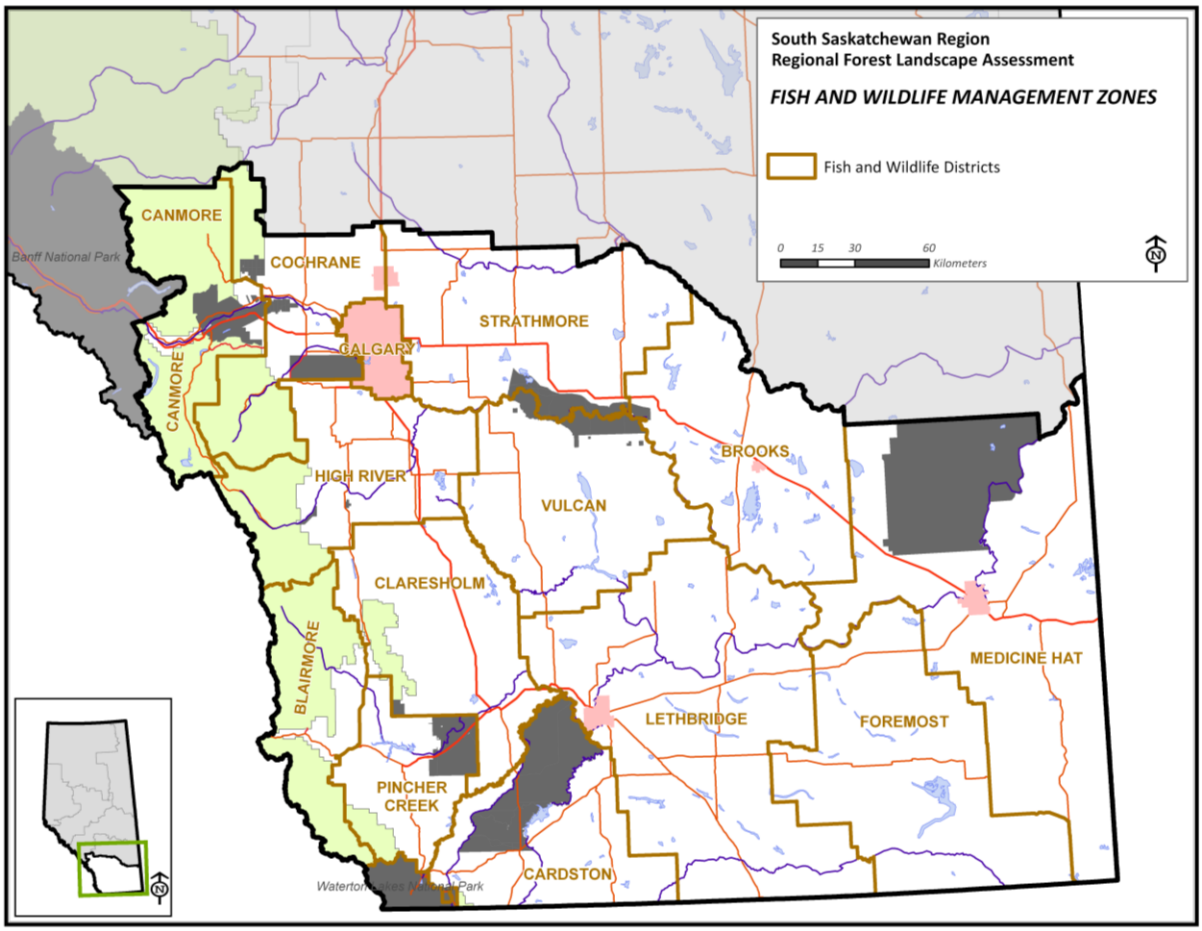


Figure 5-6 Fish and Wildlife Districts

5.8.2 Fisheries

Fish Management Zones (46) are used to determine fisheries health, regulate sport and commercial fishing, and determine fish stocking. Fish Management Zones are further subdivided into Fish Watershed Units which are based on specific river basins. Sport fishing regulations apply at the Watershed Unit level, or in some cases regulations are site specific to locations (lakes, streams) within a Watershed Unit.

