Regional Forest Landscape Assessment

Lower Peace Region

Prepared for:

Forest Management Branch
Alberta Environment and Sustainable Resource Development

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EXECUTIVE SUMMARY

The Lower Peace Region is one of the seven land-use regions defined in Alberta's Land-use Framework. It spans the north-west portion of Alberta, running easterly from the Alberta-British Columbia border to the eastern edge of Wood Buffalo National Park.

The Region contains significant development of the forest and energy sectors. Eight of the 20 Forest Management Agreement Areas in the province are either entirely or partially located in the Region. Conventional well sites and pipelines are abundant. Agriculture is present in the south central portion of the Region along the Peace River.

Wood Buffalo National Park makes up 19% of the area of the Region and provides significant landscapes of undisturbed forest. In addition, the Park provides unique karst topographies and additional recreation and tourism opportunities. In total, parks and protected areas cover 22% of the Region.

The topography of the Region is fairly uniform. The only significant elevation features are the Clear Hills and Caribou Mountains. The Region's climate and soil have resulted in the development of both coniferous and deciduous forests throughout the Region. There is a large component of wetlands in the Region, occurring mostly in Wood Buffalo National Park.

Forests are mostly in the immature to mature stage of seral stage development and this is confirmed by the age class distribution which indicates that 10% of the Region's forests are in the age class 70-79 years. A significant component of the age distribution (13%) occurs in the 80-89 and 90-99 year classes, which correspond to the large forest fires which occurred in the 1950's.

Threats to the forest come from natural populations of several pests, although the most recent outbreak of mountain pine beetle is proving to be the most significant pest which may impact the future volume of wood that could be extracted. Historical hardwood defoliators were significant in the past but there have been no recorded infestations since 2008.

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 II 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 II . 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 Lower Peace Region

The Lower Peace Region (1), one of seven land-use regions defined in Alberta's Land-use Framework (Alberta, 2008), covers the north-west portion of Alberta, running easterly from the Alberta-British Columbia border to the western edge of the Regional Municipality of Wood Buffalo (see Figure 1-1). The eastern part of the Region contains Wood Buffalo National Park. The Region contains a variety of industrial development, natural resource development and some minor agricultural activity.

The Lower Peace Region is the largest of the seven regions, with an area of approximately 19,217,580 hectares.

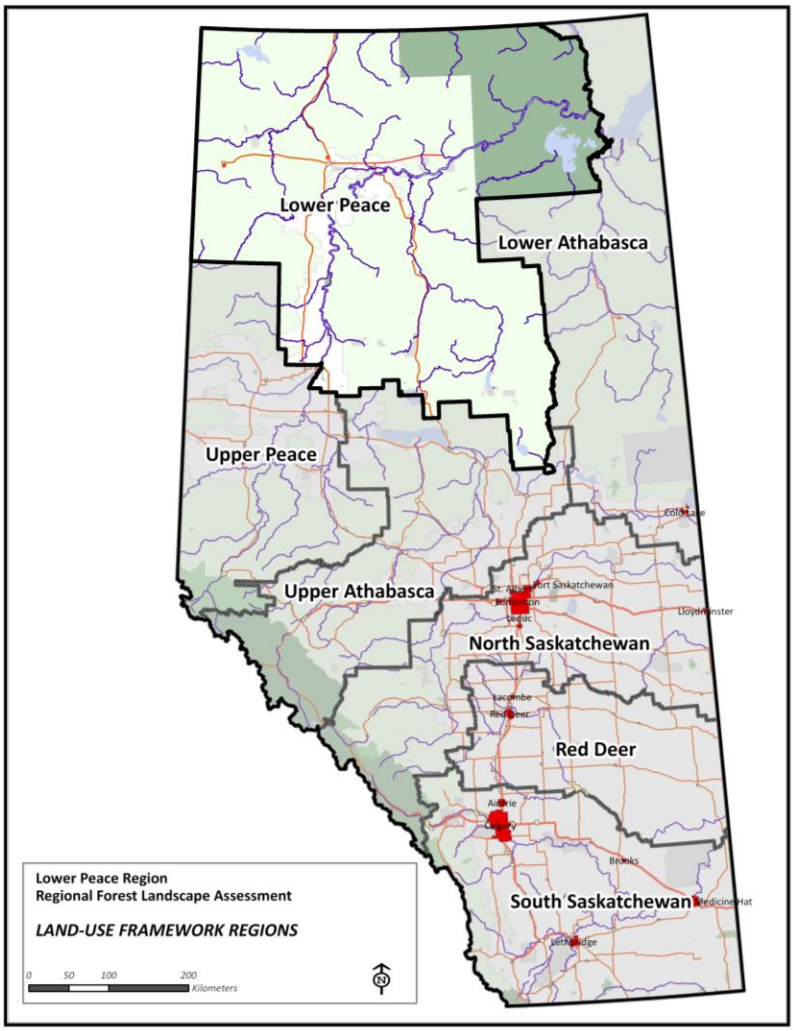


Figure 1-1 Lower Peace Region

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 is primarily made up of private land holdings related to agricultural use. The Green Area is primarily owned by the Crown, and managed for natural resource development, recreation and conservation.

As summarized in Table 1-1, approximately 73% of the Lower Peace Region is Green Area, 7% is White Area and the remaining 20% is occupied by lands managed by the Federal government. 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	14,097,263	73
White Area	1,358,732	7
Federal Lands	3,761,585	20
Total	19,217,580	100

The White Area is concentrated along highway 35 which parallels the Peace River as well as a small portion in the extreme south east of the Region.

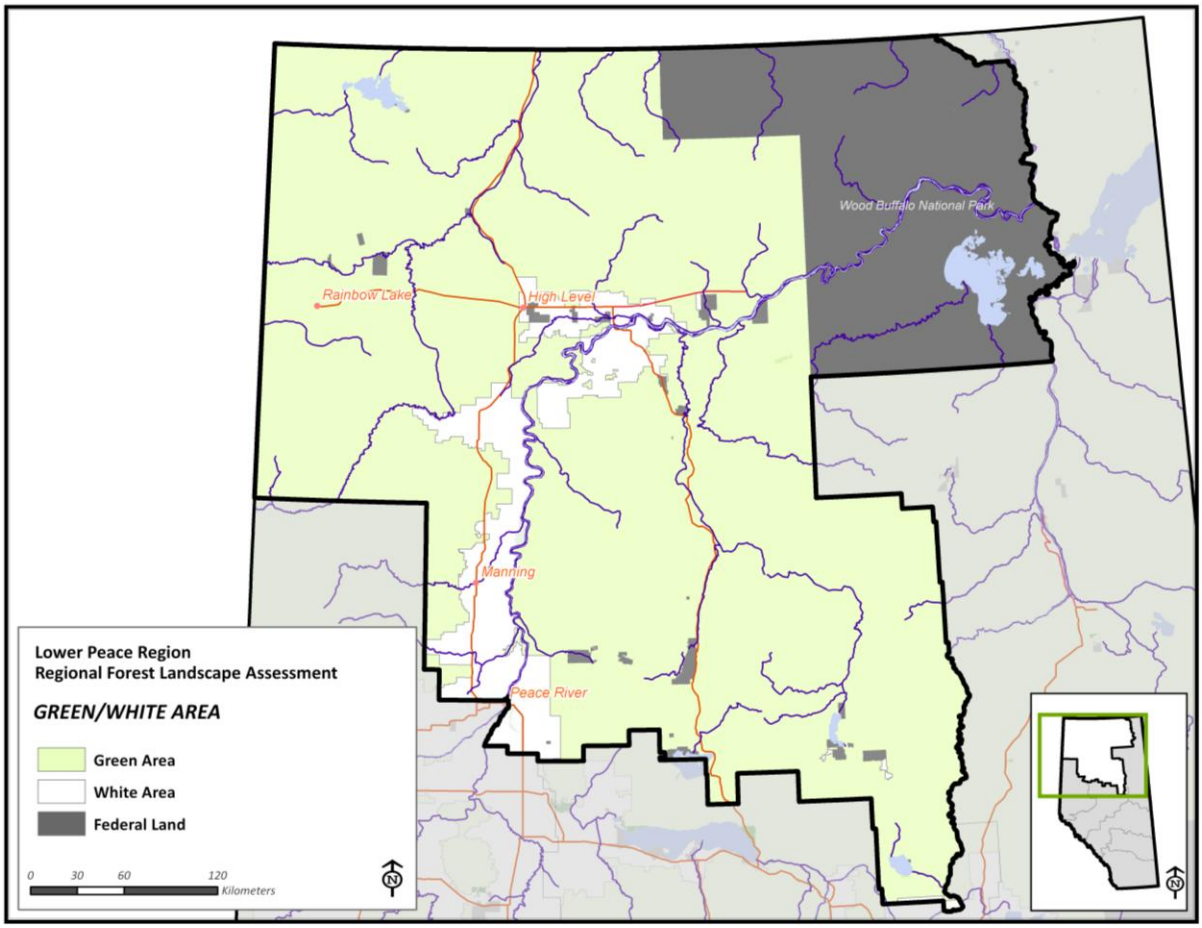


Figure 1-2 Green/White Area Distribution

1.3 Forest Management Agreement Areas

Forty-seven percent of the Lower Peace Region is covered by a Forest Management Agreement (FMA) (3). There are a total of 8 FMA areas with timber allocations in the Lower Peace Region. FMA boundaries are not coincident with the land use framework region boundaries. Table 1-2 lists (in alphabetical order), the FMAs which have lands inside the Lower Peace Region, the percent of each FMA which is inside the Region, as well as the proportion of the Lower Peace Region which is covered by the respective FMA.

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

Table 1-2 Forest Management Agreement Area summary

FMA Label	Company Name	Entire FMA Area (ha)	Portion of FMA located in Lower Peace Area (ha)	Portion of FMA located in Lower Peace % of FMA	Proportion of Lower Peace occupied by FMA % of Lower Peace
ALPAC	ALPAC Forest Products Incorporated	6,552,127	2,595,219	40	14
DMI_EAST	Daishowa-Marubeni International Ltd. (East)	1,711,618	1,711,618	100	9
DMI_WEST	Daishowa-Marubeni International Ltd. (West)	956,844	324,849	34	2
BUCH/TOLKO	Gordon Buchanan Enterprises Ltd. and Tolko Industries Ltd.	246,105	57,680	23	0
MDFP	Manning Diversified Forest Products Ltd.	930,552	565,543	61	3
TOLKO_HP	Tolko Industries Ltd. (High Prairie)	272,448	136,477	50	1
TOLK/FOOT/LAC	Tolko Industries Ltd., Footner Forest Products Ltd. and La Crete Sawmills Ltd.	3,560,321	3,560,320	100	19
TOLK/VAN/SLP	Tolko Industries Ltd., Vanderwell Contractors (1971) Ltd. and West Fraser Mills Ltd. (Slave Lake)	703,749	158,647	23	1
Sub-total		14,933,764	9,110,353		47
No Forest Management Agreement Area			10,107,227		53
Total			19,217,580		100

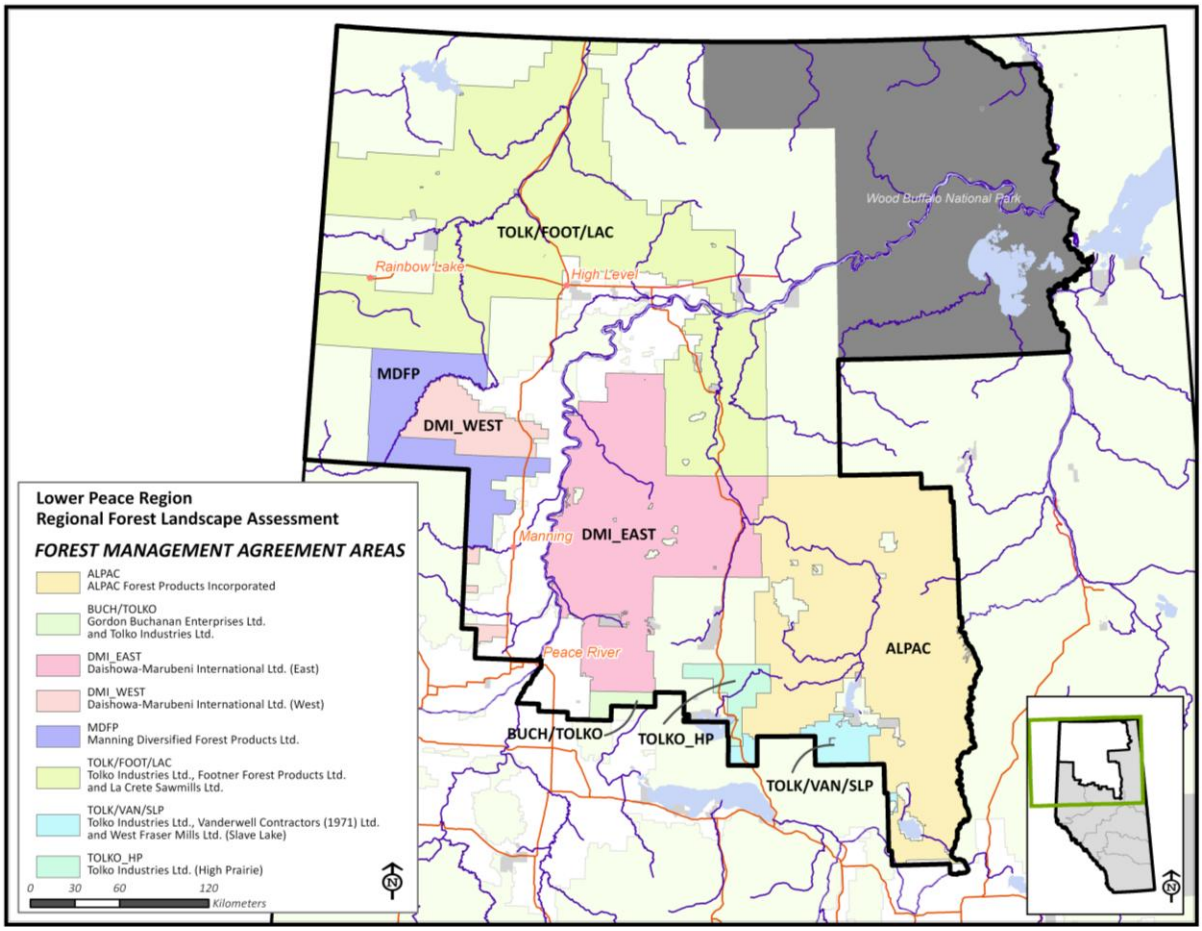


Figure 1-3 Forest Management Agreement Areas

1.4 Forest Management Units

The Lower Peace Region contains 35 Forest Management Units (FMU) (4), of which 16 are fully contained inside the Region (Table 1-3). The largest FMU in the Region is F26 which makes up 19% of the Lower Peace. Of the 35 FMUs, 17 are managed by the Crown and 18 are managed under a Forest Management Agreement (see section 1.3). Note that the unit M1 is coincident with the Paddle Prairie Metis Settlement which will be described in section 1.8. Metis settlements are not available for forest management planning but are included in the list forest management units.

The largest Crown-managed, F10, is located in the northeast, adjacent to Wood Buffalo National Park. The largest FMA managed FMU is F26 (Tolko Industries and Footner Forest Products).

A map of the FMUs within the Lower Peace Region appears as Figure 1-4.

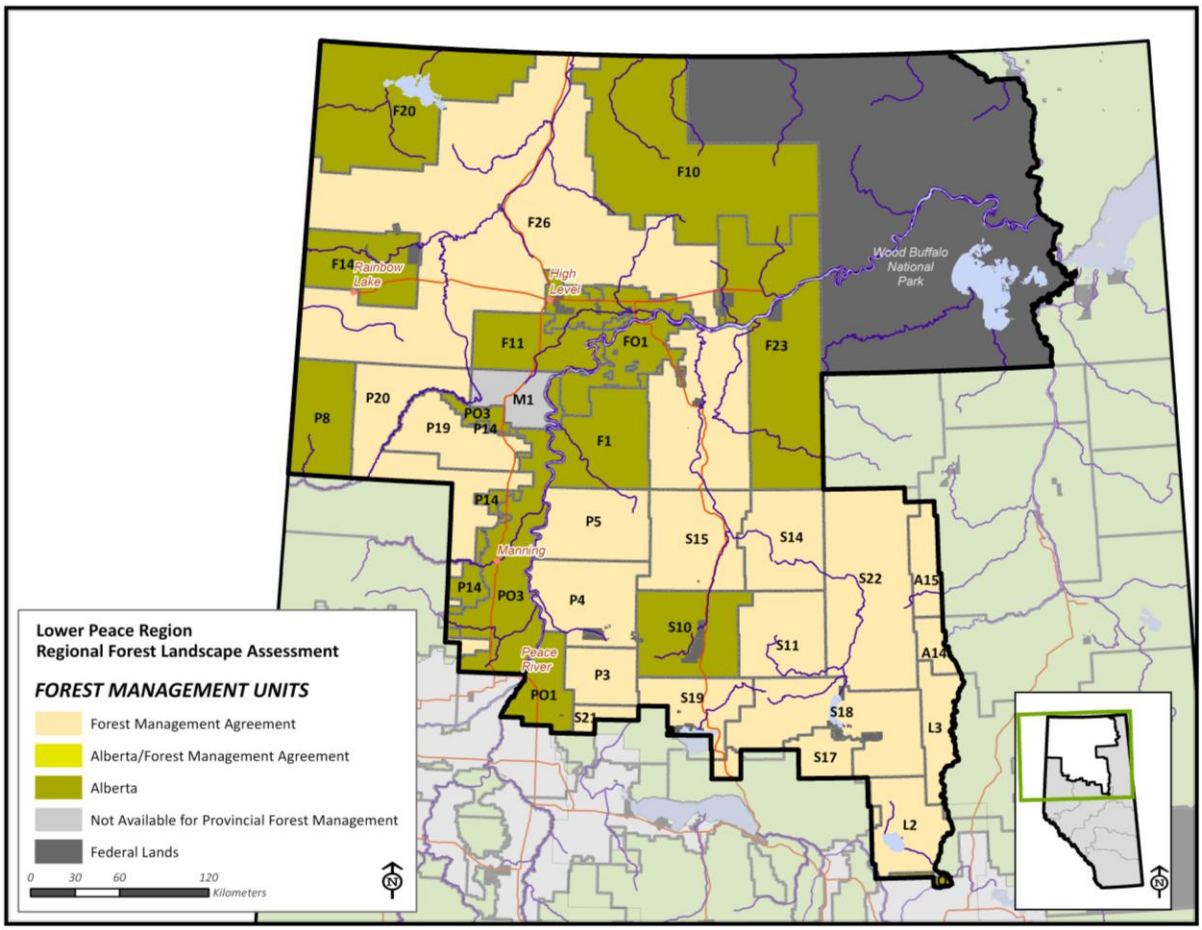


Figure 1-4 Forest Management Units

Table 1-3 Forest Management Units

FMU Name	Managed by	Entire FMU Area (ha)	Portion of FMU located in Lower Peace Area (ha)	Portion of FMU located in Lower Peace % of FMU	Proportion of Lower Peace occupied by FMU % of Lower Peace
A14	FMA	1,178,072	75,469	6	0
A15	FMA	1,437,516	142,357	10	1
F1	Crown	384,253	384,253	100	2
F10	Crown	1,249,490	1,249,490	100	7
F11	Crown	372,704	372,704	100	2
F14	Crown	344,588	344,588	100	2
F20	Crown	878,786	878,786	100	5
F23	Crown	990,684	990,684	100	5
F26	FMA	3,574,553	3,574,553	100	19
FO1	Crown	471,465	471,465	100	2
L2	FMA	298,744	285,729	96	1
L3	FMA	588,356	185,816	32	1
L8	FMA	126,796	694	1	0
LO1	Crown	2,579,926	16,919	1	0
M1	Crown	174,813	174,813	100	1
M3	Crown	170,047	70	0	0
P14	Crown	127,361	123,401	97	1
P19	FMA	969,725	324,849	33	2
P20	FMA	1,004,131	565,543	56	3
P3	FMA	184,764	184,764	100	1
P4	FMA	388,480	388,480	100	2
P5	FMA	355,537	355,537	100	2
P8	Crown	347,617	318,487	92	2
PO1	Crown	420,387	195,733	47	1
PO3	Crown	681,435	587,560	86	3
S10	Crown	407,848	407,848	100	2
S11	FMA	331,925	331,925	100	2
S14	FMA	363,700	363,700	100	2
S15	FMA	442,884	442,884	100	2
S17	FMA	727,043	164,308	23	1
S18	Crown	610,026	588,816	97	3
S19	Crown	415,173	251,357	61	1
S21	FMA	247,777	57,680	23	0
S22	FMA	801,696	792,199	99	4
S7	FMA	238,805	938	0	0
Sub-total		23,887,107	15,594,398		81
No Forest Management Agreement Area			3,623,182		19
Total			19,217,580		100

1.5 Natural Subregions

In Alberta, a landscape classification system referred to as the Natural Regions and Subregions of Alberta (5) is widely utilized for land management programs (e.g., parks and protected areas network,

ecologically-based forest management tools, etc.). 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 Lower Peace Region contains portions of 11 subregions. A summary of subregion distribution is in Table 1-4 (presented in order of their dominance) and a map showing the subregions in the Lower Peace Region appears as Figure 1-5.

Table 1-4 Natural Subregion Distribution

Natural Subregion	Area (ha)	Percent (%)
Central Mixedwood	8,018,020	42
Lower Boreal Highlands	3,553,798	18
Northern Mixedwood	2,873,365	15
Dry Mixedwood	2,561,291	13
Boreal Subarctic	1,182,272	6
Upper Boreal Highlands	443,047	2
Peace-Athabasca Delta	432,515	2
Lower Foothills	62,224	0
Athabasca Plain	52,080	0
Kazan Uplands	34,249	0
Peace River Parkland	4,719	0
Total	19,217,580	100

The Central Mixedwood subregion occupies 42% of the Lower Peace Region (Table 1-4). The Lower Boreal Highlands, Northern Mixedwood and Dry Mixedwood subregions are the next most prevalent, accounting for 18%, 15% and 13% respectively. The next grouping of subregions consists of Boreal Subarctic, Upper Boreal Highlands and The Peace-Athabasca Delta, which total 10% of the Region. The remaining area lies within the Lower Foothills, Athabasca Plain, Kazan Uplands and Peace River Parkland subregions, although their combined presence represents less than 1% of the Region.

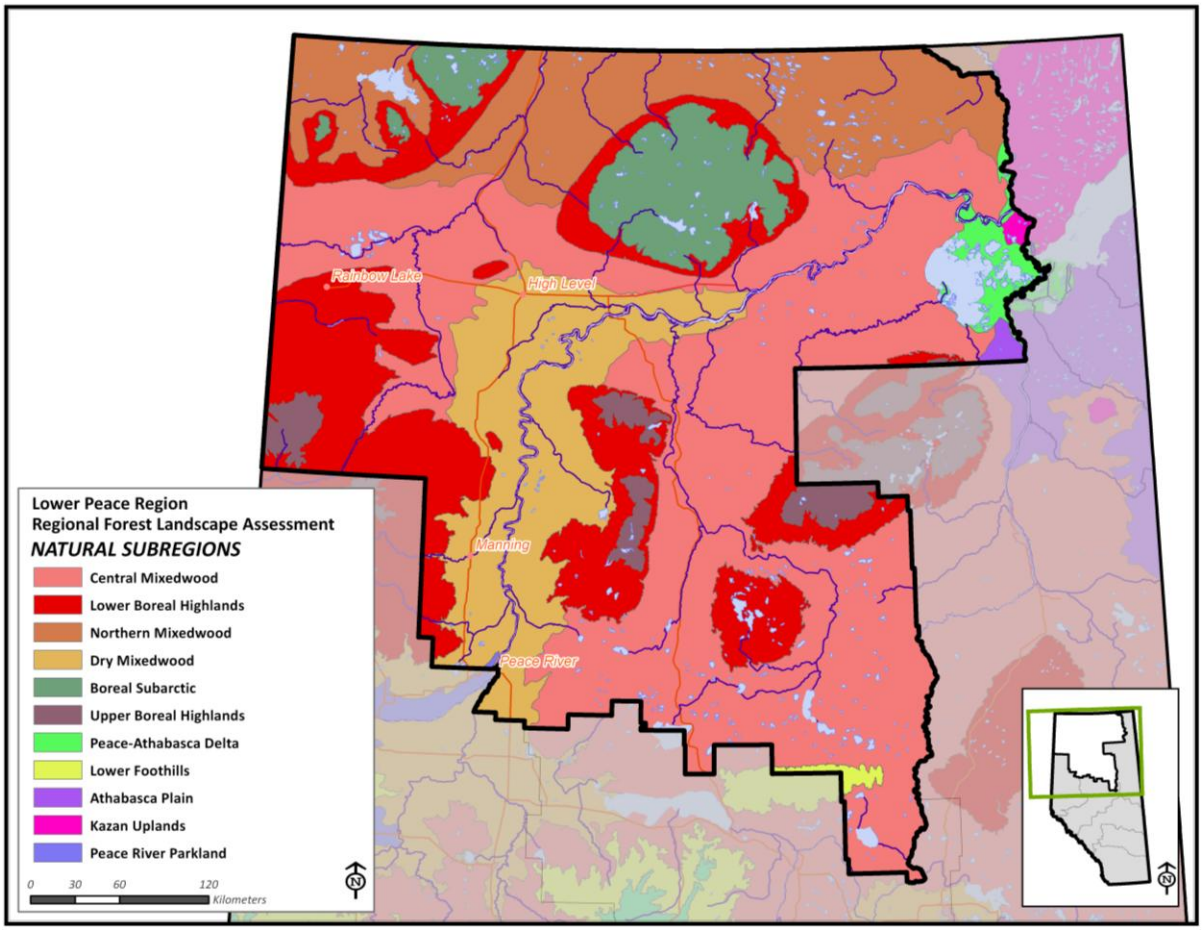


Figure 1-5 Alberta Natural Subregions

1.5.1 Central Mixedwood Natural Subregion

The Central Mixedwood Natural Subregion is the largest subregion, making up 42% of the Lower Peace Region. It is represented by undulating plains with some hummocky uplands. Its climate is continental, with warm summers and cold winters. The northern part of this Subregion has lower mean annual temperature and precipitation compared to the southern part of the Subregion. This is most likely due to the increasingly strong influence of dry and cold continental arctic weather systems in these northern areas.

Parent materials in the Subregion are a combination of glacial till, lacustrine and fluvial materials. Orthic Gray Luvisolic soils are predominant, with Brunisols occurring on sands. Wetlands are often extensive and are generally associated with Mesisols, although Fibrisols and Gleysols also occur.

On upland areas, a mix of aspen-dominated deciduous stands, aspen-white spruce stands and white-spruce dominated stands are typical of till and lacustrine areas. Jack pine forests occur on coarse materials. Black spruce is dominant in fens and bogs.

1.5.2 Lower Boreal Highlands Natural Subregion

This Subregion is characterized by diverse mixedwood forests on moist lower slopes of northern hill systems and extensive wetlands at slope bases and on adjacent lowlands. Grey Luvisols are the dominant soil type, with Organic soils and Gleysols in the wetlands.

The climate in this subregion is cooler and slightly more moist than Dry Mixedwood and Central Mixedwood Natural Subregions. July sees the majority of precipitation and summers are warmer but winters are much colder than in comparable Lower Foothills Natural Subregion.

This Subregion is a major zone of pine hybridization as well as having distinct pure white birch stands at upper elevations. Diverse young forests of aspen, balsam poplar, black and white spruce, white birch and pine hybrids occur on the slopes.

1.5.3 North Mixedwood Natural Subregion

The Northern Mixedwood Natural Subregion occurs in the far north, occupying lowlands adjacent to the border with the Northwest Territories, as well as a smaller, high elevation area in the Cameron Hills. Gently undulating plains are the dominant topographic form, with some hummocky inclusions and areas of karst topography in the eastern portion.

In the western and central plains, organic deposits are common. Fine textured glaciolacustrine materials occur at lower elevations and till deposits are in the Cameron Hills portion. Where organic deposits are less extensive in the eastern portion, fine textured glaciolacustrine and sandy eolian materials are common.

The Northern Mixedwood Natural Subregion is characterized by short, warm, and on average, dry summers and long, very cold winters. Moisture deficits may be significant in summer, especially on south-facing sites with coarse textured soils. Winters in this Subregion are the coldest of any of the boreal subregions, possibly because the cold air associated with continental arctic and continental polar outbreak tends to pool at lower elevations.

Black spruce is a persistent seral species on upland sites. White and black spruce stands are typical on upland areas. Mixedwood aspen/white spruce-black spruce stands occur on better drained soils along rivers and on local, well-drained elevated areas. Much of the Subregion is wetland and is vegetated with open, stunted black spruce, often in association with frozen organic soils.

1.5.4 Dry Mixedwood Natural Subregion

The Dry Mixedwood Natural Subregion is characterized by undulating plains, aspen dominated forests and fens. There are two geologically different areas of Dry Mixedwood Subregion in the Province, and only the area of predominantly fine-textured lacustrine materials, with little glacial till, is found in the Lower Peace Region. In the northeastern part of the Lower Peace, the subregion is primarily undulating plains and somewhat hummocky uplands. In the northwestern portion, the topography consists more of gently rolling plains. Gray Luvisols are the dominant soils on uplands and Gleysols and Organics are dominant in wetlands.

The subregion has the warmest summers and highest number of growing degree day accumulations of any of the boreal subregions. About 70% of the annual precipitation falls during the April to August period with peak precipitation in June and July.

Aspen forests with mixed understories of rose, low-bush cranberry, beaked hazelnut and buffaloberry are typical on uplands. Treed, shrubby or sedge-dominated fens occupy low-lying areas. In the extreme eastern range, one may find jack pine stands on dry, well to rapidly drained glaciofluvial and eolian parent materials.

1.5.5 Boreal Subarctic Natural Subregion

The Boreal Subarctic Natural Subregion occurs on high elevation plateaus in the Cameron Hills and Caribou Mountains. It is completely surrounded by the Lower Boreal Highlands Natural Subregion except for a very small area in the Cameron Hills where the Northern Mixedwood Natural Subregion lies adjacent. Landscapes are mostly undulating and rolling plateaus and highlands with extensive low-lying, poorly drained areas.

Most of the area is covered by organic deposits and fine textured glacial till deposits are also common. Moderately will drained upland areas occupy minor areas within the Subregion.

