Range Plan for Woodland Caribou in Saskatchewan

Boreal Plain Ecozone – SK2 West Caribou Administration Unit

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Executive Summary

In 2002, boreal woodland caribou were recommended for "threatened" status by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and were listed as "threatened" under the *Species at Risk Act* (SARA) when it was proclaimed in 2003. As required under SARA, the Government of Canada developed a *Recovery Strategy for the Woodland Caribou Boreal Population in Canada* (the recovery strategy) which was released in October 2012. An amended strategy was released in 2019. The document identifies 65 per cent undisturbed habitat in a range as the disturbance management threshold. This provides a measurable probability (60 per cent) for a local population to be self-sustaining. The recovery strategy indicates that much of the Saskatchewan woodland caribou population is at risk from landscape-level disturbance.

Saskatchewan is responsible for managing woodland caribou on provincial and private lands, and as signatory to the *Accord for the Protection of Species at Risk in Canada*, has a responsibility to prepare a provincial range plan for woodland caribou. Range plans provide a path forward for effective landscape management. They provide the federal government with clear information on the measures, tools and targets for woodland caribou habitat management being deployed, and that they effectively protect woodland caribou habitat.

The goal of the *Range Plan for Woodland Caribou in Saskatchewan* is to achieve and maintain a self-sustaining woodland caribou population by managing habitat availability, while allowing for continued economic activity in northern Saskatchewan. The province considers the woodland caribou range assessment and planning processes to be part of a broader cumulative effects assessment and management strategy for provincial Crown lands and benefits multiple species simultaneously. This approach recognizes the variation of fire regimes, ecological conditions, land use activity and human-caused disturbance across Saskatchewan's boreal forest. This plan was uniquely and deliberately developed to consider the conditions experienced in Saskatchewan, and specifically in the SK2 West caribou administration unit.

Four fundamental principles guide the development of range plans in Saskatchewan:

- collaboration, consultation and transparency with participants;
- incorporating a balanced approach;
- using the best available information; and
- leveraging current tools and processes, while creating new measures as required.

The province's range planning approach has been purposefully planned with a focus on inclusiveness and participation to ensure Indigenous and Métis communities, along with stakeholders, have the opportunity to engage and be part of the planning process.

With a staged approach to range planning, initial efforts focused on the central portion of the Boreal Plain (SK2 Central), forming the framework for the planning process. The SK2 Central range plan provided the foundation on which the SK2 West range plan is built. With each consecutive range plan, refinements are made as part of the continuous improvement process and the specific conditions of the landscapes and disturbances were reflected. This provides a solid approach to landscape level planning

and developing management strategies that can be deployed in other parts of the Boreal Plain, and the Boreal Shield, with the ability to refine or supplement management strategies as required.

As part of the range planning process, Saskatchewan has identified five primary management strategies to reduce landscape disturbance:

- avoidance;
- reclamation and restoration;
- mitigation offsets for new disturbances;
- forest harvest patterns; and
- access management.

The management strategies identified in this plan are supported by existing statutes and can be implemented within the context of existing legislation, but will require the development of new associated regulations and policies.

Caribou habitat management areas have been delineated and prioritized for different management objectives and actions, in order to maintain sufficient habitat for a self-sustaining caribou population. This includes minimizing economic impacts on, and maintaining opportunities for, current and future land use. In addition, the landscape management targets have been modified depending on the local levels of fire disturbance. The management strategies identified in this plan are designed to reduce disturbance levels while allowing for continued sustainable levels of land use.

Saskatchewan's focus is on the creation of healthy forest landscapes for woodland caribou and other species. This will be achieved by managing human-caused disturbance, altering the patterns of human-caused disturbance, and maintaining adequately-sized patches of undisturbed high-value caribou habitat of various ages with connectivity between, and within, caribou administration units. As such, and specifically within the SK2 West area, the landscape management goals are to:

- reduce the amount of human-caused disturbance below current levels;
- maintain greater than or equal to 80 per cent of high potential woodland caribou habitat in a condition unaffected by direct and/or indirect human-caused disturbance;
- maintain adequate connectivity between the SK2 West, the SK2 Central, the SK1 caribou conservation unit and Alberta caribou ranges;
- create natural forest patterns through forest harvesting, that more closely resemble the variation of natural disturbances, both in distribution and scale; and
- decrease the total amount of non-permanent legacy roads and other linear disturbances.

For the SK2 West area, over a 50-year scenario period, the Saskatchewan model outputs suggest that:

- The amount of human-caused disturbance could decrease compared to current levels, as a result of strategies that promote widespread and extensive reclamation of legacy linear features. Monitoring of disturbance conditions will be used to benchmark the degree to which landscape management goals are being met. Furthermore, caribou population monitoring will ensure that Saskatchewan can respond to changes in the SK2 West population status.

- A large proportion of high potential woodland caribou habitat is expected to remain in a condition largely undisturbed by human activities.
- The location of caribou habitat management areas is anticipated to contribute to maintaining connectivity within the SK2 West area and across adjacent areas.
- Natural forest pattern harvest requirements, and potential future adjustments to these requirements, reflect a higher proportion of larger events. This will result in forest harvest event sizes and residual structure that more closely emulate natural disturbance patterns.
- The amount of linear features (e.g., non-permanent roads) is expected to be reduced through reclamation, mitigation offsets, access management and natural forest patterns based forest harvesting.

These outcomes can be achieved while maintaining current levels of land use activity.

Saskatchewan has several legislative tools that offer protection in a manner that contributes to the long-term viability of woodland caribou and supports continued economic development, including *The Environmental Management and Protection Act, 2010*, *The Forest Resources Management Act*, *The Provincial Lands Act*, *2016* and updates to the *Saskatchewan Environmental Code*. This includes the 2017 Forest Management Planning Standard and a new chapter and standard related to linear activities and corridors being developed for the *Saskatchewan Environmental Code*. These legislative tools are also applicable across woodland caribou ranges in both the Boreal Plain and the Boreal Shield[1].

In addition to the numerous regulatory instruments available for the protection of woodland caribou and their habitat, this plan also identifies and outlines principles, activities, programs, and management strategies that work toward the provision of recovery measures that benefit Saskatchewan's woodland caribou. The modelling conducted and illustrated within the plan and the appendices provides insight into the sensitivity associated with various disturbance factors and management strategies. While initial aspatial projections of a 65 per cent undisturbed habitat appear difficult to demonstrate and will not be met within the first 50 years of the assessment, it is recognized that habitat management strategies such as avoidance, reclamation and restoration, and access management will benefit the landscape on which the woodland caribou depend. It is also recognized that the benefits of some activities on the landscape such as reclamation and restoration cannot be immediately appreciated, but their early and continued implementation are essential to long-term landscape integrity and connectivity of woodland caribou habitat. Ultimately though, population assessment and trend data provide a more definitive measure of species sustainability.

This range plan builds upon the foundation of the previous SK2 Central range plan and continues to rely upon existing legislation and regulations that are in place to assure critical habitat protection. Saskatchewan is committed to ongoing assessment and research in order to support adaptive management and inform habitat indicators and targets, and will do so in collaboration with appropriate researchers, communities and agencies to deliver on these research priorities.

[1] The *Forest Management Planning Standard* is only applicable to areas with a forest management plan.

Saskatchewan will report on a five-year basis to Environment and Climate Change Canada (ECCC) and the public on range plan implementation, habitat condition, population trends and protection measures. Using an adaptive management framework, the Saskatchewan Ministry of Environment will be in a position to update range plans as required in response to the management strategies deployed and the outcomes attained.

1.0 Recovery Planning in Saskatchewan

In 2002, boreal woodland caribou were recommended for "threatened" status by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and were listed as "threatened" under the *Species at Risk Act* (SARA) when it was proclaimed in 2003. As required under SARA, the federal government developed the *Recovery Strategy for the Woodland Caribou Boreal Population in Canada* (the recovery strategy) which was released in October 2012 (Environment Canada, 2012) and amended in 2020 (ECCC, 2020). The recovery strategy identified 65 per cent undisturbed habitat in a boreal caribou range as the disturbance management threshold, which provides a measurable probability (60 per cent) for a local population to be self-sustaining. The recovery strategy indicates that Saskatchewan's Boreal Plain (SK2) population is at risk from high levels of habitat disturbance. Range plans were identified as documents that would outline how caribou ranges will be managed to protect critical habitat from destruction or improve the condition of critical habitat.

The amended federal recovery strategy identifies 40 per cent undisturbed habitat in the SK1 (Boreal Shield) conservation unit as the disturbance management threshold as well as the maintenance of total anthropogenic disturbance in the range at or below five per cent while maintaining the minimum 40 per cent undisturbed habitat (ECCC 2020). SK1 has high levels of natural disturbance (fire), but very low levels of human-caused disturbance, and has been shown to have a stable population status (McLoughlin et al., 2019).

Saskatchewan, as signatory to the Accord for the Protection of Species at Risk in Canada, and being responsible for managing woodland caribou on provincial and private lands, has a responsibility to prepare a provincial range plan for woodland caribou.

Woodland caribou in Saskatchewan were assessed provincially as "threatened" in 2000 (Godwin and Thorpe, 2000). In response to the assessment, the Saskatchewan Ministry of Environment worked with Indigenous and Métis communities and stakeholders to develop a provincial *Conservation Strategy for Boreal Woodland Caribou* (2014). The recovery goal of the conservation strategy is:

To sustain and enhance woodland caribou populations, and maintain the ecosystems they require, throughout their current range.

The conservation strategy was developed to act as the basis for management of boreal ecosystems for other species of concern. As part of this strategy, a threat assessment was conducted and it concluded that due to relatively high levels of human-caused habitat modification and fragmentation, woodland caribou populations in the Boreal Plain were at higher risk of decline and potential extirpation

compared to those in the Boreal Shield. Range plans were identified as the means by which the provincial conservation strategy would be implemented.

Following the provincial risk assessment completed as part of the caribou conservation strategy, the province has prioritized the focus of recovery efforts and range planning in the Boreal Plain ecozone. Range planning for the Boreal Shield ecozone will follow as further informed by recently acquired population and habitat data. The range assessment and range planning activities that have contributed to the development of this range plan are effectively the implementation of many actions identified in Saskatchewan's *Conservation Strategy for Boreal Woodland Caribou*.

2.0 Range Plan Development Process

This range plan will provide a path forward for effective landscape management to ensure sufficient quality habitat for a self-sustaining woodland caribou population which would allow a traditional Indigenous harvest within Saskatchewan. This includes providing the necessary information so that the federal government has a clear understanding of and confidence in, the measures, tools, and targets for management of woodland caribou habitat being deployed that effectively protect woodland caribou habitat. Additionally, as woodland caribou is a wide-ranging species, range plans developed at a landscape level will provide a foundation for addressing management of other boreal species.

The goal of the Saskatchewan Woodland Caribou Range Plan is to:

> Achieve and maintain a self-sustaining woodland caribou population by managing habitat availability, while allowing for continued economic activity in northern Saskatchewan.

The Government of Saskatchewan considers the woodland caribou range assessment and planning processes to be part of a broader cumulative effects assessment and management strategy for provincial Crown lands. This approach recognizes the variation of fire regimes, ecological conditions, the dynamic nature of caribou habitat, land use activity and human-caused disturbance across Saskatchewan's boreal forest. Our focus is on reducing human-caused disturbance, altering the pattern of disturbance, maintaining adequately-sized patches of undisturbed high-value caribou habitat with connectivity across and between caribou administration units, creating healthy forest landscapes for woodland caribou and other species.

2.1 Guiding Principles of Range Planning

Four fundamental principles that guide development of range plans are:

- **Collaboration, Consultation and Transparency:** Range plans are developed with the participation of diverse land use interests including Indigenous communities, Métis locals, industry, northern municipalities, and other stakeholders. The participation of many different land users together allows for effective information sharing, helps guide range plan development, builds collaborative relationships, deepens the understanding of potential interests, concerns, and solutions of the interested parties, and a shared commitment to the outcomes.
- **Balanced Approach:** Range plans work to ensure self-sustaining caribou populations while supporting Saskatchewan's plan for growth so that needs of the present can be met without limiting future opportunities.
- **Best Available Information:** Range plans are developed using the best information available, including local and traditional Indigenous knowledge, and western science. Range plans will be refined as new information becomes available, through continued monitoring, research and analyses.
- **Leverage Current Tools and Processes/Create New as Required:** Range plans will seek to use currently available tools, policies and processes to achieve desired outcomes. There is recognition that it will take time to meet the desired outcomes and that new adaptive management tools will be developed and implemented as required.

2.2 Process

A two-phase process involving range assessment and range planning for woodland caribou is being used in Saskatchewan. The range assessment phase provides an understanding of the status of, and the risks to, woodland caribou. It is effectively an information gathering and evaluation process to guide planning and decision making.

The range planning phase includes the development of a range plan that guides how land use will be managed through time to optimize woodland caribou habitat and natural resource use. This includes management objectives and strategies, and approaches for monitoring and adaptation. Implementation of these strategies follows the range plan development.

This range plan has been developed through an iterative process of range assessment and range planning. Range assessments that characterize the level of risk have provided a path for prioritizing planning areas, as well as enabling the demonstration of a landscape planning framework concept with woodland caribou as a focus.

2.2.1 Caribou Conservation Units

Saskatchewan's boreal woodland caribou range is divided into two woodland caribou conservation units (Figure 1), based on the boundaries of the boreal ecozones (Acton et al., 1996). The Boreal Shield (SK1) Woodland Caribou Conservation Unit (hereafter called Boreal Shield or SK1) encompasses the rocky shield, sandy plains and many lakes of northern Saskatchewan.

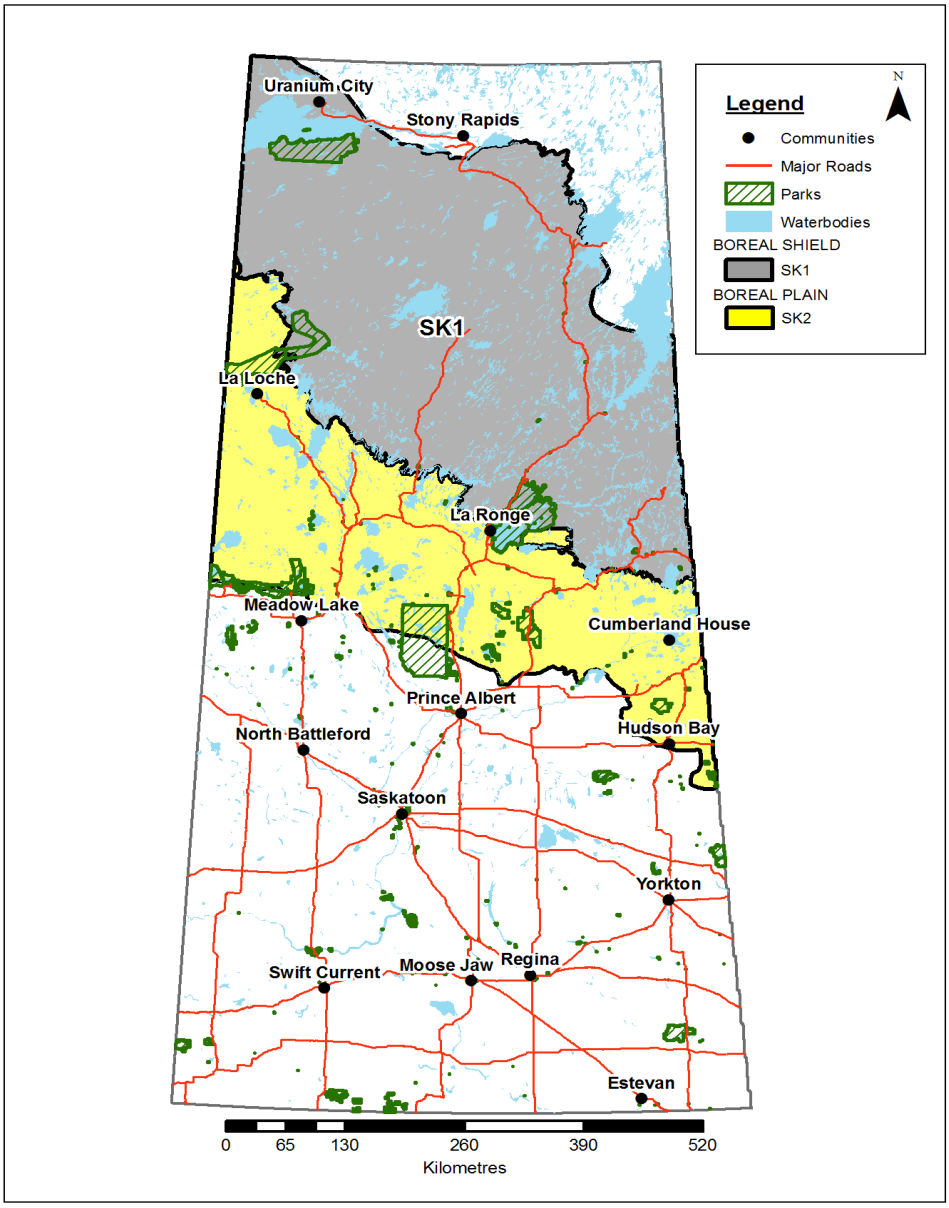

Figure 1. The caribou conservation units of Saskatchewan [1].

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[1] Caribou conservation units are available for viewing on the Hunting, Angling and Biodiversity Information (HABISask) web application at: https://gisappl.saskatchewan.ca/Html5Ext/?viewer=habisask

The Boreal Plain (SK2) Woodland Caribou Conservation Unit (hereafter called Boreal Plain or SK2) encompasses the more productive mixed-wood forests and lakes of central Saskatchewan, including large areas of low-lying peatlands. While these two units represent important differences in ecological conditions (e.g. habitat types, fire regimes, landforms, etc.) and human land use and management (e.g. overall levels and types of land use, fire management, etc.), the boundary between SK1 and SK2 does not represent a population boundary, as caribou move freely between the two areas.

The Saskatchewan Ministry of Environment considers the distribution of woodland caribou within the SK1 and SK2 woodland caribou conservation units to be relatively continuous (i.e. there are no discrete ranges). Analyses of genetic connectivity by Priadka et al (2018) across Saskatchewan has further confirmed that discrete population boundaries do not exist.

2.2.2 Caribou Administrative Units

The large size of the SK2 woodland caribou conservation unit (i.e. 109,717 km^2) is not well suited for range assessment and range planning activities, given the large variation in ecological conditions, habitat types, land use, and natural disturbance regimes across the Boreal Plain of Saskatchewan. As a result, three smaller caribou administration units within SK2 were developed: SK2 East, SK2 Central, and SK2 West (Figure 2).

The caribou administration units (CAUs) should not be considered discrete caribou population boundaries, as landscape level genetic analysis has shown the population to be continuous across the range (Priadka et al., 2018). The administration units were defined based on the following considerations:

- be large enough to be meaningful for management of woodland caribou given their ecology and life history;
- represent important ecological differences from east to west;
- follow forest management agreement or term supply licence area boundaries for ease of administration; and
- represent a geographical area that is manageable for the development and implementation of a range plan.

At present, the SK1 area has not been sub-divided into administrative units. However, it is a large area (176,774 km^2) with considerable fire disturbance, ecological differences from west to east, and different levels of development, therefore the breakdown into smaller units for range planning purposes in the future is possible, but not certain. If SK1 is considered for subdivision, it will be based on practical planning considerations, ecology, best current science as well as stakeholder input.

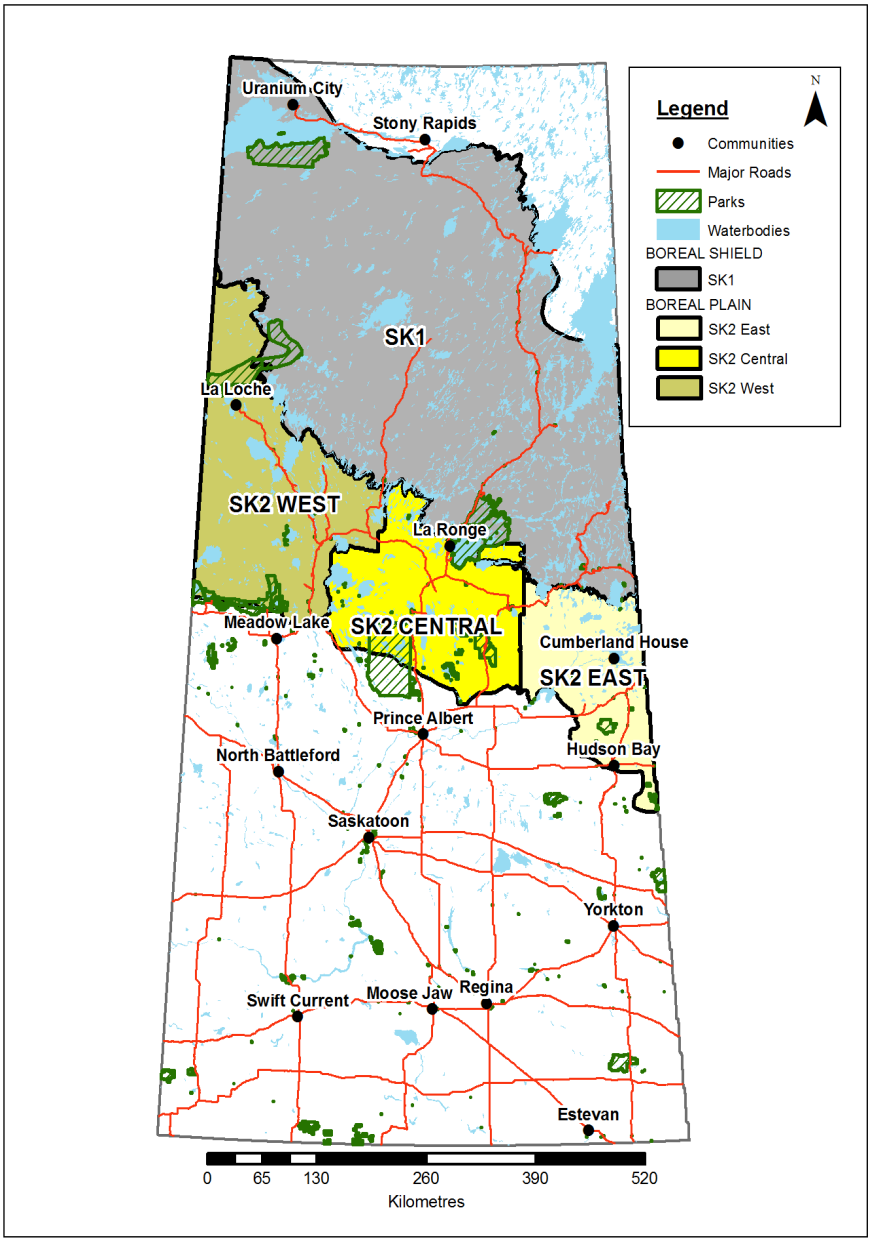

Figure 2. The caribou administration units associated with the SK2 caribou conservation unit[1].

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[1] Caribou administration units are available for viewing on the Hunting, Angling and Biodiversity Information (HABISask) web application at: https://gisappl.saskatchewan.ca/Html5Ext/?viewer=habisask

Saskatchewan has implemented a staged approach to range planning, with efforts to date focused on SK2 Central, SK2 West, and SK2 East, forming the foundation for the planning process. This also provides a solid approach to landscape-level planning and management strategies that are being deployed in the SK2 West, and likely in the SK2 East and SK1, with the ability, and intent, to refine or supplement management strategies based on the unique situations within the caribou administration units.

