Meadow Lake Provincial Park

FOREST CONSERVATION MANAGEMENT PLAN

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Prepared for:

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SASKATCHEWAN PARKS

FORSITE
Forest Management Specialists

FOREST CONSERVATION MANAGEMENT PLAN

For the

MEADOW LAKE PROVINCIAL PARK

For the 20-year period from April 1, 2018 to March 31, 2038

Approval Form

The Forest Conservation Management Plan for Meadow Lake Provincial Park (2018) is hereby approved for use by the Ministry of Parks, Culture and Sport in the management of the forest ecosystems of Meadow Lake Provincial Park.

Darryl Sande, RPF, Plan Author — October 9, 2018 (Date)

FORSITE Inc.

Recommended for approval by:

Pat Mackasey, Forest Ecologist — May 22, 2019 (Date)
Landscape Protection Unit
Ministry of Parks, Culture and Sport

APPROVED:

Glen Longpre, Director — May 22, 2019 (Date)
Landscape Protection Unit
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Bruce McCannel, Executive Director — June 19, 2019. (Date)
Park Management Services
Ministry of Parks, Culture and Sport

EXECUTIVE SUMMARY

This plan describes the details for the undertaking of a twenty years Forest Conservation Management Plan for Meadow Lake Provincial Park. This plan is intended to shift the age class distribution from predominately old and very old age classes to a forest with a more natural and diverse age distribution.

Given that MLPP does not manage their forested area for timber production, but for non-timber values, this plan is an area-based management plan as opposed to a volume based management plan. The inventory used to develop this plan was an updated UTM inventory from 2016. This inventory does not match the Saskatchewan Forest Vegetation Inventory (SFVI) standard; however, will provide a fair representation of the forested lands within the Meadow Lake Provincial Park for planning purposes. Meadow Lake Provincial Park (MLPP) encompasses 168,964 ha with approximately 105,061ha being considered productive forest that is available for forest management. The tactical plan is divided into two decades of treatment. Priority has been given to the mature to very old seral stands, and stands that have been affected by dwarf mistletoe. These selected stands are recommended to be treated within decade one of the plan. The total area of the decade one treatment area is 16,763 ha, with 9,843 ha being in the mature, old, and very old seral stage. The decade one treatment areas include the 4,363 ha of productive forested lands disturbed by the 2018 Tuff fire. Although the focus is on the older stands, some adjacent stands that are in the younger seral stages have been included in the plan. Part of the reason is to slow the spread of insect and disease infestations in the healthy stands. For example, jack pine stands that have not yet been recorded as being affected by dwarf mistletoe have been included in the tactical plan if they are near affected stands.

The two primary treatment options that Forsite is recommending include prescribed burning and timber harvesting. These two treatments will be effective in both decreasing the spread of insects and disease, and allowing for regeneration. Harvesting is recommended as a pre-treatment for prescribed burning, in conifer dominated stands, to reduce the fuel load and mitigate some of the risks associated with a prescribed burn. Harvesting of deciduous dominated stands will stimulate sucker regeneration in areas where prescribed burning is not feasible. Given the objective of MLPP is not to maximize timber extraction, harvesting treatments are recommended to retain a higher than average retention level that will produce results similar to that of a wildfire. Recommended retention levels in pine dominated stands targeted for prescribed burning are between 25 and 50% of the pre-treatment stand condition. Recommended retention levels in hardwood dominated stands is up to 25% of dispersed retention to allow for effective regeneration.

Prescribed burning involves strategically applying fire to a predetermined area to achieve a desired outcome, in this case forest management. In hardwood stands, a low intensity prescribed burn alone will allow for adequate suckering to occur for regeneration.

In areas where harvesting or prescribed burns are deemed unacceptable, Forsite recommends the establishment of a white spruce understory in existing aspen dominated stands. This understory will maintain forest cover as the over mature aspen stands start to breakup.

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OVERVIEW

1 Introduction

Saskatchewan Ministry of Parks, Culture and Sport, Landscape Protection Unit, Parks Division, herein referred to as Parks Division, is developing a 20-year Forest Conservation Management Plan (FCMP) for the Meadow Lake Provincial Park (MLPP).

This plan was developed using Thorpe's draft "Ecosystem Based Management Plan for Meadow Lake Provincial Park" as a basis on the current state of the park. The inventory used to develop this plan was an updated UTM inventory from 2016. This inventory does not match the Saskatchewan Forest Vegetation Inventory (SFVI) standard; however, will provide a fair representation of the forested lands within the Meadow Lake Provincial Park for planning purposes. The Parks Division has requested a FCMP contains the following sections.

1. Overview Document – provides background and contextual information on the MLPP and describes historical management practices.
2. Plan Document that describes the Forest Conservation Management Plan:
    a. Tactical Plan Areas
    b. Management Strategies
    c. Treatment Recommendations

2 Information Gathering

2.1 PROVINCIAL SOURCES OF DIRECTION

2.1.1 ECOSYSTEM BASED MANAGEMENT PLANS

An Ecosystem Based Management Plan for the Meadow Lake Provincial Park was developed in March 2012 and remains in a draft form. However, it does provide guidance to the FCMP process on areas of special places, tourism, traditional uses, interaction between timber and non-timber forest uses such as trapping, recreation, and wild rice production. The Draft Plan provides recommendations such as:

- Restoring a more natural disturbance regime to park ecosystems
- Monitor the state of MLPP environment and the outcomes of ecosystem-based management actions
- Ongoing inventory of MLPP's biological and ecological resources

2.1.2 RESOURCE MANAGEMENT PLANS

2.1.2.1 CHURCHILL RIVER WATERSHED – SOURCE WATER PROTECTION PLAN

Currently there is no Source Water Protection Plan for the Churchill River Watershed. Watershed Protection Plans are developed co-operatively by Watershed Advisory Committees established in each watershed planning area, the Saskatchewan Watershed Authority and its successor, the Water Security Agency (www.wsask.ca). The membership of the Watershed Advisory Committees includes representatives from urban and rural municipalities, First Nations, industry, environmental and agricultural interest organizations. These plans identify the threats to source water in the Watershed and recommends key actions to address those threats. Watershed issues specific to the MLPP are discussed in Section 3.2.8 below.

2.1.2.2 FISHERIES MANAGEMENT PLAN

The Fisheries Management Plan released by the Ministry of Environment provides a framework for maintaining and building upon the significant values and benefits of the provincial fishery. This plan will apply to fisheries management in the MLPP and will work towards ensuring the fishery remains viable.

2.1.2.3 WOODLAND CARIBOU RECOVERY STRATEGY

The Committee of the Status of Endangered Wildlife in Canada (COSEWIC) classified the Boreal Woodland Caribou as a "threatened" species in 2002 under the Species at Risk Act (SARA). As a result of this classification, Environment Canada began working on a recovery strategy for the Boreal Woodland Caribou, and then released its "Proposed Recovery Strategy for the Woodland Caribou, Boreal Population, in Canada" on August 26, 2011 and a Final Recovery Strategy document in 2012[1]. Saskatchewan's Ministry of Environment put a Woodland Caribou Management Team in place in 2002 that has been working to develop and refine recovery strategies since that time. They are currently working to deliver a provincial strategy (habitat zone maps and management guidance) in response to the federal government's 2012 Recovery Strategy that did not yet have herd trend data for Saskatchewan and some other provinces.

The federal document indicates that there are two caribou ranges in Saskatchewan. The southern (Boreal Plain) range is identified as being 'As Likely As Not' to have self-sustaining populations, while the northern (Boreal

[1] http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=2253

Shield) range's ability to sustain a Caribou population is unknown due to a lack of data (Figure 1). Approximately 75% of MLPP is in the Boreal Plain Range and will be part of the SK2 West Range Plan which is scheduled for completion in September 2019. The SK 2 Central Range Plan was submitted in October 2017 and can be viewed here.

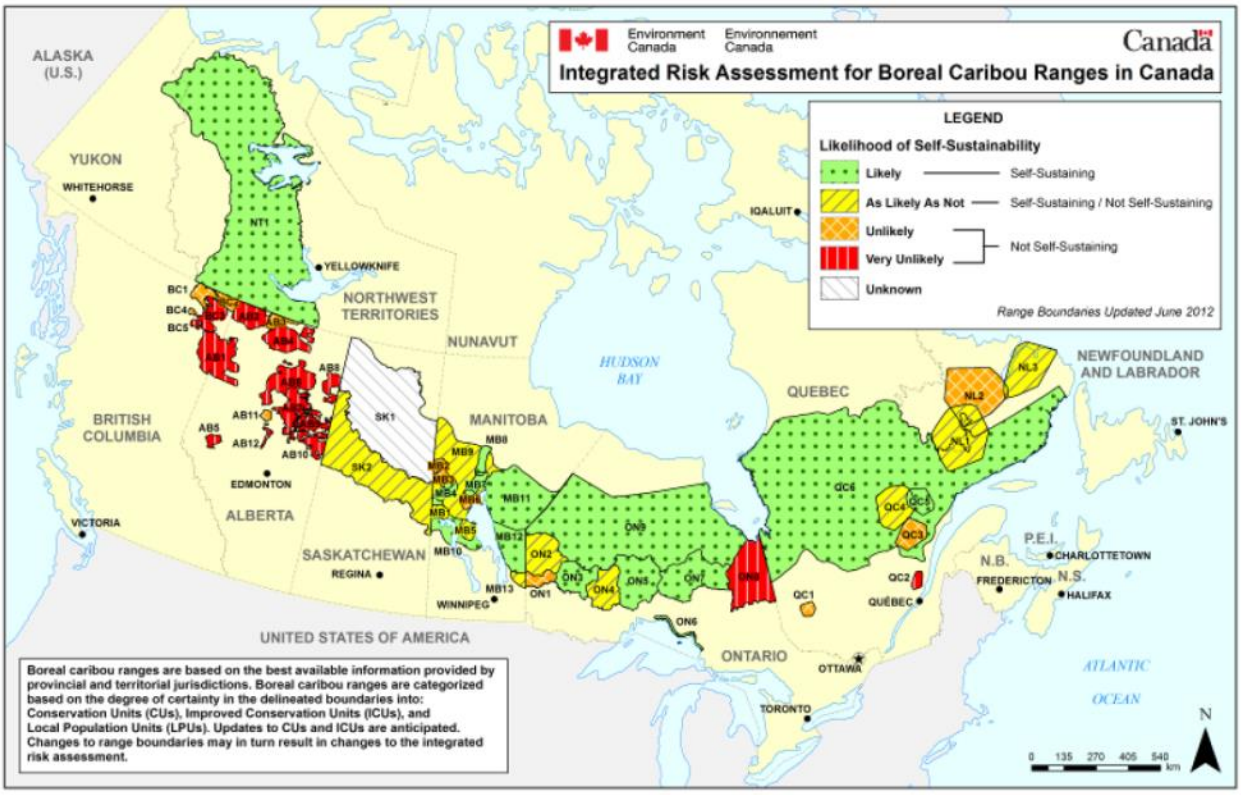


Figure 1 Boreal Caribou Distribution and Status (2012 Federal Recovery Strategy)

3 Park-Specific Information

3.1 LOCATION OF MEADOW LAKE PROVINCIAL PARK

Meadow Lake Provincial Park (MLPP) is located northwest of the community of Meadow Lake. The extents of the MLPP range from 55°1'42"N to 56°3'21"N in latitude and 106°30'39"W to 108°23'9"W in longitude (GCS_WGS_1984 datum). MLPP is located at the boundary between the Mid-Boreal Upland Ecoregion (the main area of commercial forest in Saskatchewan) and the Boreal Transition Ecoregion (the southern fringe in which agriculture has encroached on the boreal forest) (Padbury and Acton 1994) (Figure 3). According to Wilson and Martin (1998), MLPP is important in representing the Boreal Transition in the provincial park system, but is less so for the Mid-Boreal Upland, which is also represented by Duck Mountain, Narrow Hills, Clarence-Steepbank, Great Blue Heron, Makwa Lake and Candle Lake Provincial Parks.

3.2 BIOPHYSICAL DESCRIPTION

3.2.1 FOREST VEGETATION

The MLPP encompasses 168,964 ha with approximately 105,061 ha being considered productive forest (Figure 2), and is available for forest management treatments.

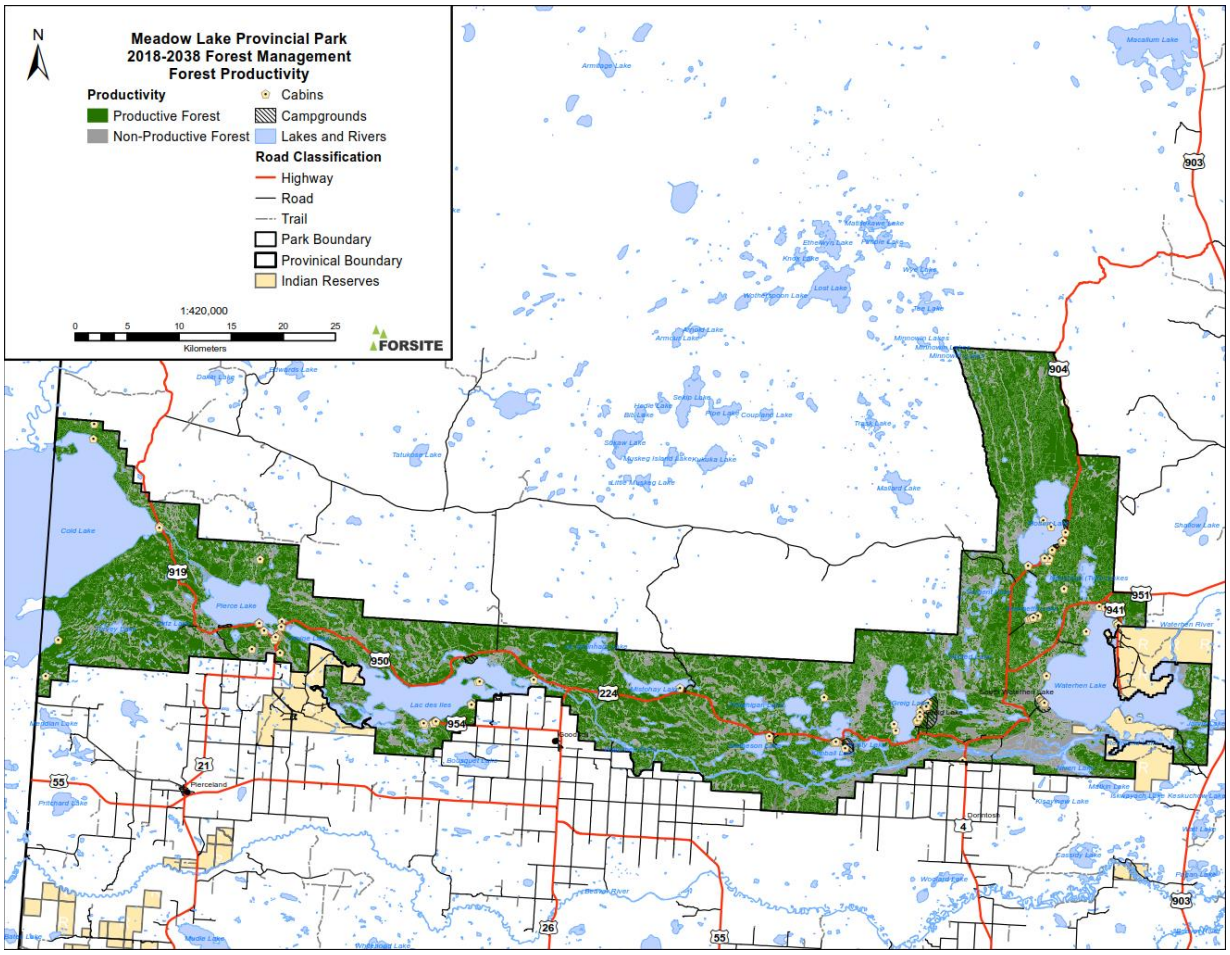


Figure 2 Productive Forest within MLPP. This classification is not intended to diminish the ecological value of non- productive lands, but is designed to differentiate these lands from lands capable of producing mature forest cover.

This transitional location is reflected in the different types of land administration surrounding MLPP (Figure 3). Immediately north of the Park is a belt of Provincial Forest approximately 30 km wide which is managed for commercial forestry under the Mistik Forest Management Agreement. North of that is the remote terrain of the Cold Lake Air Weapons Range. Immediately south of the Park is the agricultural zone in the Meadow Lake – Pierceland area, which is mostly either privately owned farmland or agricultural crown land. The closest settlements are in this agricultural zone, the main one being Meadow Lake (population 4771 in 2006), only 41 km from the park gate. There are two Indian reserves bordering the Park, Big Island Lake Cree Nation in the west and Waterhen Lake First Nation in the east. Therefore the Park is at the interface of major changes in land use.

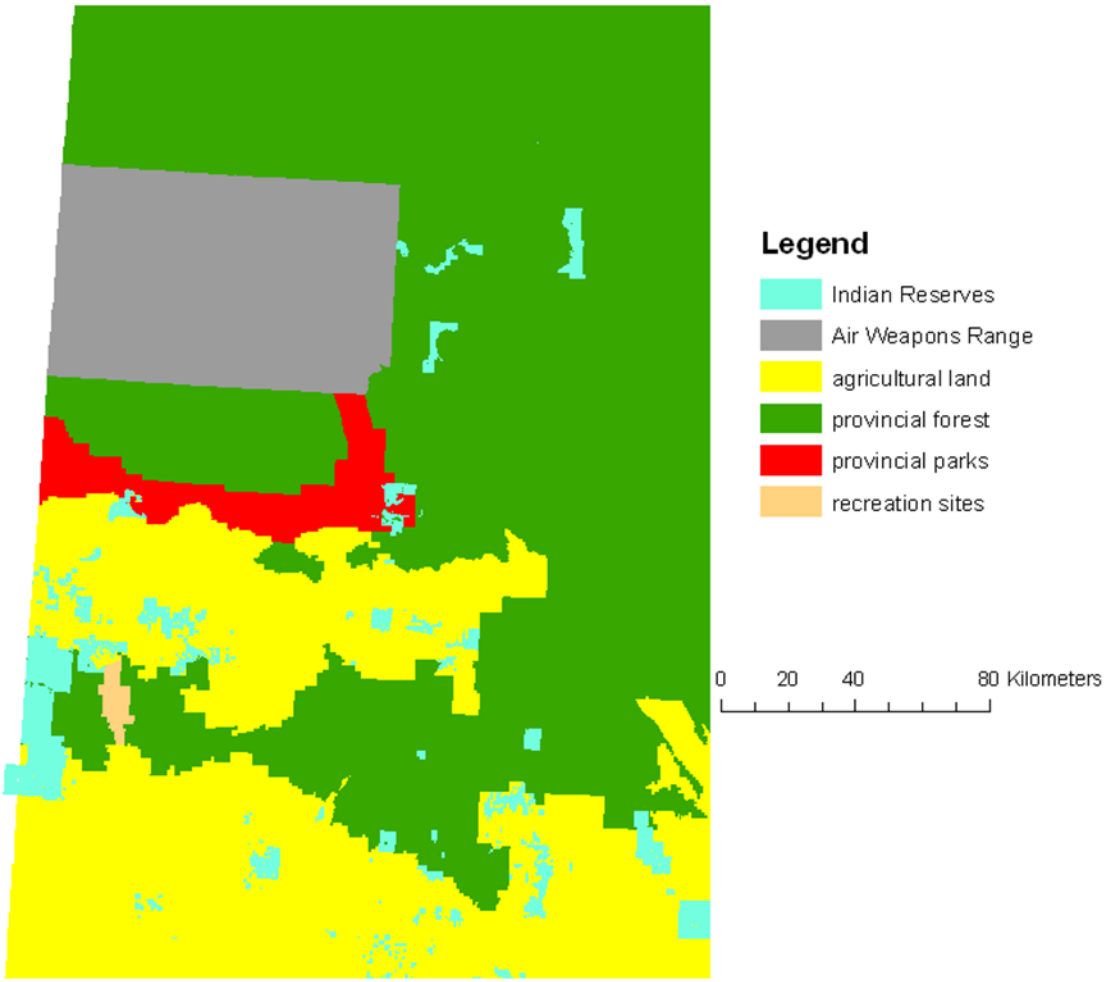


Figure 3 Land administrations in the region of MLPP (shown in red)

3.2.2 LAKES

Lakes are a dominant feature across the Saskatchewan landscape and make up a significant area of MLPP. About a quarter of the park is water, including several popular recreation lakes and the Waterhen River system.

3.2.3 CLIMATE

As described by Thorpe in the draft "Ecosystem Based Management Plan for Meadow Lake Provincial Park", the climate of MLPP is typical of the southern edge of the boreal forest (Table 1). Temperatures are somewhat cooler and precipitation is somewhat higher compared to the Prairie Ecozone of southern Saskatchewan. The average of 1408 growing degree-days[2] compares to 1612 growing degree-days at North Battleford (in the Aspen Parkland, about 200 km south of the park). Annual precipitation of 432 mm compares to 366 mm at North Battleford. The

[2] The sum of growing degree-days is a measure of the length and warmth of the growing season, and is calculated by summing the daily deviations above a base temperature of 5°C over the whole year.

result is a somewhat moister climate compared to the Prairies. Hogg (1994) showed that the forest/grassland boundary in the Prairie Provinces is closely related to a climatic moisture index (CMI), calculated as annual precipitation minus annual potential evapotranspiration[3]. CMI values in the forest are generally positive (excess of precipitation over potential evapotranspiration) while those in the grassland are generally negative. CMI in MLPP averages -34 mm, close to the zero value that Hogg found typical of the forest/grassland boundary. By comparison, CMI at North Battleford is -128 mm, and values in the driest parts of the Prairies go below -400 mm. Precipitation is concentrated in the warm months, with 69% of the annual total occurring in the five months from May through September.

Table 1Climate of MLPP based on 1961-90 normals and two climate change scenarios for the 2050s

Timeframe	Growing Degree-Days	Annual Precipitation (mm)	Potential Evapo-transpiration (mm)	Climatic Moisture Index (mm)	Proportion of Precipitation in May – Sep
1961-90	1408	432	465	-34	69%
2050s (cool scenario)	1590	427	504	-77	69%
2050s (warm scenario)	1935	452	573	-122	69%

Climate change is expected to have a major effect on this region. Analysis of global climate models (Thorpe 2011) shows that the park could be substantially warmer by the 2050s, depending on which climate change scenario is used (Table 1). Precipitation could stay the same or increase somewhat by the 2050s, depending on the scenario. However because of the substantial warming, the climatic moisture index will be lower, indicating a drier climate. The seasonal distribution of precipitation is not predicted to change much by either scenario.

An ecoclimatic model (Thorpe 2011) was used to predict the effect of this climatic change on vegetation zones. For the region of MLPP, this model is driven by the climatic moisture index (CMI), with a threshold of -18 mm separating forest from Aspen Parkland, and -143 mm separating Aspen Parkland from Moist Mixed Grassland.

Application of the model to the current climate shows the position of the park close to the climatic boundary between forest and aspen parkland. This seems reasonable in light of the amount of aspen dieback seen in this part of Saskatchewan during recent droughts. The cooler scenario for the 2050s shows the climate of the Aspen Parkland Ecoregion expanding northward over the park and the forest land to the north. The warmer scenario for the 2050s shows further northward shifts, with the climate of the Moist Mixed Grassland Ecoregion approaching the park. In addition to these changes in average conditions, climatologists predict that variability will increase, meaning that extreme events such as severe droughts may happen more frequently (Thorpe 2011).

[3] Potential evapotranspiration is an estimate of the amount of evaporation that would occur if there is always an ample supply of soil moisture and depends mostly on temperature.

3.2.4 ECOZONES, ECOREGIONS AND ECODISTRICTS

The MLPP area is within the Boreal Plain Ecozone, and the Mid-Boreal Upland and Boreal Transition Ecoregions (Figure 4)[4]. Ecoregions each have a particular climate, soil or landform structure that determines the types of forest and productivity found within them. These regions are further subdivided into Ecodistricts reflecting local variations of the same factors and often expressed with distinctive vegetation.

The area occupied by each Ecoregion is described in Table 2. The bulk of the MLPP area (74%) is within the Mid-Boreal Upland Ecoregion. This region is south of the Canadian Shield and is characterized by an ascending sequence of steeply sloping, eroding escarpments, hilly glacial till plains and level plateau-like tops. The intervening areas are comparatively level, with large, sparsely treed peat land being common. The Boreal Transition Ecoregion occurs on 26% of the MLPP area.