This Subregion has the coldest of the boreal Subregions, having the lowest mean annual temperature. Summers are short, cool and moist. Growing degree-day accumulations are markedly lower than in other boreal subregions. Winters are long and very cold. Low temperatures, low sun angles and insulating effects of deep, water-saturated organic and moss layers combine to produce thermal conditions that contribute to permafrost formation.

Characteristic sites are species-poor, open black spruce bogs and fens with bog bilberry, lichen and mosses. Nutrient-poor upland sites are typically forested by black spruce dominated stands with feathermoss understories. Lichens may dominate the understory in more open stands. Moist, rich sites associated with minor fluvial deposits in stream valleys are very uncommon, but when found, contain aspen, birch and white spruce.

Open black spruce, lodgepole pine (or lodgepole pine-jack pine hybrids), and mixed lodgepole pine/aspen stands with lichen, associated with very dry coarse textured glaciofluvial deposits (Brunisolic soils) are found, but uncommon.

1.5.6 Upper Boreal Highlands Natural Subregion

The Upper Boreal Highlands Natural Subregion is completely surrounded by the Lower Boreal Highlands Natural Subregion. Medium textured glacial till deposits occur on slopes, with colluvial and residual materials on steep slopes. Organic deposits occur in depressions on the plateaus. Luvisols and gleyed subgroups occur on well to imperfectly drained upland sites. Organic soils, Cryosols and Gleysols occur on poorly drained areas.

This Subregion has shorter, cooler summers and lower growing degree-day accumulations than the surrounding Lower Boreal Highlands Natural Subregion. Peak precipitation occurs in July and precipitation patterns are very similar to the Lower Boreal Natural Subregion.

Forests are predominantly coniferous, consisting of lodgepole pine, lodgepole pine-jack pine hybrids, white spruce and black spruce. At the highest elevations in the Clear Hills, pure lodgepole pine with species-poor understories are common and there are no aspen-leading mixedwood stands nor pure aspen forests. Black spruce often establishes at the same time as pine, but forms a secondary canopy below the main canopy owing to slower growth.

1.5.7 Peace-Athabasca Delta Natural Subregion

The Peace-Athabasca Delta Natural Subregion lies south and west of Lake Athabasca. It is the lowest elevation subregion in the province and is nearly flat. Water is the dominant feature. Most of the vegetation throughout the Subregion is a mixture of submerged and emergent aquatic communities, sedge fens and willow shrublands.

Soils are Regosols and Gleysols. Only very minor parts of the Subregion are occupied by deep, medium texture, well drained soils and their associated vegetation.

Extensive sedge meadows occur where the water table is near or at the surface. Shrub communities composed of willow, alder and dogwood develop on slightly elevated sites adjacent to streams and ponds where the water table is below the surface. Less recently disturbed sites support pure or mixed stands of balsam poplar, white birch and white spruce with understories of alder, dogwood and horsetail.

1.5.8 Lower Foothills Natural Subregion

The Lower Foothills Natural Subregion is represented by a small area of the Marten Hills located in the extreme southern part of the Region. The typical elevation range is approximately 700-800 m in the north to approximately 1500 m in the south 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 subregion, 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 within the subregion.

1.5.9 Athabasca Plain Natural Subregion

The Athabasca Plain Natural Subregion occurs south of Lake Athabasca along the border with Saskatchewan. Strongly hummocky and rolling sandy and gravelly uplands occur in the eastern and southern portions. Level to undulating sandy fluvial and eolian plains with some prominent dune fields occur to the east and north. Dune areas have unique plant communities that stabilize the dune surfaces, but areas of bare sand do exist.

Soils are typically Brunisols on the uplands, Regosols on the active dunes, and Mesisols in the wetlands. The Subregion has warmer summers than any of the other boreal subregions. Winters are very cold, reflecting the influence of continental polar and continental arctic weather systems.

Very dry, gravelly plains and sand dunes are largely unvegetated. Dry jack pine stands with sparse understories are the dominant upland vegetation occurring on well to moderately well drained medium textured soils, which are uncommon. Moist, rich sites are also uncommon, occurring mainly along rivers and in narrow zones around small lakes. Here, pure or mixed stands of aspen, balsam poplar and white birch occur, sometimes together with white spruce or black spruce.

1.5.10 Kazan Upland Natural Subregion

The Kazan Upland Natural Subregion occurs in the far northeastern corner of Alberta, lying mostly north of Lake Athabasca. This Subregion is part of the Canadian Shield Natural Region. On average, 60 percent of the landscape is exposed bedrock. Topography is hummocky to rolling, with little local relief.

Parent materials are ice-scoured bedrock and coarse textured glacial drift. Bedrock barrens are interspersed with pockets of vegetation consisting mostly of lichens, mosses and drought-tolerant ferns. The area has short summers in which July is the warmest month, and cold winters. July is also the month of the highest precipitation. Winter snowfall accounts for approximately 40 percent of the total annual precipitation.

Various lichen communities occupy south-facing and steep rock faces. Stunted jack pine and birch form open stands with sparse shrub understories in pocket communities where mineral soil has accumulated and moisture conditions are better. Bog communities are the dominant wetland type. Black spruce forms open to dense stands on organic soils. Permafrost is discontinuous but widespread.

1.5.11 Peace River Parkland Natural Subregion

The Peace River Parkland Natural Subregion is the smallest Subregion in the province, and consists of three small sub-areas in northwestern Alberta. The Dry Mixedwood Natural Subregion surrounds all three units. Agricultural development began in the early 1900s and little of the original native prairie remains today.

Because most of the area is cultivated, the Subregion is defined by soil criteria. The area is defined by the occurrence of Chernozemic and Solonetzic soils.

Aspen forest communities with an understory of willow, rose and a variety of fobs occur on well drained, fine textured Gray and Dark Gray Luvisols. These are the most common remaining native

community types in the uplands. Moist, rich sites on lower valley walls and fluvial terraces along the Peace River support tall stands of balsam poplar. White spruce may occur as an associate species.

In wet, poorly drained upland depressions, willow/sedge communities or black spruce/Labrador tea/peat moss fens develop on Gleysols or Terric Mesisols.

1.6 Municipal Districts/Counties

The Lower Peace contains types of municipal jurisdictions (6):

- 3 Municipal Districts (MD),
- 1 Improvement District (ID),
- 1 Special Municipality (SM),
- 3 towns, and
- 1 village, and
- 70 smaller populated centers.

These registered municipal entities are listed in Table 1-5. MD, ID and SM boundaries appear in Figure 1-6. Table 1-5 includes the population of each of the registered areas according to the most recent census (7). Note that all the MD and ID boundaries are coincident with the Region boundary, so no MD or ID is split by the Region.

Figure 1-7 shows the locations of 16 hamlets and 54 smaller localities, all with registered names in Alberta. The population of these locations is rolled up into the Municipal District to which they belong.

Table 1-5 Summary of Municipal Locations

Municipal Classification	Name	Population (2010)
Municipal District	Northern Lights, County of	3,556
	Northern Sunrise County	2,880
	Opportunity No. 17, M.D. of	3,259
	Total	9,695
Improvement District	I.D. No. 24 Wood Buffalo	422
	Total	422
Special Municipality	Mackenzie County	10,002
	Total	10,002
Town	High Level	3,887
	Manning	1,493
	Rainbow Lake	1,082
	Total	6,462
Village	Nampa	373
	Total	373
Total		26,954

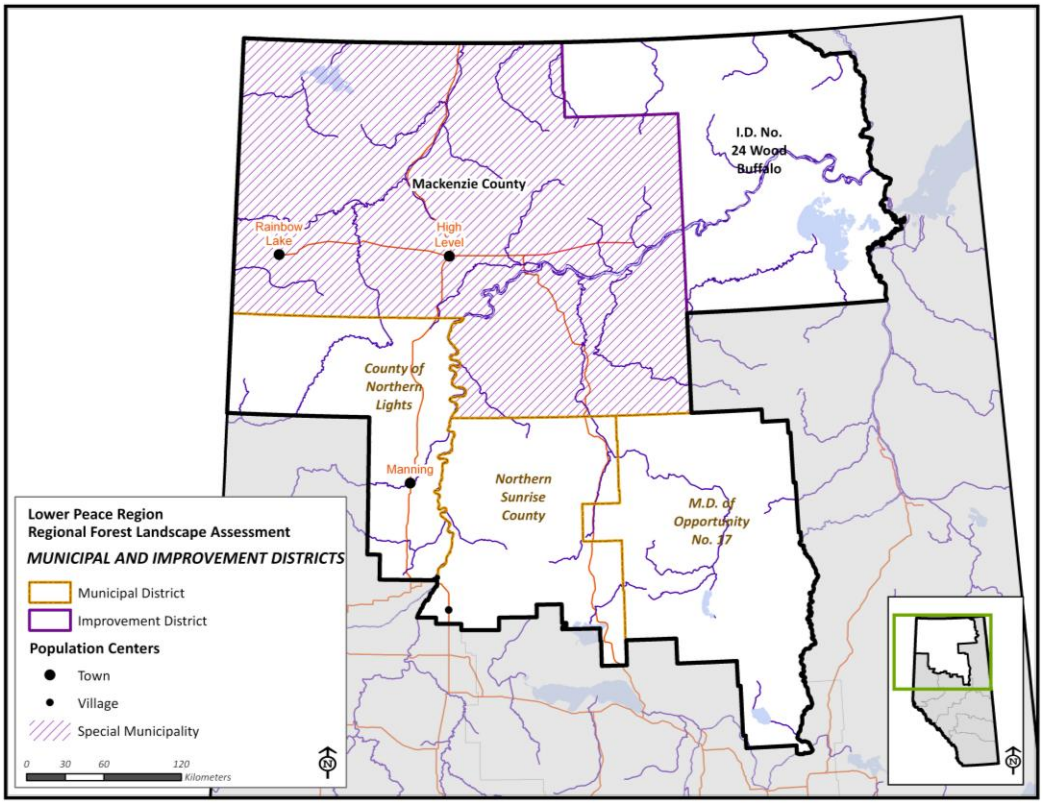


Figure 1-6 Municipal Jurisdictions

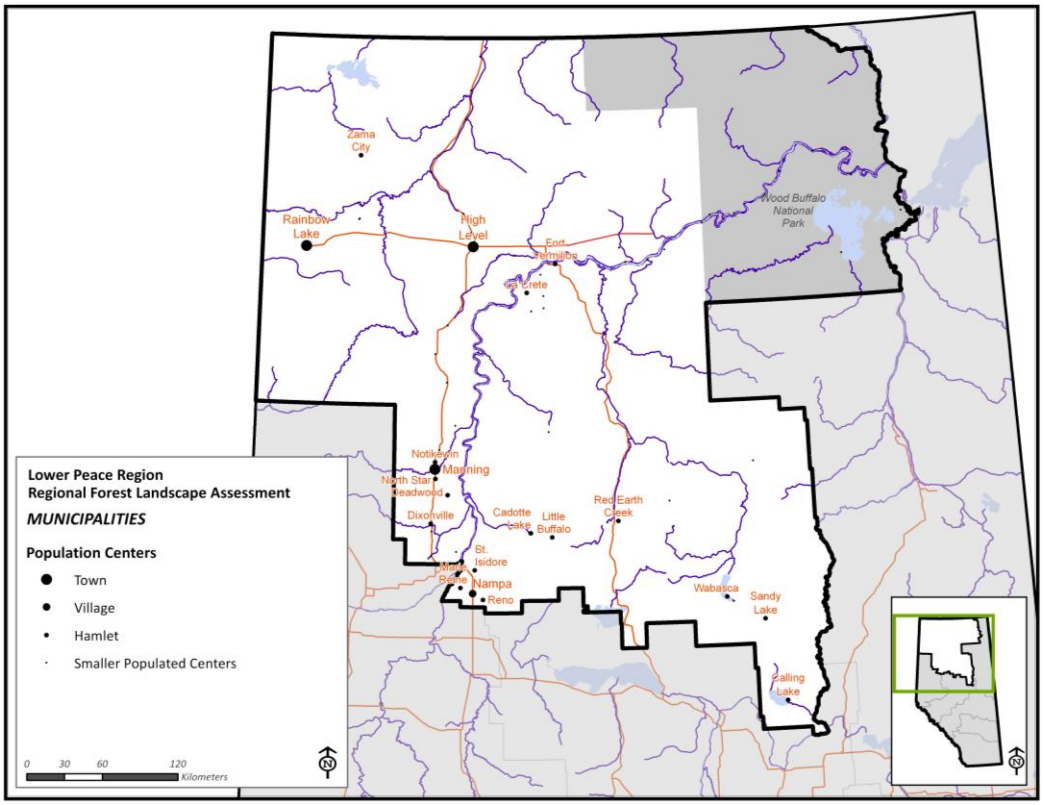


Figure 1-7 Towns and Other Population Centers

1.7 Federal Government Lands

Federally managed land in the Lower Peace Region consists of First Nation lands (section 1.8) and national parks (section 1.10). Encompassing 3,621,682 hectares, Wood Buffalo National Park represents 19% of the Region.

1.8 First Nations

A summary of the First Nation communities (10) is shown in Table 1-6 which also shows the number of reservations which belong to the band. The population of each band is also indicated along with a citation of the source of the population value. 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 or data from Aboriginal Affairs and Northern Development Canada was used.

First Nation lands total 139,690 hectares which represents only 0.7% of the Lower Peace Region. The largest single First Nation is Wabasca at 20,804 hectares, and is comprised of 5 separate reserves in various locations across the Region.

Four First Nations communities (EJeré K'elni Kue, Peace Point, Thebathi, and Tsu Nedehe Tue) are within the boundaries of Wood Buffalo National Park. 84% of the First Nation Communities (based on area) occur in the Green Area.

Table 1-6 First Nation Communities

First Nation Name	Treaty Number	Area (ha)	Percentage of all First Nations (%)	Number of Reserves	Population	Population Source
EJeré K'elni Kue[1]	8 (1899)	212	0	1	0	Canada (2012)
Amber River	8 (1899)	2,330	2	1	(1953)[2]	Canada (2012)
Beaver Ranch	8 (1899)	1,343	1	3	16	Canada (n.d.)
Bistcho Lake	8 (1899)	352	0	1	(1953)[2]	Canada (n.d.)
Boyer	8 (1899)	4,288	3	1	213	Canada (n.d.)
Bushe River	8 (1899)	11,125	8	1	492	Canada (n.d.)
Child Lake	8 (1899)	2,849	2	1	188	Canada (n.d.)
Fox Lake	8 (1899)	10,610	8	1	1,875	Canada (n.d.)
Ft. Vermilion	8 (1899)	50	0	1	97	Canada (n.d.)
Hay Lake	8 (1899)	12,342	9	1	949	Canada (n.d.)
Jackfish Point	8 (1899)	128	0	1	(1953)[2]	Canada (2012)
Jean Baptiste Gambler	8 (1899)	199	0	1	254	Canada (n.d.)
John D'Or Prairie	8 (1899)	14,123	10	1	1,123	Canada (n.d.)
Loon Lake	8 (1899)	7,046	5	1	511	Canada (n.d.)
Loon Prairie	8 (1899)	259	0	1	(511)[3]	Canada (2012)
Peace Point (Mikisew Cree)	8 (1899)	519	0	1	153	Canada (2012)
Swampy Lake	8 (1899)	14,719	11	1	(511)[3]	Canada (2012)
Tall Cree	8 (1899)	7,981	6	2	365	Canada (n.d.)
Thebathi	8 (1899)	182	0	1	30	Canada (n.d.)
Tsu Nedihe Tue[1]	8 (1899)	587	0	1	0	Canada (2012)
Upper Hay River	8 (1899)	1,425	1	1	292	Canada (n.d.)
Utikoomak Lake	8 (1899)	7,383	5	3	765	Canada (n.d.)
Wabasca	8 (1899)	20,804	15	5	2,207	Canada (n.d.)
Wadlin Lake (Tall Cree)	8 (1899)	50	0	1	(365)	Canada (n.d.)
William McKenzie (Duncan's)	8 (1899)	389	0	1	142	Canada (2012)
Woodland Cree	8 (1899)	16,234	12	3	849	Canada (n.d.)
Zama Lake	8 (1899)	2,374	2	1	(1953)[2]	Canada (2012)
Total		139,690	100	38	10,521	

[1] EJeré K'elni Kue and Tsu Nedihe Tue are part of Smith's Landing First Nation

[2] Dene Tha' First Nations includes Amber River, Bistcho Lake, Bushe River, Hay Lake, Jackfish Point, Upper Hay River and Zama Lake. Population in parenthesis is for entire first nation and not included in total

[3] Loon River Cree First Nation includes Loon Lake, Loon Prairie, and Swampy Lake

Locations of First Nations communities are shown in Figure 1-8.

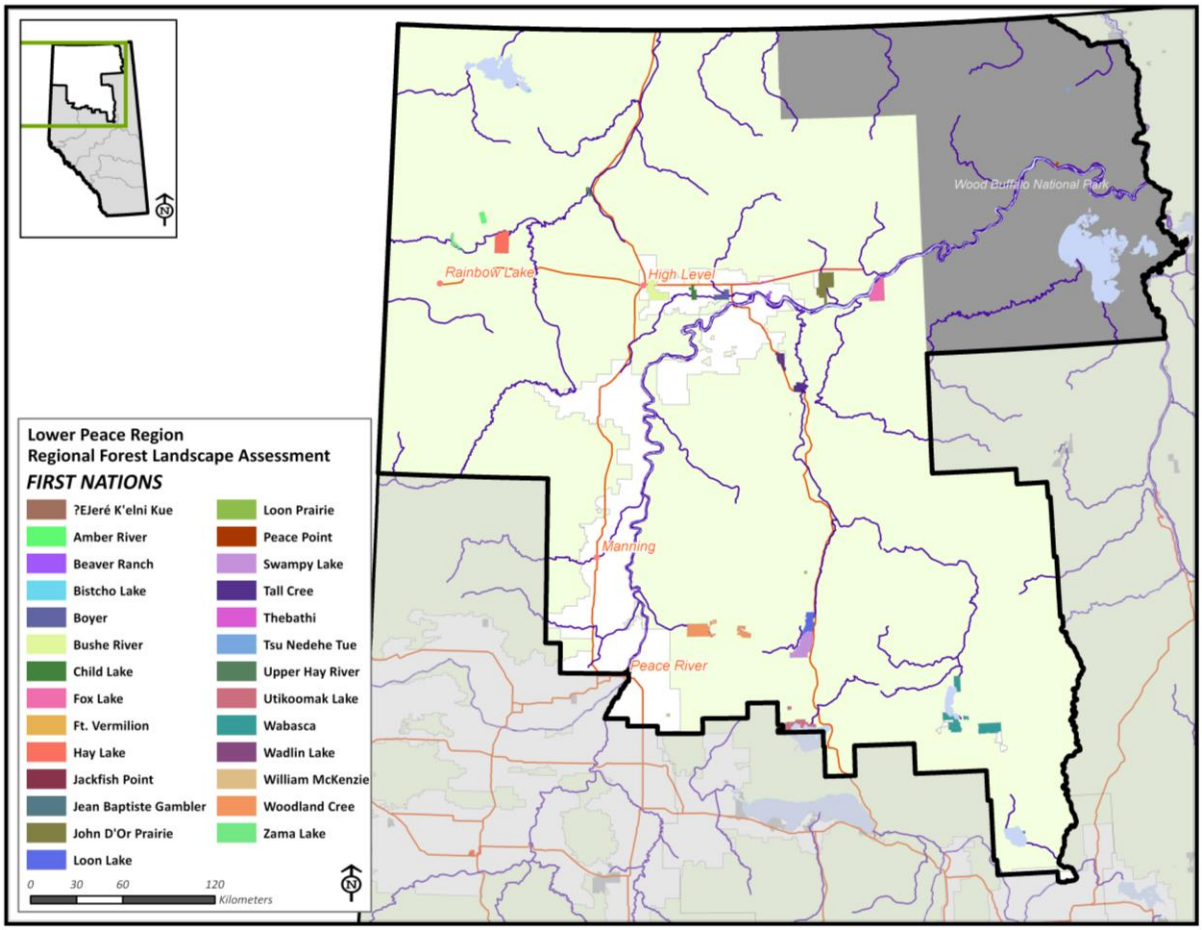


Figure 1-8 First Nations

1.9 Metis Settlements

There are 2 Metis settlements (11) contained in the Lower Peace Region. The most significant is Paddle Prairie, located south of the town of High Level. The majority of Gift Lake is located in the Upper Athabasca region. Metis settlements are larger than First Nations lands and total 172,661 hectares, or approximately 2% of the Region's area.

Table 1-7 Metis Settlements

Metis Settlement	Area (ha)	Percentage of Metis (%)	Percentage of Region (%)	Population	Population Source
Paddle Prairie	172,542	100	1	1,089	Alberta (2010)
Gift Lake	70	0	0	1,115	Alberta (2010)
Total	172,612	100	1	2,204	

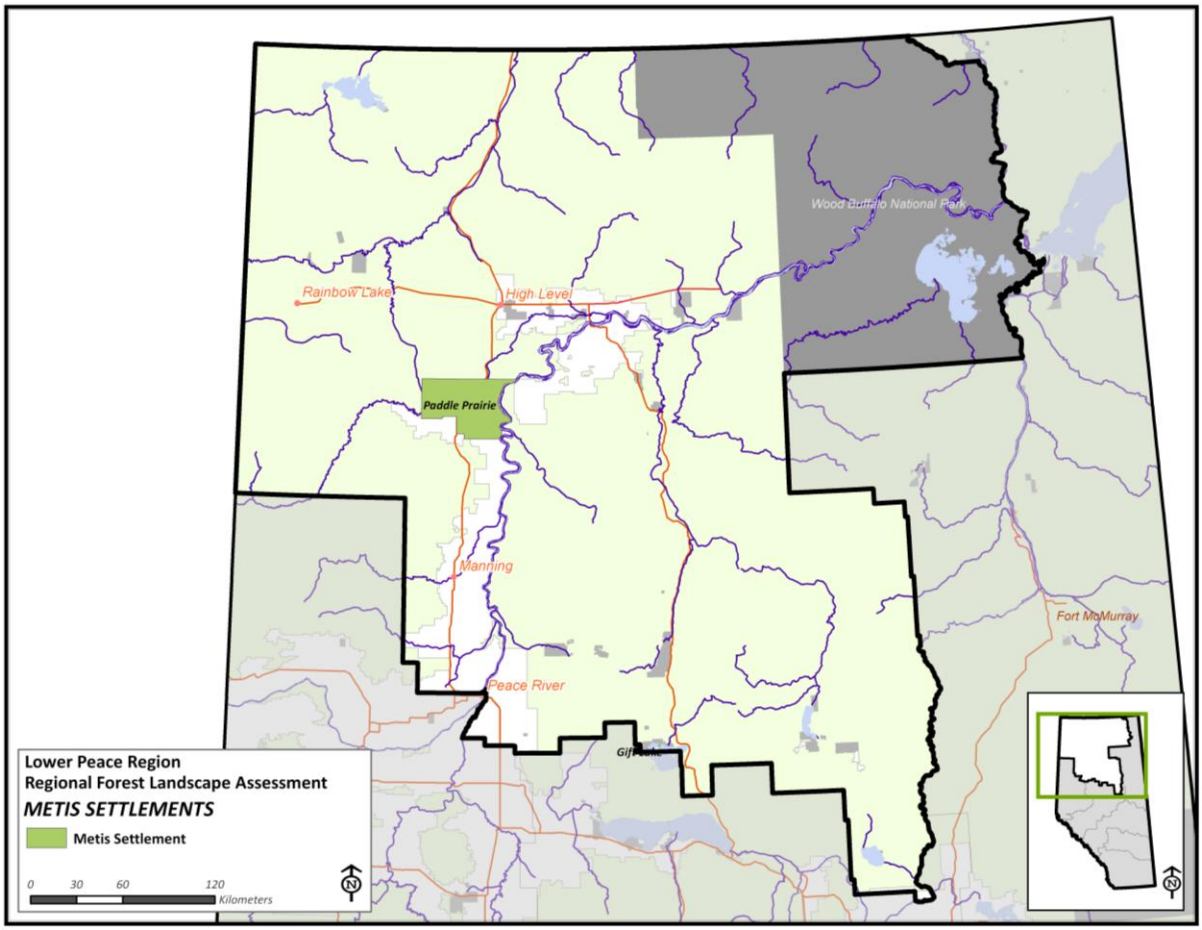


Figure 1-9 Metis Settlements

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 significant 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 it's 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 it's 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 to the activity to protect the integrity of the land.

The Lower Peace Region contains several of the park and protected area designations noted above. The largest feature is Wood Buffalo National Park which occupies approximately 19% (Table 1-9) of the Region. A total of 22% of the Region 4,290,423 ha) is allocated under some form of protection. In addition, another 0.02% of the Region (4,741 ha) contains protective or consultative notations to allow the Province 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).

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	3,621,682	84	19
	Provincial Park	3	14,031	0	0
	Provincial Recreation Area	8	271	0	0
	Wildland Park	5	651,251	15	3
	Total	17	4,287,235	100	22
Protected Areas	Natural Area	3	3,188	0	0
	Total	3	3,188	0	0
Total		20	4,290,423	100	22

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 Recreation Area	2	1,289	27	0
Protected Areas	Natural Area	7	3,452	73	0
Total		9	4,741	100	0

A detailed list of individual parks, recreation areas, wildland parks, and natural areas can be found in 0. An overview map of the distribution of parks and protected areas is shown in Figure 1-10.

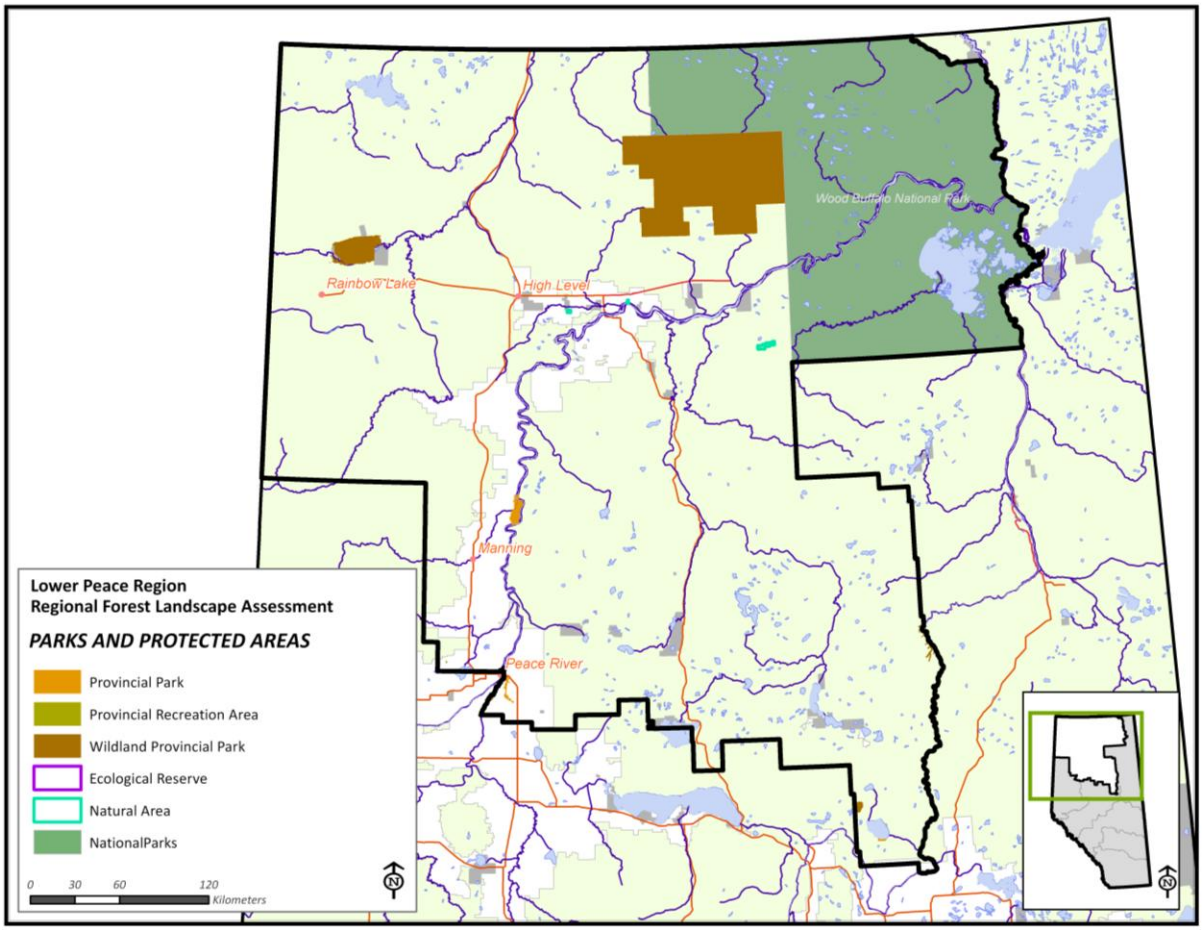


Figure 1-10 Parks and Protected Areas

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 (in order of their predominance in the Region) and shown in Figure 1-11. The predominant wildfire management area is Upper Hay, occupying 43% of the Lower Peace Region. Both Lesser Slave and Peace occupy 17% of the Region. Only very small portions of the Lac La Biche and Waterways Wildfire Management Areas fall inside the Lower Peace Region.

Table 1-11 Alberta Wildfire Management Areas

Wildfire Management Area Name	Entire Wildfire Management Area Area (ha)	Portion of ESRD Region located in Lower Peace Area (ha)	(%)	Proportion of Lower Peace occupied by ESRD Region (%)
Upper Hay	8,189,408	8,189,408	100	43
Lesser Slave	5,614,687	3,291,363	59	17
Peace	5,313,685	3,267,503	61	17
Lac La Biche	6,380,629	489,897	8	3
Waterways	6,078,388	217,826	4	1
Sub-total	31,576,796	15,455,995		80
Federal Lands		3,761,585		20
Total		19,217,580		100

In terms of the influence of Lower Peace planning activities on the Wildfire Management Areas, all of Upper Hay is located in the Lower Peace.