Table 5-7 Fish Management Zones

Fish Management Zone	Entire Zone Area (ha)	Portion of Zone in South Saskatchewan Area (ha)	(%)	Proportion of South Saskatchewan occupied by Zone (%)
Parkland-Prairie Zone	15,539,920	5,829,650	38	70
Eastern Slopes Zone	12,264,460	2,496,906	20	30
Sub-total	27,804,380	8,326,556		99
No Fish Management Zone		49,876		1
Total		8,376,432		100

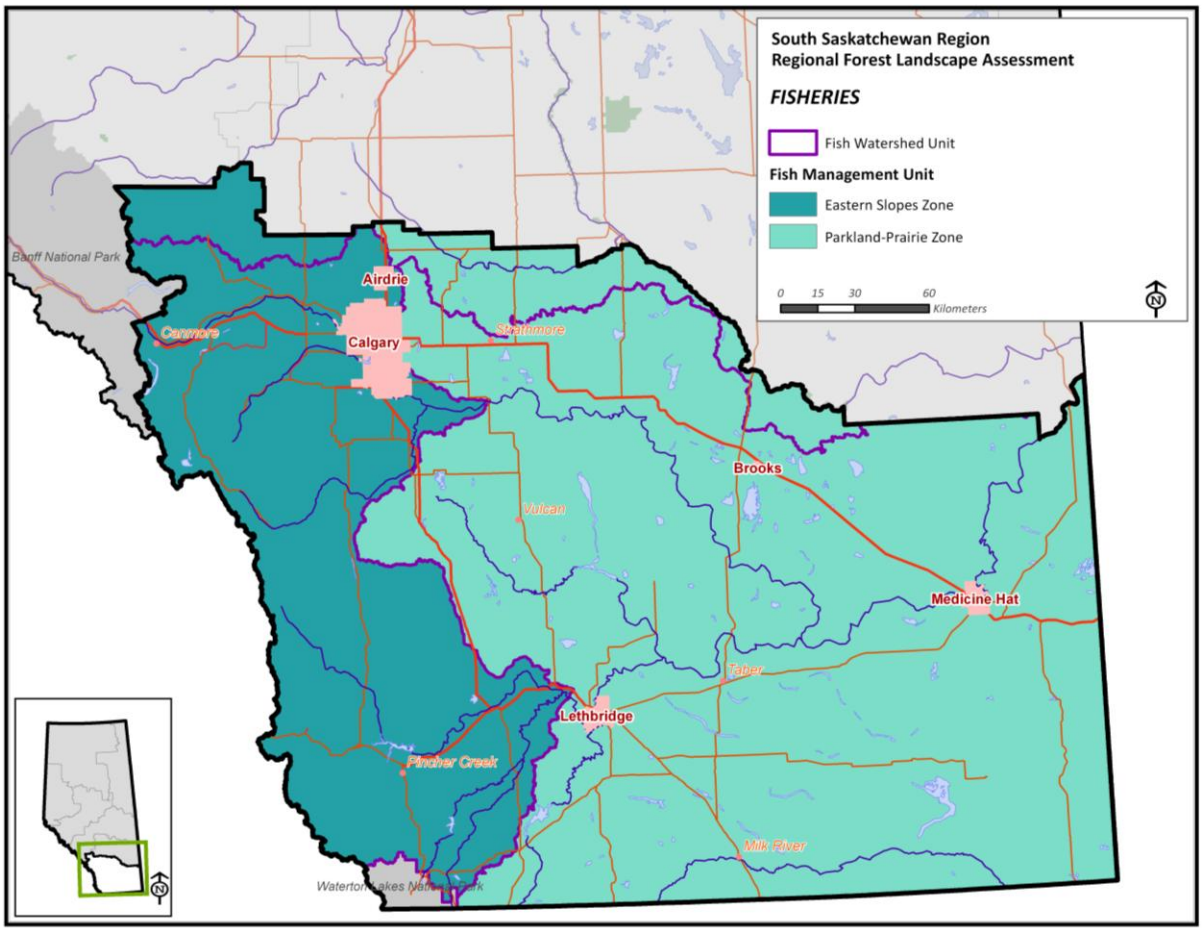


Figure 5-7 Fish Management Units and Fish Watershed Units

5.8.3 Wildlife

Wildlife sensitivity zones (Table 5-8 and Figure 5-8) are derived from aerial surveys, historical information, movements of collared animals and specific habitat type requirements. They are used by industrial operators and government departments in operational decision making on Crown land. In addition, these zones provide everyone with the best information currently available on the extent of wildlife sensitivities in Alberta.