Table 2 Ecoregions area summary

Ecozone	Ecoregion	Hectares in MLPP Area	Percent of MLPP Area by Ecoregion
Boreal Plain	Mid-Boreal Upland	124,598.2	74.2%
	Boreal Transition	43,368.2	25.8%

[4] 2017 Saskatchewan Conservation Data Center / Canadian Plains Research Center (Ecoregions of Saskatchewan 1998)

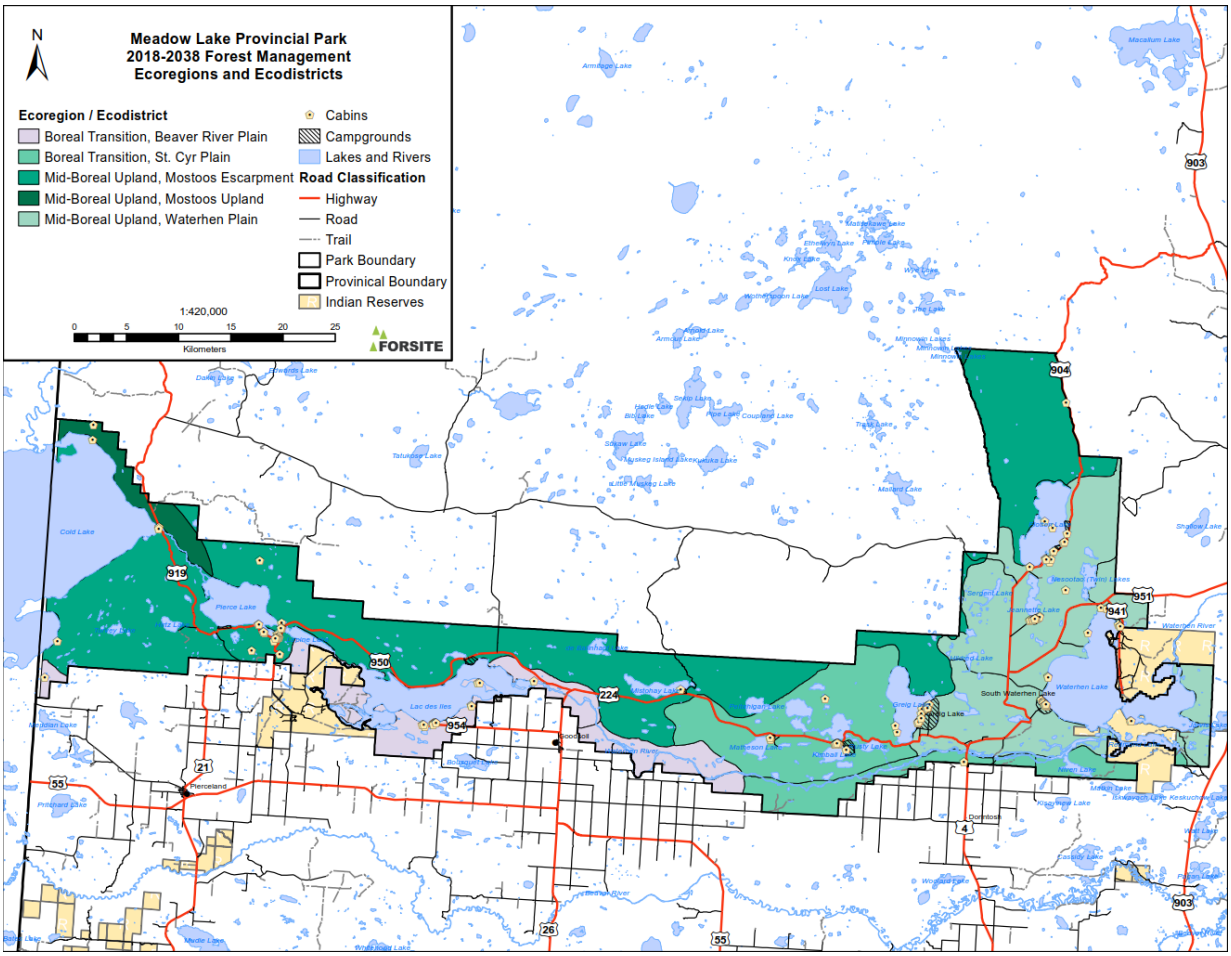


Figure 4 Ecoregions and Ecodistricts in MLPP

The Ecoregions within the MLPP are described below:

The largest Ecoregion in MLPP is the **Mid-Boreal Upland** and is a major timber producing region of the province. The upland areas form part of the continuous mid-boreal mixed coniferous and deciduous forest. Forested zones consisting of white and black spruce, jack pine, and balsam fir with a mixture of trembling aspen and balsam poplar dominate this Ecoregion. The landscape is characterized by steep escarpments, rolling glacial till plains and level plateaus. In amongst these features are relatively level large peat land areas. The dominant soil structure is characterized by loamy to sandy loam soils.

Figure 5 Mid Boreal Upland Ecoregion

The **Boreal Transition** Ecoregion is located along the south edge of MLPP and is characterized by a mix of forest and farmland, marking both the southern advance of the boreal forest and the northern limit of arable agriculture. Gray soils supporting tall stands of aspen are characteristic of the hilly upland areas. White spruce and jack pine occur throughout the area but are less common than in the more northern ecoregions. Peatlands are also less common.

http://www.virtualsk.com/maps/ecoregions_images/boreal_agriculture.jpg

Figure 6 Boreal Transition Ecoregion

3.2.5 GEOLOGY

Meadow Lake Provincial Park is primarily located over sedimentary rock that makes up the Western Canada Sedimentary Basin.

3.2.6 LANDFORMS

Most major landforms of Saskatchewan were created by the deposition and erosion of sediments and rock by water and ice during the glacial and immediate postglacial periods. The dominant parent soil mode of deposition in MLPP is till (morainal), and second being fluvial (Figure 7).

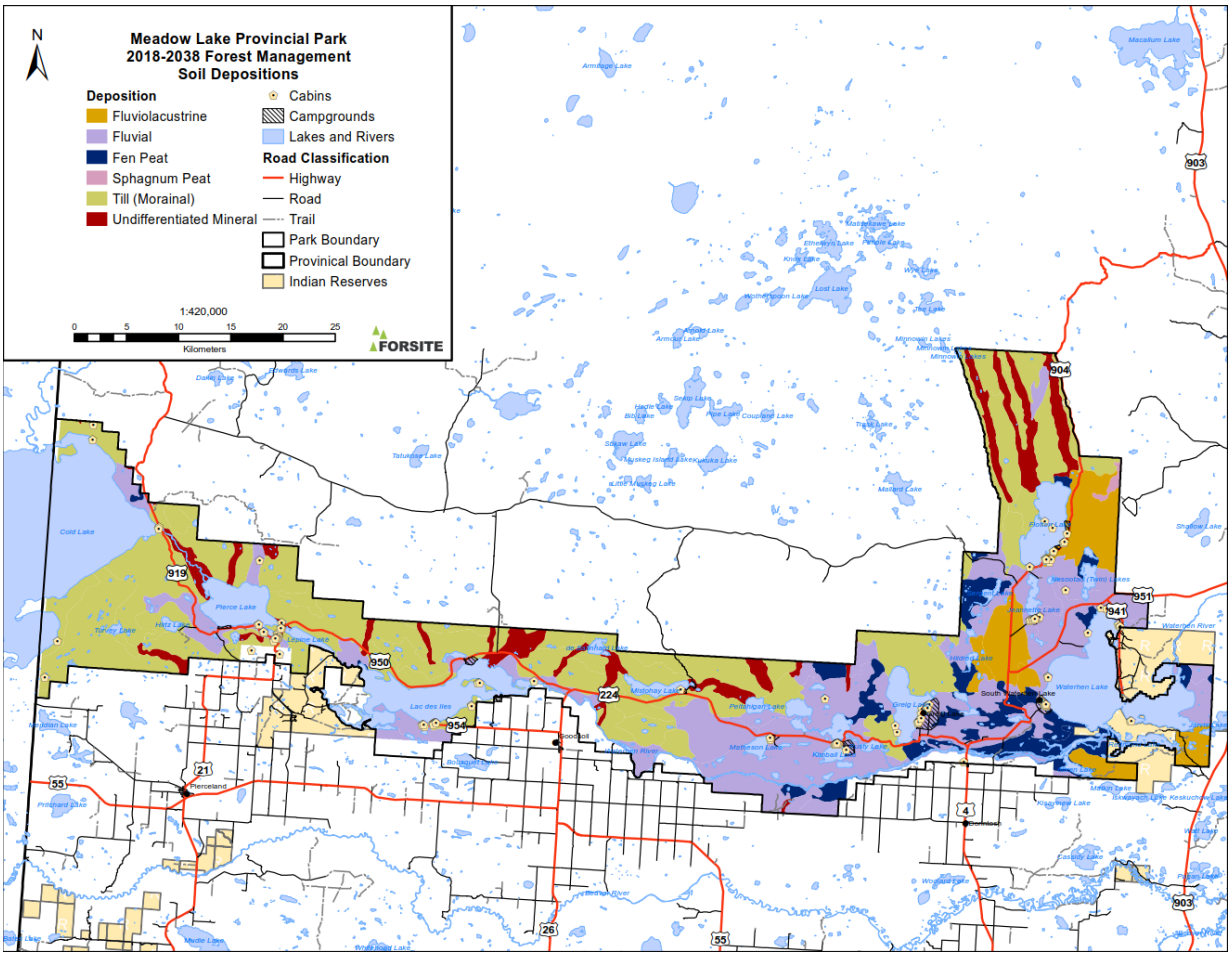


Figure 7 Parent soil mode of deposition

3.2.7 SOILS

Soils and soil landforms within MLPP are determined to a large degree by the manner in which the soils were deposited after the last glaciation. Morainal (undulating) deposition is the most common, with fluvioglacial (glacial outwash), eolian (windblown), and lacustrine (lake bottom) depositions occurring on smaller areas.

Well-drained gray Luvisolic soils are dominant in the region.

The upland areas that dominate MLPP area consist of deep, loamy to clayey-textured glacial till, lacustrine deposits, and inclusions of coarse fluvioglacial deposits. Rougher moraine deposits with a large number of small lakes, ponds, and sloughs occupy shallow depressions. Permafrost is very rare and only found in peat lands. Well-drained gray Luvisolic soils are dominant in the region. Figure 8 displays soil productivity by drainage in the region. Significant inclusions are peaty Gleysols and Mesisols that occupy poorly drained depressions. Eutric Brunisols are associated with sandy uplands[5]. Figure 9 displays the soil orders occurring within MLPP, and Figure 10 displays the soil great groups. A description of the soil types (based on great groups and order) is provided below[6].

[5] University of Saskatchewan – Ecoregions of Saskatchewan;

[6] Soils of Saskatchewan - University of Saskatchewan

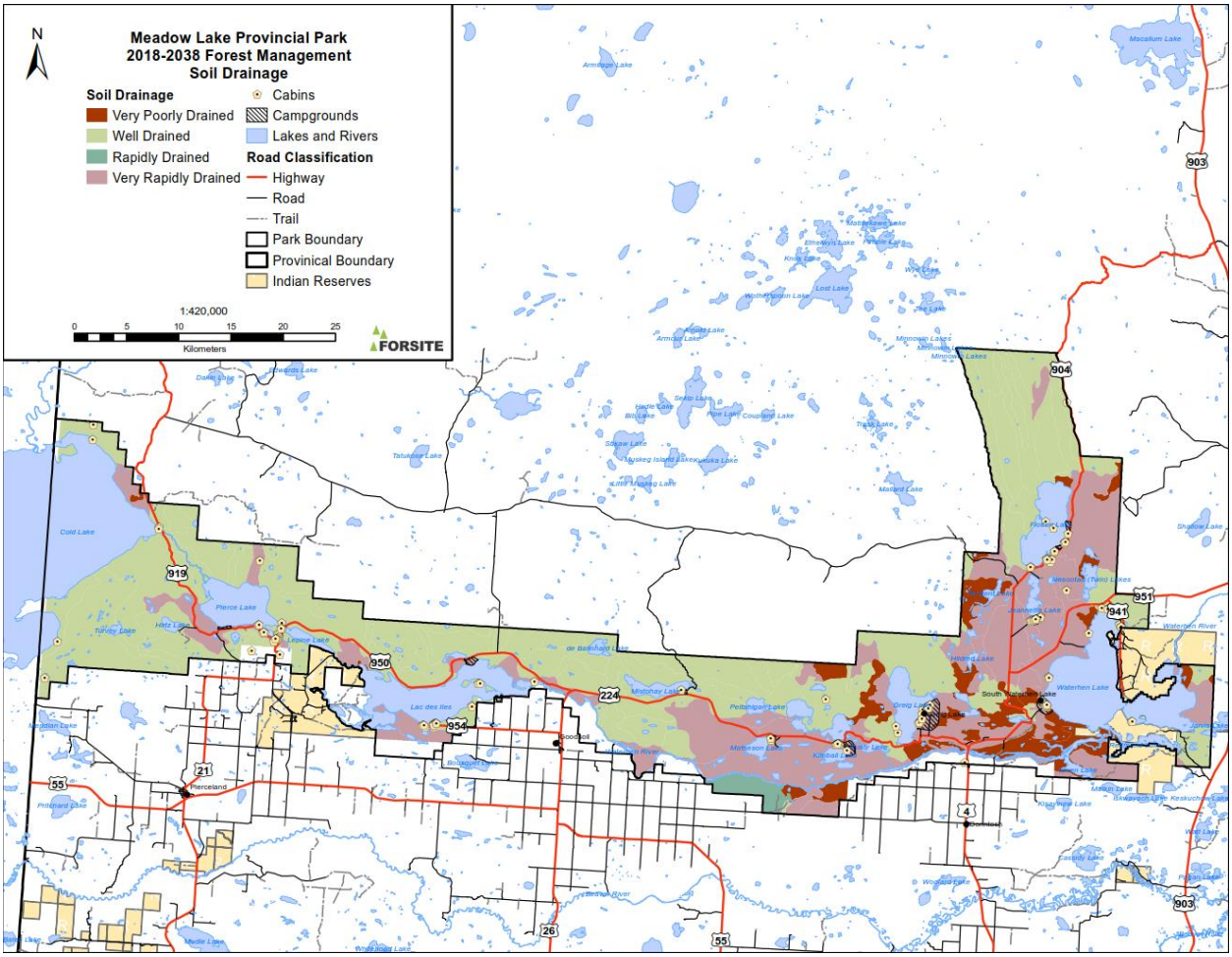


Figure 8 Soil productivity by drainage

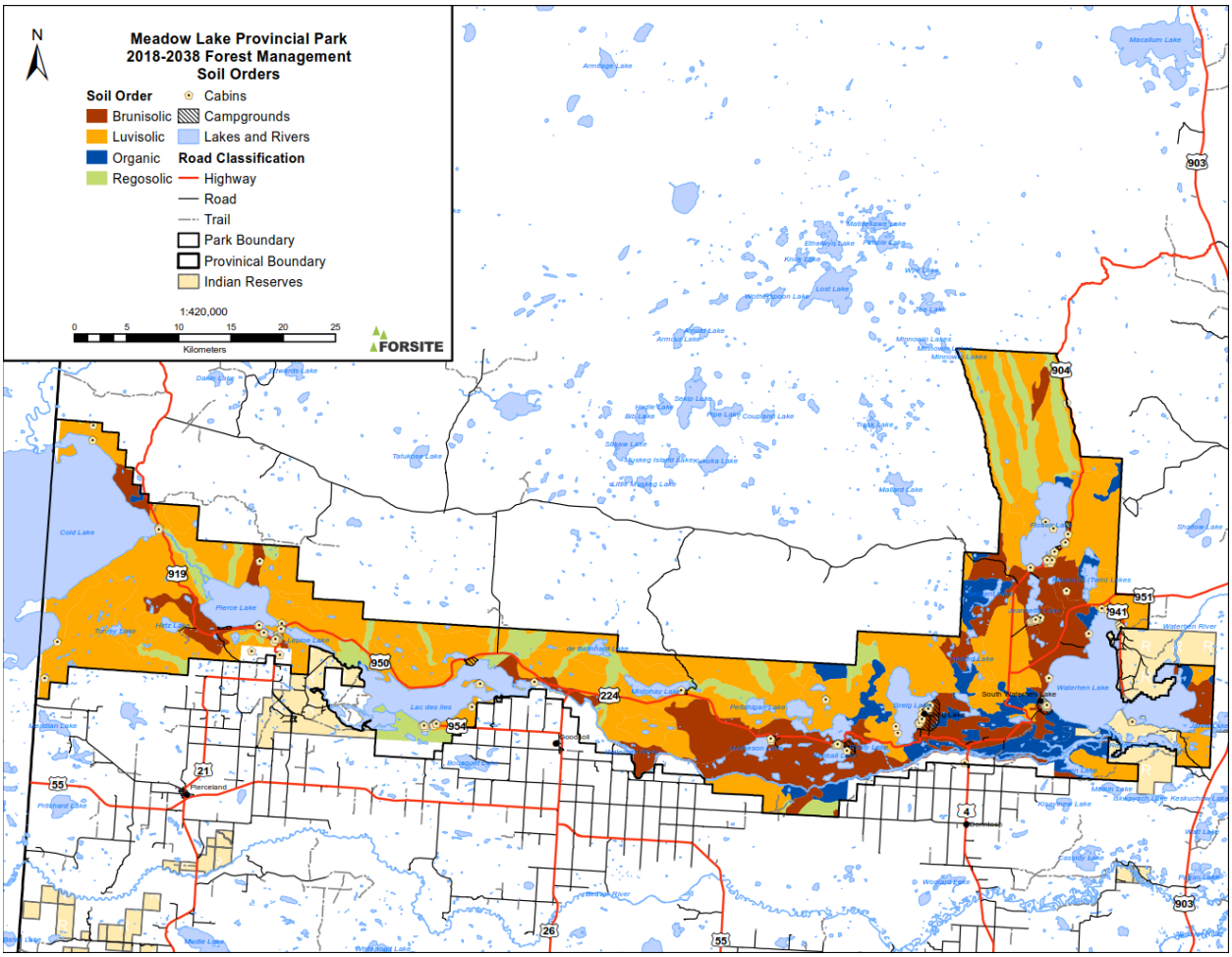


Figure 9 Soil development showing soil orders

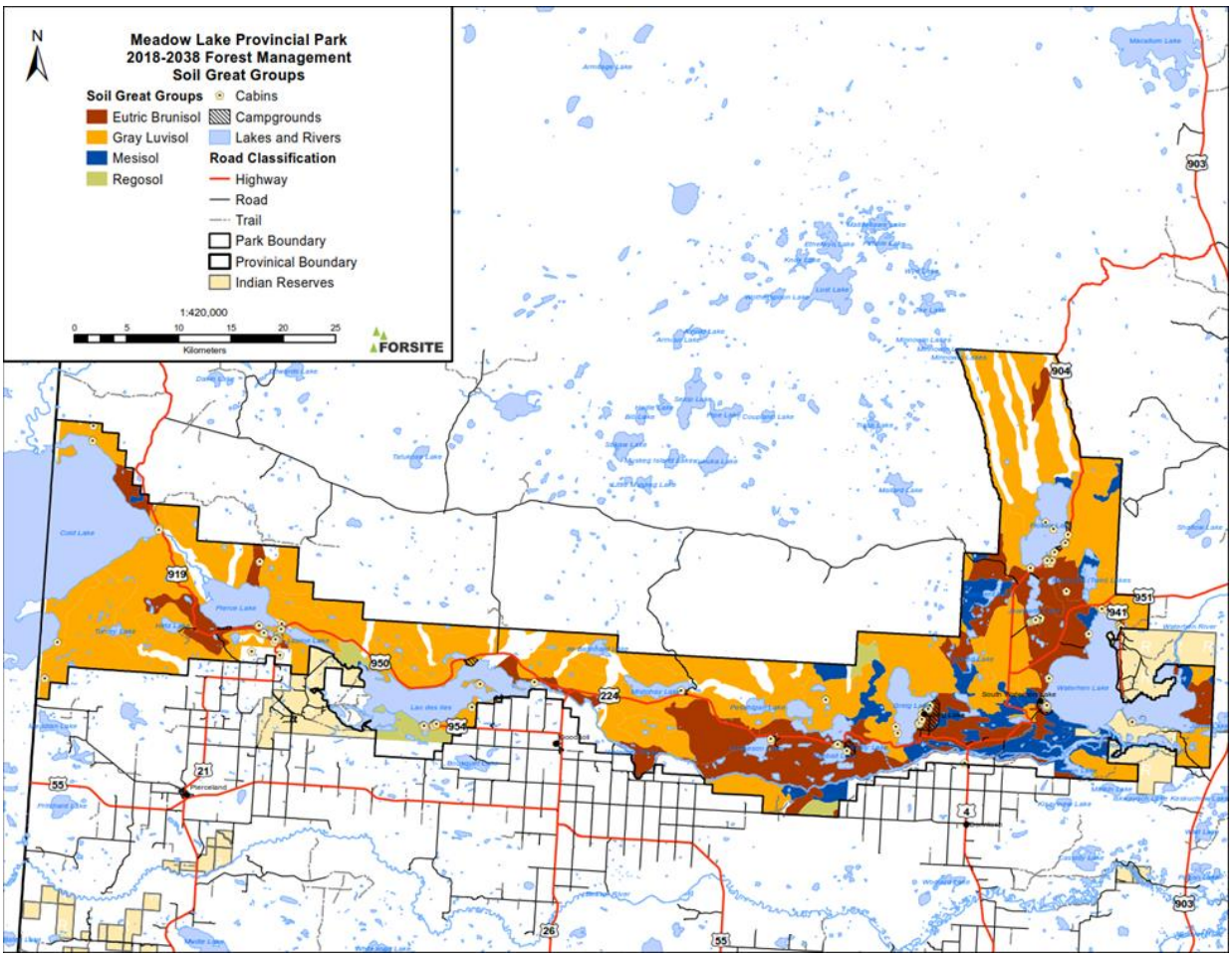


Figure 10 Soil development showing dominant great groups

Luvisols

Luvisolic soils are the dominant soils group of Central Saskatchewan. They occur on loamy glacial till deposits throughout this region. The glacial deposits are derived from sedimentary rocks and have an abundant supply of base cations such as calcium and magnesium. They typically have a grayish, sandy or silty Ae horizon overlying a B horizon that has higher clay content than either the Ae or the C horizon. The C horizon of the Luvisolics usually contains calcium carbonate (lime). When scarified the surface Ae horizon is exposed and the soils often have a grayish appearance and hence this region is known as the Gray soil zone in Saskatchewan.

Brunisols

Brunisolic soils are Boreal forest soils that primarily develop in sandy glacial sediments. Sand is resistant to transformation by weathering and these soils have undergone very limited soil formation. The diagnostic horizon is the Bm horizon, which has undergone only slight chemical change from the original parent material although it may have a bright red colour compared to the underlying C horizon. The sandy glacial sediments contained little or no calcium carbonate and hence carbonate rich C horizons are rare in the Brunisolic soils.

Eutric Brunisol soils occur primarily on glacio-fluvial sand parent materials in Central Saskatchewan of the boundary with the Canadian Shield. The pH of the soils is neutral or basic (i.e., greater than 5.5). The sand deposits may also occur as small inclusions in the glacial till uplands in this region.

Mesisols

The three Great Groups of the Organic Order found in Saskatchewan are based on the degree of decomposition of the middle tier (i.e., from 40 to 120 cm thickness of the peat). The degree of decomposition can be assessed in the field using the Van Post Scale of Decomposition. Mesisols consist of organic soils of which the material in the middle layer is in an intermediate stage of decomposition between fibric and humic.

Water-saturated conditions of wetlands in the forested regions of Saskatchewan commonly lead to the formation of layers of organic matter or peat. Where the high organic content (i.e., > 17% organic carbon) layer is greater than 60-cm thick (if fibrous) or 40-cm thick (if it is more decomposed), the soils are classified into the Organic Order. In Saskatchewan, organic soils occur in two main types of peat lands. Fens are dominated by sedges and brown mosses, and the water is high in dissolved base ions (e.g. calcium, magnesium); bogs are dominated by sphagnum and woody peat and the water has a low base cation content.

Regosols

Regosolic soils lack significant soil formation and occur typically on very young surfaces (such as sand dunes or river floodplains) or unstable surfaces (such as slope positions that experience high rates of soil erosion). Regosolic soils either completely lack a B horizon or have a thin B less than 5 cm thick. In rolling or hummocky agricultural landscapes in Saskatchewan, the soils on the knolls have often been heavily eroded by tillage and the calcium carbonate-rich C horizon become mixed by tillage into the A horizon. This Apk horizon often directly overlies the C horizon. In sand dunes or recent river floodplain deposits there may be no A horizon and the C horizon extends to the surface of the soil.

3.2.8 WATERSHEDS

The Churchill River watershed encompasses the whole Meadow Lake Provincial Park. Its headwaters are in the interior plains of east-central Alberta and in the Boreal Plains and Boreal Shield of west-central Saskatchewan[7]. The Churchill River flows north east into the Hudson Bay. The lake storage within the basin serves to control flows, generally resulting in continuous flow throughout the entire year. The only significant dam is near Sandy Bay, towards the Manitoba border, but it has a relatively small reservoir storage capacity.

3.3 OTHER LAND USES AND VALUES

3.3.1 WILDLIFE

MLPP's forested land, water, plants and ecological processes provide habitat for an array of wildlife species. Common wildlife species found in MLPP include moose, white-tailed deer, elk, black bear, timber wolf, cougar, lynx, snowshoe hare, beaver, and muskrat.

Over 175 bird species use the park as breeding, staging and/or wintering habitat. Some of the more common species include[8]:

[7] The Encyclopedia of Saskatchewan – University of Regina

[8] Saskatchewan Bird Atlas, Saskatchewan Ministry of Environment, https://www.birdscanada.org/birdmon/skatlas/atlas_stats.jsp?orderby=o_spname&type=species&prov=SK&region=SK15&square=

- Alder Flycatcher
- American Bittern
- American Coot
- American Kestrel
- American White Pelican
- American Wigeon
- Bald Eagle
- Black Tern
- Pileated Woodpecker
- Blue Jay
- Broad-Winged Hawk
- Canada Goose
- Canvasback
- Caspian Tern
- Cliff Swallow
- Common Goldeneye
- Common Loon
- Golden Eagle
- Gray Jay
- Great Blue Heron
- Great Gray Owl
- Great-Horned Owl
- Hairy Woodpecker
- Horned Lark
- Killdeer
- Least Sandpiper
- Osprey
- Pectoral Sandpiper
- Black-Backed Woodpecker
- Red-Tailed Hawk
- Ring-Billed Gull
- Ring-Necked Duck
- Semipalmated Sandpiper
- Solitary Sandpiper
- Spruce Grouse
- Tree Swallow
- Tundra Swan
- Whiskey Jack
- Yellow-Bellied Sapsucker

The Migratory Birds Convention Act (MBCA) of 1994 protects most of the migratory birds located in Canada and works in conjunction with the Migratory Birds Convention of 1916 between Canada and the USA. Environment Canada holds the responsibility to develop and implement policies and regulations to ensure the protection of migratory birds, theirs eggs and nests identified in the Convention. The Canadian Wildlife Service branch of Environment Canada administers the MBCA.

Enforcement of the MBCA in Saskatchewan is coordinated by the Wildlife Enforcement Directorate of Environment Canada in cooperation with Environment Canada Game Officers, Government of Saskatchewan Ministry of Environment, the Royal Canadian Mounted Police and provincial law enforcement agencies. (Environment Canada, 2017)

The wildlife serves as a source of income for trappers and big game outfitters, food for local Aboriginal Peoples and enjoyment for sport hunters and wildlife observers. Wildlife harvesting for food and clothing by the area's traditional inhabitants is among the oldest human activity in the forest. Saskatchewan Ministry of Environment is responsible for overall management of MLPP's wildlife resources and the allocation of rights to harvest and use these resources.

3.3.2 FISH

About 22% of MLPP consists of water. The area's lakes and rivers support domestic, commercial, sport and tourist-based fishing opportunities.

Domestic (subsistence) fishing provides an important food source for Saskatchewan's Aboriginal communities. First Nations and Métis people have the right to hunt and fish for food as written in treaties and guaranteed in the Natural Resources Transfer Agreement. These rights are protected in the Canadian Constitution and are given priority in resource allocation over all other users.

Sport fishing is a major recreational activity in MLPP. Pike, walleye, and lake trout are among the most popular sport fishing species in the region. In addition to personal enjoyment, recreational fishing provides income and employment to fishing outfitters.

3.3.3 HUNTING AND TRAPPING

There are currently 4 individual Fur Conservation Areas (FCA's) within MLPP: M-38, M-38b, M-94, and M-37 (Figure 11). FCA's are typically associated with nearby communities and managed through the Northern Saskatchewan Trappers Association (NSTA). Fur licences are granted to registered members to trap in portions of their local FCA. The 4 FCA's are used by trappers from the predominantly Aboriginal communities on or adjacent to the park.

A diverse species mix of animals are hunted and trapped in MLPP (Table 3). Trapping generates an annual provincial revenue of between $1 and $6 million[9].