The range planning approach has been purposefully planned with a focus on inclusiveness and participation to ensure that stakeholders and Indigenous communities have had the opportunity to engage and be part of the planning process. Some of the objectives met through this approach include:

- identifying industries, non-government organizations, associations, municipalities, First Nations and Métis locals that may have interests in the particular caribou administration unit;
- establishing a planning table consisting of representatives from First Nations, Métis locals, industry, non-governmental organizations, and municipalities to ensure effective and meaningful dialogue during the planning process and provide an opportunity to discuss specific interests of particular groups as related to planning purposes;
- engaging and consulting with planning table participants and others at locally held meetings and other forums to present and discuss the program intent, the desired outcomes, current disturbance levels, future disturbance scenarios, and possible management strategies to facilitate desired outcomes;
- engaging and consulting with participants to understand the implications of management strategies on communities, organizations, industry, and treaty and Aboriginal rights; and
- preparing a cohesive plan that has been developed with participation of various communities and interest groups that addresses the desired outcomes, and is both feasible and practical for land users and the provincial government that provides for a Saskatchewan-based solution.

2.3 Range Plan Integration

Following the completion of the three range plans for the SK2 caribou conservation unit and the range plan for the SK1 caribou conservation unit, efforts will be taken to ensure monitoring, implementation, and integration will occur. The development of the range plans to date have involved planning table participation from those responsible for shared woodland caribou populations in adjacent jurisdictions as well as from federal agencies with leases of Provincial Crown lands (i.e. Primrose Lake Air Weapons Range) or designated federal lands (i.e. Prince Albert National Park) within Saskatchewan. Additionally, it is expected that collaboration will continue to occur with adjacent jurisdictions and with partner agencies whose shared interests include both woodland caribou populations as well as habitat.

3.0 Local Population Self-Sustainability Status

To evaluate the status of caribou populations across Canada, Environment Canada (2011) used an integrated risk assessment approach that incorporated three lines of evidence:

- caribou population trends;

- population size; and
- habitat condition based on total disturbance levels.

Data was not available in Saskatchewan for caribou population trends or size, so disturbance was used as an index of these parameters (Table 1). The federal recovery strategy identified Saskatchewan's Boreal Plain (SK2) woodland caribou sub-population to be "as likely as not self-sustaining" meaning that it is at the point of highest uncertainty of population status. Range retraction from the southern boundary of caribou range has been documented (Arsenault 2003) and also points to a caribou population that is not self-sustaining.

The province initiated population monitoring in the SK2 West Administration Unit in 2020. This involves the collection of caribou fecal pellets over a three-year period to provide genetic information and estimate population size by 2021 and trend by 2023. Results from a traditional knowledge study indicated that woodland caribou in the southern part of SK2 West are considered to have a reduced or declining population status. This is based on the fact that caribou have rarely been seen and/or, only in small groups over the last 10-20 years, by study participants (Mamun and Brook, 2017).

It is expected that the SK2 West population size and trend estimates will be available in 2023. Enhanced information and direction from population monitoring, or significant changes in landscape disturbance levels, may trigger an update to the range plan.

Saskatchewan and Alberta have transboundary caribou populations, so status information from both these areas should be considered for the SK2 West area. Caribou population structure analyses show a connectivity between the SK2 West and the caribou in Alberta's Cold Lake population (Priadka et al., 2018). In addition, based on movements of radio-collared animals, Alberta has identified local population ranges for caribou. There are three populations that move between Alberta and Saskatchewan – Richardson, East Side of the Athabasca (ESAR) and Cold Lake. The Richardson population is currently assessed as stable, while both ESAR and Cold Lake status are declining (Government of Alberta 2017). The Alberta ranges have a higher level of disturbance (i.e. 84 to 91 per cent) (Government of Alberta 2017) than the SK2 West (i.e. 61 per cent), the majority of which is human-caused, so a direct comparison of population status between jurisdictions may not provide a realistic picture.

The very high fire disturbance, in combination with low human-caused disturbance in northern Saskatchewan's Boreal Shield conservation unit (SK1), differs from ranges of most other populations in Canada that informed the disturbance model used by Environment Canada (2011). The probability of self-sustainability was reported as "unknown" and a schedule of studies was identified to better understand population trend and critical habitat in the SK1 area. Results from the research that was undertaken showed a stable population status (McLoughlin et al., 2019) and were used by Environment and Climate Change Canada to identify a new management threshold of 40 per cent undisturbed habitat, with no more than five per cent human-caused disturbance, for SK1. The most northern part of the SK2 West administrative unit is very similar to SK1 with very high levels of fire and relatively low anthropogenic disturbance.

Table 1. Environment and Climate Change Canada (2017) boreal caribou population and habitat condition assessment for the entire SK2 caribou conservation unit.

Range Identification	Range Name	Range Type	Population Size Estimate	Population Trend	Disturbed Habitat (per cent)			Risk Assessment (4)
					Fire (1)	Anthropogenic (2)	Total (3)	
SK2	Boreal Plain	Conservation Unit	Not available	Not available	30	20	45	Not self-sustaining / self-sustaining

[1] Fire disturbance is any area where a fire has occurred in the past 40 years (without buffer).
[2] For anthropogenic disturbance, a 500-metre buffer is applied to all linear and polygonal (areal) disturbances.
[3] For total disturbance, anthropogenic (human-caused) and fire disturbances that overlap are counted once in the total.
[4] Environment Canada, 2012.

4.0 Current Habitat Condition and Important Areas for Boreal Caribou

The three caribou administration units, the SK2 East, SK2 Central and SK2 West were evaluated to compare population status, disturbance levels, habitat characteristics and the potential level of risk to maintaining a sustainable caribou population across different areas of the Boreal Plain. Based on these results, Saskatchewan has implemented a staged approach to range planning, beginning with SK2 Central and subsequent planning for SK2 West and East, respectively. Range planning on the Boreal Shield (SK1) will be initiated after the Boreal Plain. This section currently focuses on SK2 West and will be updated as the subsequent planning areas are completed.

4.1 Overview of SK2 West

The vast majority of the area in SK2 West falls within the Mid-Boreal Uplands and Boreal Transition ecoregions, with a small portion occurring within the Churchill River Upland; it is the characteristic landscape of Saskatchewan's Boreal Plain ecozone with low rolling forested hills and plains interspersed by many wetlands (e.g. fens, bogs and marshes of different classes) and lakes.

Over half of the SK2 West is considered to be in the upland forest condition, with the remaining areas represented by wetland and open water (Table 2).

The SK2 West is considered an important area for woodland caribou in Saskatchewan, because it provides the physical connection between caribou in the western portions of SK2, SK1, and caribou in Alberta. SK2 West has a relatively large proportion of high-value upland (e.g. pine - lichen forest) and lowland (e.g. peatland) caribou habitat. Of the three SK2 caribou administration units, SK2 West has the highest levels of both wildfire and total disturbance.

Table 2. Summary of the SK2 West caribou administration unit land base features.

Land Class[1]	Area (km²)	Area (per cent)
Upland[2]	24,957	51.6
Wetland	17,962	37.2
Water	5,408	11.2
Total	48,327	100.0

[1] Land class categories are based on ecosite mapping developed by the Ministry of Environment, Government of Saskatchewan.

[2] The Saskatchewan forest inventory identifies that the timber harvest land base covers 10,491 km² or 21.7 per cent of the SK2 West area.

The SK2 West area has a history of industrial forest management activities, resulting in an extensive network of permanent and non-permanent roads, which make up a large part of the human-caused disturbance. Forestry is one of the primary land use sectors and the SK2 West area is expected to experience slightly increasing levels of forestry activity in the future.

Three forest licences have been issued within the SK2 West administrative unit: the North West term supply licence (TSL) issued to Carrier Forest Products Ltd. for the North West timber supply area (TSA), the Tolko Industries Ltd. – Meadow Lake OSB Division TSL issued to Tolko Industries Ltd. for the Bronson-Green Lake TSA, and the Mistik Management Ltd. Forest Management Agreement (FMA) issued to Mistik Management Ltd. for the Meadow Lake TSA. The Turnor TSA also overlaps with SK2 West, but this area has experienced almost no forestry activities historically and there are no forestry activities currently planned within the area (Figure 3). Under the *Forest Management Planning Standard* of the *Saskatchewan Environmental Code*, licensees shall develop and implement a management strategy using best available information to mitigate the negative effects of forest management activities on long-term caribou habitat supply and shall adapt their forest management plan to meet the objectives and targets of the corresponding woodland caribou range plan within the licence area (Government of Saskatchewan 2017a).

There are also significant oil and gas activities in SK2 West, ranging from seismic exploration to conventional oil and gas extraction in the southern portion of the range, to historic oil sands exploration in the northwest. These activities have also resulted in a significant network of access roads and seismic lines which also contributes to the current human-caused disturbance levels. Currently, active natural gas extraction activities will likely continue into the future, but new natural gas development is not expected to occur within SK2 West. Other current industrial activity in the SK2 West includes uranium exploration and potential development, peat exploration, and sand and gravel mining.

An overview of land use allocations in the SK2 West is illustrated in Figure 4. While a relatively large proportion of the areas is leased or under disposition, this does not necessarily equate to these areas being affected by activity nor development. Additionally, some of the linear features identified are used by multiple sectors.

The SK2 West also represents a combination of provincial, federal, and municipal land categories as shown in Table 3.

Table 3. Summary of SK2 West land categories.

Land Category	Agency/Type	Area (km^2)	Area (per cent)
Provincial Crown Lands	Ministry of Environment Crown Lands	43,352	89.7
	Ministry of Agriculture Crown Lands	104	0.2
	Provincial and Regional Parks	2,399	5.0
	Ecological Reserves	1,590	3.3
	Wildlife Refuge	118	0.2
	Sub-Total	**47,563**	**98.4**
Municipal Areas	Towns/Villages/Resort Areas/Other Private Lands [1]	244	0.5
	Sub-Total	**244**	**0.5**
Federal Lands	Indian Reserves	521	1.1
	Sub-Total	**521**	**1.1**
	Total [2]	**48,327**	**100.0**

[1] Other private lands represent a very small proportion of SK2 West.

[2] A significant area (i.e. 6,371 km^2) of SK2 West is contained within Primrose Lake Air Weapons Range (PLAWR). The Air Weapons Range is provincial Crown land leased from the Ministry of Environment by the Department of National Defense. The PLAWR area also overlaps with two ecological reserves (i.e. McCusker River and Primrose Lake provincial ecological reserves) and one wildlife refuge (i.e. Primrose Lake wildlife refuge).

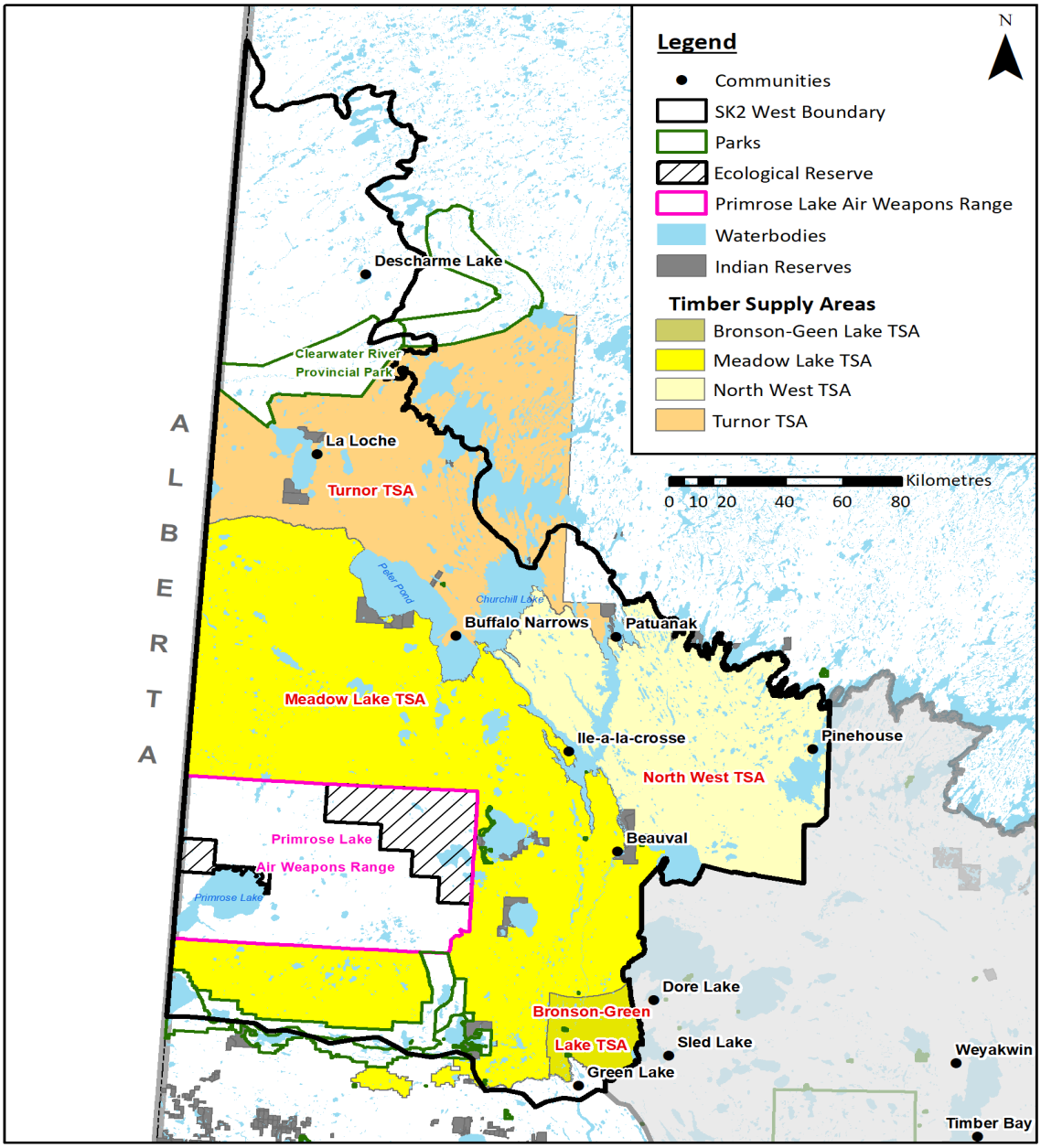

Figure 3. Forestry land tenure contained within the SK2 West caribou administration unit.

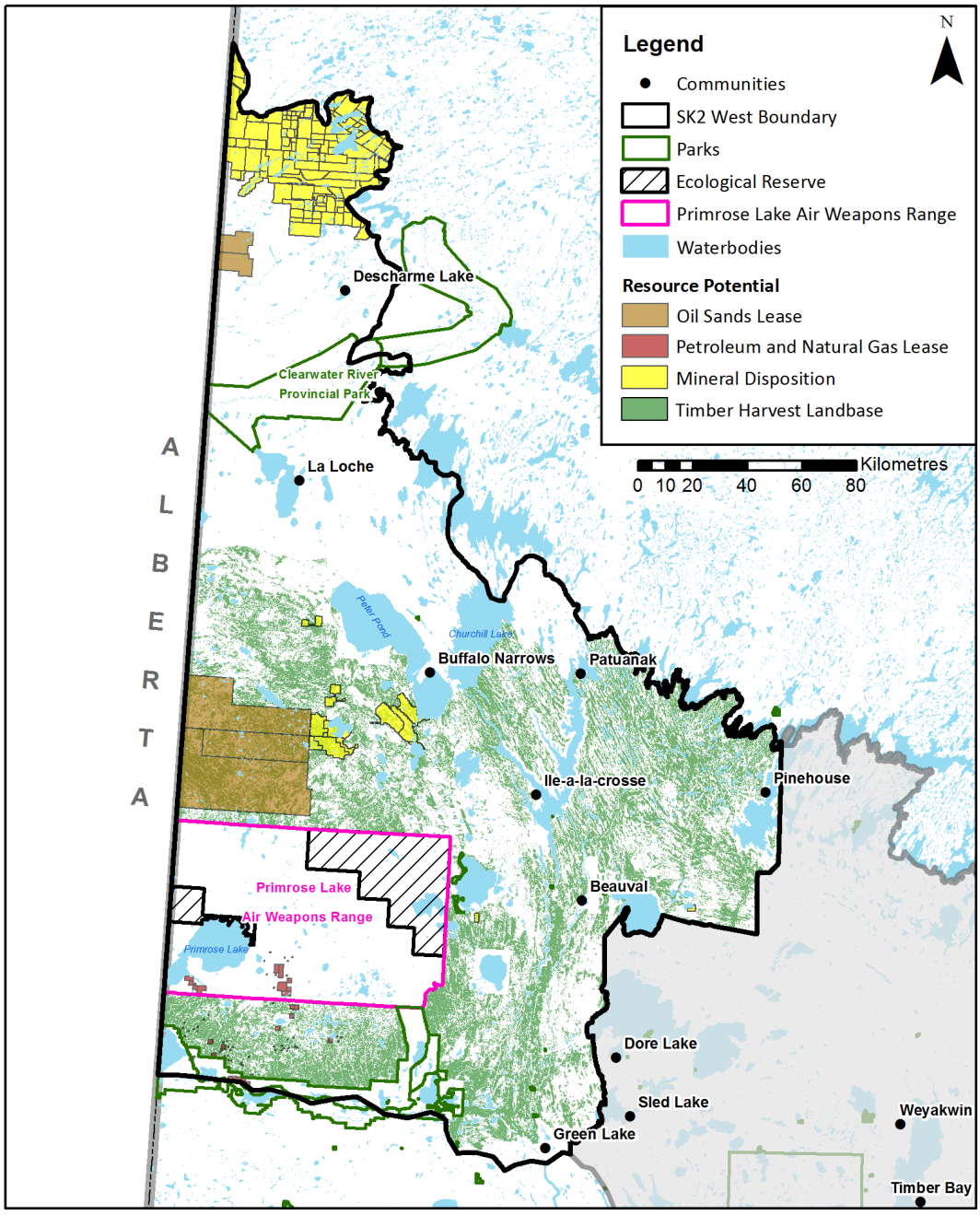

Figure 4. Current overview of land use allocations in the SK2 West.

4.2 SK2 West Habitat Condition and Disturbance Levels

4.2.1 Effects of Disturbance on Caribou

Natural and human-caused disturbances affect habitat in the short and medium term because of the alteration of mature forests that are used by caribou. New growth that follows wildfires or forest harvesting is often of limited value to woodland caribou, because it is lacking lichens, the primary food source of caribou. It may also increase predation risk by providing habitat for other ungulates and their predators. Skatter et al., (2014) found that suitable lichen coverage was high 21-30 years post fire, but that thickness and biomass may limit the value to caribou in the Boreal Shield of Saskatchewan. This is in agreement with the findings by Gruel (2018). When human-caused changes occur over a large scale and encroach upon the southern-most provincial range boundary, they can lead to caribou range retraction as evidenced over the last century (Trottier, 1988; Arsenault, 2003; Schmid, n.d.). In the longer term, regeneration after wildfire or forest harvesting can renew habitats which are of importance to woodland caribou.

Fragmentation of the landscape by roads, seismic lines, cut lines and other linear developments discourages or impedes the ability of caribou to make optimum use of the available resources within their range. Roads, which do not allow sufficient flow of water through wetland complexes, can impact wetland function. Disturbances reduce connectivity between important habitats, making the behaviour of the animals more predictable and increasing their risk of predation. Disturbances may reduce the size of important habitat patches, thereby concentrating animals and making it easier for predators to find them. Linear features also provide humans and predators with access to areas of formerly inaccessible habitat.

Small populations of caribou can become isolated if the landscape is divided by barriers that they will not cross, such as highways or large lakes. Such populations are likely to become genetically homogeneous and lack the diversity necessary for long-term survival, eventually leading to local extirpation.

4.2.2 Types of Disturbance

The federal recovery strategy identified that the total disturbance level (i.e. burn over areas less than 40 years old and human-caused disturbance buffered by 500 metres) provides the best link to caribou population status from studies of 24 caribou populations across Canada (Environment Canada, 2012). This link between population status and disturbance was re-confirmed with subsequent analysis of 46 caribou populations (Johnson et al., 2019). Disturbance levels reported in this range plan are also calculated in this manner using disturbance datasets developed and maintained by the Ministry of Environment. These buffers will continue to be used until new science comes available which demonstrates a different buffering approach is more appropriate, then range plans will be adjusted accordingly.

Human-caused disturbance features can be considered as either linear or area-based. Linear features include roads, trails, power lines, seismic lines and railways. Area-based disturbance features include forest harvest blocks, oil well pads, gravel pits, mine sites or settlements. Area-based disturbance can

also include wetlands affected as a by-product of road construction and interference with natural drainage systems and area hydrology. Human-caused disturbances can be further classified as permanent or non-permanent. Permanent disturbances include municipal and industrial infrastructure, graded and paved roads, and long-term forest and oil and gas resource roads. Non-permanent disturbances include forest harvest blocks, seismic lines, and short-term access roads. Disturbance mapping is consistent with ECCC disturbance methodology and assumes that restoration of these non-permanent features would take approximately 40 years to be considered undisturbed. Wildfire was also considered as a disturbance in the ECCC assessment and will contribute to disturbance mapping in the Saskatchewan disturbance assessment.

4.2.3 SK2 West Disturbance Levels

Using up-to-date and quality controlled provincial datasets, the Saskatchewan Ministry of Environment has updated the disturbance mapping in SK2 West and this mapping is consistent with Environment and Climate Change Canada human disturbance mapping (Appendix A: SK2 West Disturbance Mapping). Saskatchewan Ministry of Environment estimates that the current disturbance level in the SK2 West is 61.2 per cent. Currently, approximately 24.8 per cent of SK2 West is affected by human-caused disturbance and the associated 500 m buffer (Table 5). The footprint of forest harvest blocks (less than 40 years old) in SK2 West, not including the 500 m buffer, is 1,180 km^2. There are approximately 5,001 km of seismic lines and 11,812 km of non-permanent forestry, recreational, and oil and gas-related access roads in the SK2 West. Forest harvesting, transportation, and oil and gas activities have resulted in a dispersed and sometimes overlapping pattern of human-caused disturbance in the southern portion of the SK2 West caribou administration unit. Oil and gas exploration and development of oil sands areas in the northern portion of SK2 West have also resulted in pockets of human-caused disturbances.

Table 4. Disturbance levels in the SK2 West caribou administration unit as assessed by Saskatchewan Ministry of Environment (2016).

Disturbance	Area (km^2)	Area (per cent)
Human-caused Disturbance[1]		
Permanent	2,297	4.8
Non-Permanent	9,672	20.0
Total	11,970	24.8
Wildfire[2]		
Total	17,628	36.5
Disturbance Summary		
Total Disturbed	29,598	61.2
Total Undisturbed	18,729	38.8

[1] Human-caused disturbance includes 500 metre buffer.
[2] Wildfire disturbance is based on 1977 to 2016 fire records. Human-caused and wildfire disturbance are based on the non-overlapping area of each, with human-caused disturbance taking priority over wildfire. Waterbodies were removed from the wildfire polygons (i.e. 473 km^2 of waterbodies were removed) and do not contribute to the total wildfire disturbance.