The list of species is not exhaustive for the Region but identifies species that ESRD has listed as a concern related to the development of industrial activities. A Landscape Analysis Tool (LAT) has been developed to incorporate the Wildlife Sensitivity zones (47) when planning industrial activity. Reporting from the LAT allows for informed decisions, risk mitigation and adherence to standards.

Table 5-8 Wildlife Sensitivity Zones

Wildlife Species	Area of Wildlife Sensitivity within Alberta (ha)	Portion of Wildlife Sensitivity Zone in South Saskatchewan (ha)[1]	(%)	Proportion of South Saskatchewan occupied by Sensitivity Zone (%)
Burrowing Owl *(Athene cunicularia)* Range	5736218	3973087	47	69
Eastern Short-Horned Lizard (*Phrynosoma douglassii brevirostre*) Range	221036	221036	3	100
Greater Sage Grouse (*Centrocercus urophasianus*) Habitat				
- Habitat	204,062	204,062	2	100
- Buffer	128,201	128,201	2	100
Grizzly Bear (*Ursus arctos horribilis*)				
- Core Habitat	3,726,439	658,325	8	18
- Secondary Habitat	2,476,588	188,072	2	8
Mountain Goat (*Oreamnos americanus)* and Sheep (*Ovis canadensis*)	1,246,003	490,158	6	39
Ord's Kangaroo Rat (*Dipodomys ordii*) Range	169364	80758	1	48
Piping Plover (*Charadrius melodus*) Habitat	53,435	17,488	0	33
Sharp-tailed Grouse (*Pedioecetes phasianellus*)	15,810,566	6,934,361	83	44
Swift Fox (*Vulpes velox*)	604457	604457	7	100
Trumpeter Swan (*Cygnus buccinator*)	538,615	5,754	0	1
Colonial Nesting Birds	46,319	11,704	0	25
- American White Pelican (*Pelecanus erythrorhynchos*)	14,911	6,980	0	47
- Great Blue Heron (*Ardea herodias*)	31,408	4,724	0	15
Endangered and Threatened Plants Range	446,944	364,225	4	81
- Porsild's Brym (*Bryum porsildii*)	367	28	0	8
- Small-flowered Sand Verbena (*Tripterocalyx micranthus*)	151,101	136,435	2	90
- Soapweed (*Yucca glauca*)	35,944	35,941	0	100
- Tiny Cryptanthe (*Cryptantha minima*)	259,096	191,385	2	74
- Western Spiderwort (*Tradescantia occidentalis*)	435	435	0	100
Sensitive Raptor Range [2]	33,006,540	21,721,205		66
- Bald Eagle (*Haliaeetus leucocephalus*)	4,382,724	1,497,867	18	34
- Ferruginous Hawk (*Buteo regalis*)	9,168,331	6,416,950	77	70
- Golden Eagle (*Aquila chrysaetos*)	8,601,626	6,894,452	82	80
- Peregrine Falcon (*Falco peregrinus*)	13,246	314	0	2
- Prairie Falcon (*Falco mexicanus*)	10,840,613	6,911,621	83	64
Sensitive Amphibian Range	5,907,072	3,912,718	47	66
Sensitive Snake Range	1,185,147	799,642	10	67
Key Wildlife and Biodiversity Zone	4,689,713	747,509	9	16
Total Area of South Saskatchewan		8,376,432		

[1] Zones overlap each other (see Figure 5-8), so the areas are not additive

[2] Sensitive Raptor Range contains overlapping Ranges of 5 species of Raptors.

