Regional Forest Landscape Assessment

Upper Peace Region

Prepared for:

Forest Management Branch
Alberta Environment and Sustainable Resource Development

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EXECUTIVE SUMMARY

The Upper Peace Region is second smallest of the seven land-use regions defined in Alberta's Land-use Framework. This Region forms a pocket in the central north-west portion of Alberta, running north from the Rockies along the Alberta-British Columbia border up to the Chinchaga River.

The Region contains considerable development of the forest and energy sectors. Eleven 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 central portion of the Region where the landscape has been under cultivation for many years.

Willmore Wilderness Area is the largest and most well known protected area in the Region. Five wildland parks (most notably Kakwa and Chinchaga) together represent 28% of all the parks and protected area present in the Upper Peace. In total, parks and protected areas cover 9% of the Region.

The topography of the Region is diverse; from the northern foothills in the southwest to the prairie-like plains in the northeast. The Region is dominated by primarily coniferous stand types with 53% of the inventoried area covered by spruce and pine forest cover types. These types are most common in the western part of the Region where the foothills lead into steeper slopes and cooler environments. Deciduous stands are significant in the Region (30% of the inventoried area) and are generally found in the central part of the Region

Forests are mostly in the mature stage of seral stage development and this is evidenced also by the age class distribution which indicates that 50% of the Region's inventoried forests are of ages between 70 and 129 years.

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. The Upper Peace Region is one of the hardest hit regions with respect to mountain pine beetle infestations. Historical defoliators continue to persist in the Region, but to date, have not had the same impact seen by the current mountain pine beetle infestation.

NOTICES AND DATA SOURCES

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

The source of data for each topic is referenced with the use of end notes. The full data list is presented in APPENDIX 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.

Table of Contents

List of Tables

List of Figures

1. Administrative Boundaries

1.1 Upper Peace Region

The Upper Peace Region (1), one of seven land-use regions defined in Alberta's Land-use Framework (Alberta, 2008), forms a pocket in the central north-west portion of Alberta, running north from the Rockies along the Alberta-British Columbia border. The Region encompasses the northern foothills extending east to the edge of the M.D. of Greenview (see Figure 1-1). The southern part of the Region contains Willmore Wilderness Park. The Region contains a significant variety of industrial development, agriculture, natural resource development as well as large areas of protected lands for the purposes of conservation.

The Upper Peace Region is the second smallest of the seven regions, with an area of approximately 7,427,031 hectares.

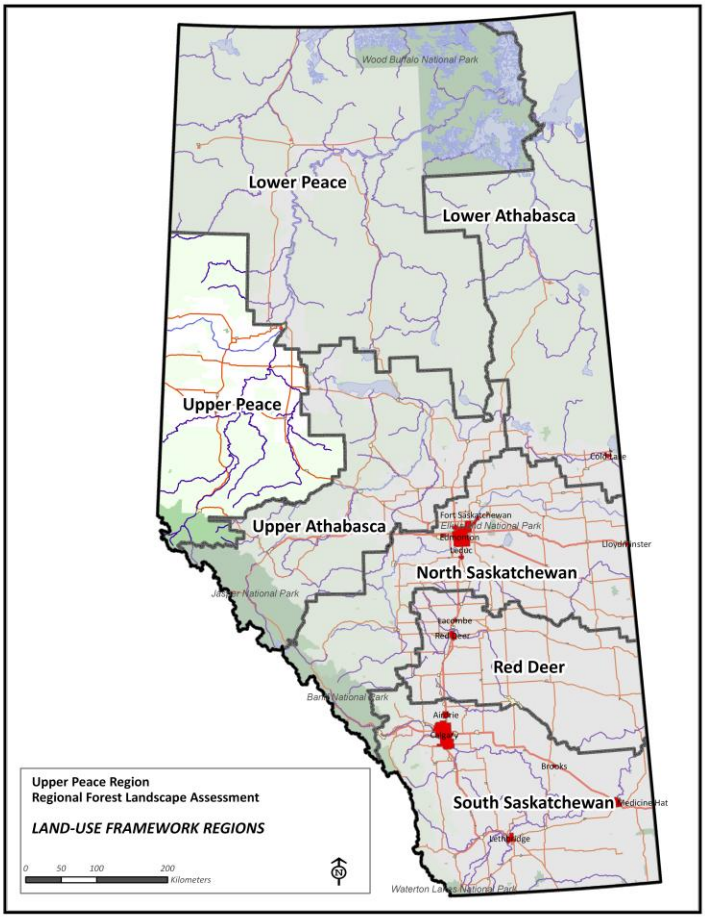


Figure 1-1 Upper Peace Region

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 and is spread throughout the north portion of the Region centering out from the towns in the area. The Green Area is land primarily owned by the Crown, and managed for natural resource development, recreation and conservation.

As summarized in Table 1-1, approximately 66% of the Upper Peace Region is Green Area, and 34% is White Area. No national parks occur in the Upper Peace Region (see Figure 1-2).

Table 1-1 Green / White Area summary

Area Name	Area (ha)	Percentage (%)
Green Area	4,893,462	66
White Area	2,510,417	34
Federal Land	23,152	0
Total	7,427,031	100

The White Area is spread throughout the north portion of the Region centering out from the towns in the area.

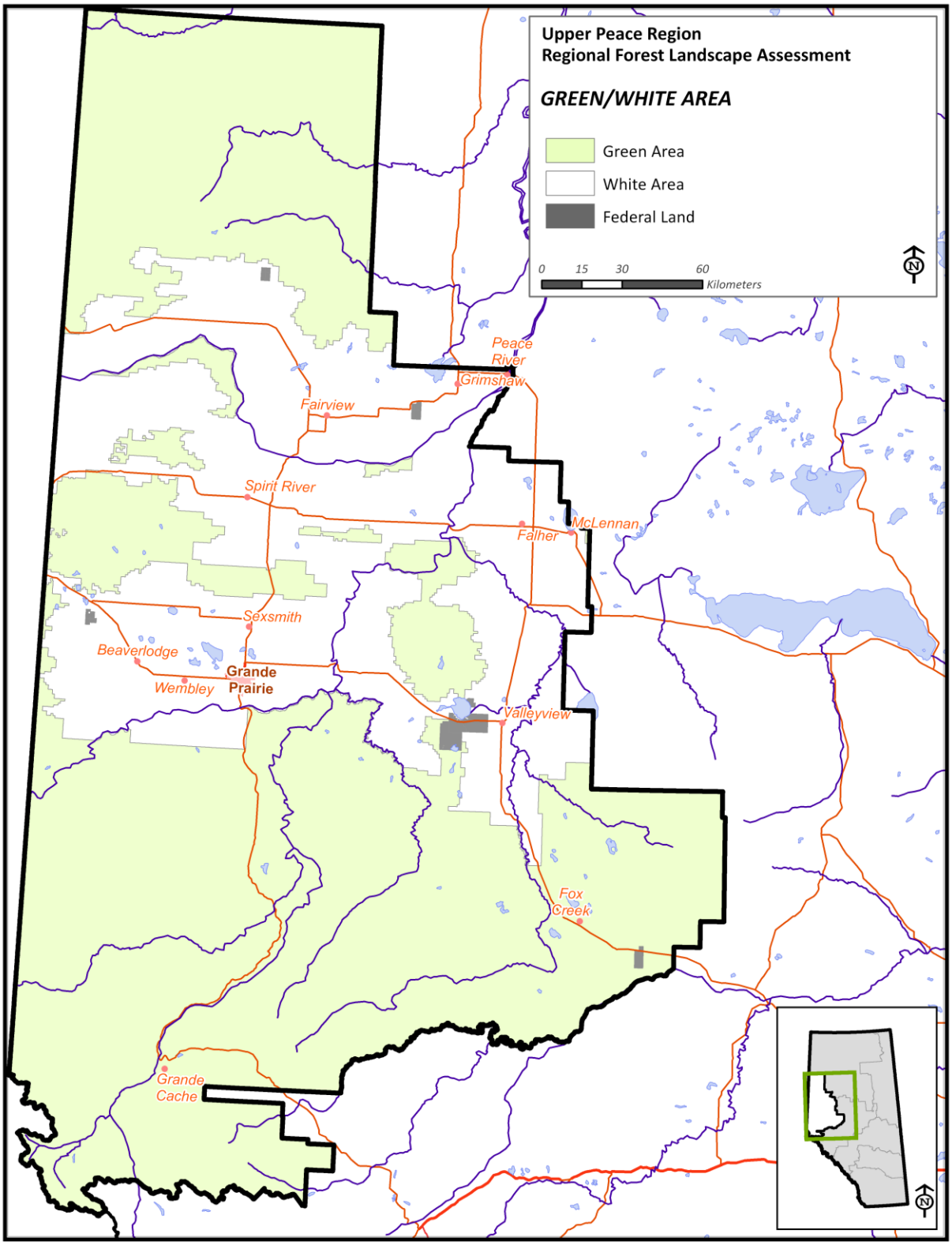


Figure 1-2 Green/White Area Distribution

1.3 Forest Management Agreement Areas

Forty-nine percent of the Upper Peace Region is covered by a Forest Management Agreement (FMA) (3). There are a total of 11 FMA holders with timber allocations in the Upper Peace Region. FMA boundaries are not coincident with the land use framework region boundaries. Table 1-2 lists the FMAs which have lands inside the Upper Peace Region, the percent of each FMA which is inside the Region, as well as the proportion of the Upper Peace Region which is covered by the respective FMA.

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

Table 1-2 Forest Management Agreement Areas

FMA Label	Company Name	Entire FMA	Portion of FMA located in Upper Peace		Proportion of Upper Peace occupied by FMA
		Area (ha)	Area (ha)	% of FMA	% of Upper Peace
ANC	ANC Timber Ltd.	373,980	329,835	88	4
BRL	Blue Ridge Lumber Inc.	661,772	334,643	51	5
CANFOR	Canadian Forest Products Ltd.	644,702	644,702	100	9
DMI_WEST	Daishowa-Marubeni International Ltd. (West)	956,844	631,995	66	9
BUCH/TOLKO	Gordon Buchanan Enterprises Ltd. and Tolko Industries Ltd.	246,105	77,996	32	1
MDFP	Manning Diversified Forest Products Ltd.	930,552	365,008	39	5
MWFP	Millar Western Forest Products Ltd.	442,627	73,057	17	1
SLP	Slave Lake Pulp Corporation	629,689	10,168	2	0
TOLKO_HP	Tolko Industries Ltd. (High Prairie)	272,448	79,223	29	1
HWP	West Fraser Mills Ltd. (Hinton)	988,614	3,771	0	0
WEYER-GP	Weyerhaeuser Company Limited (Grande Prairie)	1,118,173	1,118,173	100	15
Sub-total		7,265,505	3,668,573		49
No Forest Management Agreement Area			3,758,458		51
Total			7,427,031		100

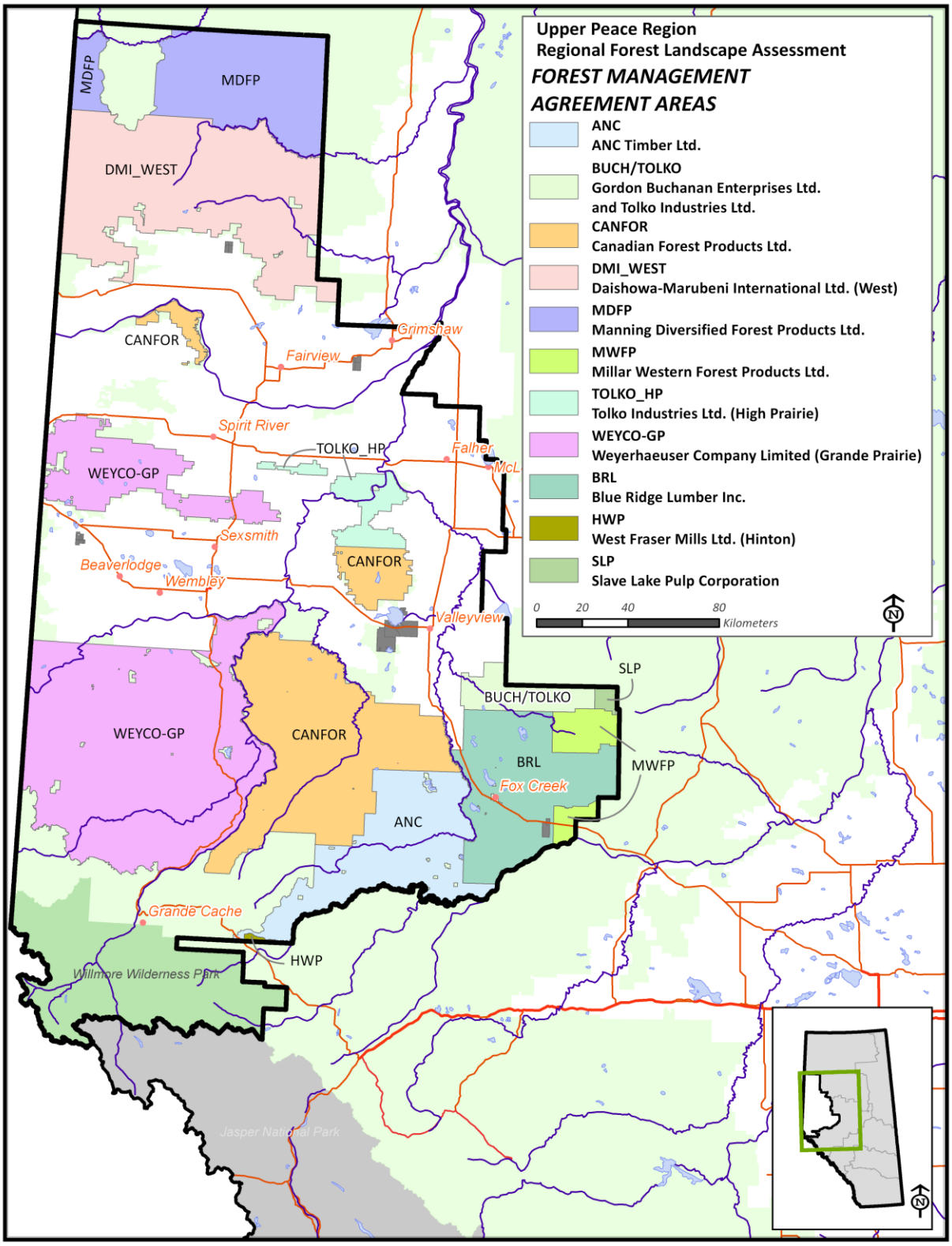


Figure 1-3 Forest Management Agreement Areas

1.4 Forest Management Units

The Upper Peace Region contains 30 Forest Management Units (FMU) (4), of which 15 are fully contained inside the Region (Table 1-3). The largest FMU in the Region is G16 which makes up 16% of the Upper Peace. Of the 30 FMUs, 19 are managed by the Crown and 11 are managed under a Forest Management Agreement (see section 1.3).

The largest Crown-managed units (GO1, GO3, PO2, and GO4) are located in the White Area. The largest FMA managed FMU is G16 (Weyerhaeuser Company Ltd – Grande Prairie).

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

Table 1-3 Forest Management Units

FMU		Entire FMU	Portion of FMU located in Upper Peace		Proportion of Upper Peace occupied by FMU
Name	Managed by	Area (ha)	Area (ha)	% of FMU	% of Upper Peace
E10	Crown	65,098	65,098	100	1
E14	FMA	1,022,231	5,266	1	0
E8	Crown	219,562	210,984	96	3
G10	Crown	7,292	7,292	100	0
G11	Crown	16,940	16,940	100	0
G12	Crown	41,463	41,463	100	1
G13	Crown	25,165	25,165	100	0
G14	Crown	46,561	46,561	100	1
G15	FMA	660,334	660,334	100	9
G16	FMA	1,179,754	1,179,754	100	16
G9	Crown	27,202	27,202	100	0
GO1	Crown	572,954	572,954	100	8
GO2	Crown	139,713	139,713	100	2
GO3	Crown	632,817	632,817	100	9
GO4	Crown	258,424	258,420	100	3
P14	Crown	127,361	3,960	3	0
P19	FMA	969,725	644,876	67	9
P20	FMA	1,004,131	438,588	44	6
P8	Crown	347,617	29,130	8	0
PO1	Crown	420,387	200,799	48	3
PO2	Crown	543,244	543,244	100	7
PO3	Crown	681,435	93,876	14	1
S19	FMA	415,173	80,187	19	1
S20	FMA	658,367	10,551	2	0
S21	FMA	247,777	77,996	31	1
SO2	Crown	598,075	126,740	21	2
W13	FMA	301,616	73,057	24	1
W14	FMA	668,335	339,313	51	5
W15	FMA	379,054	334,910	88	5
WO3	Crown	13,751	13,751	100	0
Sub-total		12,291,560	6,900,939		93
No Forest Management Agreement Area			526,092		7
Total			7,427,031		100

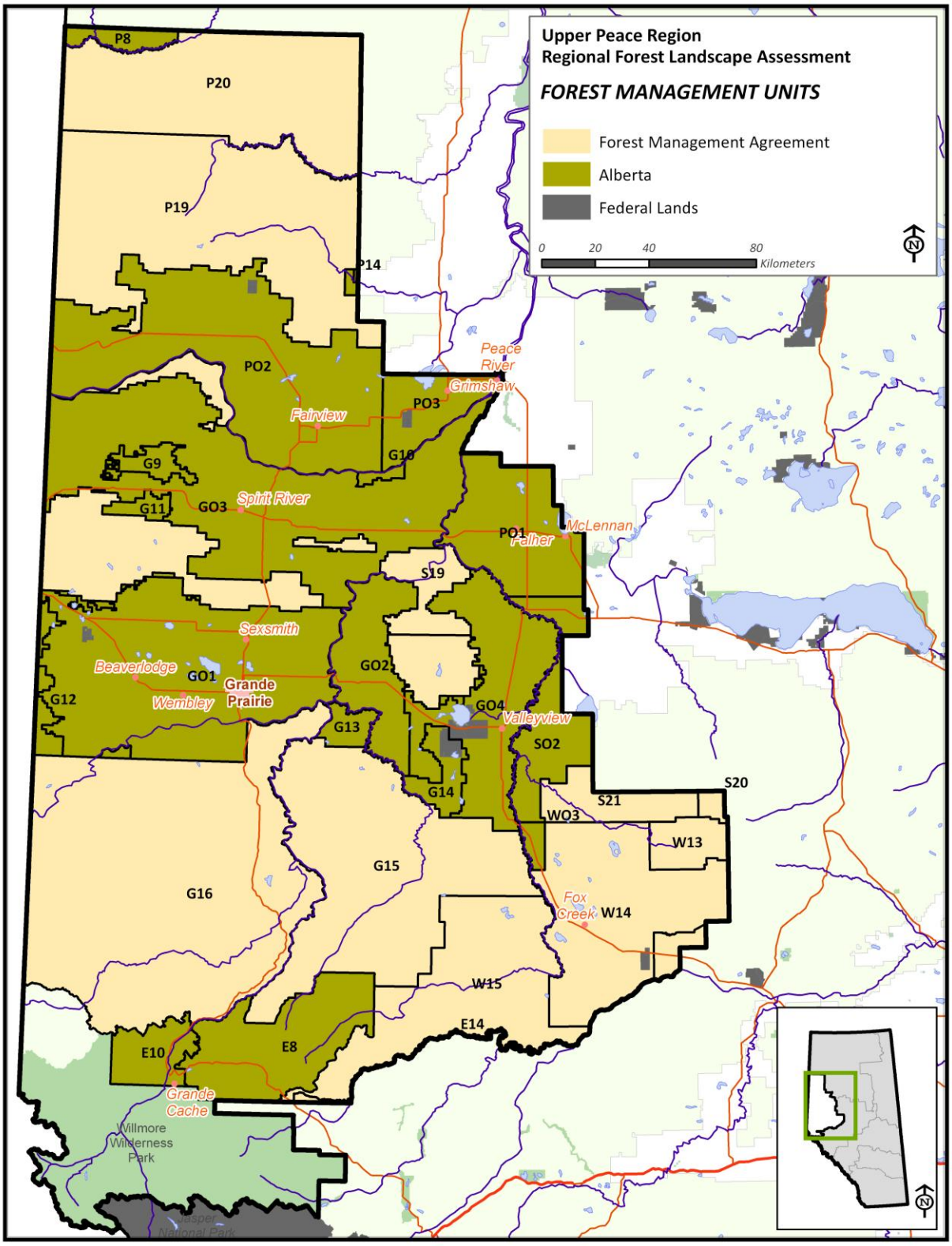


Figure 1-4 Forest Management Units

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). 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 Upper Peace Region contains portions of 10 subregions. A summary of subregion distribution (ordered by dominance in the Upper Peace) is in Table 1-4 and a map showing the subregions in the Upper Peace Region appears as Figure 1-5.

Table 1-4 Natural Subregion Distribution

Natural Subregion	Area (ha)	Percentage (%)
Dry Mixedwood	2,128,379	29
Lower Foothills	1,259,935	17
Central Mixedwood	999,534	13
Lower Boreal Highlands	890,626	12
Upper Foothills	679,906	9
Subalpine	663,042	9
Peace River Parkland	307,323	4
Upper Boreal Highlands	290,448	4
Alpine	159,418	2
Montane	48,420	1
Total	7,427,031	100

The Dry Mixedwood and Lower Foothills Subregions together occupy almost half of the Upper Peace Region accounting for 46% of the Region (Table 1-4). The Central Mixedwood and Lower Boreal Highlands Subregions are the next most prevalent, accounting for 13% and 12% respectively. The remaining area lies within the Upper Foothills, Subalpine, Peace River Parkland, Upper Boreal Highlands Subregions.

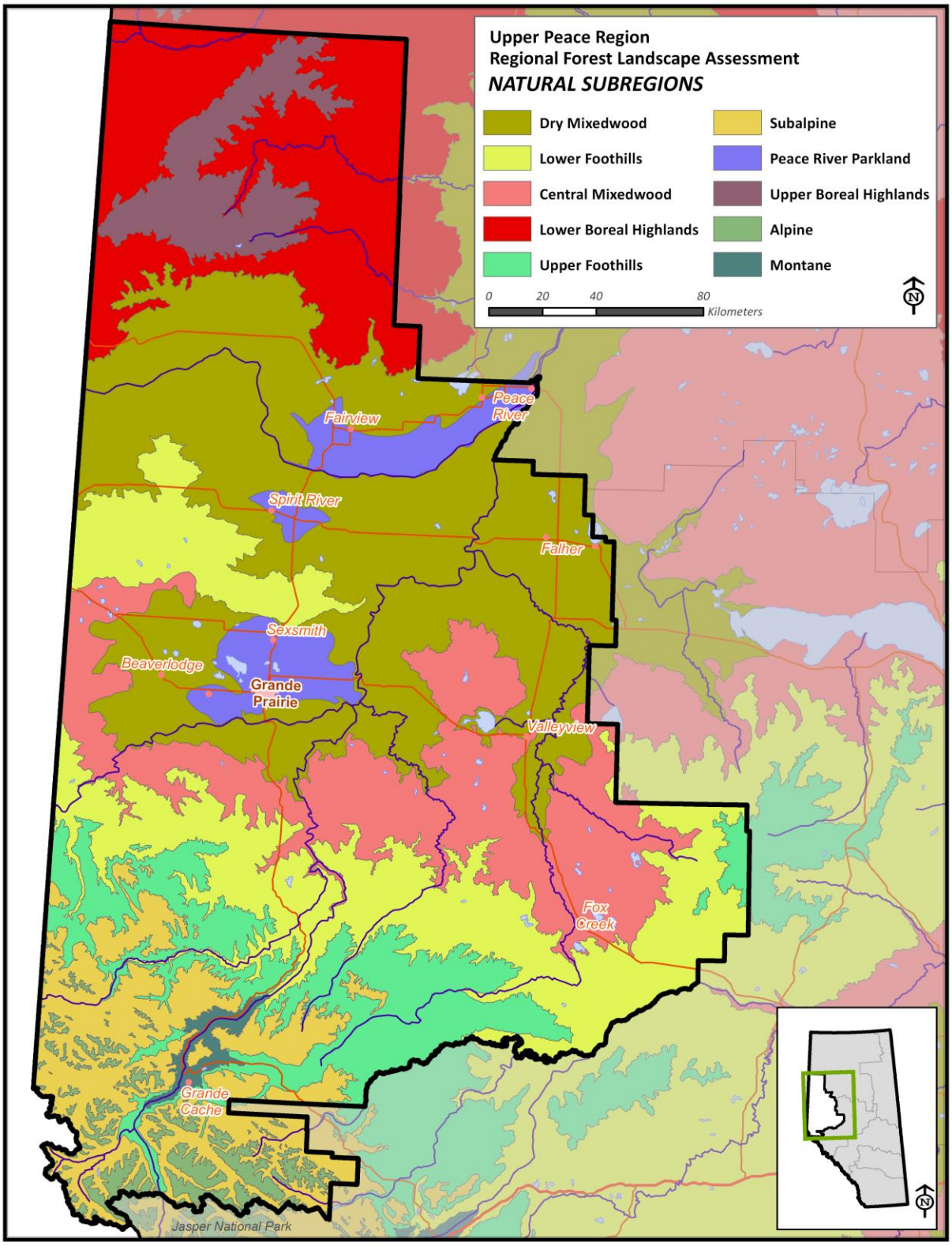


Figure 1-5 Alberta Natural Subregions

1.5.1 Dry Mixedwood Natural Subregion

The Dry Mixedwood Natural Subregion is the largest subregion making up 29% of the Upper Peace region. It is characterized by undulating plains, aspen dominated forests and fens. There are two geologically different areas of Dry Mixedwood Subregion in the Province; of the two, the topography in the Upper Peace consists more of gently rolling plains where Gray Luvisols are the dominant soils on uplands and Gleysols and Organics are dominant in wetlands.

This 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.

1.5.2 Lower Foothills Natural Subregion

The Lower Foothills Natural Subregion is the second largest subregion making up 17% of the Upper Peace region. It occurs at lower elevations along the foothills of the Rocky Mountains. 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.

1.5.3 Central Mixedwood Natural Subregion

The Central Mixedwood Natural Subregion 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.

1.5.4 Lower Boreal Highlands Natural Subregion

The Lower Boreal Highlands occurs in the northern extent of the Upper Peace Region. 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 moister 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.

1.5.5 Upper Foothills Natural Subregion

The Upper Foothills Natural Subregion primarily rests below the Subalpine Subregion, but also has a small pocket on the east side of the Region, which is near the Swan Hills area. The climate soils and vegetation patterns indicate that this is a transition zone between the drier, somewhat warmer conditions of the Lower Foothills Subregion and the cooler, wetter conditions of the Subalpine Subregion. Strongly rolling to steep terrain with thin glacial deposits and exposed bedrock are typical.

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

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

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

1.5.6 Subalpine Natural Subregion

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

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

1.5.7 Peace River Parkland Natural Subregion

Gently rolling plains and steep, south-facing grassy and forested slopes along the Peace River define the Peace River Parkland Natural Subregion. It is the smallest Natural Subregion in Alberta, mainly occurring in the Upper Peace Region (3 areas near Grande Prairie, Spirit River and Fairview). Almost all the upland plains have been cultivated with aspen stands dominating the forested area. Dark Gray Chernozems or Luvisols support the forested area with well drained Solonetzic Chernozems dominant on cultivated lands and remaining sedge-California oat grass-porcupine grass communities.

Climate is slightly drier and warmer than the surrounding Dry Mixedwood Natural Subregion. This unique Subregion is characterized by upland forests of aspen and white spruce and valley slopes with dry grasslands and aspen forests.

1.5.8 Upper Boreal Highlands Natural Subregion

The Upper Boreal Highlands is defined by coniferous forests on the upper slopes and undulating plateaus of northern hill systems along with short, cool and moist summers and cold winters. Orthic and Brunisolic Gray Luvisols are common soils with Organic soil and Gleysols in the wetlands

The predominantly coniferous forests, made up of lodgepole pine – jack pine hybrids, and white and black spruce, are found on the upper slopes and plateaus of the Buffalo Head, Naylor and Clear Hills, and the Birch Mountains. Elevations range from 825 m in the eastern Birch Mountains to 1100 m in the western Clear Hills.

1.5.9 Alpine Natural Subregion

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

1.5.10 Montane Natural Subregion

Around the town of Grande Cache, the Montane Natural Subregion sits below the Subalpine Natural Subregion. Lodgepole pine, Douglas fir and aspen stands occur on east and northern aspects. Grasslands can occur on south and west aspects at lower elevations. At higher elevations, closed mixedwood and coniferous forests (dominated by lodgepole pine) can be found.

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

1.6 Municipal Districts/Counties

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

- 9 Municipal Districts (MD),
- 1 Improvement District (ID),
- 1 city
- 12 towns,
- 6 villages, and
- 106 smaller populated centers.

These registered municipal entities are listed in Table 1-5 and 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.