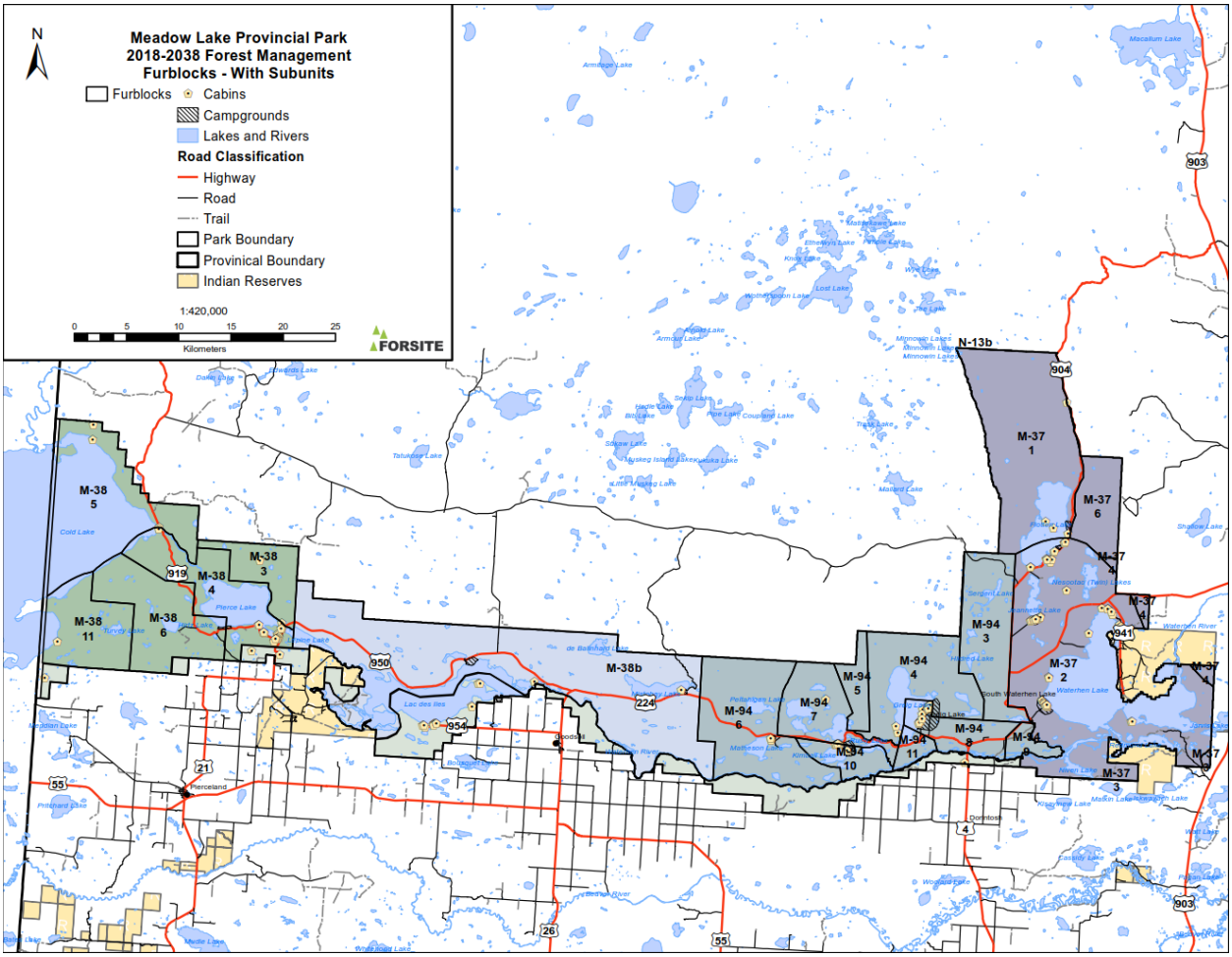


Figure 11 Furblocks within MLPP

[9] Saskatchewan Wildlife Management Report 2016, MOE Fish, Wildlife and Lands Branch, July 2017

Table 3 Species hunted and trapped in MLPP

Big Game	Birds	Furbearers	
White Tail Deer	Sharp-tailed Grouse	Bear	Marten
Moose	Ruffed grouse	Beaver	Mink
Black Bear	Spruce Grouse	Coyote	Muskrat
	Geese: All Species	Fisher	Otter
	Ducks: All Species	Fox	Squirrel
	Wilson's Snipe	Lynx	Weasel
			Wolf

Adapted from Saskatchewan Wildlife Management Report 2016, MOE Fish, Wildlife and Lands Branch, July 2017

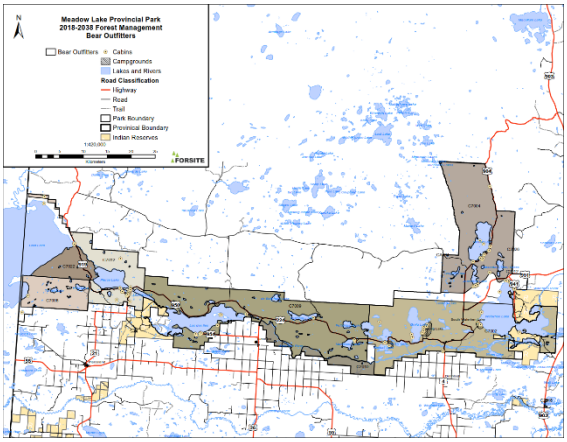
During the 1980s, the number of northern trappers declined only slightly compared to a drastic reduction in the number of southern trappers. Although the size and the value of the northern harvest have since decreased significantly, there have been positive trends in harvest over the last couple of years. This may signify increasing numbers.

The future of the trapping industry depends heavily on fur prices and access to European, and more recently, Chinese markets. If fur prices continue to be low, then trapping activity will be low. If there is a renewed interest in fur coats and other fur products, rising prices could rejuvenate the industry and increase trapping levels.

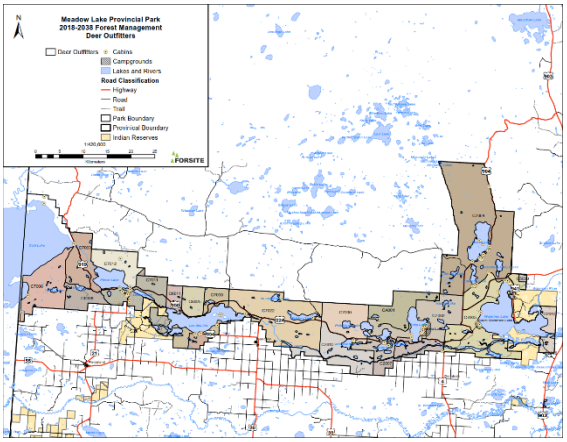
A small amount of cultural / recreational trapping may also occur in MLPP area, with the animals trapped for food and fur. This activity could increase in the future as younger generations of Aboriginal People take up this activity to restore their cultural identity and enjoy the outdoors.

Subsistence hunting is widely practiced by Aboriginal communities in northern Saskatchewan. The main species hunted for sustenance meat is Moose but also harvested to a lesser extent is bear, deer, waterfowl, grouse and snowshoe hare. Since Aboriginal hunting is an unregulated activity data on number of hunters and harvest levels is not available.

There are approximately 625 Licenced hunting outfitters in Saskatchewan with up to 33 operating exclusively within MLPP (see Figure 12 for outfitter zones). Commercial outfitters are an important employer and revenue generator within the region.



Bear



White Tail Deer

Figure 12 Outfitter Licence boundaries in MLPP for Bear and White Tail Deer

Sport hunting is open to both Canadian and non-resident hunters with limits, season and other restrictions set by the Ministry of Environment. Wildlife Management Zone 69 covers MLPP.

3.3.4 ARCHAEOLOGICAL, CULTURAL AND HERITAGE SITES

Archaeological heritage sites consist of archaeological and historic sites recognized under the Heritage Property Act. MLPP contains sites that are known to the Heritage Conservation Branch of the Ministry of Parks, Culture and Sport. Areas in MLPP with the highest probability of archaeological heritage sites are areas surrounding large lakes, and the Waterhen River. The Heritage Property Act provides for the preservation, interpretation and development of heritage property in Saskatchewan.

Cultural sites consist of sites identified by local Aboriginal groups that have traditional and cultural importance. These sites include, but are not limited to, burial sites, ceremonial grounds, and sacred sites.

The Ministry of Parks, Culture and Sport plays an important role to ensure that irreplaceable and non-renewable heritage is protected and preserved. These heritage resources contribute to our understanding and appreciation of Saskatchewan's past, its people and its culture.

The Heritage Property Act of Saskatchewan broadly defines heritage property as:

- Archaeological objects;
- Paleontological objects; and,
- Any property of interest for its architectural, historical, cultural, environmental, archaeological, paleontological, aesthetic or scientific value.

In Saskatchewan, the main heritage resources that have been traditionally recognized, and are actively managed and regulated, include:

- Archaeological heritage sites and objects reflecting First Nations and later Euro-Canadian settlement and use of land;
- Paleontological heritage sites and objects, including dinosaur fossil localities and stratotypes and,
- Built heritage properties and structures of historical and architectural importance.

Other types of heritage locations are only now being recognized as heritage resources.

These include:

- "traditional cultural properties" (associated with the cultural practices and beliefs of a living community, and are central to the cultural and historical identity of that community); and
- "Cultural heritage landscapes" (geographical areas that have been modified or influenced or give special cultural meaning by people)

3.3.5 NON-TIMBER FOREST PRODUCTS

Aboriginal People who live adjacent to the MLPP have traditionally gathered firewood, berries, medicinal plants, branches and birch bark from the forest for food, health remedies and crafts.

MLPP currently allows for the traditional harvest of non-timber forest products.

3.3.6 RECREATIONAL ACTIVITIES

Being a provincial park, MLPP boasts a variety of recreational activities, including fishing, hiking, and camping. Park managed trails span 653km through the park for outdoor enthusiasts. There are cabin developments and remote cabins throughout the park. There are also a number of campgrounds in the park, as shown below.

Sandy Beach Campground	Greig Lake Campground
Murray Doell Campground	Waterhen Campground
Mistohay Lake Campground	South Flotten Campground
Matheson Lake Campground	North Flotten Campground
Kimball Lake Campground	

Figure 13 displays the locations of campgrounds, cabins, and park trails throughout MLPP.

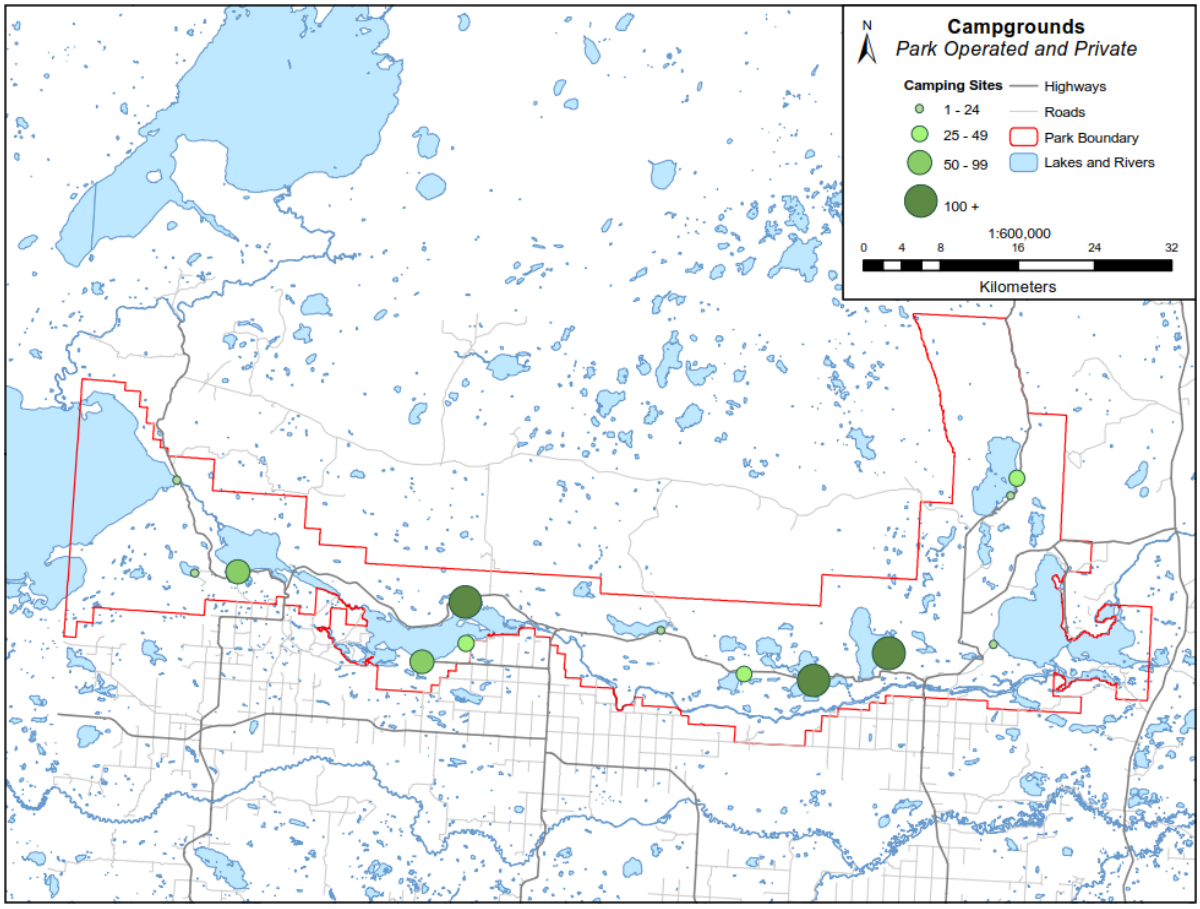


Figure 13 Recreation areas in MLPP

3.3.7 GRAZING

There are grazing permits within a south portion of MLPP. The grazing areas can be seen in Figure 14 below. Parks Division has been completing range assessments in the grazing areas to monitor the quality of the grazing lands and adjust the grazing units to ensure the integrity of the forage cover.

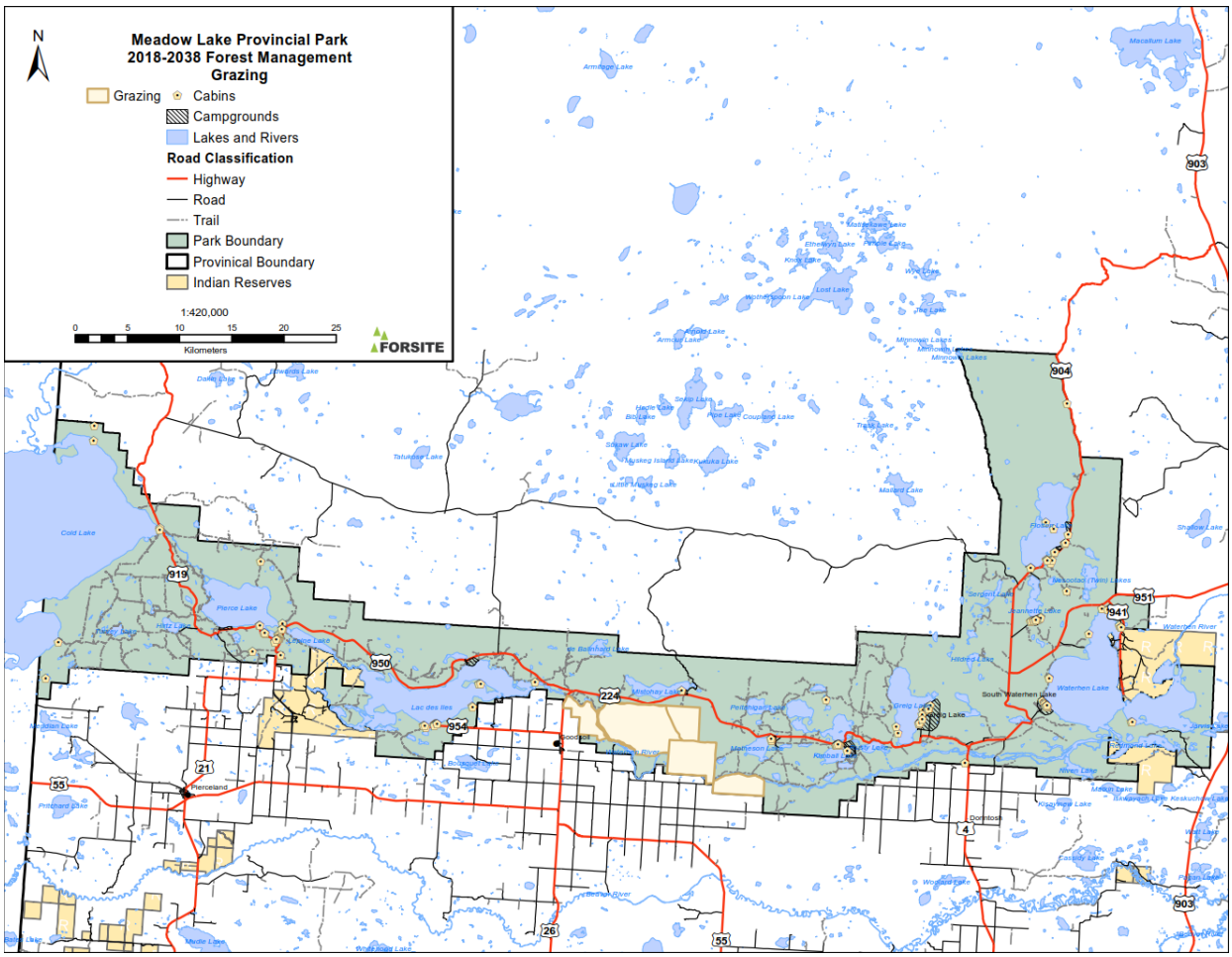


Figure 14 Grazing activity within MLPP

3.3.8 VISUALLY SENSITIVE AREAS

Visual sensitive areas within the park will be developed by Park Management. The intent is to apply visual quality objectives in areas adjacent to highways, campgrounds, recreational lakes and rivers, and other important viewscapes where appropriate.

3.3.9 SPECIES AT RISK

In Saskatchewan, the Wildlife Act, the Wild Species at Risk Regulations and the federal Species at Risk Act (SARA) provide the mechanisms for both protecting wildlife and species at risk. The intent of the legislation is to prevent native species from becoming extirpated or extinct, to provide for the recovery of extirpated, endangered or threatened species, and to encourage the management of other species to prevent them from becoming threatened or endangered.

Within MLPP, there are a number of species that are identified as "at risk" by the Species at Risk Act (SARA) and as found on the provincial Conservation Data Centre list relevant to MLPP[10] (Table 4).

The woodland caribou is a species of key concern in MLPP. The federal government has developed a recovery strategy and the province of Saskatchewan is currently preparing a range plan for this species.

Figure 15 below displays where rare species inhabit MLPP.

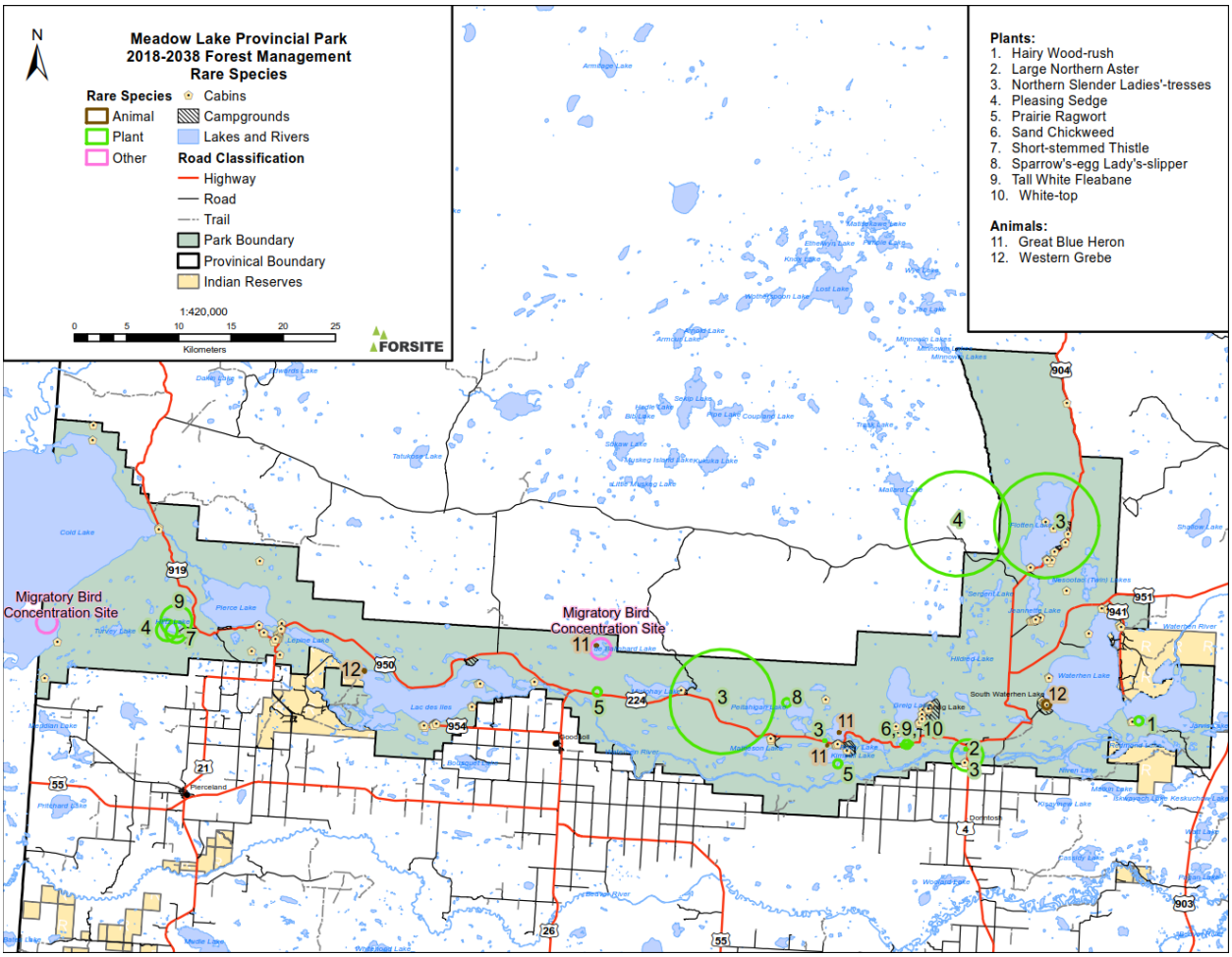


Figure 15 Rare species within MLPP

[10] A query was conducted of the Conservation Data Centre list for species at risk that are filtered for the province and relevant ecoregions/landscape areas. Not all of these species are likely to be impacted by forest management activities given their habitat.

Table 4 Species at risk (MLPP)

Type of Species	Scientific Name	Common Name	Global Rank	National Rank	Subnational Rank	COSEWIC Status
Plant	*Canadanthus modestus*	Large Northern Aster	G5	N5	S3	
	Carex leptonervia	Pleasing Sedge	G5	N5	S1	
	Cirsium drummondii	Short-stemmed Thistle	G5	N4N5	S3	
	Cypripedium passerinum	Sparrow's-egg Lady's-slipper	G5	N5	S3	
	Erigeron elatus	Tall White Fleabane	G4G5	N4N5	S3	
	Erigeron strigosus	White-top	G5	N5	S3	
	Luzula acuminata var. acuminata	Hairy Wood-rush	G5T5	N5	S1	
	Spiranthes lacera var. lacera	Northern Slender Ladies'-tresses	G5T5	N5	S3	
Animal	*Aechmophorus occidentalis*	Western Grebe	G5	N5B,N3N	S3B,S3M	Special Concern
	Ardea herodias	Great Blue Heron	G5	N5B	S5B	Special Concern
	Rangifer tarandus caribou	Woodland Caribou	G5T5	N5	S3	Threatened

3.3.10 MINERAL DISPOSITIONS

There are no known active mineral dispositions in MLPP.

3.3.11 OIL AND GAS EXPLORATION

Saskatchewan is Canada's second largest oil producer and third largest producer of natural gas[11]. In 2017, Saskatchewan produced 176.9 million barrels of oil with an approximate gross value of $9.02 billion[12]. In 2017 Saskatchewan produced 4.1 trillion m^3 of natural gas available for sale worth $346.3 million[13]. Figure 16 shows the location of current gas dispositions and the associated status located within MLPP.

[11] https://www.capp.ca/canadian-oil-and-natural-gas/industry-across-canada

[12] http://publications.gov.sk.ca/documents/310/97958-2017%20Crude%20Oil%20Volume%20And%20Value%20Summary_201808.pdf

[13] http://publications.gov.sk.ca/documents/310/97959-2017%20Natural%20Gas%20Volume%20And%20Value%20Summary_201808.pdf

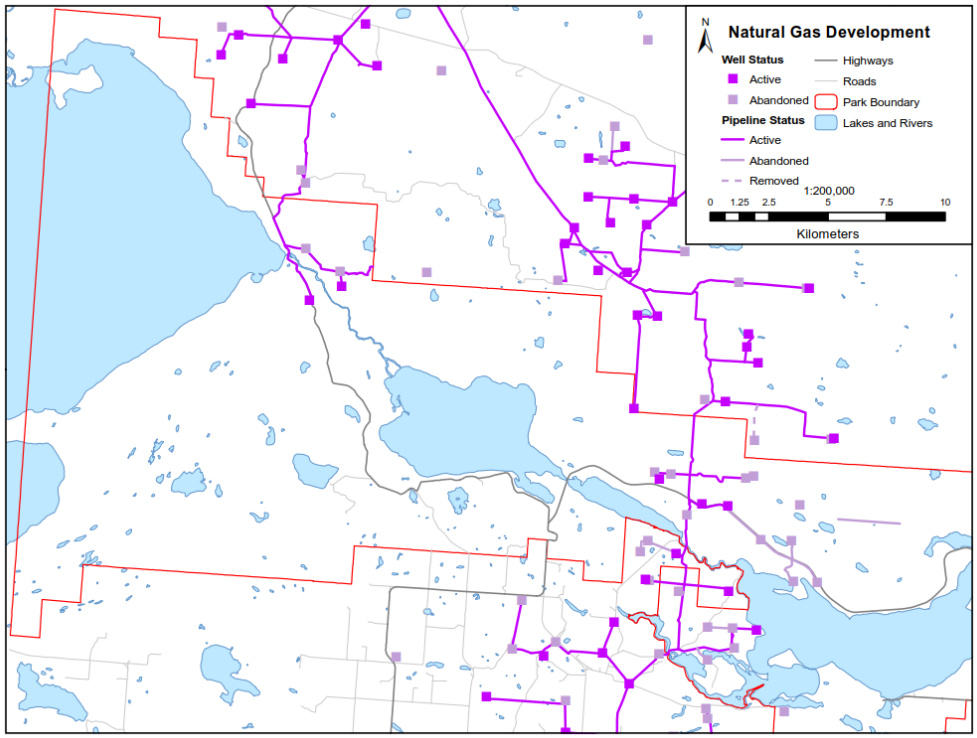


Figure 16 Location of Active and Inactive Natural Gas Developments.