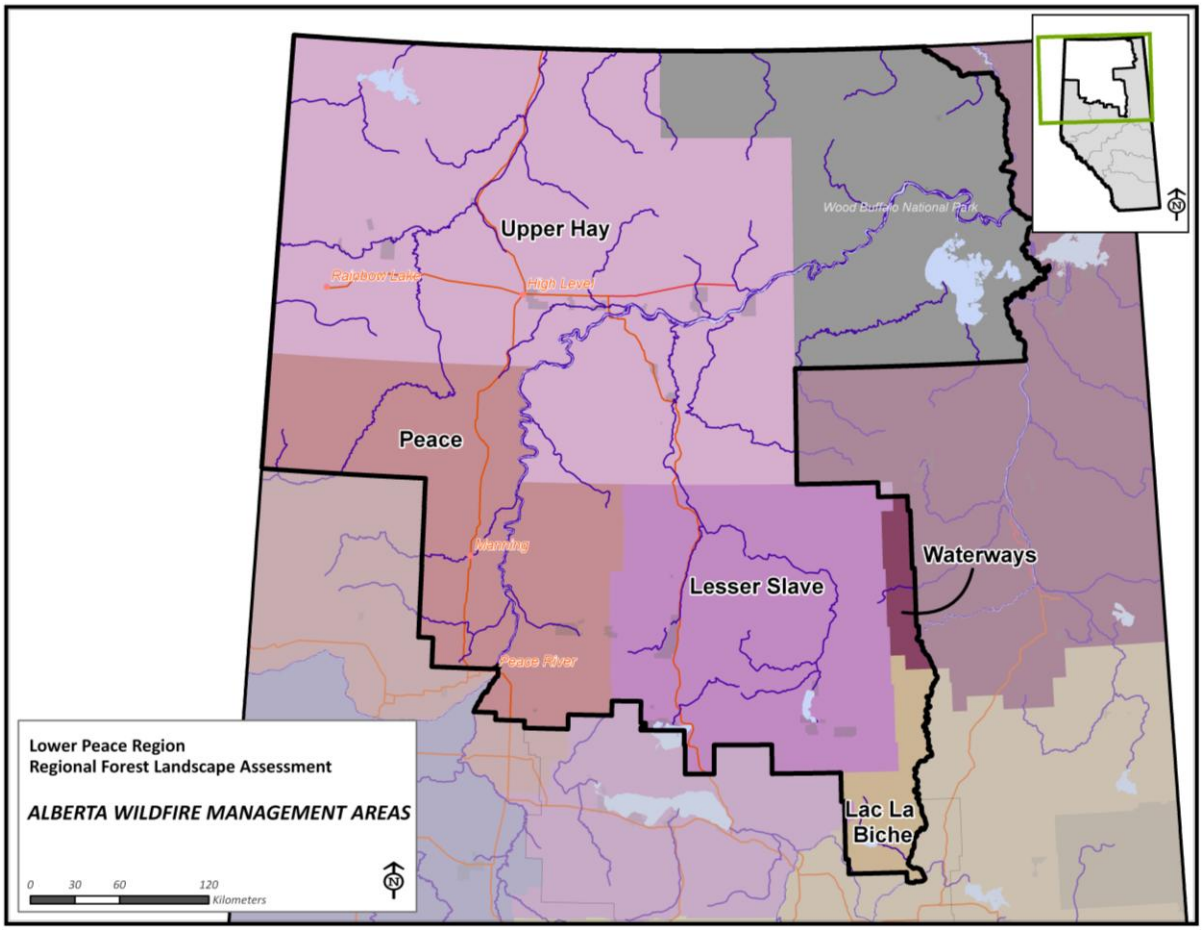


Figure 1-11 Alberta Wildfire Management Areas

2. Physical Conditions

2.1 Topography

The Lower Peace Region has a fairly uniform landscape (16) as it extends from the Alberta – Northwest Territory border, making up the entire northwest of the Province. The Peace River channel dominates the topography as it flows north and east toward Lake Athabasca. Low landforms allow for a large percentage of lakes, wetlands and bogs in this part of the Province.

The highest elevation in the Region is 1,062 m, which is found in the Clear Hills, south of Rainbow Lake. The lowest elevation is approximately 170 m at the Northwest Territories border, in the northeast corner of the Region. Figure 2-1 illustrates the general topography of the Region.

An important element of topography for natural resource management is 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 operability for machinery 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 almost no inoperable area within the Green Area portion of this Region (Table 2-1), meaning that there should be very few constraints to mechanical operations. There are virtually no steep slopes in the entire Region.

Table 2-1 Slope Class Distribution

	Slope Class (percent)								Total	
	0 - 30%		31 - 45%		46 - 60%		60% +			
Location	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)
Green Area	14,093,183	100	3,916	0	160	0	4	0	14,097,263	100
White Area	1,355,594	100	2,947	0	176	0	15	0	1,358,732	100
Federal Lands	3,761,231	100	352	0	2	0		-	3,761,585	100
Total	19,210,008	100	7,215	0	337	0	20	0	19,217,580	100

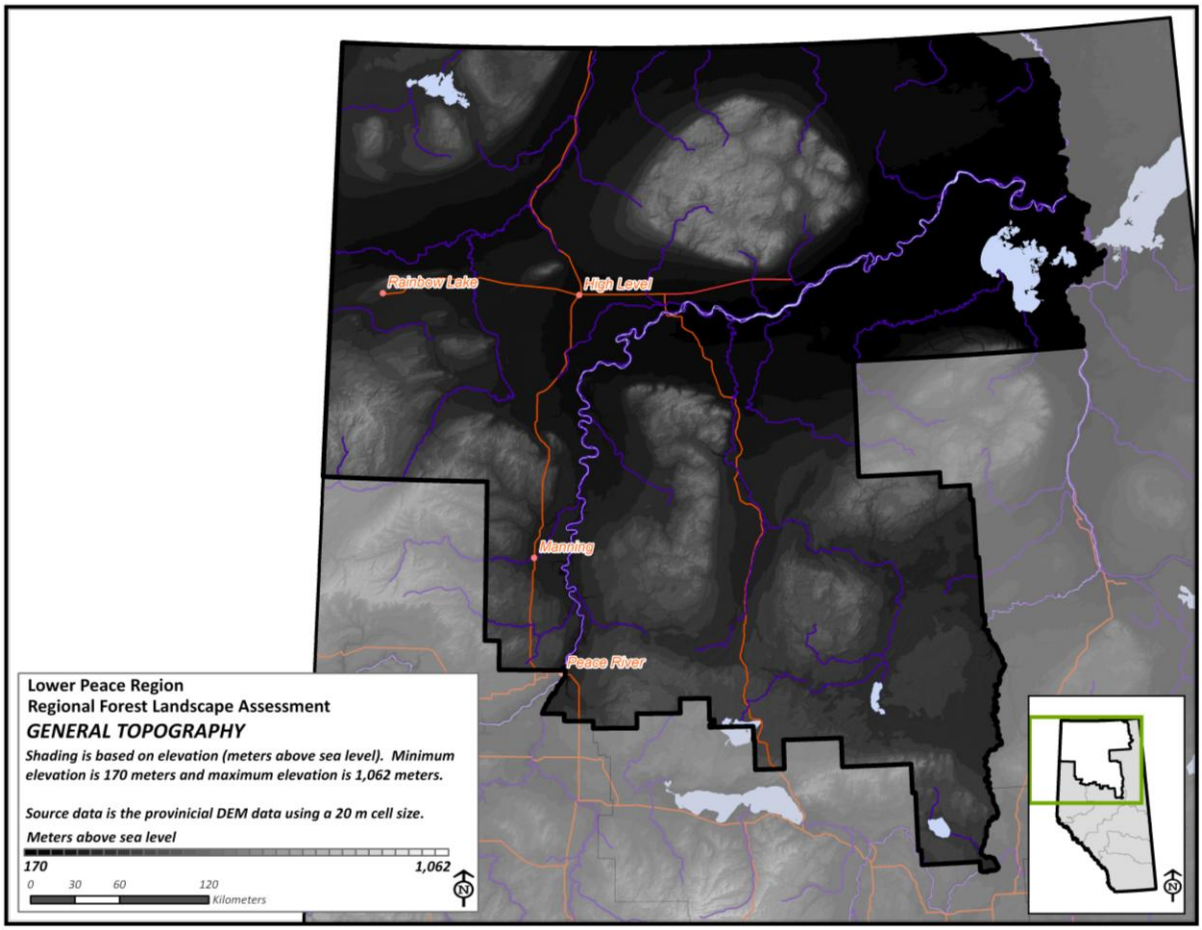


Figure 2-1 Topography

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 Luvisolic (17), which covers approximately 50% of the Region (Table 2-2). Luvisols and Organics are the only two of four Canadian forest soil orders (also Brunisols and Podzolic soils) represented in the Region. Organics, the second most dominant soil order, is often associated with Luvisolic soils in Alberta. Cryosolic soils are abundant along the northern border of the Region (the 60th parallel) and the higher elevations of the Caribou Mountains. This soil order is formed from perennially frozen mineral or organic materials (within 1 m of the surface).

Table 2-2 Soil Types

Soil Type			Area (ha)	Percentage (%)
Soil Order	**Soil Group**	**Soil Subgroup**		
Brunisolic	Dystric Brunisol	Eluviated Dystric Brunisol	446,865	2
Brunisolic	Eutric Brunisol	Eluviated Eutric Brunisol	199,279	1
Sub-total			646,144	3
Chernozemic	Black Chernozem	Rego Black Chernozem	66,780	0
Chernozemic	Dark Gray Chernozem	Gleyed Dark Gray Chernozem	18,865	0
Chernozemic	Dark Gray Chernozem	Gleyed Solonetzic Dark Gray Chernozem	64,223	0
Sub-total			149,868	1
Cryosolic	Organic Cryosol	Mesic Organic Cryosol	2,520,884	13
Gleysolic	Gleysol	Orthic Gleysol	619,847	3
Gleysolic	Gleysol	Rego Gleysol	87,411	0
Gleysolic	Humic Gleysol	Orthic Humic Gleysol	76,376	0
Gleysolic	Luvic Gleysol	Orthic Luvic Gleysol	358,663	2
Sub-total			1,142,295	6
Luvisolic	Gray Luvisol	Dark Gray Luvisol	70,974	0
Luvisolic	Gray Luvisol	Gleyed Gray Luvisol	833,879	4
Luvisolic	Gray Luvisol	Gleyed Solonetzic Gray Luvisol	751,185	4
Luvisolic	Gray Luvisol	Orthic Gray Luvisol	7,916,139	41
Sub-total			9,572,177	50
Organic	Mesisol	Terric Fibric Mesisol	8	0
Organic	Mesisol	Terric Humic Mesisol	116,394	1
Organic	Mesisol	Typic Mesisol	3,792,145	20
Sub-total			3,908,547	20
Regosolic	Humic Regosol	Orthic Humic Regosol	11,748	0
Regosolic	Regosol	Cumulic Regosol	117,316	1
Regosolic	Regosol	Gleyed Cumulic Regosol	510,670	3
Regosolic	Regosol	Orthic Regosol	114,797	1
Sub-total			754,532	4
Solonetzic	Solodized Solonetz	Gray Solodized Solonetz	512,549	3
No Significant Soil Development			10,585	0
Total			19,217,580	100

Luvisolic soils are dominant in forested landscapes and are generally underlain by loamy tills. Organics occur when there is decomposition caused by water accumulation, which is consistent with the low elevation landforms of this northern region. The presence of many gleyed subgroups indicates that much of the Region is exposed to prolonged or frequent water saturation of the soil profile.

Figure 2-2 illustrates the distribution of soil orders in the Region. Notable is the wide distribution of Luvisols as confirmed by their dominance in total area. An isolated pocket of Solonetzic soils along the base of the Caribou Mountains is likely related to an arid microclimate.

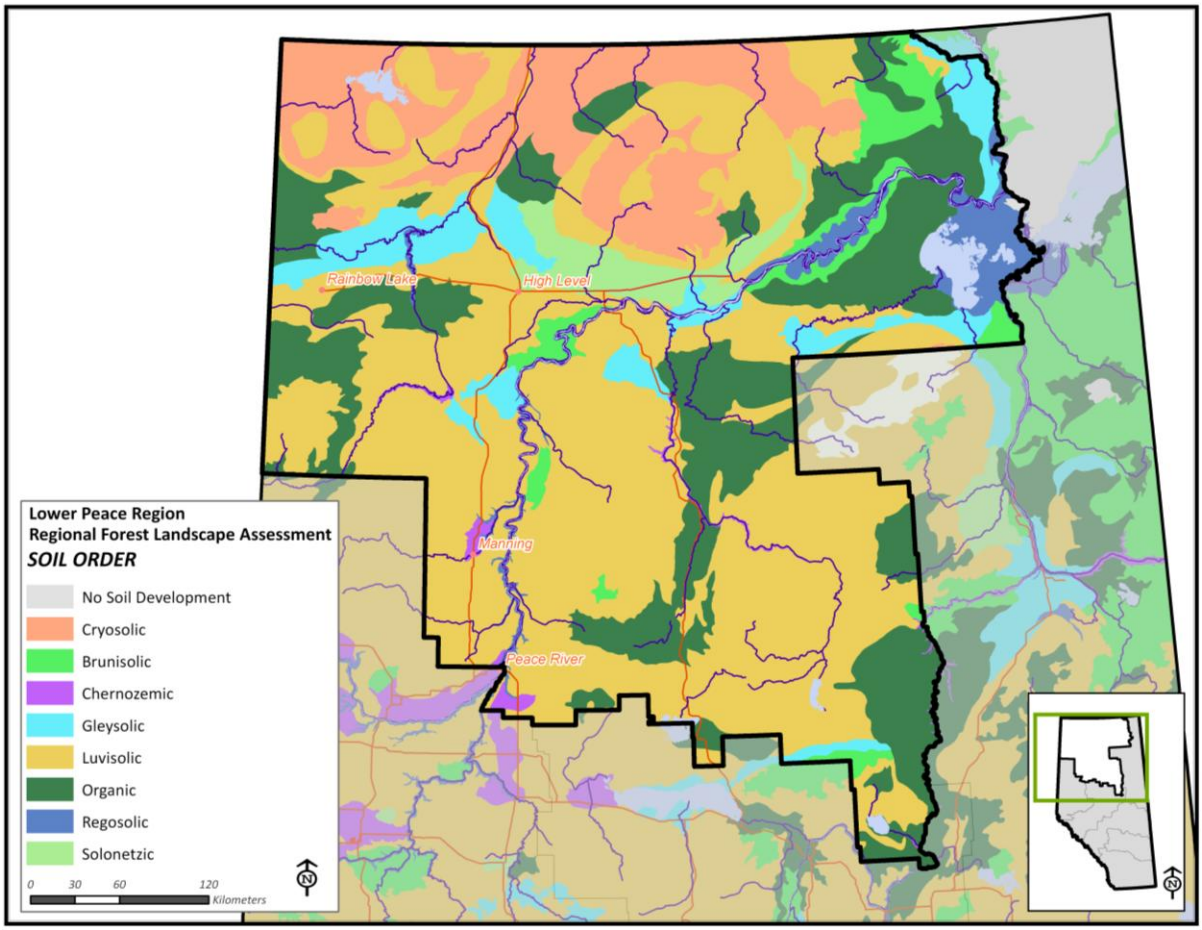


Figure 2-2 Soil Order

2.3 Hydrography

2.3.1 Water Basins

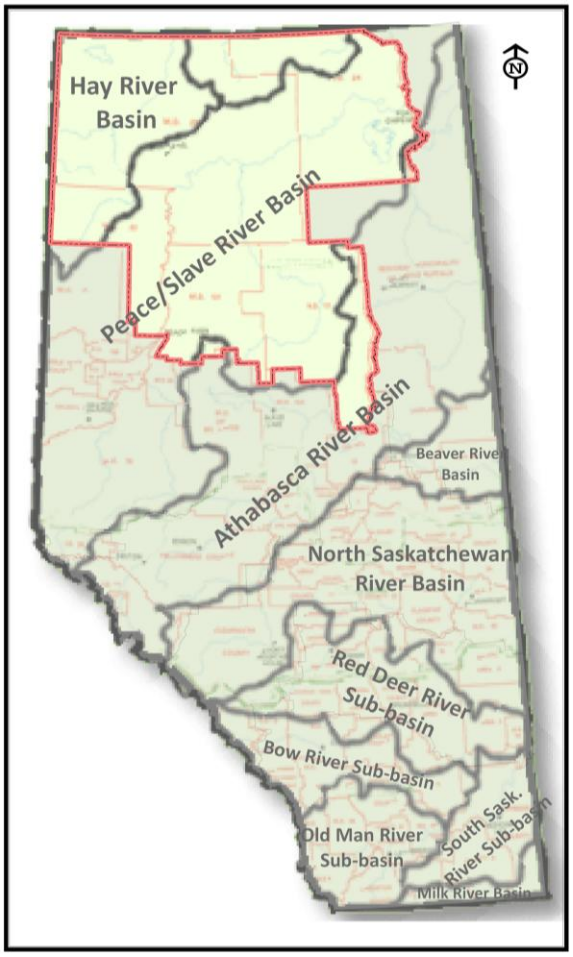


Figure 2-3 Major Water Basins

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 Lower Peace Region (shown in ***red*** on Figure 2-3) represents the lower reaches of the Peace River basin, which spans from the western border of the Province east to the Athabasca River and the Peace River delta.

2.3.2 Rivers, Streams and Waterbodies

Hydrologic features (19) are mapped by the province and are classified according to their water status (permanent, recurring, intermittent). Many man-made features are identified by type (canal, reservoir, quarry, etc.), 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 Lower Peace Region within each of the Green and White Areas as well as Federal lands (primarily Wood Buffalo National Park). 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

(primarily Wood Buffalo National Park). 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	52,719	20,552	36,238	109,509
Lake (Permanent)	352,364	8,395	240,565	601,324
Lake (Recurring)	54,809	4,976	52,040	111,825
Oxbow (Permanent)	2,266	331	95	2,692
Oxbow (Recurring)	2,424	419	17	2,860
Man-made Features	916	176	33	1,125
Total	465,497	34,849	328,989	829,336

Table 2-4 River/Stream Network Classification

	Length of River/Streams (km)			
River/Stream Class	**Green Area**	**White Area**	**Federal Lands**	**Total**
Stream (Permanent)	9,107	1,126	1,649	11,882
Stream (Recurring)	622	21		643
Stream (Indefinite)	1,479	238		1,717
Man-made Features	4	2	0	6
Total	11,212	1,387	1,649	14,248

Figure 2-4 shows the distribution of *permanent* water features in the Lower Peace Region. In addition, the significant rivers draining the Region are labeled. In total there are 207 named lakes in the Region, of which the largest is Lake Claire (142,142 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)**
Lake Claire	142,142	Peace River	846
Bistcho Lake	41,291	Hay River	631
Mamawi Lake	14,594	Wabasca River	562
Calling Lake	13,910	Chinchaga River	507
North Wabasca Lake	11,273	Buffalo River	475
Utikuma Lake	9,655	Mikkwa River	365
Peerless Lake	8,171	Birch River	351
Margaret Lake	7,902	Boyer River	349
Baril Lake	6,881	Yates River	270
Zama Lake	6,787	Athabasca River	270

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

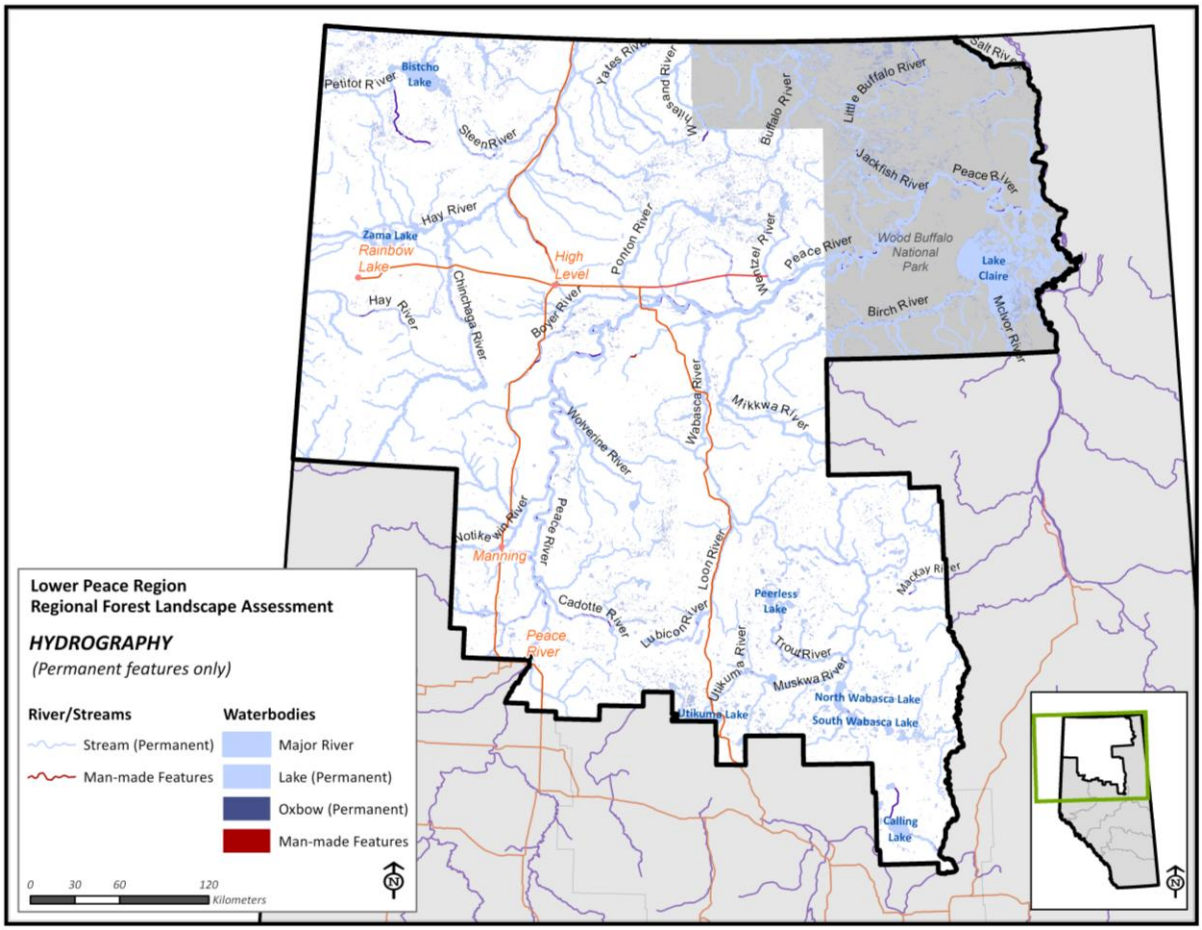


Figure 2-4 Permanent Waterbodies and Rivers

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 (20) 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 Lower Peace Region contains approximately 1,745,167 hectares of wetland (Table 2-6). The majority of identified wetland is located in Wood Buffalo National Park (see Figure 2-5). A second distribution of wetlands also occurs north of High Level east of the Hay River, running into the Northwest Territories.

Table 2-6 Wetland Summary

Wetland Classification	Area of Defined Wetland (ha)			
	Green Area	White Area	Federal Lands	Total
AVI				
Herbaceous Forbs/Grasses	-	-	-	9,651
Shrubs	-	-	-	64
Hydrography				
Wetlands	388,875	8,681	1,337,895	1,735,451
Total	-	-	-	1,745,167

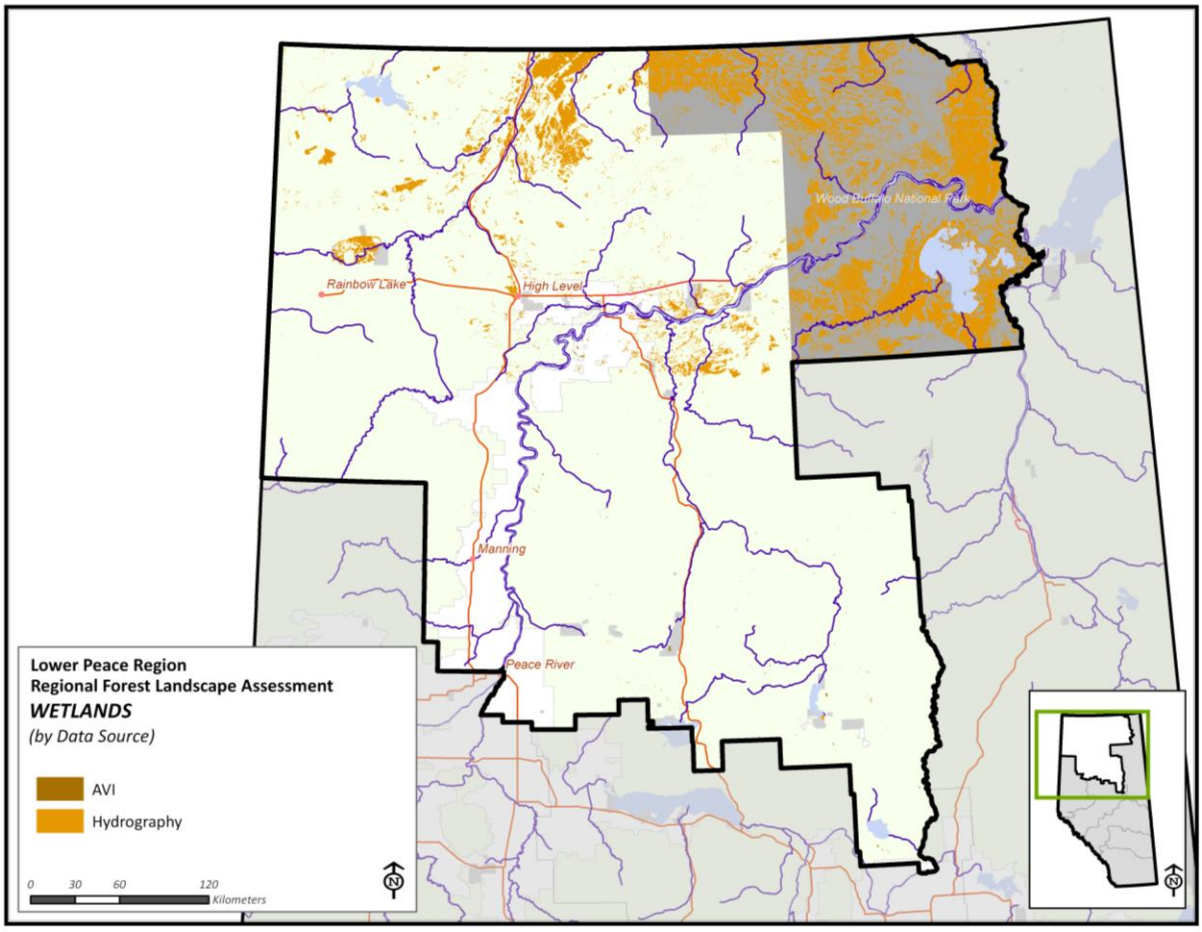


Figure 2-5 Wetlands

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 Lower Peace due to the variety of topography from the Rocky Mountains in the west, to boreal 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).