In addition, Figure 1-7 shows the locations of the City of Grande Prairie, 12 towns, 29 hamlets and 77 smaller localities, all with registered names in Alberta. The population of these locations is rolled up into the Municipal District to which they belong.

The Improvement District of Willmore includes all of Willmore Wilderness Park but there is no population within the boundaries.

Grande Prairie is the only city in the Region, and is a hub for local government, transportation, education and resource development. Some towns in the Region are centers of forestry operations (e.g.: Grande Prairie, Manning, Peace River, Grande Cache), and some towns are associated more with agriculture (e.g.: McLennan, Spirit River). In this northern region, there is an increasing interaction with oil and gas operations.

Table 1-5 Municipal Locations

Municipal Classification	Name	Population (2010)
Municipal District	Birch Hills County	1,610
	Clear Hills County	3,293
	Fairview No. 136, M.D. of	1,856
	Greenview No. 16, M.D. of	5,464
	Grande Prairie No. 1, County of	17,989
	Peace No. 135, M.D. of	1,487
	Saddle Hills County	2,478
	Smoky River No. 130, M.D. of	2,442
	Spirit River No. 133, M.D. of	662
	Sub-total	37,281
Improvement District	I.D. No. 25 Willmore Wilderness	0
	Sub-total	0
City	Grande Prairie	50,227
	Sub-total	50,227
Town	Beaverlodge	2,264
	Fairview	3,297
	Falher	941
	Fox Creek	2,278
	Grande Cache	3,783
	Grimshaw	2,537
	McLennan	824
	Peace River	6,315
	Sexsmith	2,255
	Spirit River	1,148
	Valleyview	1,884
	Wembley	1,443
	Sub-total	28,969
Village	Berwyn	561
	Donnelly	374
	Girouxville	282
	Hines Creek	396
	Hythe	821
	Rycroft	638
	Sub-total	3,072
Total		119,549

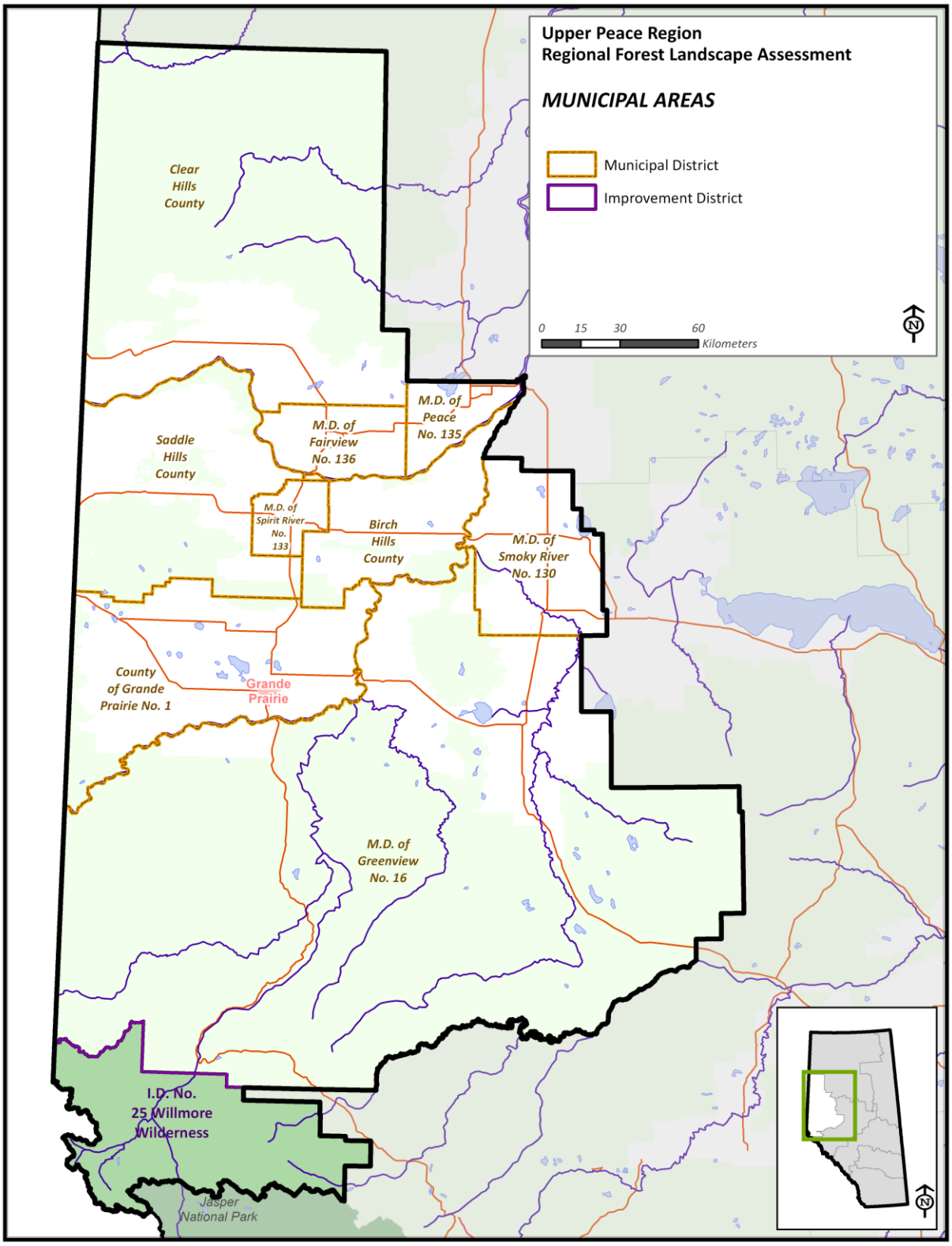


Figure 1-6 Municipal Jurisdictions

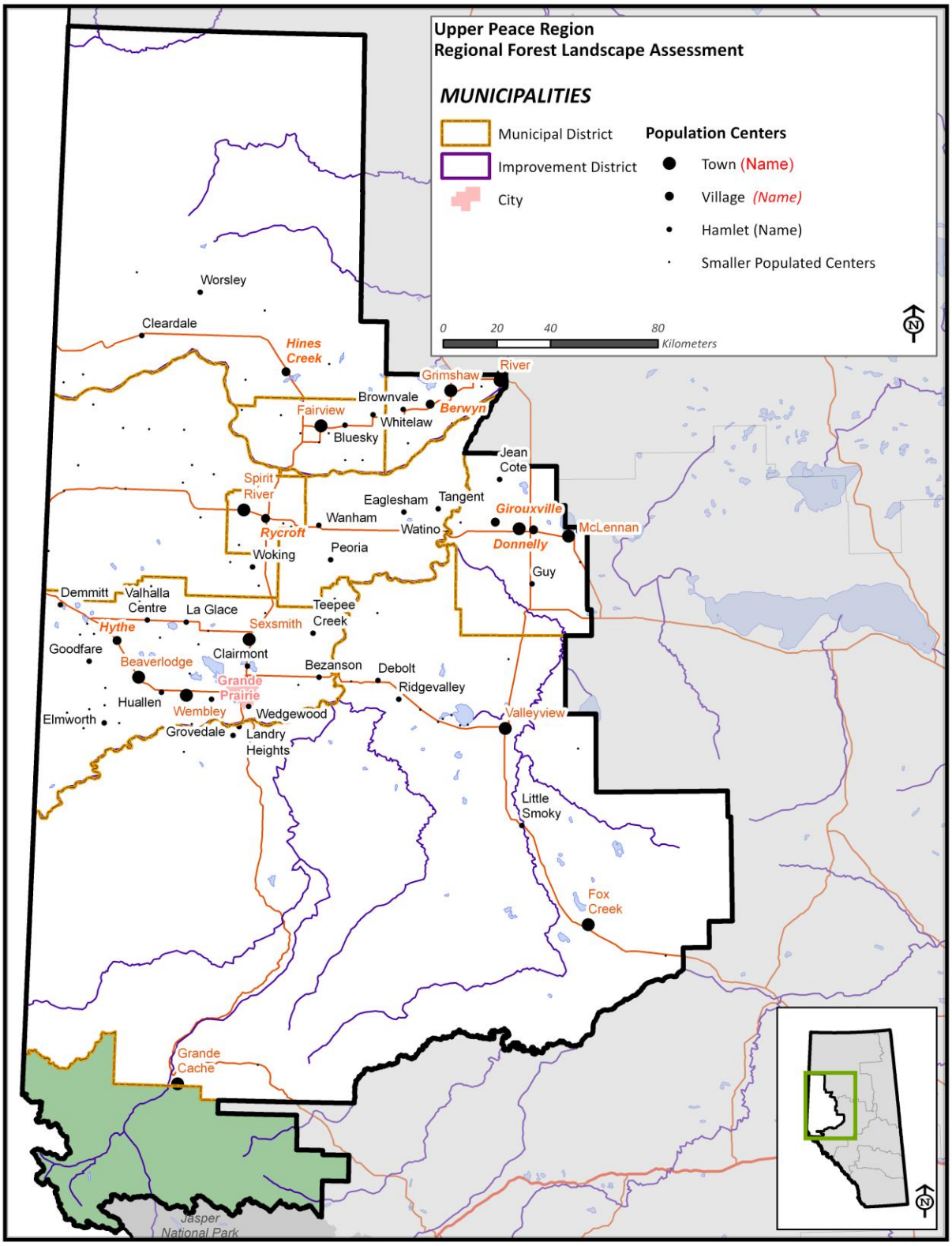


Figure 1-7 Towns and Other Populated Centers

1.7 Federal Government Lands

The only federally managed lands in the Upper Peace Region consist of First Nations (section 1.8).

1.8 First Nations

First Nation communities (10) cover 23,152 hectares of the Upper Peace Region. A summary of the First Nation communities is shown in Table 1-6, and the geographic distribution of First Nations is shown in Figure 1-8.

Each First Nation band is listed in Table 1-6, with the number of reservations belonging 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 was used.

First Nation lands represent 0.3% of the Upper Peace Region. The largest single First Nation is Sturgeon Lake at 15,710 hectares, and is comprised of 3 separate reserves around Sturgeon Lake. Other First Nation reservation lands are spread across the entire Region.

The Alexander First Nation and a portion of the Sturgeon Lake First Nations are located in the Green Area, with the balance all occurring in the White Area.

Table 1-6 First Nation Communities

First Nation Name	Treaty	Area (ha)	Percentage of all First Nations (%)	Number of Reserves	Population	Population Source
Alexander	8 (1899)	2,244	10	1	997	Alberta (2010)
Clear Hills	9 (1899)	1,544	7	1	0	Canada (n.d.)
Duncans	10 (1899)	2,055	9	1	132	Alberta (2010)
Horse Lakes	11 (1899)	1,599	7	1	436	Alberta (2010)
Sturgeon Lake	12 (1899)	15,710	68	3	1,379	Alberta (2010)
Total		23,152	100	7	2,944	

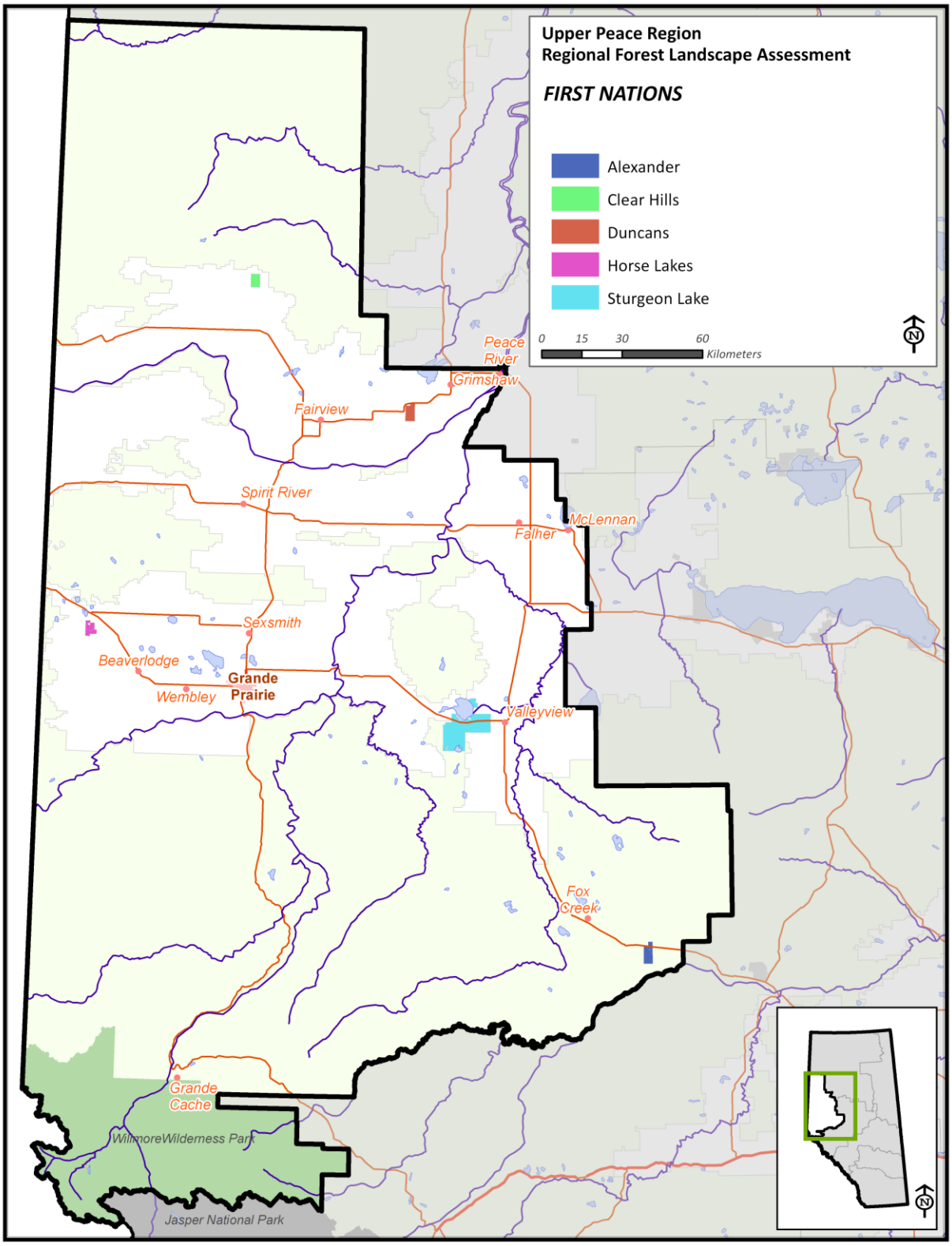


Figure 1-8 First Nations

1.9 Metis Settlements

There are no Metis Settlements (11) in the Upper Peace Region.

1.10 Parks and Protected Areas

There are many different designations of parks and protected areas in Alberta (13). These are defined in Table 1-7.

Table 1-7 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 Upper Peace Region contains several of the park and protected area designations noted above. The largest feature is Willmore Wilderness Park which occupies approximately 6% (Table 1-8) of the Region. Kakwa Wildland Park and Chinchaga Wildland Park are the two next largest protected areas. A total of 9% of the Region (668,070 ha) is allocated under some form of protection. In addition, another 0.16% of the Region (11,970 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 1-9).

Table 1-8 Park and Protected Area Allocations

Classification	Type of Park/Protected Area	Number	Area in Region (ha)	Percentage of PPA (%)	Percentage of Region (%)
Parks	Provincial Park	11	8,134	1	0
	Provincial Recreation Area	19	4,587	1	0
	Wildland Park	5	189,110	28	3
	Wilderness Park	1	460,377	69	6
	Total	36	662,208	99	9
Protected Areas	Natural Area	4	3,689	1	0
	Ecological Reserve	2	2,173	0	0
	Total	6	5,862	1	0
Total		42	668,070	100	9

Table 1-9 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	220	2	0
Protected Areas	Natural Area	6	11,750	98	0
Total		8	11,970	100	0

A detailed list of individual parks, recreation areas, wildland parks, natural areas and ecological reserves can be found in APPENDIX I . A map showing the general location of parks and protected areas is presented as Figure 1-9.

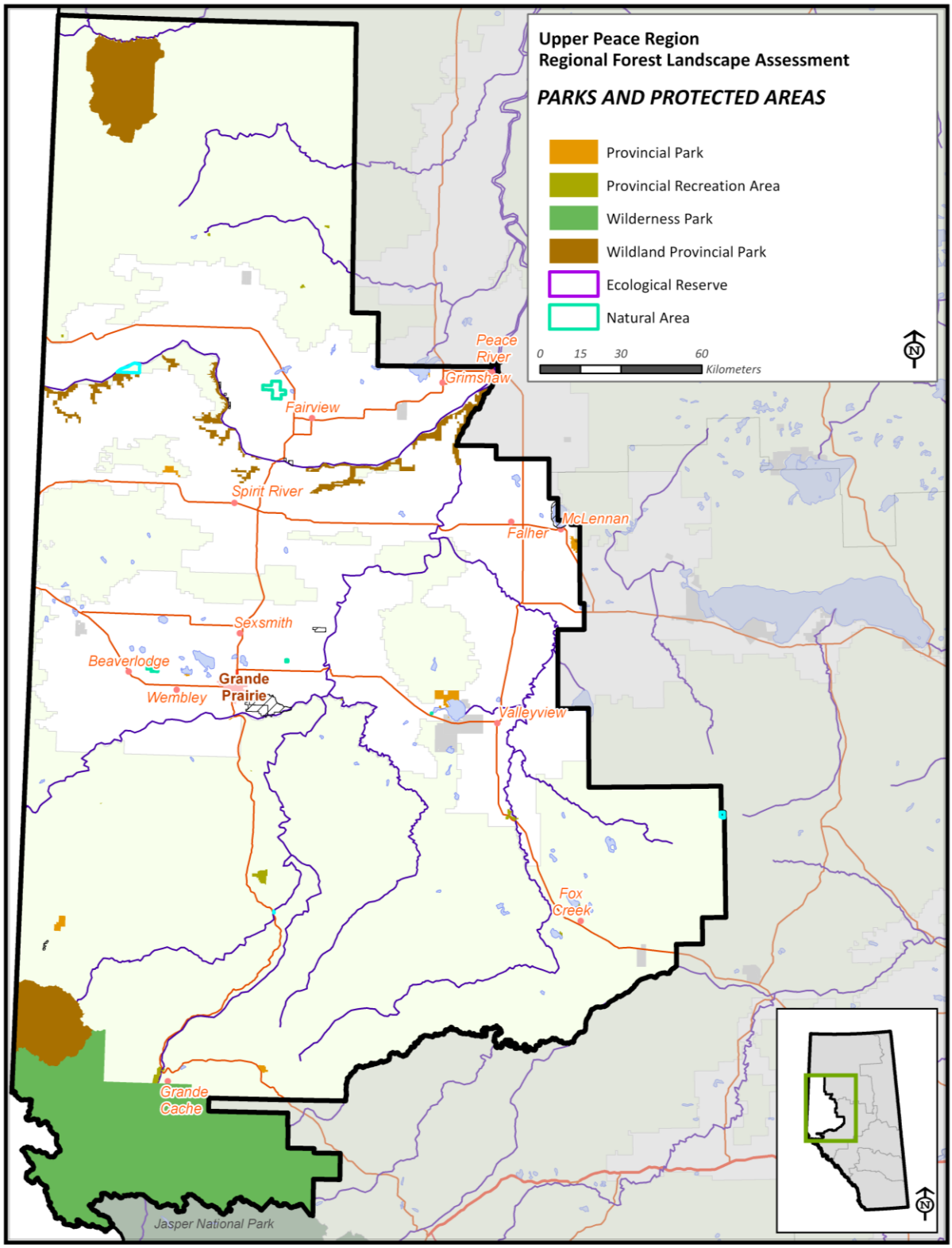


Figure 1-9 Parks and Protected Areas

1.11 Wildfire Management Areas

Wildfire management areas (15) are those areas which define wildfire management responsibilities. These areas are listed in Table 1-10 (ordered by prevalence in the Upper Peace Region) and shown in Figure 1-10. The two predominant Wildfire Management Areas are Smoky and Peace, occupying (respectively) 51% and 26% of the Upper Peace Region. Only a small portion of the Lesser Slave region falls inside the Upper Peace Region.

Table 1-10 Alberta Wildfire Management Areas

Wildfire Management Area Name	Entire Region Area (ha)	Portion of Wildfire Mgmt Area located in Upper Peace Area (ha)	Portion of Wildfire Mgmt Area located in Upper Peace (%)	Proportion of Upper Peace occupied by Wildfire Mgmt Area (%)
Smoky	3,831,838	3,814,529	100	51
Peace	5,313,685	1,957,383	37	26
Foothills	3,058,620	811,269	27	11
Woodlands	2,609,414	703,962	27	9
Lesser Slave	5,614,687	116,736	2	2
Sub-total	20,428,244	7,403,879		100
Federal Lands		23,152		0
Total		7,427,031		100

In terms of the influence of Upper Peace planning activities on the ESRD Regions, all of the Smoky is contained inside the Upper Peace Region.

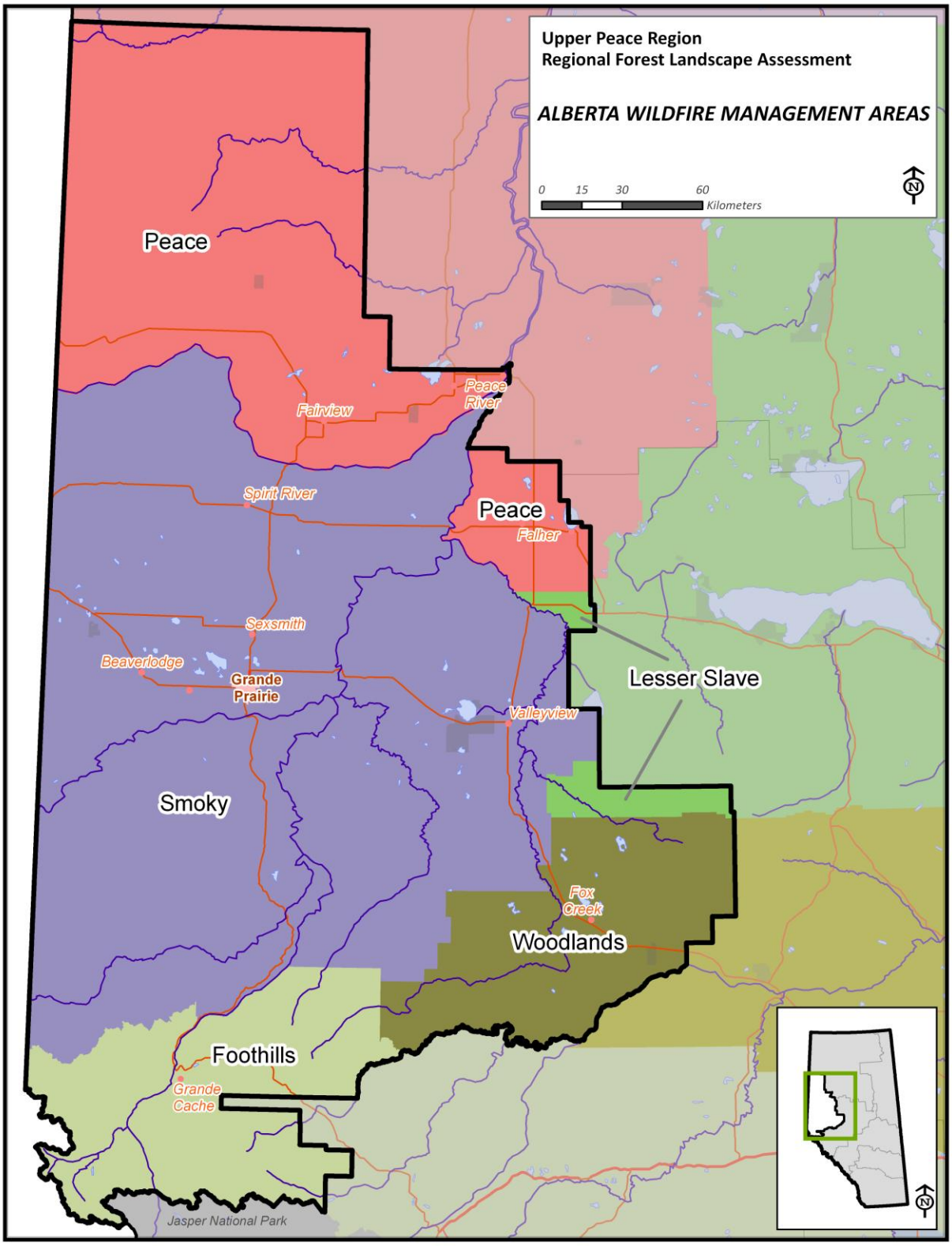


Figure 1-10 Alberta Wildfire Management Areas

2. Physical Conditions

2.1 Topography

The Upper Peace Region has a wide range of landscapes (16) as it extends from the Rocky Mountains north-easterly to boreal plains. Several major river channels (e.g.: Peace, Smoky, Simonette) have created deeper valleys when they occur in the foothills, broadening out to more shallow valleys as they flow north and east.

The highest elevation in the Region is 3,586 m, which is found in the extreme south of the Region, along the border with Jasper National Park (part of Mt Chown on the continental divide). The lowest elevation is approximately 497 m where the Peace River leaves the Region, at the town of Peace River. 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 very little inoperable area within the Green Area portion of this Region (Table 2-1), meaning that there should be very few constraints to mechanical operations. As expected, the majority of steep slopes are found in Willmore Wilderness Park, in the southwest corner of the Region.

Table 2-1 Slope Class Distribution

	Slope Class (percentage)								Total	
	0 - 30%		31 - 45%		46 - 60%		60% +			
Code	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)
Green Area	4,575,638	94	165,778	3	86,955	2	65,091	1	4,893,462	100
White Area	2,495,428	99	12,228	0	2,463	0	297	0	2,510,417	100
Federal Lands	23,150		2						23,152	
Total	7,094,407	96	177,909	2	89,367	1	65,349	1	7,427,031	100

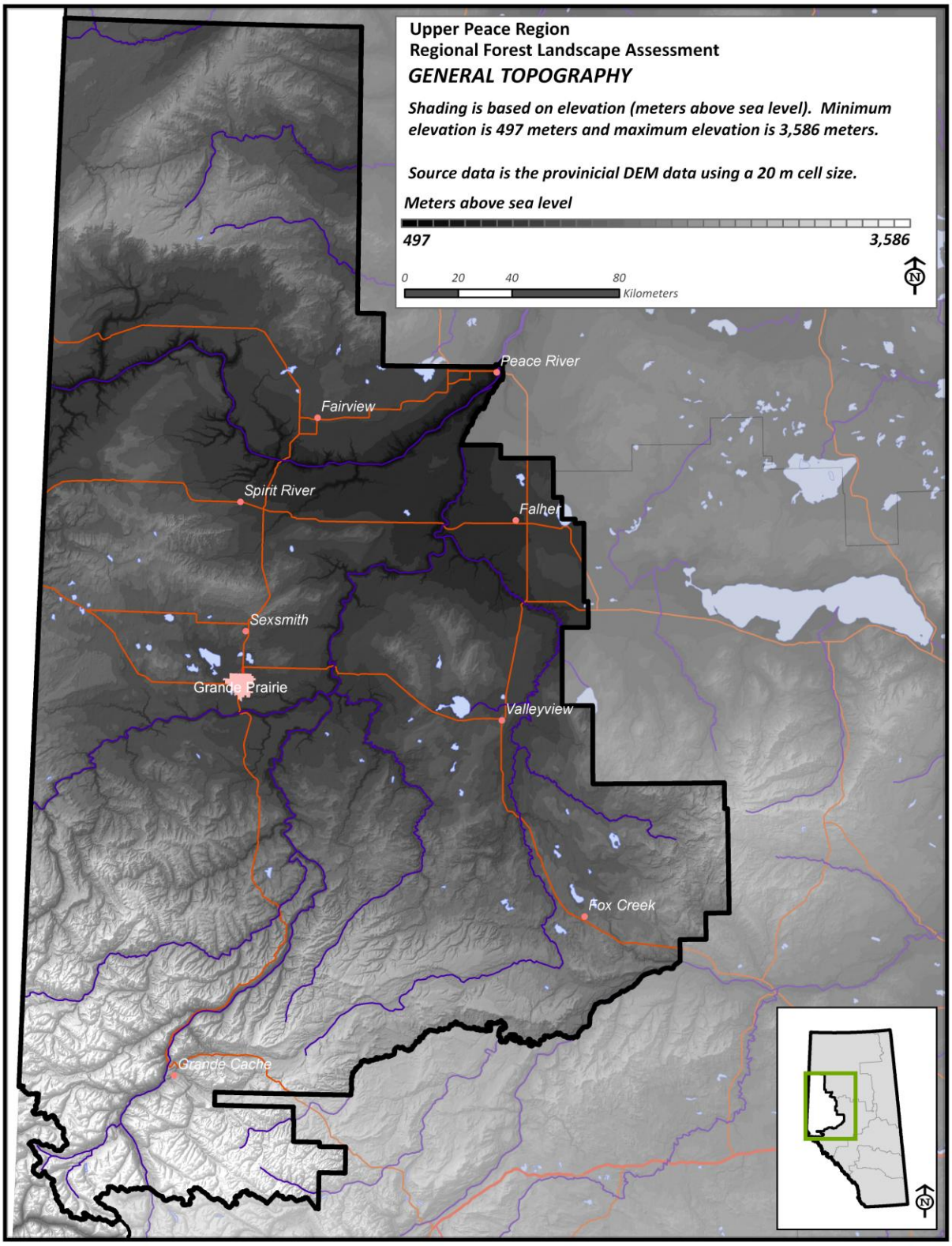


Figure 2-1 Topography

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 69% of the Region (Table 2-2). Luvisols, along with Brunisols (the second most common soil order in this Region) and Podzolic soils are the three soil orders for forest soils in Canada. Brunisolic soils are typically interpreted as a "transitional" soil between generally unweathered parent material (common to Regosols) and mature forest soils represented by the Podzolic or Luvisolic orders.