3.3.12 LAND DISPOSITIONS AND LEASES

The Ministry of Environment has leased a number of other parcels within MLPP for non-timber uses. These include gravel and quarries, trapper, outfitter and recreation cabins, oil and gas wells, etc. Figure 17 shows the locations of these dispositions in the park.

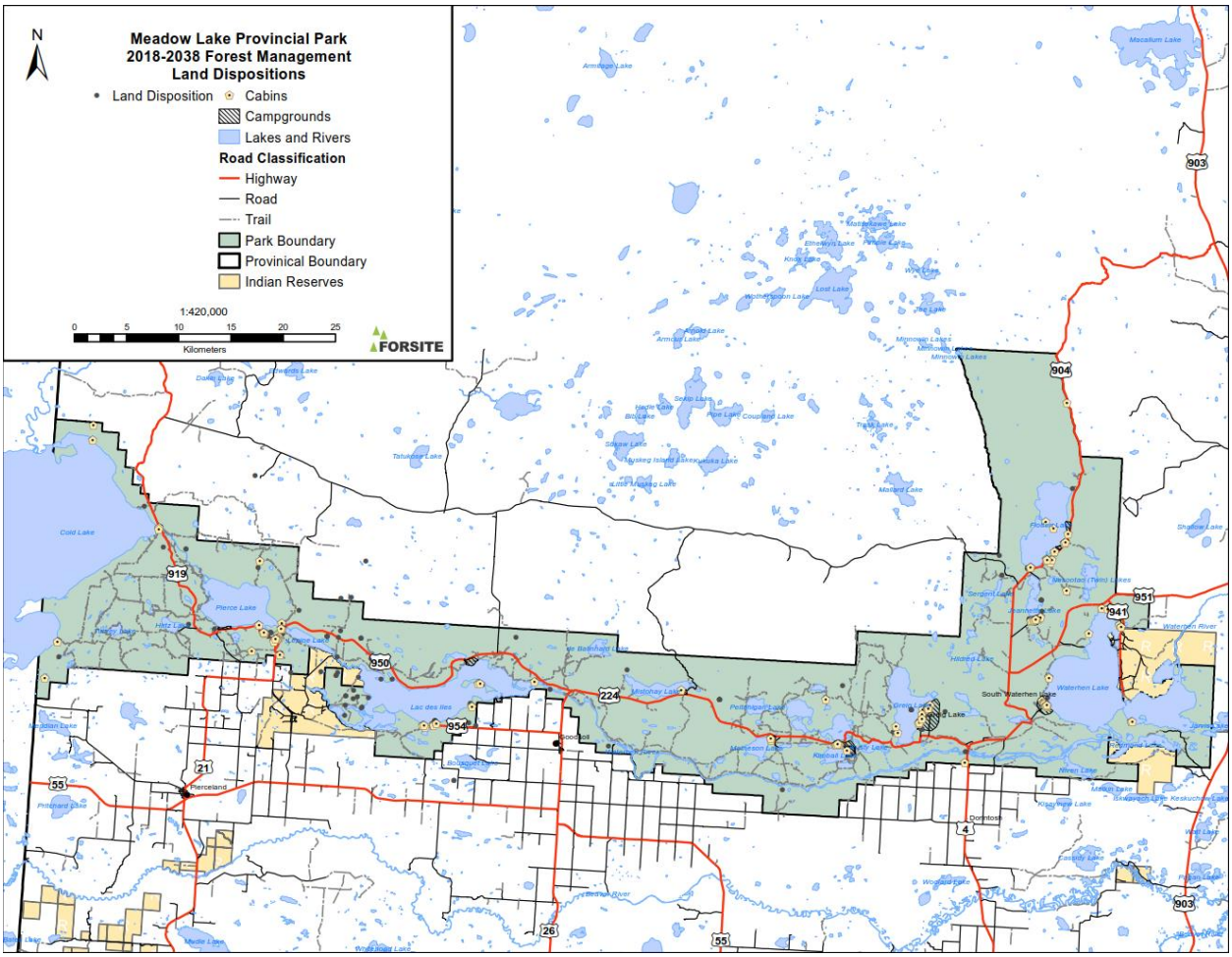


Figure 17 Non-timber dispositions on MLPP

3.3.13 LINEAR DEVELOPMENTS

Figure 18 provides an overview of the linear developments located in MLPP. Currently, there is approximately 295 km of highway, road, and trail not managed by the park, and 653km of trails managed by the park. Many of the remote park trails were impacted by an early snow in the fall of 2016 and are not planned to be opened again.

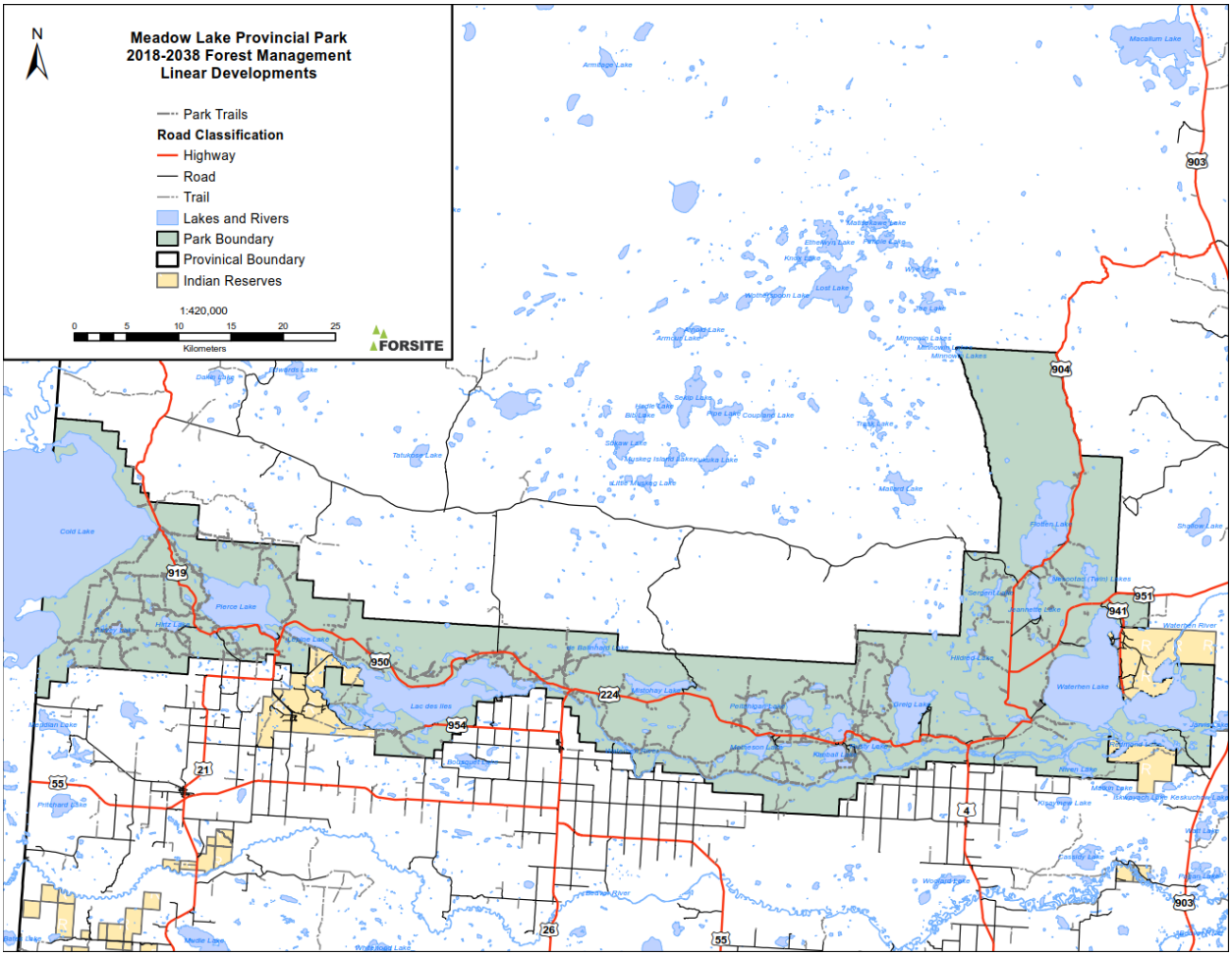


Figure 18 Linear developments within MLPP

4 Current Forest Conditions

4.1 LANDBASE SUMMARY

Table 5 below describes the area with the extents of the current MLPP land base and differentiates between the areas available for forest management and areas designated as unavailable and excluded (such as cabin developments, campgrounds, and grazing) from the plan. The gross area of the park is 168,964 hectares. Not all area within the extent of the park is available for management. The following table itemizes the areas excluded from the managed forest land base. For each land base element the total area within that classification is noted, as well as the percent of the total area.

Table 5 Management area land summary

Land Base element	Total Area (ha)	% Total Area
Total Park Area	168,963.6	100.0%
Non Productive Forest	63,903.0	37.8%
Productive Forest	105,060.6	62.2%
The following dispositions are productive forest lands currently not supporting forest growth available for forest management.		
Cabins (Buffered 100m)	474.1	0.3%
Campgrounds	880.6	0.5%
Grazing	4,524.9	2.7%

4.2 FOREST ATTRIBUTES

Table 6 and Table 7 describe and summarize the total productive forest area for MLPP by Provincial Forest Type (PFT) and seral stage. Figure 19 displays the graphical representation of this summary.

Table 6 Description of Provincial Forest Types (PFT) in Saskatchewan

PFT	Broad Description of Forest Type and Non-Forested Areas
BSJ	Black spruce and Jack pine dominated mixed softwood stands
BSL	Black spruce or tamarack/larch dominated softwood stands
HPM	Hardwood with pine mixedwood
HSM	Hardwood with spruce (bS, wS, bF, and tL) mixedwood
JLP	Jack or lodgepole pine dominated softwood stands
PMW	Pine dominated mixedwood stands
SMW	Spruce dominated mixedwood stands
TAB	Trembling aspen or white birch dominated hardwood stands
WSF	White spruce or balsam fir dominated softwood stands

Table 7 Area by Provincial Forest Type (PFT) and seral stage

Area (Ha) by Seral Stage						
PFT	**Young (0-20 yrs.)**	**Immature H/HS: (21-70 yrs.) S/SH: (21-80 yrs.)**	**Mature H/HS: (71-90 yrs.) S/SH: (81-100 yrs.)**	**Old H/HS: (91-110 yrs.) S/SH: (101-120 yrs.)**	**Very Old H/HS: (>110 yrs.) S/SH: (>120 yrs.)**	**Total Area (ha)**
BSJ	835	1,289	543	166	291	3,125
BSL	582	562	726	50	425	2,346
HPM	359	884	1,806	1,015	186	4,250
HSM	562	257	1,806	3,502	4,120	10,248
JLP	1,815	3,155	1,563	196	1,557	8,287
PMW	596	2,417	1,243	151	500	4,907
SMW	289	616	629	855	2,726	5,144
TAB	997	8,274	28,655	26,729	637	65,292
WSF	84	37	73	166	1,132	1,493
Total	6,119	17,492	37,044	32,832	11,574	105,061

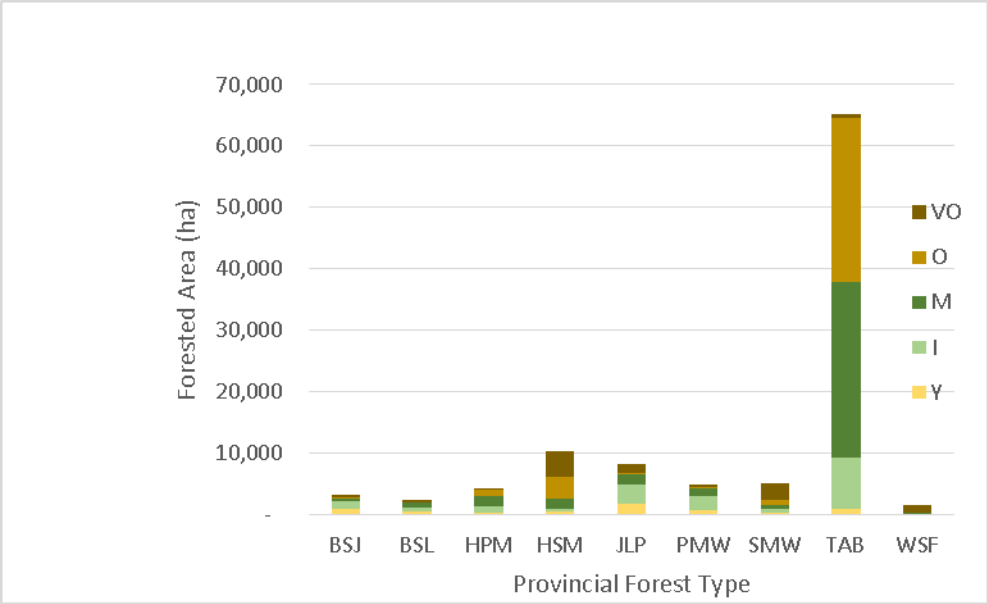


Figure 19 Productive forest area by PFT and seral stage

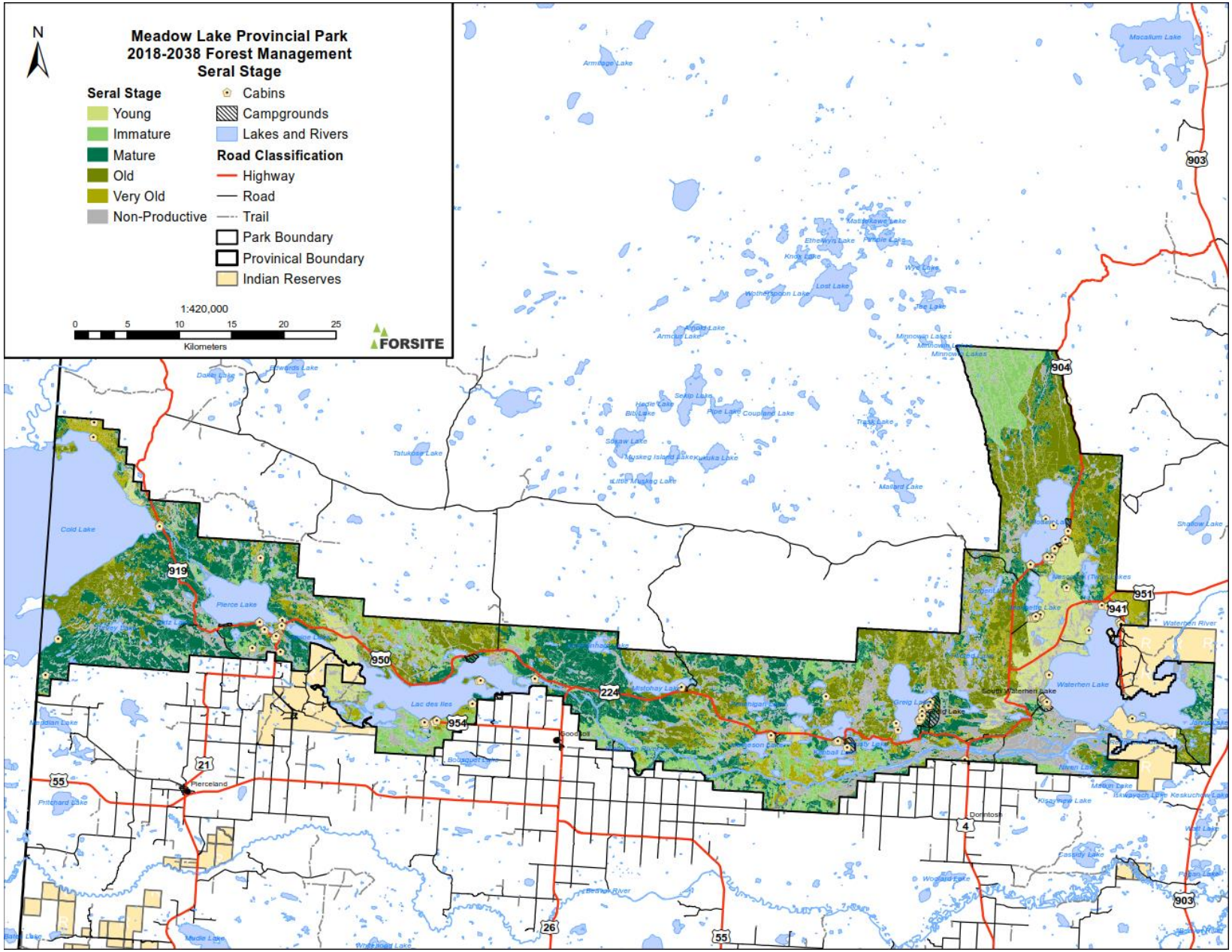


Figure 20 Productive forest by seral stage in MLPP

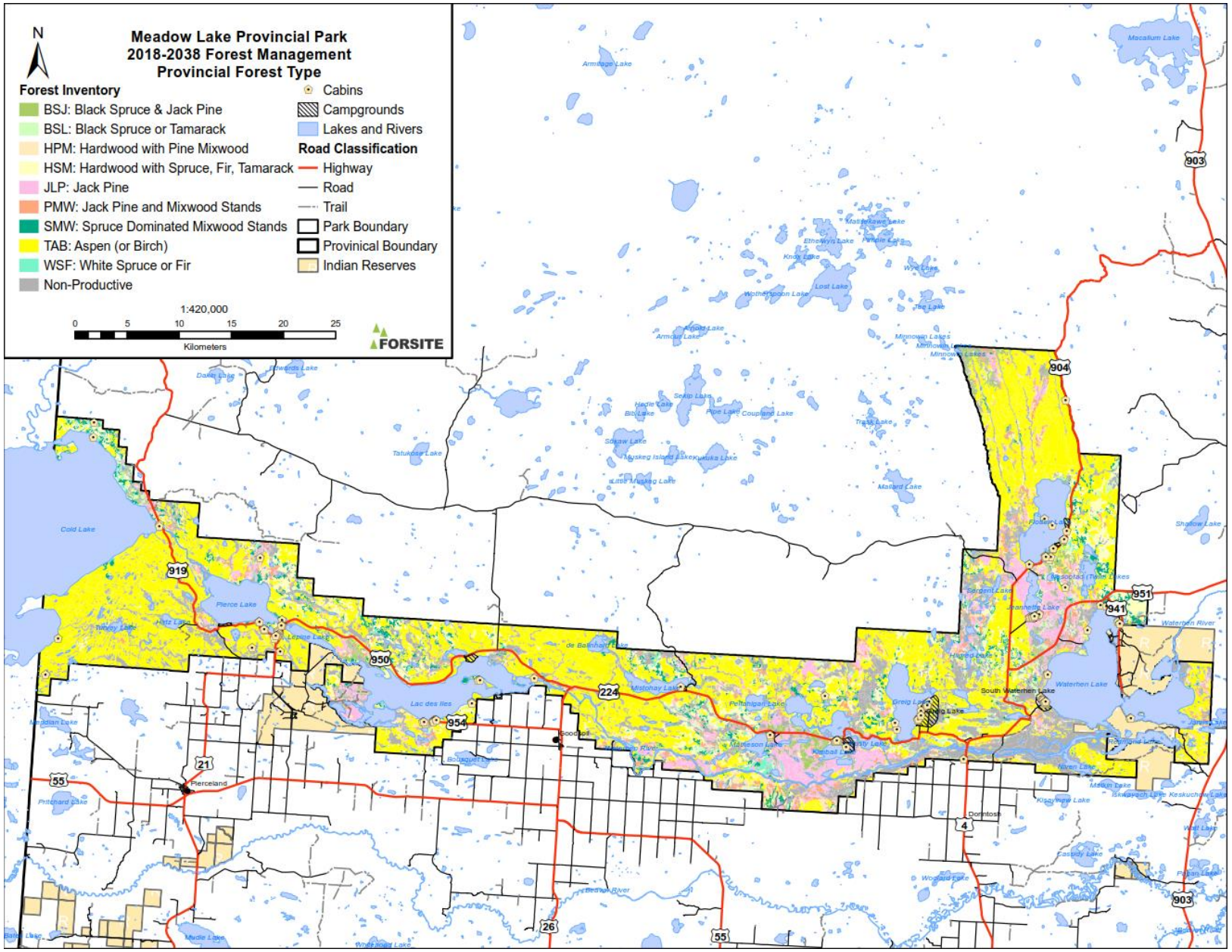


Figure 21 Productive forest by PFT in MLPP

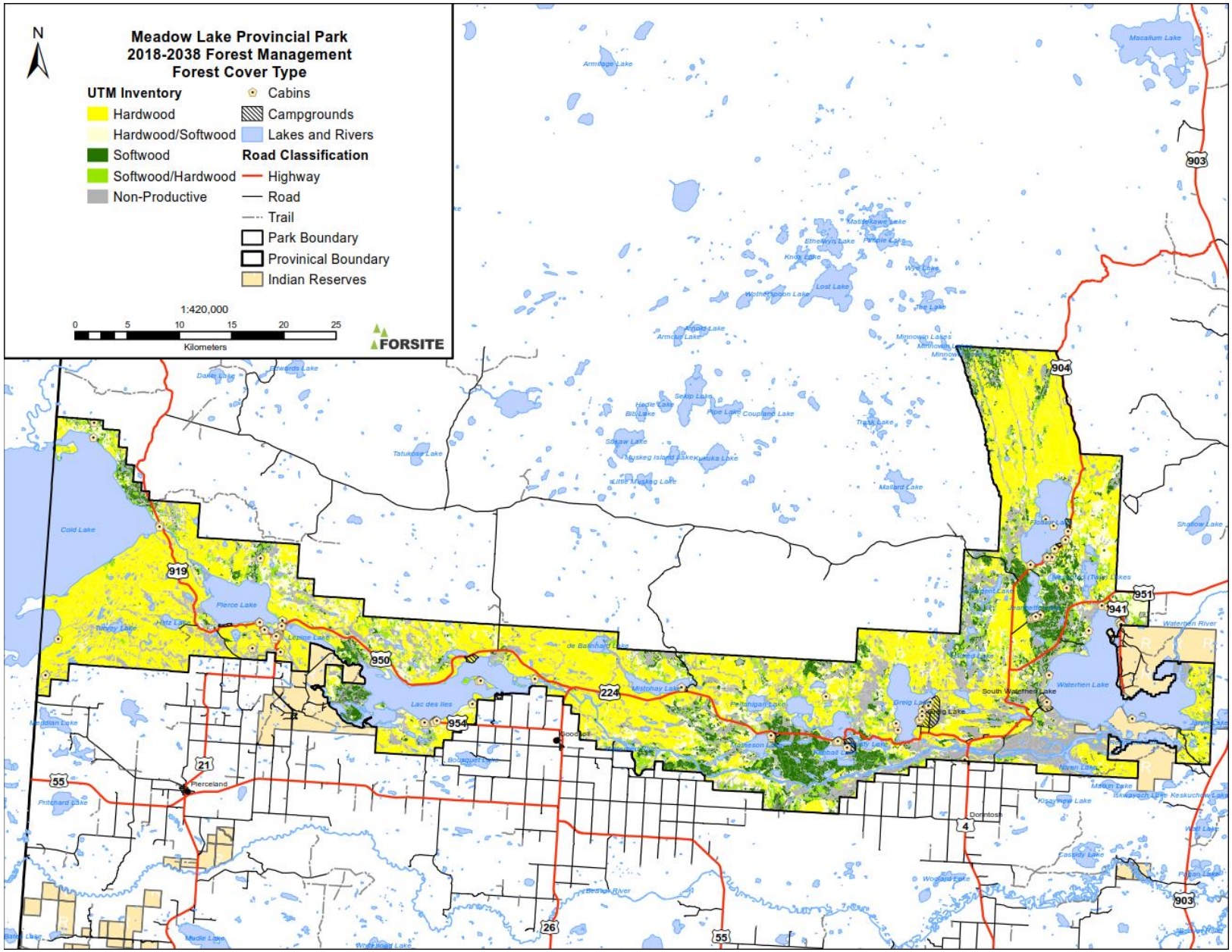


Figure 22 Productive forest area by species type in MLPP

4.3 NATURAL DISTURBANCE

4.3.1 FIRE

Natural disturbance plays a dominant role in the ecology of the boreal forest and fire is the primary natural disturbance agent affecting large amounts of forest each year (Table 8). Fire acts as a catalyst for stand renewal and is a key agent for the maintenance of forest health and vigour[14]; fire plays an important role in controlling insect and disease outbreaks within the forest. If left to die of old age, disease, or from insect damage, many forest stands will not be replaced by healthy, vigorous new growth. Instead, sparse, ecologically different stands can result and grass, scrubby brush and balsam fir will become more common.

Most plant and tree species in the boreal forest are adapted to regenerate following fire, creating even aged forest stands. Trembling aspen and white birch sprout back from their roots immediately after a fire. Jack pine and black spruce cones require heat to open. The heat of a fire opens the cones so that the seeds are released onto the newly burned forest floor. Softwood species depend on fire burning away much of the forest floor's organic (duff) layer so that their seeds can germinate on exposed mineral soil. White spruce regenerate from seed blown onto exposed soil by the wind from nearby unburned patches of forest. Furthermore, fire results in a pulse of nutrients being released from burned trees, shrubs and other organic materials which promote the growth of newly suckering and germinating seedlings in the first few years following a fire.