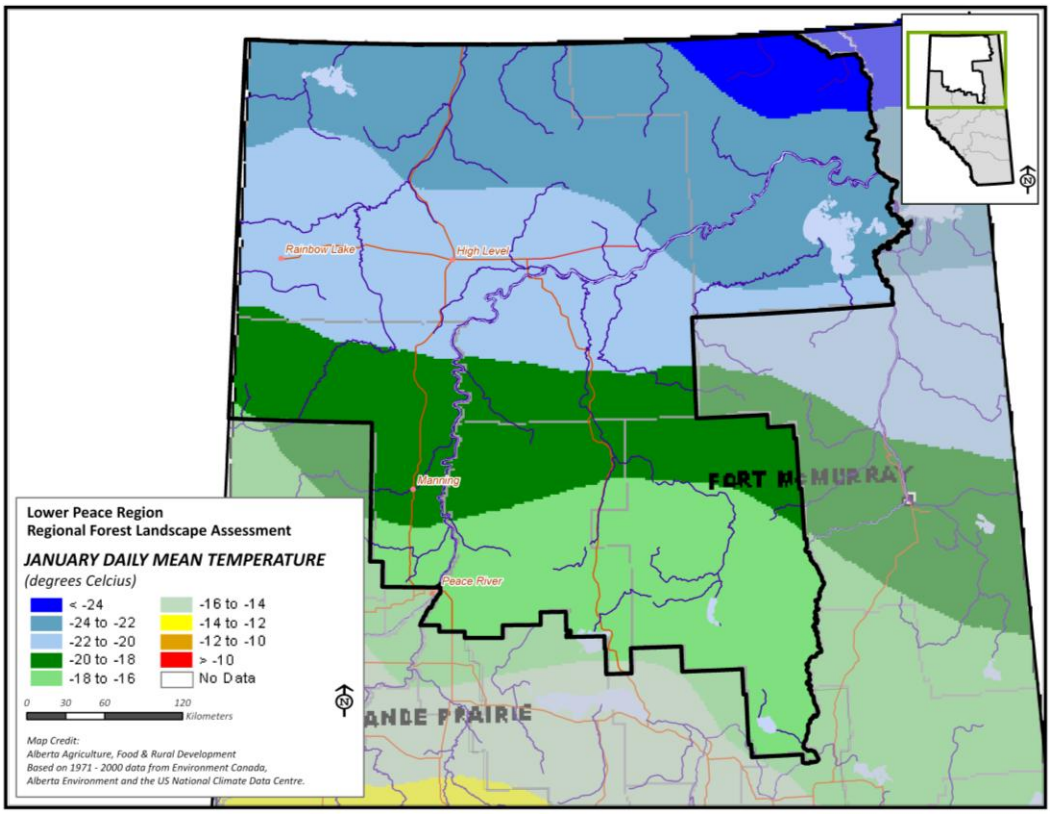


Figure 2-6 Daily Mean January Temperature

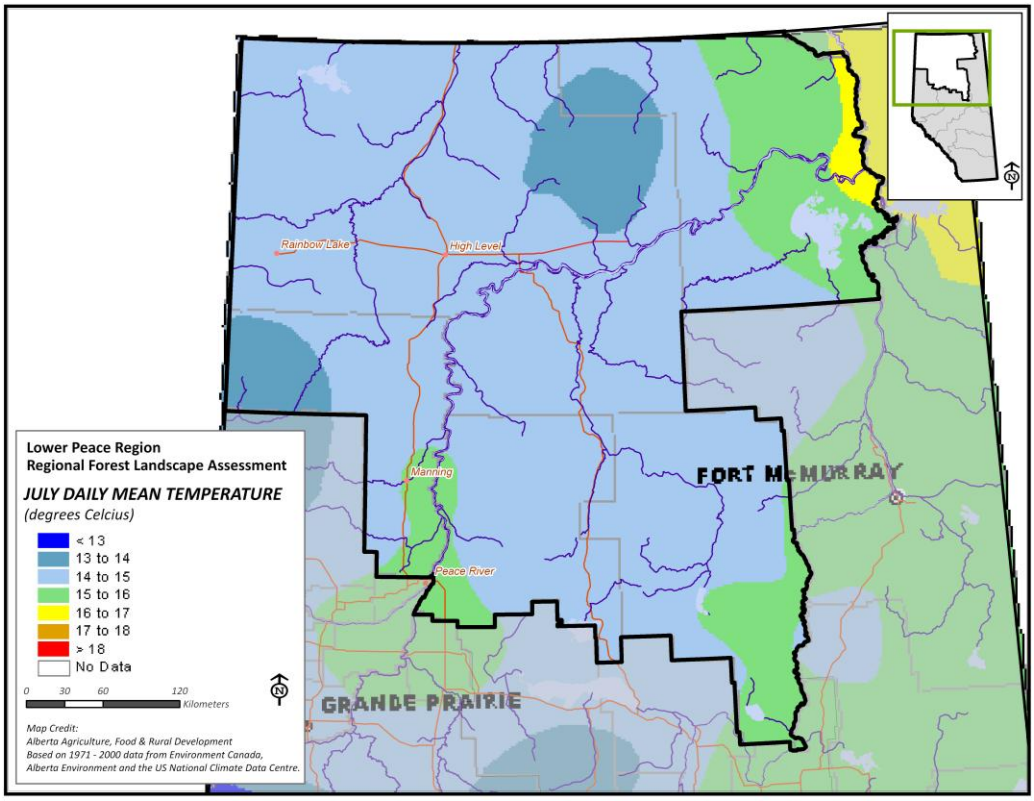


Figure 2-7 Daily Mean July Temperature

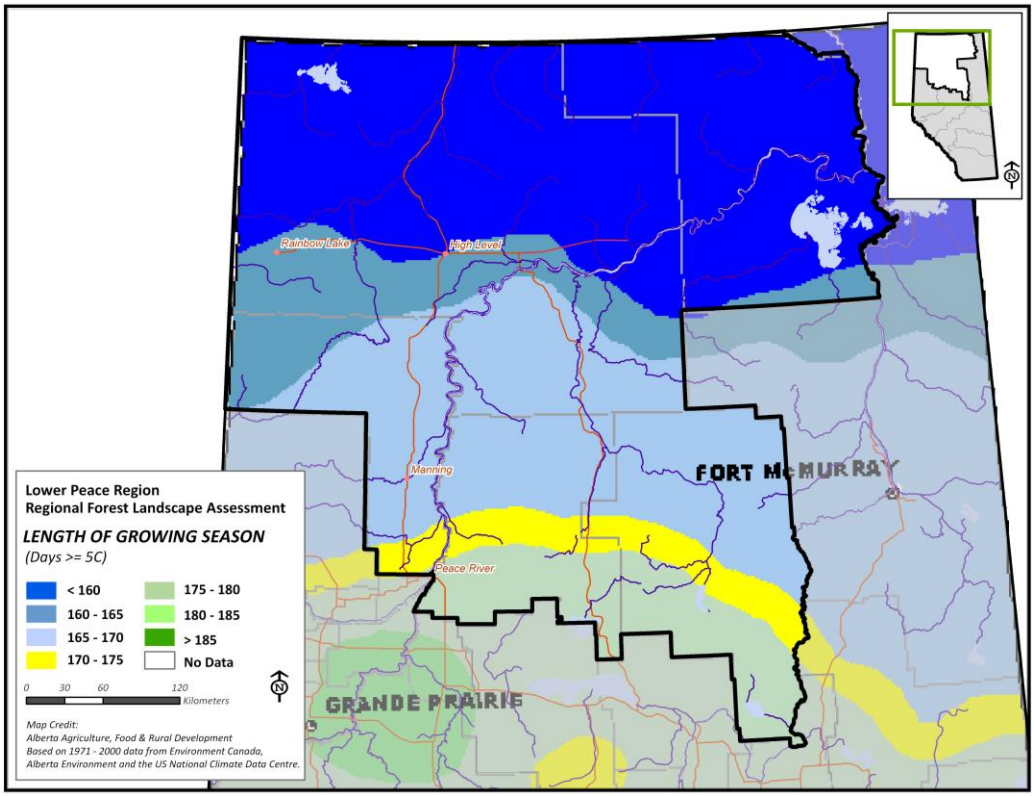


Figure 2-8 Length of Growing Season

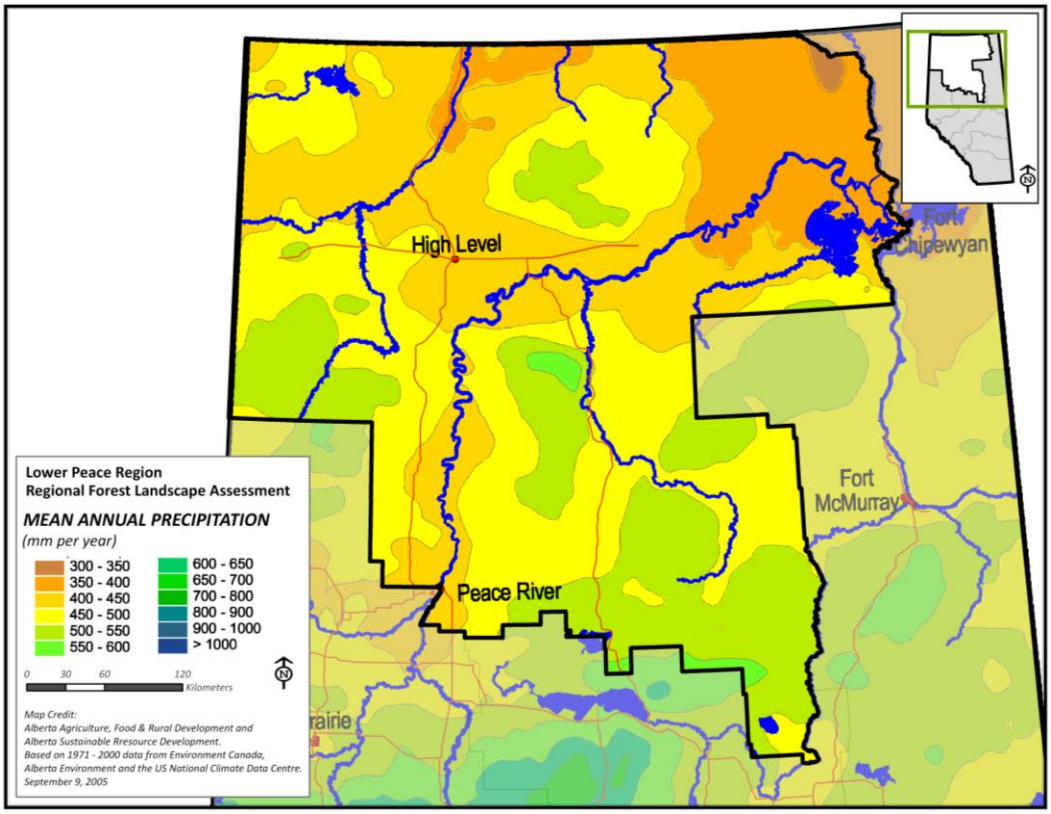


Figure 2-9 Mean Annual Precipitation

The provincial ecological classification identifies the Boreal ecoclimatic province as the dominant climatic presence within the Lower Peace Region. In addition to temperature, length of growing season and precipitation shown above, three important factors affecting 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.

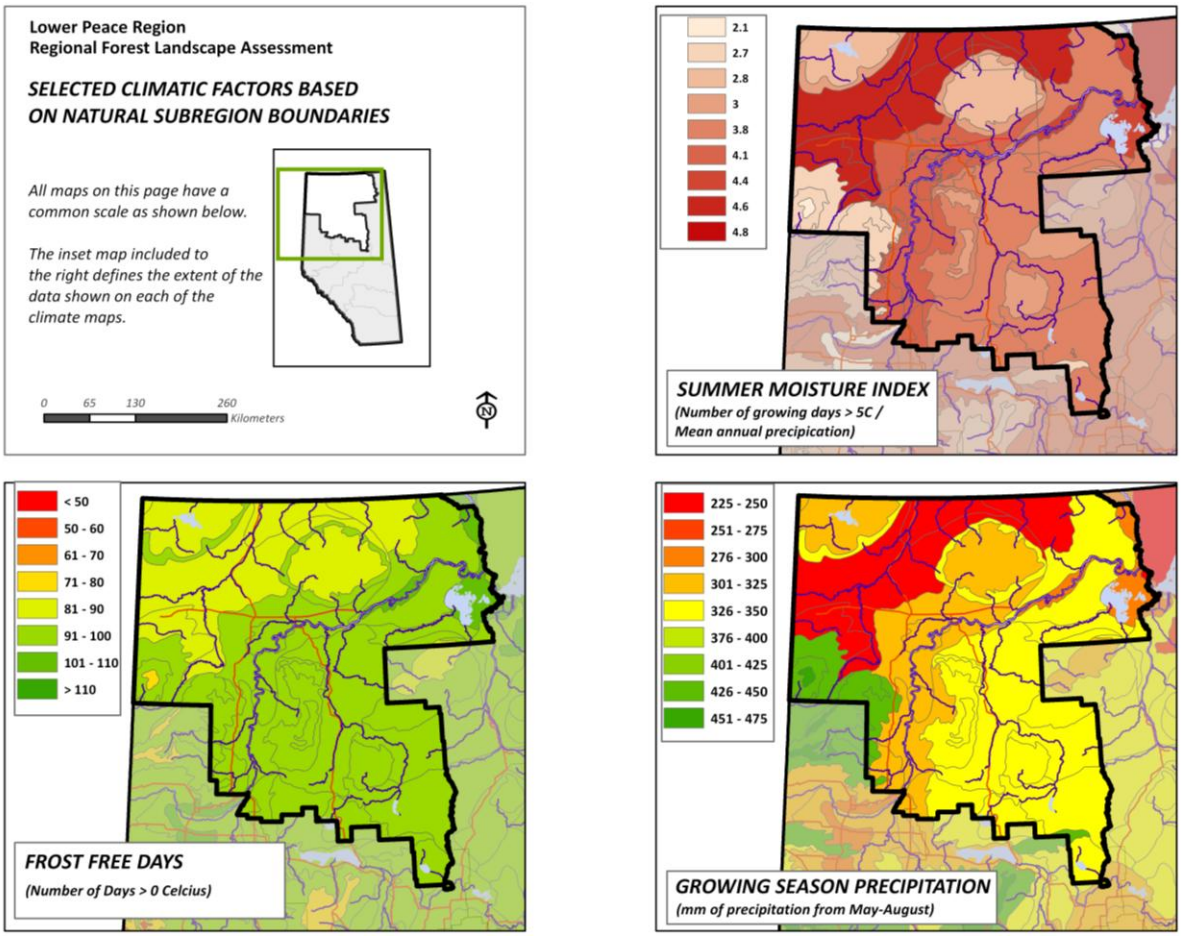


Figure 2-10 Climatic Factors Associated with Natural Subregions

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. Approximately 65% of the Lower Peace Region has detailed AVI data available. Figure 3-1 indicates the relative coverage of AVI detail across the Lower Peace Region and the source of that information. All AVI specifications data meet the minimum standard for vegetation classification as described in Alberta (2005).

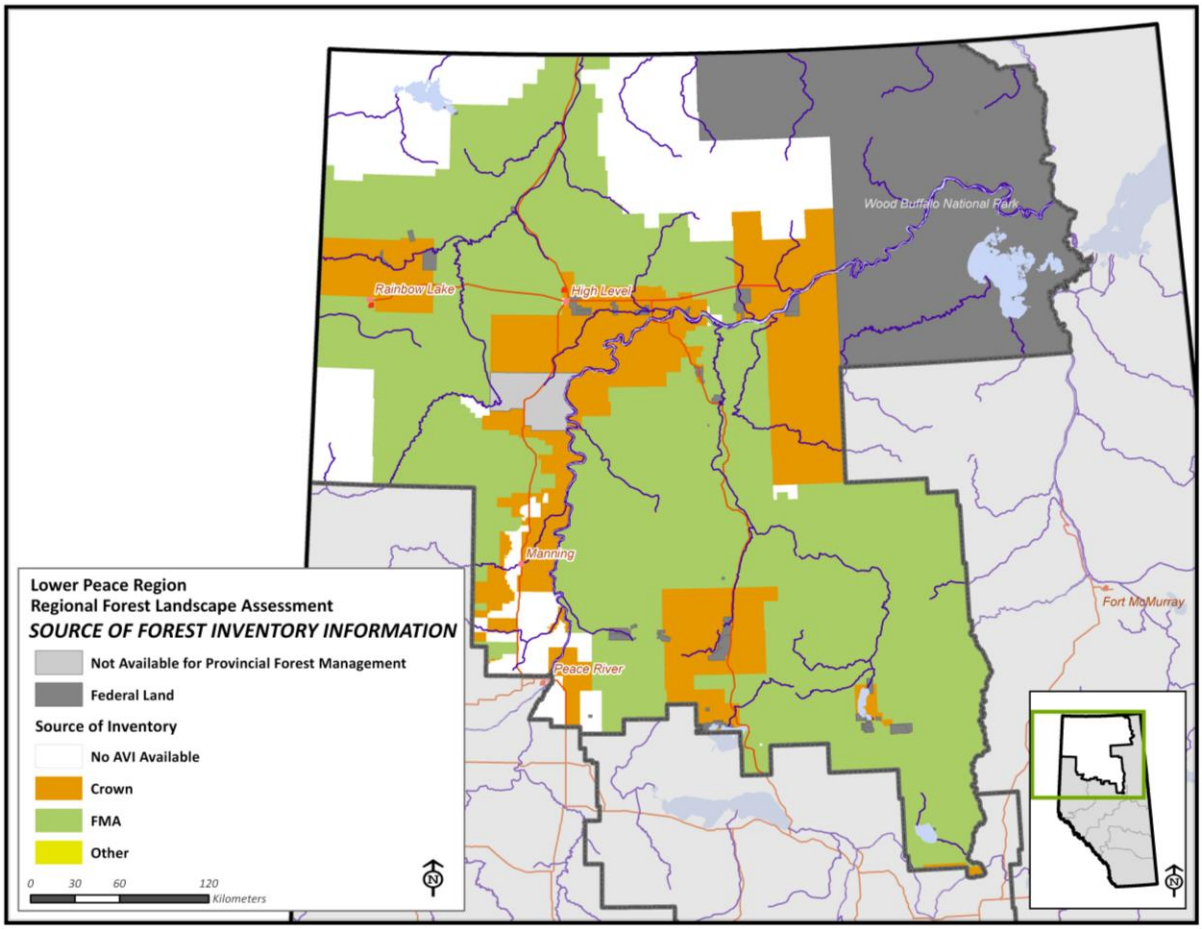


Figure 3-1 Source of AVI Information

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 AVI in this Region is in the 16 to 20 year class. A further 2% of the area has an inventory age greater than 20 years

old, indicating that the inventory is in need of a significant update. For the purposes of further landscape assessment for the Lower Peace Region, 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 largely comprised of Wood Buffalo National Park (3,629,581 ha). The balance of the non-inventoried area is in the White Area or identified forest management units that have low potential for resource development (F10 and F20 as shown on Figure 1-4).

Table 3-1 Age of AVI Information

Age of AVI (years)	Area (ha)	Percentage (%)
0 to 5 years	970,646	5
5 to 10 years	3,236,854	17
11 - 15 years	2,256,321	12
16 - 20 years	5,592,646	29
Greater than 20 years	475,263	2
Sub-total	12,531,730	65
No AVI Available	6,685,851	35
Total	19,217,580	100

For the purposes of this landscape assessment, only the overstory detail was used for the classifications of species, forest types, age class and seral stage; the understory information was not considered. 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. The class "Pine- undiff" represents areas where lodgepole pine and jack pine are indistinguishable either because of hybridization between the two species, or the quality of the aerial photography used for interpretation was not adequate to differentiate the precise species.

Both aspen-leading and black spruce-leading stand types are the most common over the area of inventoried lands. Together these two leading species make up 61% of the forest land in the Region. White spruce is the next most common coniferous species with only small amounts of lodgepole pine, jack pine and tamarack found.

Note that there may be significant areas of sparse black spruce and larch occurring in wetlands. These areas would typically be classified as "Not Treed" due to the wetland being the dominant feature. 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*	1,192,003
Engelmann spruce	*Picea engelmannii*	11
Black spruce	*Picea mariana*	3,042,949
Pine - undiff	*Pinus sp.*	8,026
Lodgepole pine	*Pinus contorta*	207,815
Jack pine	*Pinus banksiana*	314,845
Balsam fir	*Abies balsamea*	1,776
Tamarack	*Larix laricina*	413,576
Western larch	*Larix occidentalis*	15
Sub-total: Coniferous		5,181,002
Deciduous		
Hardwood - undiff	*Populus sp.*	177
Trembling aspen	*Populus tremuloides*	3,885,875
Balsam poplar	*Populus balsamifera*	141,817
Paper birch	*Betula papyrifera*	162,579
Sub-total: Deciduous		4,190,448
Regeneration		
Undeclared species		573,269
Sub-total: Regeneration		573,269
Sub-Total Forested Land		9,944,720
Not Forested		1,334,296
No Inventory Data		7,938,565
Total		19,217,580

Tree species geographic distribution is presented in Figure 3-2. The large area of “Not Treed” in the south central part of the Region is primarily agricultural land.

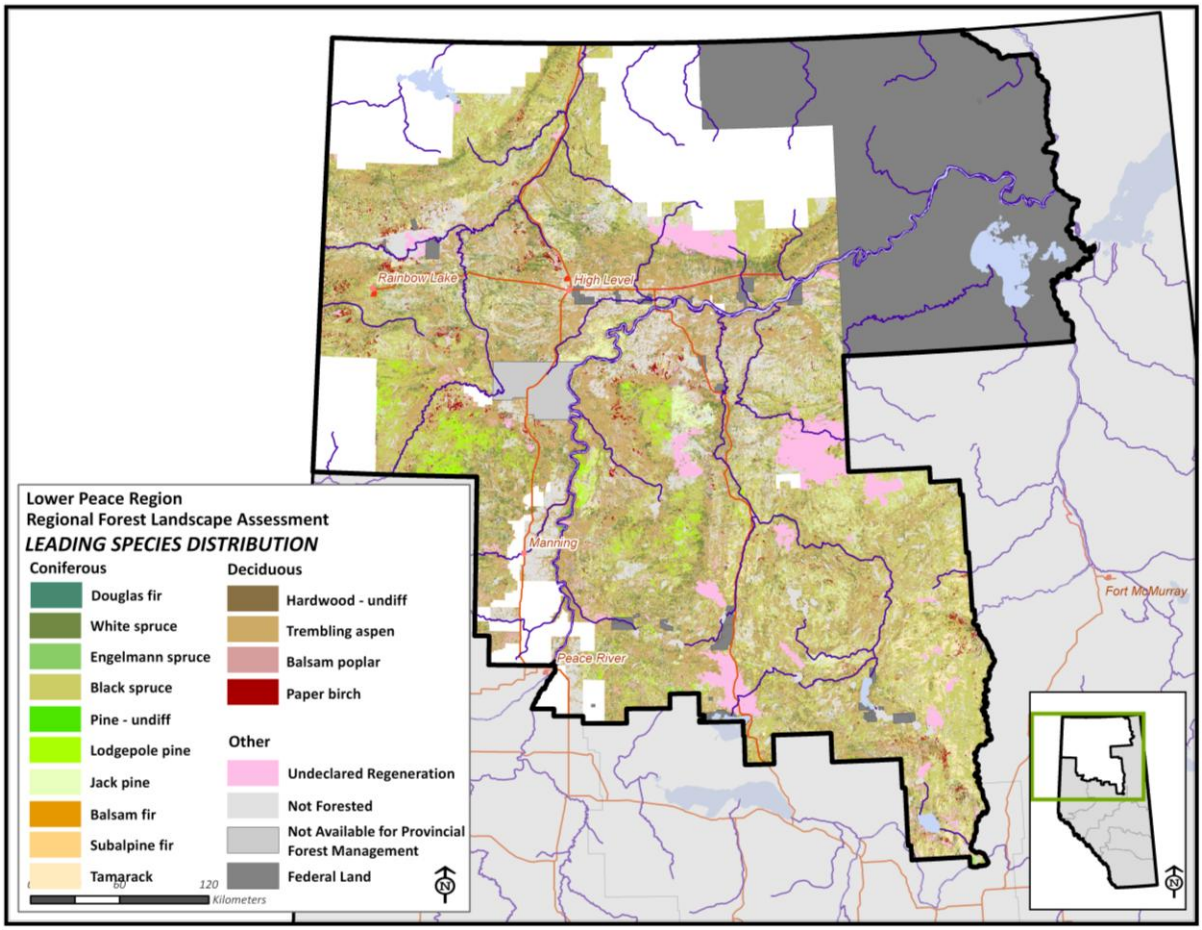


Figure 3-2 Leading Tree Species

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. The stratum 'Coniferous – Douglas fir leading' is not represented in the forest inventory information available for the Lower Peace region..

The Region is dominated by black spruce and deciduous stand types (Table 3-3), with little of the forest occurring as mixed coniferous/deciduous strata. Deciduous stands are significant in the Region (33% of all the inventoried land) and are found throughout the Region.

Figure 3-3 shows the spatial distribution of cover types across the Lower Peace Region.

Table 3-3 Forest Cover Type Summary

Description	Code	Area (ha)
Forested Land		
Pine pure or leading	C-P	469,772
Black spruce pure or leading	C-Sb	3,422,158
White spruce pure or leading	C-Sw	981,083
Pine/Hardwood	CD-P	62,771
Black spruce/Hardwood	CD-Sb	36,299
White spruce/Hardwood	CD-Sw	213,838
Hardwood/Pine	DC-P	75,185
Hardwood/Spruce	DC-S	336,931
Deciduous	D	3,773,429
Regeneration (undeclared strata)		573,269
Sub-total		9,944,735
Not Forested		1,334,296
No Inventory Data		7,938,549
Total		19,217,580

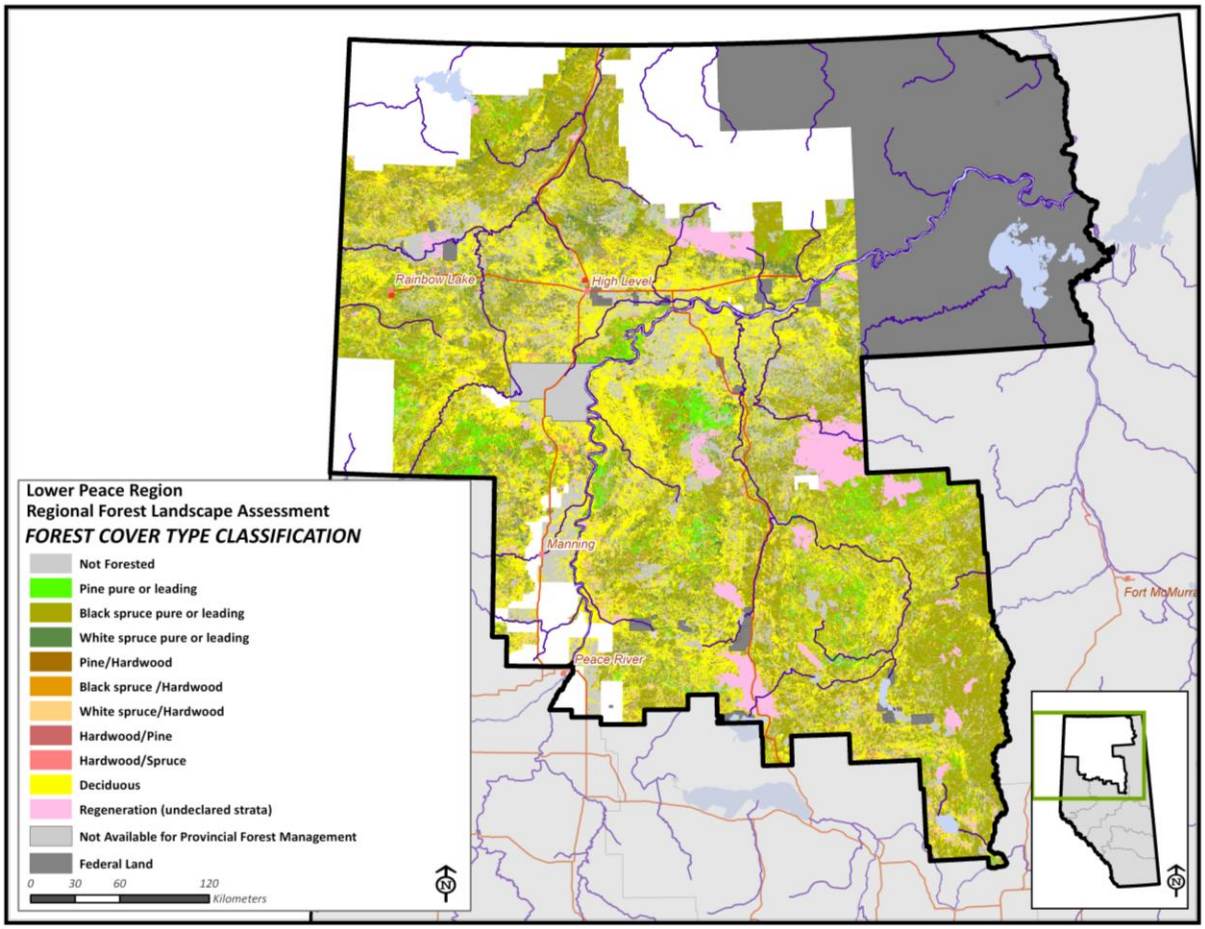


Figure 3-3 Forest Cover Type Distribution

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 immature, with a full 15% of the inventoried area represented by the 70-79 year age class. The second largest grouping of ages is the amalgamation of the 80-89 and 90-99 classes, which represent 20% of the landbase for which detailed information is available. The prevalence of these three age classes is consistent with the wildfire history in the Region, with several large fires having occurred in the 1950's (see section 4.5).

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
Forested Land	**(ha)**
0 - 9	281,869
10 - 19	458,826
20 - 29	86,043
30 - 39	337,804
40 - 49	117,741
50 - 59	262,250
60 - 69	900,729
70 - 79	1,985,828
80 - 89	1,321,542
90 - 99	1,161,278
100 - 109	756,034
110 - 119	735,868
120 - 129	452,879
130 - 139	324,090
140 - 149	244,613
150 - 159	243,232
160 - 169	102,613
170 - 179	86,057
180 - 189	25,750
190 - 199	24,544
200 +	35,142
Sub-total	9,944,735
Not Forested	2,595,919
No Inventory Data	6,676,926
Total	19,217,580

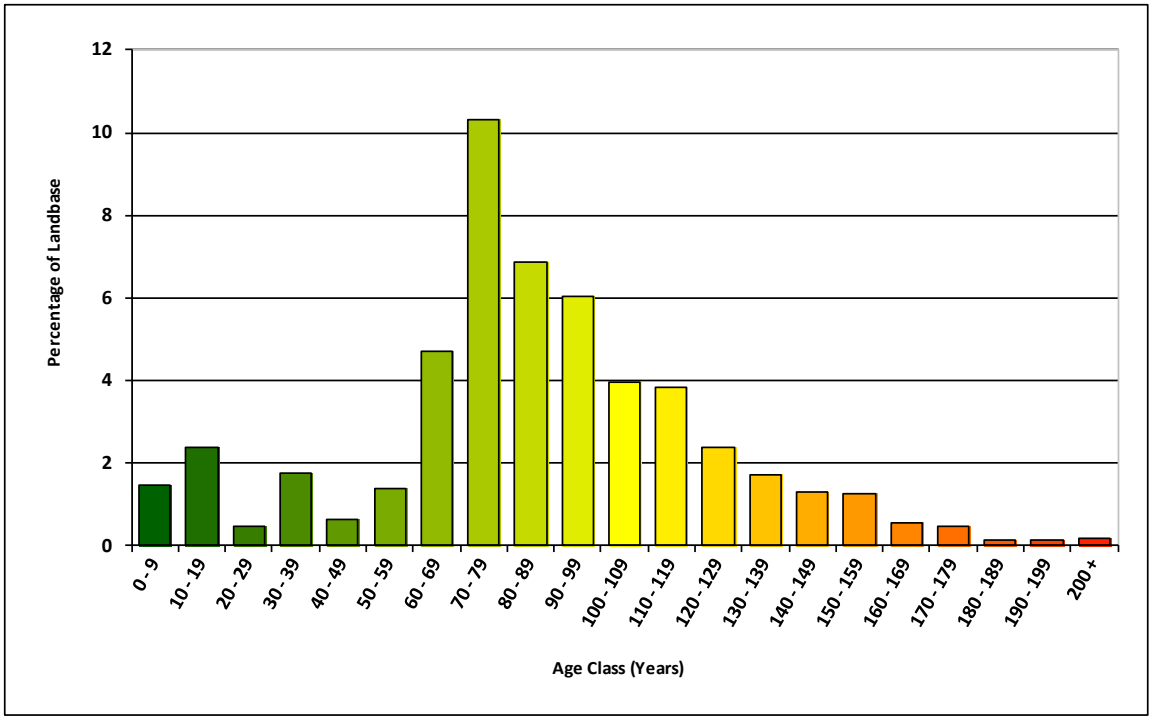


Figure 3-4 Distribution of Age Classes in Reporting Area

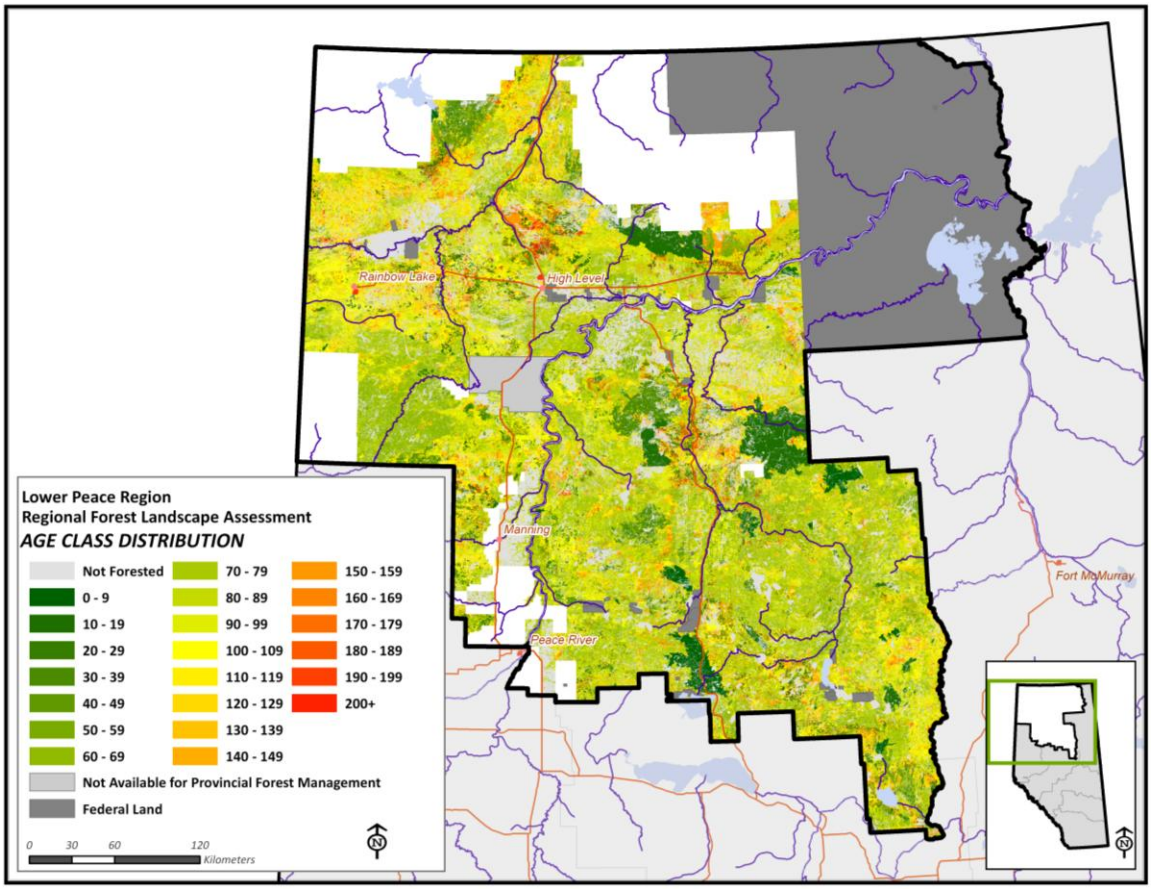


Figure 3-5 Age Class Distribution

3.5 Seral Stages

Seral stages (23) 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 Lower Region are represented mostly by Immature and Mature classes (Table 3-5). The Young class is made up primarily of regenerating harvest areas and wildfires. It covers approximately 4% of the Region. Old and Very Old forest comprise approximately 8% of the Region.