Table 2-2 Soil Types

Soil Type			Area (ha)	Percentage (%)
Soil Order	**Soil Group**	**Soil Subgroup**		
Brunisolic	Dystric Brunisol	Eluviated Dystric Brunisol	526,014	7
Brunisolic	Eutric Brunisol	Eluviated Eutric Brunisol	390,901	5
Sub-total			916,916	12
Chernozemic	Black Chernozem	Rego Black Chernozem	29,601	0
Chernozemic	Black Chernozem	Solonetzic Black Chernozem	119,922	2
Chernozemic	Dark Gray Chernozem	Gleyed Dark Gray Chernozem	39,331	1
Chernozemic	Dark Gray Chernozem	Gleyed Solonetzic Dark Gray Chernozem	351,134	5
Sub-total			539,987	7
Gleysolic	Gleysol	Fera Gleysol	63,712	1
Gleysolic	Humic Gleysol	Orthic Humic Gleysol	51,682	1
Gleysolic	Luvic Gleysol	Orthic Luvic Gleysol	69,709	1
Sub-total			185,103	2
Luvisolic	Gray Luvisol	Brunisolic Gray Luvisol	644,172	9
Luvisolic	Gray Luvisol	Dark Gray Luvisol	80,566	1
Luvisolic	Gray Luvisol	Gleyed Dark Gray Luvisol	289,840	4
Luvisolic	Gray Luvisol	Gleyed Gray Luvisol	1,324,278	18
Luvisolic	Gray Luvisol	Gleyed Solonetzic Gray Luvisol	183,319	2
Luvisolic	Gray Luvisol	Orthic Gray Luvisol	2,566,617	35
Luvisolic	Gray Luvisol	Podzolic Gray Luvisol	17,830	0
Sub-total			5,106,623	69
Organic	Mesisol	Terric Fibric Mesisol	328	0
Organic	Mesisol	Terric Mesisol	31,865	0
Organic	Mesisol	Typic Mesisol	35,292	0
Sub-total			67,485	1
Regosolic	Regosol	Orthic Regosol	205,716	3
Solonetzic	Solodized Solonetz	Dark Gray Solodized Solonetz	17,296	0
Solonetzic	Solonetz	Gleyed Black Solonetz	10,835	0
Sub-total			28,130	0
No Significant Soil Development			377,070	5
Total			7,427,031	100

Luvisolic soils are dominant in forested landscapes and are generally underlain by loamy tills. Brunisolic soils are primarily found on sand-dominated parent materials throughout the Boreal forest.

Figure 2-2 illustrates the distribution of soil subgroups in the Region. Notable is the distribution of Chernozemic orders in the White Area, in addition to the wide distribution of Luvisols as evidenced by their dominance in total area.

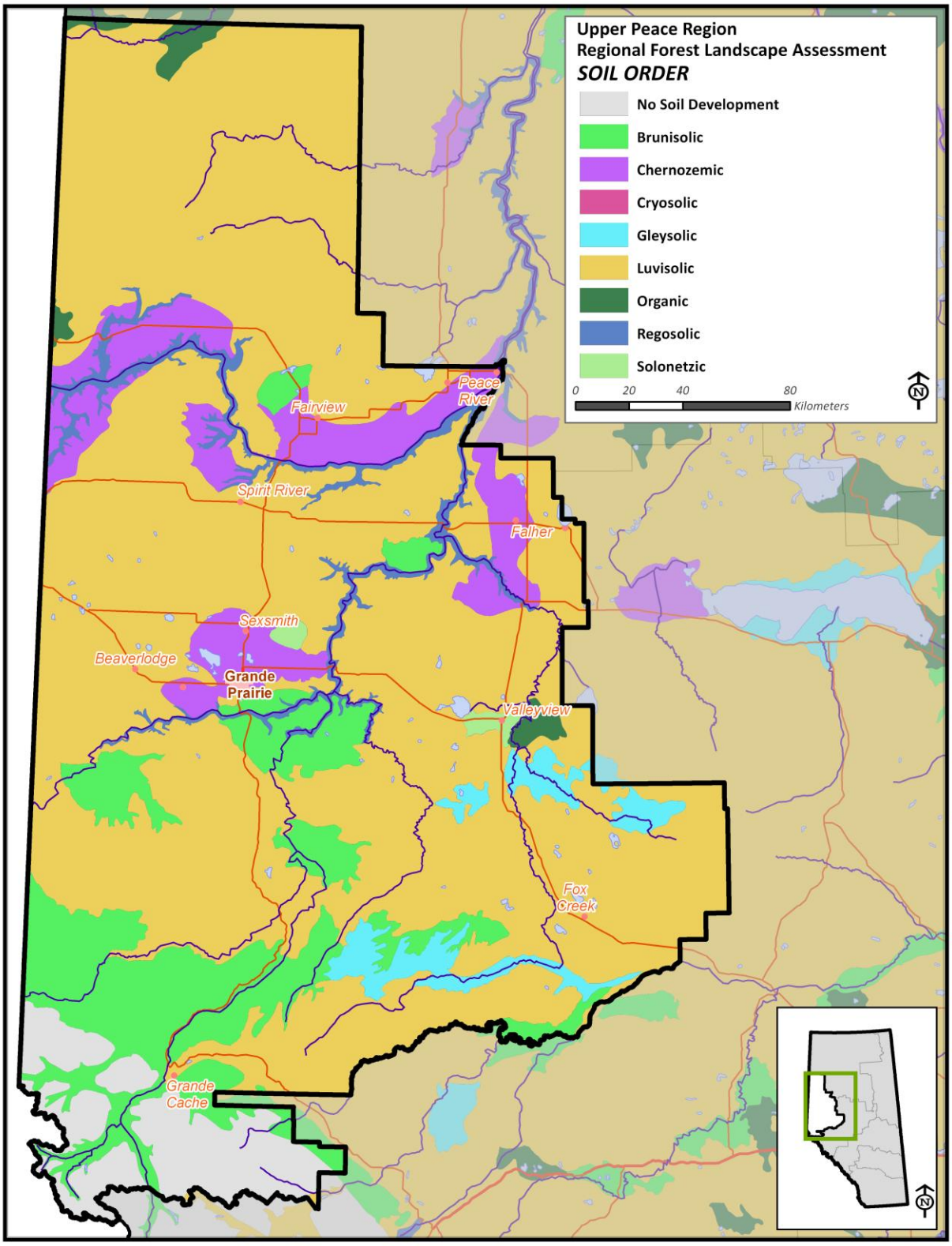


Figure 2-2 Soil Orders

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 Upper Peace Region (shown in ***red*** on Figure 2-3) represents the upper reaches of the Peace River basin, which is on the west-central border of Alberta-British Columbia.

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 Upper Peace Region within the Green and White Areas and on Federal lands. Similarly, Table 2-4 details the length of rivers and streams by their class, for

the Green and White Areas and on Federal lands. The summary of water features excludes wetlands as these are described separately in subsequent sections.

Table 2-3 Waterbody Classification

	Area of Waterbody Features (ha)			
Waterbody Class	**Green Area**	**White Area**	**Federal Lands**	**Total**
Major River	18,426	22,097		40,522
Lake (Permanent)	24,661	29,241	289	54,191
Lake (Recurring)	10,727	8,486	441	19,653
Oxbow (Permanent)	643	327	1	970
Oxbow (Recurring)	580	232		813
Man-made Features	77	488	5	569
Icefield	1,056			1,056
Total	56,169	60,871		117,775

Table 2-4 River/Stream Network Classification

	Length of River/Streams (km)			
River/Stream Class	**Green Area**	**White Area**	**Federal Lands**	**Total**
Stream (Permanent)	5,842	2,224	38	8,104
Stream (Recurring)	27,834	8,675	19	36,527
Stream (Indefinite)	22,156	3,482	118	25,757
Oxbow (Permanent)	26	10		37
Oxbow (Recurring)	77	30	0	108
Man-made Features	24	825	1	849
Total	55,960	15,246	176	71,382

Figure 2-4 shows the distribution of *permanent* water features in the Upper Peace Region. In addition, the significant rivers draining the Region are labeled. In total, there are 145 named lakes in the Region, of which the largest is Sturgeon Lake (4,850 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)**
Sturgeon Lake	4,850	Little Smoky River	596
Bear Lake	3,450	Smoky River	513
Cardinal Lake	3,083	Simonette River	314
Kimiwan Lake	2,481	Notikewin River	254
Iosegun Lake	1,429	Peace River	236
Meekwap Lake	1,317	Goose River	207
Winagami Lake	974	Kakwa River	197
Smoke Lake	938	Berland River	191
La Glace Lake	845	Hines Creek	170
Saskatoon Lake	832	Wapiti River	169

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

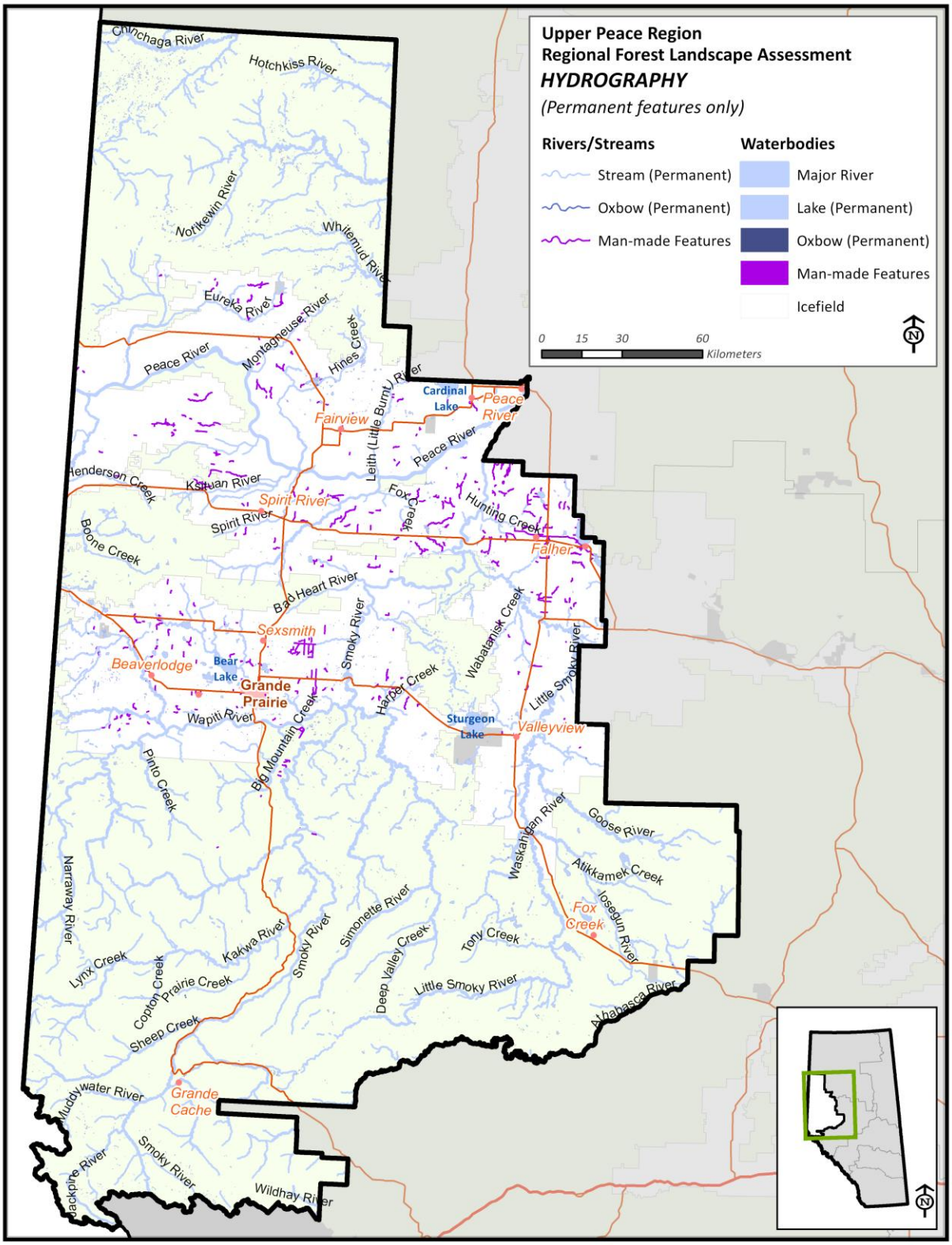


Figure 2-4 Permanent Waterbodies and Rivers

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 Upper Peace region contains approximately 974 hectares of wetland (Table 2-6) which occurs as small features, distributed across the Region. A map of wetlands is not provided as they would not be visible on the scale of maps used in this report.

Table 2-6 Wetlands

Wetland Classification	Area of Defined Wetland (ha)			
	Green Area	White Area	Federal Lands	Total
AVI				
Herbaceous Forbs/Grasses	753	198	12	964
Hydrography				
Wetlands	10			10
Total	763	198	12	974

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 Upper Peace due to the variety of topography from the northern Rocky Mountains in the south, to boreal plains in the north. 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 2-5, Figure 2-6, Figure 2-7 and Figure 2-8 (respectively).

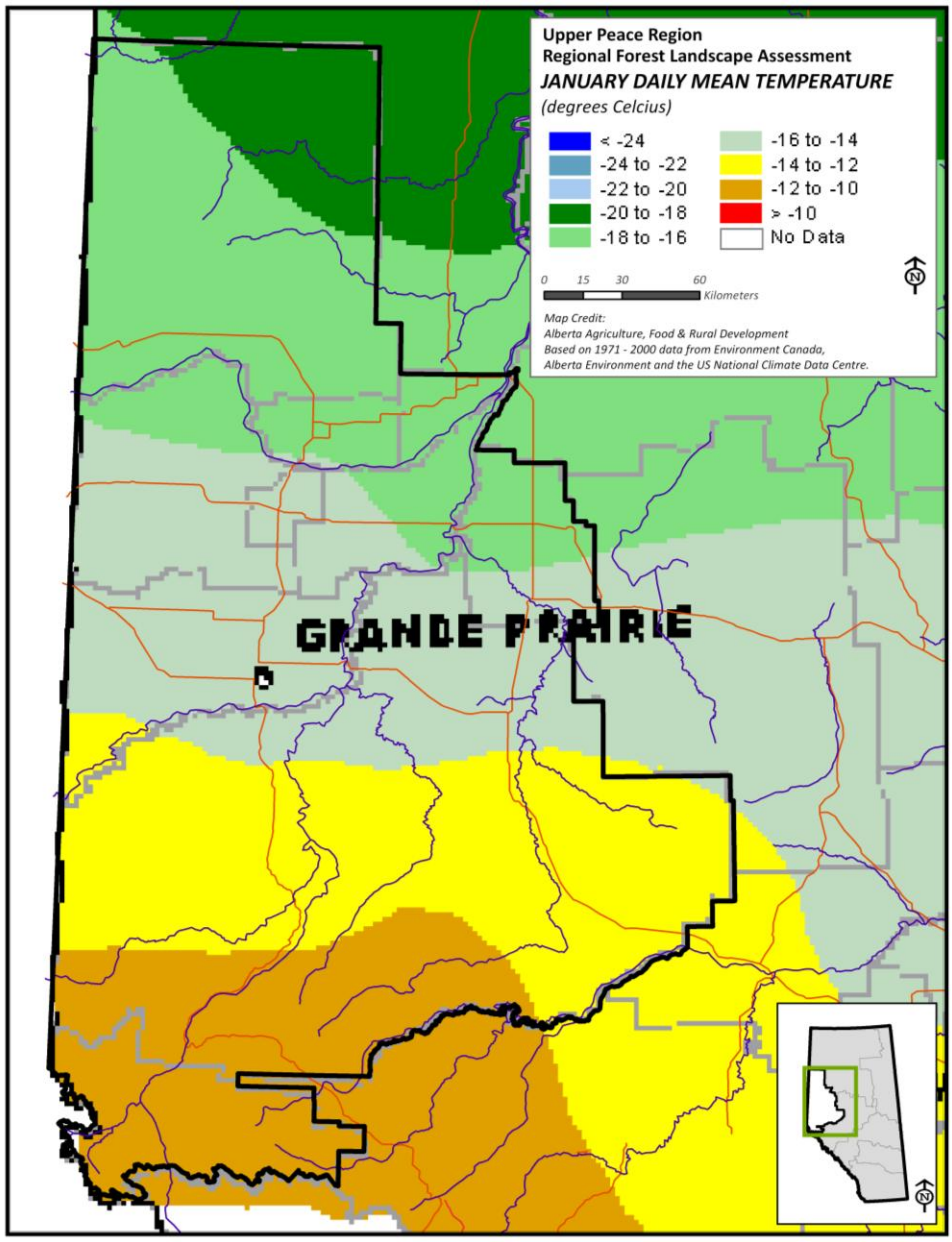


Figure 2-5 Daily Mean January Temperature

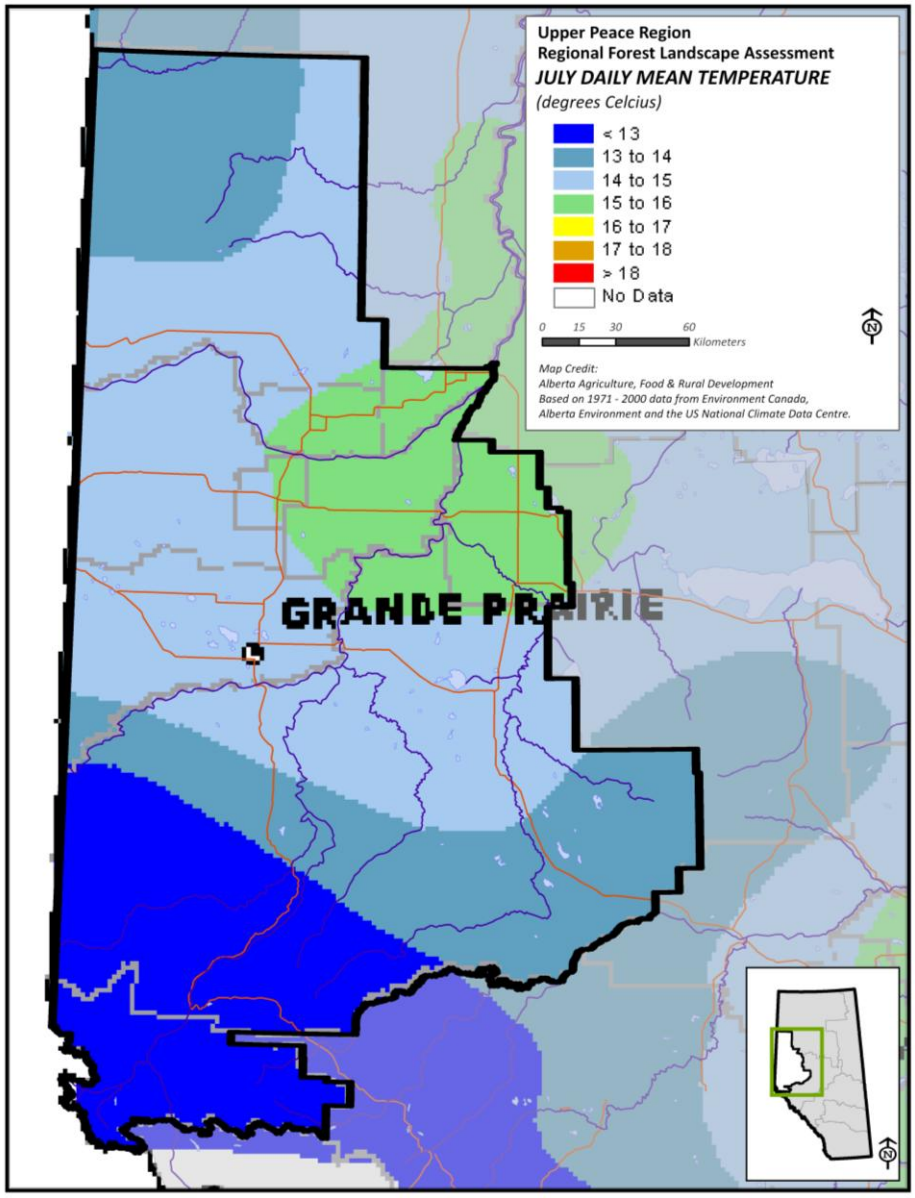


Figure 2-6 Daily Mean July Temperature

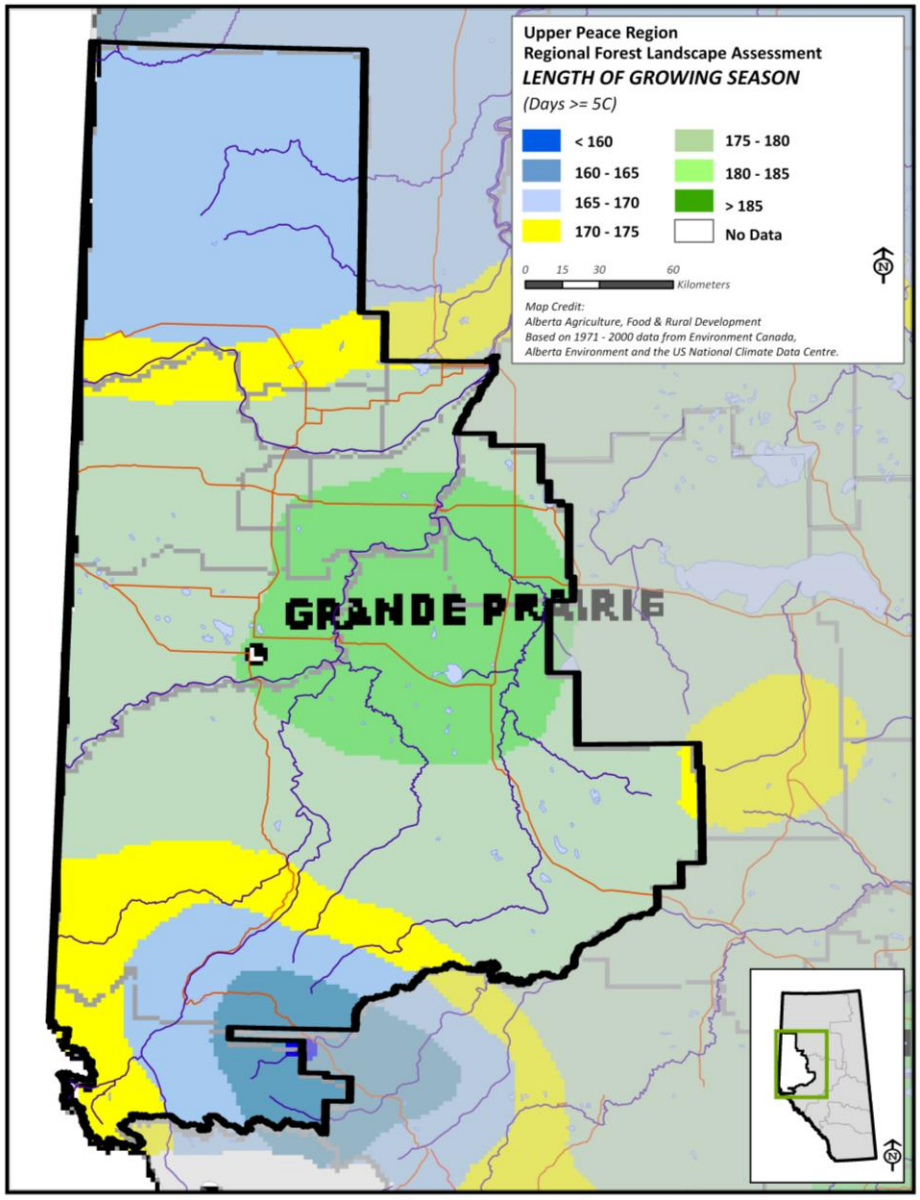


Figure 2-7 Length of Growing Season

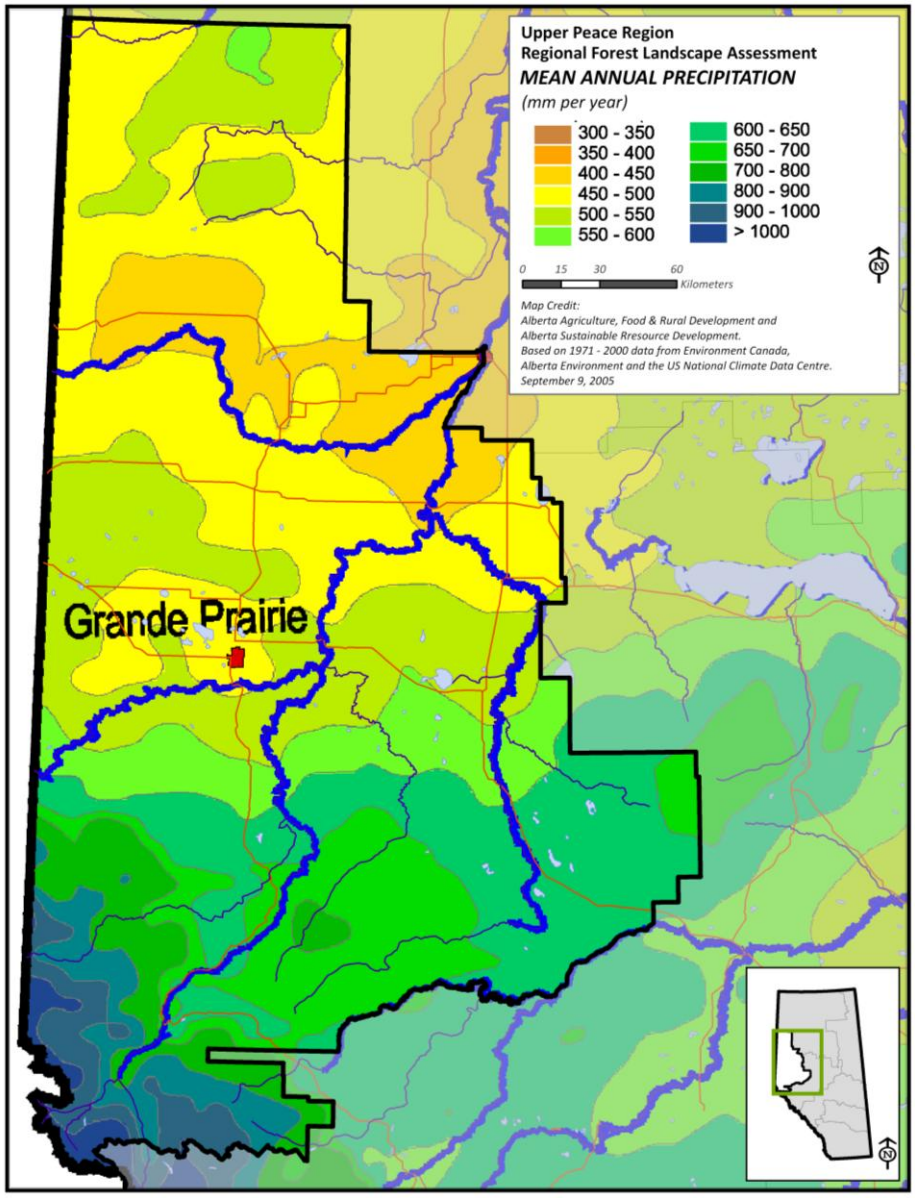


Figure 2-8 Mean Annual Precipitation

The provincial ecological classification identifies two ecoclimatic provinces present within the Upper Peace Region: Boreal and Cordilleran. The Cordilleran regime is typical in the Alpine, Subalpine and Montane Natural Subregions. The Boreal regime is largely in the north and eastern part of the Upper Peace Region which is occupied by the Central Mixedwood and Dry Mixedwood Subregions. The Upper Foothills and Lower Foothills, which occupy 26% of the Upper Peace Region (table 1-4) are considered transitional zones between Boreal and Cordilleran ecoclimates.