Table 8 Area affected by natural disturbances

PFT	Seral Stage	Area affected (hectares)			
		Fire	DMT	FTC	Total
BSJ	YOUNG	338	84	150	572
	IMMATURE	578	109	199	886
	MATURE	178	10	132	320
	OLD	210	11	93	314
	VERY OLD	109	48	52	209
	Total	1,413	262	626	2,301
BSL	YOUNG	109	6	207	322
	IMMATURE	47	58	254	359
	MATURE	330	10	334	674
	OLD	47	0	15	62
	VERY OLD	96	7	205	308
	Total	629	82	1,015	1,726

[14] Report on Saskatchewan Forests, 2012

PFT	Seral Stage	Fire	DMT	FTC	Total
HPM	YOUNG	46	0	19	65
	IMMATURE	138	62	600	800
	MATURE	205	15	883	1,103
	OLD	50	44	272	366
	VERY OLD	30	6	77	113
	Total	468	127	1,851	2,446
HSM	YOUNG	216	0	123	339
	IMMATURE	36	10	192	238
	MATURE	104	13	705	822
	OLD	169	30	1,918	2,117
	VERY OLD	73	7	2,230	2,310
	Total	599	61	5,168	5,828
JLP	YOUNG	381	283	93	757
	IMMATURE	164	572	841	1,577
	MATURE	822	56	390	1,268
	OLD	214	26	56	296
	VERY OLD	384	544	139	1,067
	Total	1,965	1,481	1,519	4,965
PMW	YOUNG	105	23	32	160
	IMMATURE	490	124	1,217	1,831
	MATURE	125	97	294	516
	OLD	30	4	75	109
	VERY OLD	20	31	250	301
	Total	771	278	1,868	2,917
SMW	YOUNG	97	4	117	218
	IMMATURE	39	13	304	356
	MATURE	72	12	338	422
	OLD	40	0	386	426
	VERY OLD	69	17	1,393	1,479
	Total	316	45	2,538	2,899

PFT	Seral Stage	Fire	DMT	FTC	Total
TAB	YOUNG	444	0	319	763
	IMMATURE	2,966	85	5,029	8,080
	MATURE	186	37	20,444	20,667
	OLD	325	171	15,423	15,919
	VERY OLD	8	0	411	419
	Total	3,929	294	41,627	45,850
WSF	YOUNG	22	0	16	38
	IMMATURE	3	1	2	6
	MATURE	0	0	45	45
	OLD	41	0	41	82
	VERY OLD	21	10	405	436
	Total	86	11	510	607
Total		10,177	2,641	56,721	69,539

Available fire records were obtained from the Ministry of Environment. Eight known fires have occurred in the years of 1993, 1995, 1998, 2002, 2006, 2009, 2011, and 2018 and their locations are shown in Figure 23. The 2018 Tuff fire burned the largest gross area within the park; however, the 1995 Moose fire that occurred in the north-eastern portion of the park in burned the most forest area. Figure 24 provides the sizes of the fires that occurred in the park by year and Figure 25 shows the area disturbed by fire by PFT and seral stage.

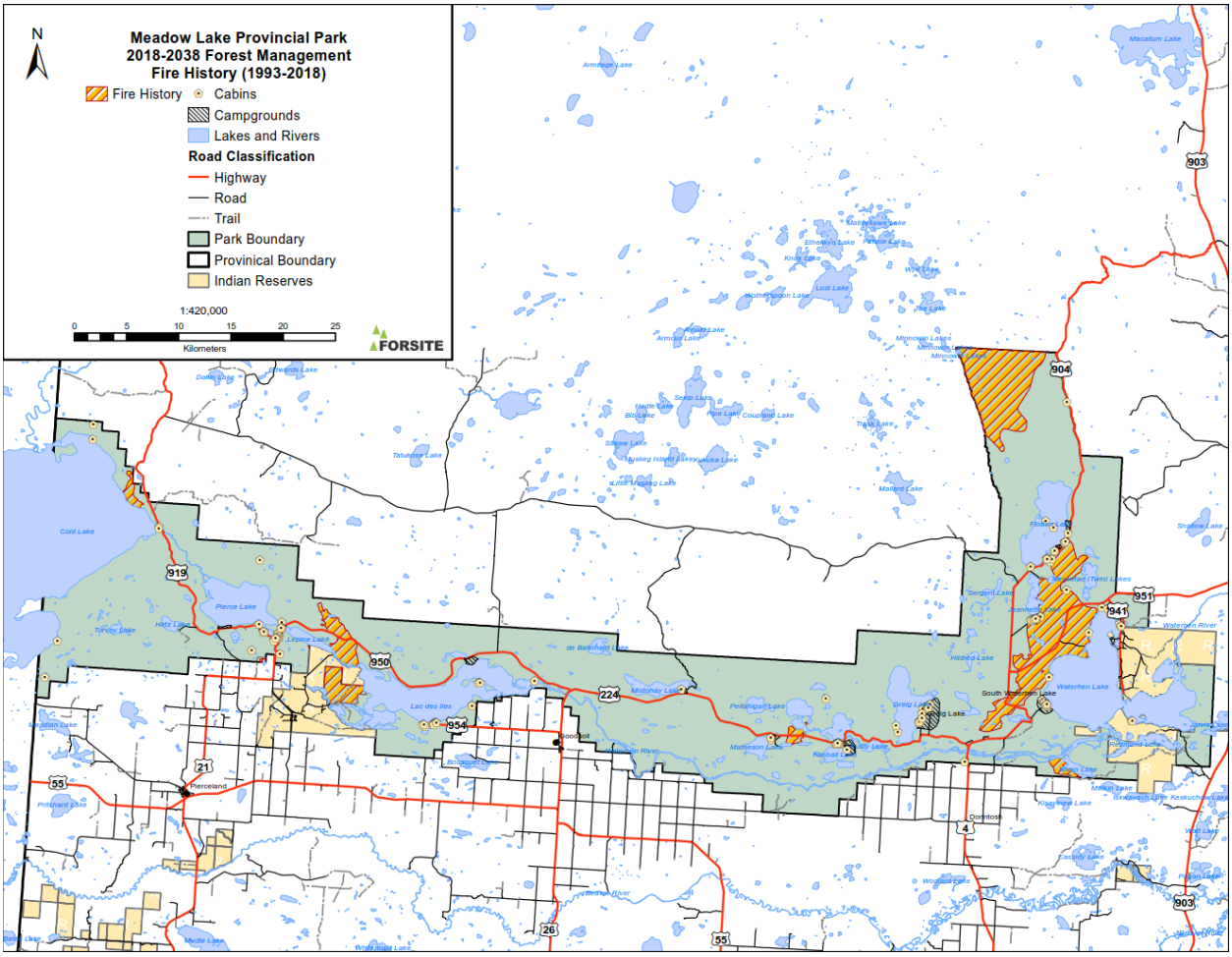


Figure 23 Location of fires 1993-2018 in MLPP

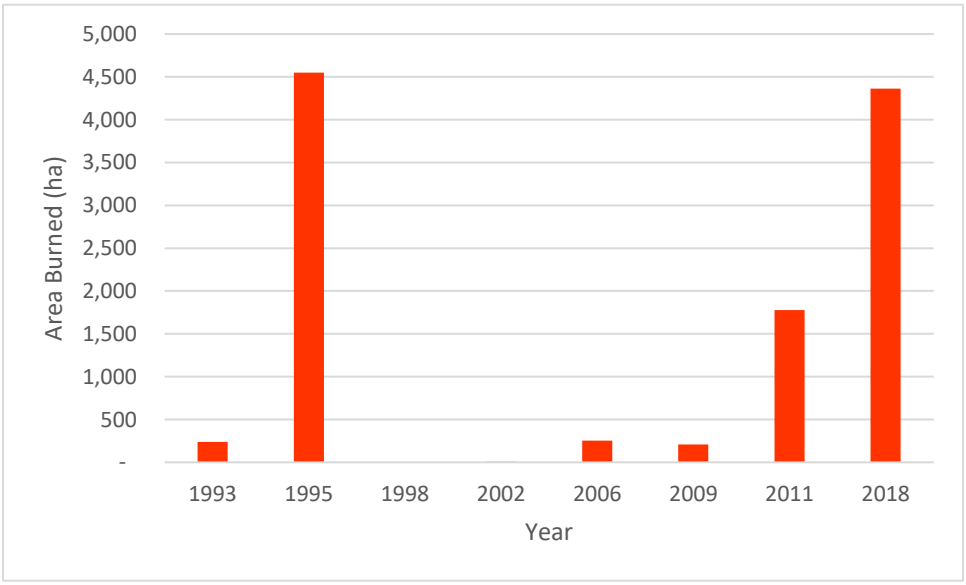


Figure 24 Area burned 1993-2018 in MLPP

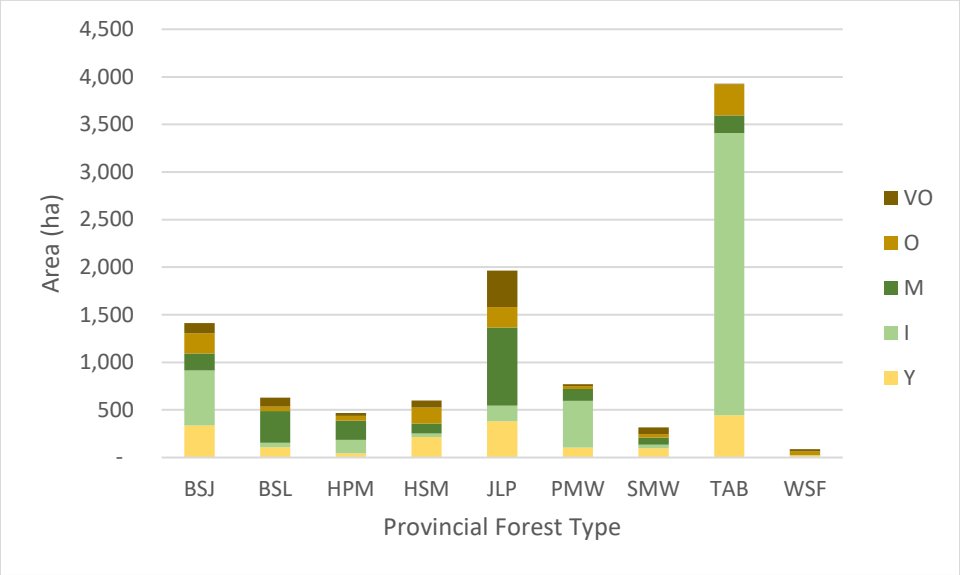


Figure 25 Area disturbed from fire by PFT and seral stage

Dr. David Andison has conducted detailed research on wildfire events within Saskatchewan forests to understand and quantify patterns of burning within individual fire events. His research focused on three topic areas: 1) Disturbance event patterns[15] ; 2) Island remnant patterns[16] , and; 3) Event composition and spatial controls[17] . The key finding from each of the three areas in relation to MLPP are summarized below:

- In general, wildfires in Saskatchewan create a single large contiguous disturbed patch, which may or may not have associated smaller patches. Disturbed patches become significantly more complex as they increase in size;
- The corridor matrix remnant (unburned vegetation between disturbed patches) area is absent from fire events smaller than 150 ha. In events larger than 150 ha, an average of 28% of the total area is in corridor matrix remnants;
- On average island remnants (areas with greater than 5% tree survival) account for 27% of the disturbed area, with a high degree of variability.
- Majority of burn and residual patterns can be captured by one of three parameters: soil moisture, topography or major vegetation type. Soil moisture is the simplest and most robust parameter; topography is simple, but highly correlated with soil moisture and more subjective to define, and; major vegetation type can be used to differentiate various burn and retention probabilities, but requires soil moisture – vegetation alone was less able to predict burn and retention probabilities.
- There is a large amount of pattern variation within disturbance events that cannot be predicted and is therefore a naturally occurring phenomenon.

[15] Determining Island Remnants and Meso-scale Fire Patterns in Saskatchewan. Part 1: Disturbance Event Patterns. 2005

[16] Determining Island Remnants and Meso-scale Fire Patterns in Saskatchewan. Part 2: Island Remnant Patterns. 2006

[17] Determining Island Remnants and Meso-scale Fire Patterns in Saskatchewan. Part 3: Event Composition and Spatial Controls. 2006.

- Forest type (softwood vs. hardwood) has no influence on the formation of remnant islands (partially disturbed) within an event. Hardwood areas are about twice as likely to be in matrix remnants (completely undisturbed areas) than pure softwood forests.
- Older forests had a higher burnt area and smaller matrix remnant than younger forests.
- The more complex land types (e.g. hilly) are more likely to burn and have smaller island remnants than the simpler land types (e.g. depression).
- The greater the canopy closure the higher the percentage of area burnt. Probability of burning generally increases with tree height.
- Multiple forest canopy types (two canopy layers) has an increased burn area compared to simple or complex (three or more layers) classes, and a lower area in island remnant.

Previous research suggests that the Saskatchewan boreal forest likely had a pre-1900 fire cycle of between 30 and 50 years[18] . Dr. Andison broke this average down as follows: "If one assumes that the natural fire cycle is 50 years, the fire return interval for forested areas would be 47 years, 60 years for non-commercial forest, and 74 years for non-forested areas".[19] Based on the three parameters (i.e. vegetation class, soil moisture regime and topographic position) the forested, dry and hilly classes would have a more frequent fire return interval than the non-forest, wet and flat classes.

4.3.2 INSECTS AND DISEASE

Other natural disturbances that have affected MLPP include insects and disease which have caused damage to the forests but are an integral part of the forest system. Currently, the disturbance with the most concern in the park is dwarf mistletoe (DMT). Dwarf mistletoe is a parasitic seed plant that causes deformity, growth loss, and mortality in its host tree (jack pine and lodgepole pine)[20]. The Forest Service completed surveys from 2001-2017 of areas affected by Dwarf Mistletoe in MLPP. Figure 26 displays the distribution of DMT affected areas by PFT and seral stage. Figure 27 shows a map of dwarf mistletoe locations in MLPP from 2001 - 2017.

[18] Thorpe, J. 1996. Fire history and its application to management of Saskatchewan forest. In Proceedings: Fire management and fire impacts on the landscape.

[19] Determining Island Remnants and Meso-scale Fire Patterns in Saskatchewan. Part 3: Event Composition and Spatial Controls. 2006.

[20] Saskatchewan Ministry of Environment, Forest Pest Fact Sheet

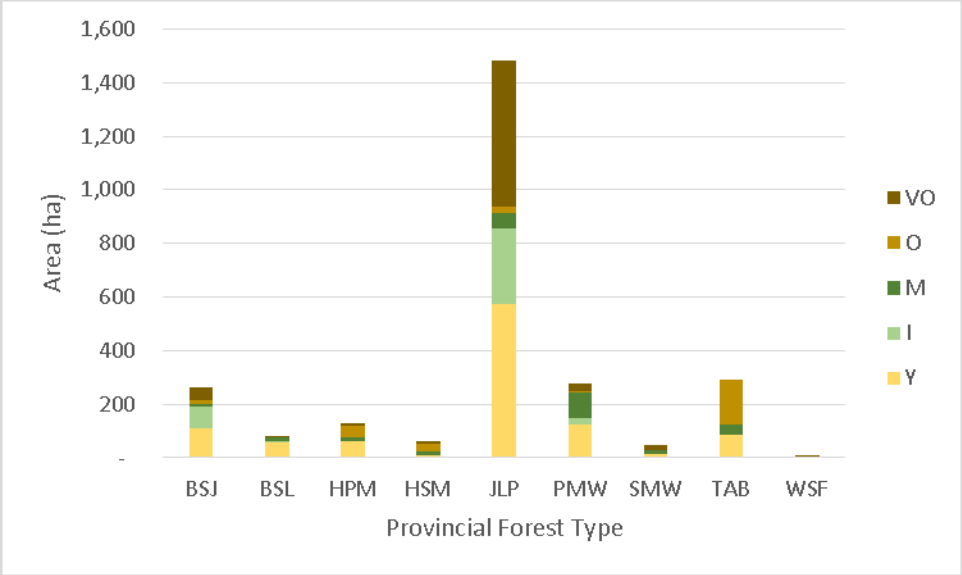


Figure 26 Area disturbed from dwarf mistletoe by PFT and seral stage

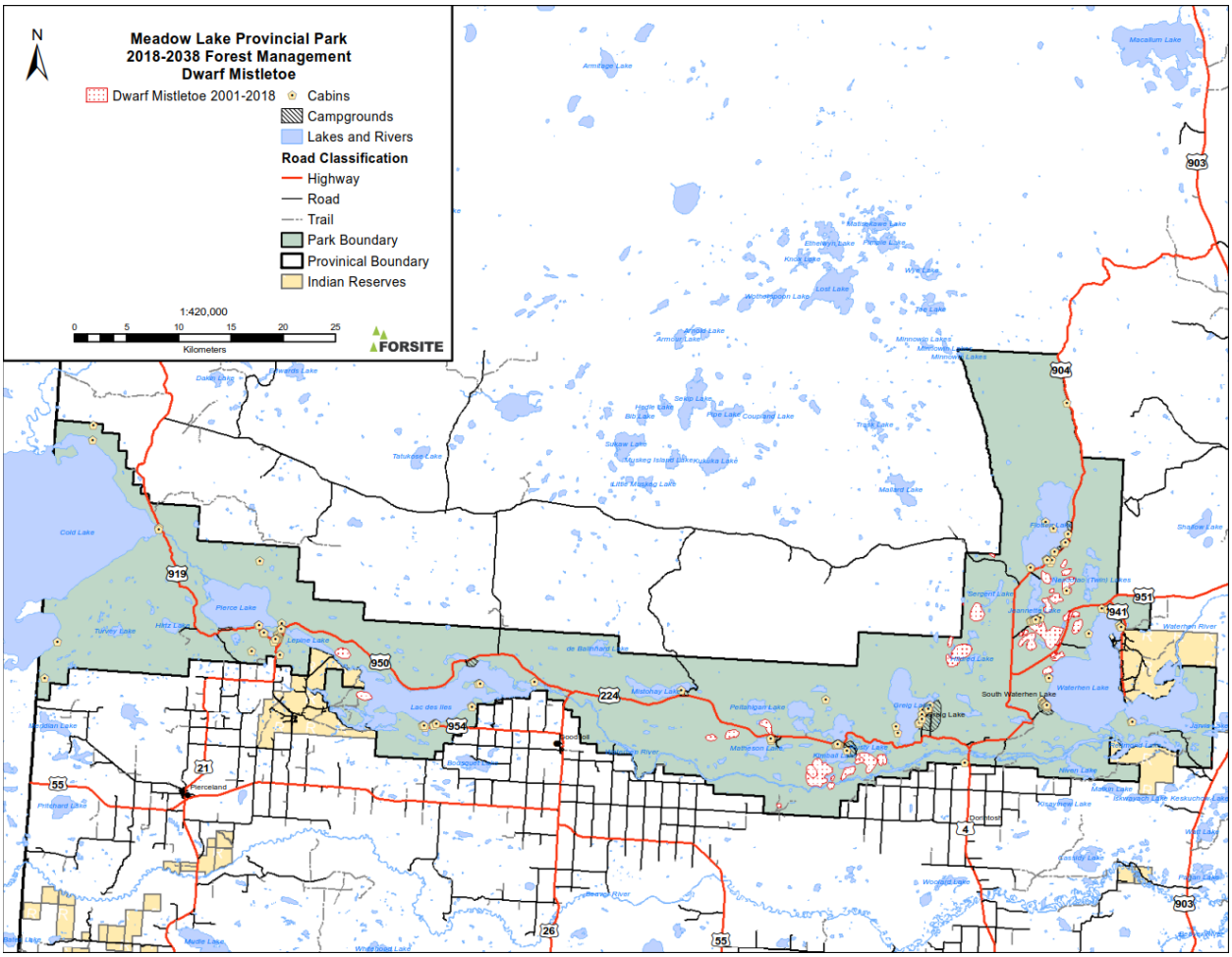


Figure 27 Area affected by dwarf mistletoe from 2001-2017

Although, not considered a stand replacing disturbance, Forest Tent Caterpillar (FTC) outbreaks are still monitored by the Forest Service. Forest Tent Caterpillar outbreaks detract from the recreational experience of MLPP guests by defoliating aspen trees, clinging to structures, furniture, vehicles, and overstory trees. The area of FTC disturbance by PFT are shown in Figure 28 and the distribution of disturbance in 2016 and 2017 is identified in Figure 29.

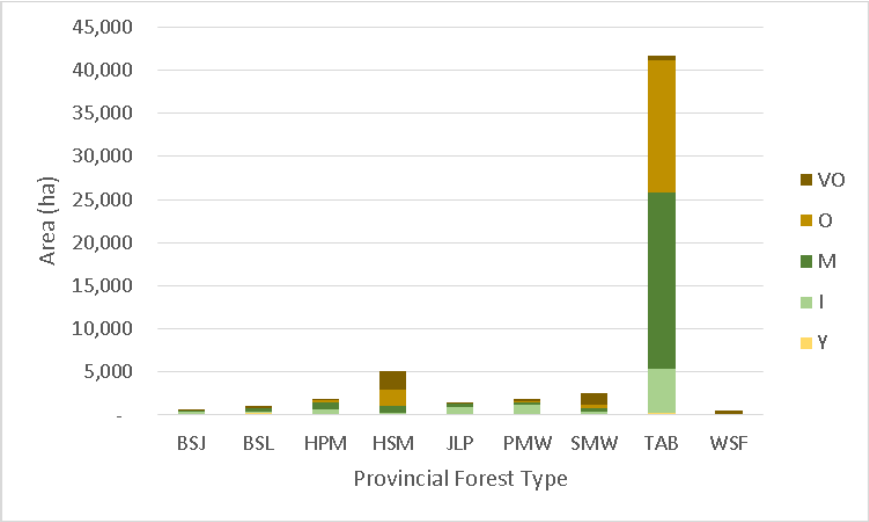


Figure 28 Area disturbed from Forest Tent Caterpillar in 2017

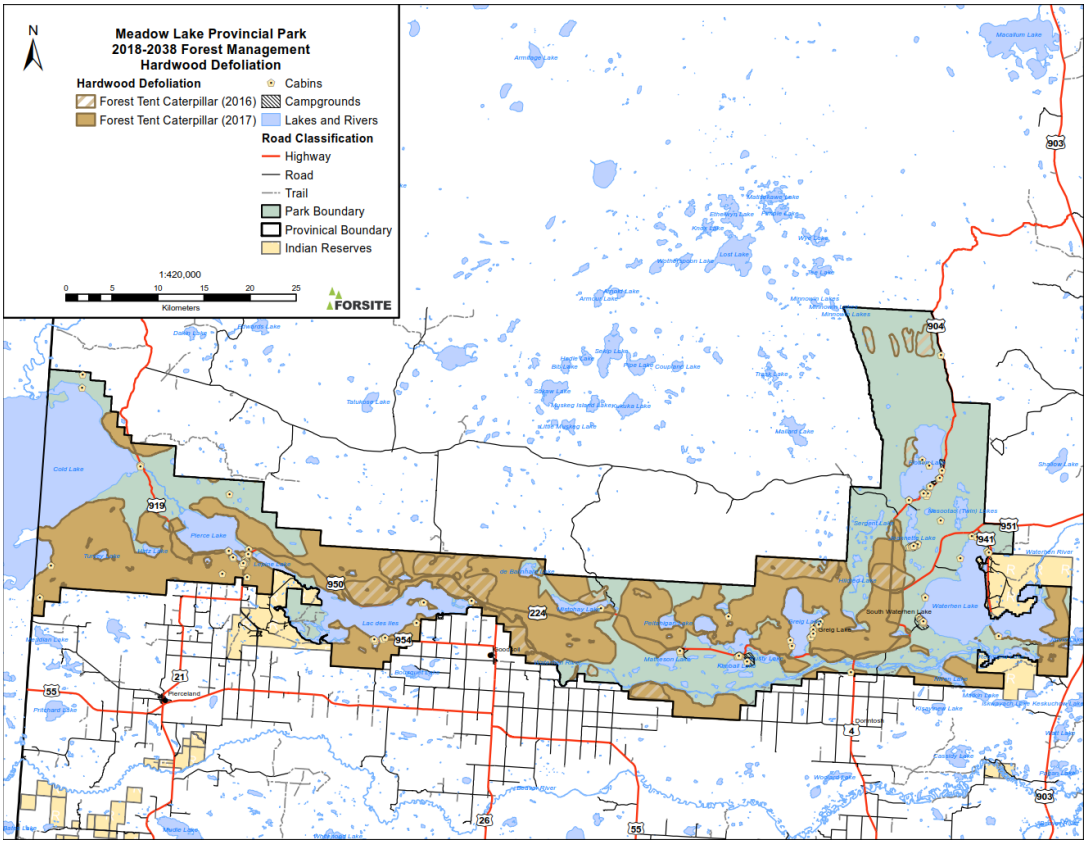


Figure 29 Area disturbed by Forest Tent Caterpillar in 2016 and 2017

4.3.3 LINKS TO FOREST MANAGEMENT

Much of the natural forest present in MLPP today was initiated by fire. The protection of forest resources through fire suppression alters the natural disturbance regime of these forests. To some degree natural disturbance patterns can be emulated through strategic landscape planning by creating a natural range of harvest opening sizes and appropriate levels of stand retention. Harvest openings cannot entirely replicate the character of fire disturbances; conversely wildfire cannot be eliminated, so collectively these disturbances may capture reasonably well many of the ecological processes observed across the broader landscape.

Diversity of native species is more likely to be conserved over the long-term if natural patterns and processes are emulated in forest management. As the climate changes, in particular warmer temperatures and shifts in seasonal precipitation, the fire return interval and disease and insect outbreak will be altered and may need to be considered in future planning.

4.3.4 NON-FOREST / NON-PRODUCTIVE FOREST

Land that is not forested and not capable of supporting a timber producing forest is classified as non-forest, non-productive (lakes, swamps, rock, clearings, etc.), as well as areas without forest cover information (non-typed). The specific classifications of these non-productive lands, as well as the area associated with these classifications, are listed in Table 9 below. This classification is not intended to diminish the ecological value of these lands, but is designed to differentiate these lands from lands capable of producing mature forest cover.

Table 9 Non-Forested Lands

NON-PRODUCTIVE TYPE	AREA (HA)
Brushland	9,346.3
Clearing	923.3
Flooded Land	705.7
Meadow	12.9
Non-Productive Burn-over	205.2
Not Typed	192.3
Open Muskeg	4,635.1
Sand	13.3
Treed Muskeg	7,911.7
Treed Rock	81.0
Water	38,377.2
Total	62,404.1

5 Tactical Plan

A 20 year tactical plan is a key component of this FCMP and is designed to guide forest planners during the development of operating plans during the FCMP term. It is a spatial representation of where treatment is planned to occur over the next two decades.

5.1.1 DEVELOPMENT APPROACH

The tactical plan areas (TPA's) were selected based on the following parameters:

1. **Very Old Seral Stands–** Areas with a high proportion of very old stands were given priority for treatment in decade one. Mature, old, and very old stands are at a greater risk of natural disturbances, such as insects, disease, and fire. MLPP will benefit from regeneration for age class diversity over the land base.
2. **Dwarf Mistletoe Affected Stands–** Surveys completed between 2001and 2017 outlined areas within MLPP that have been affected by dwarf mistletoe (DMT). The decade one tactical plan intends to capture as much of the affected areas as possible. Once trees are infected, they become unsightly and can become a safety hazard to property and the public. Left unmanaged, DMT will continue to spread to other jack pine stands across the landscape.

5.1.2 TACTICAL PLAN AREAS

Tactical Plan Areas (TPAs) are shown on the maps in Appendix A.

Table 10 provides an overall summary of area broken down by Tactical Plan decade, PFT, and seral stage. There are 16,763 ha planned for the decade one tactical plan, with up to 9,843 ha being in the mature, old, and very old seral stages. The target treatment area in each decade is 10,506 ha. The decade one treatment area includes the 4,363 ha of timber productive forested lands disturbed by the 2018 Tuff fire. The young and immature stands were not targeted in the tactical plan.