There is large variation in the location and extent of area burned across the Boreal Plain, reflecting spatial differences in fire regimes. The total area burned from 1977 to 2016 is 28,143 km^2 or 58.2 per cent of the SK2 West area (Figure 5). However, the amount of fire disturbance in SK2 West varies from the low-fire southern region to the northwestern region which is largely disturbed by wildfire

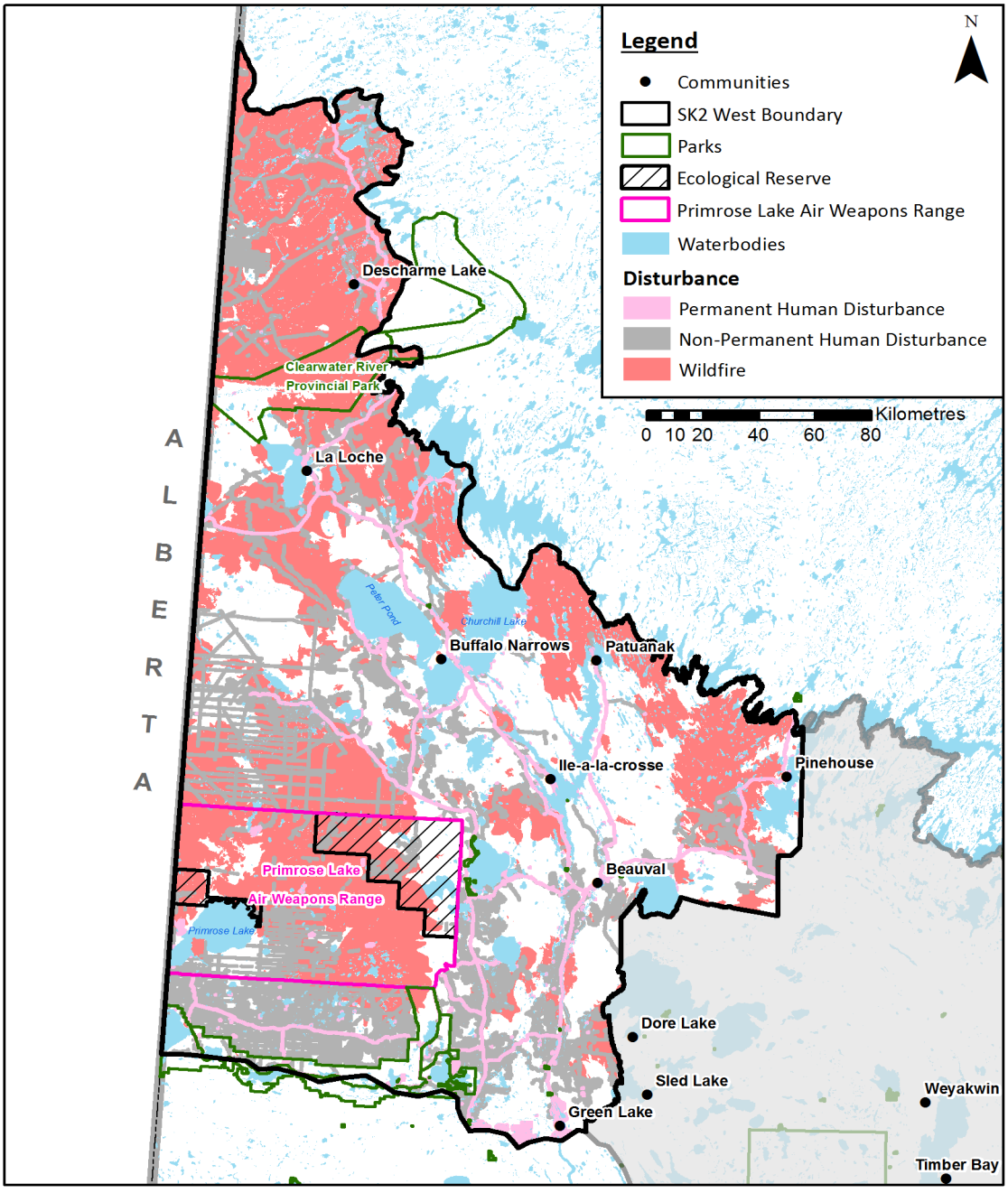

Figure 5. The extent of human-caused disturbance and wildfire in the SK2 West based on the 2016 Saskatchewan Ministry of Environment updated disturbance mapping assessment.

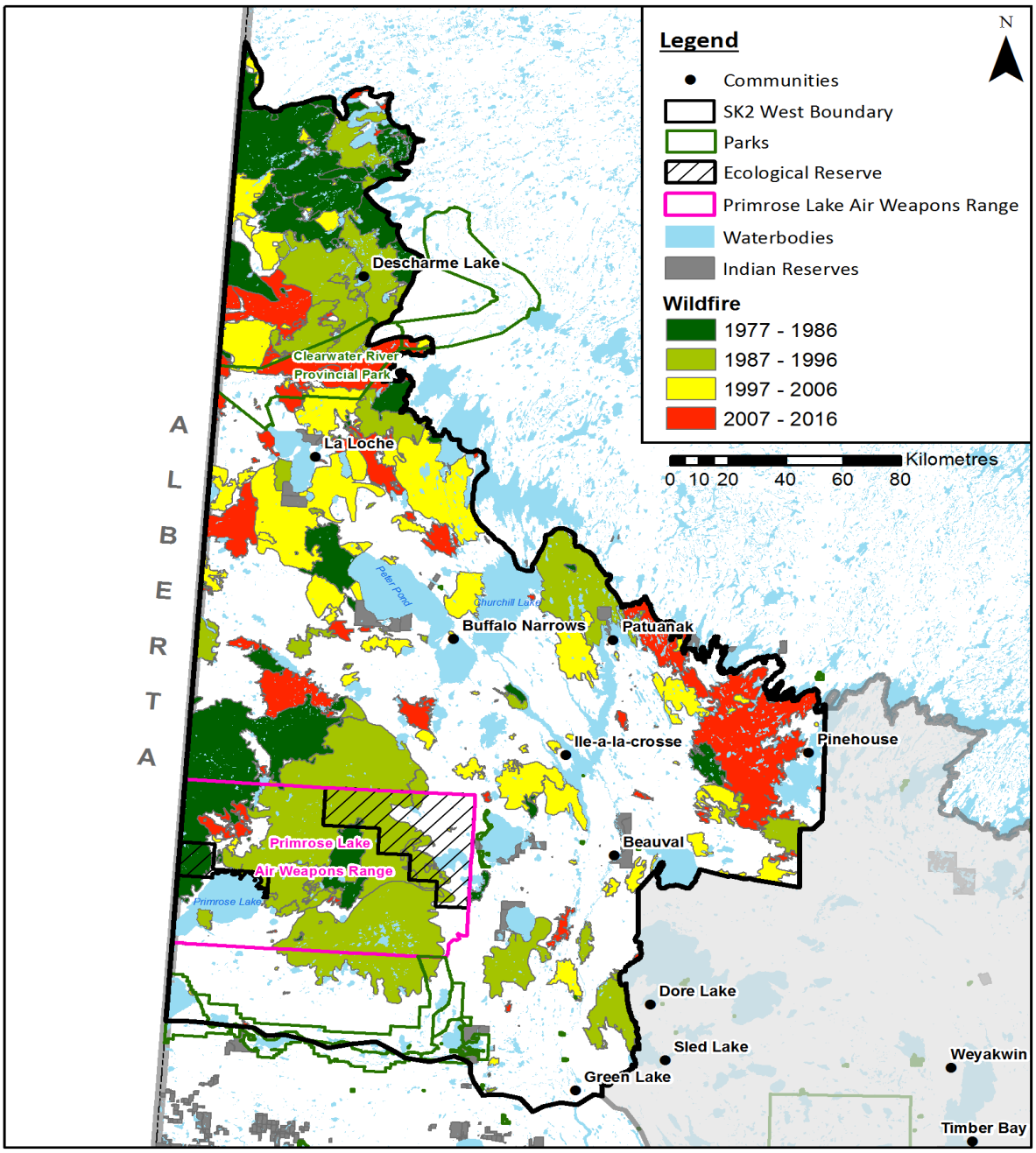

Figure 6. Wildfire history from 1977 to 2016 in the SK2 West caribou administration unit.

4.2.4 Northern and Southern SK2 West Sub-units

The unequal and geographically concentrated distribution of wildfire within SK2 West makes managing disturbance levels at the scale of the entire administration unit difficult. In light of this, two sub-units were identified in the SK2 West (Figure 7). Separate management options and targets are developed for each sub-unit as described later in the range plan. A boundary following the southern borders of the Fire Bag Hills, Garson Lake Plain, and Palmbere Plain ecodistricts identifies a delineation of the SK2 West where there is a transition from higher fire levels in the north to an area in the south that is less affected by fire (Figure 6; Table 6). This boundary is further supported by research that characterizes the fire regime in the northern sub-unit of the SK2 West as more closely resembling that of the Boreal Shield (i.e. SK1 range) rather than the Boreal Plain (Boulanger et al., 2014; Boucher et al., 2018; Appendix B). This boundary also reflects a change in wildfire suppression strategies, changing from wildfire suppression efforts in the primary and secondary timber areas to wildfire suppression efforts that focus on protecting values in the northern wildfire management zone (Appendix B). Lastly, the direct causes of human disturbance within the two sub-units also differs and resulting management options for dealing with those different causes of disturbances will differ. The northern sub-unit currently has a relatively low human footprint, mostly as a result of mineral and oil and gas activities. The southern sub-unit has higher levels of human-caused disturbances, mostly resulting from forestry and oil and gas exploration and extraction activities. See Appendix B for further documentation on the characteristics and supporting information for establishing two sub-units.

Caribou continue to use the northern sub-unit even though the majority of it has burned between 1975 and 2014. It is likely that caribou are utilizing residual areas that did not burn, as shown by Skatter et al., (2017) in the Boreal Shield (SK1) conservation unit. However, it is important to note that work being conducted by the Regional Industry Caribou Collaboration has identified that even though fire boundaries can contain a large proportion of unburned residual patches within the burn complex, habitat selection results suggest that caribou are avoiding burned landscapes, including both the burn complex and residual patches and that this avoidance can persist for up to 30 years after the fire (Konkolics et al., 2018).

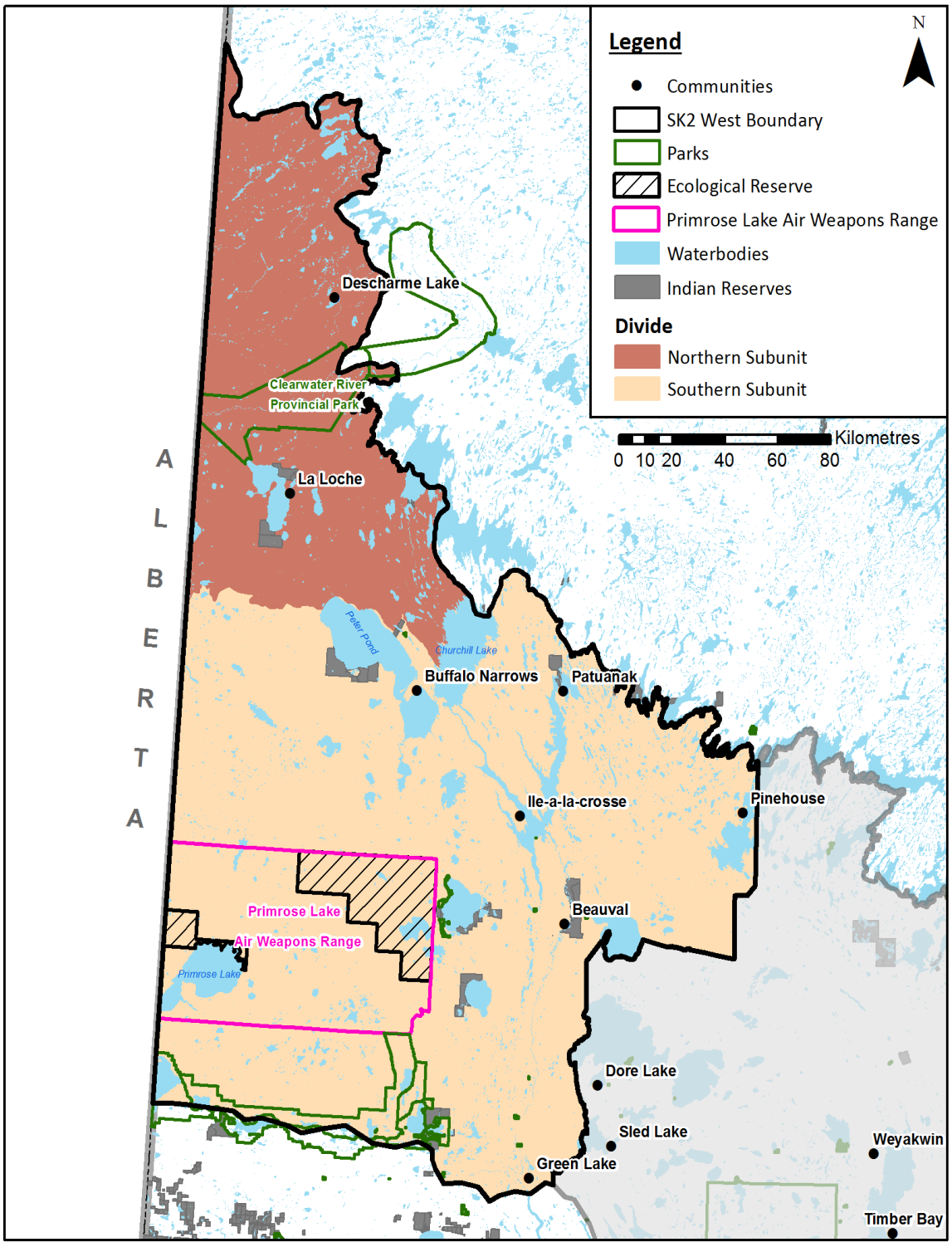

Figure 7. Sub-units of the SK2 West where wildfire is the main driver of disturbance in the northern sub-unit and less dominant in the southern sub-unit.

Table 5. Wildfire disturbance levels associated with the northern and southern sub-units of the SK2 West caribou administration unit.

Sub-unit	Total Area (km^2)	Area of Fire [1] (km^2)	Area (per cent)
Northern	12,750	7,834	61.4
Southern	35,577	9,795	27.5
Total	48,327	17,629	

[1] Outside of human-caused disturbance.

4.3 Important Areas for Caribou

The quality of woodland caribou habitat was evaluated using three approaches:

1. ranking ecosites and mapping habitat potential;
2. considering the current suitability of potential habitats; and
3. habitat modelling based on Indigenous traditional knowledge.

Woodland caribou habitat potential within the provincial forest of central and northern Saskatchewan has been identified using a forest ecosite geographic information system layer which has been mapped for the SK2 West area. Forest ecosites represent information about a site's tree species, plant-abundance and soil and site characteristics (McLaughlan et al., 2010). Forest ecosite habitat potential ranks were assigned by individually evaluating the ecosites potential to provide forage, refuge and calving habitat. Forage value was rated based on the availability of lichen and other plant species, which are palatable to caribou (Thomas and Armbruster, 1996). Refuge value was rated based on the availability of plant species which provide food value for other ungulates (e.g. moose, deer, elk). This was used as a surrogate for the probability of predation. If these food sources are not present, the ecosite has potential to provide refuge for caribou from predators.

Calving and post-calving ratings were made in consideration of both the time of calving and the following two to four-week period. The primary consideration was safety from predation. The related factors considered were the ability to hide a calf and the lack of spring black bear forage. A secondary consideration was whether there was caribou forage available on the site. The ecosite rankings were completed for the Boreal Shield and Taiga Shield, and the Boreal Plain by a panel of biologists with expertise on woodland caribou habitat use in Saskatchewan (see Appendix D). Forest ecosites were mapped with the assigned habitat potential value (Figure 8). This approach to defining habitat potential provides similar results to outcomes of habitat modeling based on Indigenous traditional knowledge done by Mamun and Brook (2017) as seen in Figure 9. Both methods correspond in defining a landscape with the potential to provide contiguous, high quality caribou habitat.

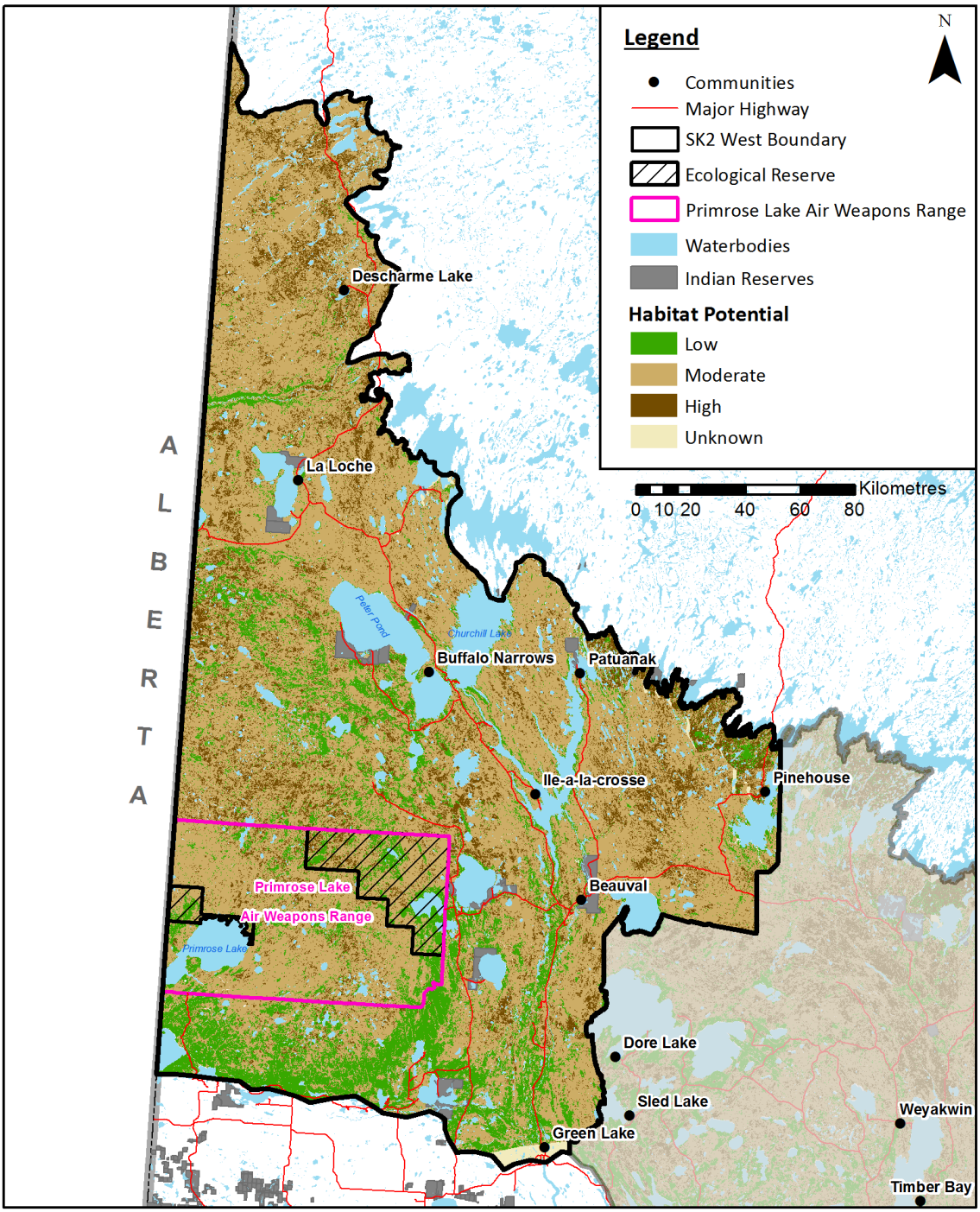

Figure 8. Caribou habitat potential in the SK2 West caribou administration unit [1].

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[1] The caribou habitat potential spatial layer is available for viewing by detailed users on the Hunting, Angling and Biodiversity Information (HABISask) web application: https://gisappl.saskatchewan.ca/html5ext/?viewer=habisask and for download on the Saskatchewan GeoHub: https://geohub.saskatchewan.ca/ in raster format.

Habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life cycle requirements. Potential does not consider the current state of the habitat (e.g. recently burned, harvested or industrial development), but its optimal state. In comparison, habitat suitability reflects the current status of the habitat and incorporates the effects of fire or forest harvesting on seral stage (i.e. sequence of vegetation development over time), habitat loss, reduced use of a habitat by caribou resulting from sensory disturbance adjacent to human land use, increased risk of mortality, and other factors.

Over 60 per cent of the SK2 West (i.e. 29,466 km^2) falls into the moderate habitat potential class, while the high habitat potential class makes up approximately 12 per cent of SK2 West (i.e. 5,671 km^2). The low habitat potential class accounts for 15.3 per cent of the SK2 West (i.e. 7,374 km^2), and unclassified areas (i.e. 0.8 per cent or 407 km^2), and water (i.e. 11.2 per cent or 5,408 km^2) make up the remaining area in SK2 West.

The current suitability of habitat shows a fragmented landscape of suitable habitat patches, somewhat isolated from others (Figure 8). The high level of fragmentation also requires the careful management of the remaining large patches of suitable habitat, while other disturbed areas are restored or mature into suitable habitat in the future.

Recent work from the Boreal Shield ecozone in Saskatchewan has shown use by caribou of unburned residuals within fire boundaries as calving habitat, especially those dominated by bogs and fens (Skatter et al., 2017). Further research will be necessary to better understand how these results apply to the Boreal Plain ecozone (i.e. SK2), although it is likely most relevant in the northern portion of SK2 West.

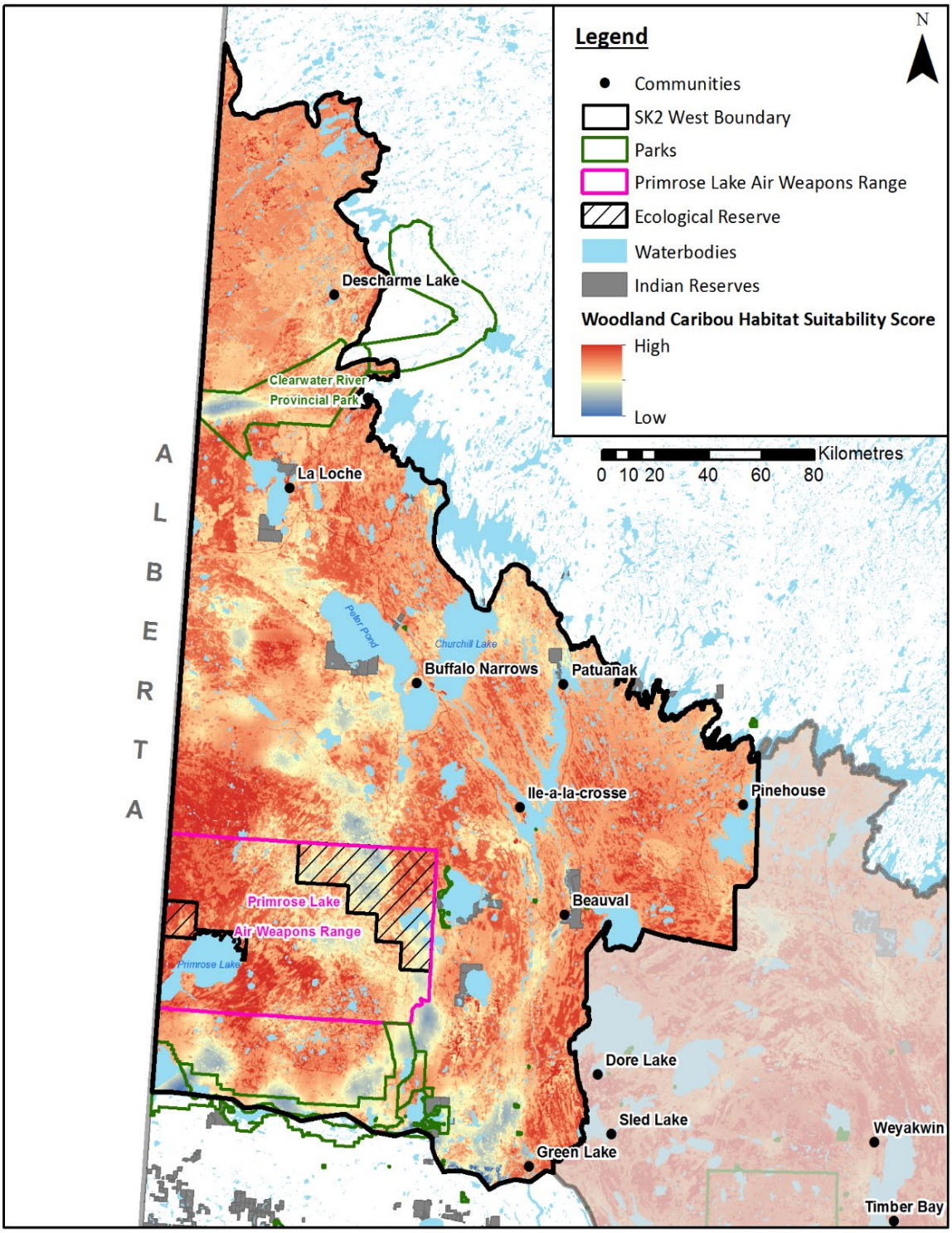

Figure 9. Suitability score of woodland caribou habitat for the SK2 West area based on Indigenous traditional knowledge (Mamun and Brook, 2017).