Table 3-5 Distribution of Seral Stage by Cover Group

Seral Stage	Definition	Area (ha)
Forested Land		
Young	Stand age < 20 years	740,696
Immature	Stand age 20 to 79 years	3,690,395
Mature	Stand age 80 to 119 years	3,974,722
Old	Stand age 120 to 179 years	1,453,485
Very Old	Stand age >= 180 years	85,437
Sub-total		9,944,735
Not Forested		2,595,919
No Inventory Data		6,676,926
Total		19,217,580

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

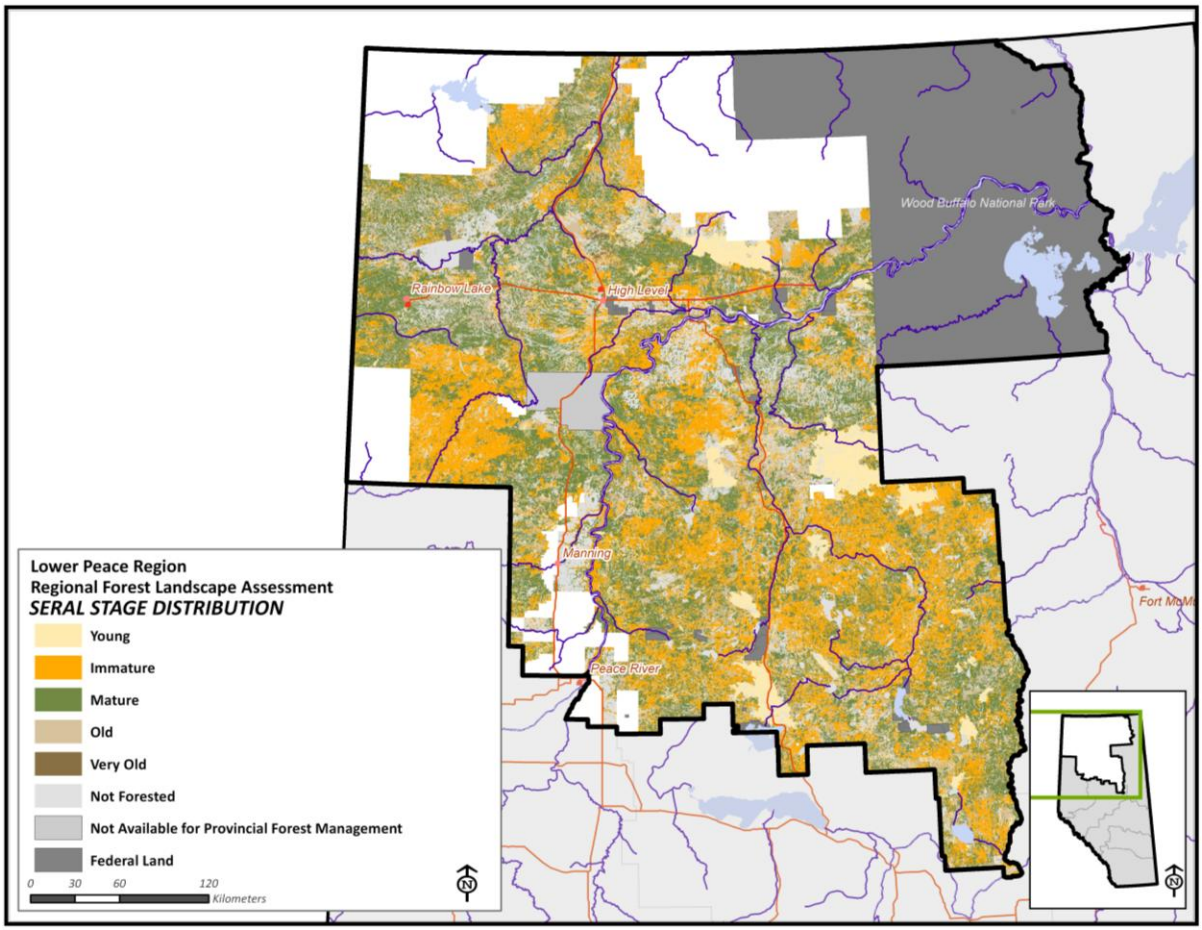


Figure 3-6 Seral Stage

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 - 20	22,890	102,186
20 - 100	3,807	148,903
100 - 250	370	55,539
250 +	224	434,054

The large area represented by the patch size class of greater than 250 hectares, is primarily due to large wildfires in the central and south central areas of the Lower Peace Region which occurred in 1995, 1998 and 2002 (see section 4.5).

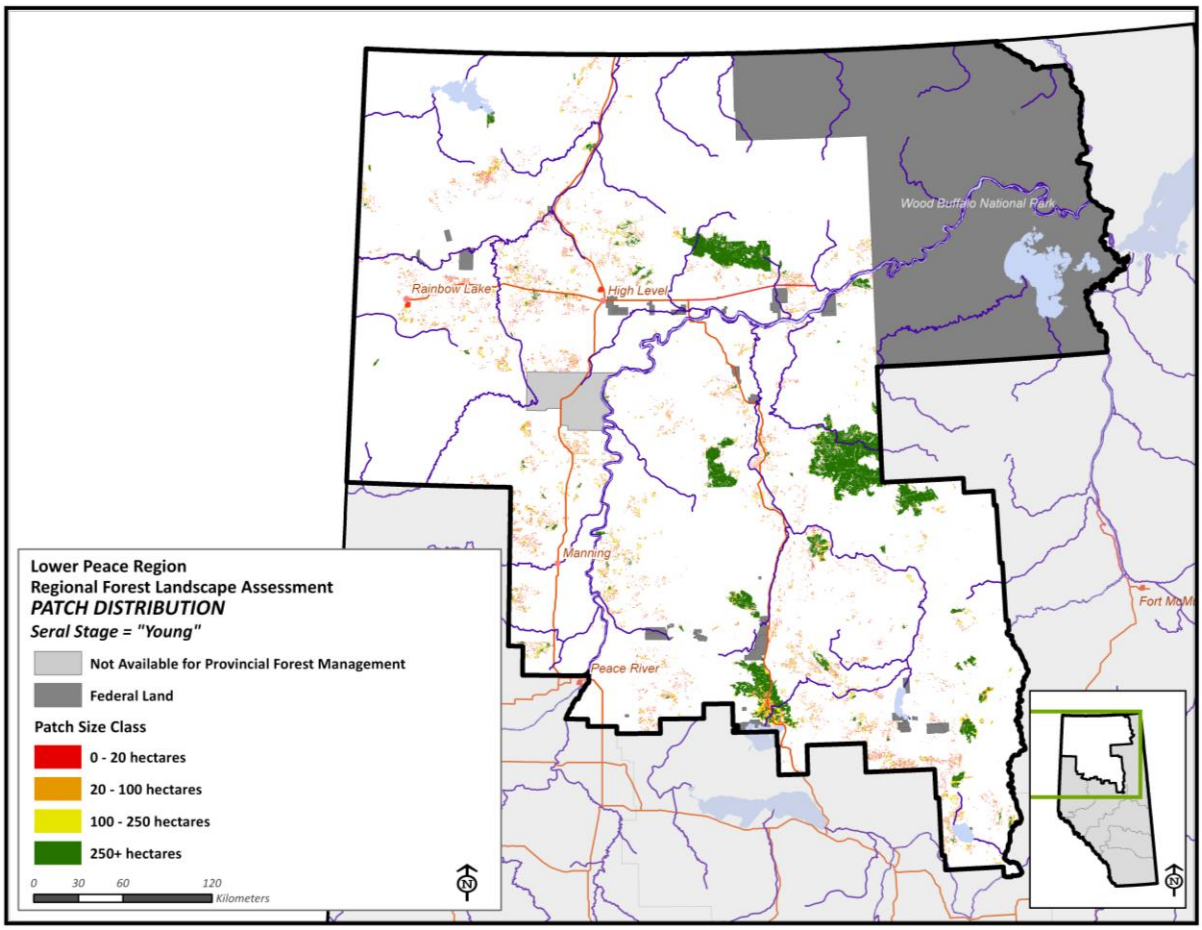


Figure 3-7 Patch Distribution of Young Stands

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, old or very old forest. Using these rules, the resulting interior forest was determined for the Lower Peace Region. The area summary is displayed in Table 3-7, and a map of the interior forest distribution 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
Immature	0	0
Mature	4,322	1,729,010
Old	1,420	411,949
Very Old	53	10,343

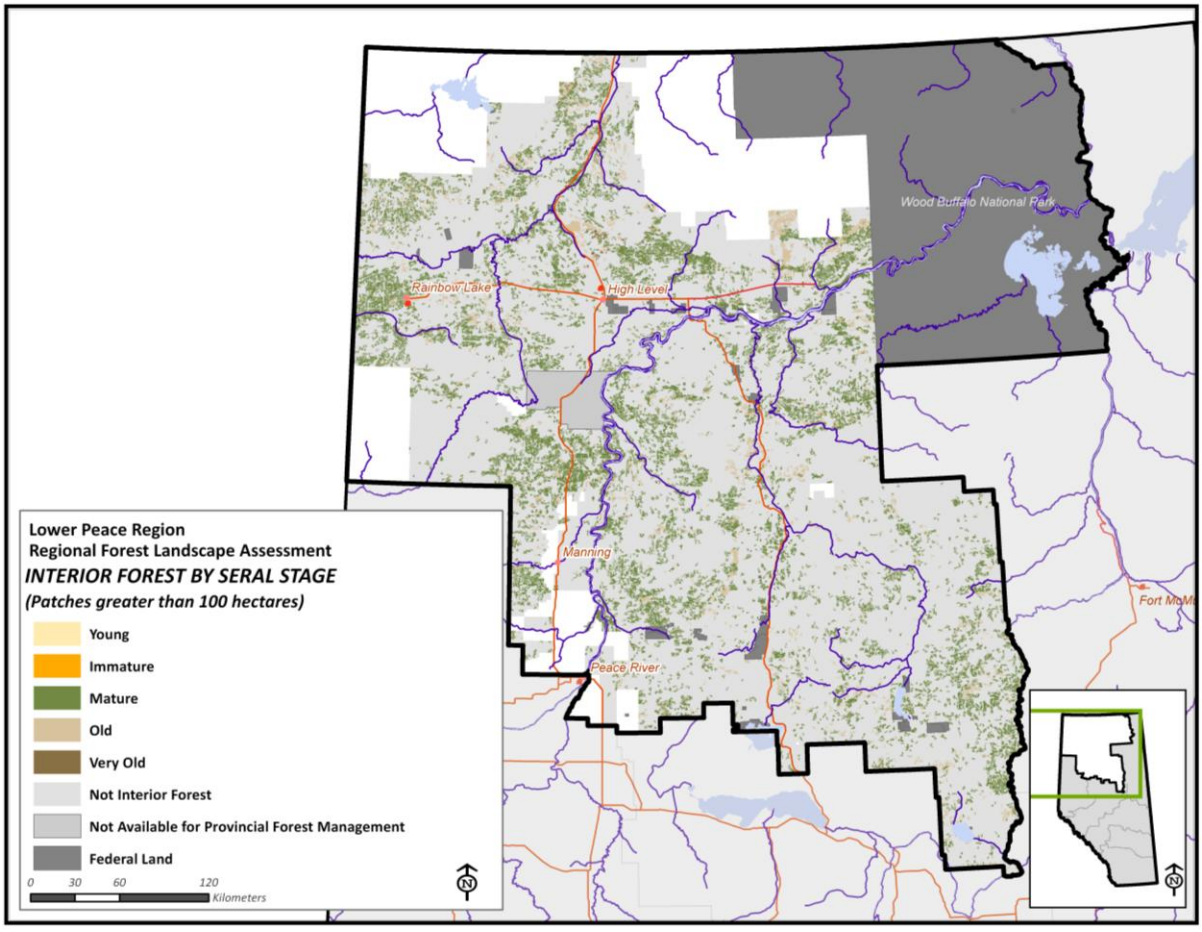


Figure 3-8 Interior Forest by Seral Stage

4. Landscape Disturbance and Succession

4.1 Inherent Disturbance Regime

The natural disturbance regime in the Lower Peace 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 that introduces most of the variability in the forest mosaic (Andison 1999).

Additional disturbances on the landscape associated with settlements and development of the forest and energy industries, the dominant impact on landscape disturbances are now through anthropogenic, or man-caused, events. In addition, regulation and policy to limit the impact of natural disturbances (wildfire control, wildfire prevention, insect suppression programs, etc) 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*)
    - Bruce spanworm (*Operophtera bruceata*)
    - Tent caterpillar (*Malacosoma disstria*)
- Spruce budworm (*Choristoneura fumiferana*)

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 is the preferred host, but as populations increase, smaller-sized pines 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 Lower Peace Region since annual surveys were undertaken in 2006 (24). The Lower Peace Region forests have been increasingly impacted since the summer 2009.

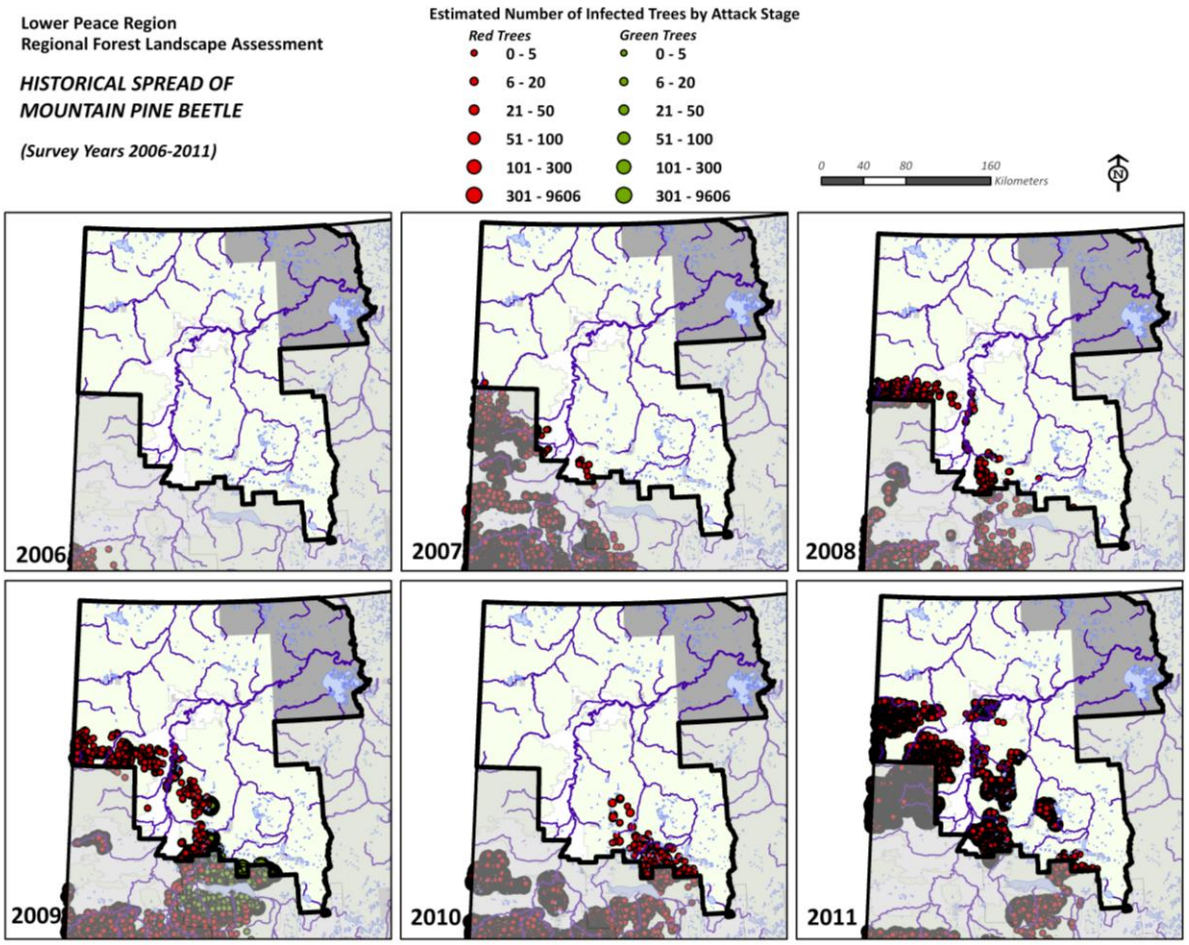


Figure 4-1 Historical Spread of Mountain Pine Beetle

4.2.2 Hardwood Defoliators

Table 4-1 summarizes the total area of hardwood defoliation as surveyed by ESRD between 1998 and 2011 (inclusive) (25).

The hardwood defoliator agent causing the most damage in this Region is large aspen tortrix which accounts for 53% of the total area impacted by hardwood defoliators. The majority of the historical infestations are of moderate 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 leaf-roller) are present in the province and potentially in the Lower Peace Region, but no surveys have detected any significant populations worth noting.

Table 4-1 Summary of Hardwood Defoliator 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*	236,133	1	8,410,362	40	2,586,407	12	11,232,902	53
Bruce spanworm	*Operophtera bruceata*	47,060	0	7,716	0	334	0	55,111	0
Forest tent caterpillar	*Malacosoma disstria*	476,251	2	4,937,596	23	4,524,265	21	9,938,112	47
Total[1]		759,444	4	13,355,675	63	7,111,006	34	21,226,125	100

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

Figure 4-2 is an overview of the history of the presence of hardwood defoliator outbreaks impacting forests in the Lower Peace 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, Bruce spanworm and tent caterpillar) is presented in following sections.

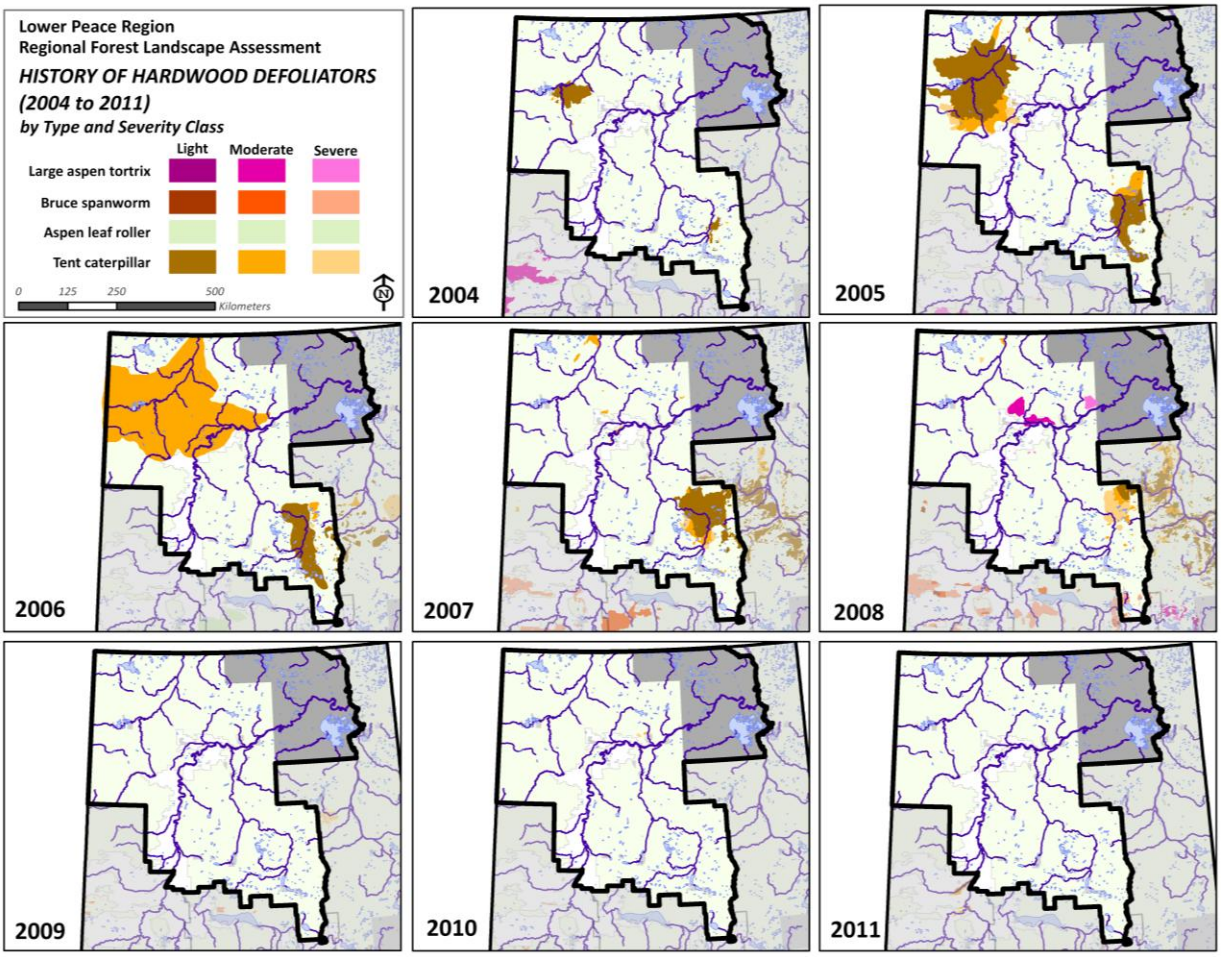


Figure 4-2 History of Hardwood Defoliation Outbreaks (2004-2011)

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.

The last severe infestation in the Lower Peace was in 2000, with only moderate to light infestations being reported between 2001 and 2011. Over the last 10 year period, infestations in the Lower Peace account for approximately 15% of the overall provincial infestation level.

Bruce Spanworm

Bruce spanworm also occurs widely across Canada. Aspen is the principle host, but the spanworm will also feed on willow, balsam poplar, white birch and shrubs such as Saskatoon, currants and wild rose. Historically, outbreaks have not lasted more than 2 years and typically decline very quickly. Hence there seems to be little value in adopting control measures for this pest.

Infestations of Bruce spanworm are sporadic, with the most recent occurring over 2007 and 2008 which quickly collapsed. The prevalence of spruce budworm infestation in the Lower Peace Region has been low in comparison to other regions, and typically represents less than 10% of the overall provincial infestation.

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 to 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 2005 to 2008. Incidence of tent caterpillar outbreaks in the Lower Peace 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

The spruce budworm is the most important defoliator pest of spruce-fir forests in North America. In Alberta, white spruce is the preferred host, but tamarack and balsam fir can also be attacked. While attacks are more visible in pure host stands, mixedwood stands are also prone to attack once an infestation is underway. Re-occurrence and length of infestations vary widely. Damage to trees is significant as the budworms attack new needle growth as well as buds. After 4-5 years of defoliation, dead tops can appear on trees. Additional years of infestation may result in mortality.

Table 4-2 indicates the summary of historical infestations of spruce budworm in the Lower Peace Region (26). The budworm is a more serious pest than in other Regions. As indicated in Figure 4-3, the budworm appears throughout the Region. The most recent infestation noted was in 2010 with decreased budworm activity observed in the 2011 survey.

Table 4-2 Summary of Spruce Budworm Presence

Insect Pest - Spruce Budworm		Severity of Impact						Total	
		Light		Moderate		Severe			
Common Name	Latin Name	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)
Spruce budworm	*Choristoneura fumiferana*	230,063	6	1,096,001	27	2,695,104	67	4,021,168	100
Total[1]		230,063	6	1,096,001	27	2,695,104	67	4,021,168	100

[1] Sum of infestation survey records 1987 to 2011 inclusive

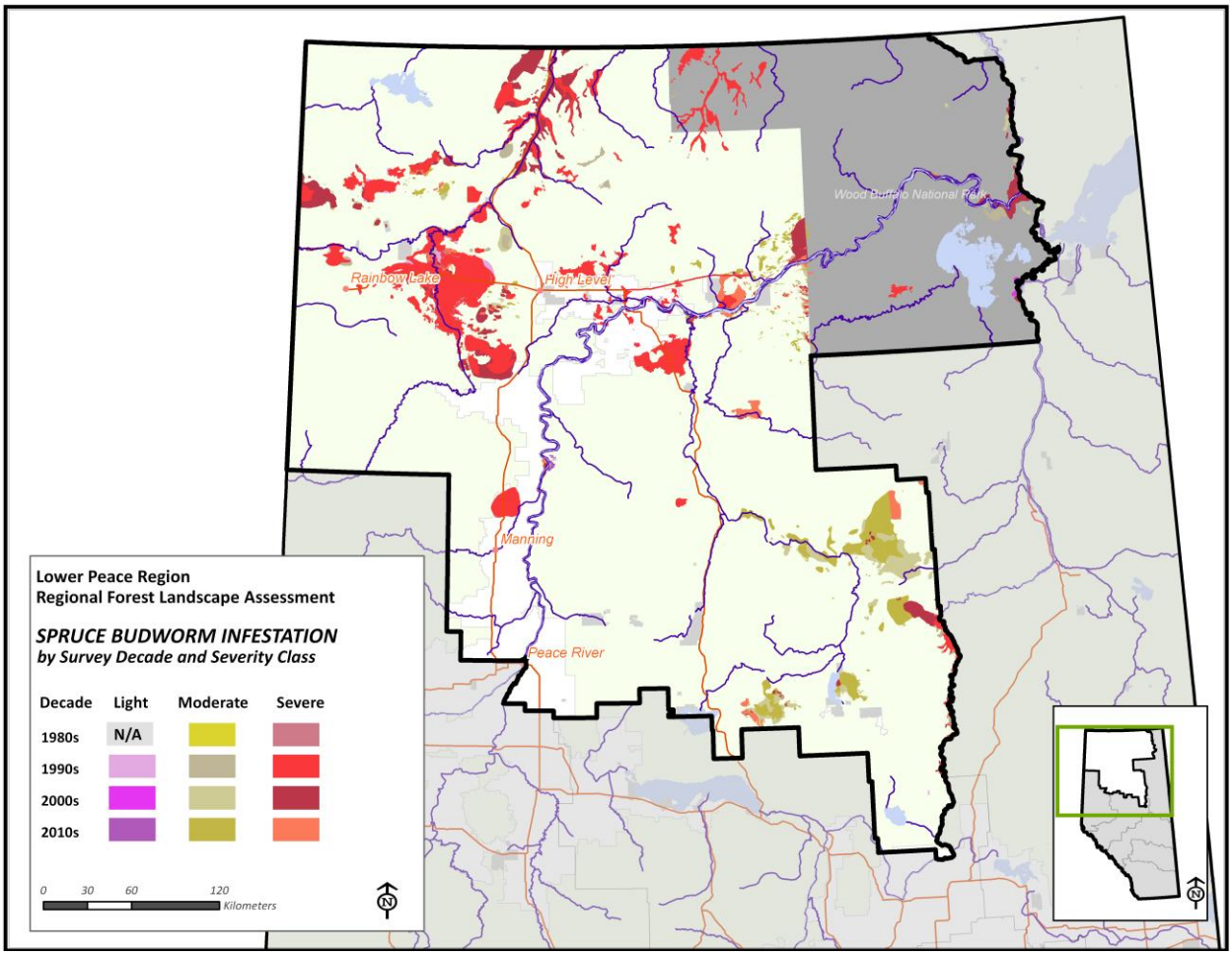


Figure 4-3 History of Spruce Budworm

4.2.4 Other Forest Health Agents

Aside from fire, insects and human impacts, weather can have an affect on the health of the forest. ESRD (48) has reported localized flooding in 2010 (east of High Level) and drought in 2011 (northeast of

Red Earth Creek), with one drought area totalling 276,188 ha. Figure 4-6 shows the areas of tree decline and tree kill due to these abiotic forest health damaging agents.