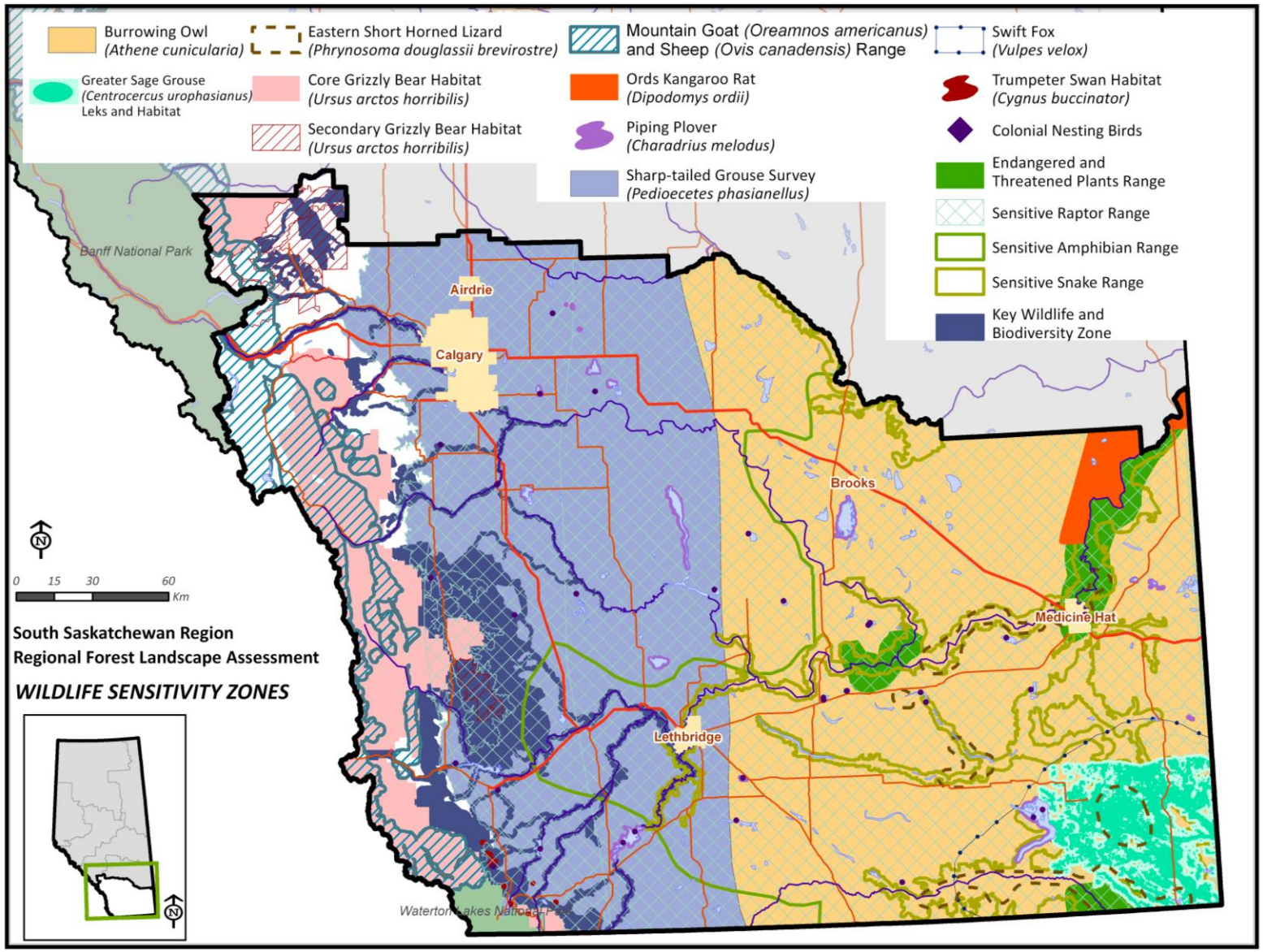


Figure 5-8 Wildlife Sensitivity Zones

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7. Glossary

Glossary	
Term	**Definition**
ABMI	See Alberta Biodiversity Monitoring Institute
AVI	see Alberta Vegetation Inventory
Alberta Biodiversity Monitoring Institute (ABMI)	The ABMI was incorporated in 2007 as a registered not-for-profit member-based organization.. The ABMI measures and provides information on the state of Alberta's biodiversity in order to facilitate the responsible management of the environment.
Alberta Vegetation Inventory (AVI)	AVI is an air-photo based inventory in the province of Alberta. The inventory includes a set of defined specifications for the classification of vegetation as well as specifications for the digital capture of polygon boundaries.
Brunisolic	Very poorly developed soil with a thin topsoil layer. One of three soil orders for forested soils in Canada. Typically developed from sandy parent materials and will often have a slightly acidic or basic pH.
Chernozemic	A productive, well-developed soil with a thick, rich topsoil layer. Typically develop in parent materials ranging from coarse sands to fine-textured silts and clay loams. These soils are found in the grassland and aspen parkland natural regions. The best agricultural land in Alberta is on this soil type.
Cryosolic	Mineral or organic soils that have a permanently frozen layer within one metre of the soil's surface.
ecoclimate	Classification using climate as an ecological factor.
ecoclimatic province	A broad complex of ecoclimatic areas that have similar climatic conditions as reflected by vegetation (Strong 1992).
FMA	see Forest Management Agreement
FMU	see Forest Management Unit
Forest Management Agreement (FMA)	A large, area-based agreement between Alberta and a company, giving the company rights to establish, grow, harvest and removed timber from a defined area of land. An FMA is typically granted for 20 years and are renewable.
Forest Management Unit (FMU)	A forest management unit is a Crown-defined area which is the basis of calculating a sustainable supply of timber. Allowable harvest levels within an FMU are then allocated under the Alberta forest tenure system.
FRAGSTATS	FRAGSTATS is a computer program designed to quantify landscape metrics. Chosen metrics are those typically associated with habitat characteristics (patch size, shape, contiguity, connectivity, etc.). It was developed at the University of Massachusetts, first released for public use in 1995 and currently is published as version 4.0.

Glossary	
Term	**Definition**