Tactical Plan Decade	PFT	Young	Immature	Mature	Old	Very Old	Total
Decade One	BSJ	624	342	120	18	168	1,272
	BSL	516	65	135	3	75	794
	HPM	323	23	93	154	40	633
	HSM	359	11	196	595	1,652	2,813
	JLP	1,713	977	265	52	1,144	4,152
	PMW	537	131	182	8	183	1,040
	SMW	232	62	109	21	1,333	1,757
	TAB	566	366	556	2,094	101	3,682
	WSF	74	0	46	23	477	620
	Total	4,944	1,976	1,702	2,968	5,172	16,763
Decade Two	BSJ	45.3	175.7	151.8	214.3	132.7	719.8
	BSL	6.0	359.5	286.3	3.2	303.8	958.8
	HPM	32.5	80.1	892.7	333.4	93.7	1,432.4
	HSM	62.3	10.2	972.1	1,242.8	1,141.0	3,428.4
	JLP	97.5	905.2	560.9	196.6	541.4	2,301.6
	PMW	36.4	869.9	425.5	29.4	215.3	1,576.6
	SMW	5.0	339.1	188.2	130.1	912.5	1,574.9
	TAB	268.8	896.3	7,087.4	4,959.6	140.2	13,352.2
	WSF	1.7	34.8	0	2.5	476.4	515.4
	Total	555.3	3,670.8	10,565.1	7,111.8	3,957.1	25,860.0
	Grand Total	1,141.3	6,067.9	12,563.7	10,520.9	9,408.8	39,702.5

Table 10 Tactical Plan Area (TPA) decade by PFT and seral stage

	Treatment Area (ha) by PFT				
Tactical Plan Decade	**PFT**	**Mature**	**Old**	**Very Old**	**Total**
Decade One	BSJ	120	18	168	306
	BSL	135	3	75	212
	HPM	93	154	40	287
	HSM	196	595	1,652	2,443
	JLP	265	52	1,144	1,462
	PMW	182	8	183	372
	SMW	109	21	1,333	1,463
	TAB	556	2,094	101	2,751
	WSF	46	23	477	546
	Total	1,702	2,968	5,172	9,843
Decade Two	BSJ	90	1	87	178
	BSL	185	3	255	444
	HPM	436	217	90	743
	HSM	766	861	1,083	2,709
	JLP	317	8	287	611
	PMW	326	4	198	528
	SMW	163	32	789	984
	TAB	3,262	2,149	140	5,551
	WSF	0	2	431	434
	Total	5,545	3,277	3,359	12,182
	Grand Total	7,247	6,245	8,532	31,945

Table 11 Areas by PFT and seral stage available for Tactical Plan Treatments

6 Engagement and Information Sharing

6.1 FIRST NATIONS AND MÉTIS ENGAGEMENT

The identification, management, and potential accommodation of aboriginal rights is significant to resource management activities. Engagement with First Nations and Métis communities has sought to identify where aboriginal rights are present and may be affected by plan activities. The plan will consider potential impacts on aboriginal rights and traditional use and will seek to minimize them. Engagement with First Nations and Métis will occur regularly during the term of the plan. Additional opportunities for input occur when MLPP meets First Nations and Métis groups to discuss traditional knowledge and annual operating plans.

The Ministry of Parks, Culture, and Sport is responsible for the Duty to Consult with First Nations and Métis for Government decisions and actions that have the potential to adversely impact the exercise of Treaty and Aboriginal rights and pursuit of traditional uses. The Ministry's duty to consult process is directed by The Government of Saskatchewan's First Nation and Métis Consultation Policy Framework (CPF)[21]. It is recommended that MLPP will follow this framework prior to implementation of the plan.

[21] Government of Saskatchewan (2010). First Nation and Métis Consultation Policy Framework. http://publications.gov.sk.ca/documents/313/98187-Consultation%20Policy%20Framework.pdf

Flying Dust First Nation, Waterhen Lake First Nation, and Big Island Lake Cree Nation have identified traditional use on the lands contained within the MLPP. Traditional use activities include gathering medicinal plants and berries, hunting, trapping, and spiritual experiences. During consultation sessions, First Nations are asked to comment on proposed treatments. If a proposed treatment contains a culturally sensitive feature, such as a burial site, MLPP staff will establish a stakeholder commitment sufficient in size to maintain the integrity of the culturally sensitive feature. The specific feature within the stakeholder commitment will not be identified on the maps to ensure the feature is protected from public disturbance.

6.2 STAKEHOLDERS AND OTHER TENURE HOLDERS ENGAGEMENT

MLPP shares the landbase with other tenured rights holders. Other rights holders include trappers and outfitters, who have rights to harvest wildlife; and snowmobilers, who have rights to develop and use recreational trails. MLPP must consider these other holders when conducting timber management activities. MLPP is recommended to consult with other tenure and rights holders in the development of this plan and consider the comments received in the plan's development.

It is beneficial for engagement with stakeholders to occur regularly during the term of the plan as part of the development process.

6.3 PUBLIC ENGAGEMENT

MLPP is recommended to hold meetings with stakeholders and interested public to discuss upcoming treatment plans in the TPA's. The public will be able to discuss any concerns they may have concerning the operations in the plan.

MLPP held two Public Open Houses and Duty to Consult Sessions to review and seek input on the Ecosystem-based Management (EBM) Plan, the Forest Conservation Management Plan (FCMP), and a proposed Forest Operating Plan (FOP). Open Houses were held:

- Monday December 10th, 2018 from 7pm to 9pm in MLPP Greig Lake Interpretative Centre.
- Tuesday December 11th, 2018 from 7pm to 9pm in Meadow Lake Catholic Church – Parish Hall 506 3 Ave E, Meadow Lake.

Input from these sessions has been incorporated into this revision of the FCMP.

7 Strategies to Address Natural Disturbance in MLPP

The boreal forests found in MLPP are often influenced by natural disturbances from insects, disease, and wildfires. It is recommended that MLPP will use the response strategies detailed below to incorporate consideration of natural disturbance into its forest management and implementation.

7.1 STRATEGY FOR WILDFIRE MANAGEMENT

Wildfires are the single largest source of natural disturbance in Saskatchewan's boreal forest. Past fires have had an influence on the mosaic of forest types and associated biodiversity within the park. The active suppression of fire requires that the chosen treatments mimics natural disturbance to maintain similar forest types.

Saskatchewan's Fire and Forest Insect and Disease Policy Framework (2003) was developed to provide direction for ministry staff and forest management licensees regarding how wildfires, insects and disease outbreaks will be managed on the landscape. This Policy framework represents a fundamental shift from fire control and suppression to wildfire management and planning. The forest insect and disease component of the policy framework is discussed in Section 7.2.

The policy framework includes recognition that the boreal forest is a fire dependent ecosystem. Where opportunities exist to support forest resource management objectives, fire will be used to protect, maintain, and enhance forest resources, and will be allowed to perform its natural ecological role. Prescribed burning is proposed as a treatment to achieve these objectives. The Wildfire Management Branch is working closely with Park Management to implement a FireSmart Program to reduce the risk of wildfire to park and public assets. The Park's Division is also developing a Wildfire Management plan for the MLPP.

7.1.1 FOREST PROTECTION

The wildfire season in Saskatchewan falls between April 1 and October 31 each year. However, due to predicted changes associated with global climate change, it is anticipated that this window will expand and that more extreme fire conditions will likely occur. The Wildfire Act and Regulations allows for the extension of the wildfire season if required.

The Wildfire Act provides the legal framework for the protection and management of Saskatchewan resources in relation to wildfire. MOE is responsible for fire suppression efforts within Saskatchewan's provincial forests.

7.1.2 VALUES AT RISK

The provincial "Wildfire Management Operational Policy and Procedure Manual, April 11, 2016" (OPS 311) indicates that Wildfire Management Branch (WFM) of the MOE will use a "values at risk" approach to decision-making relating to prioritizing wildfire suppression activities ensuring that human life and safety receive and maintain the highest priority. This approach is used by WFM for wildfire suppression and also to prioritize requests for assistance from other ministries, governments, municipalities, industry and organizations.

The Wildland Urban Interface (WUI) is an area where structures are built close to, or within the forest. The consequence of wildfires within these areas is often very severe. MLPP is recommended to consider WUI areas within the park during treatment planning in these areas with the goal of enhancing wildfire prevention and preparedness of forest communities.

7.2 MANAGEMENT OF FOREST INSECTS AND DISEASE DISTURBANCES

At a provincial level the surveillance, monitoring, and management of insects and disease are completed by MOE. Information on most of the key pests found in Saskatchewan forests is available on the MOE website[22]. At the time of preparing this plan, the main concern for MLPP is dwarf mistletoe (DMT). There are affected patches sporadically throughout the park. The spread of DMT has a greater chance of increasing if treatment of the old growth pine stands does not occur.

Other insects and diseases that already do, or can, occur on the park landscape are listed below. MLPP is recommended to contribute to the province's insect and disease management strategy as outlined below.

7.2.1 DEFOLIATORS (LEPIDOPTERAN SPECIES)

This order of insects is characterized by the butterflies and moths whose life cycles follow complete metamorphosis with distinct egg, larval, pupal and adult stages. Impacts to forest vegetation occurs during the larval feeding stages (i.e., caterpillar phase) when these insects feed on fresh succulent foliage. During outbreak populations these insects can "back feed" on older foliage thereby increasing the impact and stress on trees. Significant growth reduction and tree mortality can occur if trees are repeatedly exposed to larvae over several years.

The two main forest insects that defoliate **softwoods** are:

1. eastern spruce budworm; and
2. Jack pine budworm.

The two main forest insect defoliators of **hardwoods** are:

1. forest tent caterpillar; and
2. large aspen tortrix.

These species follow a very similar life cycle and MLPP will employ similar strategies and tactics when managing for them. MLPP, with the assistance of Ministry of Environment, Forest Service monitors the impacts of forest defoliators in the park area through forest health observations made during annual forest health flights, and regular planning and operational activities. The main treatment options to mitigate the impacts of defoliators are as follows:

- **No Action** will be taken in the case of low risk of mortality or significant growth loss.
- **Mapping and Monitoring** will occur when pocket(s) of infestation are detected that warrant an ongoing assessment of potential impact. It is recommended that such areas be mapped and their locations provided to MOE.
- **Removal (Harvest) of Host Trees**: Where it makes sound forest management sense and is economically feasible, it is recommended that MLPP will harvest affected and/or susceptible host tree species to control defoliator populations by removing nearby food supplies.
- **Biological Control**: *Bacillus thuringiensis* var. *kurstaki* (Btk) is considered by MOE as an acceptable biological control agent for forest defoliating insects. Btk is a naturally-occurring soil bacterium used as a microbial insecticide for caterpillar control. It is not harmful to humans, birds, pets, fish, honey bees, beetles, spiders, etc.

[22] Saskatchewan Ministry of Environment, Forest Pest Fact Sheets
http://www.publications.gov.sk.ca/deplist.cfm?d=66&c=4537

7.2.2 BARK BEETLES AND ENGRAVERS – COLEOPTERAN SPECIES

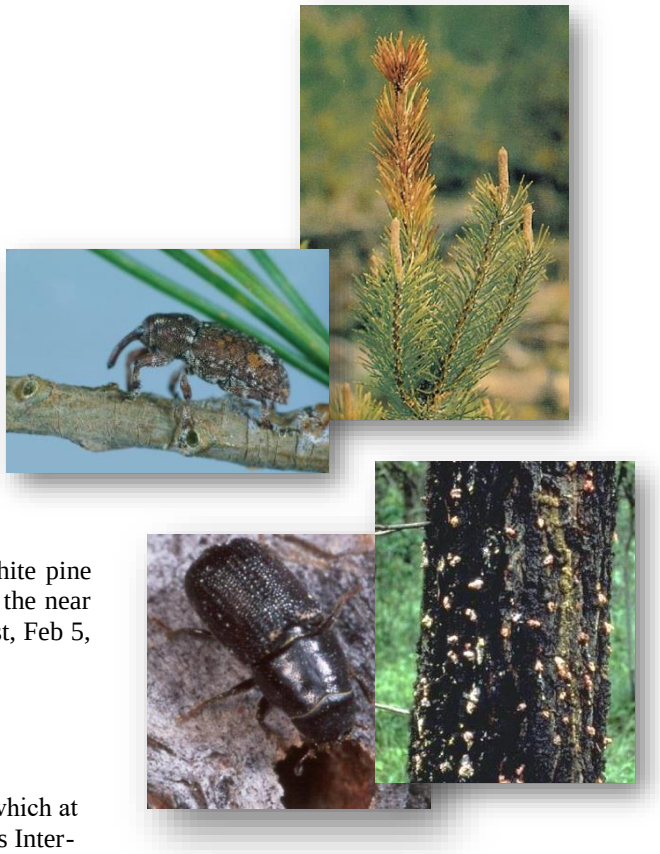
Bark and Engraver beetles typically colonize stressed or old coniferous trees. The impact of bark beetles and engravers is characterized by beetles entering the cambium layer of softwood species. Adult beetles, attracted to stressed down or old conifers bore into the stem of the tree creating galleries under the bark in the cambium layer where they lay their eggs. Once the eggs hatch, the larvae feed on the nutrient rich cambium layer, which results in girdling and killing the host tree.

The three primary Coleopteran species that can impact large areas of the boreal forest are:

1. Lodgepole pine Terminal weevil (*Pissodes terminalis*);
2. White pine (or spruce) weevil (*Pissodes strobi*); and
3. Mountain pine beetle (*Dendroctonus ponderosae).*

To a lesser extent:

1. Spruce Beetle
2. Aspen Borer



7.2.3 TERMINAL AND WHITE PINE WEEVILS

Terminal weevils are pests of open growing young pine and spruce trees, and can cause considerable deformity to a tree's main stem. They can cause a major impediment to the successful regeneration of pine and spruce trees. It is recommended that MLPP monitor the presence and impacts of weevils in plantations through regularly scheduled surveys. In the event that impact levels are deemed unacceptable, a site specific mitigation strategy will be developed by qualified professionals. According to recent MOE surveys, terminal and white pine (spruce) weevils are anticipated to remain at background levels in the near term (personal communication Rory McIntosh, Forest Entomologist, Feb 5, 2016).

7.2.4 MOUNTAIN PINE BEETLE (MPB)

In addition to spruce budworm, the most significant and potentially devastating forest insect threat to Saskatchewan's forests is MPB, which at present is only found naturally in Saskatchewan in the Cypress Hills Inter-provincial Park area in association with lodgepole pine. In British Columbia this insect has killed millions of hectares of lodgepole pine forest and is moving eastwards. In 2006 and again in 2009, MPB breached the Rocky mountain Geophysical divide and scattered beetles as far east as the Slave Lake area of central Alberta. Since 2009 MPB has slowly spread through the lodgepole/jack pine hybrid zone and in 2010 research led by scientists at the University of Alberta, confirmed that MPB had attacked and colonized pure Jack pine in the eastern boreal forests in Alberta (Cullingham et al 2011). Small numbers of MPB have since been captured in pheromone-baited trap-trees near Cold Lake, Alberta in 2015 (on the Alberta side of the Primrose Lake Air Weapons Range), but no significant attacks on Jack pine have been recorded yet. However in 2017, one baited tree was found to be positive only 27 km from the AB/SK border. MOE continues to collaborate with the Government of Alberta and has increased monitoring efforts in Saskatchewan near the Alberta border (personal communication Rory McIntosh, Forest Entomologist November 16, 2017).

MPB poses a risk to all pine forests, but because pine stands in the northern prairie and boreal regions are sparser and have lower volumes than lodgepole pine stands in British Columbia and adjacent Alberta expected losses in the boreal pine forests of Alberta, Saskatchewan, and Manitoba will likely be less than those experienced in British Columbia. Even under outbreak conditions average stand-level losses in the boreal forest are unlikely to exceed 30% of stems or 40-60% of standing volume (Nealis and Peter 2008, p 16).

Given the context of the impacts of the MPB in adjacent provinces, its spread represents a low to moderate threat to MLPP area. At the time of writing this report, no MPB treatment has been required. It is recommended that MLPP be vigilant in detection of MPB infestations if they appear in the park.

The Saskatchewan government has stepped up its monitoring program for MPB in the last 5 years, with a focus in Alberta at the eastern leading edge of the infestation spread. Two mass dispersal events occurred in 2006 and 2009, when the beetle breached the Rocky Mountains in British Columbia.

Currently, MOE has established and monitors a bait station program (one bait site per Township) throughout the western part of Saskatchewan, including inside the Cold Lake Air Weapons Range. The information gathered from the MOE monitoring and the collaboration with the Department of Defense is shared with the Parks Division.

7.2.5 DWARF MISTLETOE

Lodgepole pine dwarf mistletoe (*Arceuthobium americanum*) is a native obligate parasitic seed plant. It is one of most serious diseases of pines in western North America. Damage to host trees includes deformity, growth loss and mortality. This disease generally spreads slowly through the forest over many years. However, long-range dispersal can occur from movement of seeds by mammals and birds.[23]

Brandt et al. (1998) completed an aerial survey of the distribution of severe infestations of dwarf mistletoe in western Canada. Maps in this report show that the park area is moderately infected. No quantitative data were collected in this study; however, the presence of the dwarf mistletoe in jack pine is visually quite pervasive and extensive.

MLPP considers dwarf mistletoe a moderate risk to the park's forests. Although trees typically live following infection, and the spread of infection is slow, the infected trees become weak and a hazard to property and the public. The impact of dwarf mistletoe is typically greater on drier forest sites occupied by pine, and log quality is negatively impacted.

Because it is an obligate parasite, removing the host also removes the problem. For MLPP, the most practical treatment for dwarf mistletoe is achieved through silvicultural practices such as:

- harvesting infected trees;
- prescribed burns;
- buffering healthy pine plantations from areas of infected forest; and
- removing infection sources (residual trees > 1 m in height) from within harvested pine stands.

The dwarf mistletoe parasite is an integral part of the boreal forest ecosystem. Complete eradication of the species is not the objective, nor the intended end result.[24] It is recommended that MLPP will assess dwarf mistletoe infection in regenerating post-treatment areas.

[23] Saskatchewan Ministry of Environment , Forest Pest Fact Sheet

[24] Background Document – Dwarf Mistletoe: Ecology and Management, Forest Service, Saskatchewan Environment, Rory L. McIntosh – March 2004.

7.2.6 ARMILLARIA ROOT ROT

Armillaria is a genus of soil borne fungi that causes root disease and mortality in a wide variety of plant species, but is of particular concern with commercial conifers in the park area, including spruce, pine, and fir.

Armillaria is not a significant threat to MLPP area's forest because its presence is considered during regular forest management practices. Potential management strategies include uprooting tree stumps post-treatment to expose and kill the Armillaria, or planting and managing for tree species that are less susceptible to the disease.

8 Strategy for Management of Woodland Caribou Habitat

MLPP overlaps with the SK2 West caribou range and will continue to monitor and comply with the provincial Caribou Range Management Plan.

9 Management Challenges

9.1 ECONOMIC CHALLENGES

Provincial budget constraints will pose a challenge for the implementation of the management plan. The treatment options have the potential to become expensive to implement, depending on the size and location of the area. Therefore, the timing and type of treatment will rely on the annual provincial budget.

Provincial parks rely on visitors annually, which can also be an economic challenge for MLPP. The treatment recommendations could lead to issues associated with visitor numbers. For example, the implementation of the plan has the potential to cause areas of the park to be temporarily closed to the public that might have recreational importance. This in turn might lead to a reduction of visitor numbers.

9.1.1 CLIMATE CHANGE

Climate change presents a significant risk to MLPP. In general, climate change may result in increased frequency or area of natural disturbances. Climate change may also affect growth rates, stand composition, and regeneration success.

9.1.2 FIRST NATIONS, MÉTIS, STAKEHOLDERS, AND PUBLIC

MLPP's forest management objectives may be difficult to achieve if there is significant opposition to the treatments. It is recommended that MLPP will manage these risks by promoting open communication.

9.2 NON-FOREST INDUSTRY RELATED RESOURCE-BASED INTERESTS

Other resource-based interests in MLPP include oil and gas, outfitting, trapping, fishing, hunting, camping and grazing. MLPP attempts to work collaboratively with these interests through regular communication. Stakeholder concerns will be taken into consideration, and activities will be integrated with these stakeholders where possible.

9.3 COMMUNITY INTERESTS

MLPP is located close to several communities, including Meadow Lake, Big Island Cree Territory, Waterhen Indian Reserve, and Flying Dust First Nation. There is significant interest in MLPP's activities, as well as use of the park by the public for recreational and traditional activities.

9.4 ABORIGINAL INTERESTS

Aboriginal rights within MLPP must be identified and respected. The primary mechanism used to identify aboriginal issues is regular communication with First Nations and Métis.

9.5 NATURAL DISTURBANCES

Natural disturbance emulation is a challenge facing MLPP. The boreal forest is a fire dominated landscape and the many wildlife species found in the boreal forest have adapted to the natural frequency and scale of fire disturbance, and the stand and forest structures it creates.

The challenge to MLPP is to have their forest management practices emulate NFP, including the size and scale of historic disturbances. There is no intention to create extremely large disturbance events, but even large events approaching are likely to prove difficult due to the presence of non-timber values.

9.6 ACCESS MANAGEMENT AND ROAD AND TRAIL DENSITY

There are a number of trails and road access that can be utilized for the treatment of the TPA's in MLPP. Since these trails are used by many stakeholders, this FCMP must be sure to leave the trails accessible after treatments are concluded. Stakeholders who commonly use these trails should also be consulted prior to treatments to address any concerns they may have. Concerns may include buffers around high-value trails.

10 Vulnerability Assessment to Address Climate Change

10.1 CLIMATE CHANGE CONSIDERATIONS

Central Canada, Saskatchewan, is predicted to experience higher and faster impacts of climate change than other areas of Canada and the rest of the world.[25] Climate change has the potential to positively and negatively impact the forests and hydrology of MLPP. Recent reports[26,27] indicate that climate has already begun to change in Saskatchewan, demonstrated by some of the warmest annual temperatures on record in 1998, 2001, 2002, 2003, and 2004[28].

[25] Johnston, M., T. Williamson, E. Wheaton, V. Wittrock, H. Nelson, H. Hesseln, L. Vandamme, J. Pittman, and M. Lebel. *Climate Change Adaptive Capacity of Forestry Stakeholders in the Boreal Plains Ecozone*. Prepared for the Government of Canada's Climate Change Impacts and Adaptation Program, 2008.

[26] Barrow, E.M. (2009) Climate Change Scenarios for Saskatchewan; http://www.parc.ca/pdf/research_publications/summary_docs/SD2009-01.pdf

[27] Sauchyn, D. et. al. (2009) Saskatchewan's Natural Capital in a Changing Climate: An Assessment of Impacts and Adaptation; http://www.parc.ca/pdf/research_publications/summary_docs/SD2009-02.pdf

[28] Hogg, E.H. and P.Y. Bernier. Climate change impacts on drought-prone forests in western Canada. The Forestry Chronicle, 81(5), 2005.

The predicted annual climate change conditions for Saskatchewan over the next 3-7 decades were calculated based on the Intergovernmental Panel on Climate Change (IPCC) scenarios[26]. By 2020 the Saskatchewan forested area will have temperatures increase by 1-3 degrees, by 2050 the increase is between 2 and 5 and 2-7 degrees by 2080[26]. Precipitation levels are expected to vary over time from slight decreases (1-5%) by 2020 and (0-2%) by 2050 to an overall increase of 10-12% by 2080. The seasonal distribution of these conditions is significant: increased temperatures will be most evident in the winter; precipitation increases only in the winter and spring (up to 30%), mostly as rain; and summer precipitation decreases (as much as 10% in summer and 5% in the fall), delivered via short intense storms[26,28,29]. This is expected to result in longer, warmer summers that are drier in the mid- to late stages of the season. The predicted changes in Saskatchewan's climate will affect the hydrology and soil moisture, fire regime, and ultimately the plant communities growing within each ecosystem.

The main impact climate change will have on the landscape will be the increase in frequency and duration of droughts. Due to the precipitation falling as rain in the winter, there will be no snow pack to fuel the base flow of the watercourses on which many ecosystems rely. On a provincial scale, average long-term predictions are for reductions in stream flows[30]. The increase in precipitation occurring in the winter and spring will result in spring flood events and will not be enough to counter increased evapotranspiration caused by the longer, hotter, and more arid summer and fall seasons[25]. The result will be forest ecosystems limited in growth, reproduction and overall health by lack of water (soil and surface). Studies are predicting future droughts will be similar to the drought experienced in the Prairies from 2001-2003, but more often and severe[29].

The second most important impact of a climate change will be the fire regime. Changing climate and weather patterns dramatically alter wildfire activity; based on predicted conditions, Saskatchewan could potentially have the largest increase in fire danger in North America[31]. New fire regimes could form representing increased annual area burned, extended fire seasons, increased fire frequency and severity[32]. The area burned in Canada is expected to increase 25% by 2030, and 74-140% by the end of the 21st century. If CO_2 levels are doubled, then seasonal fire severity in Saskatchewan will increase by 50% due to the amount of flammable white spruce affected by the warmer climate[29]. Fire severity is measured in kW/m (the energy released per meter), fires greater than 10,000 kW/m cannot be fought by fire fighters. Doubling CO_2 is predicted to result in a 4-fold increase in the number of days a 10,000 kW/m forest fire could occur[31].

Plant communities will be affected by climate change in two ways. Increased CO_2 levels and CO_2 enrichment has the potential to enhance plant growth by increasing water use efficiency and CO_2 fertilization[29]. The warming climate will also extend the growing season and increase the amount of heat units experienced in MLPP. It can be expected that areas not affected by drought could experience an increase in productivity, potentially up to 40-60%[33]. Plant communities on the boundaries of their species ranges will be negatively affected by the warming climate because the rate of current climate change is faster than experienced in the past 100,000-200,000 years. Species migration and adaptations to the changing climate will likely not be fast enough to address the changes. Many plant communities will be affected by the above dramatic climate changes, but for the purpose of this document the effect on forest ecosystems will be examined further.

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[29] Qualtiere, E. *Impacts of climate change on the western Canadian southern boreal forest fringe*. Report prepared for Alberta Sustainable Resource Development, 2011.

[30] Pomeroy, J.W., Fang, X., Williams, B. (2009) Impacts of Climate Change on Saskatchewan's Water Resources

[31] Parisien, M-A., V. Kafka, N. Flynn, K. Hirsch, B. Todd, and M. Flannigan. Fire behavior potential in central Saskatchewan under predicted climate change. Prairie Adaptation Research Collaborative, 2005.

[32] Weber, M.G. and M.D. Flannigan. Canadian boreal forest ecosystem structure and function in a changing climate: impact on fire regimes. Environmental Reviews, 5(3-4), 1997.