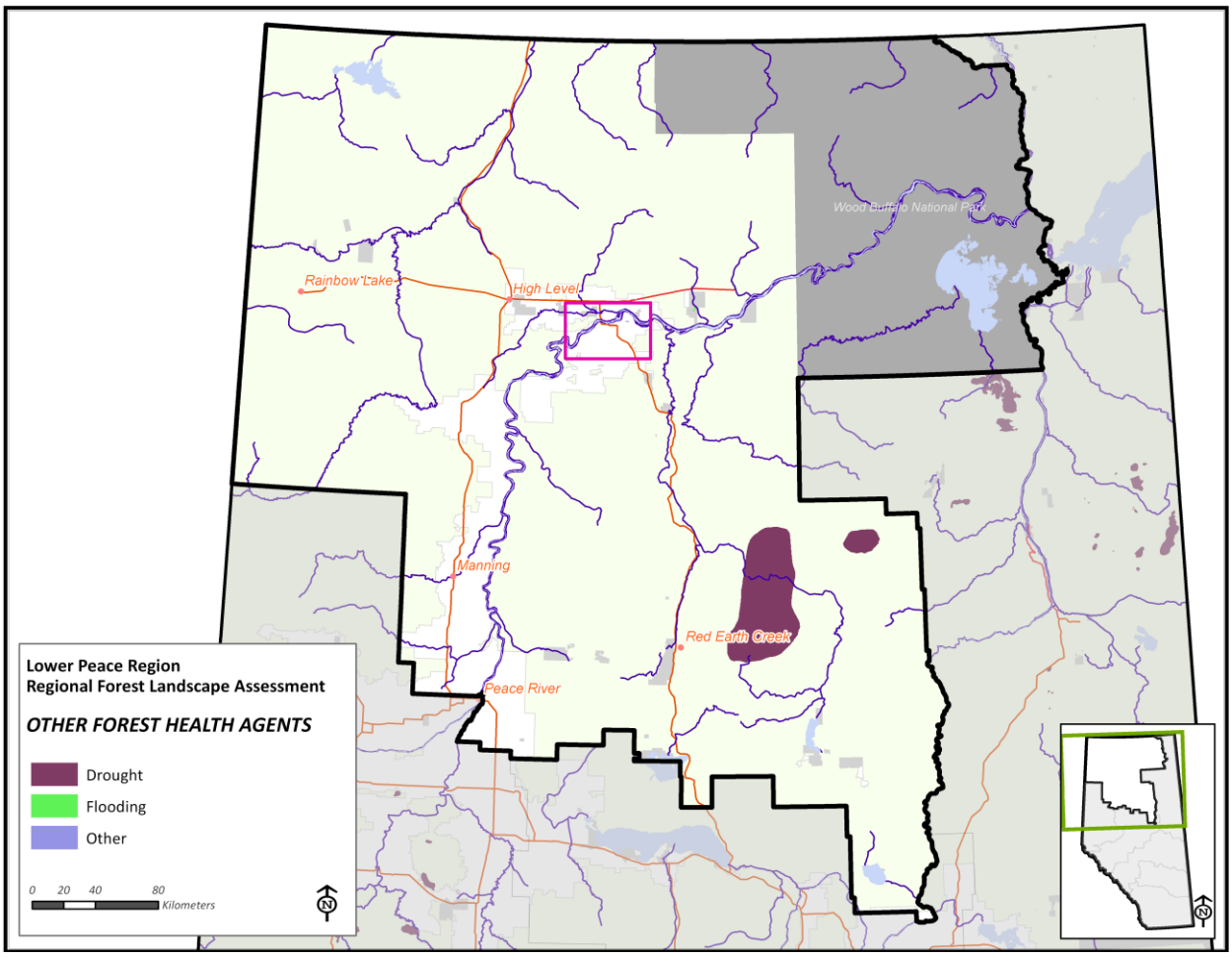


Figure 4-4 Other Forest Health Agents

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 6336 sites of observed invasive species in the Lower Peace 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 4-3 shows the invasive plants status for the Region by class (prohibited, noxious, nuisance).

No problem weeds were surveyed on 24% of the sites visited. Fortunately, there were no occurrences of prohibited noxious weeds. Incidences of noxious plants is the highest category at 76% of all observed invasive plants, with the most common problem species being Perennial Sow Thistle and Scentless Camomile.

Figure 4-5 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.

Table 4-3 Ranking of Invasive Plant Species

Classification and Weed Name	Incidence of Observed Weeds	Percentage of All Obs. (%)
No Weeds Found		
None	1952	24
Sub-total No Weeds Found	1952	24
Noxious		
Annual Sow Thistle	1	0
Canada Thistle	427	5
Common Tansy	484	6
Field Scabious	4	0
Oxeye Daisy	19	0
Perennial Sow Thistle	2944	36
Scentless Chamomile	2238	27
Tall Buttercup	181	2
Toadflax	20	0
White Cockle	7	0
Sub-total Noxious	6325	76
Nuisance/Unknown Status		
Foxtail Barley	1	0
Wild Caraway	10	0
Sub-total Nuisance	11	0
Total	8288	100

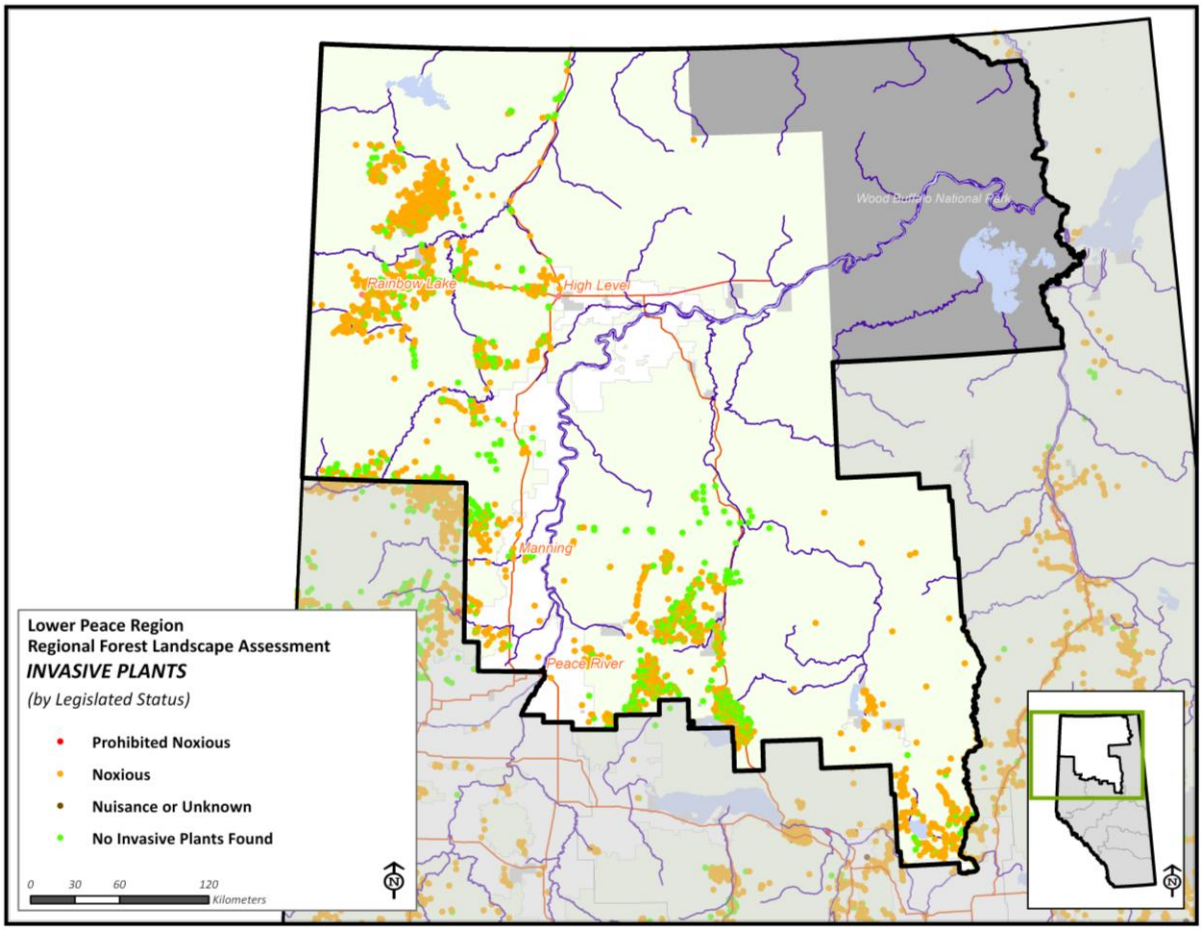


Figure 4-5 Invasive Plant Distribution

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 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 indicate 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).

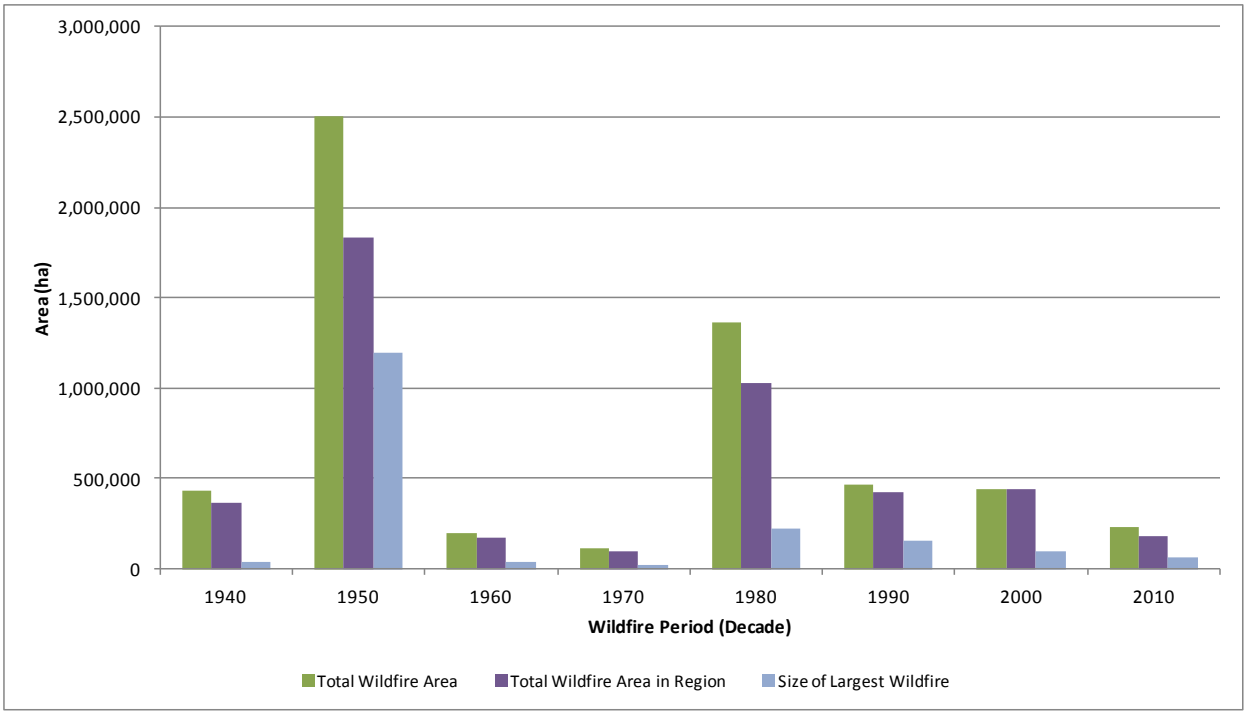
Summary statistics of the Region's history are reported in Table 4-4. The areas reported in Table 4-4 include only burned area and do not include residual islands that may not have burned during a wildfire event. The reporting period is by decade with the labelled wildfire date representing the start of the decadal period (i.e.: period '1930' represents 1930-1939 inclusive, etc.). The number of wildfires by decade is highly variable, as are the total area burned, average wildfire size and size of largest wildfire (Table 4-4, Figure 4-6). However, the median wildfire size is on a clear trend downwards (Figure 4-7). This is likely the result of substantial efforts in the areas of proactive wildfire prevention activities, faster wildfire response and improved wildfire control practices. These factors are also reflected in the drop in percent of the Region burned each decade (Table 4-4).

Table 4-4 Wildfire Statistics by Decade

Wildfire Period	Number of Wildfires	Total Wildfire Area (ha)	Wildfire Area in Lower Peace (ha)	Average Wildfire Size (ha)	Median Wildfire Size (ha)	Size of Maximum Wildfire (ha)	Area Burned as percentage of Region[2] (%)
1940	118	428,897	368,535	3,635	1,168	36,920	3
1950	124	2,503,096	1,830,575	19,404	814	1,194,823	16
1960	55	195,818	172,161	3,264	286	41,575	1
1970	52	111,753	100,163	2,109	491	24,974	1
1980	98	1,365,577	1,028,286	14,078	829	224,561	9
1990	141	469,200	425,801	3,192	139	151,300	3
2000	603	444,492	439,893	699	12	98,676	3
2010[1]	173	234,378	181,503	1,260	5	62,611	2

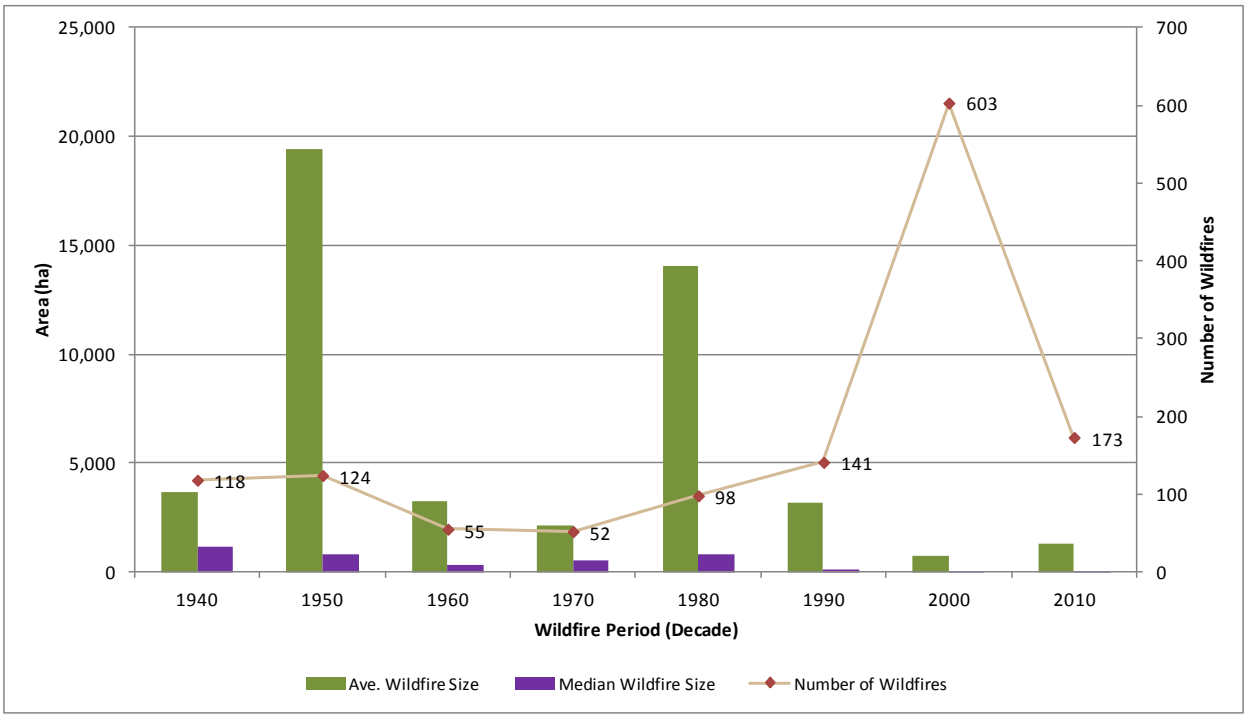
[1] The 2010 'decade' contains only 2 years of data

[2] The area used for percentage calculation is only the Region's Green and White Area



NB: The 2010 decade contains only two years of data

Figure 4-6 Wildfire Size Statistics by Decade



NB: The 2010 decade contains only two years of data

Figure 4-7 Average and Median Wildfire Size by Decade

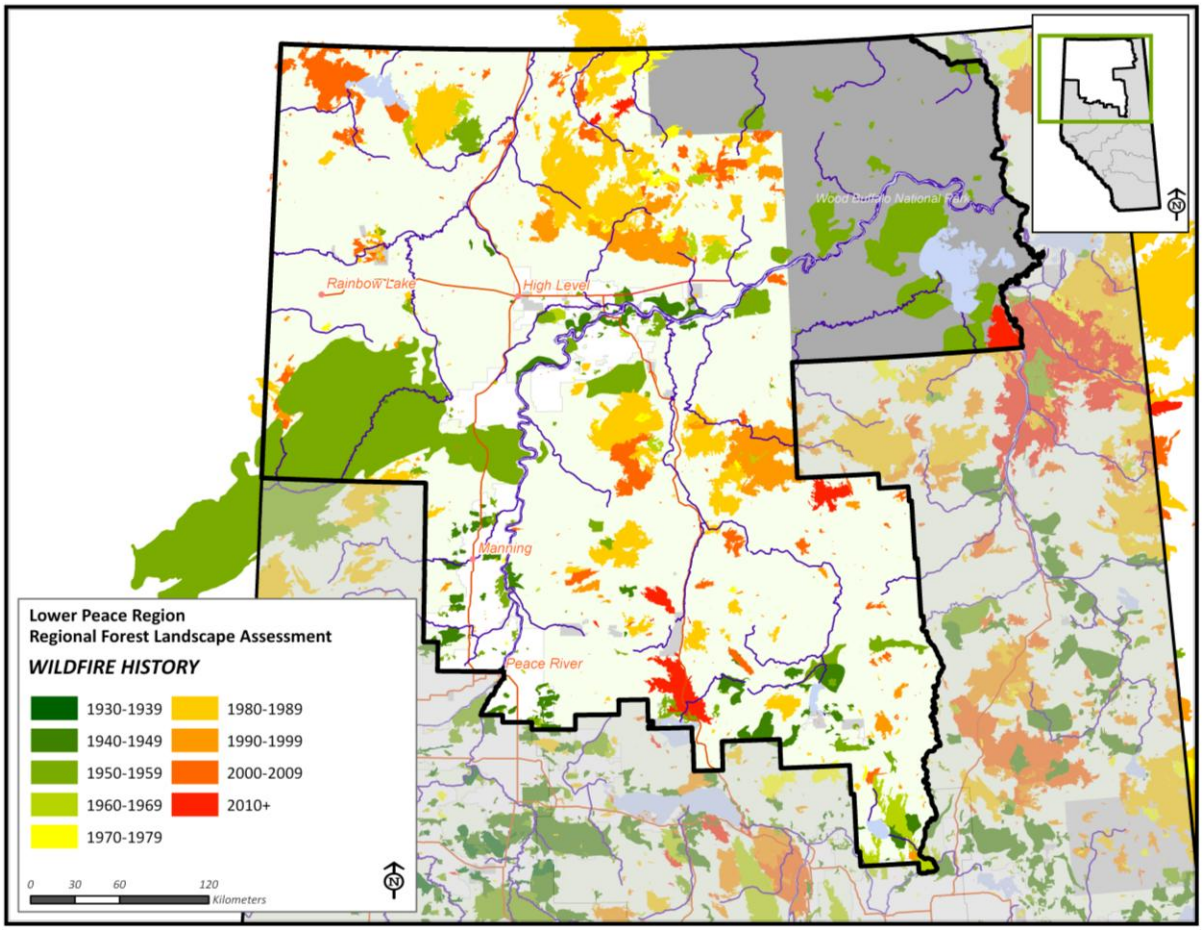


Figure 4-8 Wildfire Distribution by Decade

4.6 Timber Harvesting

From the time of the transfer of resource management from the Federal government to the provincial government in 1930 (Alberta 1930) to approximately the mid-1950's, forest harvesting was generally for local or regional use. Large scale commercial harvesting began in 1989 with the establishment of the first Forest Management Agreement in the Region with Daishowa-Marubeni International Ltd., who established a bleached kraft pulp mill near Peace River. Timber harvesting continued a rapid expansion in the early 1900's with further FMAs taking effect in 1991 (Alberta Pacific Forest Industries), 2002 (Manning Diversified Forest Products and Gordon Buchanan/Tolko Industries), amongst others.

A summary of the harvest area and number of harvest areas by decade is displayed in Table 4-5. The area summaries presented in Table 4-5 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 where some of the harvesting may not have been clear cuts. 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 (31,30) 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 4-5 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 4-5 is a best approximation based on the information available.

Table 4-5 Summary of Harvest Area by Decade

	Total Harvested Area		Number of Harvest Areas		Average Harvest /Year [1]
Year of Harvest	(ha)	(%)	Count	(%)	(ha)
1940-1949	1	0	1	0	1
1950-1959	704	0	27	0	235
1960-1969	4,540	1	429	1	454
1970-1979	26,142	5	2,048	7	2,614
1980-1989	87,279	17	3,480	12	8,728
1990-1999	134,624	26	10,379	34	13,462
2000-2009	156,569	30	8,487	28	15,657
2010 [2]	10,992	2	428	1	5,496
Unclassified	103,215	20	4,948	16	
Total	524,065	100	30,227	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 4-5 and Figure 4-9. However, many of the local cutblock areas from the 1950's and 1960's may not be included in this summary as historic information is not available. A map of the distribution of harvested area by decade appears as Figure 4-10.

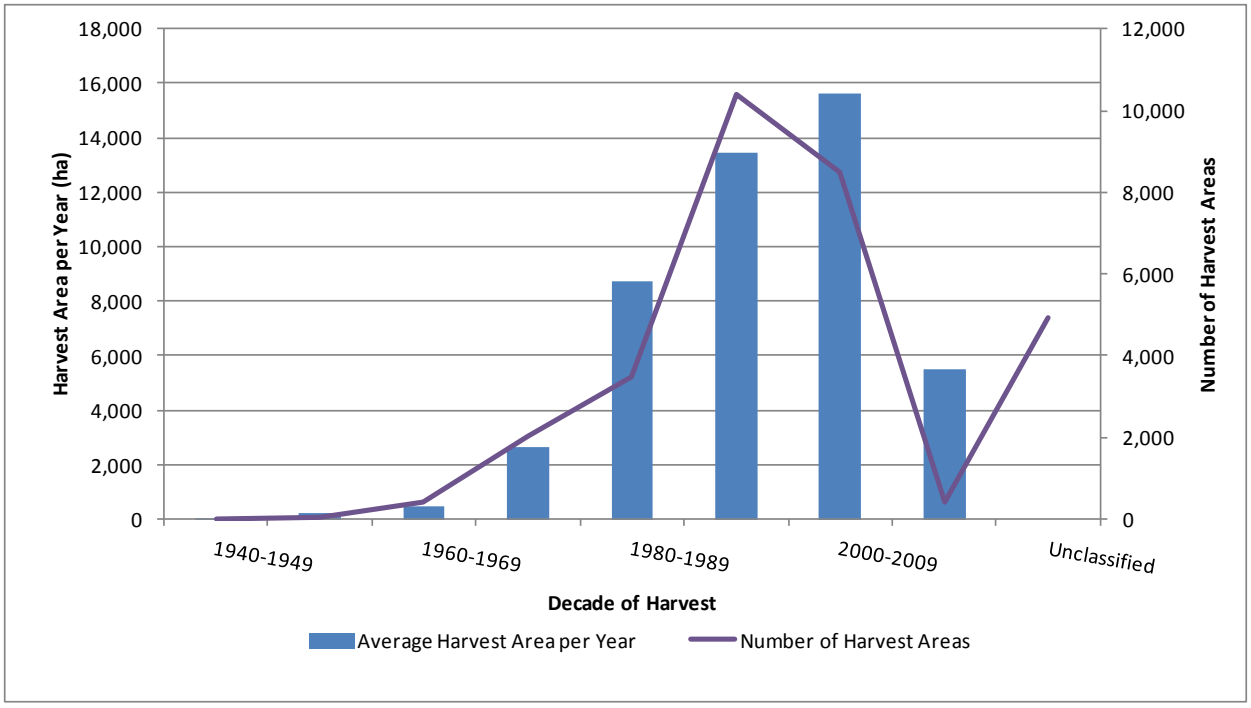


Figure 4-9 Average Annual Harvest Area and Block Count By Decade

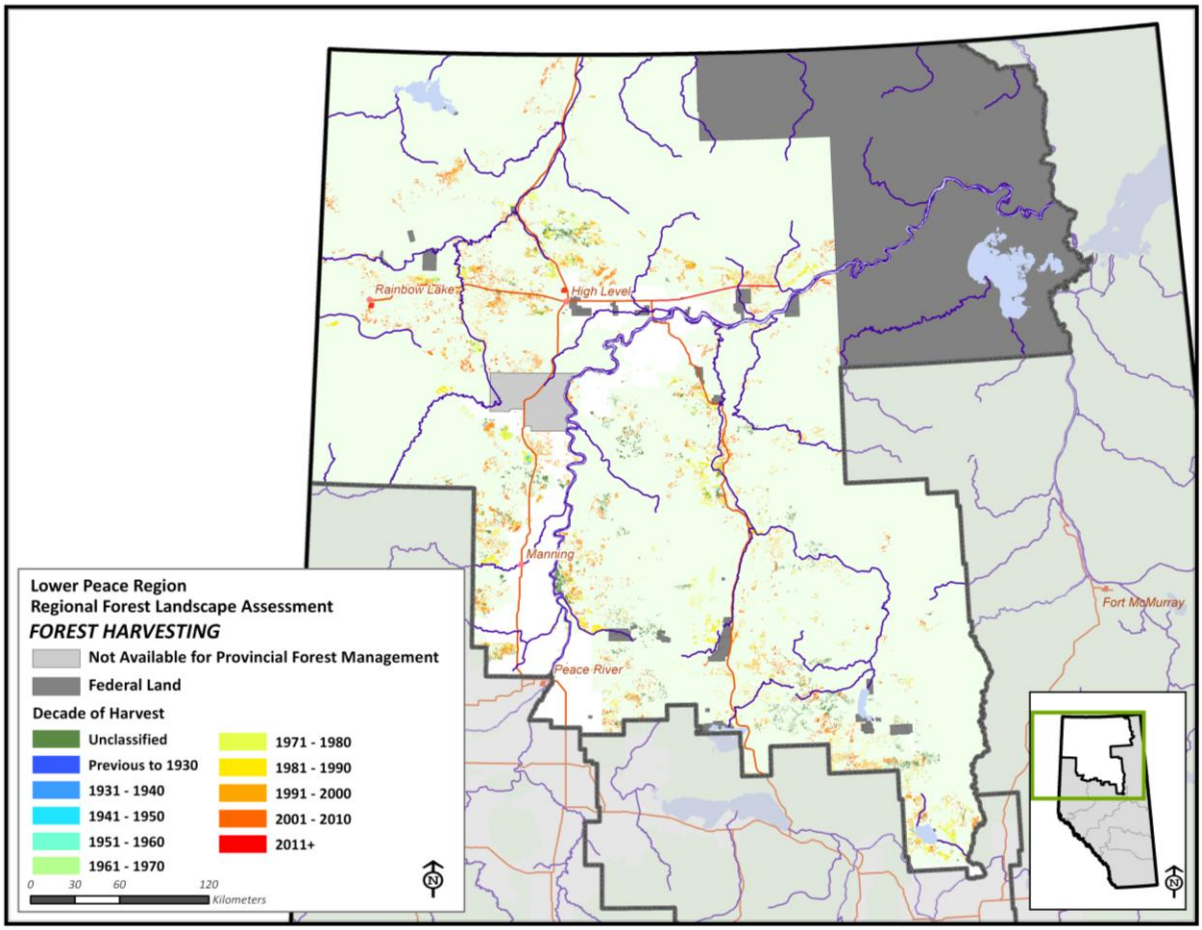


Figure 4-10 Harvest Area By Decade

4.7 Access

Relative to other Land-use Regions, road development in the Lower Peace would be considered sparse (32). In the Green Area, resource exploration and extraction (forestry, oil and gas, etc) have been the main drivers of road development.

Figure 4-11 shows the major transportation routes in the Region, including railroad access. In this map, note that only major paved and all-season gravel roads are displayed. The main transportation corridors are:

- Highway 35: running north-south through Manning and High Level to the Northwest Territories border. Highway 35 is a major corridor for truck transport of goods into the Northwest Territories.
- Highway 2: running south from Peace River, connecting to the rest of the province.
- Highway 58: running east-west from High Level to Rainbow Lake in the west and Fort Vermilion in the east.
- Highway 88 running north of Slave Lake connects to Red Earth and then becomes a gravel road to Fort Vermilion

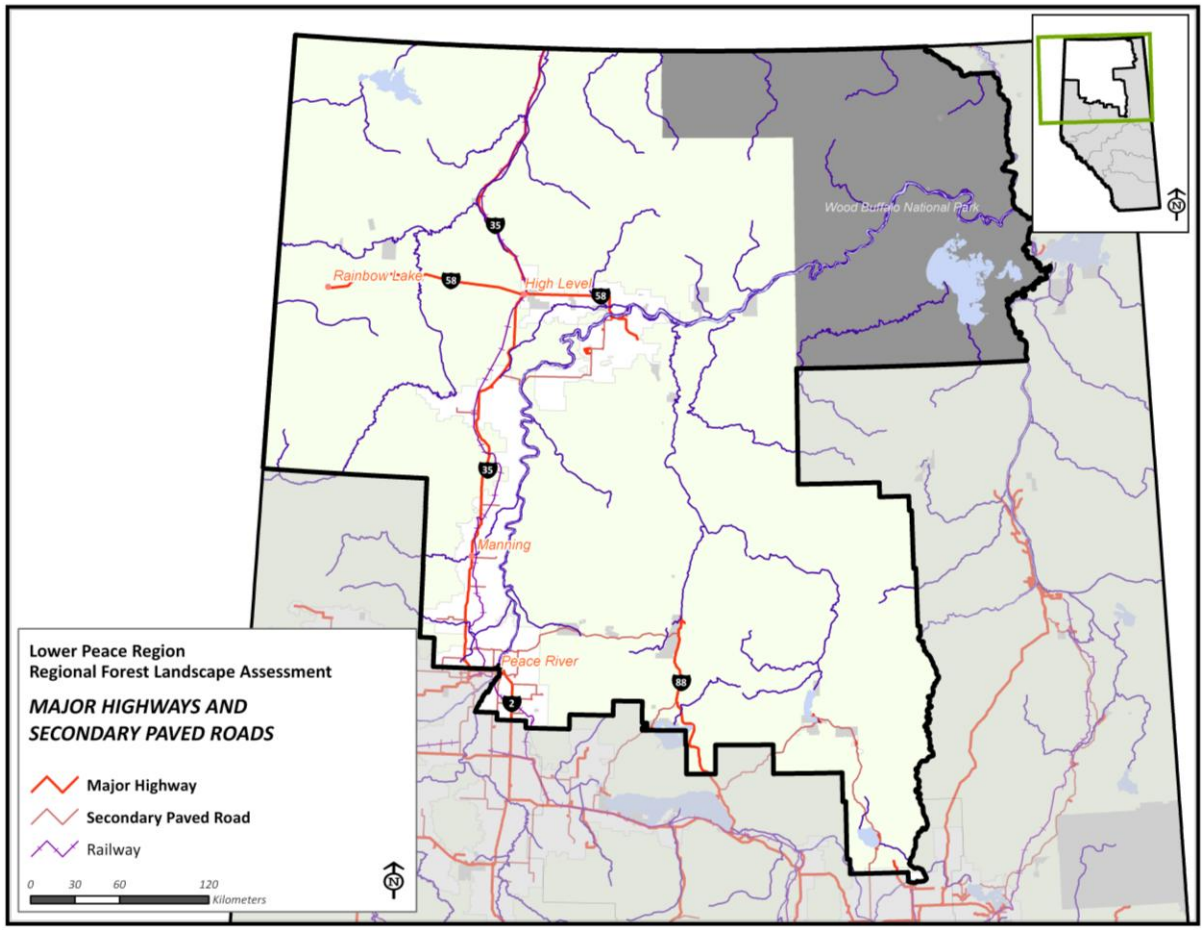


Figure 4-11 Major Transportation Access

Table 4-6 summarizes the length of road by road class within each of the Green Area, White Area and National Parks. At only 214 kilometers, road development on Federal lands is minimal.