Gleysolic	A distinctive soil that results from being saturated with water for long periods of time. This soil is not productive, and is unable to retain nutrients. The water-saturated conditions also reduce the rate of transformation of organic matter which can lead to the build up of organic matter on the surface of mineral Gleysolic soils.
HRV	see Historic Resource Value
Historic Resource Value	An index related to relative importance of historical and cultural features as identified and assigned by Alberta Culture.
National Forest Inventory (NFI)	Canada's National Forest Inventory (NFI) monitors a network of sampling points covering one percent of Canada's land mass on an ongoing basis to provide accurate, timely and consistent information on the state and sustainable development of Canada's forests. This information is shared with collaborators and the public and is used to provide credible information to inform domestic forest policies and positions, and to support science initiatives, and regional, national and international reporting commitments.
NFI	see National Forest Inventory
LAT	see Landscape Analysis Tool
Landscape Analysis Tool	The Landscape Analysis Tool is a web-enabled tool allowing users to plan activities on Alberta land with the purpose of identifying operational constraints which may apply to the activity. The generated report provides provinicial and sensitivity section approval standards and operating conditions that are specific to a proposed activity.
Luvisolic	Soil that has large organic but low humus content. Nutrients are easily washed out of the topsoil and therefore this type of soil is not as productive as the Chernozems soils. Parent materials of Luvisolic soils are typically well supplied with base cations and have loamy or clay domiinated soil textures.
Organic	A soil that is made up of mostly organic, natural material. Usually refers to peat, bog or fen soils. The wetland variants of Organic soils are associated with landscape positions where water accumulates and saturates the soil. Upland versions of these soils are composed of leaf litter and other woody debris.
Permanent Sample Plot (PSP)	A sampling program installed with the express purpose to measure biological metrics on a repeated basis. Such plots are typically revisited on a fixed schedule, depending on the purpose of the programme. In many cases, the plot locations are protected under a provincial disposition, requiring authority from the plot owner for the plot to be accessed or disturbed.
Podzolic	Podzols are forested soils found primarily on sandy parent materials in areas underlain by igneous rocks. Can be prone to cementation of layers within the soil profile. Cemented layers anc form barriers to vertical penetration of tree roots and water, leading to water saturation above the cemented layer.