[33] Johnston, M. and T. Williamson. Climate change implications for stand yields and soil expectation values: a northern Saskatchewan case study. The Forestry Chronicle, 81(5), 2005.

10.1.1 IMPACT OF CLIMATE CHANGES ON FOREST VALUES

Warmer winters, increased precipitation in the winter and spring, longer and drier summers, and an increase in storm intensity and frequency may result in positive and negative influences on forest ecosystems (Table 12).

Table 12 Potential impacts of climate change on MLPP forests

Positive Impacts	Negative Impacts
• More favourable growing conditions where sites are not moisture limited • Lengthened growing season • CO_2 enhanced growth	• Increased drought stress for vegetation on sites that are moisture limited • Increased fire frequency and intensity • Increased insect and disease outbreaks • Increased wind and mechanical (ice and snow) damage • Increased flooding and mass wasting events

The degree to which improved tree growth may offset increased losses due to drought, fires, insects, or disease is not well understood and requires monitoring. Trees are most vulnerable to drought in the regeneration stage. Regeneration success and seedling survival may be threatened by climate change and affect a stand's ability to meet free to grow standards[29]. Droughts can significantly increase stem mortality and decrease regional stem growth for trembling aspen, making it a vulnerable species to climate change[25]. Droughts weaken the trees' ability to fend off insects and disease, in combination with warmer climates insects and diseases have the potential to thrive and increase their natural ranges further north into the boreal forest[29]. Coniferous species could be severely impacted by mountain pine beetle and spruce budworm outbreaks. Insects and disease not only affect tree vitality and survival, but they also affect the quality of timber. Droughts and insects infestations predispose stands to forest fires by creating more fire fuels and weaker trees. Most boreal species are adapted to fire, but if fire cycles increase such that coniferous trees are not old enough to produce cones before another fire, many species could be eliminated from the landscape[29]. Increased fires will promote vegetation changes from the present mixed-wood and coniferous stands to an aspen/grassland mosaic along the southern boreal boundary. Many studies suggest that fire induced changes on the landscape could greatly exceed any changes based on climatic warming alone[32].

11 Integration of Forest Management Activities with Non-Timber Values

MLPP recognizes the importance of non-timber values and commits to working collaboratively with other users of the land base to provide for these values.

11.1 MAINTENANCE OF BIODIVERSITY

Maintaining species and genetic biodiversity in MLPP is a key driver of this FCMP. Maintaining forest types and spatial patterns similar to those produced by natural disturbances, at stand and landscape levels, is expected to maintain habitat diversity, and therefore, promote ecological diversity at a species and genetic level. This 'coarse-filter' approach makes managing for biodiversity practicable, as it eliminates the need to separately manage for individual wildlife and plant species and communities.

Landscapes in MLPP are comprised of matrices of upland forests, bogs, fens, marshes, brush, rock, and water which provide a diversity of landscape patterns, ecosystems and wildlife habitats at many scales. These landscapes are made even more diverse by the influence of disturbance events such as wildfire, wind-throw, pathogens, and insect infestations. Historically, fire is the largest disturbance agent in the boreal forest. Before 1900, it is estimated that fires burned through Saskatchewan's boreal forest every 30 to 50 years on average. More recently, fire suppression has succeeded in reducing the extent of fire events on the landscape today, and has resulted in much higher fire return intervals.

The current forest age class distribution for MLPP is shown in Figure 30. One of the objectives of this FCMP is to shift the forests age class structure toward what would be found under natural disturbance regimes.

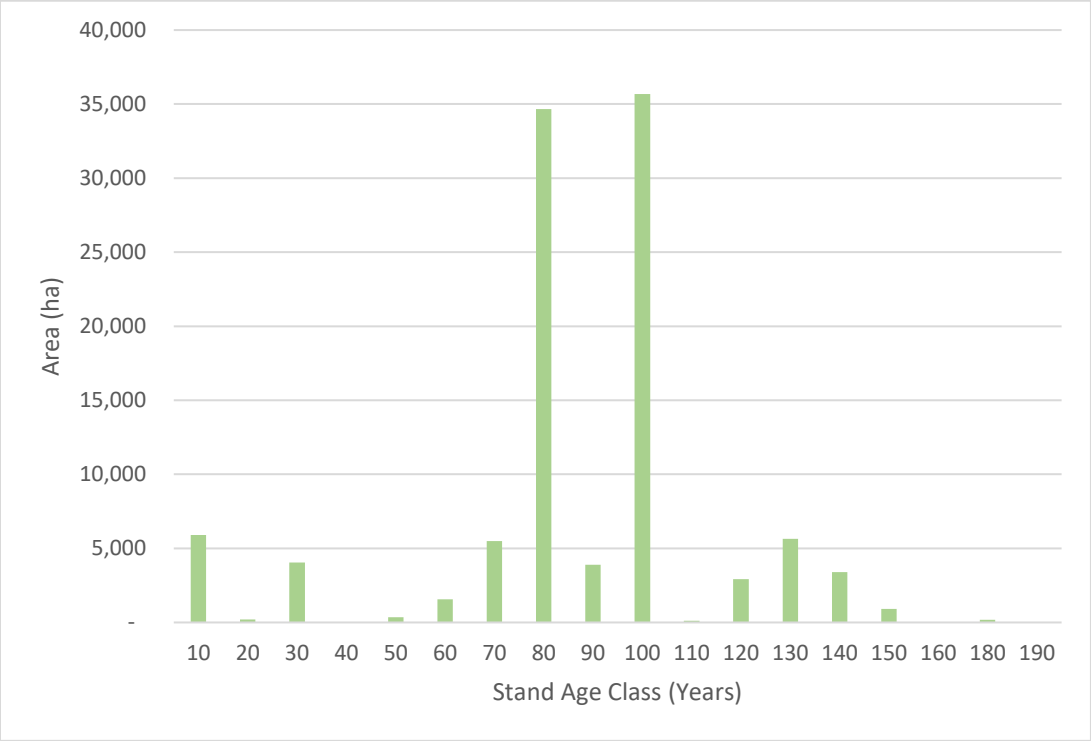


Figure 30 Forest stand age class distribution in MLPP

11.2 SPECIES AT RISK / SENSITIVE SPECIES

It is recommended that fine-scale habitat management will be used by MLPP to accommodate habitat protection for species at risk (endangered, threatened, special concern). Currently, 11 rare and at-risk species have the potential to occur within MLPP during at least some portion of the year; these species are listed in Section 3.3.9.

The Ministry of Environment has developed the "Saskatchewan Activity Restriction Guidelines for Sensitive Species (June 2015)" that outline restricted activity periods and setback distances by disturbance category. MLPP is recommended to use these guidelines where occurrences of sensitive species have been identified.

11.3 ARCHAEOLOGICAL RESOURCES, TRADITIONAL USE AREAS, AND CULTURALLY SIGNIFICANT SITES

It is recommended that digital spatial files of the tactical plan areas will be provided to the Heritage Conservation Branch (HCB) of the Saskatchewan Ministry of Parks, Culture, and Sport for assessment of archaeological and heritage resource potential. Based on location, topography, known heritage resource information, and professional judgment, HCB rates each area for heritage site potential. A qualified professional archaeologist is then engaged to carry out field surveys if soil disturbance occurs within the specified minimums identified in the screening. If sites are found, planned activities are modified to avoid disturbing them.

In addition to the HCB annual review, sites of archaeological or cultural significance may be identified during the public engagement process. Engagement with First Nations and Métis communities, and discussions with the HCB will identify appropriate management actions for such sites.

11.4 VISUALLY SENSITIVE AREAS

Visually Sensitive Areas (VSAs) in MLPP include the large recreation lakes (Waterhen, Pierce, Lac des Îles, etc.), cabins, and campgrounds. More VSA's may also be identified during the plan process.

11.5 NON-TIMBER BOTANICAL FOREST PRODUCTS

Non-timber botanical forest products include berries, mushrooms, and floral products. Most harvesting of non-timber botanicals is for personal use, including traditional use by Aboriginal Peoples.

In addition to natural disturbance events such as wildfire, forest harvesting and renewal techniques, it is recommended that forest practices by MLPP will maintain the presence of these resources within the park. The abundance and location of non-timber botanical resources will vary over time, as the location of disturbance events and time between events varies.

11.6 OUTFITTING (HUNTING, FISHING, TOURISM)

MLPP is recommended to consult regularly with hunting, fishing, and other guide service providers in the park through the development of treatments. Engagement around harvest areas and access management will provide outfitters with the opportunity to identify mitigation opportunities relative to their interests.

Accommodation measures may include adjusting treatment areas, leaving retention in specific locations, and measures to manage access. Appropriate measures will be determined at the treatment plan stage.

11.7 TRAPPING

There are currently four individual Fur Conservation Areas (FCAs) within MLPP. FCAs are typically associated with nearby communities and managed through the Northern Saskatchewan Trappers Association. Fur licences are granted to registered members to trap in a portion of their local FCA.

It is recommended that MLPP will consult regularly with trappers operating in the park through the development of treatment plans. The primary points of contact will be the chairpersons of each local trapper's association. Engagement will provide trappers with knowledge of planned forest operations, and provide the opportunity to identify mitigation measures or opportunities that can reduce the potential impacts of forestry operations on individual trappers and the trapping community.

Accommodation measures may include retention of high value trapping habitat within treatments, and the maintenance of traditional access. Damage and loss of traps will be avoided through a clear understanding between the trapper and MLPP about where and when treatment is going to take place.

11.8 RECREATIONAL USE

A wide variety of recreational activities occur in the forested lands of MLPP. It includes amenities such as campgrounds, extensive trail networks, hunting, and access to water-based recreational activities. The numerous recreation trails existing in the park are used by snowmobiles and ATVs. There are also several cabin developments and remote cabins within MLPP.

Treatment buffers have been implemented around large recreation lakes, cabins, and campgrounds in the park. This is done to minimize impacts on the aesthetic value important to the public. It is recommended that the timing of the treatments will also be considered in order to minimize the effects on recreational users.

It is recommended that public engagement during development of treatment plans will be used as the primary means of identifying concerns about recreational values and identifying potential mitigation options.

11.9 RESORTS AND TOURISM

MLPP is recommended to work with resort owners and other tourism operators to mitigate impacts on the forest resources and values on which these businesses depend. Potential mitigation measures can include visuals buffers, leave areas, maintenance of access, restrictions on operation timing, etc.

11.10 CABINS

Legally established cabins will be buffered by up to 100 metres as required to maintain a visual buffer from treatment areas. Access to cabins will also be maintained at a level that is similar to that which existed prior to treatment. It is recommended that cabin owners will be informed of MLPP's planned activities prior to operations.

11.11 COMMERCIAL, RECREATIONAL AND ABORIGINAL FISHING

The *Fisheries Act* (Canada) was amended in 2012, to manage threats to the sustainability and ongoing productivity of Canada's commercial, recreational, and Aboriginal (CRA) fisheries. Amendments also provided the Department of Fisheries and Oceans Canada (DFO) with enhanced compliance and protection tools, and provided clarity, certainty, and consistency of regulatory requirements across the country. One of the key amendments to the Act involves the merging of two previous sections into a single provision (Section 35 (1)):

"No person shall carry on any work, undertaking, or activity that results in serious harm to fish that are part of a CRA fishery, or to fish that support such a fishery."

Under the amended Act, DFO's regulatory role is focused on managing threats related to habitat degradation and loss, and flow alterations that have potential to impact CRA fisheries. An Authorization must be obtained from DFO under the *Fisheries Act* in order to proceed with any development or project that may result in localized effects to fish populations or fish habitat. DFO's policy interpretation of serious harm to fish includes:

1. the death of fish;
2. permanent alteration to fish habitat; or
3. destruction of fish habitat.

11.12 LIVESTOCK GRAZING LEASES

It is recommended that MLPP will work with livestock grazing lease holders when operating in grazing lease areas, and will seek to minimize impacts to natural grazing lease barriers and other grazing lease resources (e.g., corrals, watering sites).

11.13 BELOW GROUND RESOURCE EXPLORATION AND DEVELOPMENT

As exploration and development for below ground resources occurs in the park, it is recommended that MLPP will communicate with oil and gas, mineral exploration companies, and developers.

12 Forest Management Recommendations

12.1 TREATMENT OPTIONS

Based on the desired outcome and goals set by Meadow Lake Provincial Park, Forsite is recommending two primary treatment options. These include prescribed burning and timber harvesting. These two treatments will be effective in both decreasing the spread of insects and disease, and promoting regeneration which will start shifting the age class distribution to younger age classes and return the park to more historical age classes.

Harvesting is recommended as a pre-treatment for prescribed burning, in conifer dominated stands, to reduce the fuel load and mitigate some of the risks associated with a prescribed burn. Harvesting of deciduous dominated stands will stimulate sucker regeneration in areas where prescribed burning is not feasible. Given the objective of MLPP is not to maximize timber extraction, harvesting treatments are recommended to retain a higher than average retention level that will produce results similar to that of a wildfire. Recommended retention levels in pine dominated stands targeted for prescribed burning are between 25 and 50% of the pre-treatment stand condition. The harvesting will remove the trees best suited for sawmill production and leave the more heavily impacted trees as retention. The harvest treatment will leave the pine branches and tops disbursed throughout the treatment area to ensure even distribution of cones for natural regeneration. The subsequent prescribed burn treatment will sanitize the trees infected with Dwarf Mistletoe and stimulate natural regeneration. The prescribed burn must follow the harvesting treatment by no more than two growing seasons. If the prescribed burn occurs more than two growing seasons after harvesting, supplemental treatments of seeding or planting may be required to ensure adequate pine regeneration as the in-situ pine cones will start to open and shed their seed. A prescribed burn at this time would potentially consume the cones and any new pine germinants.

Areas with a significant white spruce component (greater than 75% of the area) will not be targeted for treatments within the first 10 years of the plan. Areas of old and very old white spruce are underrepresented within MLPP and these stand types provide excellent wildlife habitat and winter thermal cover.

Hardwood stands can either be treated by harvesting or with prescribed burns. Recommended retention levels in harvested hardwood dominated stands is up to 25% of dispersed retention in the stand to allow for effective regeneration through suckering. Prescribed burning involves strategically applying fire to a predetermined area to achieve a desired outcome, in this case forest management. In hardwood stands, a low intensity prescribed burn will result in a low density hardwood understory to establish from suckering while maintaining the existing overstory. As the crown of old and very old hardwood stands start to open up and more light reaches the forest floor, a new cohort of hardwood regeneration may start to develop. Where these stands are starting to regenerate and are producing stocking greater than 800 stems per hectare, it is recommended to allow them to develop naturally.

Large-scale aspen harvest treatments will be limited until the on-going aspen regeneration in declining aspen stands research project is completed. This study is evaluating the extent and vigour of aspen regeneration occurring in over mature aspen stands that are declining and breaking up. The findings of this study will guide future aspen stand treatments.

The size of treatment areas will be constrained by treatment method, forest type, geographic features, and stakeholder considerations. Larger treatment areas are recommended over small fragmented treatments so as to align with the principles of natural forest patterns.

Harvested treatment areas will target 20% retention of merchantable trees representative of the pre-treatment species composition. The acceptable retention range is from 15 to 25% except for treatments of areas infected with Dwarf Mistletoe, in this case, all live jack pine will be removed within the treatment area and non-susceptible species will contribute to retention where available. Retention will occur as either dispersed residuals (individuals

or up to 4 trees), clump residuals (contiguous areas less than 1 hectare), or island residuals (contiguous areas of at least 1 hectare). Retention can be located within treatment areas to reduce line of sight into treatment areas from visually sensitive areas such as roads, lakes, or major streams; or to provide wildlife travel corridors. Retention will be measured on an area basis, i.e. if a treatment area is 100 ha, then a retention range of 15 to 25 ha of dispersed residuals, clumps, or islands will remain post treatment.

In areas where harvesting or prescribed burns are deemed unacceptable, Forsite recommends the establishment of a white spruce understory in existing aspen dominated stands. This understory will maintain forest cover as the over mature aspen stands start to breakup. The white spruce can be planted at densities between 800 and 1,200 stems per hectare. This treatment aligns with the natural successional path of hardwood dominated stands.

With forest management treatments and natural disturbance events over an extended time frame, it is possible to maintain the attributes of forested lands and achieve a more diverse age class within MLPP. The following charts show the gradual shift in age class over time if management activities are initiated and maintained.

12.2 TACTICAL PLAN TREATMENT AREA SELECTION

Figure 33, Appendix A, compares the Tactical Plan treatment areas for the first 20 years of the plan with the areas of high fire risk. Fire risk is calculated using forest species cover, age, density, health, and accumulations of fuel from dead trees and branches. Generally, jack pine stands that are over mature, infested with Dwarf Mistletoe, and have several dead standing or dead and down stems, are of higher risk to fire than a healthy mature aspen stand. The objective of the Tactical Plan is to prioritize treatments within the first 20 years of the plan in the areas with the highest fire risk. For logistical reasons, not all stands designated as high risk are scheduled for treatment, and not all stands treated are of high fire risk. The objective is to reduce the risk of fire across the landscape over time; however, wildfire cannot be eliminated from within MLPP. Managing the fire risk will improve the effectiveness of wildfire control efforts and reduce the risk to human life, park and private assets, and landscape level disturbance to forest stands.

Fire is not the only consideration for Tactical Plan treatment area selections. One of the management objectives for MLPP is to reduce the average age of the forests within the park to an age class distribution that more closely represents the natural forest condition prior to management of wildfire. To achieve this objective, some stands with a potentially lower risk of fire were scheduled for treatment to manage for age class by replacing an over mature stand with a young regenerating stand. This management objective will assist the park in maintaining the forest cover of the park with greater age diversity.

12.3 ACCESS MANAGEMENT

Roads and trails are required for the treatment options to allow equipment and personnel access required to implement the treatments. For prescribed burn treatments, roads and trails (fuel breaks) provide control points required to contain the fire within the treatment area. Access can have negative ecological impacts as it increases human pressure on wildlife, creates linear disturbances that impact movement of Caribou populations, and increases predator efficiencies. For species such as caribou it is important that access and the density of roads, trails and similar features be minimized. Therefore, it is important to reclaim access disturbances and establish forest cover on these disturbances so that there is no net increase in the area of roads and trails within MLPP.

When entering a tactical plan area, the objective is to develop primary access to the farthest extent and conduct treatment options from there out to the frontend. Whenever possible, exiting access will be utilized to minimize the development of new access. As treatments are completed, all new access will be reclaimed and regenerated

within two years. Once a tactical plan treatment area is completed, all new access will be treated and returned to forest cover. This will allow the tactical plan area to proceed along its natural successional path without significant increases in human activity and linear disturbances on the landscape.

Currently within the park, there are 931 km of roads and trails as shown in Table 13. The proposed access within the Tactical Plan areas are Class 3 Forest Bush Roads. These roads have a right-of-way width between 20 to 30 metres and a road surface no wider than 7 metres. The proposed length of roads within the Tactical Plan areas is 239 km and shown in

Table 14.

Table 13 Existing Roads and Trails within MLPP

Road Class	Total Length (km)
Trail	638
Street	16
Collector	65
Resource / Recreation	45
Highway	167
Total	931

Table 14 Proposed Tactical Plan Class 3 Roads

Road Class	Total Length (km)
Decade 1 Proposed Class 3	146
Decade 2 Proposed Class 3	93
Total	239

Figure 31 Forest stand age class distribution in MLPP over 200 years of management

Parks Division has a target to maintain 15 percent of forest cover in an old or very old seral stage and a minimum of 5 percent as very old. This target is designed to maintain the ecological attributes of old forest within a management area. Within MLPP, it is possible to maintain 15% in an old and very old condition on the landbase for the next 100 years. Given there is little young forest on the landbase today, the old and very old target will drop below 15% and range between 11 to 15% from 110 years to 190 years of management treatments. An equilibrium of 15% will be reached after 200 years of management. In periods of a shortfall, mature stands can be used as recruitment stands to maintain the old and very old targets and attributes. Figure 32 shows the amount of old and very old forest within MLPP over a 200 year management horizon.

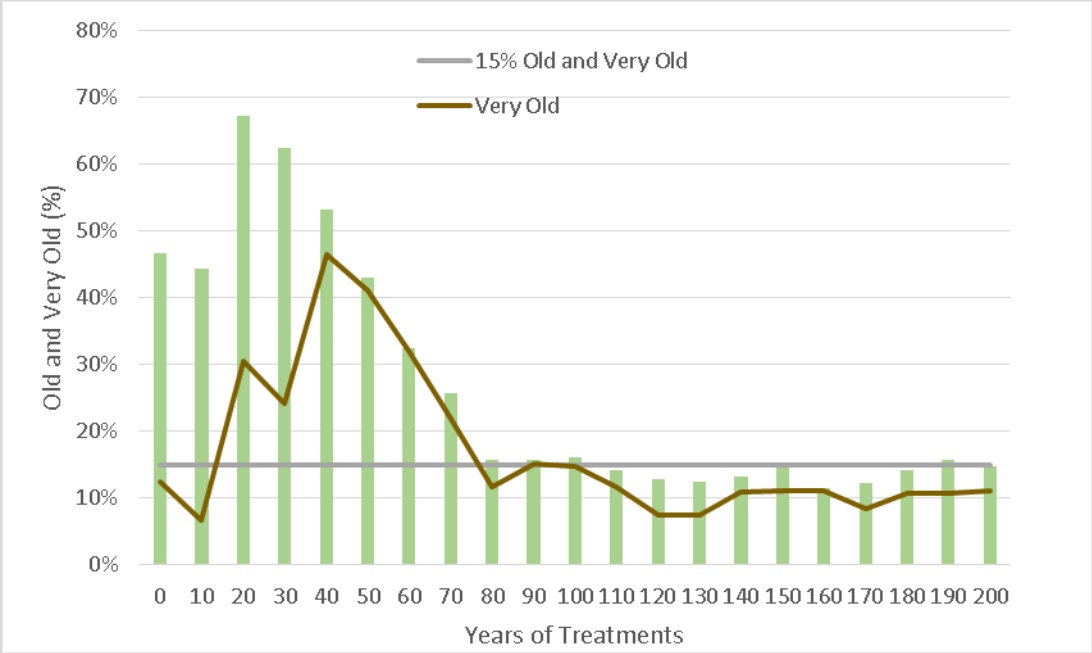


Figure 32 Percent of total old and very old and very old only seral stages over a 200 year management horizon

13 Silviculture Treatment Recommendations

Silviculture treatment recommendations (STR) identify the current and expected future forest conditions, silviculture systems, management options, regeneration standards, renewal and stand tending treatments for a specific development type. STRs guide prescriptions for operational treatments (i.e., harvest, renewal and stand tending). They also provide linkages between stand development types, silviculture regimes and modelling assumptions.

Nine STRs were developed for the MLPP FCMP. For easy reference, each STR is organized with all pertinent components (i.e., reference code, transitions, treatment options) described in a single table, Table 15. These components are briefly described in the sections below.

Reference Code

The reference code is used to identify each STR for reference in the FCMP, operational plans and reports. The three-part code (separated by dashes) indicates the appropriate: STR number (1 to 9), species type and development type.

Transitions

There are no transitions of forest types (H, HS, SH, H) planned at the landscape level however, stands or portions of stands may regenerate to different types. Overall, the amount of each type regenerated will be consistent with the treatment areas, but the treatment level flexibility will allow for the efficient application of silvicultural resources. For example, a small area of H in a larger SH treatment is likely to be planted and shift types – but small HS areas within a larger H treatment may well be left for natural regeneration.

Existing Forest Condition

The existing forest condition describes how development types are organized into stand groups for modelling purposes. This section also provides the corresponding provincial forest type (PFT) and approximate area of the productive forest for each development type for context.

Future Forest Condition

The future forest condition lists the future stand group(s) used to project forest growth after treatment and provides expected species types and areas predicted for a typical rotation age.

Treatment Options

The treatment options column describes the appropriate operational treatments (i.e., plant, scarify, and leave for natural) for each STR.

Silviculture System

The silviculture system of clear-cut with retention is assumed to be applied on all treatment blocks.

Site Preparation

Site preparation is not anticipated within the plan; however, some sites may require a mechanical site preparation treatment to manage soil moisture and temperature. Mechanical site preparation may be required to treat areas of heavy competition, generally as a treatment for Not Sufficiently Regenerated (NSR) areas as determined by an establishment or performance regeneration survey.

Regeneration

This section describes the appropriate treatment options for stand regeneration (e.g., natural, plant, seed) and planting densities.

Tending

Tending is not anticipated in the plan; however, stand tending treatment options (e.g., cleaning, spacing) may be required to meet the regeneration standard.

Table 15 Silviculture Treatment Recommendations

	Existing Forest Condition					Future Forest Condition		
Silviculture Reference Code	Area (ha)	Forest Dev. Type	PFT	Min. Age	Max. Age	Treat-ment	% [1] Area Treated	Regeneration Prescription
1-H-HW	56,021	HW	TAB	78	148	LFN	95	Leave for natural HWD
							5	Plant 800 sph white spruce / jack pine on roads and NSR areas
2-HS-HjP	3,007	HjP	HPM	78	178	Scarify	45	Drag scarify pine
							50	Leave for natural HWD
							5	Plant 800 sph jack pine on roads and NSR areas
3-SH-jPH	1,894	jPH	PMW	88	148	Scarify	90	Drag scarify pine
							5	Leave for natural pine
							5	Plant 1,800 sph jack pine on roads and NSR areas
4-HS-HwS	9,428	HwS	HSM	78	178	Plant	95	Plant 800 sph white spruce
							5	Leave for natural
5-SH-wSH	4,209	wSH	SMW	88	178	Plant	95	Plant 1,200 sph white spruce
							5	Leave for natural

1: % Area Treated values are intended as guidelines and are not to be considered as absolute values.

Sph – Stems per hectare.

100% of forest development types will have a post-harvest silviculture treatment.

The silviculture system is clear-cut with retention.

	Existing Forest Condition					Future Forest Condition		
Silviculture Reference Code	Area (ha)	Forest Dev. Type	PFT	Min. Age	Max. Age	Treat-ment	% [1] Area Treated	Regeneration Prescription
6-S-bS	1,202	bS	BSL	88	148	Plant	90	Plant 1,800 sph black spruce
							9	Drag scarify black spruce
							1	Leave for natural black spruce
7-S-jP	3,317	jP	JLP	88	178	Scarify	90	Drag scarify jack pine
							5	Leave for natural jack pine
							5	Plant 1,800 sph jack pine
8-S-jPbS	1,000	jPbS	BSJ	88	178	Scarify	80	Drag scarify jack pine / black spruce
							15	Plant 1,800 sph jack pine / black spruce
							5	Leave for natural jack pine / black spruce
9-S-wSbF	1,372	wSbF	WSF	88	188	Plant	99	Plant 1,200 sph white spruce
							1	Leave for natural white spruce

1: % Area Treated values are intended as guidelines and are not to be considered as absolute values.