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 2-9.

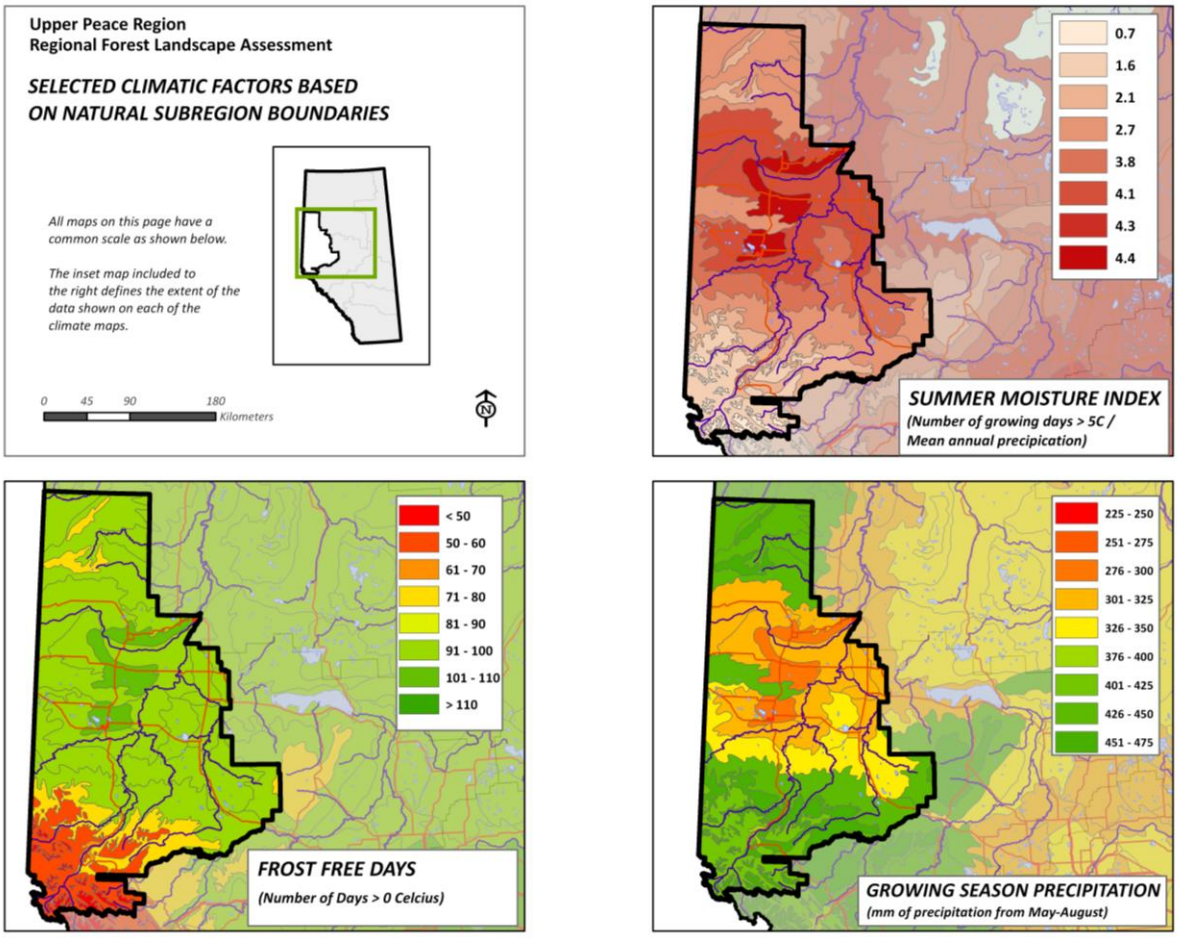


Figure 2-9 Climatic Factors Associated with Natural Subregions

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 62% of the Upper Peace Region has detailed AVI data available. Figure 3-1 indicates the relative coverage of AVI detail across the Upper Peace Region and the source of that information. All AVI specifications data meet the minimum standard for vegetation classification as described in Alberta (2005).

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 11 to 15 year class, followed by inventory data which is 5 to 10 years old.

For the purposes of this report, the inventory data has been updated with known depletions related to harvest area, 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 the White Area, or areas within wildland or wilderness parks. The balance of non-inventoried lands are where ESRD has no management responsibilities (e.g.: First Nations).

Table 3-1 Age of AVI Information

Age of AVI (years)	Area (ha)	Percentage (%)
0 - 5 years	667,102	9
5 - 10 years	906,939	12
11 - 15 years	2,066,357	28
16 - 20 years	562,171	8
Greater than 20 years	419,688	6
Total	4,622,257	62
No AVI Available	2,804,774	38
Total	7,427,031	100

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

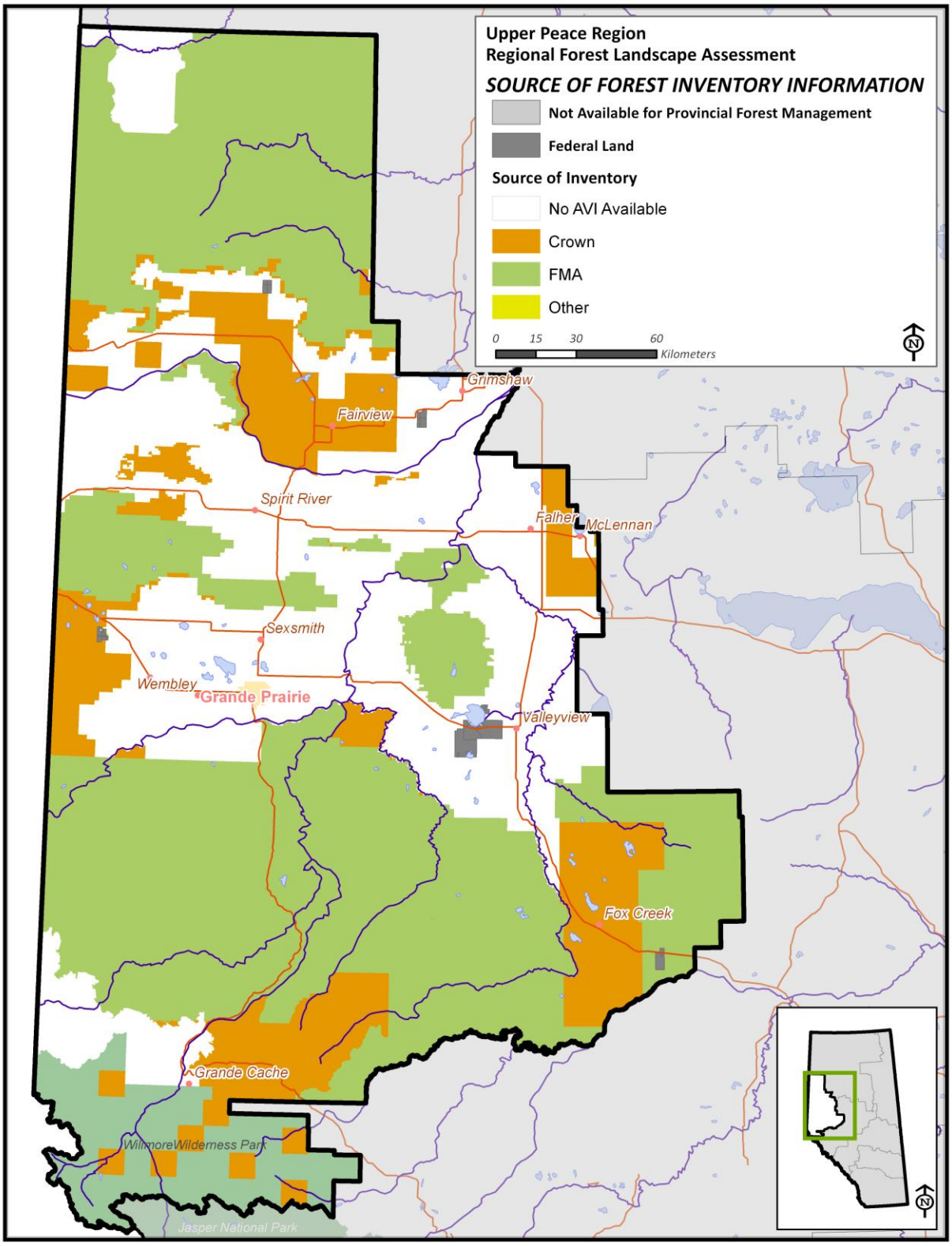


Figure 3-1 Source of AVI Information

3.2 Forest Species

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

Aspen-leading stand types are the most common over the area of inventoried lands. It is more common to find aspen in pure deciduous stands, rather than occurring in mixedwood stands. Pine is the most prevalent leading conifer species, forming both pure stands as well as occurring in mixed coniferous stands. Black and white spruces occur commonly throughout the Region. The spruces occur more often in mixedwood stands than pine. Black spruce is found on both upland and lowland forest sites.

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*	528,250
Engelmann spruce	*Picea engelmannii*	50,178
Black spruce	*Picea mariana*	582,552
Pine - undiff	*Pinus sp.*	3,007
Lodgepole pine	*Pinus contorta*	1,029,608
Balsam fir	*Abies balsamea*	12,228
Alpine fir	*Abies lasiocarpa*	3,770
Tamarack	*Larix laricina*	63,116
Sub-total: Coniferous		2,272,710
Deciduous		
Hardwood - undiff	*Populus sp.*	39
Trembling aspen	*Populus tremuloides*	1,249,450
Balsam poplar	*Populus balsamifera*	100,436
Paper birch	*Betula papyrifera*	42,112
Sub-total: Deciduous		1,392,037
Regeneration		
Undeclared species		279,757
Sub-total: Regeneration		279,757
Sub-Total Forested Land		3,944,504
Not Forested		664,848
No Inventory Data		2,817,679
Total		7,427,031

The general trend for species geographic distribution is evident in Figure 3-2. Coniferous species are most prevalent in the southern and northern parts of the Region with deciduous occurring in lower elevations and in areas close to the White Area. The large area of "Not Forested" in the north central part of the Region is primarily agricultural land.

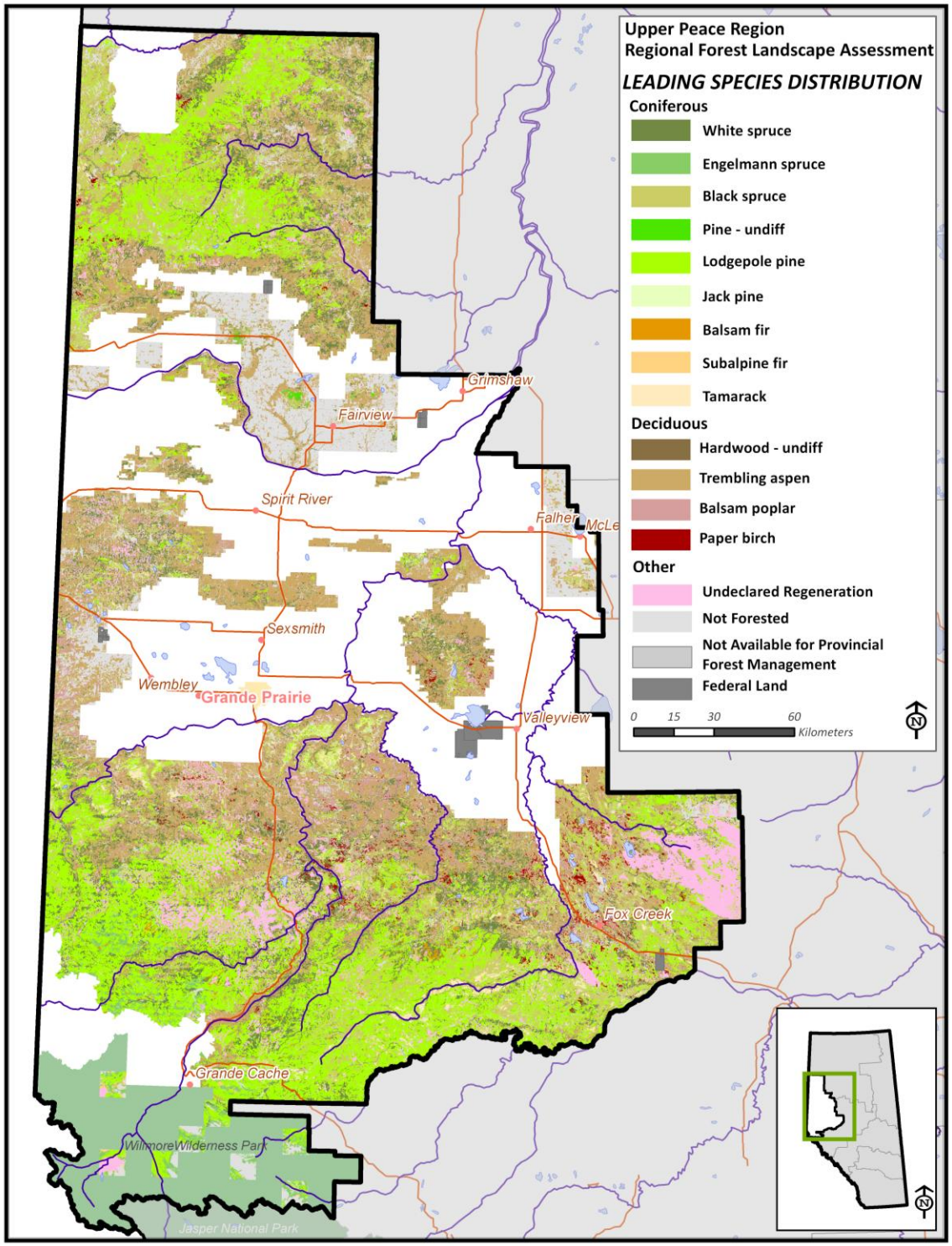


Figure 3-2 Leading Tree Species

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 Upper Peace region.

The Region is dominated by primarily coniferous stand types (Table 3-3), with 53% of the inventoried area covered by spruce and pine forest strata. These types are most common in the western part of the Region where the foothills lead into steeper slopes and cooler environments. Deciduous stands are significant in the Region (30% of the inventoried area) and are generally found in the central part of the Region.

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

Table 3-3 Forest Cover Type Summary

Description	Code	Area (ha)
Forested Land		
Pine pure or leading	C-P	959,917
Black spruce pure or leading	C-Sb	640,796
White spruce pure or leading	C-Sw	507,792
Pine/Hardwood	CD-P	74,388
Black spruce/Hardwood	CD-Sb	5,528
White spruce/Hardwood	CD-Sw	87,666
Hardwood/Pine	DC-P	72,171
Hardwood/Spruce	DC-S	130,815
Deciduous	D	1,185,676
Regeneration (undeclared strata)		279,757
Sub-total		3,944,504
Not Forested		664,848
No Inventory Data		2,817,679
Total		7,427,031

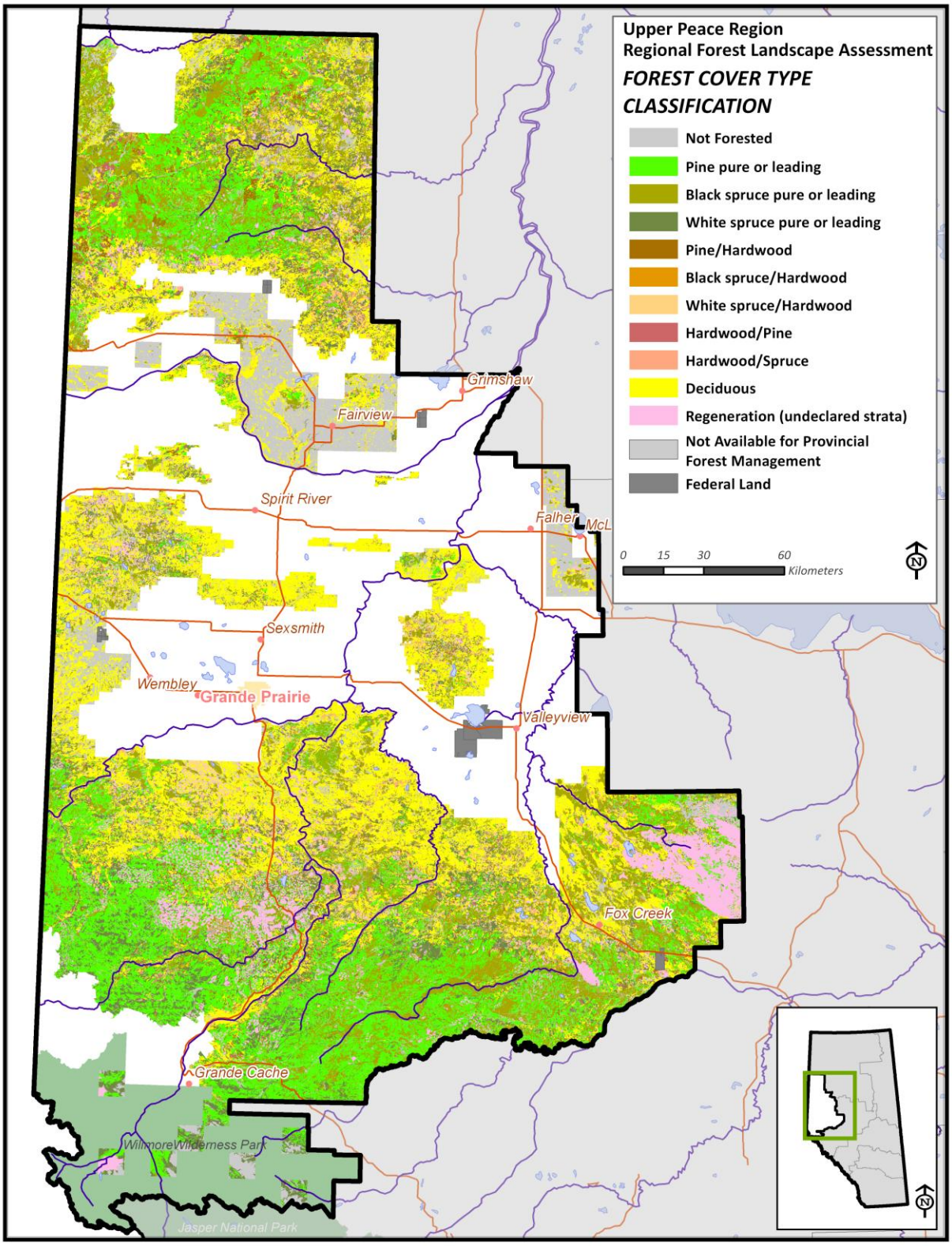


Figure 3-3 Forest Cover Type Distribution

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 early mature, with a full 50% of the inventoried area falling in ages between 70 and 129 years. This clumping of ages is clearly evident on the graphical representation of the distribution (Figure 3-4).

Table 3-4 Age Class Distribution

Age Class (years)	Area (ha)
Forested Land	
0 - 9	149,955
10 - 19	259,891
20 - 29	124,670
30 - 39	172,461
40 - 49	51,223
50 - 59	57,174
60 - 69	214,985
70 - 79	395,910
80 - 89	310,897
90 - 99	396,060
100 - 109	410,423
110 - 119	573,787
120 - 129	255,509
130 - 139	194,675
140 - 149	107,040
150 - 159	91,537
160 - 169	77,310
170 - 179	29,913
180 - 189	17,793
190 - 199	15,076
200 +	38,216
Sub-total	3,944,504
Not Forested	664,848
No Inventory Data	2,817,679
Total	7,427,031

An overview map of the distribution of age classes appears as Figure 3-5. The large area of young stands in the south east corner of the Region is primarily due to recent wildfire events.

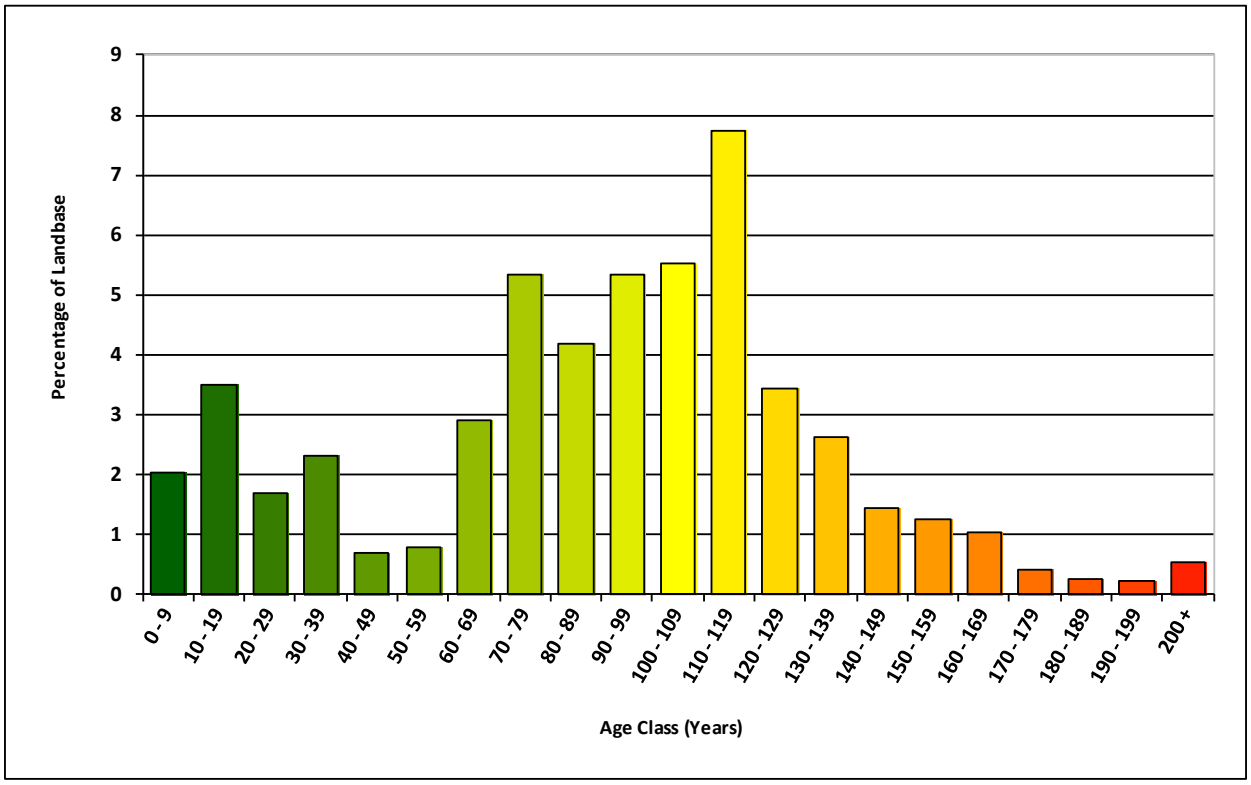


Figure 3-4 Distribution of Age Classes in Reporting Area

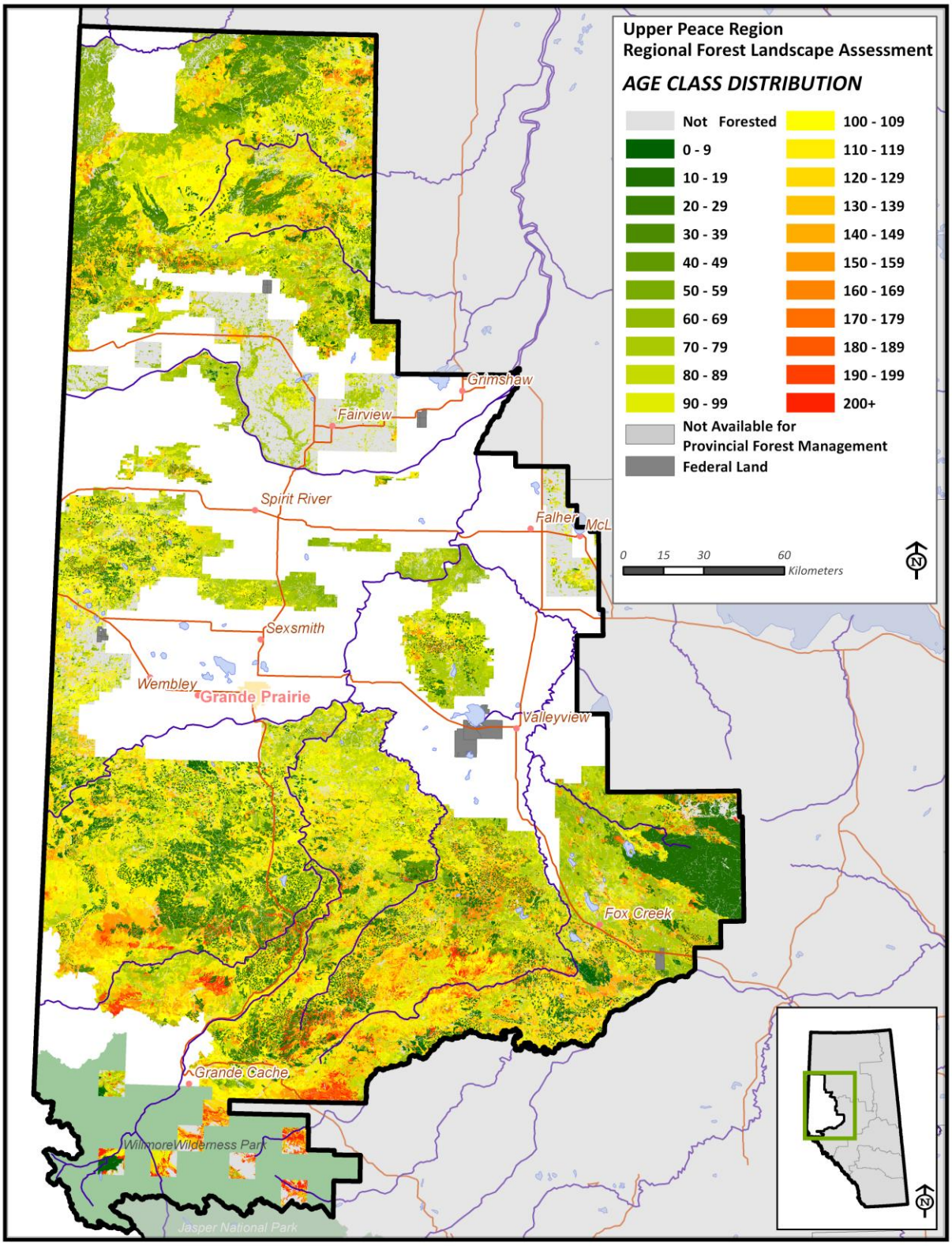


Figure 3-5 Age Class Distribution

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 Upper Peace Region are represented mostly by the Mature class (Table 3-5). The Young class, made up primarily of regenerating harvest areas and wildfires, occupies approximately 9% of the inventoried land base. Old and Very Old forest comprise approximately 17% of the inventoried land base.