Glossary	
Term	**Definition**
PSP	See Permanent Sample Plot
Regosolic	Poorly developed soil that has a thin topsoil layer. This soil does not retain nutrients well. Commonly associated with landforms where the land surface is (or has recently been) unstable. Because of the instability, the soils has had little time to develop and hence soil horizons are weakly expressed.
Solonetzic	A typical grassland soil usually found in a subhumid or semiarid climate under grass and shrub vegetation. These typically occur in the same ecozones as Chernozemic soils. Developed primarily from glacial re-working of sedimentary rocks. Typcially the A horizon is depleted of clay which has been deposited in the B horizon.
Seral stage	The series of progressive plant communities that develop during ecological succession from bare ground to the climax stage. A seral stage is defined by species composition and time since stand development.
Vertisolic	Vertisolic soils are found on parent materials high in clay. Lacustrine sediments high in clay were often deposited in the deepest parts of glacial lakes. Vertisolic soils are associated with these flat, level lacustrine surfaces.The mixing of soil material caused by wet/dry cycles (leading to swelling/contraction of the soil layers) is characterisitic of Vertisolic soils. Common throughout the Pairies, but have a limited extent in other regions of Canada.

APPENDIX I Named Towns and Villages in the South Saskatchewan

Table 7-1 List of Towns

Town Name	Population (2010)
Bassano	8,721
Black Diamond	868
Bow Island	12,586
Canmore	1,534
Cardston	1,215
Chestermere	2,033
Claresholm	818
Coaldale	6,534
Coalhurst	6,893
Cochrane	1,512
Crossfield	2,848
Fort Macleod	761
Granum	1,019
High River	1,664
Irricana	1,192
Magrath	2,125
Milk River	7,636
Nanton	823
Okotoks	2,078
Picture Butte	2,192
Pincher Creek	7,231
Raymond	891
Redcliff	1,010
Stavely	5,632
Strathmore	14,177
Taber	1,876
Turner Valley	1,232
Vauxhall	5,834
Vulcan	4,472
Total	107,407

Table 7-2 List of Villages

Village Name	Population (2010)
Arrowwood	197
Barnwell	172
Barons	465
Beiseker	374
Carmangay	232
Champion	579
Coutts	515
Cowley	321
Duchess	294
Foremost	175
Glenwood	219
Hill Spring	155
Hussar	393
Lomond	193
Longview	895
Milo	134
Nobleford	429
Rockyford	150
Rosemary	398
Standard	266
Stirling	233
Tilley	444
Warner	847
Total	8,080

APPENDIX II Parks and Protected Areas in the South Saskatchewan

Detailed lists of parks and protected features are provided. The registered park/protected area is noted along with any additional areas that are under Crown Reservation and subject to referral if any industrial activity is being planned for the area. Note that some parks/protected features are not wholly contained in the South Saskatchewan and these are noted in footnotes under each table.

Table 7-3 List of Provincial Parks

Provincial Park	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Beauvais Lake	1,159	1	0
Beaverdam-Paine	0		577
Big Hill Springs	31	0	0
Bow Valley	3,408	3	0
Bragg Creek	129	0	0
Brown-Lowery	277	0	0
Canmore Nordic Centre	629	1	0
Castle River	0	0	37,114
Chain Lakes	397	0	0
Cypress Hills	20,768	17	0
Dinosaur	4,740	4	0
Fish Creek	1,430	1	0
Glenbow Ranch	1,329	1	0
Kinbrook Island	527	0	0
Little Bow	82	0	0
Park Lake	144	0	0
Peter Lougheed	51,364	42	0
Police Outpost	214	0	0
Sheep River	6,188	5	0
Spray Valley	25,517	21	0
Tillebrook Trans-Canada Campsite	139	0	0
Willow Creek	80	0	0
Woolford	38	0	0
Writing-on-Stone	2,690	2	0
Wyndham-Carseland	182	0	0
Total	121,462	100	37,691

Table 7-4 List of Wildland Parks

Wildland Park	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Bluerock Wildland	12,697	6	0
Bob Creek Wildland	20,754	10	0
Bow Valley Wildland	37,296	17	0
Don Getty Wildland	62,572	29	0
Elbow-Sheep Wildland	79,955	37	0
Total	213,276	100	0