4.3.1 Disturbance Levels by Habitat Potential Class

Disturbance levels within the various habitat potential classes provide an indication of the human impacts associated with specific habitat types for caribou, but these numbers should not be confused with the overall range planning target of achieving 65 per cent of the SK2 West in an undisturbed state. Figure 10 shows the overlay of the human-caused disturbance on habitat potential. Over 40 per cent of the low potential habitat category is currently affected by human-caused disturbance or the associated 500-m buffer; 23 per cent of moderate potential habitat is affected by human disturbance; and 18 per cent of the high potential habitat potential is affected by human disturbance. The proportion of disturbed habitat in the moderate and high potential classes is relatively low and is expected to remain approximately at these levels into the future, as the moderate and high habitat potential classes contain a greater proportion of non-timber productive wetlands and uplands.

The human-caused disturbance levels illustrated in figure 10 reflect both linear and areal disturbance features and both contribute toward the overall measurement of landscape disturbance. Individual targets for linear-based or areal-based disturbances have not been identified because both types of features are accounted for in the 65 per cent undisturbed habitat target. However, the province is in the process of habitat management planning and linear density targets and effects are being considered.

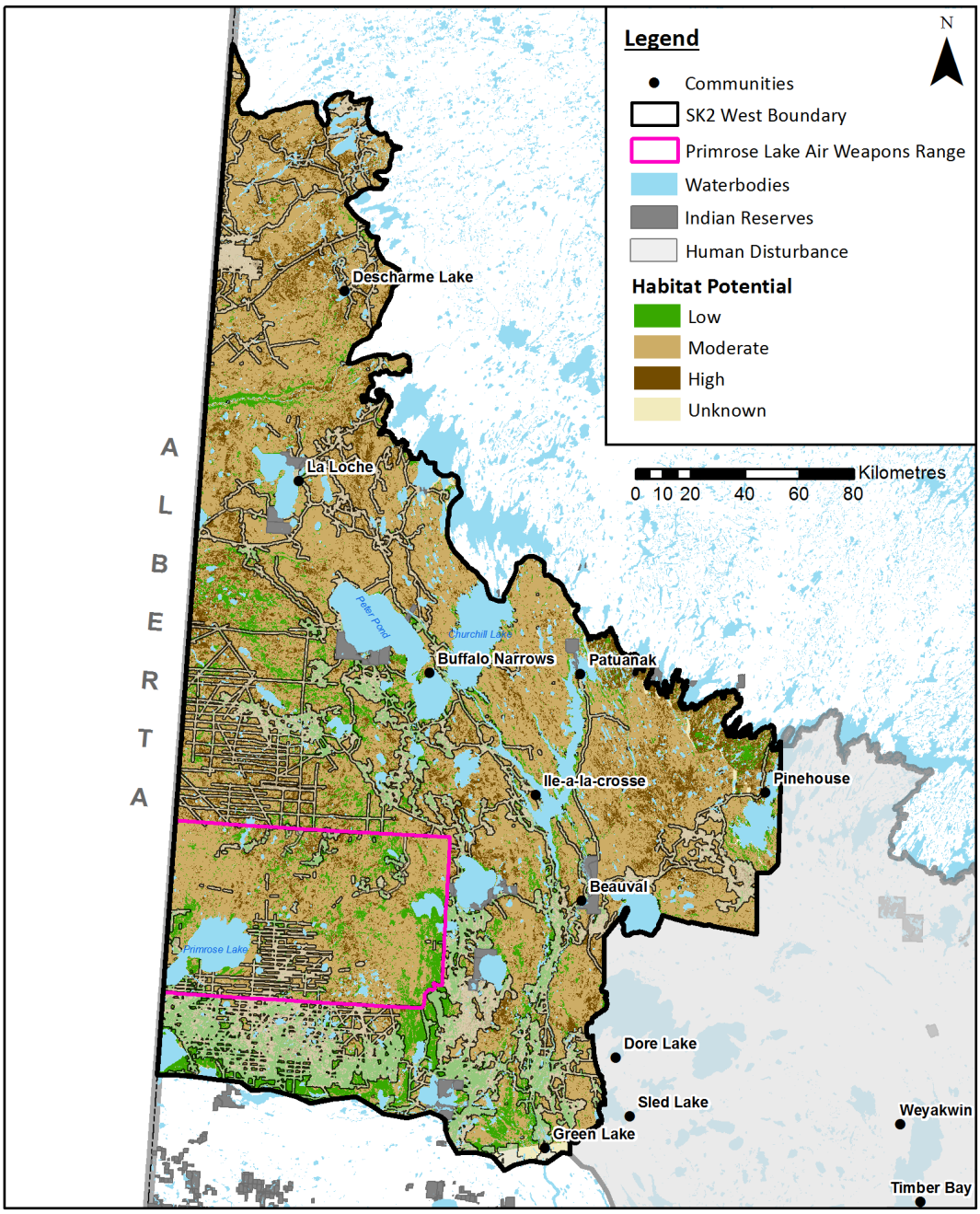

Figure 10. Habitat potential classes in the SK2 West caribou administration unit overlaid with the current human-caused disturbance.

4.3.2 Biophysical Attributes of Habitat

In the SK2 conservation unit, high value woodland caribou habitat potential is characterized by open jack pine sites with very high (i.e. greater than or equal to 20 per cent) lichen coverage and black spruce treed bogs. Most wetland types, and other jack pine dominated and black spruce dominated sites,

provide moderate value habitat potential (Appendix E). These ecosites meet the biophysical attributes as outlined in the federal recovery strategy (Environment Canada, 2012).

Sites classed as low value habitat potential for caribou are hardwood, hardwood dominated mixedwoods, or white spruce dominated forest stands. These high nutrient, moist ecosites tend to provide forage and additional habitat values for other ungulates (e.g. deer, moose, and elk) and are typically used less frequently by caribou, but may be required to maintain connectivity between patches of high and moderate habitat potential. Suitable caribou habitat exists in areas where high and moderate value habitat potential is found intermixed in large, contiguous patches with little fragmentation.

4.3.3 Patterns of Habitat Use

Data from radio collared caribou from the early 1990s indicated that caribou in the SK2 Central area preferred peatlands and black spruce dominated stands compared to all other habitat types (Rettie and Messier, 2000). An additional telemetry-based study in the mid-2000s showed that caribou selected treed muskegs and mature jack pine and avoided hardwoods, young conifer, recent cut blocks and linear features (Arlt, 2009). Late winter habitat use assessments done on the Mistik Forest Management Agreement area showed that caribou used tamarack and black spruce dominated wetlands in the south (Proulx, 2013) and also used jack pine dominated habitats further north (Proulx and Gillis, 2017).

To understand geographic patterns of caribou habitat use in SK2 West, caribou location information has been compiled from a combination of data sources since 1970. Woodland caribou location information has come from incidental sightings (e.g. report a caribou database; Saskatchewan Conservation Data Centre), industrial, First Nation and provincial government surveys, telemetry data, and fecal pellet collections. Because caribou have large home ranges, a grid consisting of 15 km x 15 km squares, the approximate size of a caribou home range (Rettie and Messier, 2001; Dyke, 2009) was constructed across SK2 West. If a caribou observation occurred within a grid square, it was assumed that caribou used all or part of the square. The caribou observation map (Figure 11) represents knowledge to date on caribou locations and habitat use in SK2 West. Without having long-term and systematic surveys, the absence of caribou observations in Figure 11 should not be interpreted necessarily as an absence of caribou, but rather a lack of survey information to detect caribou. Resource users and outdoor enthusiasts are encouraged to submit their sightings of woodland caribou on the report a caribou sighting webpage (http://www.biodiversity.sk.ca/ReportaCaribou.php). Reporting of caribou sightings may also be submitted through the Cooperative Wildlife Management Survey (CWMS) app.

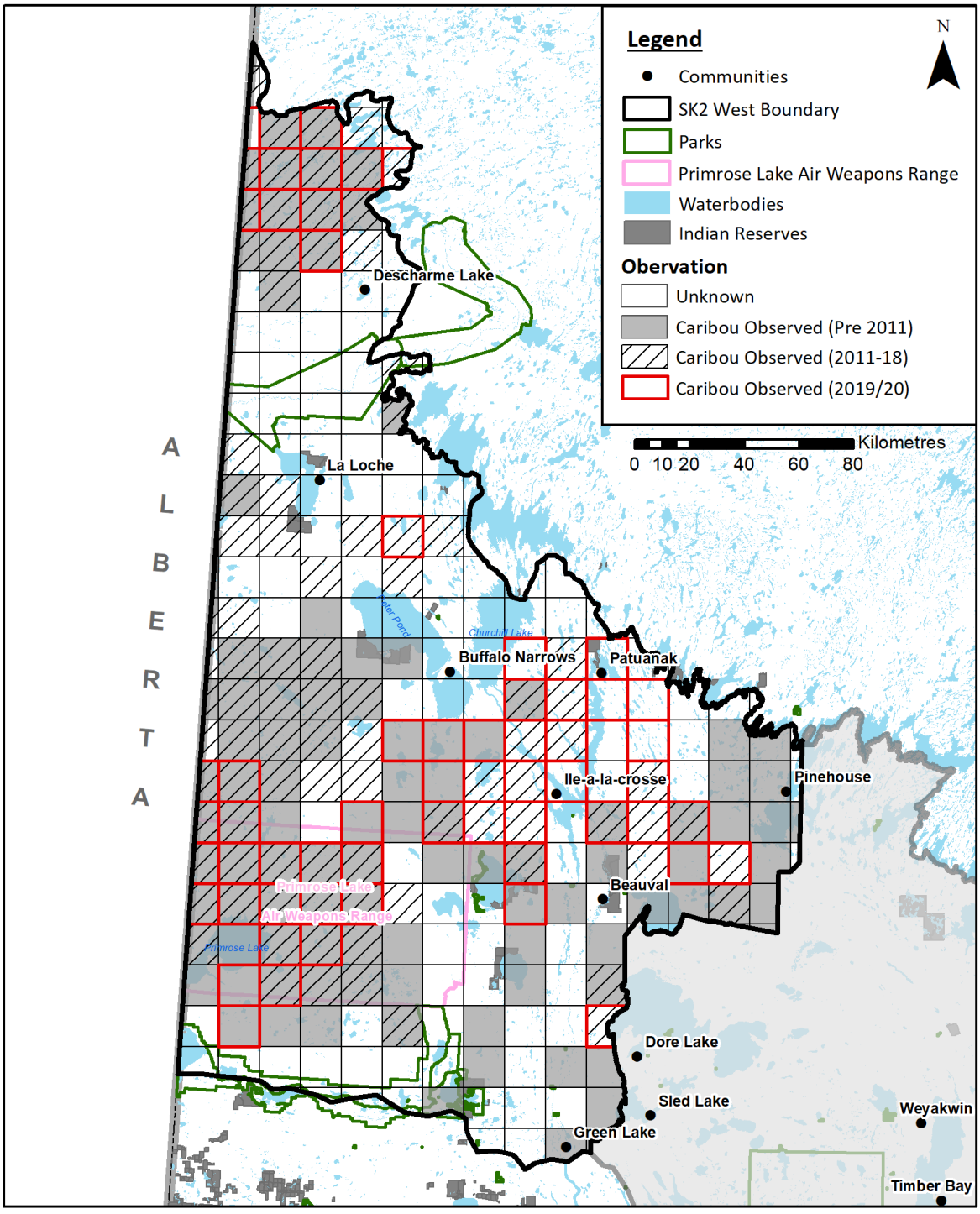

Figure 11. Areas with woodland caribou observations in the SK2 West from 1970 to 2020[1].

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[1] Fifteen square kilometre grid squares that are marked as unknown reflect a lack of survey information to detect caribou and not necessarily absence of caribou use of the square.

5.0 Habitat Management

The Government of Saskatchewan considers the woodland caribou range assessment and planning processes to be part of a broader cumulative effects assessment and management strategy for provincial Crown lands. Our approach recognizes the variation of fire regimes, ecological conditions, land use activity and human-caused disturbance across Saskatchewan's boreal forest.

5.1 Landscape Management Goals

Landscape level genetic analysis has shown the woodland caribou population to be relatively continuous across the province with weak population structure mostly caused by distance between animals but also affected by landscape features which cause resistance to movement (e.g. large water bodies, roads, and harvest blocks). The province is incorporating the landscape level approach to management, which can provide suitable habitat conditions to support the recovery and long-term sustainability of the woodland caribou population across the provincial range. Ultimately, the measured population size and trend of the woodland caribou within SK2 West will provide the best indication of the effectiveness of Saskatchewan's landscape management goals. An adaptive management approach, including annual disturbance monitoring and longer-term population monitoring, will allow Saskatchewan to respond to changes in caribou population status and assess the effectiveness of current management options.

Our focus will be on managing human-caused disturbance, altering the pattern of human-caused disturbance, and maintaining adequately-sized and well-connected patches of undisturbed caribou habitat across, and between, caribou administration units and jurisdictions. This approach should provide sufficient habitat availability on the Saskatchewan landscape, similar to a forest under the natural fire regime. It will also create healthy forest landscapes for other boreal species.

Specific areas of the landscape have been prioritized for different management objectives and actions in order to maintain sufficient habitat for a self-sustaining caribou population while minimizing economic impacts on, and maintaining opportunities for, current and future land use. To assist with gaining a better appreciation of habitat value and use by woodland caribou, the landscape will be stratified into three different tiers. Tier 1 represents areas of high importance where caribou habitat retention is the primary objective. Tier 2 areas are of importance to caribou, but have higher levels of habitat disturbance and have an objective of habitat restoration. Tier 3 areas represent general matrix caribou habitat where maintaining connectivity is an important objective. While tier 1 areas do contain the highest amount of high habitat potential (i.e. 17 per cent), high habitat potential can also be found in lower amounts in tier 2 (i.e. 12 per cent) and tier 3 (i.e. 10 per cent). High habitat potential is identified at the site or stand level and distributed across the landscape, so all high habitat potential sites will not be found in tier 1 areas.

The high disturbance caused by wildfire in SK2 West, especially in the northern sub-unit (Table 6), will make reaching the 65 per cent undisturbed target difficult in this administrative unit. The large and geographically concentrated contribution of wildfire requires that disturbance levels be considered and managed separately in the northern and southern portions of SK2 West. Given the high fire disturbance

in the northern portion of SK2 West, focus will be placed on, managing and reducing human-caused disturbance only. In the southern portion of SK2 West, focus will be placed on reporting, managing, and reducing total disturbance levels (e.g. wildfire and human-caused disturbance).

Additional fire suppression efforts are not currently considered a viable option to maintain or reduce disturbance levels in the SK2 West. The province identifies values at risk from wildfire with the following priority: human life, communities, public infrastructure, primary timber and important habitat, therefore caribou habitat would likely fall within the primary timber value. Increasing fire suppression resources and preventing the natural fire return interval from occurring, would contribute to the buildup of fuels over time and would ultimately make fire suppression in these areas more difficult.

Additionally, a comparative analysis of costs was completed for additional protection measures in the SK1 caribou conservation unit. The number of suppression staff, supervisors and support staff would need to be doubled with an estimated annual fixed cost increase of $ 2,581,445. Additional infrastructure required is estimated as a one-time capital cost, estimated at $ 8,600,000. Enhanced fire response would require a one-third increase in aerial fleet coverage which would include one additional 580 aircraft, two additional 250 skimmer aircraft, and two bird dog aircraft with a minimum cost of $110,000,000, if the same aircraft are available. These estimates do not include the costs associated with air operations such as staffing, infrastructure, training, and other factors. Not included in the cost estimates are needs for increased crew vehicles, fire engines, crew equipment and personal protective equipment, fire camp needs (for large fires), training needs, increased detection capabilities and program support costs. Increasing crew numbers requires a proportional increase in equipment, facilities, and resources to support them.

An overall assessment of future disturbance levels in all of SK2 West has been completed and is presented below. Saskatchewan has identified five landscape management goals for the SK2 West:

Landscape Management Goal #1:

Reduce the amount of human-caused disturbance.

Based on the Saskatchewan Ministry of Environment disturbance assessment[1], the current level of human-caused disturbance in SK2 West is approximately 11,970 km^2 or 24.8 per cent of SK2 West. However, human-caused disturbance levels differ across SK2 West, with approximately 16.6 per cent of the northern and 27.4 per cent of the southern sub-units disturbed by human-caused factors. Saskatchewan aims to reduce this level of human-caused disturbance through enhanced reclamation that targets legacy oil and gas linear features and forestry-related linear features, the application of minimization practices and mitigation for new infrastructure, access management, avoidance of important caribou habitat, and by using a natural forest pattern-based harvesting approach to reduce

[1] The Saskatchewan Ministry of Environment disturbance assessment was based on Environment Canada (2011) methodology where: a) all mapped human-caused direct footprints are buffered by 500 m, and b) human-caused and wildfire disturbances have a 40-year restoration period after which they become undisturbed habitat. See Appendix A for detailed methods and data sources.

the dispersion of forest harvesting areas and the associated amount of road access infrastructure. Other human-caused disturbances may cause localized and cumulative negative effects on caribou and their habitat, but are not the focus of future projections.

Northern Sub-unit

The focus in the northern portion will be on reducing legacy human-caused disturbances associated with resource exploration and extraction and offsetting impacts of new activities such that the amount of non-permanent human-caused disturbances is lowered over time. Saskatchewan will set as a target, five per cent overall permanent and non-permanent human-caused disturbance in this sub-unit. Given the similarities between the northern subunit and the SK1 caribou range (i.e. the Boreal Shield), the five per cent target was chosen to match the human-disturbance threshold in the *Amended Recovery Strategy for the Woodland* Caribou (2019) for the SK1 range. Recent work by Johnson et al., (2019) confirmed that human caused disturbances are the primary factor contributing to boreal caribou declines.

Southern Sub-unit

Focus will be in reducing human-caused disturbances associated with legacy forestry and oil and gas extraction and exploration to reach a level of disturbance that is below the current level. Other methods, such as natural forest harvest patterns will also be used to reduce the footprint of human-caused disturbances in the southern sub-unit.

Landscape Management Goal #2:

Maintain greater than or equal to 80 per cent of high potential woodland caribou habitat in a condition unaffected by human-caused disturbance.

Based on Ministry of Environment habitat potential mapping, the amount of high potential habitat in the SK2 West is approximately 5,671 km^2 or 11.7 per cent of SK2 West. These areas are largely comprised of treed wetlands, but also include upland jack pine-lichen ecosites. High potential habitat provides necessary forage and refuge, and is heavily used during the sensitive late-winter, calving, and post-calving periods. Currently, approximately 18.4 per cent of high potential habitat is affected by direct and/or indirect human-caused disturbance. The ministry goal is to maintain greater than or equal to 80 per cent of high potential habitat in a condition unaffected by human-caused disturbance in all of SK2 West. To be consistent, the 80 per cent threshold will be assessed at the scale of SK2 West, not the individual subunits.

Achieving this goal will ensure that important caribou habitat patches and patches important for maintaining stepping stones for movement across the landscape remain in a largely undisturbed condition across the SK2 West. To be effective, this habitat objective should be used in conjunction with other landscape objectives for connectivity, forest harvest patterns and reclamation of legacy non-permanent roads.

New disturbance in tier 1 habitat is strongly discouraged and should only be considered in exceptional circumstances.

Landscape Management Goal #3:

Maintain adequate connectivity between the SK2 West and adjacent Caribou Administration Units and jurisdictions.

Recent population genetic research has demonstrated that a relatively continuous population of woodland caribou exists across the Boreal Plain and Boreal Shield of Saskatchewan and that caribou in the eastern and western areas remain connected to woodland caribou populations in Manitoba and Alberta (Priadka et al., 2018). However, this research also suggests there is weak population structure, which is affected by landscape features that create resistance to movement such as large lakes, roads and harvest blocks. Weak structure within the woodland caribou population means that there are no discrete populations and suggests that there are still relatively few connective barriers across the landscape and that gene flow is still possible and occurring (COSEWIC, 2014).

In order to maintain a relatively continuous woodland caribou population across western and northern Saskatchewan, maintaining adequate landscape-level connectivity within the SK2 West area and adjacent caribou administration units and jurisdictions is required. Currently, a specific metric to measure and report on finer scale landscape connectivity is being developed, but reducing disturbance in tier 1 and tier 2 areas will help to maintain large patches of undisturbed and connected habitat throughout the SK2 West. This finer scale indicator of caribou habitat connectivity will be used to support planning in all tiers, and will have important implications for management of caribou habitat in tier 3 areas.

Landscape Management Goal #4:

Increase forest harvest event sizes to more closely emulate natural forest patterns.

Similar to other jurisdictions, historical forest harvesting patterns generally utilized a traditional two-pass harvest system with relatively small (ranging from 40 ha to 100 ha in size) harvest blocks with adjacent leave areas. This harvesting pattern resulted in a fragmented landscape with relatively small forest openings and a large legacy network of roads.

Through the *Saskatchewan Environmental Code – Forest Management Planning Standard*, the Saskatchewan Ministry of Environment has adopted a natural disturbance-based approach to forest management. Based on the concepts of the natural range of variation, Saskatchewan is implementing natural forest pattern harvest requirements that more closely emulate natural disturbances in scale and pattern. Natural forest pattern harvest methods will result in increased harvest event sizes that more closely emulate natural disturbance patterns, and as importantly, should contribute to a reduction in the amount of forestry-associated roads. Individual natural forest pattern harvest events can be further coordinated through forest management planning that in the long-term will create future large patches of undisturbed habitat. Emulating natural forest patterns is anticipated to have many other benefits for multiple boreal wildlife species, including woodland caribou.

Landscape Management Goal #5:

Decrease the total amount of non-permanent linear features.

SK2 West has a large network of non-permanent legacy roads and linear seismic exploration features on provincial Crown lands. Depending on the type and current status of a linear feature, responsibility for reclamation may rest either with industry or the Crown.