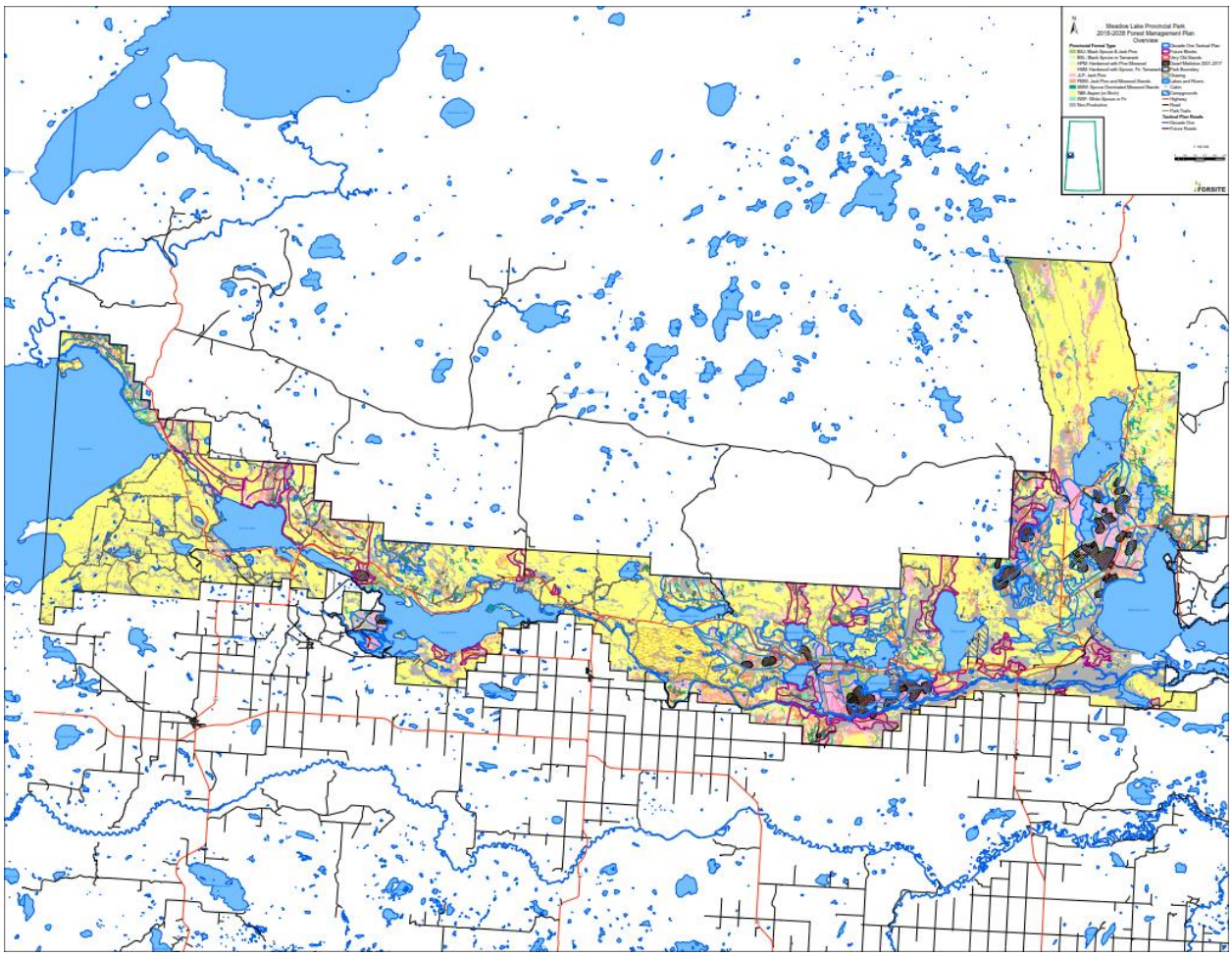
Sph – Stems per hectare.

100% of forest development types will have a post-treatment silviculture treatment.

The silviculture system is clear-cut with retention.

Appendix A Tactical Plan Areas

- 100K Overview_Map_V4.pdf



- 100K Overview_Map_Wildfire_Threat_V3.pdf

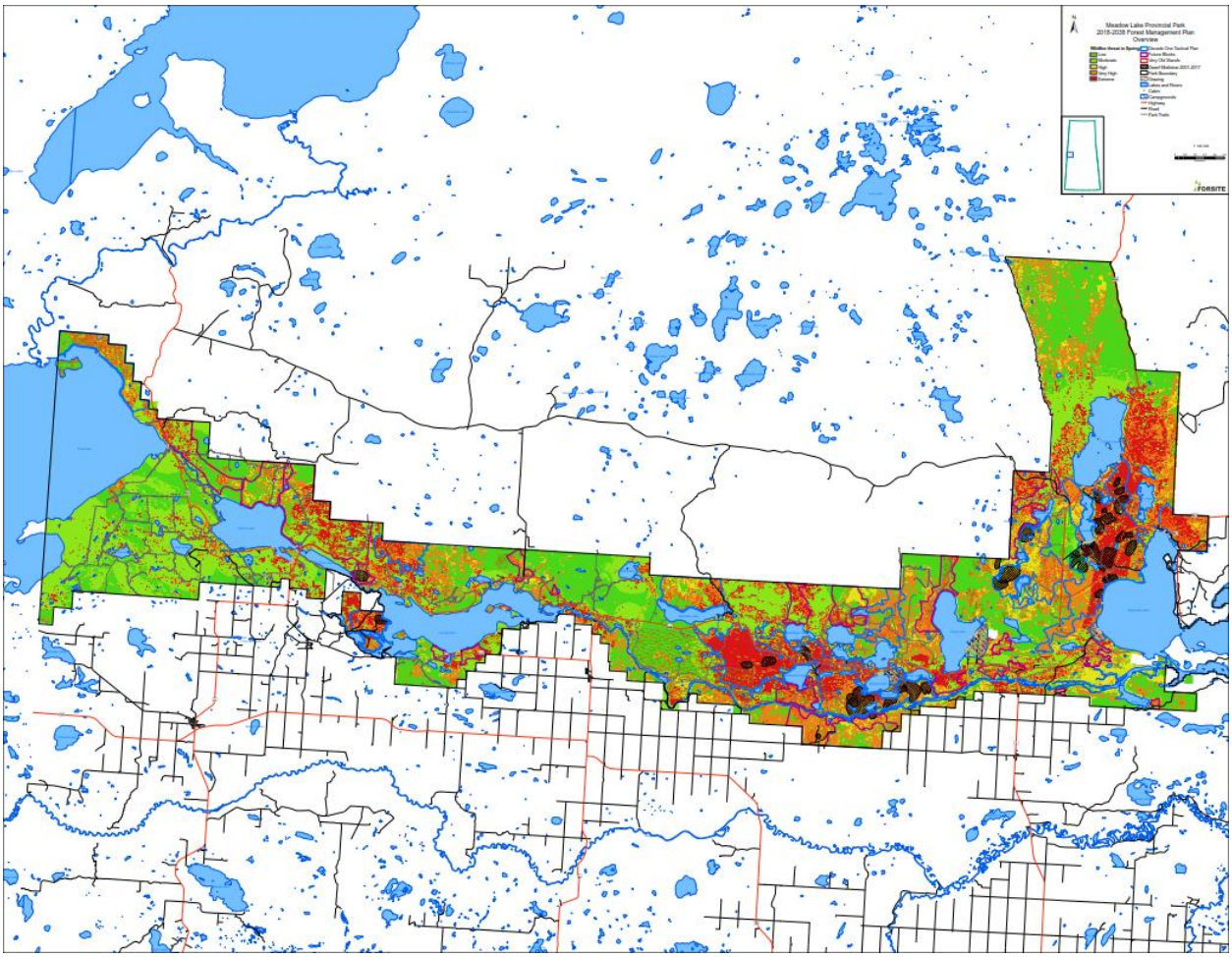
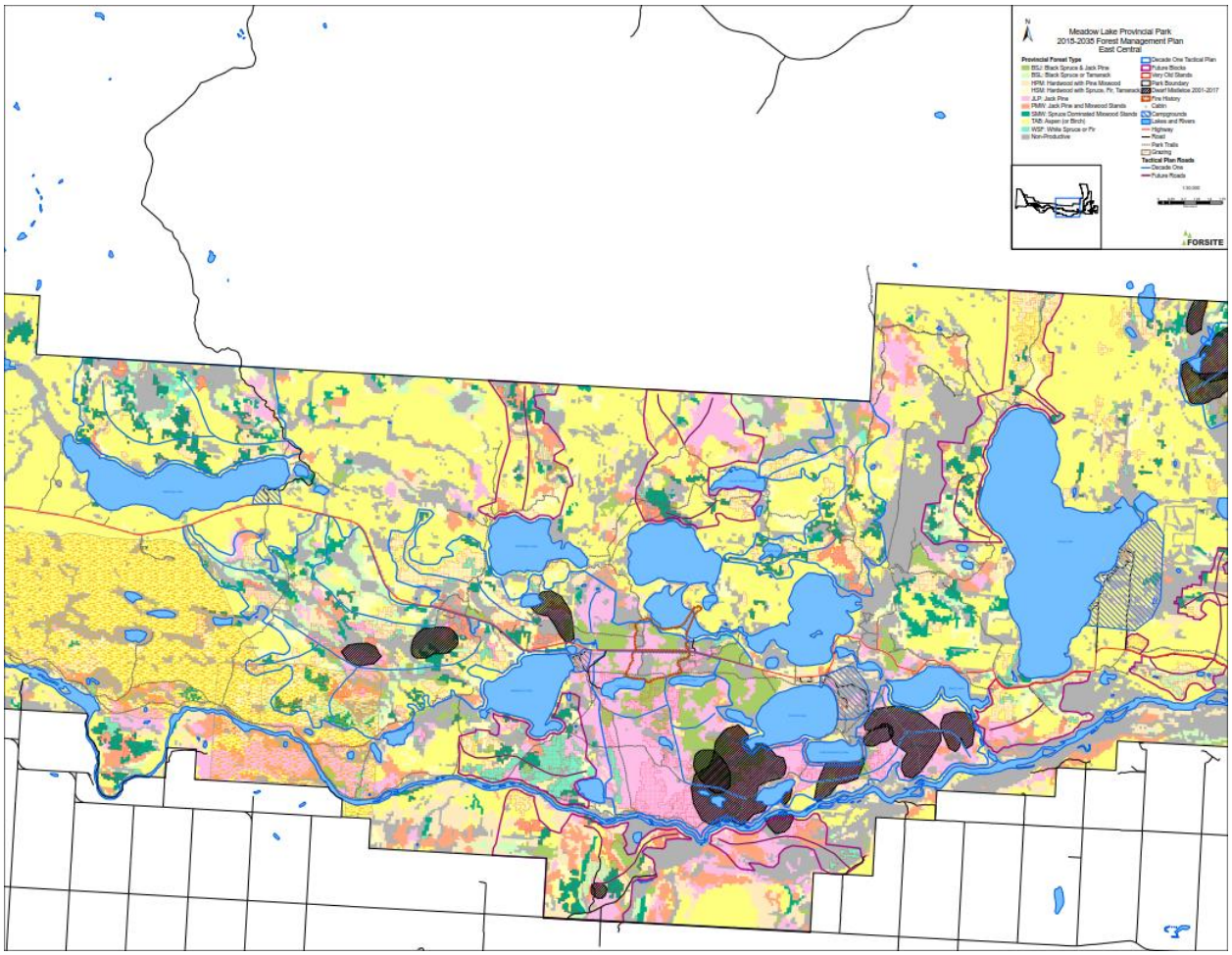


Figure 33 Wildfire Risk and Tactical Plan Overview Map

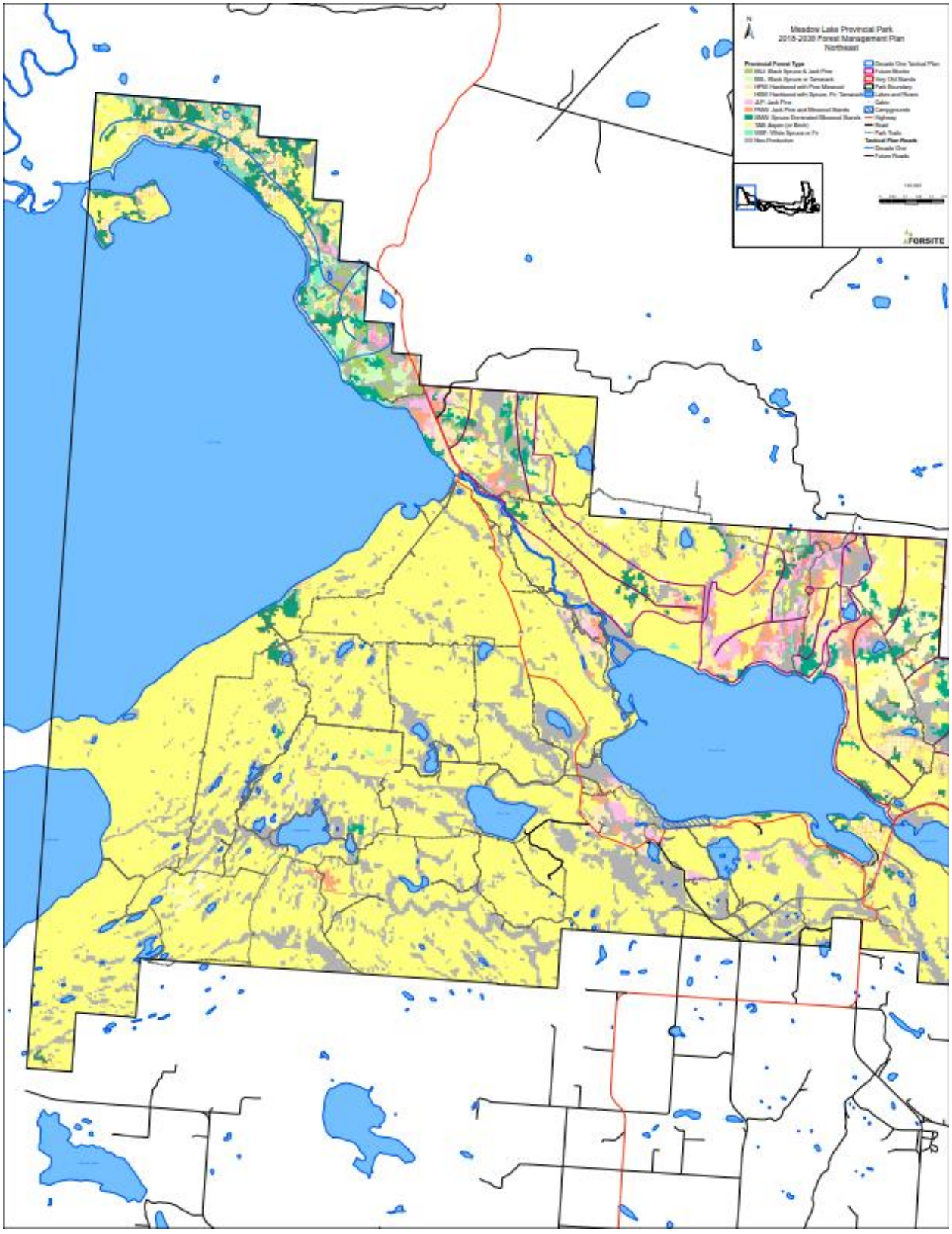
The above map, Figure 33, compares the Tactical Plan treatment areas for the first 20 years of the plan with the areas of high fire risk.

Area Maps (1:30,000)

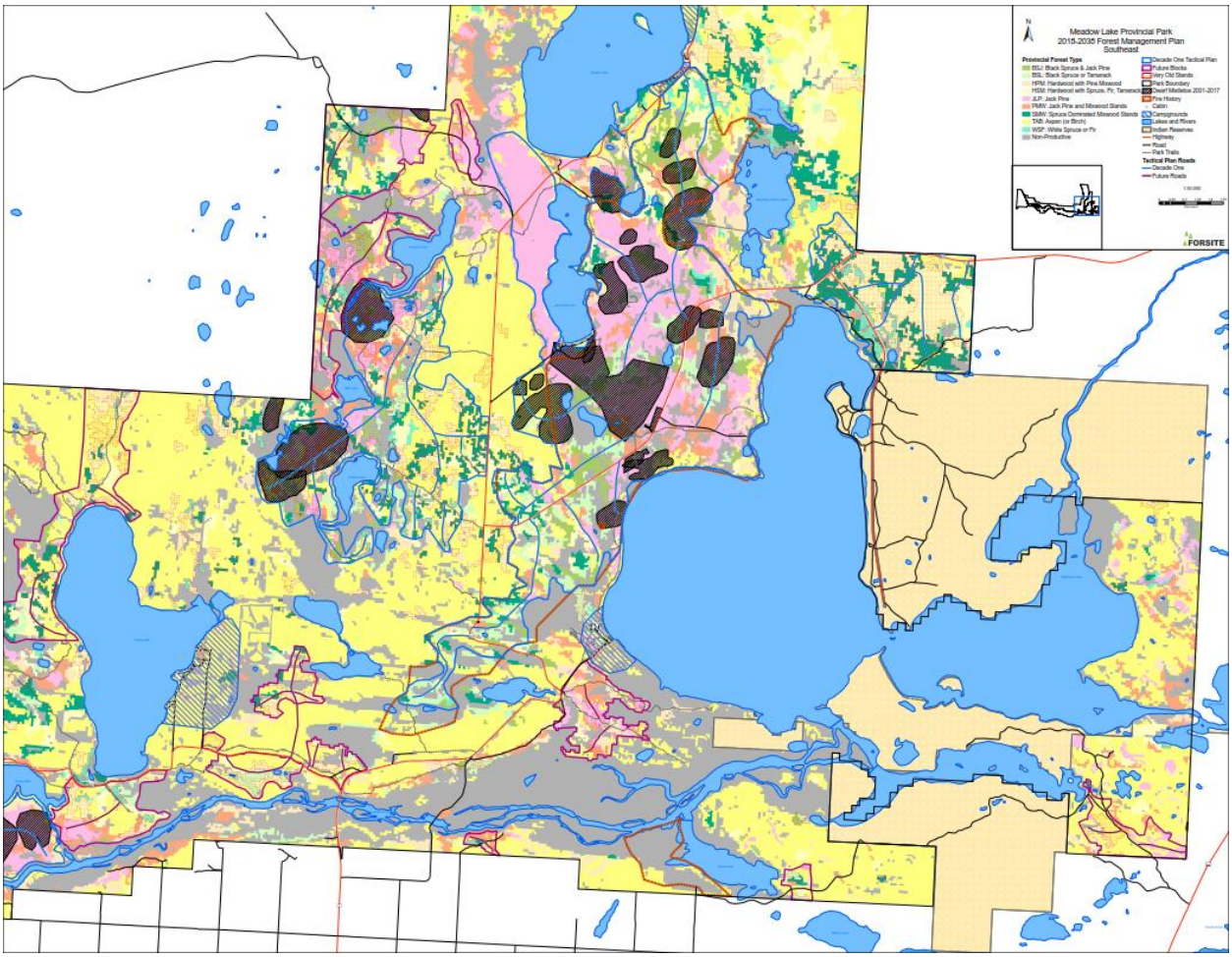
- East_Central_Final_V4.pdf



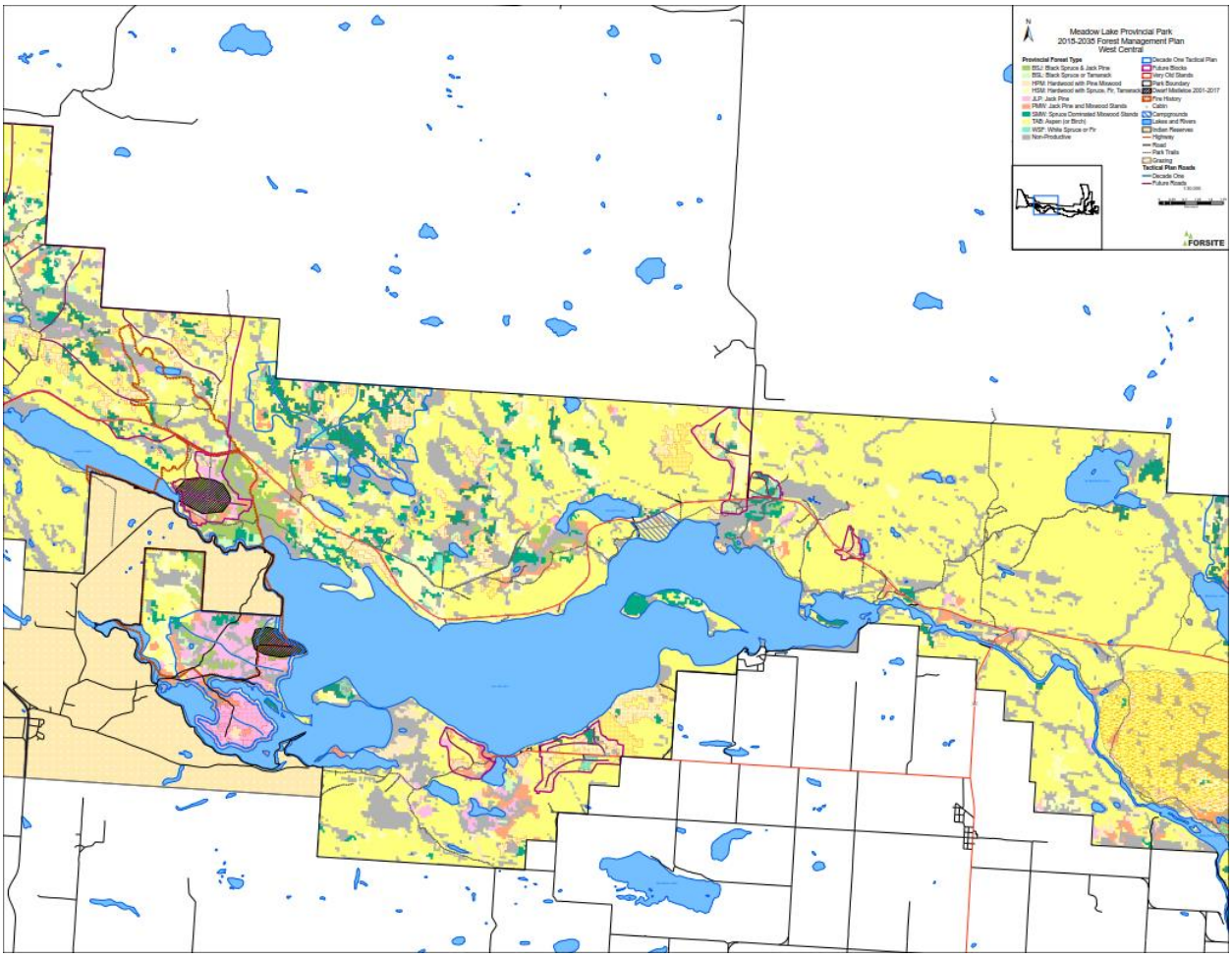
- Northeast_Final_V4.pdf



- Southeast_Final_V4.pdf



- West_Central_Final_V4.pdf



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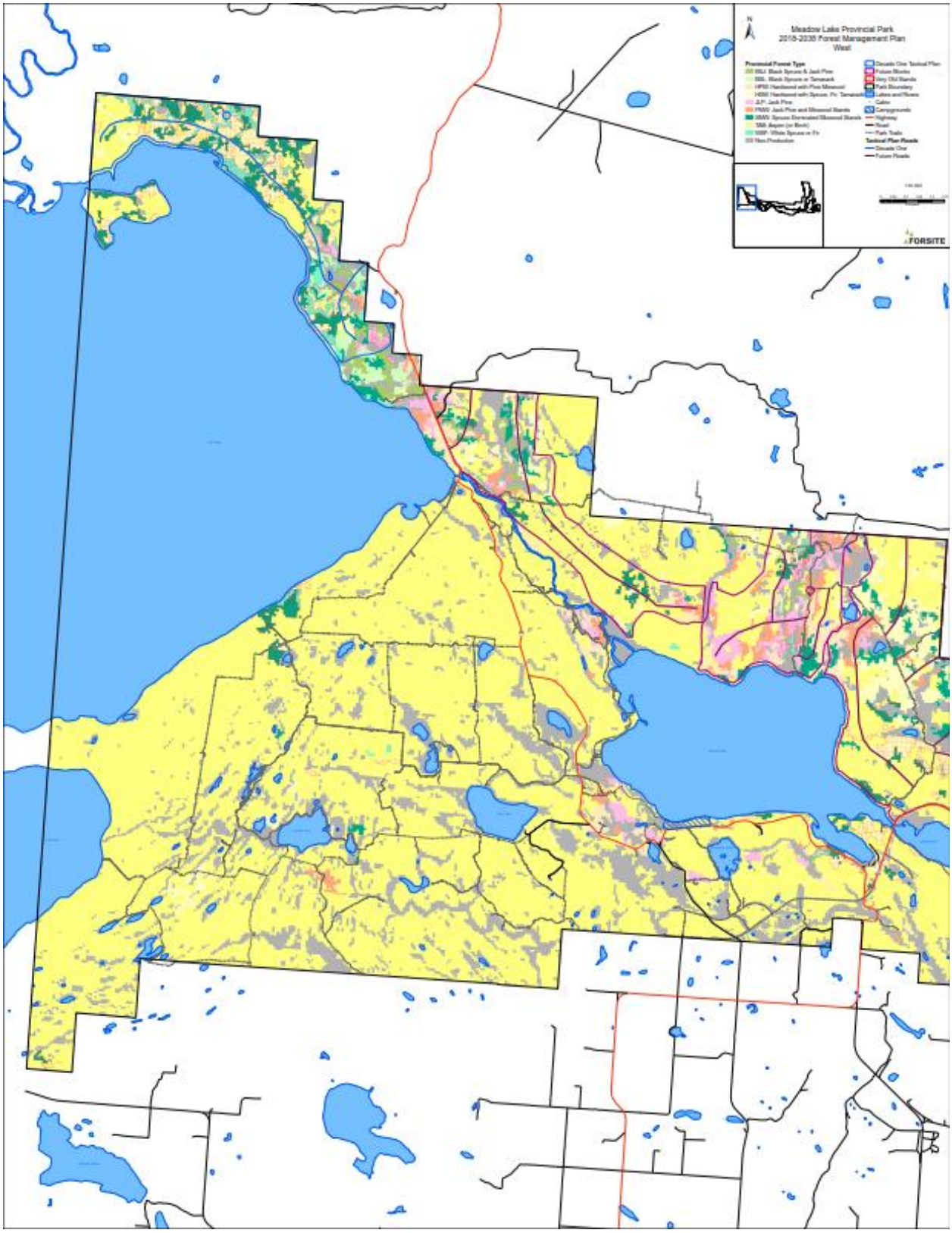

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