Table 3-5 Distribution of Seral Stage

Seral Stage	Definition	Area (ha)
Forested Land		
Young	Stand age < 20 years	409,846
Immature	Stand age 20 to 79 years	1,016,423
Mature	Stand age 80 to 119 years	1,691,167
Old	Stand age 120 to 179 years	755,984
Very Old	Stand age >= 180 years	71,084
Sub-total		3,944,504
Not Forested		664,848
No Inventory Data		2,817,679
Total		7,427,031

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

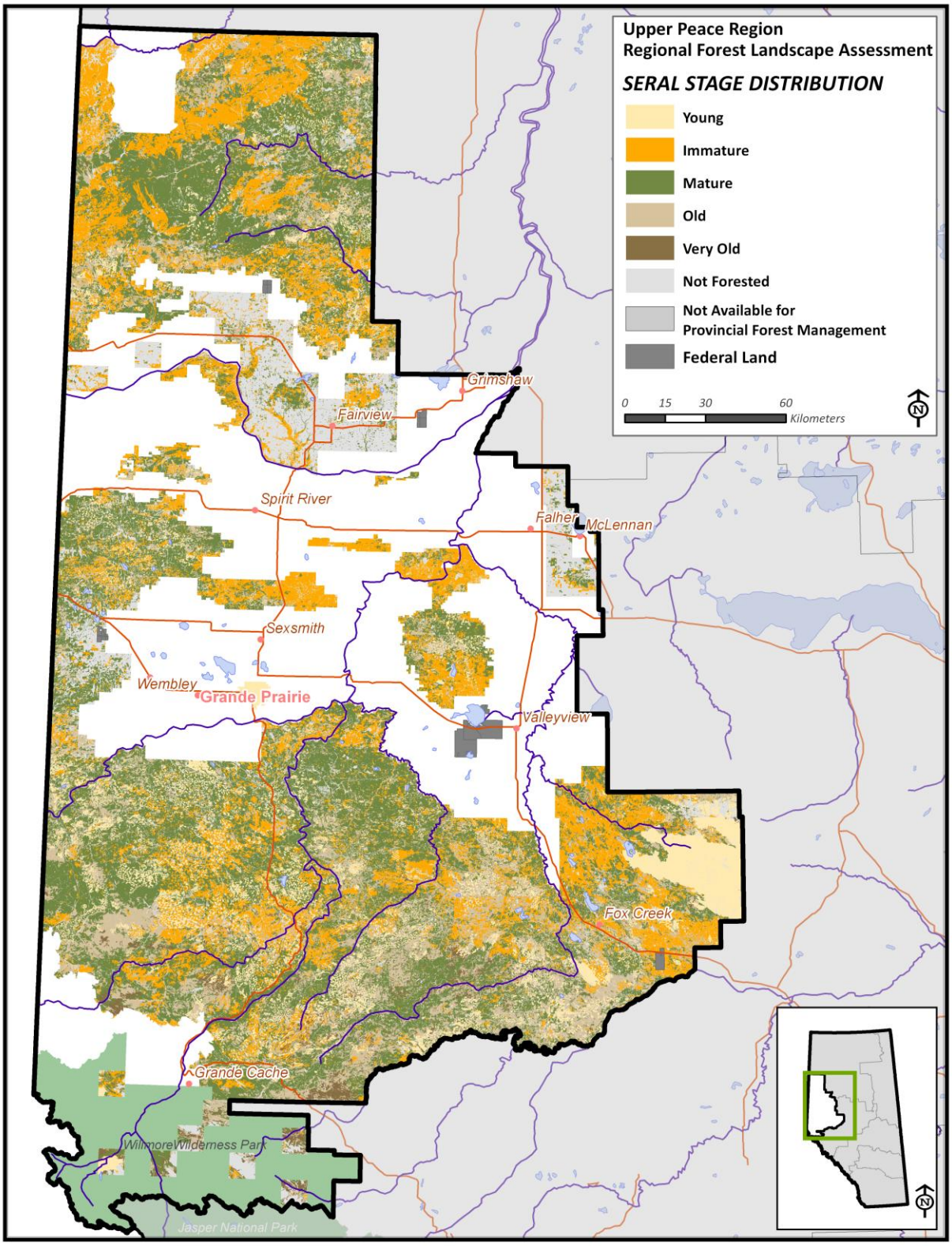


Figure 3-6 Seral Stage

3.6 Forest Patches

3.6.1 Patch Distribution of Young Stands

Patches are forest stands of the same seral stage (23) 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. The large area represented by the patch size class of greater than 250 hectares, is due largely to the Virginia Hills fire which occurred in 1998.

Table 3-6 Patch Distribution

Patch Size Class (ha)	Number of Patches	Area (ha)
0 - 19	32,223	92,047
20 - 99	4,299	164,489
100 - 249	323	47,843
250 +	96	105,429

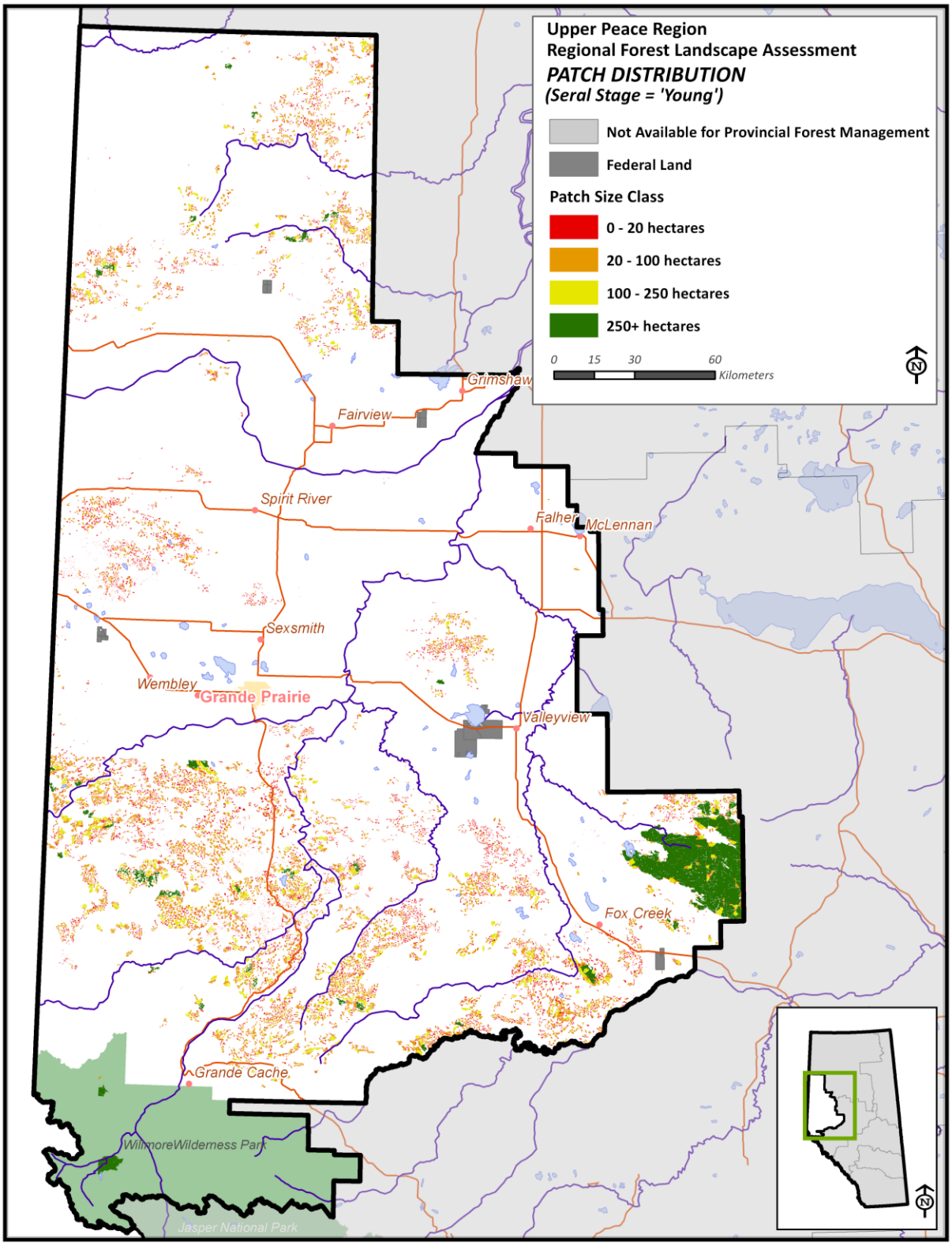


Figure 3-7 Patch Distribution of Young Stands

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 forest. Using these rules, the resulting interior forest was determined for the Upper Peace Region. The area summary is displayed in Table 3-7, and a map of the interior forest locations appears as Figure 3-8.

Table 3-7 Interior Forest

Seral Stage	Number of Patches greater than 100 ha	Area of Patches > 100 ha (ha)
Young	0	0
Mature	1,664	685,312
Old	755	221,722
Very Old	71	24,938

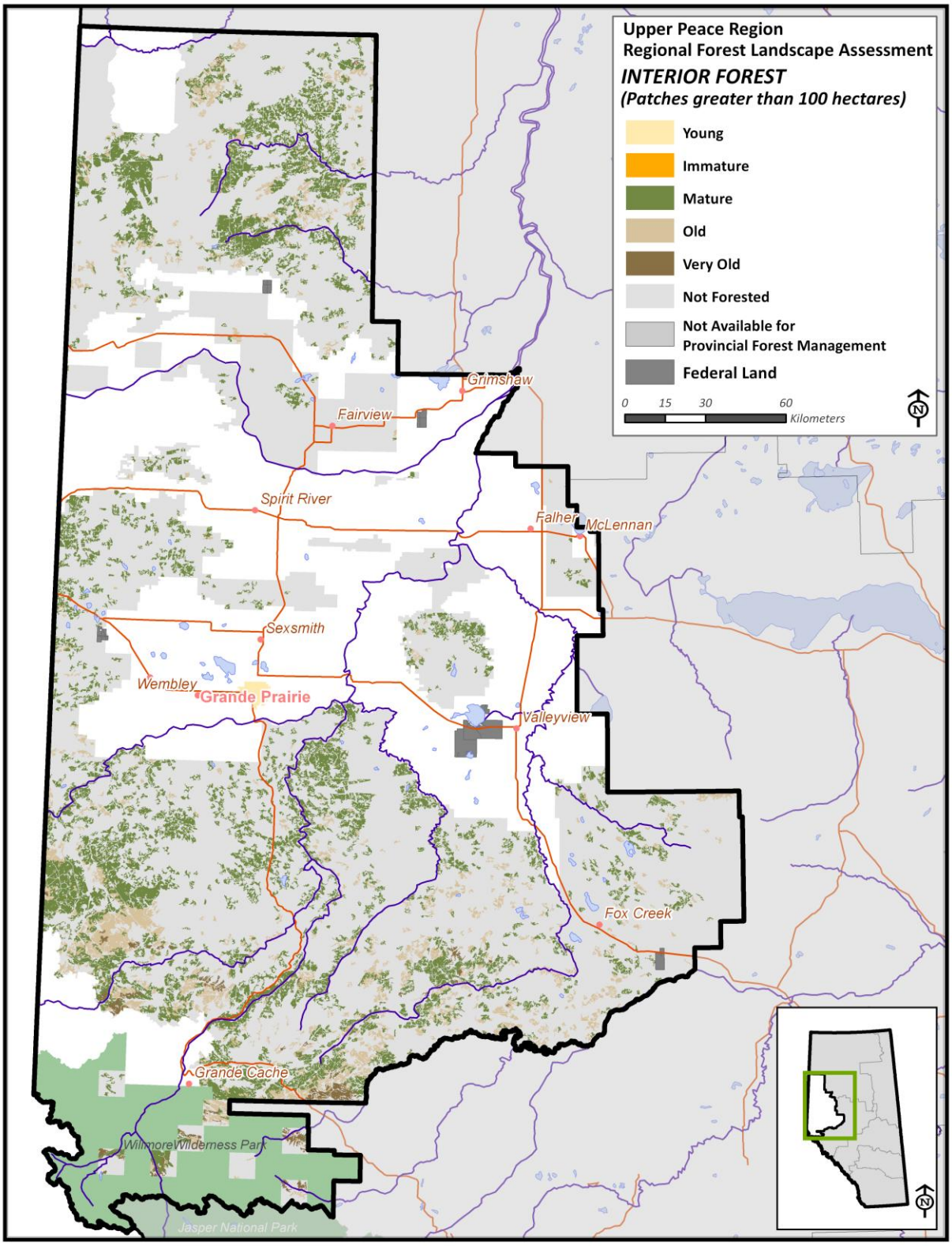


Figure 3-8 Interior Forest by Seral Stage

4. Landscape Disturbance and Succession

4.1 Inherent Disturbance Regime

The natural disturbance regime in the Upper Peace consists of forest fire and natural pests, with fire being the dominant natural factor shaping the composition and distribution of species (Rowe et al. 1973). Fire disturbance is the primary process that introduces most of the variability in the forest mosaic (Andison 1999). There is also evidence that the majority of these fires were stand replacing events, killing most of the previous stand (Johnson 1992).

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 (fire control, fire 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 Upper Peace Region since annual surveys were undertaken in 2006 (24). The Upper Peace Region forests were significantly impacted by the in-flight of beetles from British Columbia in the summer of 2009. The 2011 surveys

indicate a high success of overwinter beetle survival, indicating higher populations forecasted for 2012. These areas will be a high priority for beetle control in 2012.

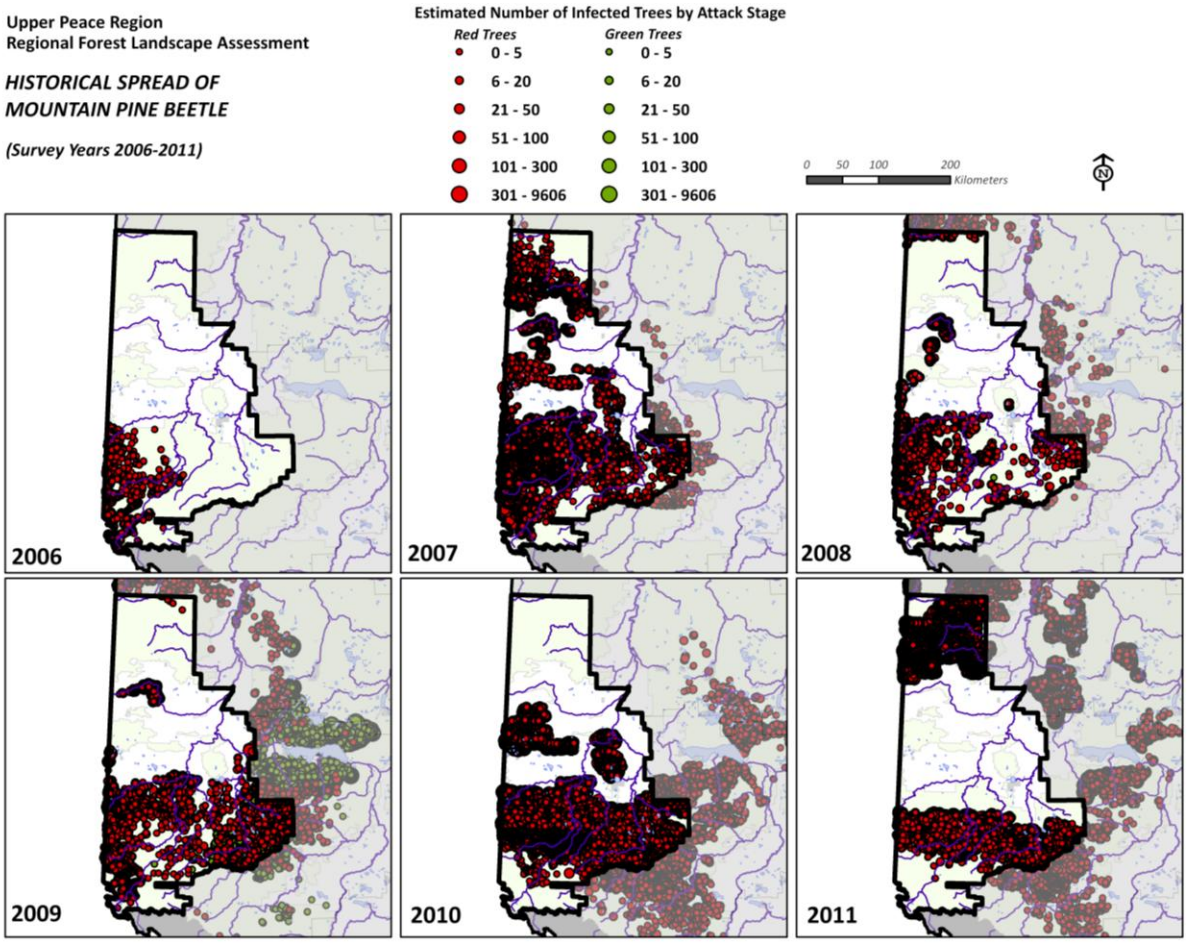


Figure 4-1 Historical Spread of Mountain Pine Beetle

4.2.2 Hardwood Defoliators

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

The hardwood defoliator agent causing the most damage in this Region is large aspen tortrix which accounts for 76% 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 leafroller) are present in the province and potentially in the Upper 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*	389,428	7	2,527,608	48	1,095,938	21	4,012,975	76
Bruce spanworm	*Operophtera bruceata*	779,190	15	132,161	3	34,375	1	945,726	18
Aspen leafroller	*Epinotia solandriana*	7,756	0	62,431	1		0	70,186	1
Forest tent caterpillar	*Malacosoma disstria*	17,205	0	89,423	2	121,379	2	228,006	4
Total[1]		1,193,579	23	2,811,623	53	1,251,692	24	5,256,894	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 Upper 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.

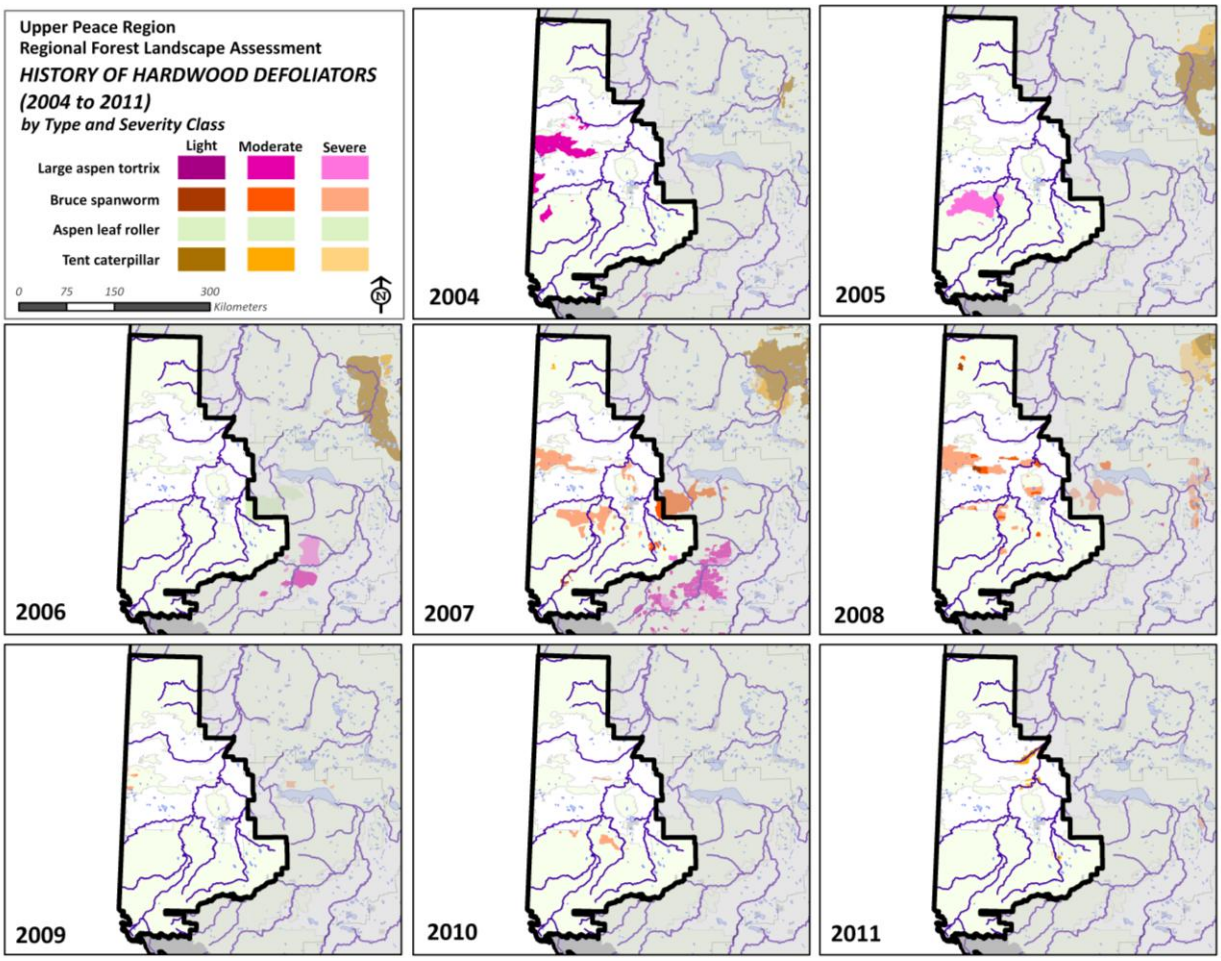


Figure 4-2 History of Hardwood Defoliation Outbreaks (2004-2011)

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.

Large aspen tortrix has not been surveyed in the Upper Peace Region since 2001. Conversely, overall in the Province, a second major infestation was experienced in 2003, but this did not appear in the Upper Peace Region.

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.

Bruce spanworm infestations are sporadic, with the most recent occurring over 2007 and 2008 which quickly collapsed. While the overall provincial incidence of Bruce spanworm is relatively low, it's prevalence in the Upper Peace Region is important to note. Even in periods of low infestation, the proportion of infected forests located in the Upper Peace Region is typically greater than 50% of the Provincial area.

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. The proportion of tent caterpillar outbreaks in the Upper Peace Region would be considered high when compared to the Provincial totals.

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 Upper Peace Region (26). The budworm is not a serious pest in this Region. As indicated in Figure 4-3, the budworm has appeared in a concentrated area east of Spirit River. The most recent infestation noted was in 2010 with no budworm activity observed in this Region in the 2011 surveys.

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*	-	-	14,575	85	2,629	15	17,204	100
Total[1]		-	-	14,575	85	2,629	15	17,204	100

[1] Sum of infestation survey records 1997 to 2011 inclusive

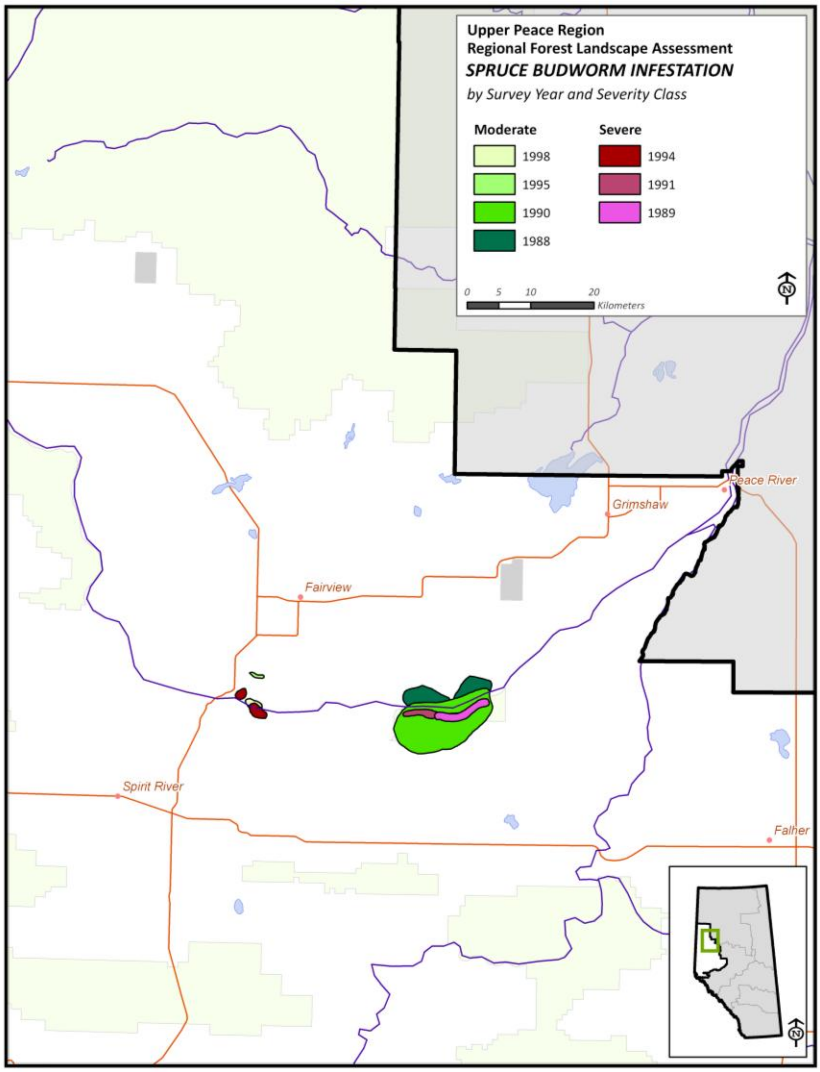


Figure 4-3 History of Spruce Budworm

4.2.4 Other Forest Health Agents

Other agents such as soil moisture, weather events and other minor insect attacks can impact the health of the forest. ESRD (48) has reported localized drought in 2010 and 2011 in the centre of the Region. Minor cases of red belt, blowdown, and Balsam bark beetle were found in Willmore Wilderness Park (although these are so small, they will not be evident on the map provided below). Figure 4-4 shows the areas of tree decline and tree kill due to these other forest health damaging agents.

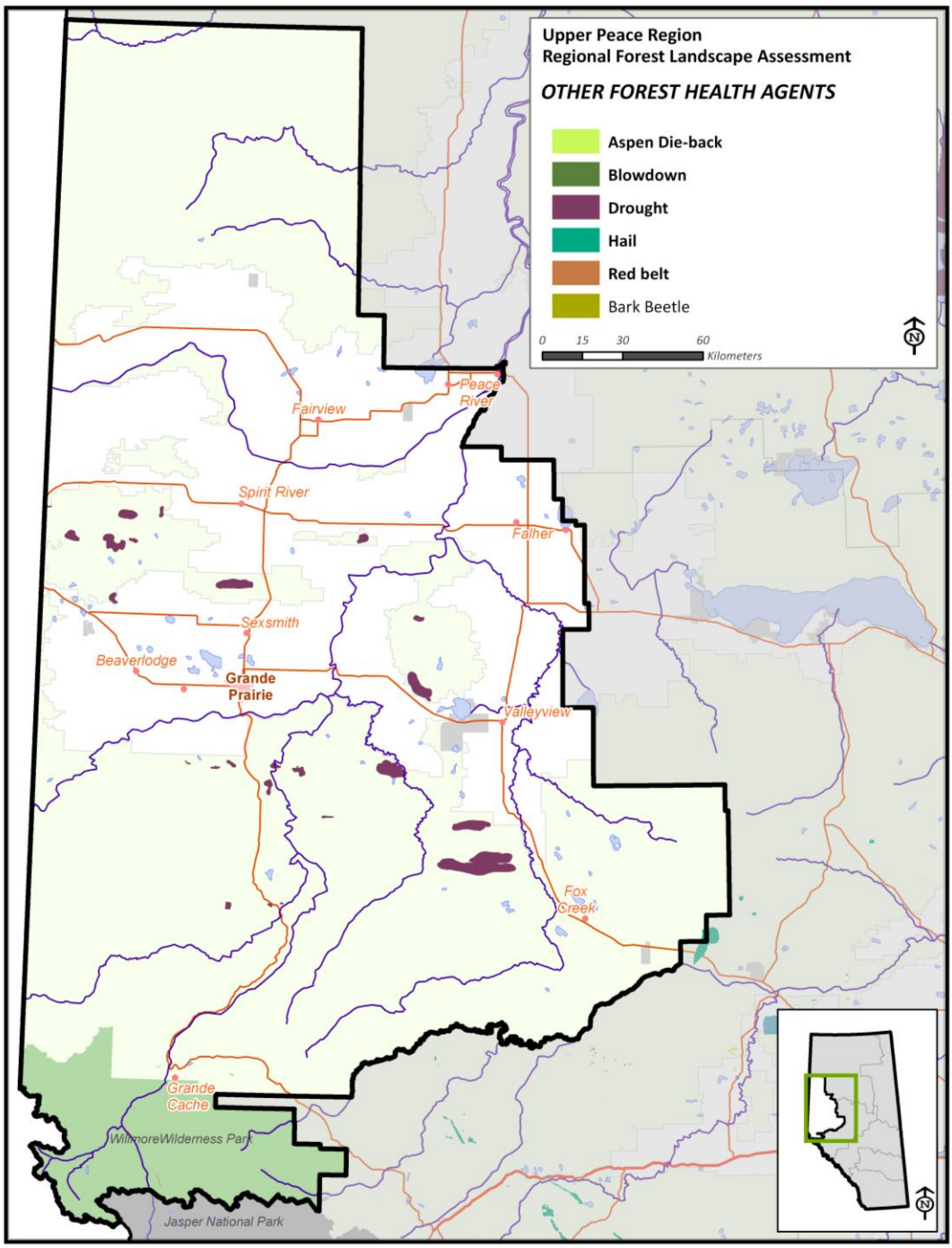


Figure 4-4 Other Forest Health Agents

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 2,667 sites of observed invasive species in the Upper 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 found on 38% of the surveyed sites. Fortunately, the occurrences of prohibited noxious plants is very low; the 7 occurrences account for only 0.16% of all observations. Incidences of noxious plants is the highest category at 59% of all observed invasive plants, with the most common problem species being Scentless Chamomile and Perennial Sow Thistle.

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.