Table 4-6 Length of Road by Class and Location

	Length of Roads (km)			
Road Classification	**Green Area**	**White Area**	**Federal Lands**	**Total**
Major Highway	594	460	2	1,056
Secondary Paved Road	302	422	4	728
Gravel Road	6,244	4,668	523	11,435
Winter Road / Unclassified	1,431	32	20	1,484
Total	8,572	5,582	549	14,703
Railway	270	289		559

A map of all road classes is shown in Figure 4-12.

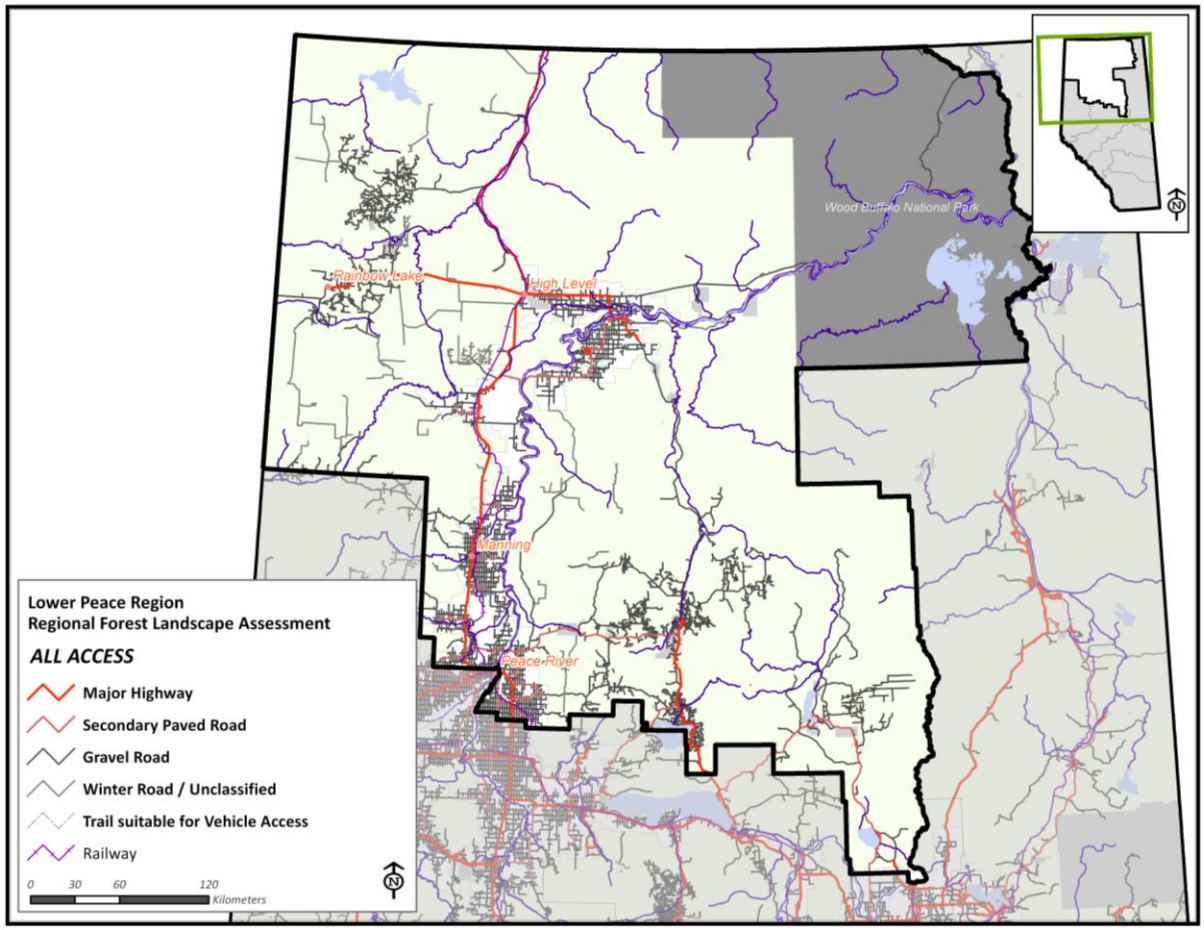


Figure 4-12 Rail Access and Road Access by Class

4.8 Industrial Development

The energy sector accounts for the majority of disposed surface dispositions in this Region (33). As indicated in Table 4-7, the highest percentages of dispositions have been issued to these types: License of Occupation, Mineral Surface Lease and Pipeline Agreement. A License of Occupation typically is for all season road access to specific areas. A Mineral Surface Lease can be issued for a number of energy industry facilities, but with the exception of coal mines, the most common feature in this Region are oil or gas well sites. Pipelines connect well sites, so naturally there are a high proportion of pipeline dispositions located in the Region.

Table 4-7 Land-use Dispositions

Industrial Dispositions			Distribution		
Description	Type	Number of Dispositions	Area (ha)	Percentage of All Dispositions (%)	Area as Percentage of Region[1] (%)
Easement	EZE	2,678	10,691	7	0
Licence of Occupation	LOC	15,484	59,677	41	0
Mineral Surface Lease	MSL	20,006	25,883	18	0
Pipeline Installation Lease	PIL	1,291	457	0	0
Pipeline Agreement	PLA	12,071	46,820	32	0
Rural Electrification Agreement	REA	63	82	0	0
Right of Entry Agreement	ROE	92	583	0	0
Vegetation Control Easement	VCE	192	2,066	1	0
Total		51,877	146,259	100	1

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

Figure 4-13 shows the dense development of well sites and pipelines, most predominantly in the northwest and southeast parts of the Region. Despite the dense network, the total area occupied by industrial dispositions is 146,259 hectares or less than 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). This is because dispositions are not authorized by the Province within Wood Buffalo National Park.

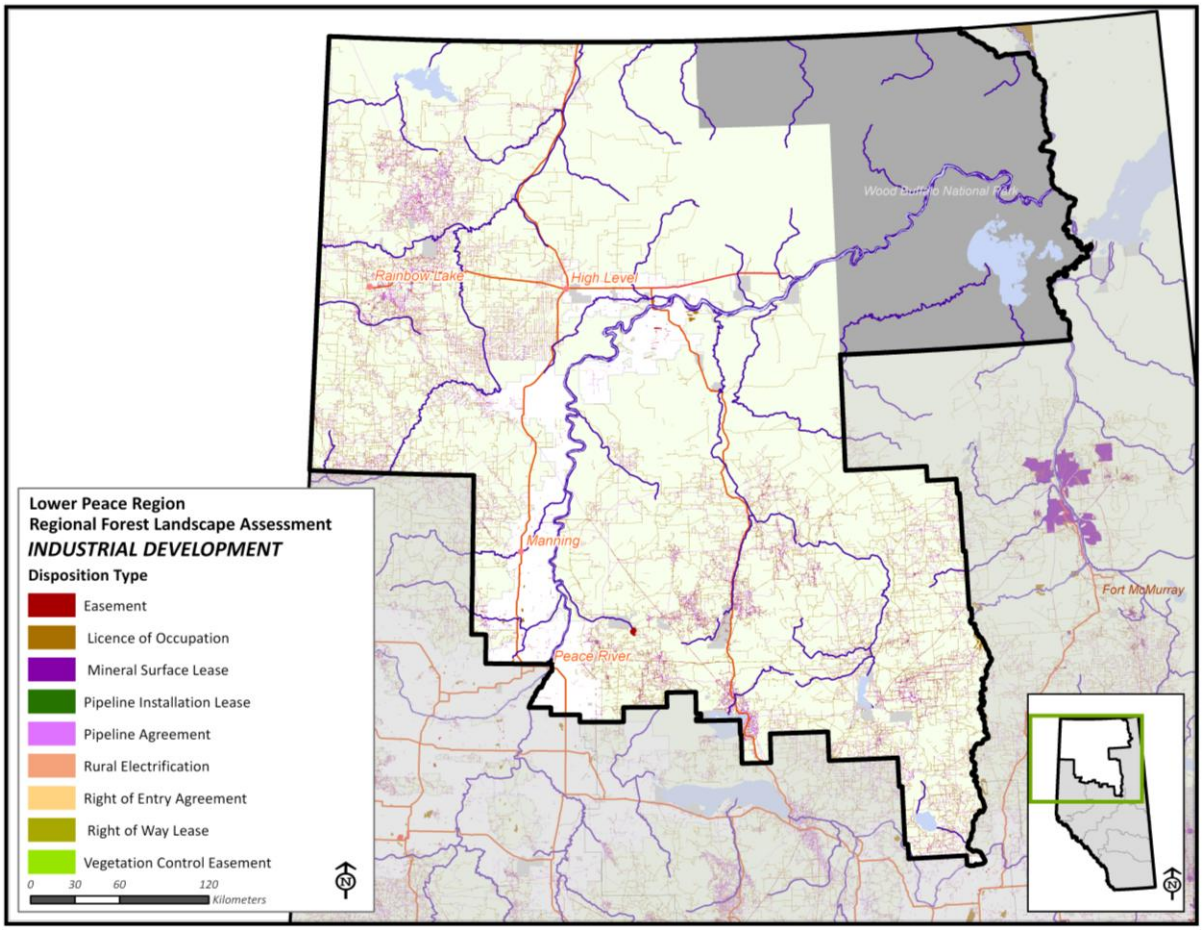


Figure 4-13 Industrial Development under Permit and License

4.9 Monitoring Sites

Permanent monitoring plots have been established throughout the Lower Peace 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 4-8.

Note that Table 4-8 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 4-8 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 4-8 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	88	187	1	1			89	188
Reforestation Monitor Plots	92	3,980					92	3,980
Stand Dynamics Plots	50	50					50	50
Other PSP (Special Projects)	6	6					6	6
Alberta Biodiversity Monitoring Institute								
ABMI Sample Grid	355	355	35	35	88	88	478	478
Other Agency Permanent Sample Plots								
ISP Registered	814	814	9	9			823	823
Total	1,405	5,392	45	45	88	88	1,538	5,525

The distribution of monitoring sites across the Lower Peace Region is displayed in Figure 4-14.

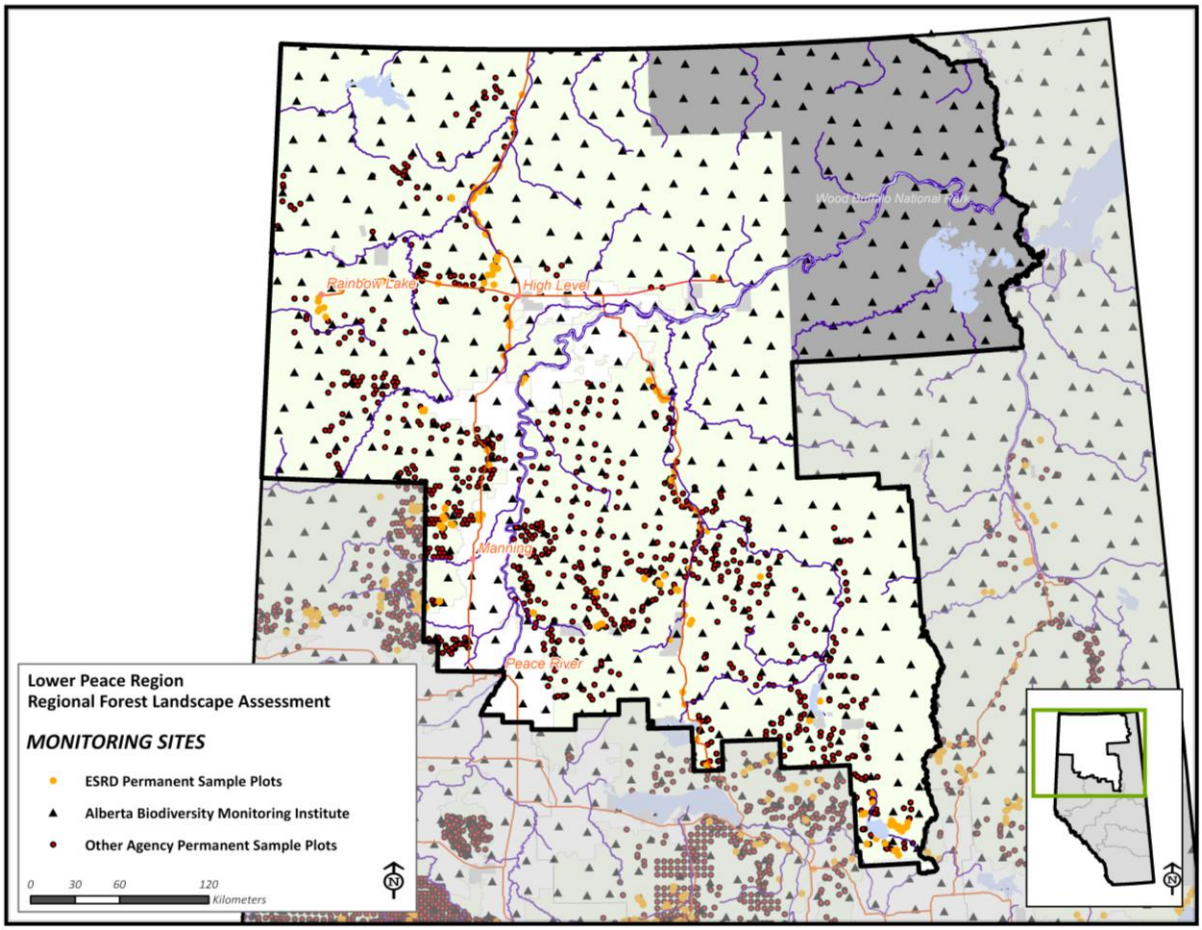


Figure 4-14 Location of Permanent Monitoring Sites

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.
Western Boreal Growth and Yield Cooperative	The Western Boreal Growth and Yield Cooperative was started in 1985 with the purpose of conducting research projects that contribute to the development of growth and yield information and modeling for both natural and regenerated stands in the boreal mixedwood region. Members of the Cooperative consist of industrial forest managers, provincial/territorial forest managers and academia. Sample design is a randomized block experiment. The re-measurement schedule is complex and depends on age and season of planting stock and reforestation activities occurring on the block.
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 PSPs 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 (spruce budworm, blowdown event, etc.).

4.9.2 Alberta Biodiversity Monitoring Institute

The Alberta Biodiversity Monitoring Institute (ABMI) conducts monitoring of more than 2000 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 1656 plots are located across the province, of which 355 fall in the Lower Peace 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 National Parks. 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 Lower Peace Region, along with AAC levels prorated by the proportion of the FMU area located inside the Lower Peace 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 FMU with Prorated AAC

FMU Name	Managed by	Entire FMU Area (ha)	Portion of FMU located in Lower Peace		Proportion of Lower Peace occupied by FMU	Annual Allowable Cut (m^3/year) (Prorated to FMU Area)		
			Area (ha)	% of FMU	% of Lower Peace	Coniferous	Deciduous	Total
A14	FMA	1,178,072	75,469	6	0	18,376	14,309	32,685
A15	FMA	1,437,516	142,357	10	1	53,540	70,346	123,886
F1	Crown	384,253	384,253	100	2	35,646	0	35,646
F11	Crown	372,704	372,704	100	2	43,281	137,660	180,941
F14	Crown	344,588	344,588	100	2	78,856	77,771	156,627
F20	Crown	878,786	878,786	100	5	0	1,500	1,500
F23	Crown	990,684	990,684	100	5	270,798	304,251	575,049
F26	FMA	3,574,553	3,574,553	100	19	1,450,000	1,000,000	2,450,000
L2	FMA	298,744	285,729	96	1	111,369	146,087	257,457
L3	FMA	588,356	185,816	32	1	54,294	30,982	85,276
L8	FMA	126,796	694	1	0	216	360	576
P14	Crown	127,361	123,401	97	1	71,884	95,270	167,154
P19	FMA	969,725	324,849	33	2	116,339	139,250	255,588
P20	FMA	1,004,131	565,543	56	3	210,455	164,842	375,298
P3	FMA	184,764	184,764	100	1	49,545	0	49,545
P4	FMA	388,480	388,480	100	2	56,831	0	56,831
P5	FMA	355,537	355,537	100	2	70,000	0	70,000
P8	Crown	347,617	318,487	92	2	0	67,249	67,249
PO1	Crown	420,387	195,733	47	1	1,733	2,413	4,147
PO3	Crown	681,435	587,560	86	3	1,476	6,706	8,182
S10	Crown	407,848	407,848	100	2	122,903	139,702	262,605
S11	FMA	331,925	331,925	100	2	123,926	175,687	299,613
S14	FMA	363,700	363,700	100	2	77,903	175,230	253,133
S15	FMA	442,884	442,884	100	2	0	546,764	546,764
S17	FMA	727,043	164,308	23	1	100,869	173,016	273,885
S18	Crown	610,026	588,816	97	3	207,717	270,262	477,978
S19	Crown	415,173	251,357	61	1	101,125	306,541	407,666
S21	FMA	247,777	57,680	23	0	50,399	65,413	115,812
S22	FMA	801,696	792,199	99	4	179,852	372,259	552,111
S7	FMA	238,805	938	0	0	201	419	620
Sub-total		19,241,366	13,681,642		71	3,659,535	4,484,287	8,143,822
No Allowable Harvest Calculated			5,535,940		29	0	0	0
Total			19,217,581		100	3,659,535	4,484,287	8,143,822

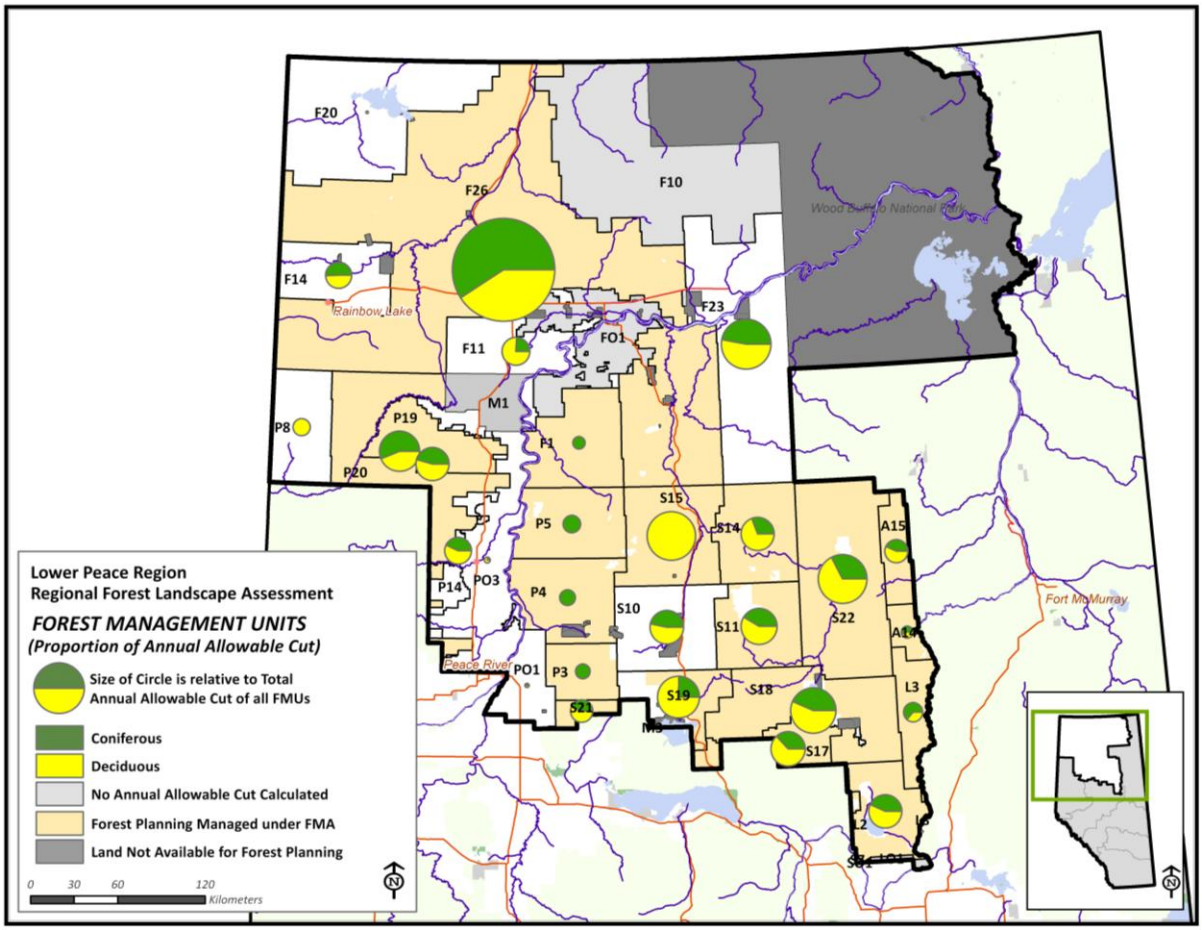


Figure 5-1 FMUs with Prorated AACs

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 Lower Peace Region contains 541 registered fur management areas (39) (or traplines) totalling 14,849,821 hectares (Figure 5-2). The average size of an individual trapline is 25,084 hectares, with the largest at 329,922 ha. The five largest traplines are located in the remote northwest corner of the Region. Except for bobcat, all Alberta furbearers can be harvested in the Lower Peace Region.

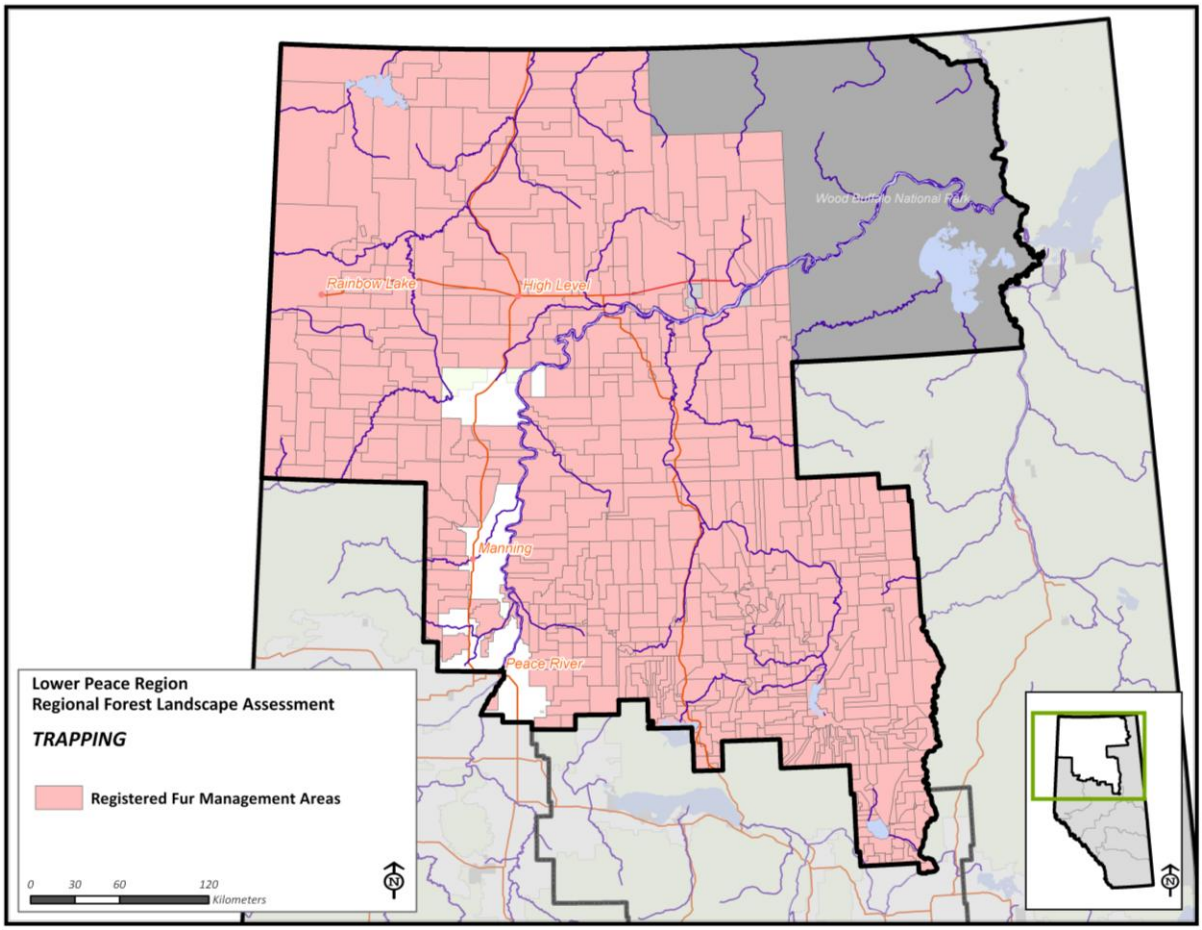


Figure 5-2 Registered Fur Management Areas

5.3 Grazing

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

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 (recreation, forest harvesting, etc) 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	10	2,203	3	0
Grazing Lease	GRL	187	46,050	53	0
Grazing Permit	GRP	13	1,730	2	0
Provincial Grazing Reserve	GRR	4	36,831	42	0
Total		214	86,814	100	0

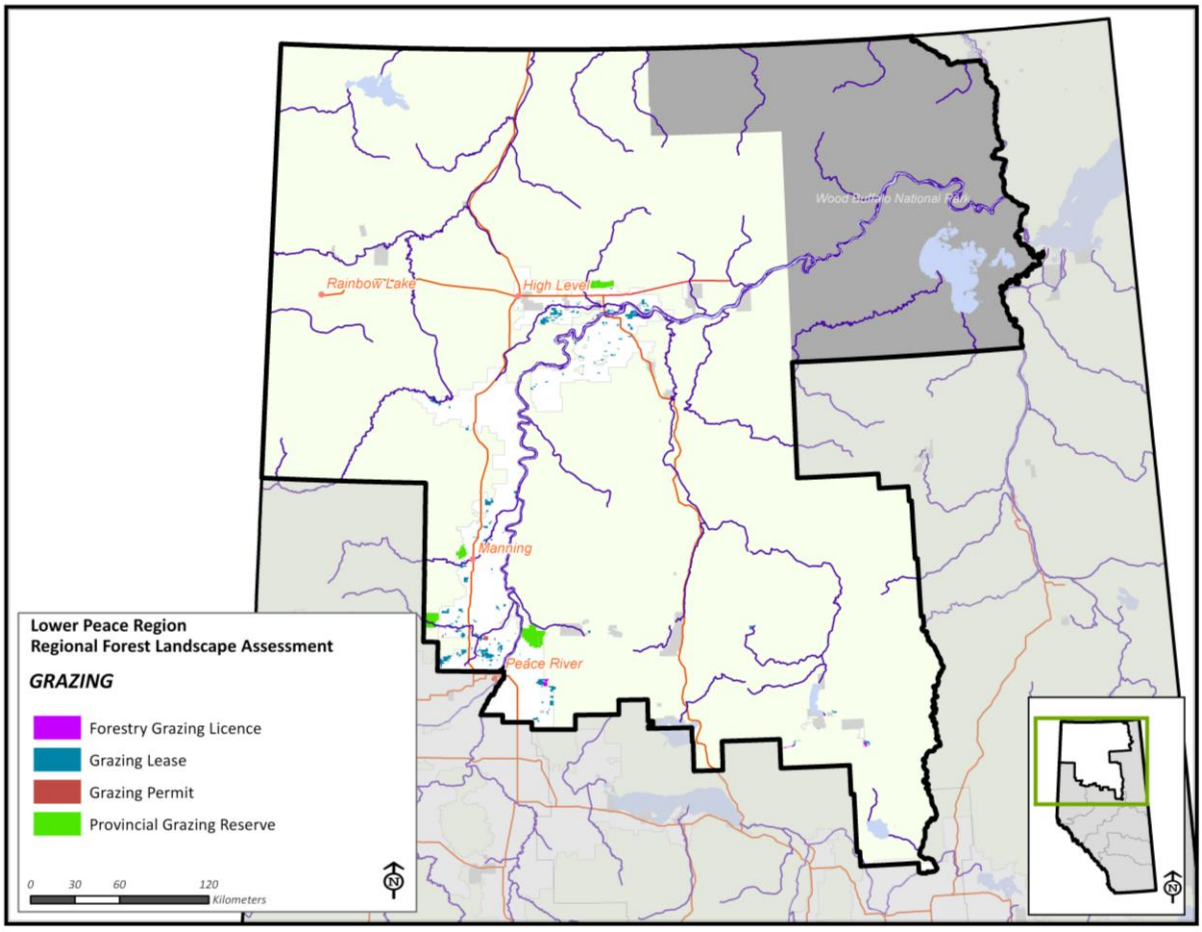


Figure 5-3 Grazing Dispositions

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

Wood Buffalo National Park (8) is the largest recreation destination, encompassing 19% (see section 1.7) of the Region. Due to the remoteness, this National Park does not see the same number of visitors as the mountain parks. Popular activities include remote camping and canoeing, boating and fishing, and hiking and wildlife viewing. Viewing of Aurora Borealis is gaining in popularity, even during the cold winter months.