The re-vegetation status and level of human activity associated with many legacy roads is currently uncertain. However, based on available information[1] the total length of non-permanent linear features in SK2 West is estimated to be approximately 16,813 km and of that amount, approximately 5,001 km of seismic lines are within the SK2 West. In-block roads which are within harvest blocks are currently required to be reclaimed at the time of block reforestation. Saskatchewan plans to decrease the total amount of non-permanent legacy roads through access management planning, and enhanced reclamation, especially focused on legacy oil and gas-related linear features and legacy forestry-related linear features. Tier 2 and tier 3 caribou habitat management areas will be initially prioritized for these activities. Tier 1 areas are generally not as suitable because by definition they contain very little disturbance, but could be considered for reclamation in cases where human-caused disturbance is higher. Through future detailed access management planning, road reclamation plans and targets will be created for different areas of the SK2 West area.

Given that this plan is also intended to support management of multiple species, reclamation of linear features will likely result in an improvement of habitat conditions for other species, especially listed species, in the boreal forest.

5.2 Management Strategies

As part of the range planning process, Saskatchewan has identified several management strategies that will be combined to reduce landscape disturbance. Five primary strategies have been identified:

1. avoidance;
2. reclamation and restoration;
3. mitigation offsets;
4. forest harvest patterns; and
5. access management (Table 7).

Each management strategy is supported by existing provincial legislation. Management strategies will be deployed strategically across the landscape to maintain or improve the amount and connectivity of suitable caribou habitat, over the 50-year time horizon of this range plan. It is recognized that these management strategies will not only benefit woodland caribou, but many other species including migratory birds that share the same habitat requirements (Environment Canada, 2012). However, it is possible that negative impacts could occur to other species and the province will be watchful of

[1] Non-permanent roads are considered to be Class 2, 3, 4 and public roads and non-permanent seismic lines are from various Ministry of Environment mapping initiatives. See Appendix A for detailed disturbance mapping methods.

unintended outcomes. These management strategies were developed for SK2 Central, but are also suitable for use in the SK2 West caribou administration unit.

The five management strategies, their application, and potential considerations, are described in Table 7. Steps or actions required to implement each strategy are identified in Sections 5.2.1 through 5.2.5 inclusive.

Table 6. Summary of SK2 West area range plan management strategies.

Management Strategy	Purpose/Intent	Actions
Avoidance	Limiting or reducing human access in areas with characteristics or features that make them uniquely important to the maintenance of caribou, their movement, or other habitat requirements. The intention is to avoid preventable human-caused impacts on caribou and caribou habitat.	<u>All Activities</u> • Evaluate the risks associated with activities and develop viable alternatives to creating new disturbance. • Areas to be avoided are anticipated to be dynamic in nature and the relevancy of these areas may change over time. • New disturbance in tier 1 habitat is strongly discouraged and should only be considered in exceptional circumstances.
Reclamation and Restoration	Return disturbed or altered habitat resulting from human activities to its former condition as functional caribou habitat.	<u>Linear Features</u> • In areas with high levels of historical human-caused disturbance, and harvesting has not been identified in upcoming forest management 20-year tactical plans, actively reclaim and restore non-permanent roads. <u>Linear and Area-based Features</u> • Carry out managed reclamation of new human-caused habitat disturbance.
Mitigation Offsets	Reduce levels of human-caused habitat disturbance by compensating with restoration of areas outside of the immediately planned disturbance.	<u>Linear and Area-based Features</u> • When land use creates new habitat disturbance, a mitigation offset will be required. Places of higher importance for caribou will require greater offsets.
Forest Harvest Patterns	Through forest harvesting, create natural forest patterns that more closely approximate the range of variation of natural disturbances, both in distribution and scale.	<u>Forest Harvesting</u> • Utilize natural forest pattern harvesting methods to emulate landscape patterns created by natural disturbances, both in distribution and scale, and reduce road network requirements. • Focus near-term forest harvesting within or around areas that received historical forest harvesting to allow for reforestation and road reclamation and closure.
Access Management	Reduce amount of human-caused disturbance. Alter and manage the pattern, locations, and frequency of human access. Reduce sensory disturbance for caribou.	<u>Linear Features</u> Create access management plans to: • Identify suitable areas and or linear features for active reclamation and restoration. • Prevent human access to restored features to ensure they remain on the path to restoration. • Coordinate future access. <u>All Activities</u> Reduce the intensity of, or conduct human activities outside of, seasonally sensitive caribou periods (late-winter and calving and post-calving).

5.2.1 Avoidance

Avoidance primarily refers to limiting or reducing human access in areas with characteristics or features that make them uniquely important to the maintenance of caribou, their movement, or other habitat requirements. The intention is to avoid preventable human-caused impacts on caribou and caribou habitat.

Avoidance of areas with substantial historical or recent species occurrences, unique habitat features, areas that attract, restrict, or facilitate species movement or other natural features required for the species will limit the risk to the species.

The identification of important caribou habitat management areas (e.g. tier 1) and the purposeful avoidance of these areas is designed to aid in the location of new northern developments by identifying areas considered to pose high risk to the species or its habitat. Tier 1 areas constitute higher current habitat value and use by woodland caribou and any activity proposed in these areas will be subject to greater assessment. Additionally, more stringent operating conditions will be required and greater planning effort is expected.

5.2.1.1 Application

- Avoidance is the purposeful altering of plans, operations or activities to maintain caribou habitat and its connectivity.
- Avoidance of important caribou habitat management areas (e.g. tier 1) will need to be considered by all provincial Crown land users.
- Avoidance is the first strategy identified under section 3-8(1)(b) of *The Crown Resource Land Regulations, 2019* to achieve mitigation outcomes.
- New disturbance in tier 1 habitat is strongly discouraged and should only be considered in exceptional circumstances.

5.2.1.2 Considerations

- As a management strategy, avoidance generally provides the greatest degree of habitat protection because reclamation, restoration, and mitigation efforts may still not be sufficient to provide for sufficient quality, quantity, and distribution of functional habitat for woodland caribou.
- Areas to be avoided are anticipated to be dynamic in nature and the relevancy of these areas may change over time as disturbance occurs or due to the natural succession of vegetation on the area.
- When avoidance is not appropriate and not selected, greater planning, mitigation, and monitoring will be required.
- Enhancing wetland conservation through deliberate avoidance can achieve multiple provincial priorities beyond caribou conservation, including enhancing climate change resiliency and mitigation, reducing flooding, improving water quality and contributing to broader biodiversity goals including waterfowl.
- Avoidance may not necessarily be desirable in all cases such as i) the potential activity or development would yield greater and shared societal benefits (e.g. public infrastructure), or ii)

an ecological (e.g. net long-term habitat) efficiency would be realized such that the destruction of habitat in one area could be compensated to a greater degree by habitat creation or improvement in another area.

5.2.2 Reclamation and Restoration

While the terms reclamation and restoration are sometimes used interchangeably, they can represent different processes. Reclamation can be considered to be the process of returning formerly disturbed lands or wetlands to their former or alternative productive uses. Restoration implies that the disturbed site is being returned to a vegetated condition that is similar or identical in composition and structure to the original condition so that ecosystem functions are restored. For range planning, these collective terms (reclamation and restoration) are being used to describe the process of returning sites disturbed by human activities back to a suitable condition as caribou habitat. One benchmark for defining the natural state of Saskatchewan's forest ecosystems is the *Field Guide to the Ecosites of Saskatchewan's Provincial Forests* (McLaughlan et al., 2010). This field guide identifies the composition (e.g. vegetation, soils) and structure (e.g. vegetation constancy and cover) associated with the ecosites found across the Boreal Plain, Boreal Shield, and Taiga Shield ecozones. The ecosites can and have been further interpreted in terms of function for providing habitat for woodland caribou.

Reclamation and restoration applies to both legacy and recent human-caused linear and area-based disturbances. Reclamation and restoration of legacy disturbance may come as a result of a government funded activity or as part of an industry led mitigation off-set associated with new development. In both cases reclamation and restoration activities will focus on areas with higher levels of human-caused disturbance and moderate to high potential caribou habitat. The expedient reclamation of recent human-caused disturbance is necessary to maintain a sufficient extent and connectivity of caribou habitat across the landscape and to prevent ongoing human use of the disturbed feature.

5.2.2.1 Linear Features

Linear features and their associated buffer are responsible for the majority of the human-caused disturbance footprint in the SK2 West area; much of the linear features were associated with previous forest harvesting and seismic exploration. Reducing the amount of linear features through reclamation and closure can therefore be an effective means to reduce the amount of human-caused disturbance and improve landscape composition. Reclamation of linear features reduces fragmentation, creates larger patches of undisturbed habitat and may reduce undesirable human and or predator access. Access management supports the reclamation of disturbed sites by allowing and promoting revegetation to desired species and accelerating habitat recovery.

In the SK2 West, historical land use practices have resulted in a large number of legacy roads, trails, and seismic lines, many of which have become part of the established transportation network. While new resource roads are subject to modern reclamation standards, legacy linear features have not yet been addressed.

5.2.2.2 Area-based Features

In the SK2 West area, forest harvest blocks are the main source of human-caused area-based disturbance. Since 1999, *The Forest Resources Management Act* has required the Saskatchewan forest industry to reforest all harvested areas when harvesting activities are complete. In accordance with the *Forest Operations* chapter of the *Saskatchewan Environmental Code*, in-block roads are required to be reclaimed and non-in-block roads are also required to be reclaimed and renewed once they are no longer in use. The success of forest industry reforestation efforts is assessed under the *Forest Regeneration Assessment Chapter* and standard in the *Saskatchewan Environmental Code*. The Ministry of Environment's Forest Service branch has addressed previously not sufficiently regenerated harvest blocks resulting from harvesting activities conducted prior to 1999.

Other land uses also contribute to area-based disturbance in the SK2 West. These include settlements, recreation areas, mineral exploration sites, and material extraction activities such as gravel and peat moss harvesting. Roads built through wetlands that do not maintain natural water flow can also create disturbance by destroying or altering the function of these wetland ecosystems. The ministry's Forest Service branch is currently developing a *Forestry Wetland and Watercourse Crossing* chapter and standards for inclusion in the *Saskatchewan Environmental Code* that will establish management practices to reduce the impact of roads to wetland ecosystems on provincial forest lands (Government of Saskatchewan, n.d.).

5.2.2.3 Application

- Reclamation and restoration of human-caused legacy habitat disturbance will be achieved through various programs and mechanisms that may be community-led, industry-led, government-led or combinations thereof.
- Implementation of consistent restoration standards is expected to accelerate the natural regeneration process and shorten the period for areas to be considered functional caribou habitat.
- Access management planning will assist in identifying appropriate locations for the reclamation of legacy linear features. The Ministry is currently acquiring and processing Light Detection and Ranging (LiDAR) data within a subset of tier 2 areas in SK2 to assess revegetation status on linear features. Using this information, coupled with information on suitable caribou habitat, a prioritization queue of linear features that are suitable for reclamation and restoration efforts, with the most benefit for caribou, will be developed.
- Managed reclamation and restoration of human-caused habitat disturbance will be required for all new disturbance features and will apply to all provincial Crown land users.
- A comprehensive reclamation and restoration framework will be produced in consultation with affected stakeholders, land users and communities. This framework will delegate details of responsibilities, targets, funding mechanisms, and end-points.

5.2.2.4 Considerations

- Expectations and reclamation standards currently differ among various land-use activities. For example, the *Forest Regeneration Assessment Standard* (Government of Saskatchewan, 2012)

commonly used by the forest sector, identifies survey protocols and standards to assess tree regeneration requirements by tree species, free-to-grow height and stocking.

- While reclamation is a requirement for most natural resource development activities, greater coordination and compliance to explicit standards is required to improve effectiveness. For example, reclamation activities should be conducted in priority areas in a sequential or progressive approach working from far to near with the intent to hasten forest establishment on large contiguous tracts of undisturbed habitat.
- Definitions for what constitutes reclaimed and restored (i.e. undisturbed) caribou habitat are not currently well-defined:
  - Environment Canada (2011) defines wildfires ≥40 years in age as undisturbed.
  - Definitions for linear features are not currently available.
- The backlog of historical linear features in the SK2 West area will require a significant financial investment to reclaim.
- Linear feature reclamation and restoration success will largely depend on restricting motorized vehicle use on reclaimed roads and trails, which can be challenging. This will require high levels of education, compliance, and enforcement in order to achieve linear feature reclamation goals.
- Currently, the revegetation condition and human use status of many linear features have yet to be verified.

5.2.3 Mitigation Offsets

Mitigation is the process of reducing or lessening the negative consequences associated with industrial developments on the landscape. Mitigation generally involves a progression of actions to avoid, minimize, and recompense residual adverse effects associated with human disturbance, followed by monitoring, to ensure goals are met. Residual effects are the environmental effects predicted to remain after all practical avoidance, minimization, and mitigation options have been implemented. Residual effects are generally described by their direction (i.e. nature of effect), magnitude, geographic extent, duration/frequency, reversibility, and other factors (Government of Saskatchewan, 2014).

Offsets are applied as part of a mitigation framework that is designed to reduce the overall amount of human-caused habitat disturbance, in order to maintain future economic opportunities. This approach has been successfully used by other jurisdictions and most recently in Saskatchewan within the potash and peat harvesting industries.

Mitigation offsets will be applied to both new linear and area-based disturbances in order to reduce and alter the pattern of human-caused disturbance. New disturbances in areas of higher importance to caribou will require greater offsets. Identification of higher importance areas within respective range planning areas will provide land users certainty as to the expectations and opportunities for avoidance and/or mitigation offsets.

5.2.3.1 Application

- Mitigation offset requirements will be applied to provincial Crown land users.
- Many industries are currently responsible for reclamation and reforestation which aids in minimizing but not removing all adverse residual effects.

- While requiring further documentation, mitigation offset requirements will be administered through existing environmental assessment, leasing and permitting processes.
- Currently, mitigation offsets are generally implemented where a project has been deemed a development under *The Environmental Assessment Act*. The need for mitigation offsets is being presented during range planning to ensure that all stakeholders are aware that this is a measure that the ministry is working toward to assist with the caribou recovery. Work is being done by the ministry to examine potential benefits of conservation banking and boreal offsets including a monitoring component. Industry, First Nations, Métis communities, and other groups will be engaged during the process to ensure that there is an opportunity to provide input in its development or application.
- Offsets will be scheduled for areas of high priority for caribou habitat restoration. Initially, tier 2 areas will be the priority to ensure they are on a pathway to become suitable caribou habitat, as soon as possible.
- Currently, details around mitigation offsets are in development; however, concepts being pursued include:
    - Mitigation offset requirements on provincial Crown lands will be based on areas of importance to caribou and habitat objectives. Caribou habitat management area tier 1 mitigation offset requirements would be the highest and tier 3 the lowest (see Section 5.3.1 for description of the caribou management area tiers).
    - Specific mitigation offset requirements and methods for their calculation have yet to be finalized. Saskatchewan anticipates using a risk-based formula approach that incorporates the spatial extent, intensity and duration of the disturbance[1] and the time lag and uncertainty of restoration success.
    - Mitigation and offset protocols will be developed in consultation with affected stakeholders, land users and communities.

5.2.3.2 Considerations

- While reclamation activities to meet mitigation offset requirements can be performed rapidly, it will take many decades to restore caribou habitat. The benefits of habitat mitigation offsets will therefore not be realized for many years. In addition, there is uncertainty whether actions taken to reclaim the site will result in caribou habitat restoration.
- Supporting tools and processes for tracking and identifying mitigation offset opportunities and completed reclamation activities require development.
- To establish a mitigation offset database, detailed mapping of the location of all linear features and the status of those features will be developed, as well as ongoing tracking of features reclaimed under a mitigation offset activity.

[1] Saskatchewan has used a formula-based approach for several preliminary cases of upland and wetland prairie systems and one boreal wetland. This method integrates ecological values and function.

5.2.4 Forest Harvest Patterns

The commercial forest is a large provincial natural resource of significant economic and ecological value. Saskatchewan's commercial forests are disturbance-adapted ecosystems, with wildfire being the primary natural agent of both disturbance and renewal. Wildfire creates and maintains a shifting landscape mosaic of different-sized and aged forest stands. If planned and implemented correctly, forest harvesting and its associated post-harvest reforestation activities can also play similar roles.

The *Saskatchewan Environmental Code - Forest Management Planning Standard* outlines the natural forest pattern requirements that aim to achieve forest harvest events that more closely emulate disturbance patterns created by wildfire events. The natural forest patterns approach will result in a reduction in the overall forest harvesting footprint, fewer forestry roads, allow for more rapid reclamation of required forestry roads and create larger areas of future caribou habitat.

Working towards the goal of emulating natural forest patterns is also aligned with steps identified in Saskatchewan's climate change strategy, *Prairie Resilience*, specifically by providing the province with another mechanism to:

> "Ensure natural and commercially forested lands are managed in a manner that enhances the removal and storage of carbon from the atmosphere while allowing for sustainable harvesting, respecting normal forest cycles and fire preparedness.", and
>
> "Maintain or restore landscape integrity to optimize ecological goods and services, enhance resilience to extreme weather events and manage the risk to biodiversity." (Government of Saskatchewan, 2017b).

Figure 12 compares a traditional forest harvest block pattern with a natural forest pattern harvest event.

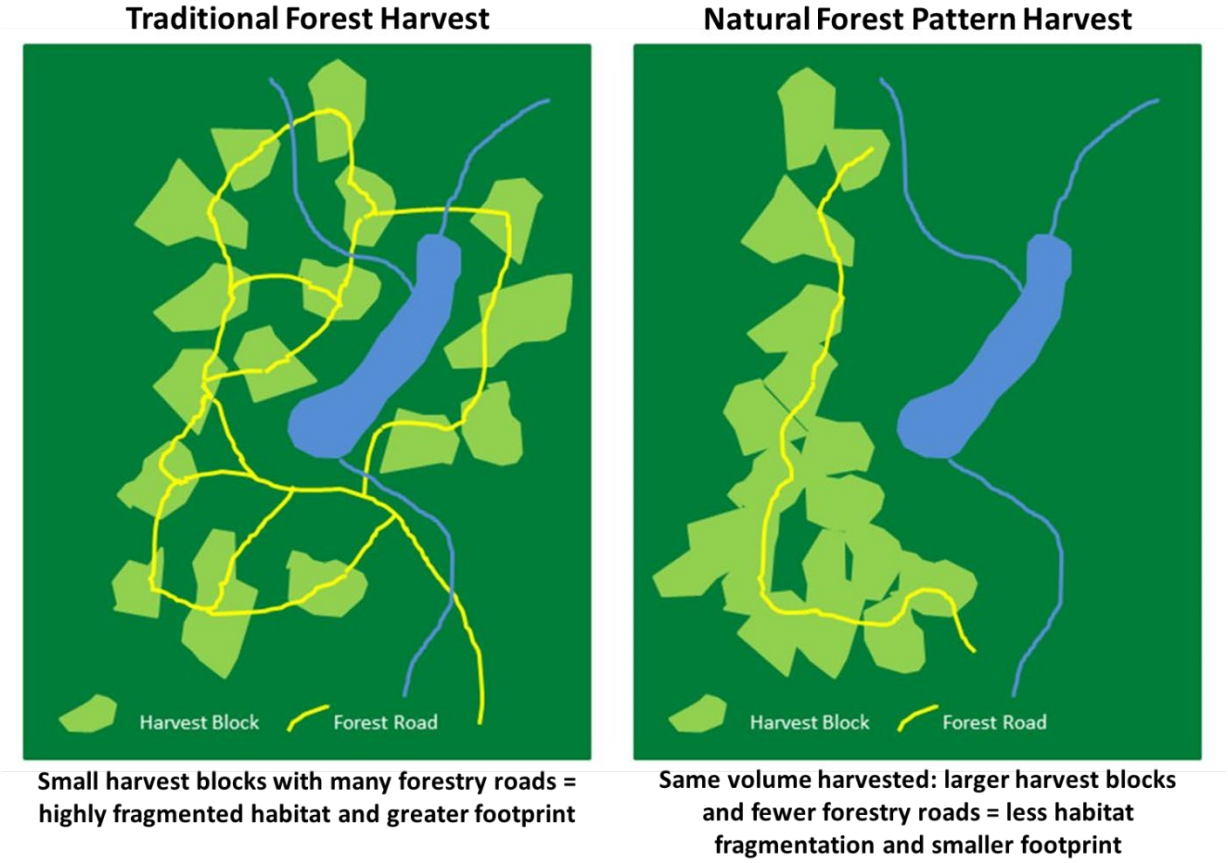

Figure 12. Comparison of a traditional harvest block pattern with a natural forest pattern harvest event[1].

Forest harvest events are larger than traditional, dispersed harvest blocks, but will maintain standing tree structure at the local level after harvest similar to live trees surviving a wildfire event. Retaining live trees provides a variety of structure in regenerating forest stands that serve many ecological functions. They provide habitat for cavity nesters, and deadwood-dependent invertebrates, amphibians, lichens, fungi and micro-organisms. Harvest events will maintain at least nine per cent of the harvested area as live representative tree residuals within the harvest event boundary (Figure 13). Tree retention will be comprised of both insular retention (including single trees, clumps and islands), which is separated from the surrounding undisturbed forests and wetlands and proximal retention (including peninsular retention extending into the harvest area and non-peninsular retention extending along the harvest area boundary), which is connected to a portion of the harvest boundary.

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[1] For further information on natural forest patterns, refer to *the Forest Management Planning Standard* of the *Saskatchewan Environmental Code* http://publications.gov.sk.ca/documents/66/86843-Forest%20Management%20Planning%20Standard.pdf

Six per cent insular retention is required by the *Forest Management Planning Standard* while proximal retention can only account for a maximum of three per cent of the total retention retained. [1] Areas between harvest patches or blocks that do not contain merchantable timber (e.g. young forest, wetlands, riparian buffers) will also be included in the harvest event as matrix residuals (Figure 14).

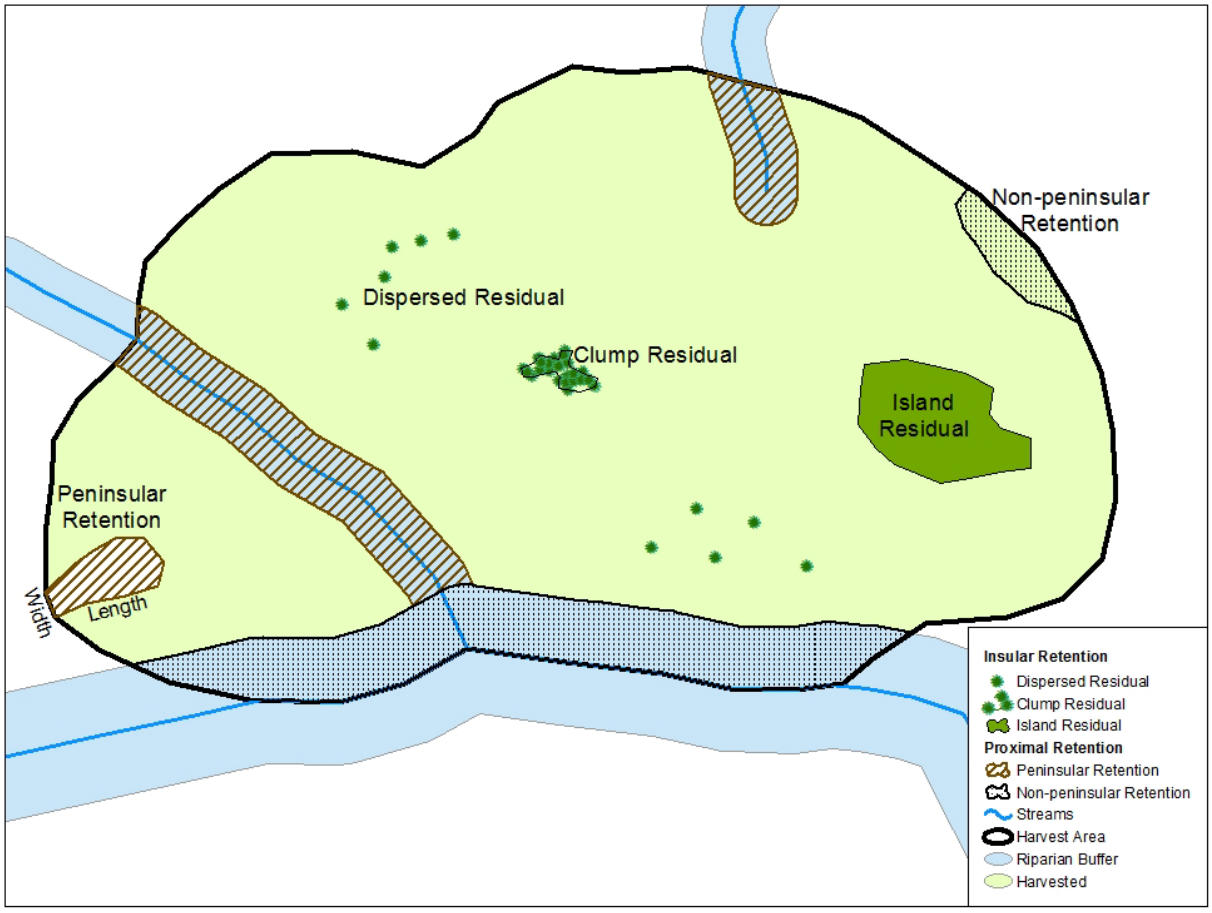

Figure 13. Illustration of how tree retention may occur within a harvest block (Government of Saskatchewan, 2017).