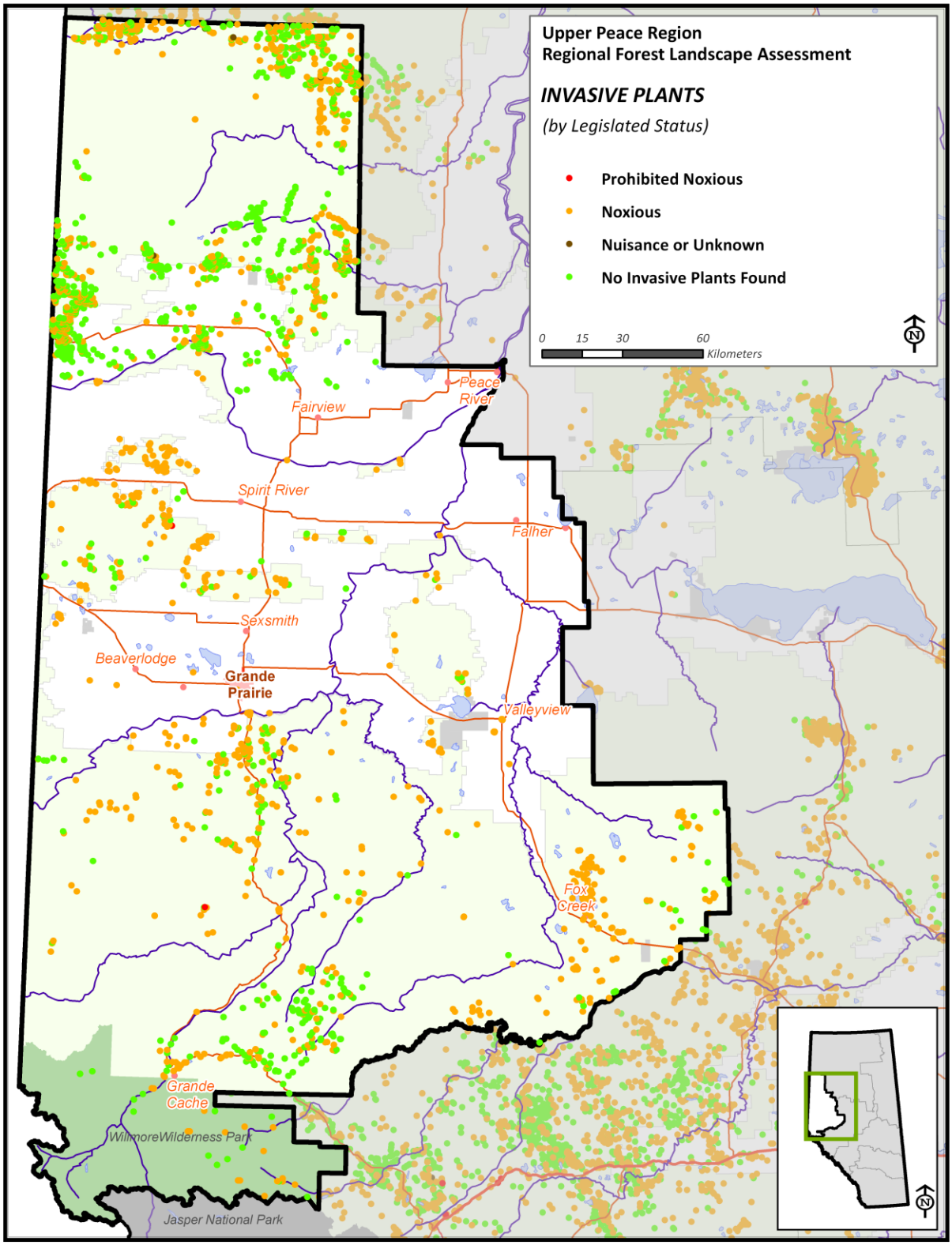


Figure 4-5 Invasive Plant Distribution

Table 4-3 Ranking of Invasive Plant Species

Classification and Weed Name	Incidence of Observed Weeds	Percentage of All Obs. (%)
No Weeds Found		
None	1811	40
Sub-total No Weeds	1811	40
Prohibited Noxious		
Knapweed	2	0
Meadow Hawkweed	2	0
Mouse-ear Hawkweed	1	0
Orange Hawkweed	2	0
Sub-total Prohibited	7	0
Noxious		
Canada Thistle	641	14
Common Tansy	199	4
Common Toadflax	1	0
Creeping Bellflower	4	0
Dalmation Toadflax	1	0
Oxeye Daisy	76	2
Perennial Sow Thistle	731	16
Scentless Chamomile	828	18
Tall Buttercup	149	3
Toadflax	9	0
White Cockle	4	0
Sub-total Noxious	2643	59
Nuisance/Unknown Status		
Bull Thistle	2	0
Foxtail Barley	2	0
Sweet Clover	1	0
Wild Caraway	12	0
Sub-total Nuisance	17	0
Total	4478	100

4.4 Forest Succession

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

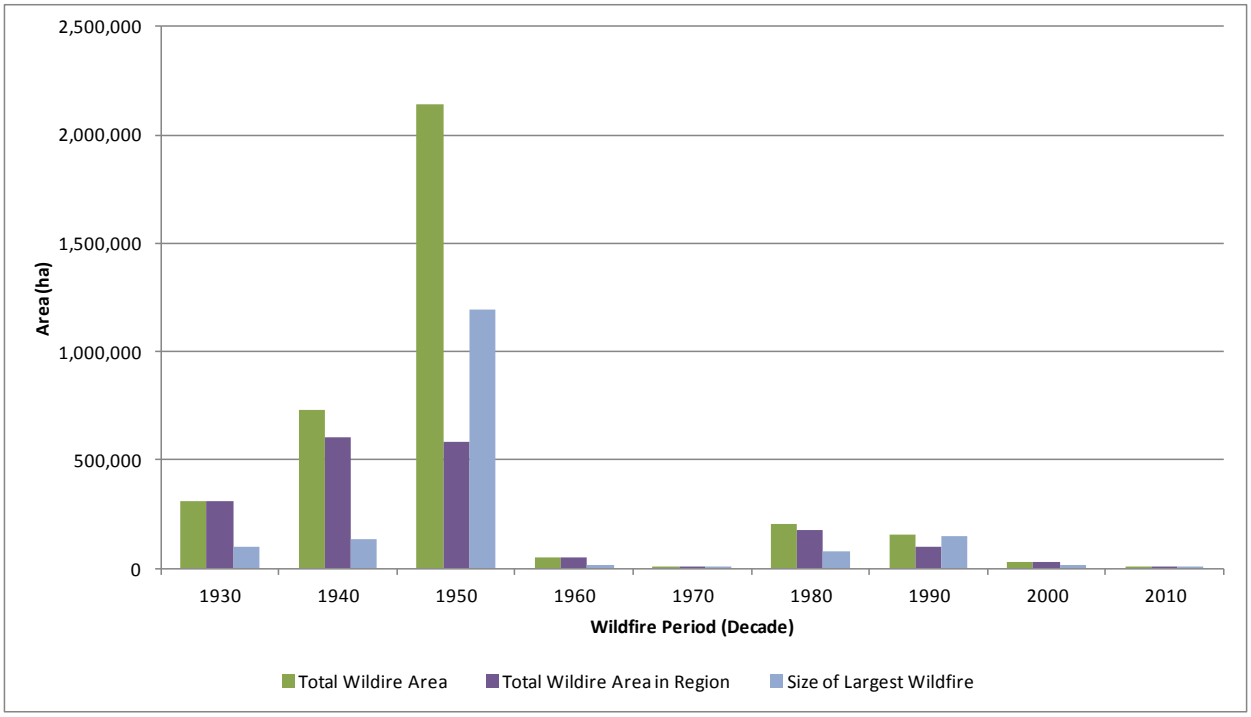
Summary statistics of the Region's wildfire history are reported in Table 4-4. The areas reported in Table 4-4 include only burned area and do not include residual islands that may not have burned during a wildfire event. The reporting period is by decade with the labelled wildfire date representing 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 Fire Area (ha)	Wildfire Area in Upper Peace(ha)	Average Wildfire Size (ha)	Median Wildfire Size (ha)	Size of Maximum Wildfire (ha)	Area Burned as percentage of Region[1] (%)
1930	64	312,865	312,242	4,889	958	97,478	4
1940	165	734,338	607,688	4,451	1,127	133,681	8
1950	92	2,143,639	584,416	22,330	785	1,195,096	8
1960	50	53,722	49,684	839	175	12,075	1
1970	22	9,876	9,844	429	268	2,774	0
1980	27	207,239	173,880	7,676	530	79,993	2
1990	24	154,167	101,460	5,929	123	147,720	1
2000	104	26,884	26,569	234	7	13,667	0
2010[2]	48	5,809	5,807	114	6	3,474	0

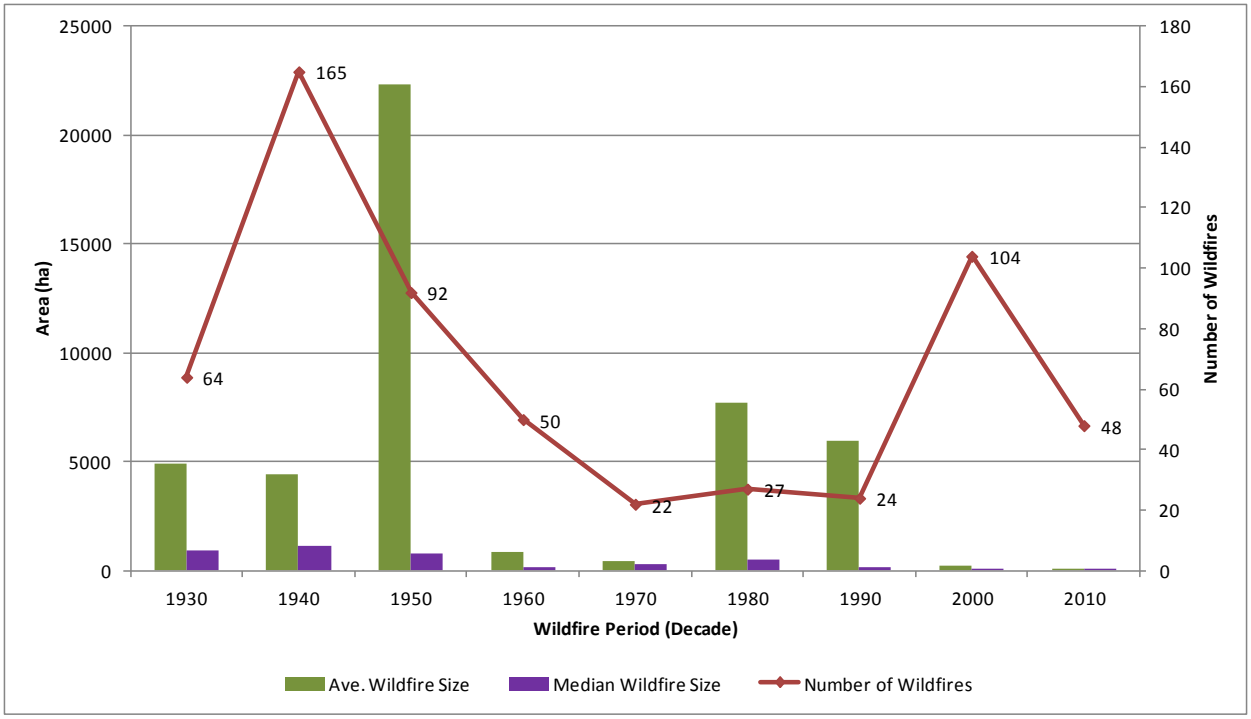
[1] Note that the area used for percent calculation is only the Region's Green and White Area.

[2] The 2010 decade consists of only 2 years of data.



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

Figure 4-6 Wildfire Size Statistics by Decade



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

Figure 4-7 Average and Median Wildfire Size by Decade

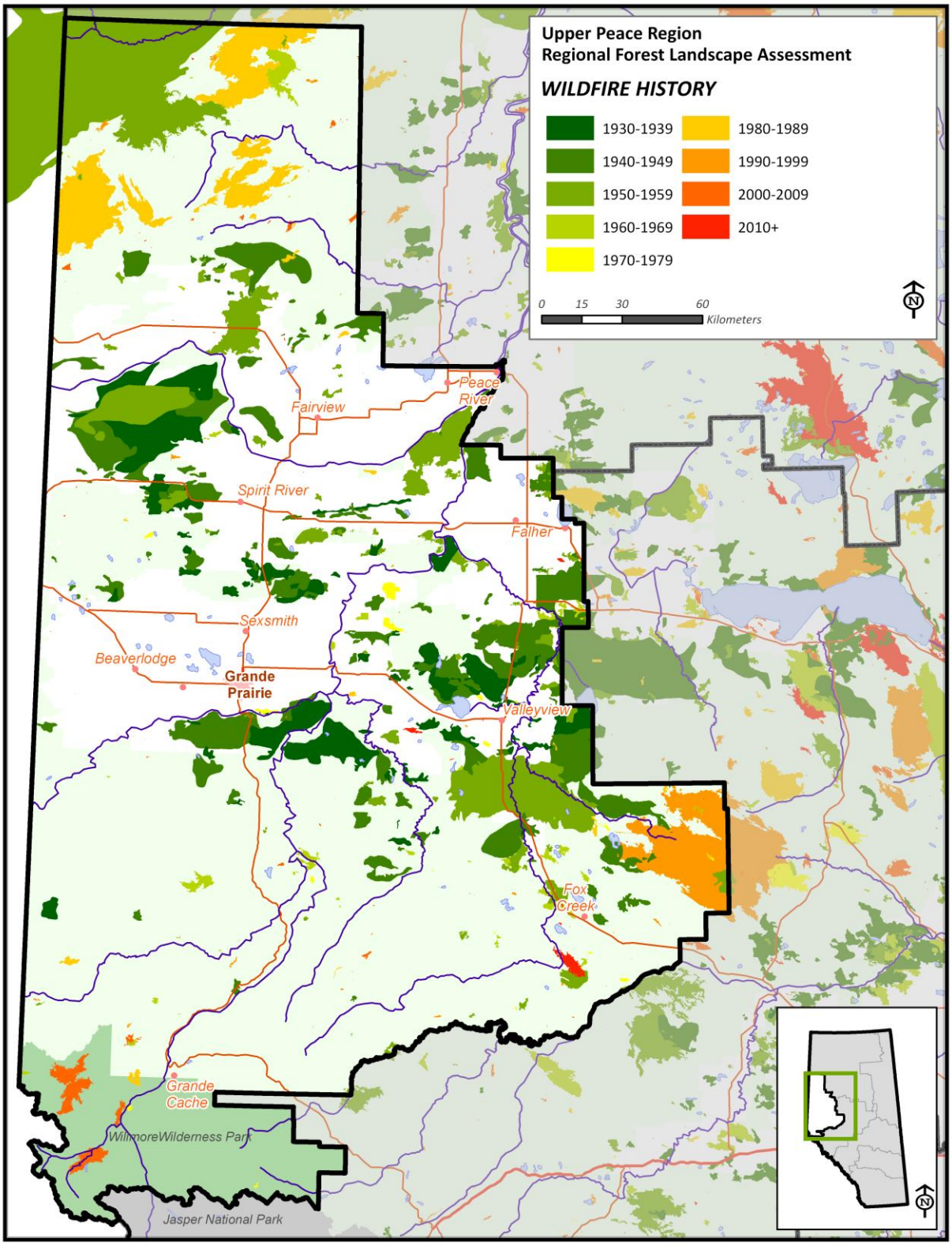


Figure 4-8 Wildfire Distribution by Decade

4.6 Timber Harvesting

Timber harvesting has been a component of anthropogenic disturbances in the Upper Peace since the beginning of the province. From the time of the transfer of resource management from the Federal government to the provincial government in 1930 (Alberta 1930) to approximately the mid-1950's, forest harvesting was generally for local or regional use. Large scale commercial harvesting began in 1964 with the establishment of the first Forest Management Agreement in the Region with Canadian Forest Products who established a dimensional sawmill in Grande Prairie. The forest industry went through a rapid expansion in the 1980's and 1990's with the establishment of many more FMAs and consolidation of various operators into joint FMAs. A summary of the area and number of harvest areas by decade is displayed in Table 4-5.

Much of the early harvesting in the Region was the result of historic species preference (conifer removed from mixedwood stands or product preference based on tree size (for example, sawlogs versus other products). In many cases, these activities would not result in complete removal of the stand (a clearcut). However, the area summaries presented in Table 4-5 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. 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 it's 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 harvested 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.

The distribution and pattern of harvest areas by decade, is shown in Figure 4-10.

Table 4-5 Summary of Harvest Area by Decade

Year of Harvest	Total Harvested Area (ha)	(%)	Number of Harvest Areas Count	(%)	Average Harvest /Year [1] (ha)
1930-1939	408	0	194	1	41
1940-1949	111	0	20	0	55
1950-1959	750	0	73	0	250
1960-1969	11,007	2	649	2	1,223
1970-1979	52,735	9	3,526	10	5,273
1980-1989	100,762	18	5,455	16	10,076
1990-1999	170,004	30	12,686	37	17,000
2000-2009	173,845	31	7,939	23	17,385
2010 [2]	26,717	5	876	3	8,906
Unclassified	23,031	4	2,989	9	
Total	559,370	100	34,407	100	

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

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

The amount of area being harvested annually has been increasing steadily as shown in Table 4-5 and Figure 4-9. However, much of the harvest activity up to the 1960's may not be included in this summary as this historic information is not available.

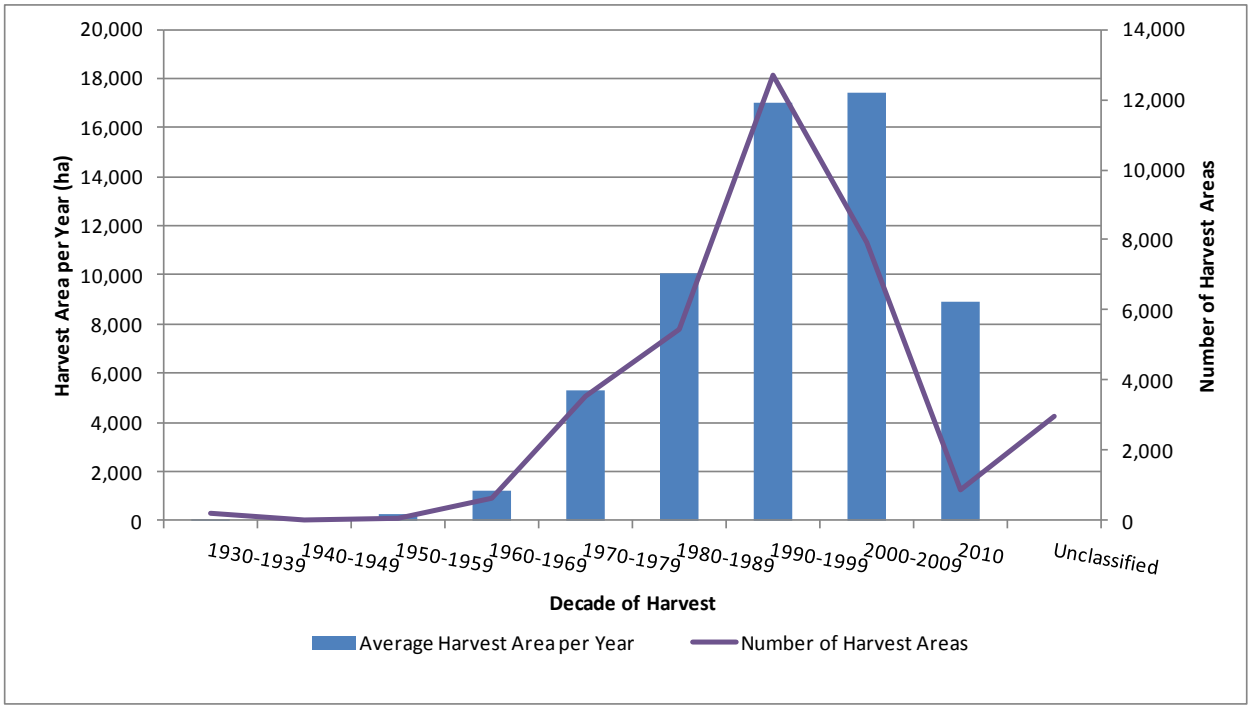


Figure 4-9 Average Annual Area and Count of Harvesting Activity

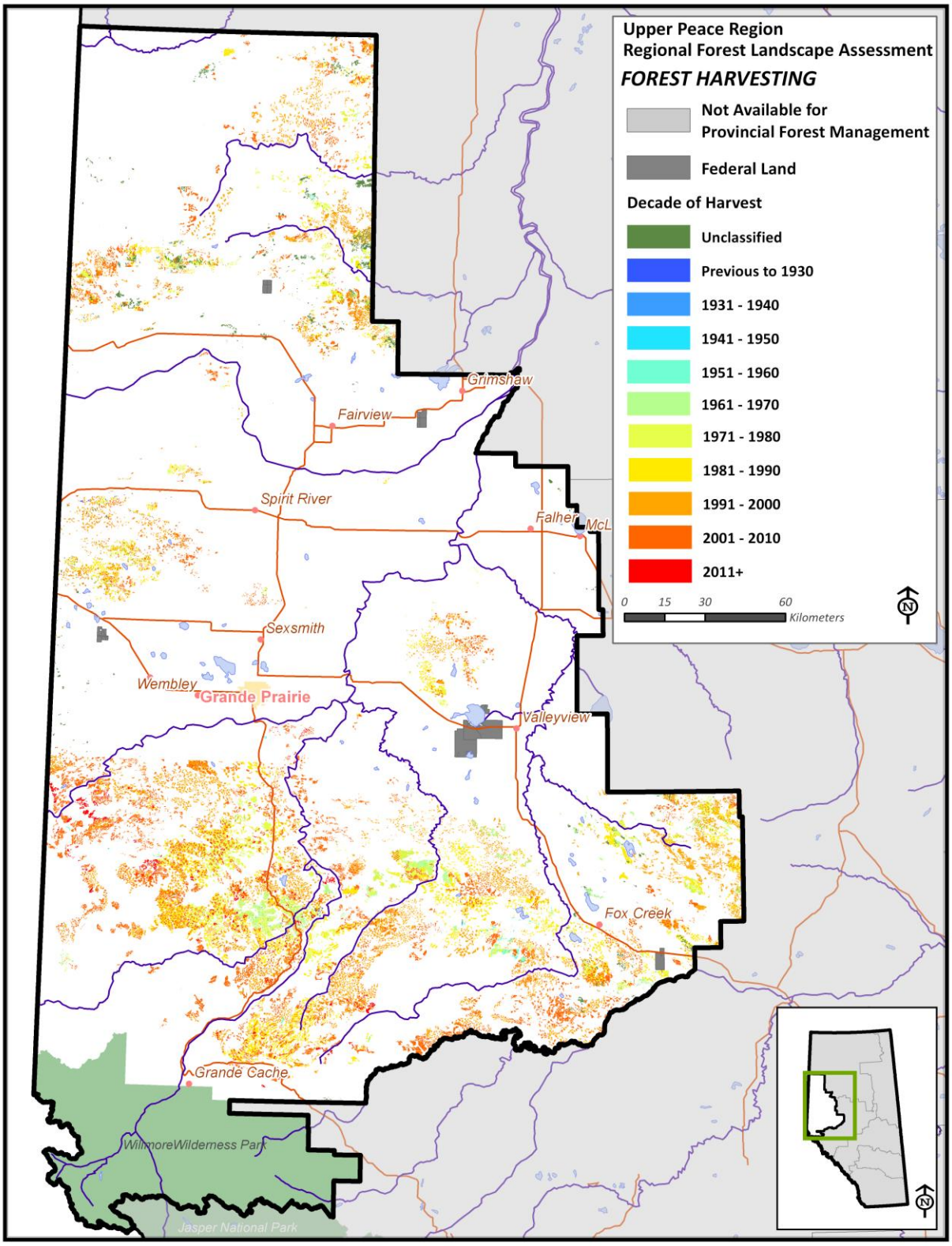


Figure 4-10 Harvest Area by Decade

4.7 Access

There is a well developed network of roads in the Upper Peace Region (32). The White Area road development is coincident with agricultural and cultural (towns, villages, etc) expansion. In the Green Area, resource exploration and extraction (e.g.: forestry, oil and gas, coal) 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 43: running northwest from Whitecourt to Grande Prairie and the British Columbia border.
- Highway 2: linking Grande Prairie and Peace River.
- Highway 40: running north from Hinton, through Grande Cache to Grande Prairie.
- Highway 49 running east across the Region from the British Columbia border to Falher, then south to Valleyview.

Table 4-6 summarizes the length of road by road class within the Green Area / White Area and Federal land. There is more road development in the White Area and this would be expected due to agricultural activities.

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	436	1,714		2,150
Secondary Paved Road	13	909		921
Gravel Road	5,192	12,688	23	17,903
Winter Road / Unclassified	1,083	80		1,163
Trail suitable for Vehicle Access	71			71
Total Roads	6,795	15,390		22,208
Railway	332	372		704

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

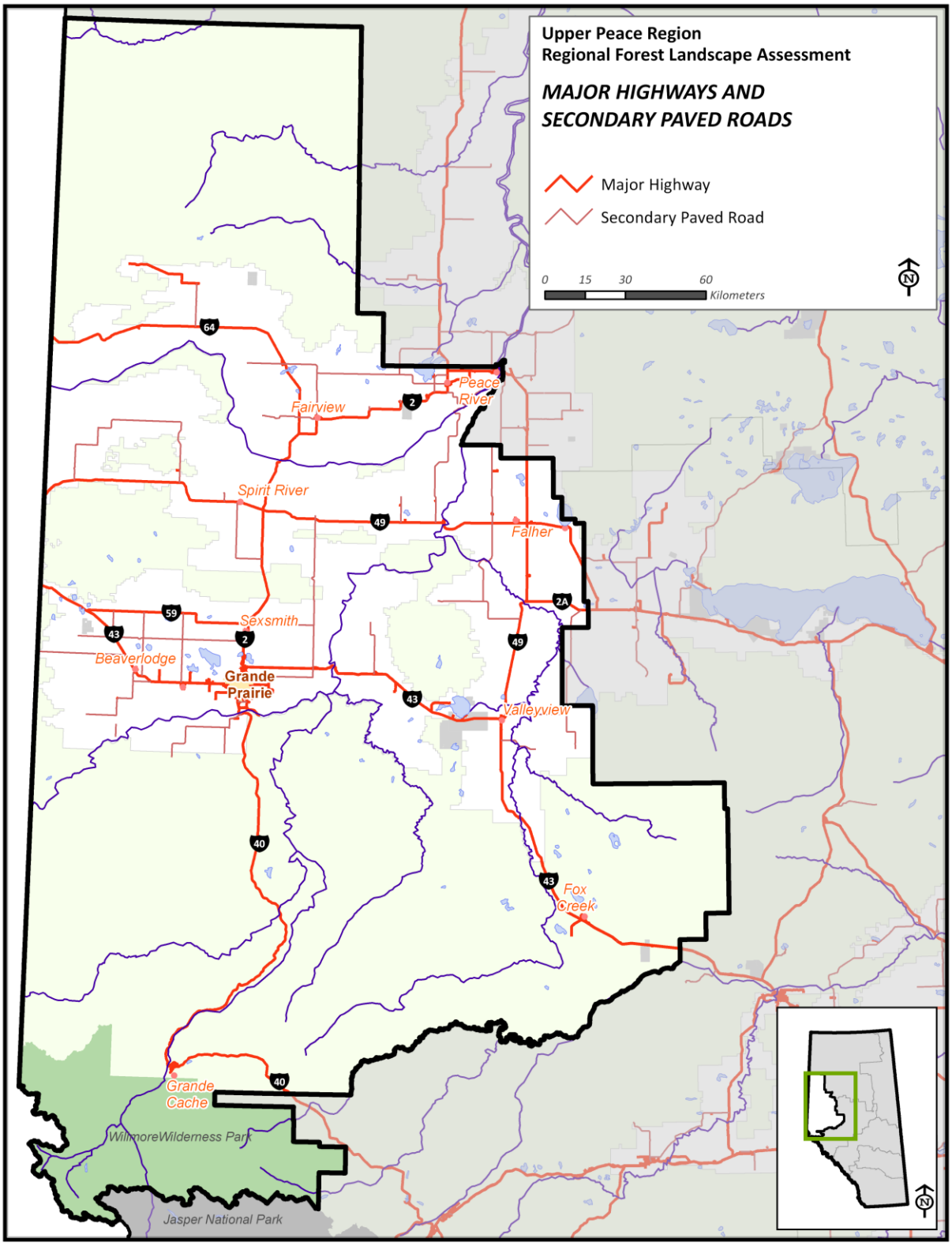


Figure 4-11 Major Transportation Access

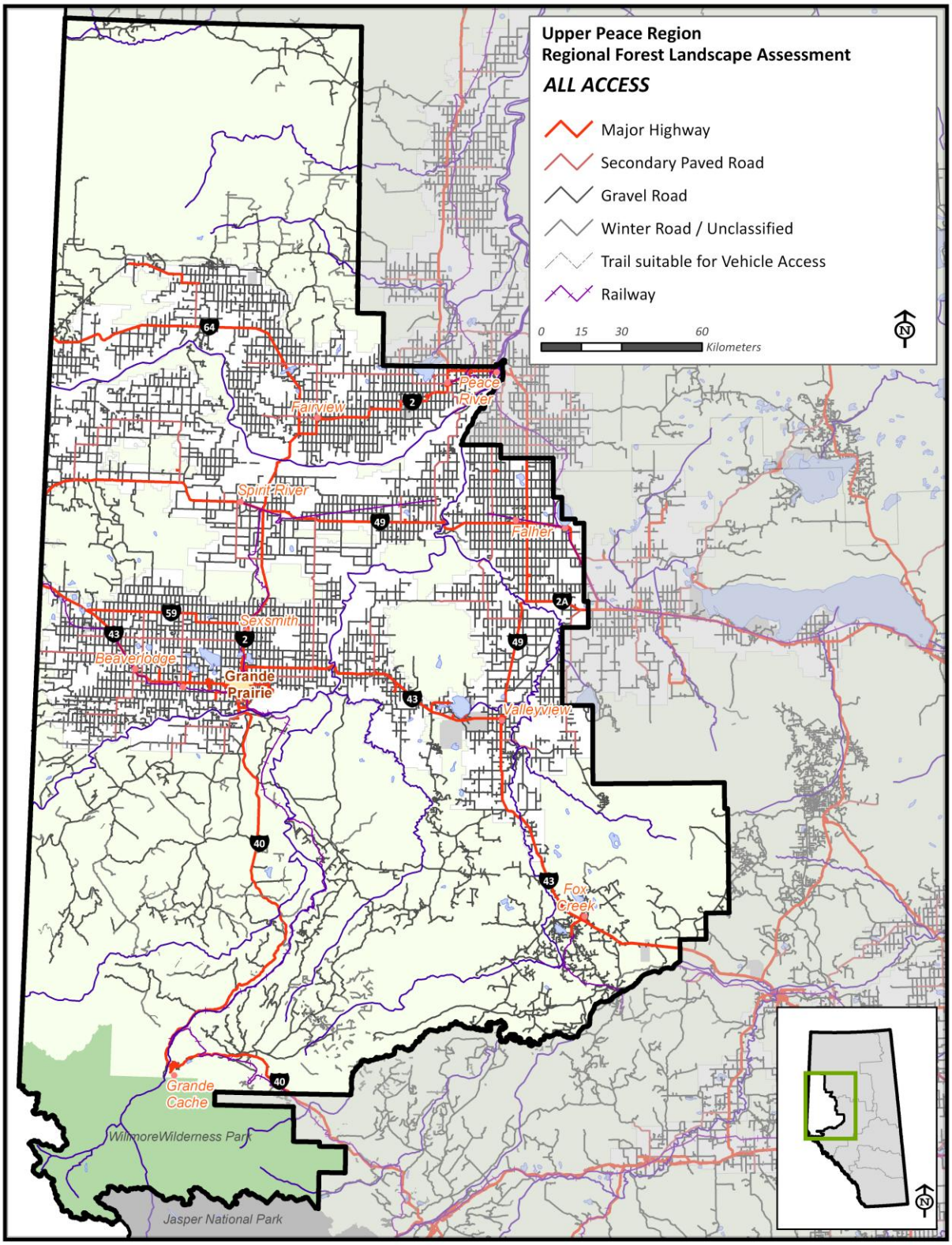


Figure 4-12 All Road Access by Road Class

4.8 Industrial Development

The energy sector accounts for the majority of disposed surface dispositions in this Region (33). As indicated in Table 4-7, 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 in the Upper Peace

Industrial Dispositions			Distribution		
Description	Type	Number of Dispositions	Area (ha)	Percentage of All Dispositions (%)	Area as Percentage of Region[1] (%)
Easement	EZE	2,025	6,283	5	0
Licence of Occupation	LOC	12,679	49,495	36	1
Mineral Surface Lease	MSL	16,505	34,609	25	0
Pipeline Installation Lease	PIL	2,994	726	1	0
Pipeline Agreement	PLA	14,149	45,524	33	1
Rural Electrification Agreement	REA	79	74	0	0
Right of Entry Agreement	ROE	484	1,965	1	0
Vegetation Control Easement	VCE	75	542	0	0
Total		48,990	139,217	100	2

[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 west and west-central parts of the Region. Despite the dense network, the total area occupied by industrial dispositions is 139,217 hectares or only 2% of the Region's area for which dispositions are allocated. The percent area occupied by disposed land is based *only* on the Green and White Areas of the Region (see section 1.2).