The Lower Peace Region is a large area with a small population; the number and area of designated recreation areas is much lower than in other regions (13). Hunting, fishing and OHV use are common on crown land; industrial activity throughout the area has increased access into more remote areas.

There are no Public land use zones in the Region (43). Due to the vast area available, land-use conflicts have not been an issue in the Region.

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.

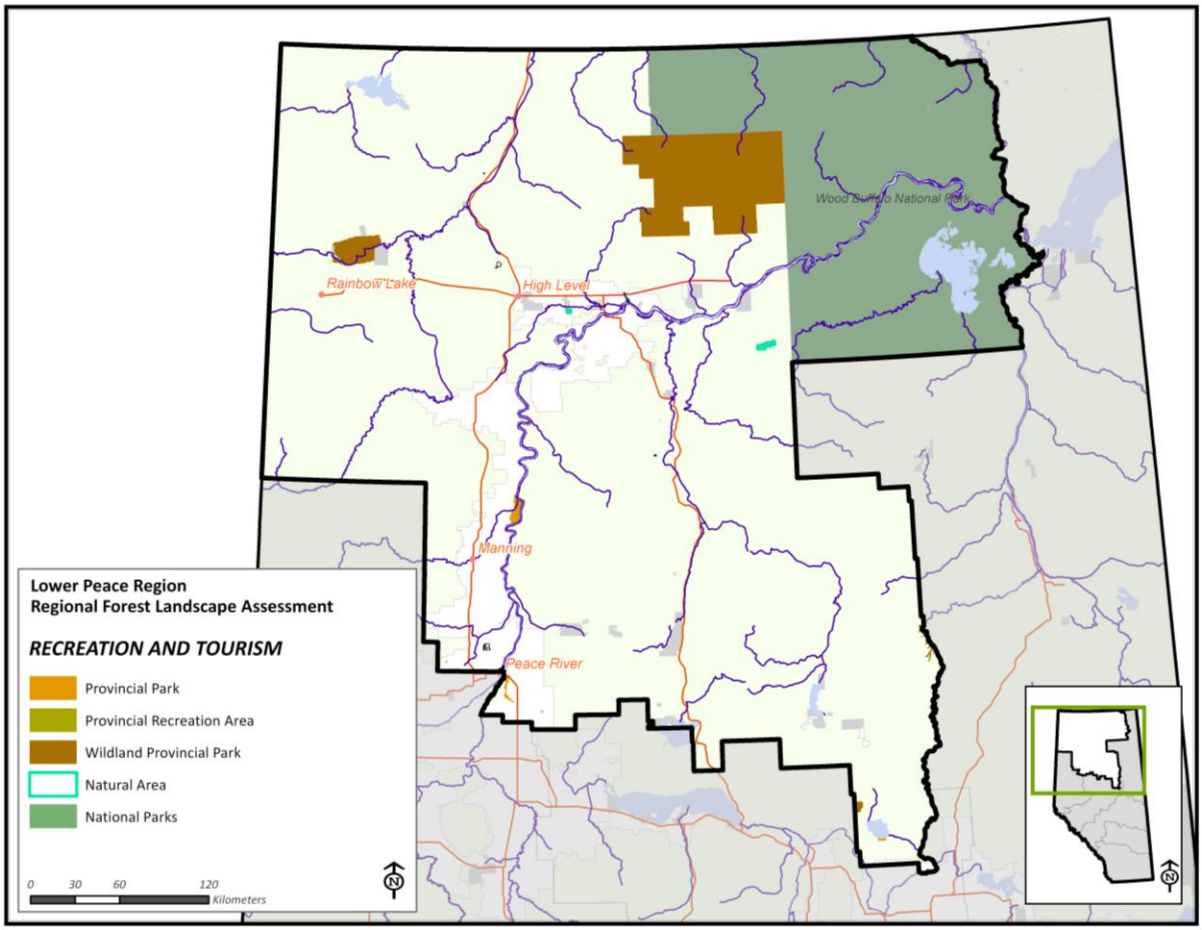


Figure 5-4 Recreation and Tourism Opportunities

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 issued 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 5-4 outlines the area covered as well as percent area of the historical resources in the Region. A total of 66 hectares are listed as HRV 1 (Historic), relating to the early homesteaders near Manning (Old Battle River Hospital), North Star (Plavin Homestead), and Fort Vermilion (national historic site). Paleontological sites are the most plentiful, occupying 80% of the listing's total area.

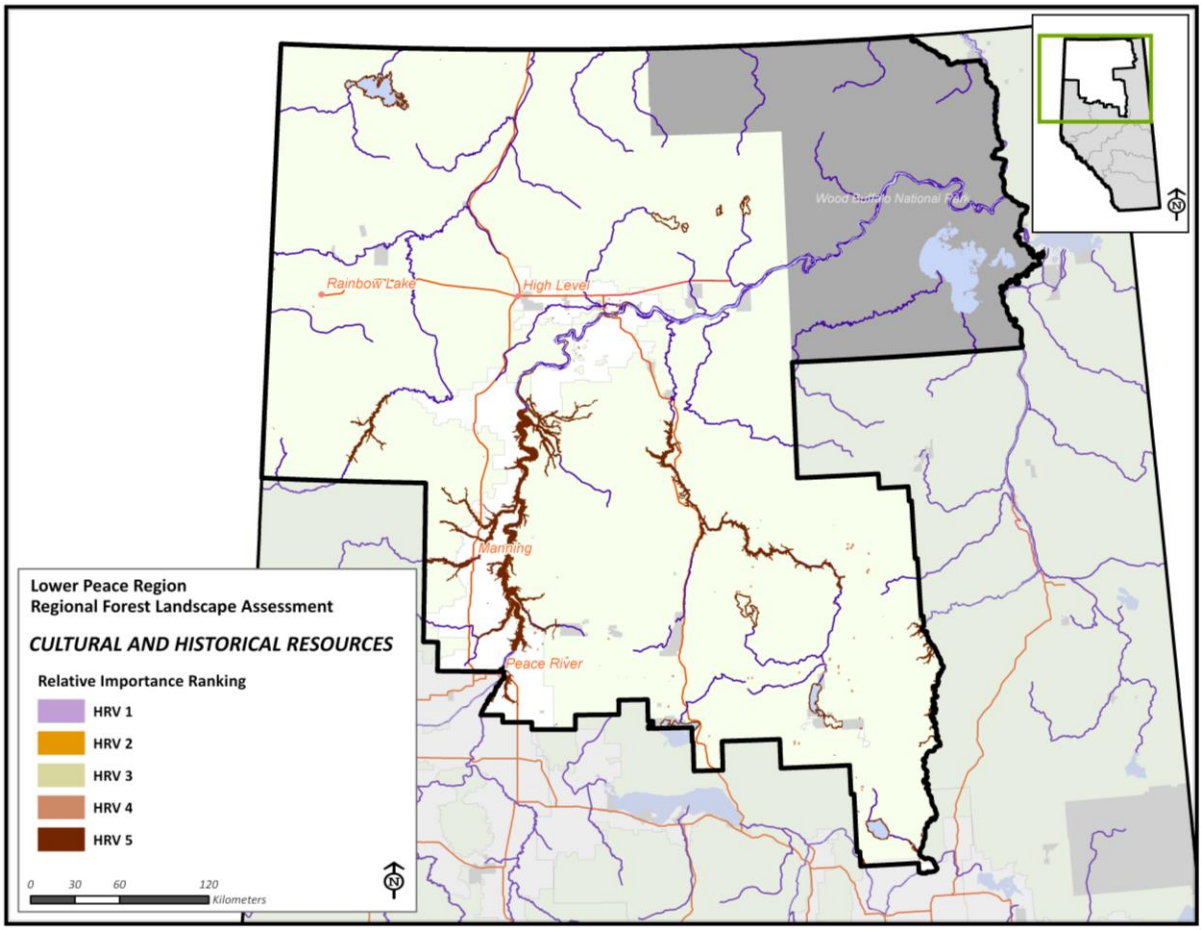


Figure 5-5 Areas of Historic Resource Value

Table 5-4 Categories and Relative Importance Value

	Relative Importance Ranking (HRV)											
	1		2		3		4		5		Total	
Category	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Archaeological					477	0	4,194	1	67,008	16	71,679	17
Archaeological, Historical					368	0			531	0	899	0
Cultural							10,887	3			10,887	3
Cultural, Historical							534	0			534	0
Historical	66	0	16	0	329	0	562	0			973	0
Palaeontological							398	0	335,370	80	335,768	80
Total	66	0	16	0	1,174	0	16,575	4	402,909	96	420,740	100

5.7 Visual Resources

No formal inventory of high value visual resources has been compiled. Large wetland complexes and vast expanses of untouched wilderness are best seen from the air. Aurora Borealis can be viewed throughout the Region due to the northern latitudes and lack of urban lighting. The Peace River valley is well known as a scenic destination.

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 5-5 outlines the size of each Management zone (45) within the Lower Peace region. Figure 5-6 shows the distribution of those districts.

Table 5-5 Fish and Wildlife Districts

Fish and Wildlife District Name	Entire District Area (ha)	Portion of District in Lower Peace Area (ha)	Portion of District in Lower Peace (%)	Proportion of Lower Peace occupied by District (%)
Athabasca	1,504,338	490,096	33	3
Fairview	1,343,401	44,037	3	0
Fort McMurray	7,071,387	217,826	3	1
Fort Vermilion	4,044,225	4,044,225	100	21
High Level	4,216,553	4,216,553	100	22
High Prairie	1,254,130	26,590	2	0
Manning	2,266,801	1,902,536	84	10
Peace River	1,707,905	1,336,019	78	7
Red Earth	2,573,826	2,564,330	100	13
Slave Lake	1,749,981	752,187	43	4
Sub-total	27,732,548	15,594,398		81
No Fish and Wildlife District		3,623,182		19
Total		19,217,580		100

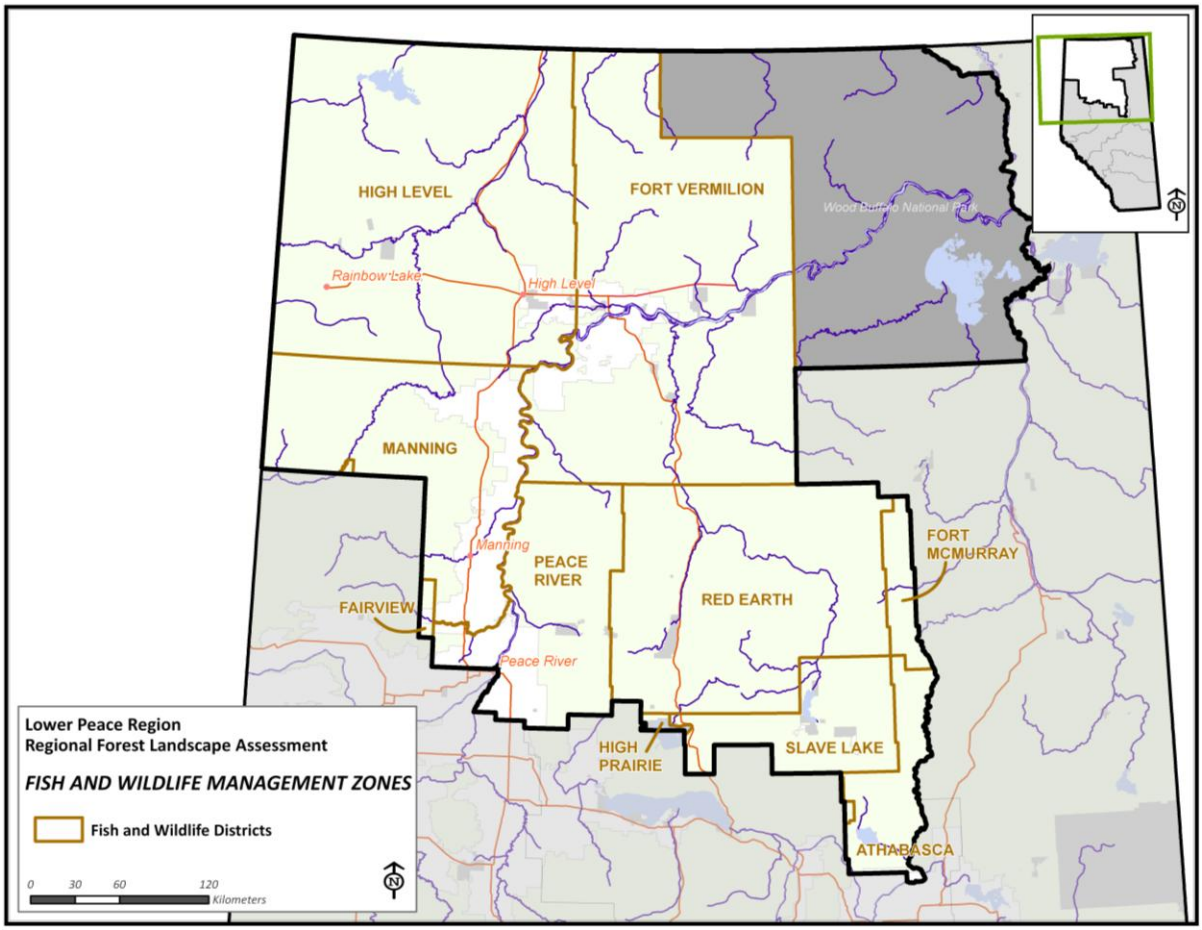


Figure 5-6 Fish and Wildlife Districts

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 5-6 Fish Management Zones

	Entire Zone	Portion of Zone in Lower Peace		Proportion of Lower Peace occupied by Zone
Fish Management Zone	Area (ha)	Area (ha)	(%)	(%)
Northern Boreal Zone	32,972,500	15,592,418	47	81
Eastern Slopes Zone	12,264,460	1,980	0	0
Sub-total	45,236,960	15,594,398		81
No Fish Management Zone		3,623,182		19
Total		19,217,580		100

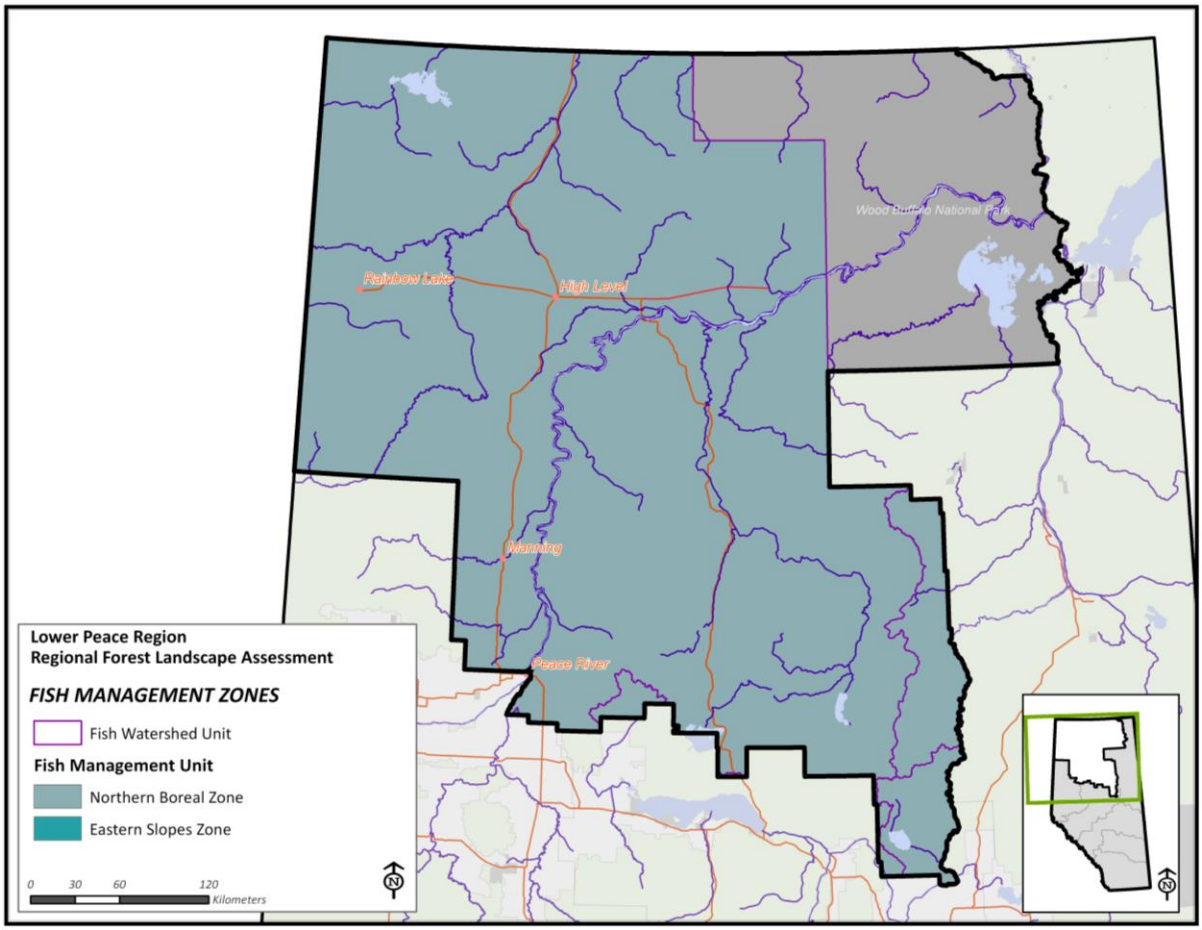


Figure 5-7 Fish Management Units and Fish Watershed Units

5.8.3 Wildlife

Wildlife sensitivity zones (Table 5-7 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 when it comes to 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 5-7 Wildlife Sensitivity Zones

Wildlife Species	Area of Wildlife Sensitivity within Alberta (ha)	Portion of Wildlife Sensitivity Zone in Lower Peace (ha)	(%)	Proportion of Lower Peace occupied by Sensitivity Zone (%)
Caribou (*Rangifer tarandus*)	9,749,350	6,329,776	65	33
Trumpeter Swan (*Cygnus buccinator*)	538,615	214,746	40	1
Sharp-tailed Grouse (*Pedioecetes phasianellus*) Survey	15,810,566	41,910	0	0
Colonial Nesting Birds	46,319		0	0
American White Pelican (*Pelecanus erythrorhynchos*)	14,911	952	6	0
- Great Blue Heron (*Ardea herodias*)	31,408	1,525	5	0
Sensitive Raptor Range	33,006,540	1,886	0	0
- Peregrine Falcon (*Falco peregrinus*)	13,246	1,886	14	0
Key Wildlife and Biodiversity Zone	4,689,713	1,164,023	25	6
Special Access Zone	1,763,820	652,242	37	3
Total Area of Lower Peace		19,217,580		

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

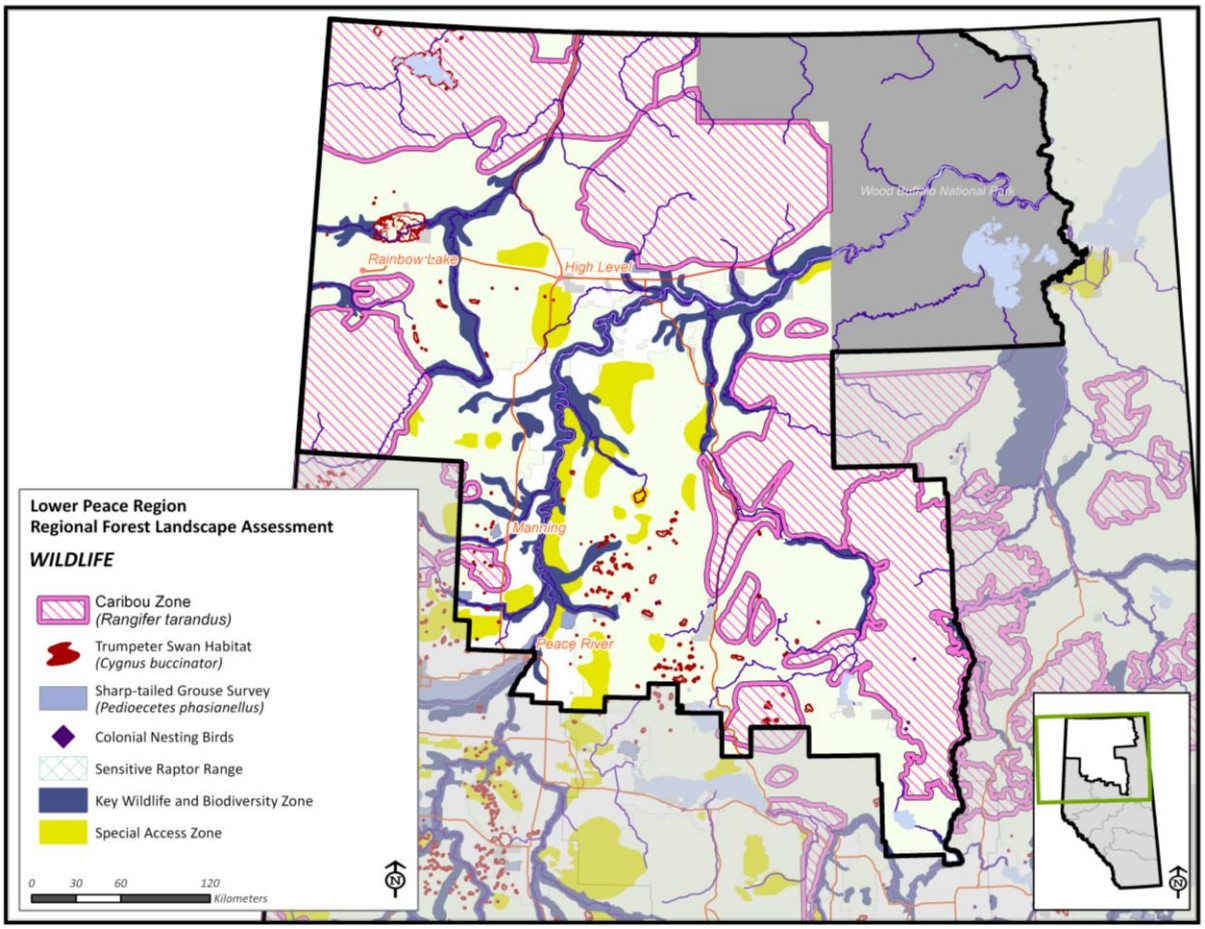


Figure 5-8 Wildlife Sensitivity Zones

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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 Parks and Protected Areas in the Lower Peace

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 Lower Peace and these are noted in footnotes under each table.

Table 7-1 List of Provincial Parks

Provincial Park	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Calling Lake	736	5	0
Greene Valley	3,187	23	59
Notikewin	10,108	72	0
Total	14,031	100	59

Table 7-2 List of Wildland Parks

Wildland Park	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Caribou Mountains Wildland	590,820	91	0
Grand Rapids Wildland[1]	5,742	1	0
Hay-Zama Lakes Wildland	48,705	7	0
Otter-Orloff Lakes Wildland[2]	3,376	1	0
Peace River Wildland[3]	2,608	0	0
Total	651,251	100	0

[1] 74% of Grand Rapids Wildland is in the Lower Athabasca Region

[2] 51% of Otter-Orloff Wildland Park is in the Upper Athabasca Region

[3] 74% of Peace River Wildland is in the Upper Peace Region

Table 7-3 List of Provincial Recreation Areas

Provincial Recreation Area	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Buffalo Tower	20	7	0
Figure Eight Lake	128	47	0
Fort Vermilion	5	2	0
Greene Valley	0	0	59
Leddy-St. Germaine Lakes	0	0	1,230
Machesis Lake	77	28	0
Peace River	5	2	0
Poacher's Landing	6	2	0
Rainbow Lake	25	9	0
Twin Lakes	5	2	0
Total	271	100	1,289

[1] 56% of Brazeau Reservoir Recreation Area is in the North Saskatchewan Region

Table 7-4 List of Natural Areas

Natural Area	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Boyer	0	0	129
Burning Sulphur	0	0	124
Caribou River	176	6	636
Child Lake Meadows	391	12	0
Harper Creek	2,621	82	0
Hot Pot	0	0	64
Ponton River	0	0	1,130
Ponton River South	0	0	463
Watt Mountain	0	0	906
Total	3,188	100	3,452

Table 7-5 List of Ecological Reserves

Ecological Reserve	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
None			

Table 7-6 List of Special Management Zones

Special Management Zone	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
None			

APPENDIX II Data Sources

	Data Source
1.	Alberta. Resource Information Management Branch. 2012. "BF_LAND_USE_FRAMEWORK" Downloaded from http://www.altalis.com
2.	Alberta. Resource Information Management Branch. 2012. "BF_GREEN_WHITE_POLYGON" Downloaded from http://www.altalis.com
3.	Alberta. Resource Information Management Branch. 2012. "BF_FMA_POLYGON" Downloaded from http://www.altalis.com
4.	Alberta. Resource Information Management Branch. 2012. "BF_FMU_POLYGON" Downloaded from http://www.altalis.com
5.	Alberta. Resource Information Management Branch. 2012. "BF_NATURAL_AREA_POLYGON" Downloaded from http://www.altalis.com
6.	Alberta. Resource Information Management Branch. 2012. "Municipal/City/Town/Settlement/Special Area/Urban Service Area/Village Shape files" Provided directly by source.
7.	Alberta. Municipal Affairs. 2012. "Population_2010.xls" Downloaded from http://municipalaffairs.gov.ab.ca/mc_official_populations.cfm
8.	Alberta. Resource Information Management Branch. 2012. "National Park.shp" Provided directly by source.
9.	Alberta Spatial Data Warehouse "Fed_Military.shp" Downloaded from: http://www.altalis.com
10.	Alberta. Resource Information Management Branch. 2012. "Indian Reserve.shp" Provided directly by source.
11.	Alberta. Resource Information Management Branch. 2012. "Metis Settlement.shp" Provided directly by source.
12.	Alberta. Municipal Affairs. 2012. "Population_2010.xls" Downloaded from http://municipalaffairs.gov.ab.ca/mc_official_populations.cfm
13.	Alberta. Resource Information Management Branch. 2012. "Provincial Park/Provincial Recreation Area/Natural Area/Wildland Park/Wilderness Park/Wilderness Area/Ecological Reserve/Crown Reservations" Provided directly by source.
14.	Alberta. Alberta Parks. Park designations. Download from http://www.albertaparks.ca/albertaparksca/management-land-use/current-parks-system.aspx.
15.	Alberta. Environment and Sustainable Resource Development. 2012. "SRDAreas.shp" Provided directly by source.
16.	Alberta. Resource Information Management Branch. 2012. "DEM by NTS mapsheets" Provided directly by source.
17.	Alberta. Agriculture and Rural Development. 2012. "AGRASID (shapefile & attribute tables)" Downloaded from: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag3249
18.	University of Saskatchewan. Referenced from http://soilsofcanada.ca/orders/vertisolic/index.php
19.	Alberta. Resource Information Management Branch. 2012. "Base Features Single Line Network

	and Base Features Waterbody Polygon" Provided directly by source.
20.	Alberta. Environment and Sustainable Resource Development. 2011. "avie_lib_2011.gdb" Provided directly by source.
21.	Alberta. Agriculture and Rural Development. 2012. "PDF climate maps." Downloaded from: http://agriculture.alberta.ca/acis/climate-maps.jsp
22.	Alberta. Environment and Sustainable Resource Development. 2012. "avie_lib_2011.gdb (AVI_INDEX / AVI_PHOTO_YR)" Provided directly by source.
23.	Alberta. Environment and Sustainable Resource Development. 2012. "avie_lib_2011.gdb (AVIE)" Provided directly by source.
24.	Alberta. Environment and Sustainable Resource Development. 2012. "mpb_Aerial_Survey.gdb" Provided directly by source.
25.	Alberta. Environment and Sustainable Resource Development. 2012. "ASPEN_AERIAL_SURVEY.gdb" Provided directly by source.
26.	Alberta. Environment and Sustainable Resource Development. 2012. "SBW_AERIAL_SURVEY.gdb" Provided directly by source.
27.	Alberta. Environment and Sustainable Resource Development. 2012. "Invasive_Plants_1997_2011_Complete.gdb" Provided directly by source.
28.	Alberta. Queens Printer. 2012. "Alberta Weed Control Act" Downloaded from http://www.qp.alberta.ca/1266.cfm?page=W05P1.cfm&leg_type=Acts&isbncln=9780779760602
29.	Alberta. Resource Information Management Branch. 2012. "HistoricalWildfireDatabase" Provided directly by source.
30.	Alberta. Environment and Sustainable Resource Development. 2012. "weyer-cutblocks.gdb" Provided directly by source.
31.	Alberta. Environment and Sustainable Resource Development. 2012. "PROV_CC.gdb" Provided directly by source.
32.	Alberta. Resource Information Management Branch. 2012. "Road/Railway/Cutline" Provided directly by source.
33.	Alberta. Resource Information Management Branch. 2012. "Digitally Integrated Disposition System Dataset (Active)" Provided directly by source.
34.	Energy and Resources Conservation Board. 2012. Coal Mine Listings. Downloaded from: http://www.ercb.ca/data-and-publications/statistical-reports/st45#1
35.	Alberta. Resource Information Management Branch. 2012. "psp.shp" Provided directly by source.
36.	Alberta Biodiversity Monitoring Institute. 2012. "000001_ABMI_2001-01-24_Survey_Locations.pdf" Downloaded from: http://www.abmi.ca
37.	Alberta. Resource Information Management Branch. 2012. "Reservation Disposition.shp (ISPs)" Provided directly by source.
38.	Alberta. Resource Information Management Branch. 2012. "AAC-CurrentFactsAndStatistics-2011.pdf" Downloaded from: http://www.srd.alberta.ca/LandsForests/ForestManagement/ForestManagementFactsStatistics/ForestManagementPlanningStatistics.aspx
39.	Alberta Spatial Data Warehouse "BF_REG_FUR_MGMT_POLYGON.shp" Downloaded from: http://www.altalis.com
40.	Alberta. Resource Information Management Branch. 2012. "Agriculture Disposition.shp" Provided directly by source.

41.	Alberta. Public Lands. 2012. Grazing Lease Definitions. Downloaded from: http://www.srd.alberta.ca/FormsOnlineServices/documents/GrazingStatisticsPublicLand-Dec-2003.pdf
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