[1] While nine per cent is the *Forest Management Planning Standard*, some licensees have implemented alternative approaches to natural forest patterns and specific insular and proximal residual targets may vary from the standard.

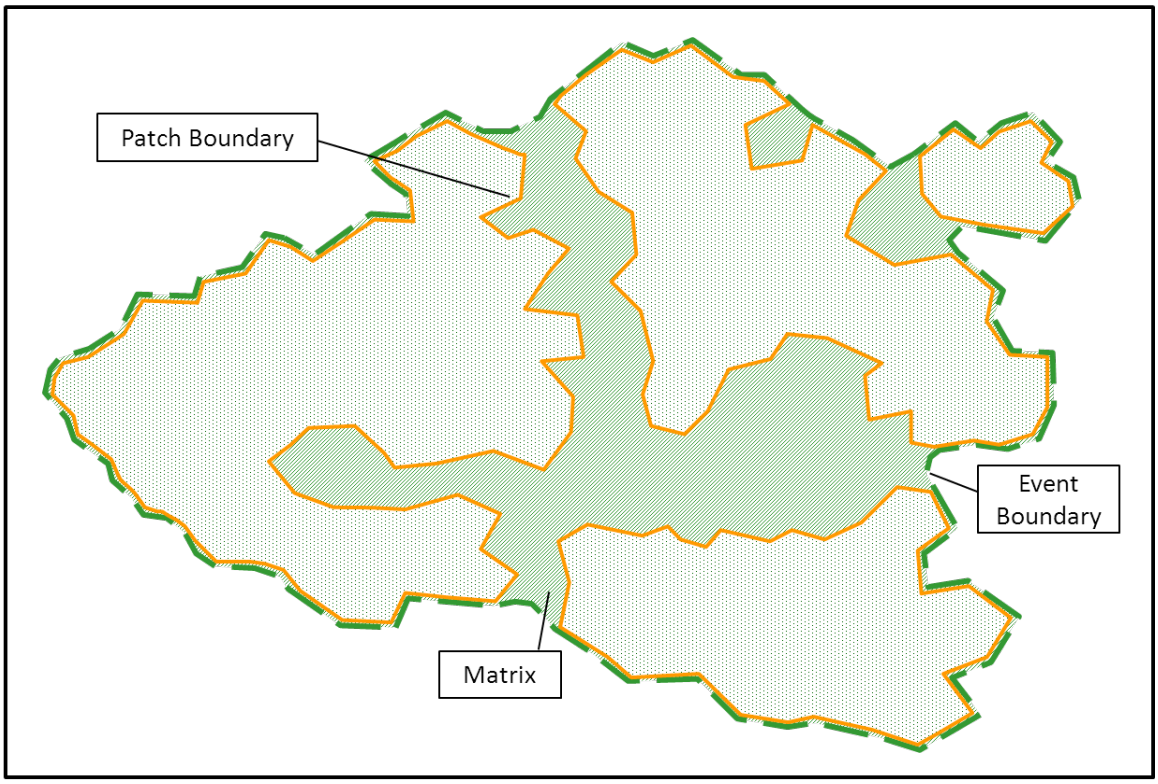

Figure 14. Illustration of unharvested areas (i.e. matrix residual) within a harvesting event (Government of Saskatchewan, 2017).

The legacy of past harvest practices provides an opportunity to schedule existing and immediate harvest plans around remnant forest harvest blocks enabling the provision of larger future caribou habitat that is less fragmented. Identification of areas within respective caribou administrative units for consolidated harvest around existing disturbances will provide the forest industry guidance for forest harvest planning. Forest management plans identify natural forest pattern targets to be achieved at both the stand and the landscape-level. Future operational planning will take direction from approved forest management plans and natural forest pattern harvesting will become the prevailing forest harvesting practice across Saskatchewan's commercial forest. Application of the natural forest pattern harvesting approach has been implemented by Mistik Management Ltd. in the SK2 West since 2001 and this approach has now been expanded and integrated within its approved 2019 forest management plan. Recently approved forest management plans for the North West term supply licence and the Tolko Industries Ltd. - Meadow Lake OSB Division term supply licence also include targets for implementing natural forest pattern harvesting.

5.2.4.1 Application

- The natural forest pattern harvesting approach has been embedded in all new forest management plans and these plans will direct harvest operations by the forest industry under area-based term supply licences or forest management agreements.[1]
- Natural forest pattern harvesting will also be promoted as a best management practice for application in other areas of forest harvesting or where vegetation management is required (e.g. provincial parks for vegetation or fuel management).

5.2.4.2 Considerations

- Given multiple land user concerns, objectives, and scales of operation, it may be challenging to fully implement spatial aggregation and natural forest pattern-based forest harvest strategies. For example, implementation of the larger harvest event sizes may conflict with other land uses like outfitting or trapping.
- Another factor to consider is that although planning may identify natural forest pattern-based harvesting, licensees may locate up to 15 per cent of their harvest areas outside of the delineated spatial boundaries of their tactical plan. However, they will still have to adhere to natural forest pattern targets within the forest management plan.

5.2.5 Access Management

Access management primarily refers to limiting or reducing human access to areas or linear features such as roads and trails, but also includes restricting specific land use activities on other disturbances. Access management supports the reclamation of disturbed sites by allowing and promoting revegetation to desired species and hastens the recovery of habitat. It also encourages consolidation of access and reduces sensory disturbance to caribou during key seasonal periods.

Access management planning will be conducted to identify linear features suitable for reclamation and will coordinate human industrial and recreational access. Access management planning will be carried out with the input of local users, and is planned to include public and stakeholder outreach and education.

In addition, policy will identify the necessary restrictions to industrial operational practices for seasonal periods to reduce sensory disturbance for caribou. The approach is intended to minimize sensory disturbance during the sensitive late-winter and calving and post-calving time periods (i.e. April 1 to July 31) which support successful population recruitment. A study of caribou habitat use during the calving season in SK2 Central (Dyke, 2009) showed strong selection for treed muskegs, but avoidance of jack pine, mixed hardwood stands and roads. Rettie and Messier, (2000) found preferential selection of open and treed peatlands and black spruce/jack pine forests by caribou. Black spruce dominated ecosites were assessed as having the highest calving and post calving habitat value (Appendix D).

[1] Although the *Forest Management Planning Standard* only applies to licensees with a forest management plan, all timber allocation holders are required to integrate their forest management activities with the forest management agreement holder or the area-based timber supply licence holder.

5.2.5.1 Application

- Access management will be applied to all areas of SK2 West and will be strategically applied to maximize disturbance recovery and habitat connectivity.
- Access management will be applied to all provincial Crown land users.
- Seasonal operating restrictions will be implemented to minimize sensory disturbance to caribou during sensitive periods.
- The ministry has completed a cross jurisdictional scan of best management practices in order to assist with the development of standard permit conditions relevant to caribou and industry activities. Staff from the appropriate units and branches within the Ministry of Environment will be engaging industry with a draft of the document to get industry feedback prior to finalizing the document. Temporal restrictions would be a consideration for discussion and input during industry/ministry engagement. The document is expected to be used by ministry staff and proponents during the planning and operational phases of projects.

5.2.5.2 Considerations

- This will require high levels of education, compliance, and enforcement in order to manage or prevent human motorized access on established roads and trails.
- Developing detailed access and reclamation plans for all of SK2 West, and subsequent range planning areas, will require a substantial investment of effort, time and collaboration.
- To be effective, access management and reclamation planning will require detailed mapping of linear features (e.g. roads, trails), and the use and re-vegetation status of those features, as well as ongoing monitoring.
- Access management is an important aspect of range planning and further engagement with First Nations, Métis communities and stakeholder groups will be required during the implementation phase to further this work.
- Early and ongoing engagement between First Nations, Métis, Ministry of Environment staff and stakeholders by industry during the planning phase is an important component in assisting to develop an access management plan that will be most effective.
- Activities required to advance caribou recovery, have the potential to impact Indigenous rights. The ministry understands the importance of early engagement and ongoing dialogue, in order for the range plan landscape goals to be successful. During development of an access management plan and in planning for linear disturbance restoration, the ministry will engage with First Nations and Métis Locals to ensure there is a clear understanding of the significance of this work and that it is approached with a coordinated effort.
- Long-term planning for common corridors and the implementation of shared road use agreements have the potential to minimize impacts and disturbance and have potential to be very beneficial tools for caribou recovery. In some instances, common corridors may be detrimental as a result of the need to create longer access routes or the need to route access through habitat that is more critical. Pre-planning will aid in identifying the most appropriate approach.

5.3 Spatial Application of Management Strategies

5.3.1 Caribou Habitat Management Areas

Provincial Crown lands within the SK2 West area have been divided into three types of caribou habitat management areas: tier 1, 2 and 3 (Figure 15). Different management objectives and strategies were developed for each tier based on their relative importance to and known use by caribou, current habitat condition and potential risks (Table 8). Appendix B provides a detailed description of each caribou habitat management area. Biophysical and disturbance attributes of the caribou habitat management areas and other land categories are described in Appendix C.

Other management concepts associated with the caribou habitat management areas include:

- The currently identified caribou habitat management areas are intended to be in place for a maximum period of 20 years, after which time they will be re-evaluated.
- The delineation of the caribou habitat management areas considered numerous factors including habitat potential based on ecosite-habitat relationships and Indigenous traditional knowledge, level and type of disturbance, caribou occupancy/utilization, connectivity, risk of northwards range retraction, and forest industry operational plans.
- The future location and classification of caribou habitat management areas may change on the landscape in response to habitat disturbance recovery, wildfire, changes in land use and woodland caribou population trends and will be updated as is practically feasible to reflect these changes.
- The area managed as tier 1, 2 and 3 on provincial Crown lands in the future will be determined based on caribou habitat and population status.
- A new decision support tool is being developed to help identify areas within all three tiers that would maintain or enhance connectivity within SK2 West and between SK2 West and SK2 Central (see Landscape Management Goal #3) and other jurisdictions. For example, high potential habitat patches within tier 3, depending on their landscape context and configuration, likely provide important stepping stones between large patches of undisturbed habitat in tier 1 and 2 areas.
- On average, tier 1 CHMAs have the greatest proportion of high value habitat potential when compared to tier 2 and tier 3 areas. Conversely, tier 3 CHMAs have the greatest proportion of low value habitat potential compared to tier 1 and tier 2 areas. However, tier 3 areas are still comprised of approximately ten per cent high value habitat potential.
- Saskatchewan currently has all of the regulatory instruments in place (e.g. section 6.2) in order to implement the management strategies of avoidance, reclamation and restoration, mitigation offsets, forest harvest patterns, and access management across all three tiers of the caribou habitat management areas. However, work remains in order to further define some of the mechanisms and programs by which the work will be carried out. Program development will become a priority following the development of the range plans in order to facilitate their implementation.

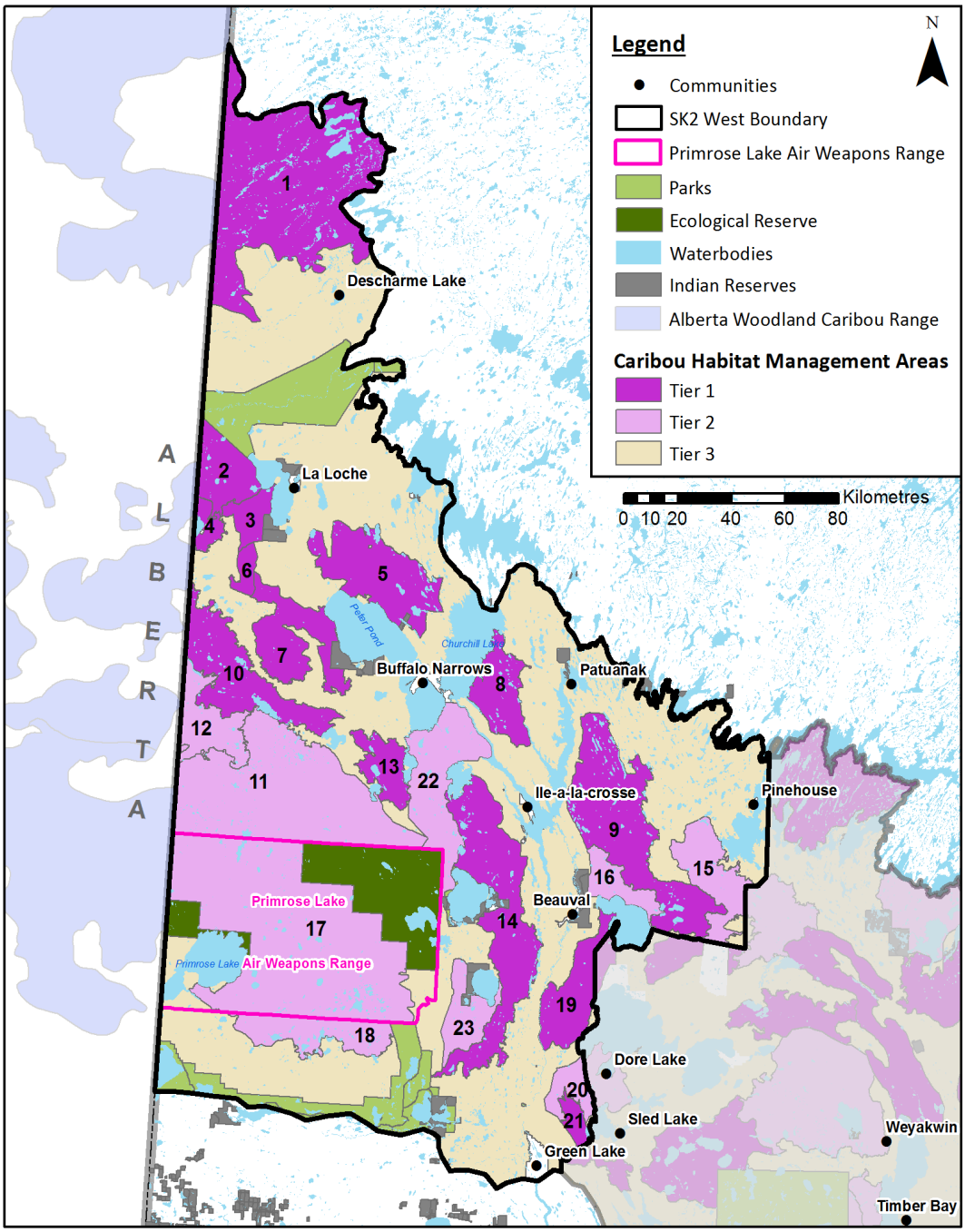

Figure 15. Location of caribou habitat management areas[1] on provincial Crown lands in the SK2 West caribou administration unit[2].

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[1] Specific information pertaining to the designation of the caribou habitat management areas can be found in Table 1 of Appendix C.

[2] Caribou habitat management area shapefiles are available to detailed users on the HABISask website at: https://gisappl/saskatchewan.ca/html5ext/?viewer=habisask and available for download via the Saskatchewan GeoHub https://geohub.saskatchewan.ca/

Table 7. Area summary, criteria for selection, management objectives and strategies for the caribou habitat management area tiers, ecological reserves, wildlife refuges, and provincial parks on SK2 West provincial Crown lands[1].

CHMA Tier	Area (km^2)	Area (per cent)	Criteria for Selection	Management Objectives	Management Strategies
Tier 1	11,815	24.4	Areas of high-moderate caribou habitat potential with high levels of observed caribou use[2] and low levels of human-caused disturbance.	• Caribou habitat retention. • These areas are preferred deferral or avoidance areas for industrial developments or other land uses.	• Avoidance. • Mitigation offsets[3]. • Access management. • New disturbance in tier 1 habitat is strongly discouraged and should only be considered in exceptional circumstances.
Tier 2	10,270	21.3	Areas of high-moderate caribou habitat potential with observed caribou use and higher levels of wildfire and human-caused disturbance.	• Caribou habitat restoration.	• Avoidance. • Reclamation and restoration[4]. • Natural forest pattern harvesting[5]. • Mitigation offsets. • Access management.
Tier 3	21,489	44.5	Areas of general caribou habitat between tier 1 and tier 2 areas. Tier 3 areas provide general habitat and connectivity between tier 1 and tier 2 areas.	• General caribou habitat management. • Maintain connectivity across the landscape.	• Natural forest pattern harvesting[5]. • Mitigation offsets. • Reclamation and restoration. • Access management.
Ecological Reserves	1,590	3.3	Caribou habitat retention.	• Caribou habitat retention. • General caribou habitat management. • Maintain connectivity across the landscape.	• Avoidance. • Mitigation offsets (if needed for access or other purposes, would be required at the same level as tier 1 areas). • Access management.

[1] Detailed descriptions of the caribou habitat management areas are provided in Appendix B.
[2] A map showing areas of caribou use in SK2 West is presented in Figure 11.
[3] Mitigation offsets associated with the various tiers of caribou habitat will assigned based on risk.
[4] Tier 2 boundaries are generally formed by recent wildfire boundaries and because of this may not be suitable for forest harvesting for many decades. Tier 2 areas are well suited for linear disturbance reclamation.
[5] In tier 3, some harvest will be planned within or adjacent to previously disturbed remnant harvests to create harvest events. This approach, in addition to using natural forest patterns for new harvest areas, will assist in reducing caribou habitat fragmentation.

Table 8. (*continued*) Area summary, criteria for selection, management objectives and strategies for the caribou habitat management area tiers, ecological reserves, wildlife refuges, and provincial parks on SK2 West provincial Crown lands.

CHMA Tier	Area (km^2)	Area (per cent)	Criteria for Selection	Management Objectives	Management Strategies
Provincial Parks	2,378	4.9	General caribou habitat management. Maintain connectivity across habitat.	• Caribou habitat retention. • General caribou habitat management. • Maintain connectivity across the landscape.	• Avoidance. • Forest harvest patterns (as required, for vegetation/fuel management). • Mitigation offsets (as required for park infrastructure, access, etc.; would be required at the same level as tier 2 areas). • Reclamation and restoration. • Access management.
Total [1]	47,542	98.4			

[1] Note: The remaining 1.6 per cent of the SK2 West area is comprised of federal lands (e.g. Indian Reserves), municipal lands, and small parcels of private or leased lands.

5.3.2 Other Provincial Lands

In addition to the designated caribou habitat management areas, there are other categories of provincial Crown lands that have management and protection features associated with them. Provincial parks are managed by the Ministry of Parks, Culture and Sport and designated under *The Parks Act*. Ecological reserves are managed by the Ministry of Environment and designated under *The Provincial Lands Act, 2016*. Game preserves and wildlife refuges are managed by the Ministry of Environment under the authority of *The Wildlife Management Zones and Special Areas Boundaries Regulations, 1990*. Each of the aforementioned provincial Crown land categories offer varying levels of protection and criteria that identify the circumstances and conditions under which they may be entered and the activities that may be conducted on them. Details for each are identified under the respective act and regulations.

The Primrose Lake Air Weapons Range represents provincial lands that have been utilized by the Federal Department of National Defence. Given the habitat potential contained within the Air Weapons Range and recognition that the Primrose Lake Air Weapons Range is provincial Crown land managed under the authority of *The Provincial Lands Act, 2016,* and other statutes within the province of Saskatchewan, the management strategies identified for the Primrose Lake Air Weapons Range will be consistent with the CHMA tier strategies outlined in Table 9.

5.3.3 Federal Lands

Federal lands such as Indian Reserves are not within Saskatchewan's management authority and may have different management objectives, but account for approximately 520.6 km^2 (1.1 per cent) of the SK2 West. Where integration, co-operation, and collaboration is possible, the ministry will endeavour to coordinate habitat management strategies with those on adjacent provincial Crown lands and Federal lands. Responsible management authorities will determine specific management objectives and strategies for these areas. Efforts will be made to coordinate the objectives and strategies developed within this plan as closely as possible with adjacent lands.

5.4 Achieving Landscape Management Goals in SK2 West

The management strategies identified in this plan are designed to reduce disturbance to woodland caribou habitat while allowing for sustainable levels of continued compatible land use. The range plan recognizes that some management activities may not result in optimized outcomes to caribou habitat for many years. The plan has adopted a 50-year implementation horizon, but will be reviewed and revised periodically (e.g. CHMAs are intended to be in place for a period of 20 years).

5.4.1 Projecting Land Use Impacts on Caribou Habitat into the Future

Using historical information and forecasted land-use, an assessment was completed to understand potential impacts of human activities on SK2 West woodland caribou habitat over a 50-year future time horizon. Any modelling beyond 50 years resulted in greater uncertainties in the main assumptions that were made (e.g. harvest level, levels of other industrial development, amount of fire disturbance) and therefore a lower confidence in disturbance outcomes. Effects of wildfire were added into the disturbance assessment aspatially due to difficulties in predicting locations and intensities of future wildfire. While these scenarios are meant to be as realistic as possible, wildfire, market fluctuations, current linear feature regeneration status, and human dimensions all complicate future projections in SK2 West. Given these complications, it is unlikely that the projected disturbance levels and geographic locations of disturbance that are depicted in SK2 West will match realized disturbance levels. However, tracking of disturbance levels in SK2 West and monitoring of the caribou population status and trend will provide a more robust method for assessing the success with which Saskatchewan is meeting the landscape management goals above and the degree to which the selected tools are effective for managing a self-sustaining caribou population in the SK2 West.

Based on these analyses, a moderate disturbance land use scenario[1] is described in Table 8. Two additional scenarios were also evaluated to understand the impacts of extensive oil and gas and forestry-related linear feature reclamation and no reclamation activities on disturbance levels.

[1] As per Environment Canada (2011) methodology, the management scenario assumes a 500 m buffer around all human-caused direct footprints included in the SK2 West disturbance map, and a restoration period of 40 years for all disturbances.

Table 8. Parameters and assumptions for three scenarios to be assessed in the SK2 West caribou administration unit.