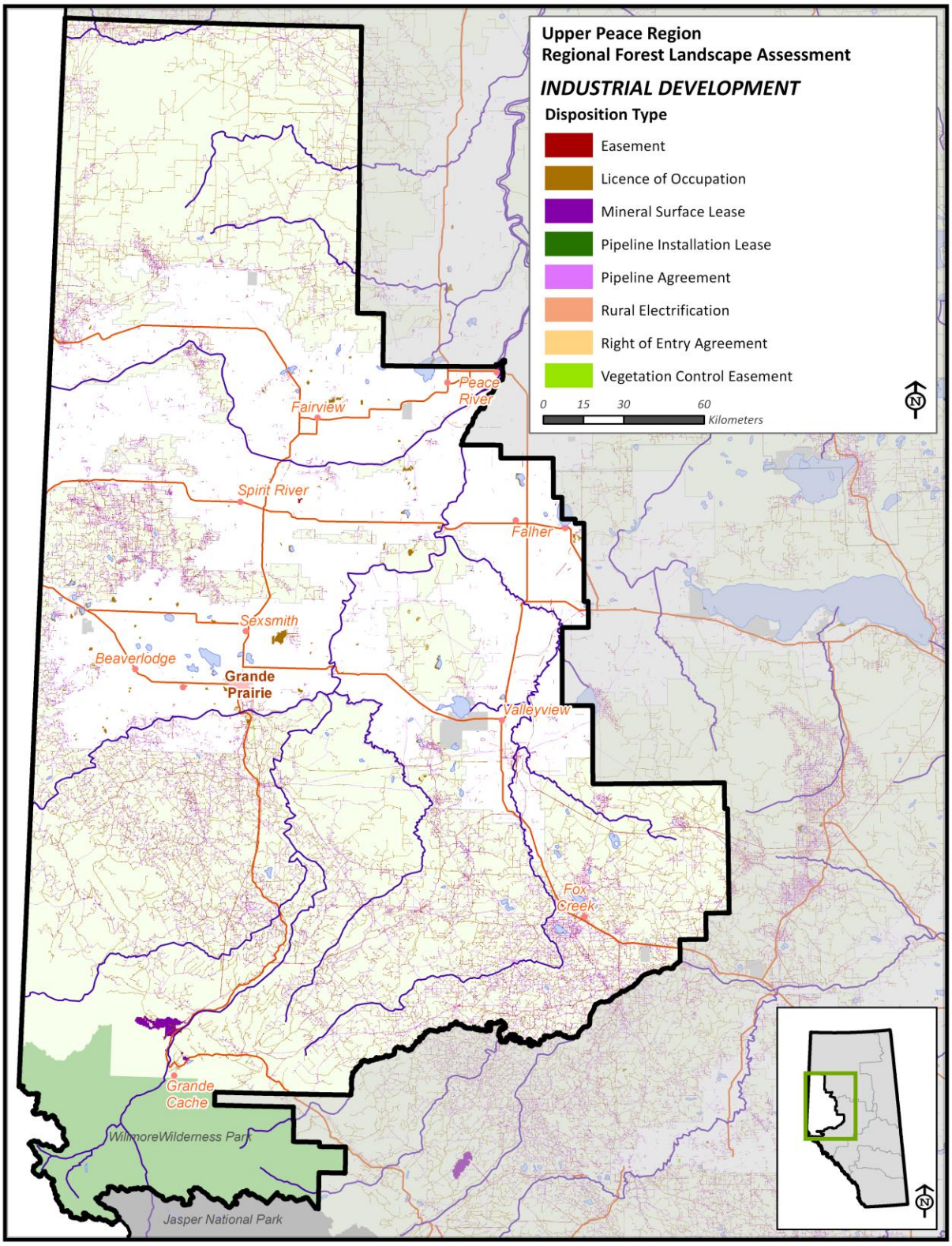


Figure 4-13 Industrial Development under Permit and License

The Upper Peace Region contains a number of operating coal mines (34). Of the 34,600 hectares of Mineral Surface Lease land in the Region, 18% or 6,265 hectares are occupied by coal mines. These mines are located in foothills areas (Figure 4-14). Other coal-bearing formations can be found in the area, but no mine development permits have been issued yet to access these formations.

All the coal mine development in the Upper Peace Region is contained within the Green Area.

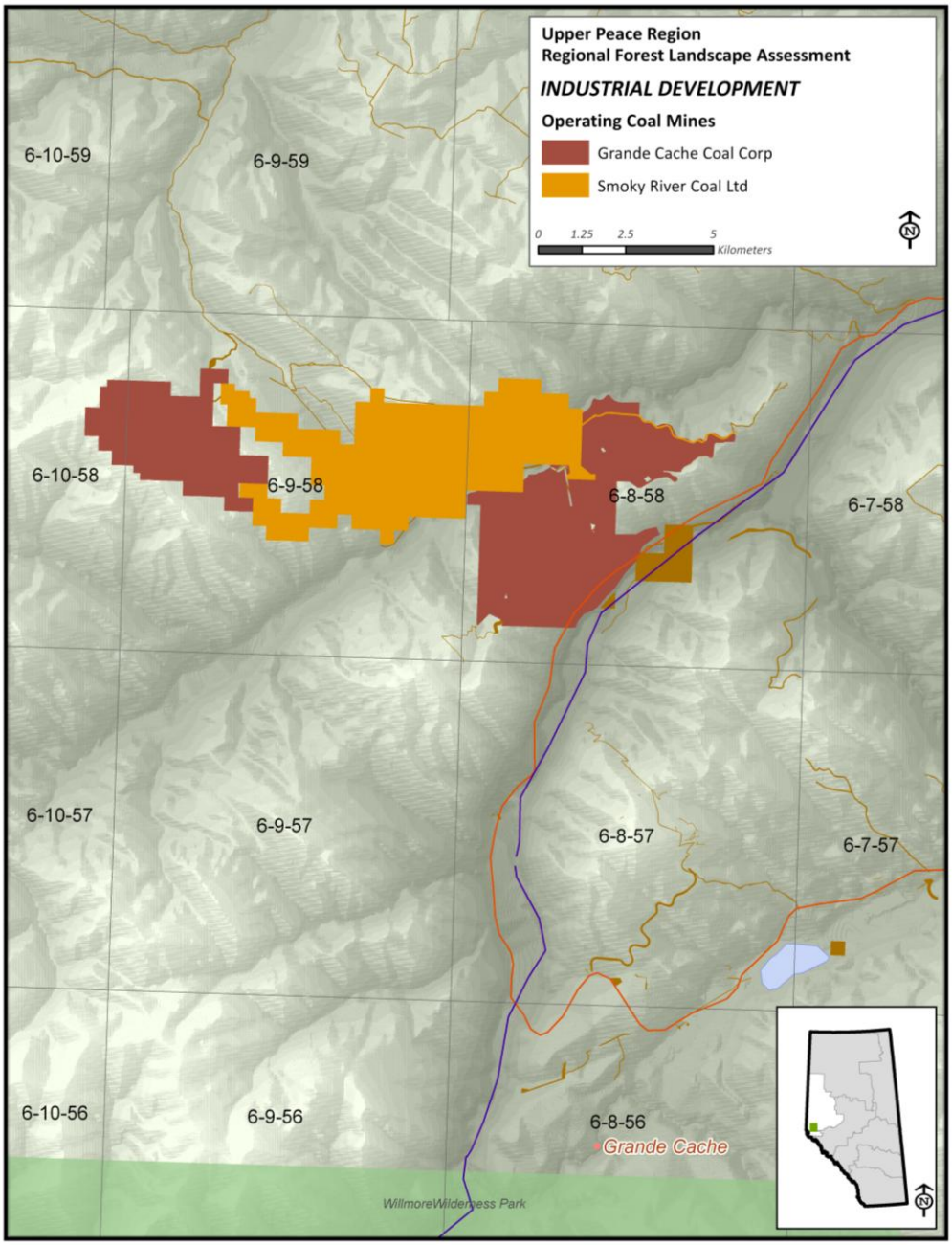


Figure 4-14 Operating Coal Mines

4.9 Monitoring Sites

Permanent monitoring plots have been established throughout the Upper 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.

Table 4-8 shows 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

	Green Area		White Area		Federal Lands		Total	
Monitor Plot Classification	No. Installations	No. Plots	No. Installations	No. Plots	No. Installations	No. Plots	No. Installations	No. Plots
ESRD Permanent Sample Plots								
Permanent Sample Plots	119	441	4	16	1	4	123	457
Reforestation Monitor Plots	61	2,450					61	2,450
Stand Dynamics Plots	39	39					39	39
Other PSP (Special Projects)	4	4					4	4
Alberta Biodiversity Monitoring Institute								
ABMI Sample Grid	104	104	64	64			168	168
Other Agency Permanent Sample Plots								
ISP Registered	2,808	2,808					2,808	2,808
Total	3,135	5,846	68	80	1	4	3,203	5,926

The distribution of monitoring sites across the Upper Peace Region is displayed in Figure 4-15.

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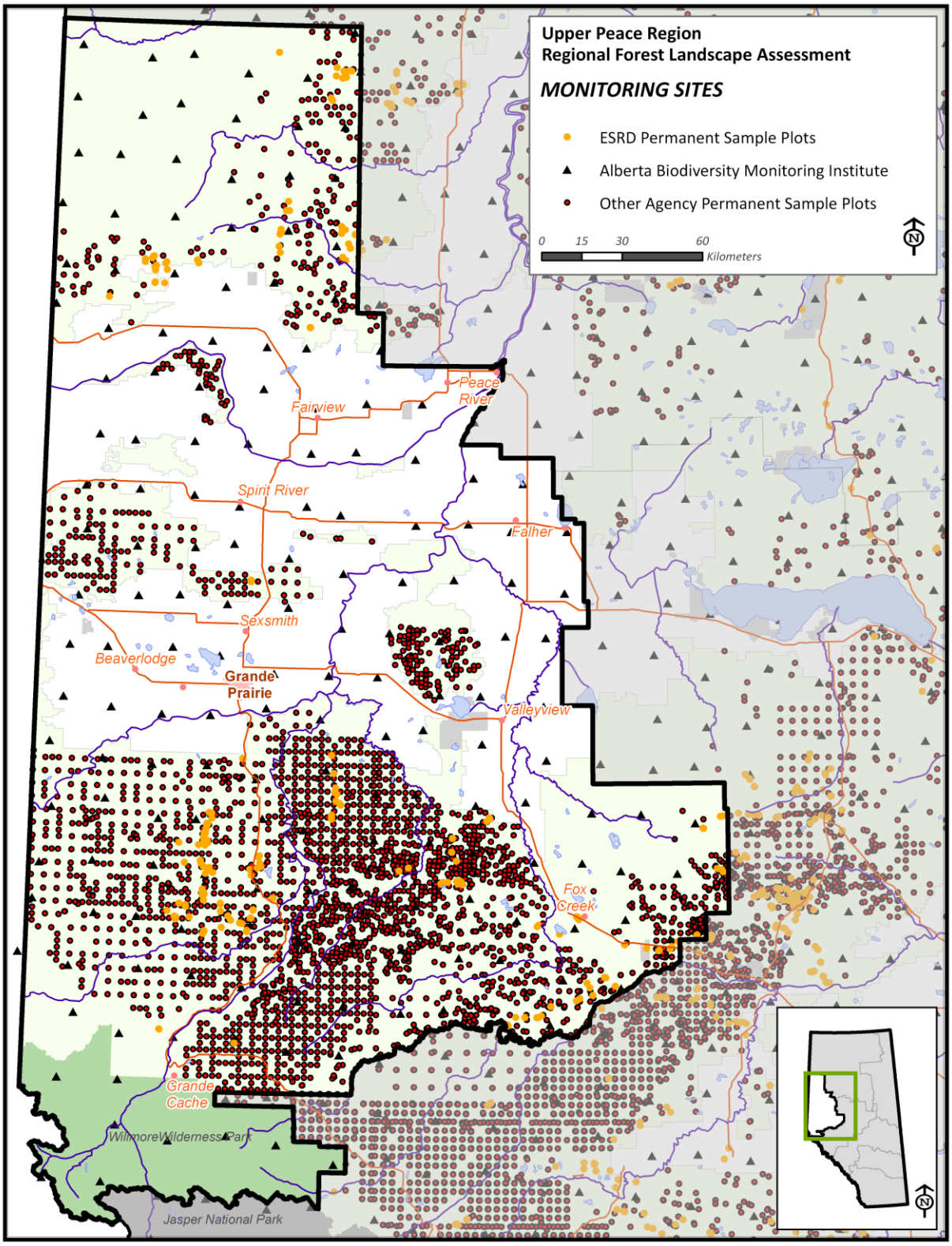

Figure 4-15 Permanent Monitoring Sites

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 168 fall in the Upper 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 Federal lands. 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 Upper Peace Region, along with AAC levels prorated by the proportion of the FMU area located inside the Upper 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 Current AAC Levels Prorated by FMU

FMU		Entire FMU	Portion of FMU located in Upper Peace		Proportion of Upper Peace occupied by FMU	Annual Allowable Cut (m^3/year) (Prorated to FMU Area)		
Name	Managed by	Area (ha)	Area (ha)	% of FMU	% of Upper Peace	Coniferous	Deciduous	Total
E14	FMA	1,022,231	5,266	1	0	9,101	1,287	10,388
E8	Crown	219,562	210,984	96	4	435,027	13,089	448,116
G11	Crown	16,940	16,940	100	0	9,000	9,000	18,000
G12	Crown	41,463	41,463	100	1	6,569	33,000	39,569
G13	Crown	25,165	25,165	100	0	1,795	18,257	20,052
G14	Crown	46,561	46,561	100	1	15,897	21,000	36,897
G15	FMA	660,334	660,334	100	12	715,000	452,529	1,167,529
G16	FMA	1,179,754	1,179,754	100	21	2,032,671	1,322,470	3,355,141
G9	Crown	27,202	27,202	100	0	11,600	11,000	22,600
P14	Crown	127,361	3,960	3	0	2,307	3,057	5,364
P19	FMA	969,725	644,876	67	11	230,950	276,432	507,383
P20	FMA	1,004,131	438,588	44	8	163,212	127,838	291,049
P8	Crown	347,617	29,130	8	1	0	6,151	6,151
PO1	Crown	420,387	200,799	48	4	1,778	2,476	4,254
PO2	Crown	543,244	543,244	100	10	20,491	32,954	53,445
PO3	Crown	681,435	93,876	14	2	236	1,071	1,307
S19	FMA	415,173	80,187	19	1	32,260	97,791	130,051
S20	FMA	658,367	10,551	2	0	13,410	9,008	22,418
S21	FMA	247,777	77,996	31	1	68,151	88,454	156,605
W13	FMA	301,616	73,057	24	1	105,569	50,723	156,292
W14	FMA	668,335	339,313	51	6	410,340	197,841	608,182
W15	FMA	379,054	334,910	88	6	1,033,743	86,145	1,119,888
Sub-total		10,003,436	5,084,155		91	5,319,107	2,861,575	8,180,682
No Allowable Harvest Calculated			526,092		9	0	0	0
Total			5,610,246		100	5,319,107	2,861,575	8,180,682

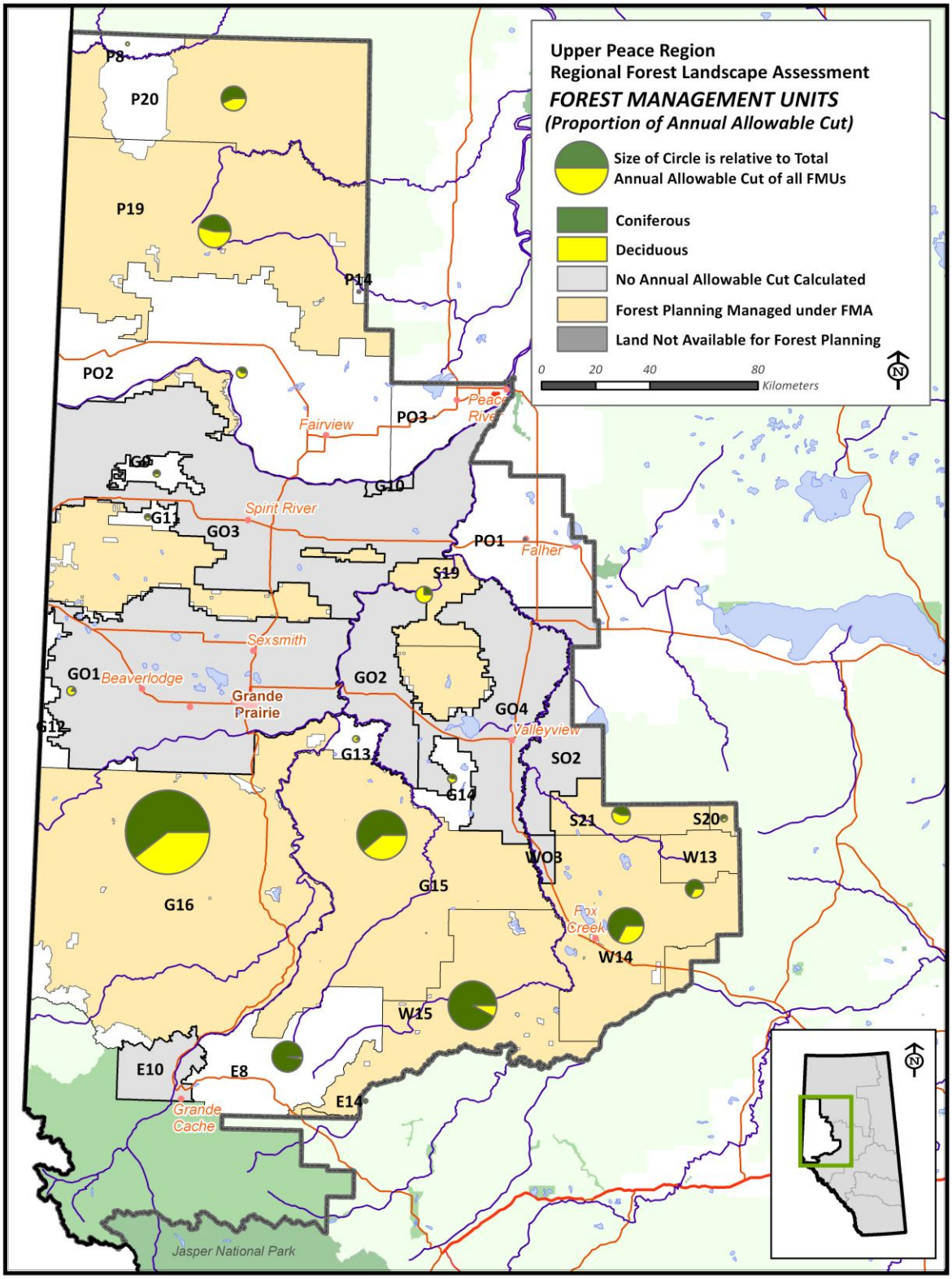

Figure 5-1 FMUs with Prorated AACs

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).

Approximately 5,742,211 hectares (77 %) of the Upper Peace Region is covered by 325 registered fur management areas (traplines) (39). These are displayed in Figure 5-2. The average size of an individual trapline is 17,668 ha, with the largest at 116,638 ha. The four largest traplines are located in the southwest of the Region, adjacent to Willmore Wilderness Park. Except for bobcat, all Alberta furbearers can be harvested in the Upper Peace Region.

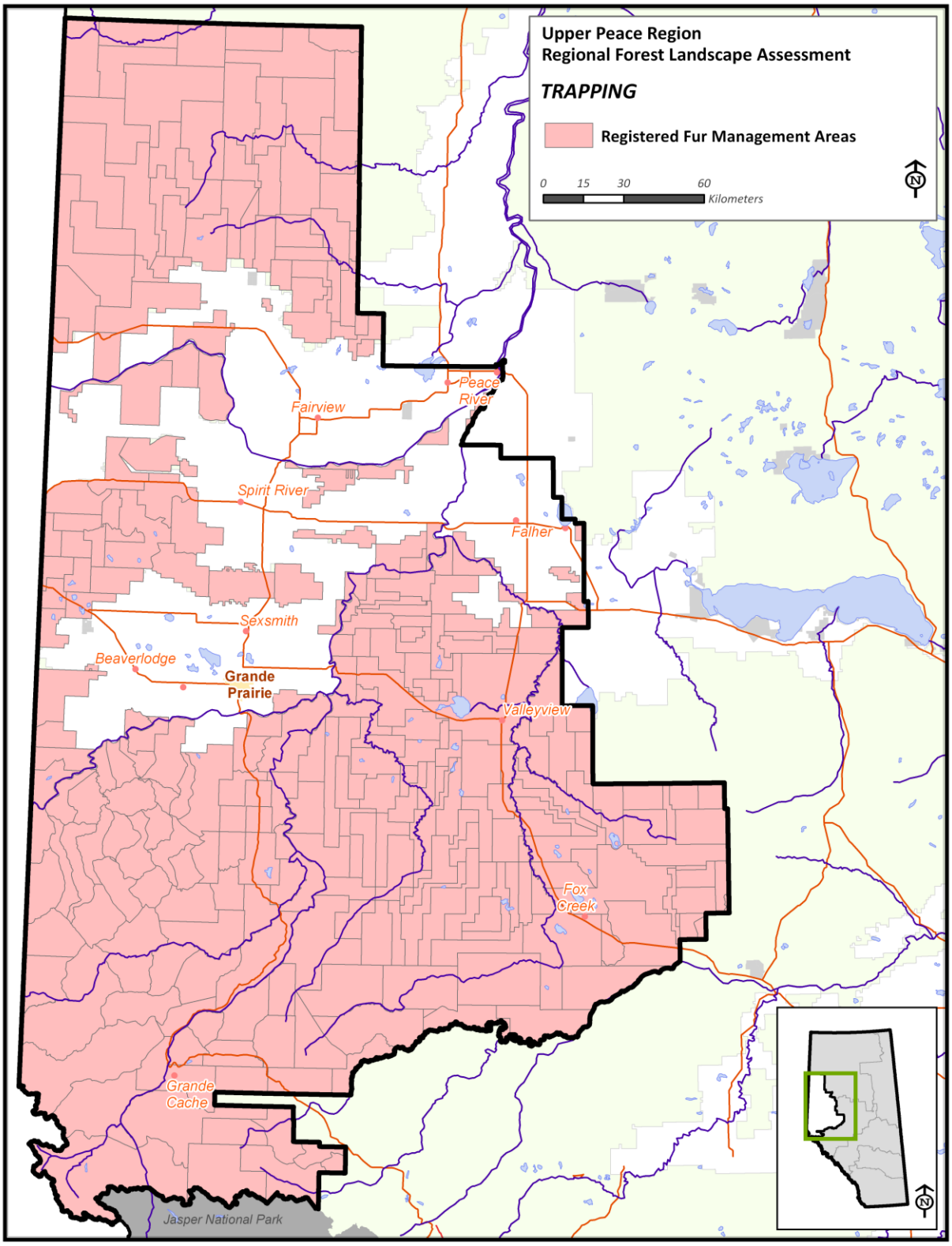

Figure 5-2 Registered Fur Management Areas

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 Upper Peace Region.