Table 7-5 List of Provincial Recreation Areas

Provincial Recreation Area	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Beaver Mines Lake	113	1	0
Big Elbow	6	0	0
Bow Valley	3	0	0
Bullshead Reservoir	5	0	0
Burnt Timber	32	0	0
Canyon Creek	0	0	65
Castle Falls	30	0	0
Castle River Bridge	15	0	0
Cat Creek	10	0	0
Cataract Creek	55	1	0
Chin Coulee	1	0	0
Chinook	44	0	0
Cobble Flats	92	1	0
Crane Meadow	4	0	0
Dawson	2	0	26
Dutch Creek	16	0	0
Elbow Falls	96	1	0
Elbow River	236	2	0
Elbow River Launch	12	0	0
Etherington Creek	48	0	0
Evan-Thomas	2,426	24	0
Eyrie Gap	3	0	0
Fallen Timber	2	0	0
Fallen Timber South	47	0	0
Fir Creek	7	0	0
Fish Creek Staging Area	0	0	16
Fisher Creek	11	0	0
Fisher Creek Staging Area	0	0	16
Fitzsimmons Creek	1	0	0
Ghost Airstrip	157	2	0
Ghost Reservoir	24	0	0
Gooseberry	41	0	0
Greenford	2	0	0
Heart Creek	10	0	0
Highwood	28	0	0
Highwood Compound	11	0	0
Highwood Junction	6	0	0
Honeymoon Creek	7	0	0
Indian Graves	15	0	0
Ing's Mine	27	0	0
Island Lake	3	0	0
Jensen Reservoir	9	0	0

Jumpingpound Creek	12	0	0
Lake McGregor	145	1	0
Lantern Creek	11	0	0
Lineham	7	0	0
Little Bow Reservoir	63	1	0
Little Elbow	215	2	0
Livingstone Falls	24	0	0
Lundbreck Falls	10	0	0
Lusk Creek	13	0	0
Lynx Creek	26	0	0
Maycroft	4	0	0
McLean Creek	245	2	0
Mesa Butte	9	0	0
Mesa Butte Equestrian Group Camp	0	0	23
Michelle Reservoir	9	0	0
Mist Creek	16	0	0
Moose Mountain Trailhead	15	0	0
North Fork	17	0	0
Old Baldy Pass Trail	28	0	0
Oldman Dam	4,908	49	0
Oldman River	2	0	0
Oldman River North	39	0	0
Payne Lake	48	0	0
Picklejar	8	0	0
Pine Grove	27	0	0
Pinetop	5	0	0
Prairie Creek	0	0	28
Racehorse	19	0	0
Sentinel	13	0	0
Sibbald Lake	72	1	0
Sibbald Meadows Pond	10	0	0
Sibbald Viewpoint	8	0	0
South Ghost	7	0	0
St. Mary Reservoir	160	2	0
Stoney Creek	12	0	0
Strawberry	42	0	0
Syncline	15	0	0
Travers Reservoir	2	0	0
Trout Pond	2	0	0
Waiparous Creek	90	1	0
Waiparous Creek Group Camp	13	0	0
Waiparous Valley Viewpoint	4	0	0
Ware Creek	4	0	0
Waterton Reservoir	17	0	0
West Bragg Creek	25	0	0
Wildhorse	16	0	0
Wolf Creek	4	0	0
Total	10,099	100	174

Table 7-6 List of Natural Areas

Natural Area	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Beehive	6,734	14	0
Emerson Creek	193	0	0
Highwood River	5	0	0
Milk River	5,544	12	0
Mt. Livingstone	564	1	0
Ole Buck Mountain	359	1	0
Onefour Heritage Rangeland	11,149	23	0
Outpost Wetlands	73	0	0
Prairie Coulees	1,799	4	0
Red Rock Coulee	326	1	0
Ross Lake	1,952	4	0
Sheep Creek	11	0	0
Threepoint Creek	59	0	0
Twin River Heritage Rangeland	19,186	40	0
Wildcat Island	8	0	0
Total	47,962	100	0

Table 7-7 List of Ecological Reserves

Ecological Reserve	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Kennedy Coulee	1,078	32	0
Plateau Mountain	2,333	68	0
West Castle Wetlands	0	0	91
Total	3,411	100	91

Table 7-8 List of Special Management Zones

Heritage Ranch	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Black Creek	7,714	64	0
OH Ranch	4,271	36	0
Total	11,985	100	0

APPENDIX III Data References

Data Source	
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