Management Factor	Assumptions
New Oil and Gas Development	There have not been any new wells drilled in the SK2 West administrative unit since 2011 and any new infrastructure will likely be associated with natural gas extraction only, because oil sands extraction is not currently possible with existing technologies. Given current market prices and the recent lack of drilling in the area, it was projected that no new natural gas activity would take place. Even if new natural gas development were to occur, it would likely be confined to the area south of Primrose Lake Air Weapons Range where new developments are unlikely to cause much new area to be disturbed given the already high disturbance levels in that area (see Appendix F; Figure 16). However, other scenarios related to new natural gas development rates were also considered and are presented in Appendix F.
Reclamation of Legacy Non-permanent Oil and Gas-related Linear Features	Two different scenarios were assessed to understand the impact of varying levels of oil and gas-related linear feature reclamation. The first scenario projects that only currently active reclamation projects will result in removing oil and gas-related linear features and well pads from the landscape. The second scenario projects an extensive oil and gas-related linear feature restoration strategy. <u>Scenario 1</u> • Reclamation of oil and gas-related linear features and infrastructure is occurring in the northwest portion of SK2 West and these features were projected to be reclaimed and restored by the end of the 50-year scenario period. • All other oil and gas-related linear features were projected to remain on the landscape <u>Scenario 2</u> • Reclamation of oil and gas-related linear features and infrastructure is occurring in the far northwest portion of SK2 West and these features are projected to be reclaimed and restored by the end of the 50-year scenario period. • There exists a significant amount of legacy oil and gas-related linear features immediately north of Primrose Lake Air Weapons Range. These are projected to be reclaimed and restored at the end of the 50-year scenario period. All other oil and gas-related linear features within and south of Primrose Lake Air Weapons Range were projected to remain on the landscape.

Table 8. (*continued*) Parameters and assumptions for three scenarios to be assessed in the SK2 West caribou administration unit.

Management Factor	Assumptions
Forest Harvest Utilization	Given existing mill capacity and forest product market conditions, future forest harvest levels in SK2 West are likely to increase from historic levels. For both scenarios, a separate harvest volume schedule (e.g. HVS or annual allowable cut) was projected for the Mistik Management Ltd. forest management area and North West and Tolko Industries Ltd. term supply licence areas. Projections were based on historical forest harvest levels, assessments of future opportunities and potential, and assessments from area foresters. It is projected that there would be no harvest in either of the Turnor blocks. Harvest for the Mistik Management Ltd. forest management agreement area was set at 50 to 60 per cent of HVS. The Tolko Industries Ltd. harvest volume schedule was set at 100 per cent utilization and the North West timber supply area was set at 40 to 50 per cent of the HVS. These harvest levels were projected for both scenarios. However, approved forest management plans do allow for up to 100 per cent utilization for each licence. The impacts of lower utilization than the scenario presented here and 100 per cent utilization on disturbance levels are also presented in Appendix F.
Location of Forest Harvest	In the presented simulations, no harvest occurs within tier 1 areas for 50 years and between 615 and 8,086 ha of harvest per decade occurs within tier 2 areas. For both scenarios, the majority of future forest harvesting will continue to occur in low and moderate potential caribou habitats. Tier 3 CHMA is anticipated to receive the majority of forest harvesting and limited forest harvest is expected to occur within tier 2 areas. Tier 2 CHMAs have higher proportions of current disturbance making them potentially less opportune for near term forest harvesting.
New forestry Roads	New forestry-related roads were added to the landscape based on information obtained by the Ministry of Environment from forestry company tactical plans.
Forest Harvest Patterns	For both scenarios, Saskatchewan natural forest pattern-based harvesting standards will be implemented for all future commercial forest harvesting.

Table 9. (*continued*) Parameters and assumptions for three scenarios to be assessed in the SK2 West caribou administration unit.

Management Factor	Assumptions
Reclamation of New Non-permanent Roads	For both scenarios, as per *The Forest Resources Management Act*, all new in-block roads will be reforested within two years of harvesting and are projected to recover at the same rate as the surrounding harvest block. New non-permanent resource access roads will be reclaimed and restored following closure.
Reclamation of Legacy Forestry and Non-oil and Gas Related Non-permanent Roads	For scenarios 1 and 2, through a combination of focused reclamation, mitigation off-sets and access management planning, an extensive road reclamation strategy for all of SK2 West is projected and all legacy class 2-6 roads are projected to be reclaimed by year 50, unless they intersect a new harvest block. Roads category are: • class 2 = Improved bush road; • class 3 = Bush roads; • class 4 = In-block spur road; • class 5 = Access roads for resource extraction or public backcountry use; and • class 6 = other roads unsuitable for timber extraction. <u>Scenario 3</u> • A third scenario was developed to understand how disturbance levels may look in 50 years if no reclamation of current class 2-6 roads occurred. This scenario is the same as scenario 1, however none of the class 2-6 roads are reclaimed. While this scenario is unlikely to occur, it does result in higher disturbance levels if the management strategies in this range plan are not implemented.
Reclamation Time	For all three scenarios, a 40-year recovery period was used for all human and wildfire disturbances to become undisturbed caribou habitat.

Table 9. (*continued*) Parameters and assumptions for three scenarios to be assessed in the SK2 West caribou administration unit.

Management Factor	Assumptions
Other Land Uses (peat harvest, mineral exploration, and settlements)	There is the possibility that Patterson Lake mine will be developed over this 50-year period. The location of the mine will likely overlap existing disturbed exploration areas and so the contribution of this mine site to overall disturbance levels in the northern subunit (and SK2 West as a whole) is assumed to be negligible. The targeted mineral exploration incentive program is located in SK2 East and so it is expected that there will be negligible amounts of future mineral exploration in SK2 West. The location and intensity of all other land uses (e.g. peat harvesting, settlements, etc.) are projected to occur in similar locations and amounts as the current situation for the duration of the 50-year scenario period. While development of small linear and area-based disturbances contribute little to the overall disturbance levels in the SK2 West, there may be significant localized negative effects on caribou habitat and connectivity that are not reflected in these scenarios.
Wildfire	Because of the differences in area burned between the southern and northern portions of SK2 West, different future wildfire levels were calculated. It was projected that the amount of fire disturbance in the northern portion of SK2 West would remain the same as the historic rate (i.e. a constant rate of 7,826 km^2 over 40-years in the northern portion of SK2 West outside of human-caused disturbance). In the southern portion of SK2 West, to account for fire overlap with direct and indirect human-caused disturbance, the adjusted annual disturbance associated solely with fire was modelled. The amount of wildfire disturbance outside of human-caused disturbances over the last 20 years was calculated and then added on a per decade basis to future projections (i.e. 1,813 km^2/decade). Therefore, the aspatial adjusted annual disturbance associated with fire was modeled at approximately 1.53 per cent for the northern subunit or 195.7 km^2 per year and approximately 0.51 per cent for the southern subunit or 181.3 km^2 per year. Because of old fires becoming mature forest over the 50-year duration period of the scenarios and the addition of an average fire amount per decade in the southern portion of SK2 West, the net amount of fire disturbance per decade fluctuates. Climate change may result in an increase of the number, size, and intensity of future fire disturbance (Brecka et al., 2020; Barber et al., 2018). Therefore, the projected amounts of fire disturbance should be viewed as a minimum. Projections will be recalculated if natural disturbances trigger a major change on the landscape.
Wildfire Management	Future wildfire management objectives and suppression efforts are not expected to change. Parts of the SK2 West area will continue to be in the high value commercial forest full response wildfire management zone for the duration of the 50-year scenario period, and it is not expected that fire suppression efforts will change in the northern wildfire management zone.

5.4.2 The Projected Landscape Management Outcomes and Goals

Based on the moderate disturbance scenario and despite key uncertainties, the following outcomes were projected for the SK2 West[1]:

- The 65 per cent undisturbed habitat threshold is not projected to be reached in the SK2 West over the 50-year timeline of the scenarios. However, the population status and trend of woodland caribou in SK2 West will be determined by 2023, which will be used as the benchmark for assessing the effectiveness of management strategies. In addition, regular reporting of disturbance levels in the SK2 West will help the Ministry of Environment continually assess actual, not projected, disturbance levels on the landscape (e.g. Section 7.0 Monitoring) and the success with which the landscape management goals are being met.
- Locations of future disturbed and undisturbed habitat based on the moderate disturbance scenario are presented in Appendix E. Estimates of the amount of new disturbance due to forest harvest and estimates of linear feature reclamation (km) needed to meet the landscape management outcomes and goals for scenarios 1 and 2 are also presented in Appendix E: Table 8.
- Light Detection and Ranging (LiDAR) data has been acquired for a subset of tier 2 areas in SK2 West to assess linear feature revegetation status. This will allow the ministry to prioritize reclamation activities and report on linear feature revegetation trajectory with more certainty than is currently available.
- The amount of human-caused disturbance is projected to decrease compared to current conditions, but decreases in disturbance levels could only be realized with an extensive linear feature reclamation strategy (i.e. results of scenario 1, 2, and 3).
- Human-caused disturbance in the northern portion of the SK2 West is projected to decrease as a result of current linear and area-based disturbance reclamation activities. However, the northern portion of SK2 West is still expected to be largely (i.e. greater than 50 per cent) disturbed by wildfire.
- The southern portion of the SK2 West caribou administration unit could experience reductions of human-caused disturbance, even with an increase in forestry activities. The decrease in human-caused disturbance is the result of projected reclamation of legacy non-permanent forestry roads and potentially extensive reclamation of oil and gas-related linear features.
- Greater than 80 per cent of high potential woodland caribou habitat across the entire SK2 West caribou administration unit is projected to remain in a condition largely undisturbed by human activities and may potentially increase to over 90 per cent. The amount of moderate potential caribou habitat that is undisturbed by human-caused factors is projected to increase in the future.
- The location of the caribou habitat management areas and associated management actions within those areas are anticipated to contribute to maintaining connectivity within the SK2 West

[1] Detailed outcomes associated with the individual landscape management goals are presented below.

and between the SK2 West and SK2 Central caribou administration units, the SK1 caribou conservation unit, and the Alberta ranges.

- Additional forms of habitat protection not accounted for in the modelling scenarios include the future designation of areas under the Saskatchewan Representative Areas Network. Currently ten percent of the province is under some form of ecological protection under the program and the target for the program is to have 12 per cent of the province protected (Government of Saskatchewan, 2019).
- Natural forest pattern-based harvest standards will result in larger forest harvest patch sizes that more closely emulate natural disturbance patterns, thereby resulting in an overall reduction in disturbance level compared to historical forestry operations.
- The amount of linear features (e.g. non-permanent roads) could be reduced through the combined application of reclamation, mitigation offsets, access management and natural forest pattern-based forest harvesting. The projected reductions in human-caused disturbances in the SK2 West will not be realized without significant linear feature reclamation activities (i.e. results of Scenario 3 where no reclamation activities occur).
- The impacts of climate change on wildfire was not assessed in this analysis, but climate change is likely to result in an increased amount and severity of wildfire disturbance in SK2 West. However, the magnitude of the increase and success of fire suppression activities in the commercial forest are unknown so the results from these scenarios should be viewed as the minimum amount of new wildfire in the landscape.

Landscape Management Goal #1:

Reduce the amount of human-caused disturbance below current levels.

Human-caused disturbance levels in the SK2 West can be reduced. It is expected that human-caused disturbance levels could be reduced from 24.7 per cent to between 13.7 and 17 per cent in all of SK2 West, depending how many linear features are reclaimed (Figure 16). Total disturbance levels (i.e. wildfire and human-caused) in the SK2 West are also likely to be reduced from 61.2 per cent to between 45 and 48.2 per cent 50 years into the future. Without the extensive reclamation of linear features, disturbance levels are forecast to increase (Figure 16).

Given that wildfire accounts for a large proportion of disturbance in the SK2 West and is geographically concentrated in the northern portion, projected disturbances levels were analyzed separately in the northern and southern sub-units. Human-caused disturbance is projected to decline from 16.6 per cent to between 5.8 and 8.7 per cent in the northern portion of SK2 West (Figure 17), largely as a result of current reclamation initiatives on oil-related linear and area-based features. Human-caused disturbance is also projected to decline in the southern portion of the SK2 West, from 27.4 per cent to between 16.4 and 19.7 per cent (Figure 18) largely as a result of forestry-related and oil and gas-related linear feature reclamation. Without extensive reclamation of linear features, human-caused disturbance levels in the southern subunit could increase to 29 per cent (Figure 18). Maps illustrating how the SK2 West landscape may change as a result of human-caused disturbance and reclamation activities over 50 years

under the assumptions of Scenarios 1 and 2 are provided in Appendix E. The long-term effects of non-permanent linear disturbance reclamation and natural forest pattern-based harvest strategies are expected to become realized near the end of the 50-year scenario period.

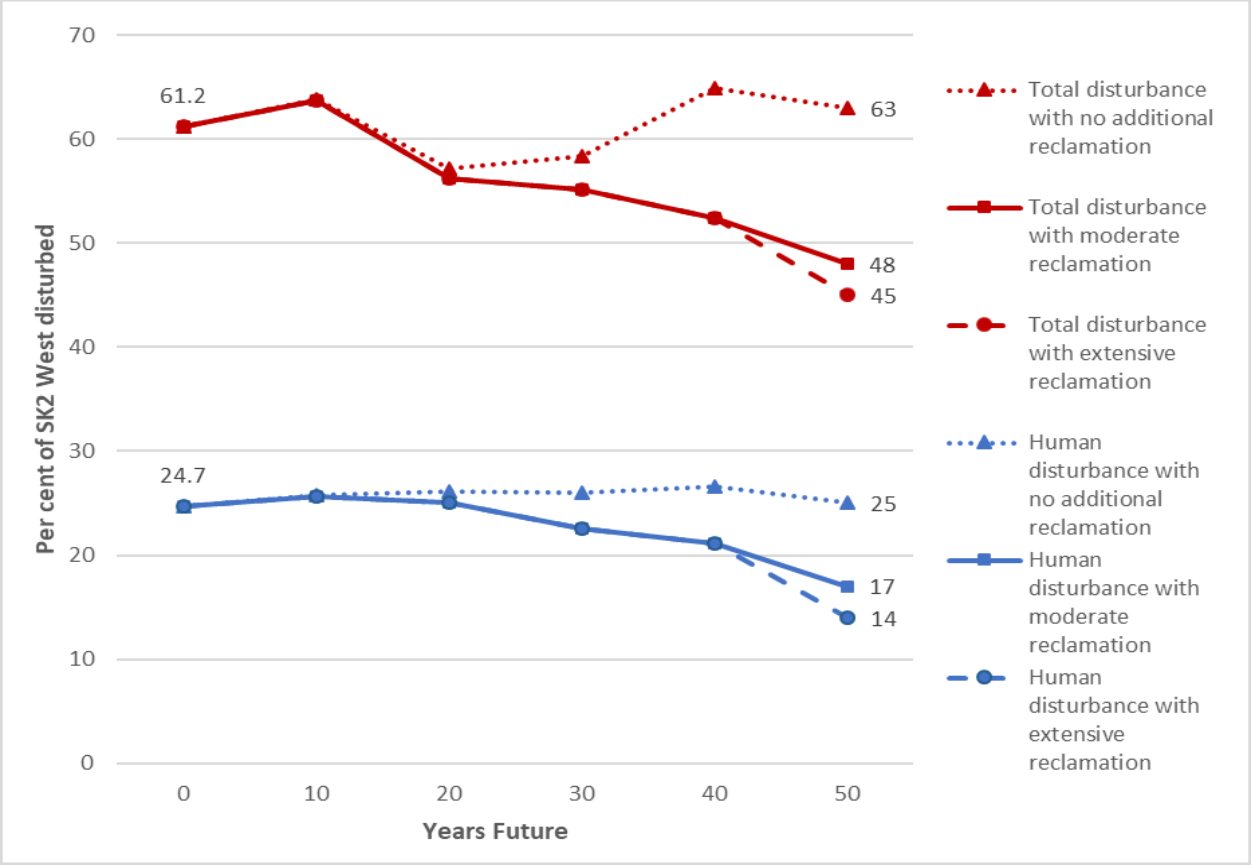

Figure 16. Projected future human and total disturbance in the SK2 West caribou administration unit for scenarios with no additional, moderate, and extensive reclamation.

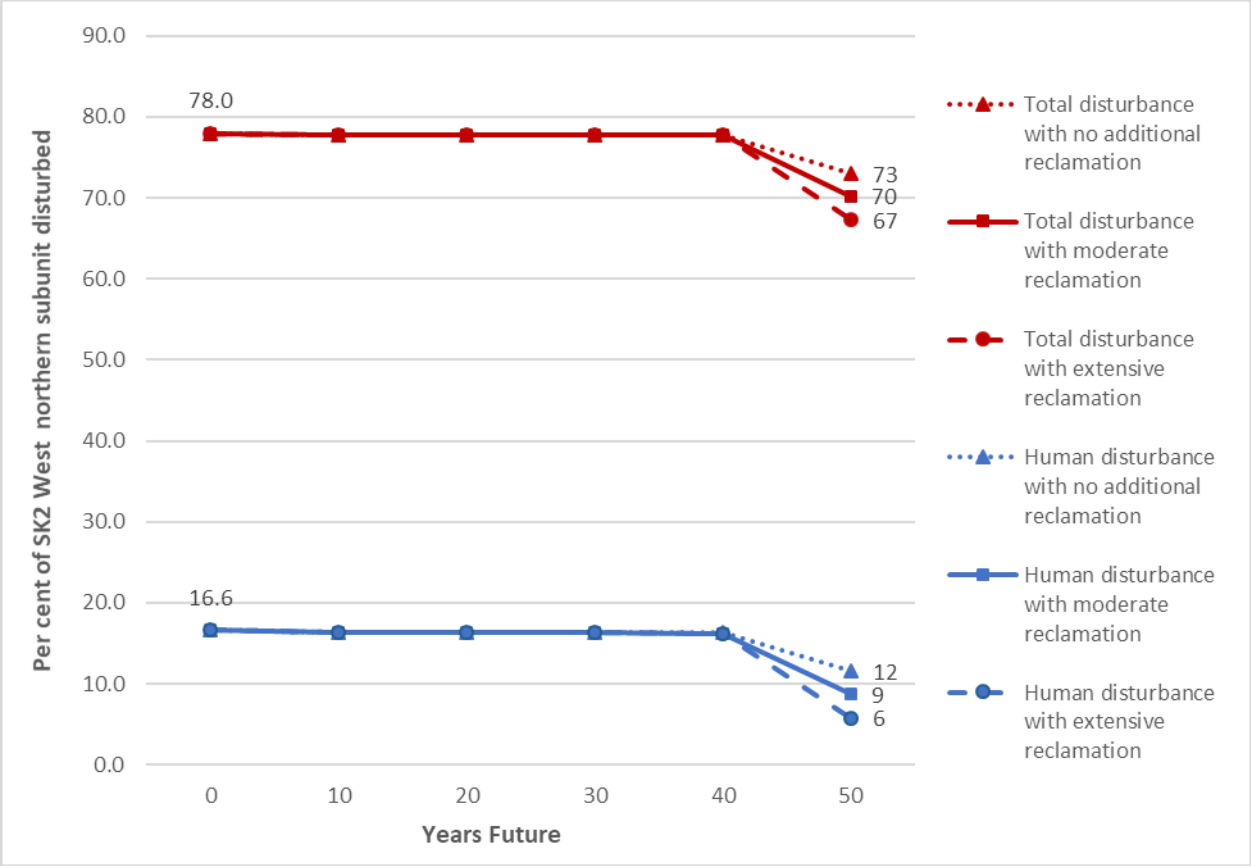

Figure 17. Projected future human and total disturbance in the SK2 West northern subunit for scenarios with no additional, moderate, and extensive reclamation.

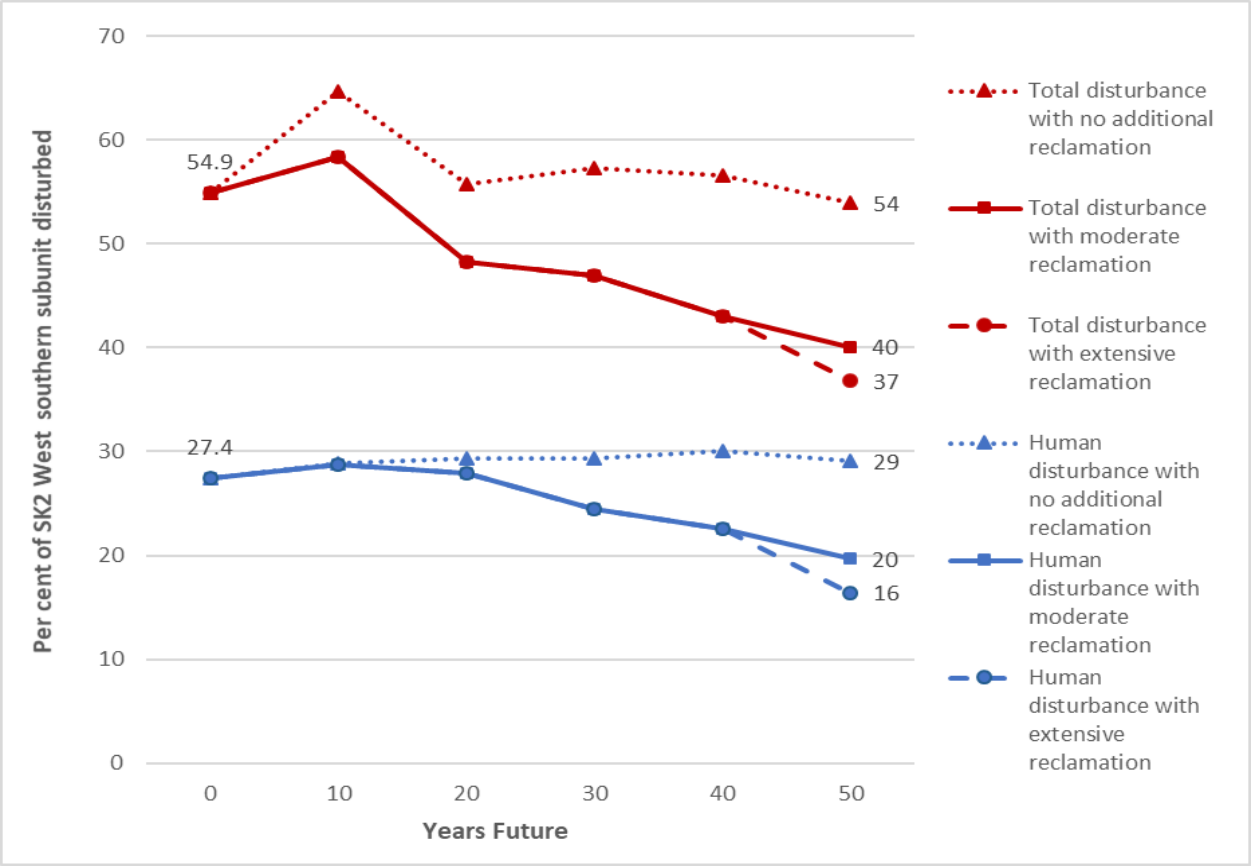

Figure 18. Projected future human and total disturbance in the SK2 West southern subunit for scenarios with no additional, moderate, and extensive reclamation.

Landscape Management Goal #2:

Maintain greater than or equal to 80 per cent of high potential woodland caribou habitat in a condition unaffected by direct and/or indirect human-caused disturbance.

Based on the scenario modeling results, the projected amount of high potential habitat unaffected by human-caused disturbance will range between 81 and 90 per cent (Figure 19) by the end of the 50-year period. The amount of high potential habitat remaining undisturbed is projected to vary little from current levels (e.g. 81 per cent) without any additional reclamation strategies beyond what is currently underway (Figure 19). These results suggest that with appropriate management actions, landscape management goal #2 is achievable and could be surpassed in the SK2 West.