The majority of the grazing dispositions are located in the White Area (Figure 5-3) with only 25% of the 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	63	26,860	9	0
Grazing Lease	GRL	715	253,089	74	3
Grazing Permit	GRP	28	1,942	2	0
Provincial Grazing Reserve	GRR	6	32,312	15	0
Total		812	314,202	100	4

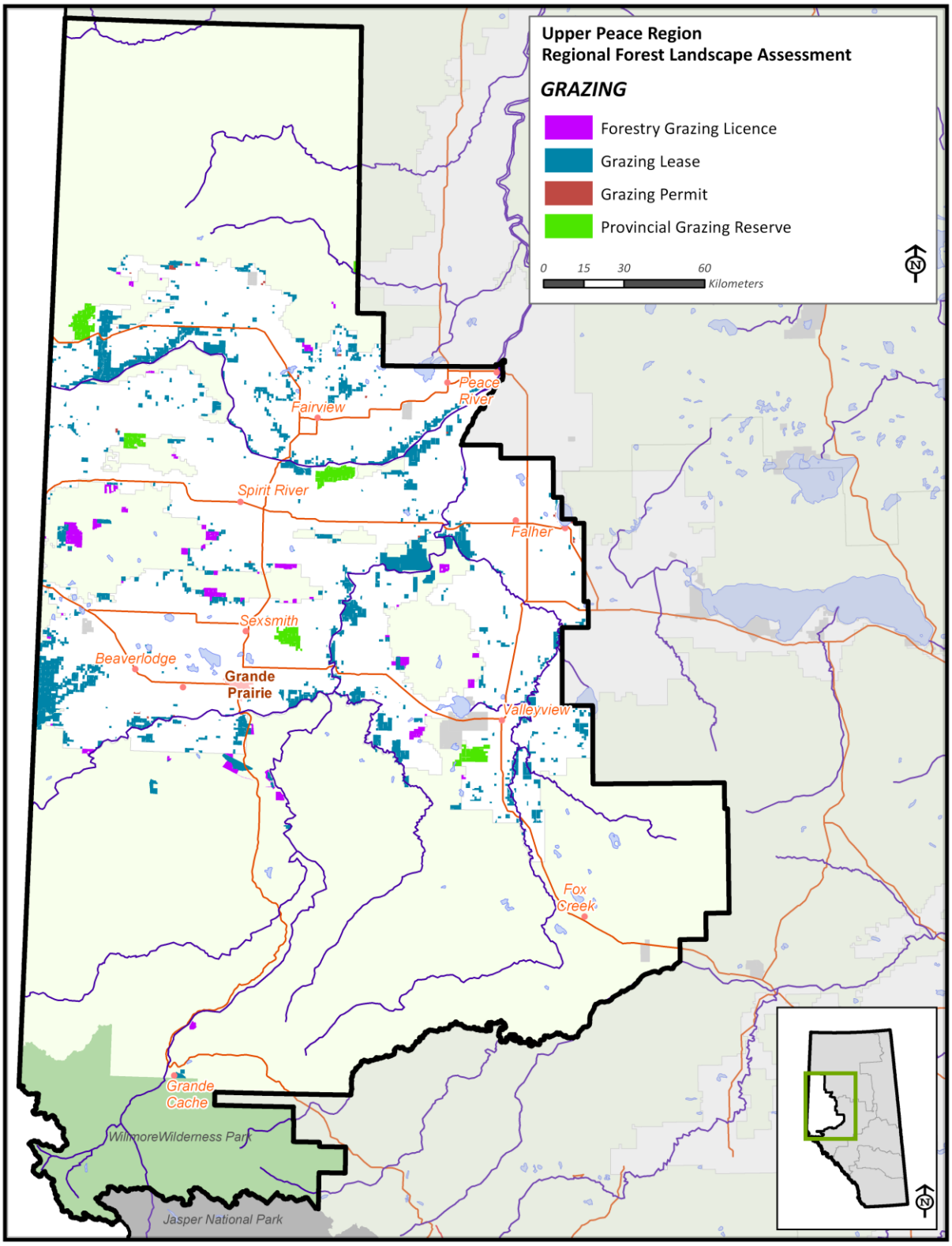

Figure 5-3 Grazing Dispositions

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

Willmore Wilderness Park and the Peace River region are the primary recreation destinations in the Region. Virtually all recreation opportunities can be found there. Horseback riding and hunting for big horn sheep are popular activities in the Willmore Wilderness.

Public Recreation areas and Wildland Provincial Parks (13) throughout the Region offer recreational opportunities parks such as OHV and snowmobiling, as well as hiking and skiing trails, wildlife viewing amongst other activities. The Canadian Death Race trail is outside the town of Grande Cache with the popular race occurring every August long weekend.

There are no Public land use zones in (43) the Upper Peace 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 operated by municipalities, towns or private organizations are not included in the analysis.

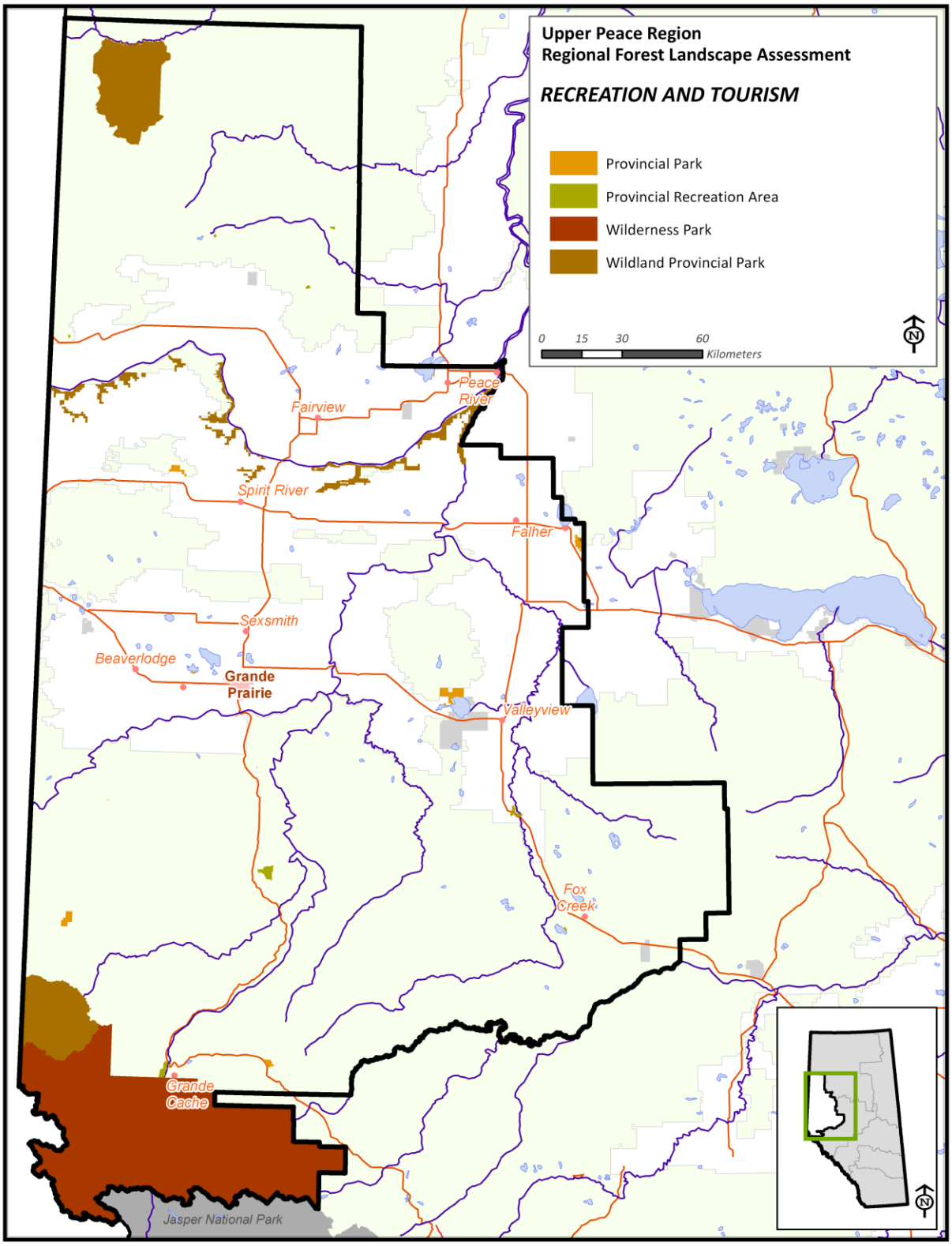

Figure 5-4 Recreation and Tourism

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 nature, and historic structures (Figure 5-5). The listing provides industry and other developers with advance notification of possible historic resource concerns. The listing is constantly being updated as new resources are found and updates are published semi-annually.

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

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

Table 5-4 outlines the area covered as well as percent area of the historical resources in the Region. A total of 1,898 hectares are listed as HRV 1, with locations just north of Grande Cache, and elsewhere near other communities (e.g.: Peace River, Spirit River). Paleontological sites are the most plentiful, accounting for 86% of the listing's total area.

Table 5-4 Cultural and Historic Relative Importance Value (HRV)

	Relative Importance Ranking (HRV)											
	1		2		3		4		5		Total	
Category	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Archaeological	17	0	83	0	509	0	9,815	2	29,413	5	39,837	7
Archaeological, Historical	32	0		-		-		-	891	0	923	0
Archaeological, Natural		-		-		-		-	3,159	1	3,159	1
Cultural		-		-		-	38,741	7		-	38,741	7
Cultural, Historical		-		-		-	115	0		-	115	0
Historical	761	0	131	0	164	0	244	0		-	1,300	0
Palaeontological	1,089	0		-	695	0	16,789	3	480,505	82	499,077	86
Total	1,898	0	214	0	1,367	0	65,705	11	513,968	88	583,152	100

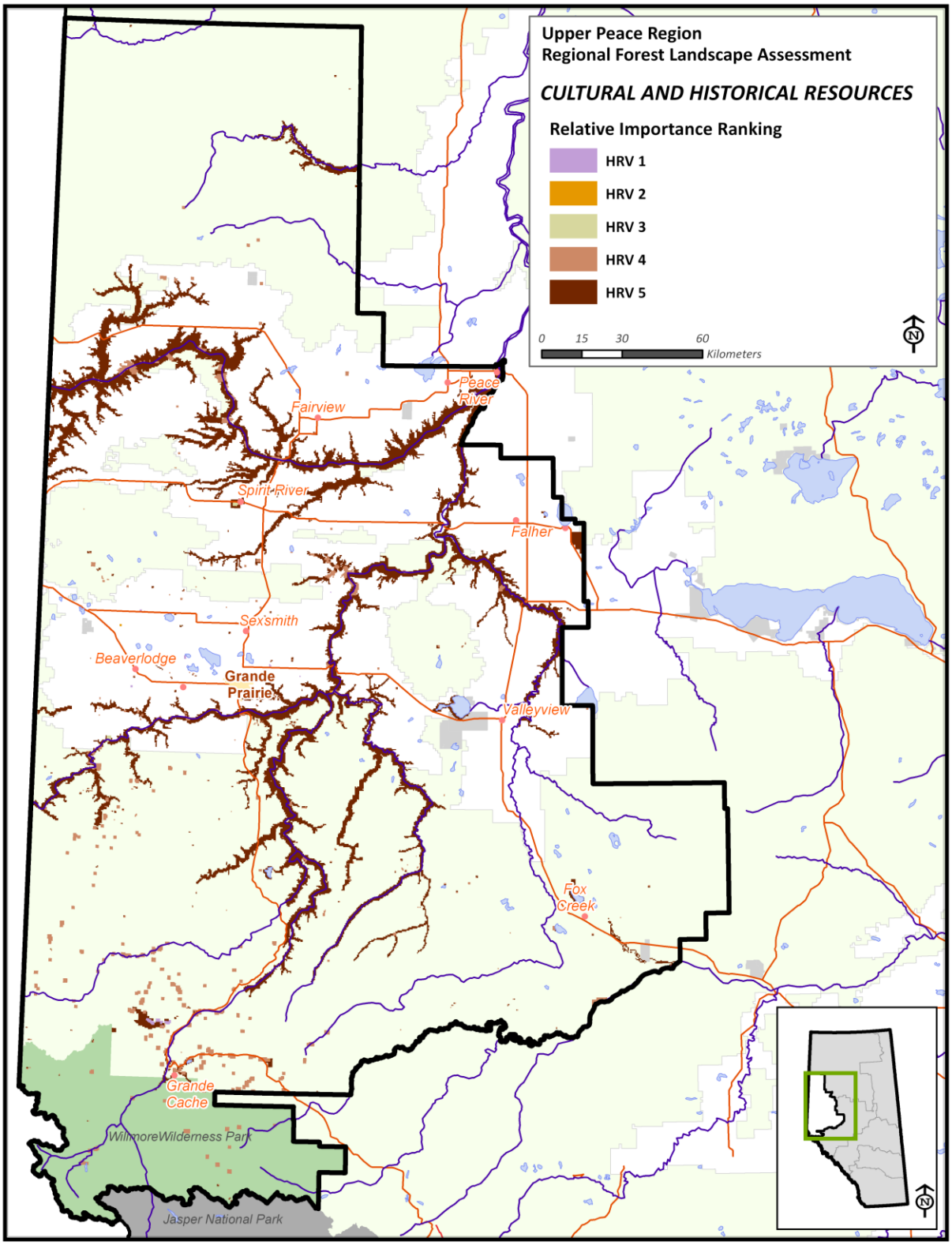

Figure 5-5 Areas of Historic Resource Value

5.7 Visual Resources

No formal inventory of high value visual areas has been compiled. Willmore Wilderness Park encompasses most of the mountainous terrain in the Region which provides users of the park with scenic vistas and landscapes. Highway 40 between Grande Cache and Hinton is well known for its visual resources.

The Region supports a number of popular canoeing routes on rivers such as the Athabasca and Peace affording views through the canyons and boreal forests. The areas around the Peace River valley are well known for their high value visual aesthetics.

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 Upper 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 Upper Peace Area (ha)	Portion of District in Upper Peace (%)	Proportion of Upper Peace occupied by District (%)
Fairview	1,343,401	1,299,365	97	17
Fox Creek	593,859	593,859	100	8
Grande Cache	795,252	752,901	95	10
Grande Prairie	1,654,959	1,654,959	100	22
High Prairie	1,254,130	59,697	5	1
Hinton	740,273	65,736	9	1
Manning	2,266,801	364,265	16	5
Peace River	1,707,905	334,616	20	5
Spirit River	819,665	819,665	100	11
Swan Hills	469,345	54,157	12	1
Valleyview	1,392,872	1,380,321	99	19
Whitecourt	439,416	47,491	11	1
Total	13,477,880	7,427,032		100

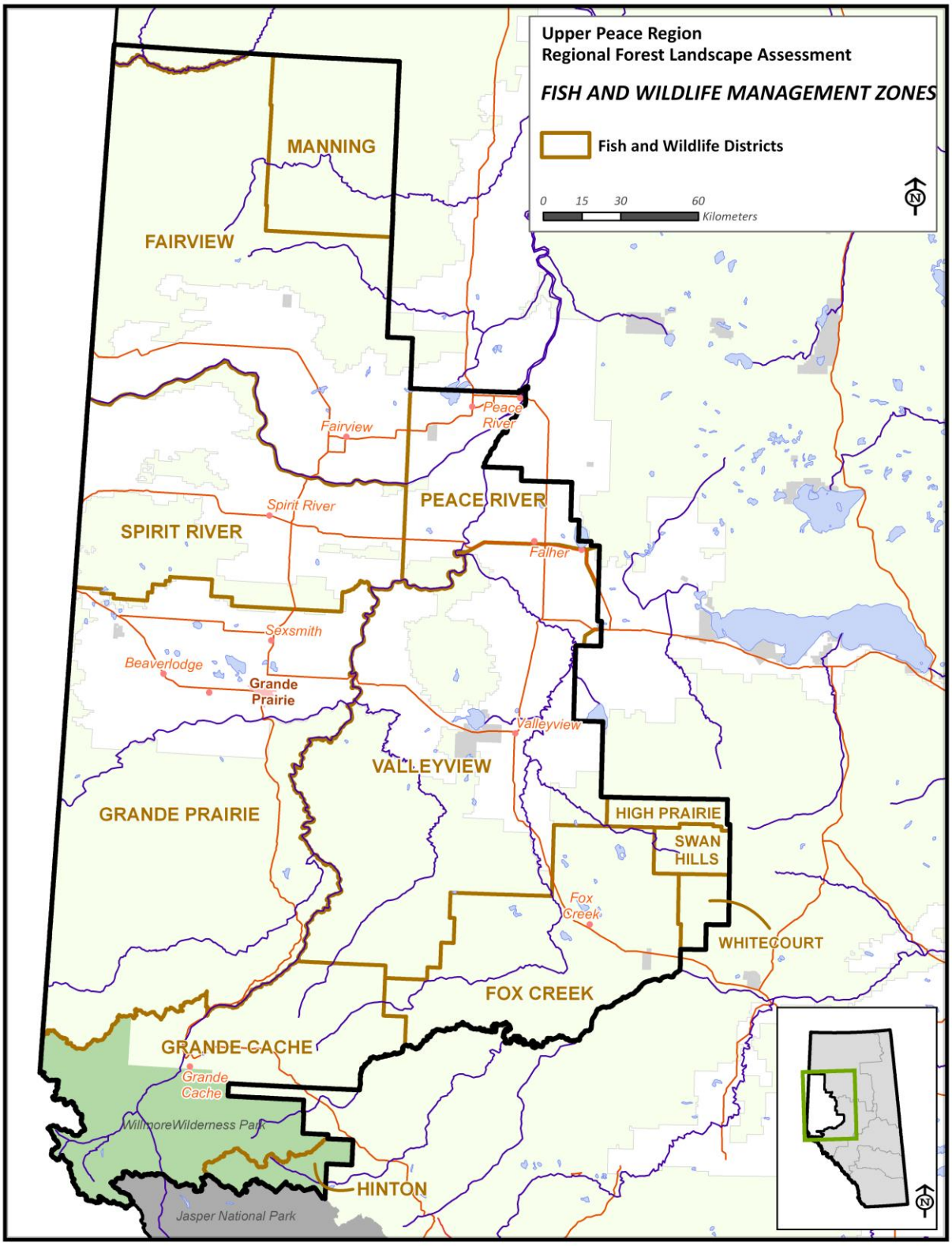

Figure 5-6 Fish and Wildlife Districts

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

Fish Management Zone	Entire Zone Area (ha)	Portion of Zone in Upper Peace Area (ha)	%	Proportion of Upper Peace occupied by Zone %
Northern Boreal Zone	32,972,500	2,609,224	8	35
Eastern Slopes Zone	12,264,460	4,817,808	39	65
Total	45,236,960	7,427,032		100

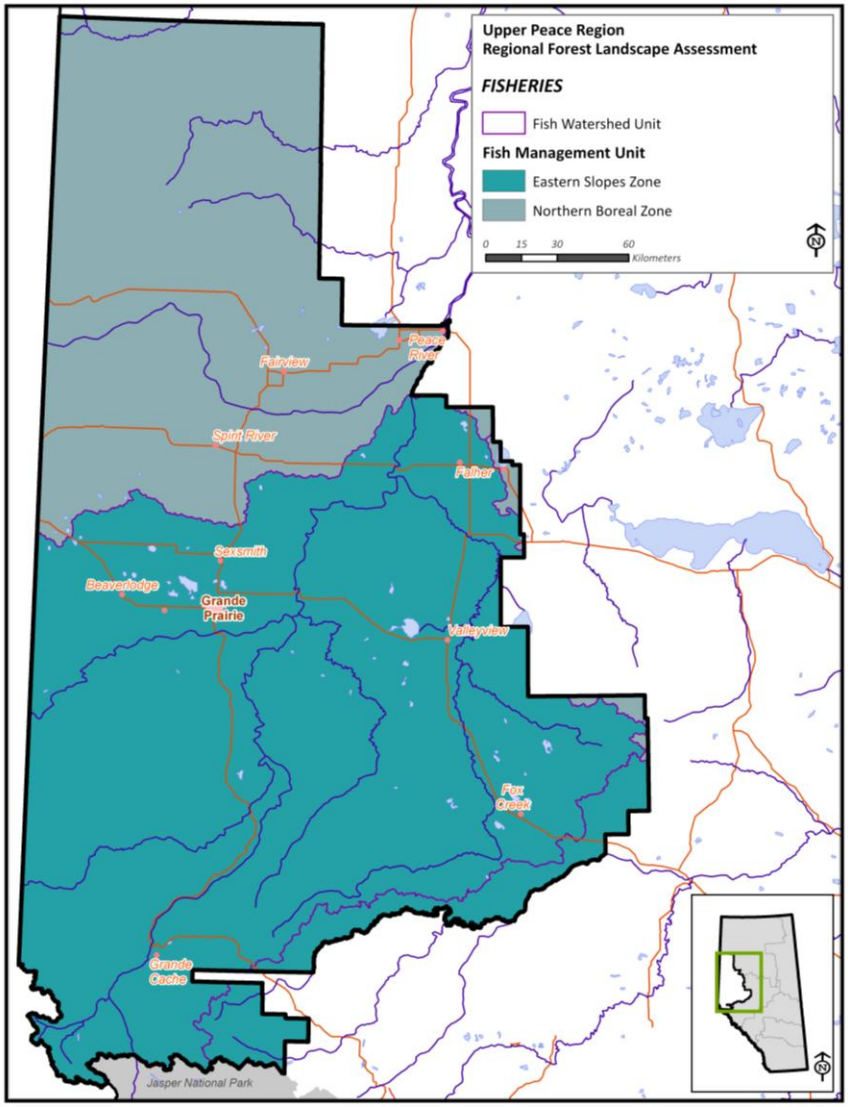

Figure 5-7 Fish Management Units and Fish Watershed Units

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 Zone within Alberta (ha)	Portion of Wildlife Sensitivity Zone in Upper Peace (ha)[1]	(%)	Proportion of Upper Peace occupied by Sensitivity Zone (%)
Caribou sp.(*Rangifer tarandus*)	9,749,350	1,042,887	11	14
Grizzly Bear (*Ursus arctos horribilis*)				
- Core Habitat	3,726,439	1,015,709	27	14
- Secondary Habitat	2,476,588	777,542	31	10
Mountain Goat (*Oreamnos americanus*) and Sheep (*Ovis canadensis*)	1,246,003	87,068	7	1
Sharp-tailed Grouse (*Pedioecetes phasianellus*	15,810,566	334,746	2	5
Trumpeter Swan (Cygnus buccinator) habitat	538,615	245,780	46	3
Colonial Nesting Birds	43,319	317	1	0
- Great Blue Heron (*Ardea herodias*)	31,408	317		
Key Wildlife and Biodiversity Zone	4,689,713	930,898	20	13
Special Access Zone	1,763,820	538,327	31	7
Total Area of Upper Peace		7,427,031		

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

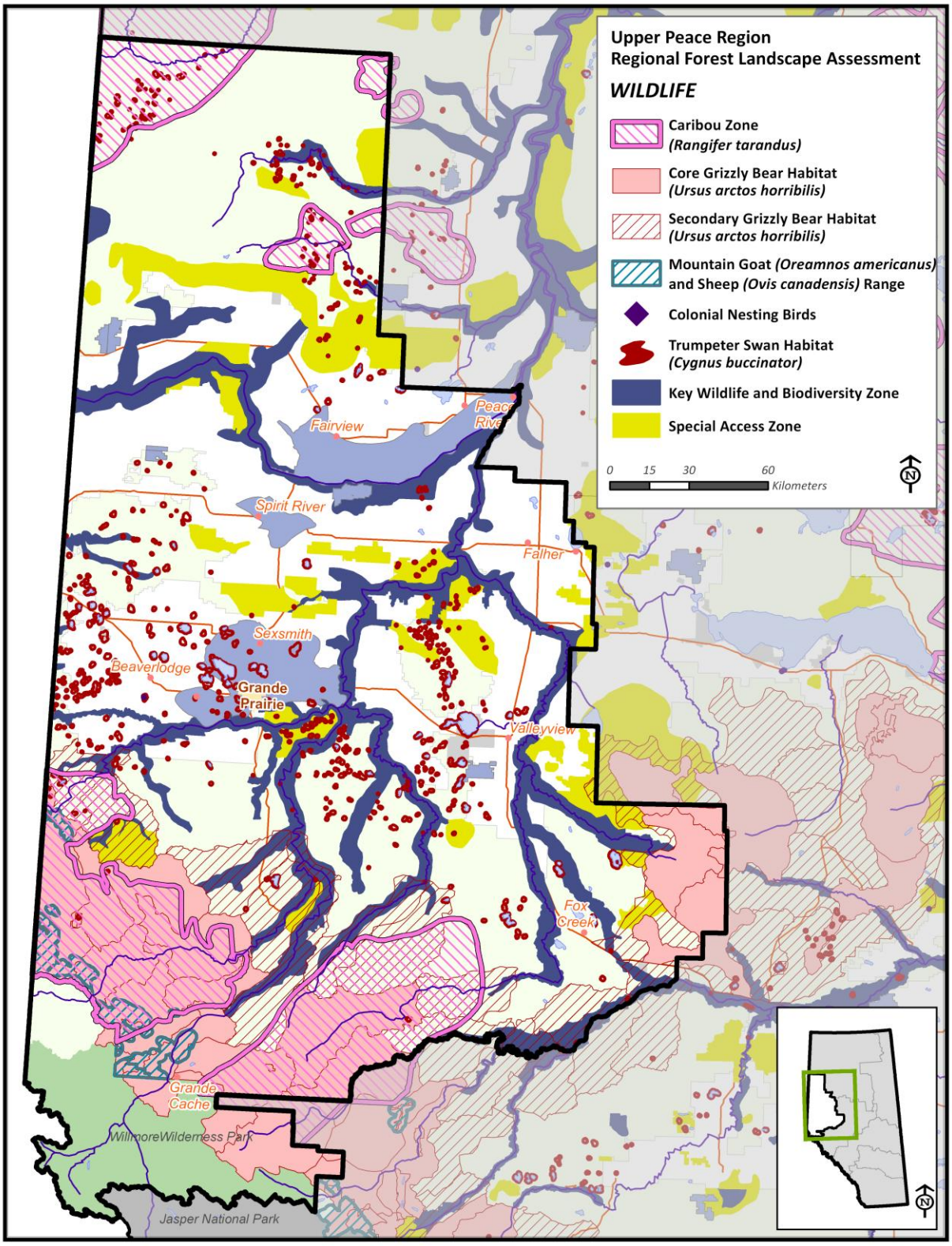

Figure 5-8 Wildlife Sensitivity Zones

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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
FMP	see Forest Planning Manual
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.
Forest Planning Manual (FMP)	The Forest Planning Manual is the short-name title of the "Alberta Forest Management Planning Standard" (version 4.1, dated April 2006). This document and its annexes, bulletins and updates comprise the standard for preparing and implementing forest management plans in Alberta.
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 Upper 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 Upper 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)
Dunvegan	10	0	0
Greene Valley	0	0	0
Moonshine Lake	1,100	14	0
O'Brien	59	1	0
Pierre Grey's Lakes	633	8	0
Queen Elizabeth	75	1	0
Saskatoon Island	113	1	0
Two Lakes	1,568	19	0
Williamson	16	0	0
Winagami Lake	1,326	16	0
Young's Point	3,236	40	0
Total	8,134	100	0

[1] 79% of Winagami Lake Provincial Park is in the Upper Athabasca Region

Table 7-2 List of Wildland Parks

Wildland Park	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Chinchaga Wildland	80,306	42	0
Dunvegan West Wildland	21,030	11	0
Kakwa Wildland	65,686	35	0
Peace River Wildland	21,864	12	0
Winagami Wildland[1]	223	0	0
Total	189,110	100	0

[1] 98% of Winagami Wildland Park is in the Upper Athabasca Region

Table 7-3 List of Provincial Recreation Areas

Provincial Recreation Area	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Big Mountain Creek	13	0	0
Demmitt	2	0	0
Greene Valley	0	0	3
Iosegun Lake	116	3	0
Kakwa River	8	0	0
Little Smoky River	2	0	0
Musreau Lake	1,801	39	0
Ole's Lake	81	2	0
Pines	18	0	0
Running Lake	107	2	0
Sheep Creek	11	0	0
Shrman Meadows	0	0	217
Shuttler Flats	15	0	0
Simonette River	54	1	0
Smoke Lake	103	2	0
Smoky River South	91	2	0
Southview	5	0	0
Stoney Lake	173	4	0
Sulphur Gates	1,091	24	0
Sulphur Lake	151	3	0
Waskahigan River	745	16	0
Total	4,587	100	220

Table 7-4 List of Wilderness Parks

Wilderness Park	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Willmore Wilderness Park	460,377	100	0
Total	460,377	100	0

Table 7-5 List of Natural Areas

Natural Area	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Bear River	0	0	7,212
Dunvegan	0	0	320
Highland Park	0	0	326
Kimiwan Lake	0	0	2,976
Kleskun Creek	0	0	714
Kleskun Hill	65	2	0
Sand lake	2,897	79	0
Saskatoon Mountain	723	20	201
Sturgeon Lake	4	0	0
Total	3,689	100	11,750

Table 7-6 List of Ecological Reserves

Ecological Reserve	Registered Area in Region (ha)	Percentage (%)	Additional PNT/CNT Area (ha)
Goose Mountain	310	14	0
Silver Valley	1,863	86	0
Total	2,173	100	0

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
42.	Alberta. Public Lands. 2012 " Reservation Disposition.shp" Downloaded from: http://www.srd.alberta.ca/FormsOnlineServices/documents/GrazingStatisticsPublicLand-Dec-2003.pdf
43.	Alberta. Resource Information Management Branch. 2012. "Refined_Eastern_Slopes_Land_Use_Zones.shp" Provided directly by source.
44.	Alberta. Resource Information Management Branch. 2012. "SocietyListingOfHistoricSitesAndPlacesInAlberta.shp" Provided directly by source.
45.	Alberta. Resource Information Management Branch. 2012. "FishAndWildlifeAdministrativeArea.shp" Provided directly by source.
46.	Alberta. Resource Information Management Branch. 2012. "FishAndWildlifeSpeciesManagement.shp" Provided directly by source.
47.	Alberta. Public Lands. 2012 "Wildlife Sensitivity Shape Files" Downloaded from: http://www.srd.alberta.ca/MapsPhotosPublications/Maps/WildlifeSensitivityMaps/Default.aspx
48.	Alberta. Environment and Sustainable Resource Development. 2012. "OTHER_FOREST_HEALTH_AGENTS.gdb" Provided directly by source.