A decision support tool will be developed in the future to prioritize which patches of high potential habitat should be the focus of the 80 per cent undisturbed target. This decision support tool will incorporate factors such as patch size, landscape context, connectivity (i.e. providing stepping stones for caribou movement, see landscape management goal #3), and Indigenous traditional knowledge to prioritize patches of high potential habitat that have the most benefit for caribou.

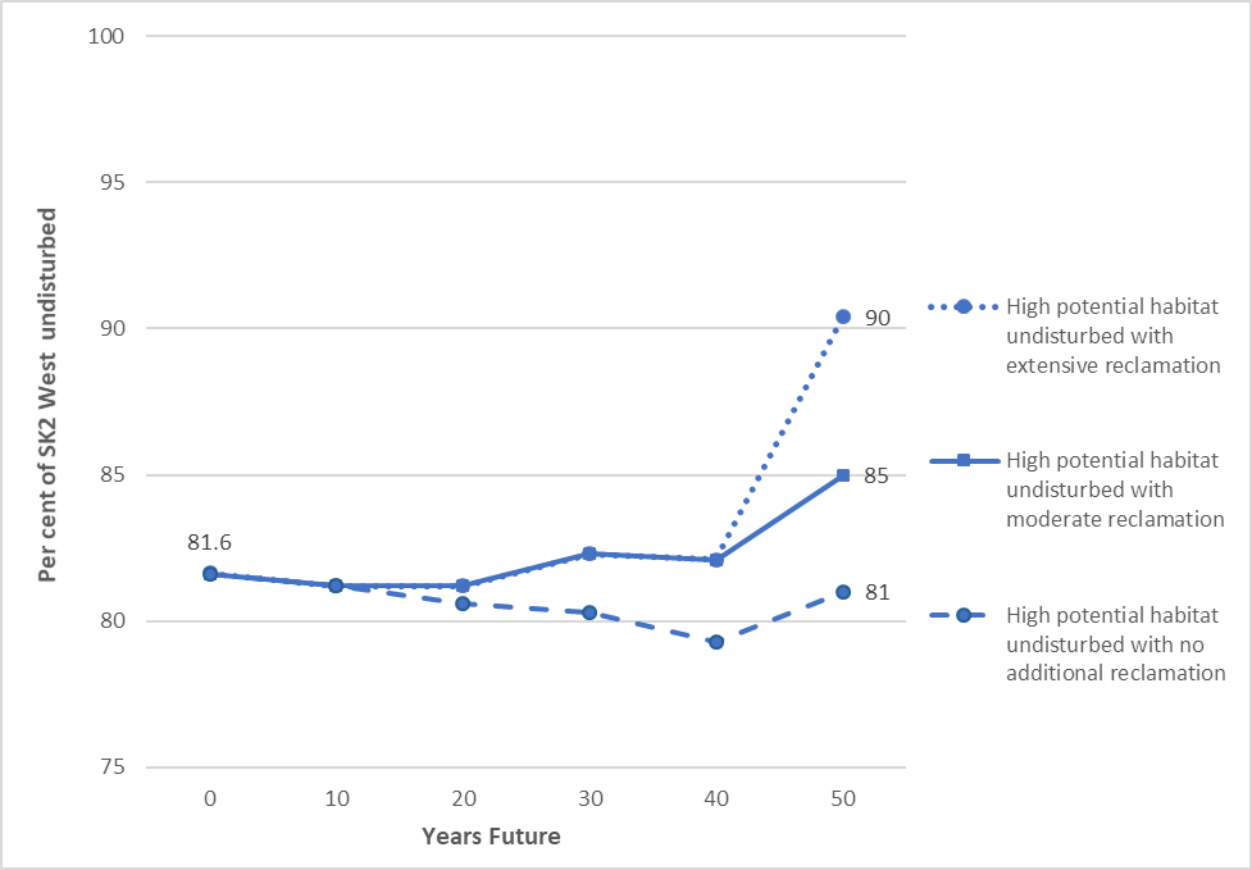

Figure 19. Projected proportion of high potential habitat unaffected by human disturbance in the SK2 West caribou administration unit for scenarios with no additional, moderate, and extensive reclamation.

Landscape Management Goal #3:

Maintain adequate connectivity between different areas of the SK2 West and adjacent caribou administration units, conservation units and Alberta ranges.

A fine-scale decision-support tool combining western science and traditional ecological knowledge to identify potential caribou movement corridors and where impediments to potential movement occur on the landscape (see Section 7.4 Research) is currently in development. This tool will be critical for proper management of tier 3 areas that provide essential connectivity between tier 1 and tier 2 areas. This analysis is taking advantage of new connectivity modelling techniques (e.g. circuit theory) and using already developed map products such as ecosites, caribou habitat potential, and natural and human-caused disturbance. The tool will be useful for:

- identifying priority areas where mitigation offsets and reclamation would be most beneficial for restoring landscape connectivity for caribou; and
- identifying areas where future development may impair connectivity. This research will complement genetic analyses by identifying potential mechanisms leading to genetic isolation.

Landscape level genetic analysis has shown the caribou population to be relatively continuous with weak structure. Weak structure within the woodland caribou population means that there are no discrete populations and suggests that there are still relatively few connective barriers across the landscape and that gene flow is still possible and occurring (COSEWIC, 2014). Much of the structure represented in Saskatchewan is caused by distance between animals across a vast range. Landscape features which cause resistance to movement and also affect population structure include large water bodies, roads and forest harvest blocks (Priadka et al., 2018). Management actions to improve connectivity are anticipated to focus on human-caused disturbance in areas where resistance to movement has affected population structure. Reducing human disturbance around natural landscape features that constrict movement will help ameliorate the compounding effect of barriers on connectivity.

Landscape Management Goal #4:

Increase forest harvest event sizes to more closely emulate natural forest patterns.

Based on the concepts of the natural range of variation, Saskatchewan is implementing natural forest pattern-based harvest requirements that more closely emulate natural disturbances in scale and pattern. Prior to this evolution in the approach to forest harvesting, traditional harvest blocks typically ranged from 40 to 100 ha in size. The natural forest pattern-based harvesting approach, found in the *Forest Management Planning Standard*, requires that forest management plans identify a distribution of harvest sizes that will better approximate that found within the natural range of variation. The event size classes are defined in the *Forest Management Planning Standard* and presented in Table 9.

Table 9. *Forest Management Planning Standard* harvest event size classes for the purposes of planning and reporting.

Event Size Classes	Size Range (ha)
Small	0 - 100
Medium	101 - 1,500
Large	1,501 - 3,500
Very Large	3,500 - 8,000
Extremely Large	> 8,000

The forest management plans for the Mistik TSA, the North West TSA, and the Bronson-Green Lake are largely contained within the SK2 West caribou administration unit plan boundary, and are associated with harvest event size distribution targets as shown in Table 10. The difference in harvest event size target ranges are a function of separately negotiated forest management agreements, unique to the conditions of each company in question, and that while the size ranges differ, they effectively represent very similar distribution profiles. While no extremely large events (> 8,000 ha) have been proposed, it is expected that the aggregation of multiple smaller adjacent harvest events will result in a similar pattern over time. A shift toward a distribution favouring even larger event sizes compared to the natural forest pattern requirements could result in further disturbance reduction.

Table 10. Harvest event size distribution targets for forest licence holders in the SK2 West caribou administration unit.

Licence Holder	Size Range (ha)	Event Size Distribution Target (per cent)
Mistik Management Ltd.	0-100	20
	101-1,500	64
	1,501-3,500	14
	3,500-8,000	2
	> 8,000	0
Carrier Forest Products Ltd.	0-4	0
	5-100	20
	101-1,500	60
	1,501-3,500	20
	3,501-8,000	0
	> 8,000	0
Tolko Industries Ltd.	0-4	0
	5-60	10
	61-800	60
	801-1,800	20
	1801-4,000	10
	> 4,000	0

Landscape Management Goal #5:

Decrease the total amount of non-permanent legacy linear features.

Non-permanent roads are considered to be class 2, 3, 4, 5 and 6 within the Saskatchewan forest database. These roads were originally created to facilitate temporary access for resource use in previous decades, but were not purposefully reclaimed. Many of these legacy roads are now used for recreational activities or other uses, but may no longer be required for their original purposes.

While the re-vegetation status and level of human activity associated with many linear features is currently uncertain, the total length of non-permanent roads represented in the SK2 West disturbance assessment is estimated to be approximately 16,813 km and there are approximately 5,001 km of seismic lines in SK2 West.

Through the combined efforts of access management planning, reclamation, and mitigation offsets, Saskatchewan anticipates the amount of non-permanent legacy roads to be reduced over time. All future dispositions will require the developer of the road to have a plan and will be responsible to restore and reclaim the road prior to the disposition terminating. A previous assessment in the SK2 Central administration unit projected that focusing near-term harvesting close to previously disturbed areas, and implementation of natural forest pattern-based forest harvesting practices, will result in much lower road to harvest areas ratios (e.g. 0.5 or 1.0 km of road to 1 km^2 of area harvested) than traditional harvest patterns. Further information about lowering road to harvest area ratios can be found in the *Range Plan for Woodland caribou in Saskatchewan: Boreal Plain Ecozone – SK2 Central*

Caribou Administration Unit available here:
https://publications.saskatchewan.ca/api/v1/products/101694/formats/112399/download .

However, given current uncertainties about re-vegetation status, levels of human activity, and definitions for caribou habitat restoration, it is difficult to project the level of non-permanent legacy road reduction that can be achieved. Therefore, the development of tools for assessing habitat connectivity and information from Light Detection and Ranging (LiDAR) imaging within a subset of tier 2 areas in SK2 West will allow for prioritization of reclamation activities on linear features where benefits are greatest for caribou and likelihood of reclamation success is high. This assessment of revegetation status will also allow for greater certainty in projections of when certain disturbances could likely to be removed from the disturbance assessment.

Detailed access management planning and enhanced inventory information is required prior to specific target development. Current assumptions and projections about reclamation activity, reclamation lag time, amount of future forest road requirements, and modern reclamation standards indicate a declining trend in total non-permanent road length.

6.0 Critical Habitat Protection

Identifying the legislative tools available to Saskatchewan that enable protection of critical habitat for woodland caribou provides certainty of the province's ability to manage activities on the landscape to ensure there is sufficient, connected habitat, capable of supporting a self-sustaining woodland caribou population.

Saskatchewan has a number of legislative tools and processes to support protection in a manner that contributes both to the long-term viability of the woodland caribou population and supports continued economic development, including *The Environmental Management and Protection Act, 2010, The Forest Resources Management Act,* and *The Provincial Lands Act, 2016*.

6.1 Range-Specific Activities Likely to Result in the Destruction of Critical Habitat

Habitat loss is variable and can be non-permanent or permanent, short to long-term, and large or small. It may be caused by wildfire, forest harvesting, other resource extraction, or through the construction of roads, trails, seismic lines and other linear features. Additionally, functional habitat loss may occur when woodland caribou stop using suitable habitat because of nearby disturbance.

The federal recovery strategy defines destruction as the degradation of critical habitat, either permanently or temporarily, such that it would not serve its function when needed by boreal woodland caribou. Destruction may result from a single activity, multiple activities at one point in time, or from the cumulative effects of one or more activities over time. Activities that are likely to result in the destruction of critical habitat, include, but are not limited to, the following:

- Any activity resulting in the **direct loss** of woodland caribou critical habitat (e.g. conversion to agriculture, forestry cut blocks, mines, industrial and infrastructure development);

- Any activity resulting in the **degradation** of critical habitat leading to a reduced, but not total loss of both habitat quality and availability for woodland caribou (e.g. pollution, drainage, and flooding); and
- Any activity resulting in the **fragmentation** of habitat by man-made linear features (e.g. road development, seismic lines, pipelines, and hydroelectric corridors) (Environment Canada, 2012).

For the purpose of identifying activities likely to result in the destruction of critical habitat, current activities also constitute foreseeable activities in the SK2 West caribou administration unit and are presented in Table 12.

Table 11. Current and foreseeable activities likely to result in the destruction of boreal caribou critical habitat in the SK2 West caribou administration unit.

Activity	Direct loss[1] of habitat	Degradation[2] of habitat	Fragmentation[3] of habitat
Conversion of habitat to agriculture	✓		✓
Transportation – road or trail development	✓		✓
Forestry cut blocks	✓	✓	✓
Wildfire	✓	✓	✓
Mining development – peat	✓		✓
Mining development – other	✓		✓
Oil and gas development	✓		✓
Urban/community development	✓		✓
Seismic/Exploration/Geophysical lines	✓		✓
Tourism - snowmobile or ATV trail development	✓		✓
Pipelines	✓		✓
Electrical power transmission lines	✓		✓
Pollution – mining development		✓	
Pollution – oil and gas development		✓	
Drainage – peat development		✓	

[1] Direct loss suggests complete loss or conversion of habitat to a condition that no longer provides functional habitat.
[2] Degradation suggests a deterioration of habitat quality and availability.
[3] Fragmentation suggests activity caused separation of otherwise functional habitat.

6.2 Current Protection of Critical Habitat on Non-Federal Lands

The following Saskatchewan provincial statutes provide for solid protection against activities likely to destroy critical habitat on provincial land, as well as supporting the management strategies identified in this plan:

- *The Forest Resources Management Act*
  - *The Forest Resources Management Regulations*
  - *The Forest Resources Management (Saskatchewan Environmental Code Adoption) Regulations*
  - Saskatchewan Environmental Code
- *The Provincial Lands Act, 2016*
  - *The Crown Resource Land Regulations, 2019*
- *The Environmental Management and Protection Act, 2010*
  - *The Environmental Management and Protection (General) Regulations*
  - *The Environmental Management and Protection (Saskatchewan Environmental Code Adoption) Regulations*
  - *Saskatchewan Environmental Code*

The Provincial Lands Act, 2016 works in conjunction with *The Environmental Management and Protection Act* and *The Forest Resources Management Act* to re-inforce the strength of these two statutes, and provides strong legislative authorities for future land use arising from woodland caribou range plans.

Pending updates to the *Saskatchewan Environmental Code*, including a new chapter and standard related to linear activities and linear corridors, will reinforce the strength of Saskatchewan's woodland caribou critical habitat protection.

The provincial statutes with the greatest coverage and influence over the SK2 West caribou administration unit are *The Forest Resources Management Act* and *The Provincial Lands Act, 2016*. Other statutes that provide additional support in the protection against habitat destruction to achieve the desired outcomes are identified in Table 12.

Saskatchewan's legislation provides considerable protective and conservation measures for both habitat and species. The following acts, sections, and clauses of the legislation represent the primary mechanisms by which habitat or species may be protected, managed, or conserved on provincial Crown lands. For the purpose of this evaluation, only the Acts have been referenced; further and more specific mechanisms are identified in the relevant associated regulations. Other sections or clauses not cited here can provide secondary, supportive, or ancillary protection or enforcement measures. Since legislation is periodically updated to maintain relevancy, readers are advised to refer to the most recent copy of the legislation at: https://publications.saskatchewan.ca/#/home

The protective measures and elements reflected in Tables 13, 14, 15, and 16 have been selected as examples of being the most relevant, least duplicative and cover the authority, responsibility, compliance and protection of both habitat (e.g. land) and species. For brevity, the associated regulations and *Saskatchewan Environmental Code* have been omitted.

The specific legislation, regulations and other environmental controls relied upon to protect the environment and associated woodland caribou habitat are unique to the conditions and considerations of the various and numerous types of land-use permitting or environmental assessment in Saskatchewan. Regulators responsible for permitting and or assessment or approval of industrial activities and other land-uses on Saskatchewan's Provincial forests draw from the appropriate environmental and regulatory controls depending upon the scale, type, location, or other factors associated with the proposed activity. The measures outlined in Tables 13 through 16 provide examples of those controls.

The selected clauses provide the legal authority for the Crown and each individual clause describes the specific and relevant activity permitted, approval required, powers available, requirements to be submitted, and penalties if not followed, for topics associated with remediation, closure of roads, harvesting requirements, planning requirements, environmental assessments, etc. Implementation of policies, conditions, regulations, and other instruments are to occur during the implementation process. Currently unavailable policies, programs, conditions, and other means to implement the range plans will be discussed by the implementation committee (further described in section 8.2).

Table 12. Statute relevance to activities likely to result in the destruction of boreal caribou critical habitat on provincial land.

Activities \ Provincial Statute	The All Terrain Vehicles Act	The Environmental Assessment Act	The Environmental Management and Protection Act, 2010	The Forest Resources Management Act	The Mineral Resources Act, 1985	The Crown Minerals Act	The Oil and Gas Conservation Act	The Provincial Lands Act, 2016	The Parks Act	The Snowmobile Act	The Water Power Act	The Wildlife Habitat Protection Act	The Wildfire Act	The Wildlife Act, 1998
Extent of critical habitat affected	local	local	all	all	all	all	all	extensive	local	all	local	local	all	all
Direct loss of habitat														
Conversion to agriculture				X				X	X			X		X
Forest harvesting				X					X			X		
Human-caused wildfire												X	X	
Mining development - peat		X	X	X				X	X			X		
Mining development - oil and gas		X	X	X	X	X	X	X	X			X		
Mining development - other		X	X	X	X	X	X	X	X			X		
Urban / community development								X						
Degradation of habitat														
Human-caused wildfire									X				X	
Pollution - mining development		X	X	X				X	X			X		
Pollution - oil and gas development		X	X	X			X	X	X			X		
Drainage - peat development		X	X	X				X	X			X		
Flooding - hydroelectric power development		X	X	X				X	X		X	X		
Habitat fragmentation by human linear features														
Road / trail development		X	X	X				X	X			X		X
Snowmobile / ATV trail development	X			X				X	X	X		X		
Seismic / exploration / geophysical lines			X	X	X	X	X	X	X			X		
Pipelines		X	X	X	X	X	X	X	X			X		
Electrical power transmission lines		X	X	X				X	X			X		

Table 13. Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Forest Resources Management Act*.

The Forest Resources Management Act	
Section	**Description**
3	**Purpose** The purpose of this Act is to promote the sustainable use of forest land for the benefit of current and future generations by balancing the need for economic, social and cultural opportunities with the need to maintain and enhance the health of forest land.
5	**Minister's responsibilities** The minister is responsible for all matters not by law assigned to any other minister, ministry, branch or agency of the Government of Saskatchewan relating to the acquisition, promotion, conservation, development, enhancement, maintenance, management, protection and utilization of forest resources.
6	**Powers of minister** The minister…may: (c) specify terms governing the harvesting, …of forest products.; (e) control the use of pesticides on land within the provincial forest; (h.1) specify requirements and procedures for the treatment, … and disposal of infected material; (i.1) specify activities on forest land that are required to be registered with the ministry; (i.3) develop or establish standards or requirements respecting any matter governed by this Act; and (j) do any thing the minister considers necessary to conserve, develop, enhance, maintain, manage, protect and utilize forest products on forest land in a sustainable manner. (4) … the minister may approve criteria, … as an alternative to those set out in the code if the minister is satisfied that: (a) those alternative criteria, … provide an equivalent or better level of protection to Crown resource lands or forest products on Crown resource lands; and (b) it is in the public interest to do so.
7	**Power to enter into agreements** (1) The minister may enter into agreements … for the purposes of … (a) the protection, on any land, of forests, trees or other arboraceous vegetation from damage…; (b) the protection of watersheds; (c) the renewal and reclamation of all components of a forest ecosystem; (d) the acquisition, promotion, conservation, development, enhancement, maintenance, management, protection and utilization of forest resources; (i) the location, … closure, management and reclamation of roads, road allowances and rights of way within the provincial forest;
12	**Provincial forests** (1) The Lieutenant Governor in Council, by regulation, may designate any Crown resource land as a provincial forest to be managed in a sustainable manner for the purposes of conserving, developing, enhancing, maintaining, managing, protecting and utilizing the forest resources on that land. (2) All lands designated as provincial forest are withdrawn from disposition, sale, settlement or occupancy except pursuant to the authority of this Act and the regulations.

Table 13. (*continued*) Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Forest Resources Management Act*.

The Forest Resources Management Act	
Section	**Description**
17	**Forest products Crown property** (1) All forest products, including forest products resulting from renewal, are property of the Crown. (2) … no person shall harvest or acquire any right or property in any forest product except in accordance with this Act, the regulations or the code.
20	**Designations by the minister** Subject to the regulations, the minister, in any licence respecting the harvesting of forest products, may set out the following: (a) the size of harvest areas; (b) harvest methods; … (e) conditions governing location, construction and use of roads; (f) any other terms that the minister considers appropriate.
24	**Import Controls** No person, without the written authority of the minister, shall import any thing into Saskatchewan that, in the minister's opinion, could cause the spread of insects or diseases harmful to Saskatchewan's forests, trees or other arboraceous vegetation.
27	**Renewal activities** A licensee shall carry out renewal activities in accordance with the regulations and the terms of the licensee's licence.
38	**Forest management plans and operating plans** (1) Subject to subsection (1.1), before commencing any activity authorized by a forest management agreement, the licensee shall submit to the minister for approval: (a) a forest management plan for the full term of the agreement; and (b) a five-year operating plan.
46	**Preparation of plans** (1) A licensee who holds a term supply licence shall prepare the forest management plan and the operating plan in accordance with: (a.1) the code; (a.2) if the plan is a development within the meaning of *The Environmental Assessment Act*, the requirements of that Act;
47	**Activities to conform to plans** (1) The operations of a licensee who holds a term supply licence are to conform to: (a) the approved forest management plan, … and (b) the approved operating plan, …
49.3	**Approval or refusal of plan re forest product permit** (2) The minister shall review a plan … and: (a) approve the plan if, in the minister's opinion, the plan complies with this Act and it is in the public interest to do so; or (b) refuse to approve the plan if the minister is not satisfied that: (i) the plan complies with this Act; or (ii) it is in the public interest to approve the plan.
49.4	**Activities to conform to plans** (1) … a licensee who holds a licence respecting a forest product permit shall ensure that the operations of the licensee conform to the approved operating plan, including any terms imposed …

Table 13. (*continued*) Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Forest Resources Management Act*.

The Forest Resources Management Act	
Section	**Description**
50.1	**Changes to approval** (1) The minister may cancel, amend, alter or suspend any approved operating plan or any licence other than a licence issued with respect to a forest management agreement, in whole or in part, if: (a) the … operating plan or licence has resulted or will result in a contravention of any Act or regulation or any other law;
56	**Minister may establish roads** (1) … the minister may construct roads within a provincial forest and may: … (c) by order, close the whole or any specified part of those roads.
57	**Construction of roads** (1) … no person shall clear any forest land for the purpose of constructing a road, trail or other right of way, except with prior authorization from the minister or in accordance with the regulations.
58	**Closure of roads** (1.1) … if the minister considers it necessary for the purposes of managing or protecting forest resources, the minister may close, by order, or require any person responsible for the construction or maintenance of the road to close, any road within a provincial forest. (2) If a road is closed … no person shall operate a vehicle on that road, and no person shall be a passenger in or on a vehicle that is on that road, …
61	**Damage prevention and repair** (1) An officer may make an order requiring any person to stop harvesting or to stop any activity … that: … (b) the person has done or is doing anything that: (i) has damaged, is damaging or is likely to damage Crown resource land or forest products on Crown land; … (4) During the period of the officer's order, the minister may make an order: … (b) directing the person to take any action the minister considers appropriate to repair the damage or prevent further damage;
62	**Forest remediation order** 1(1) If … activities being carried out on Crown resource land are being carried out in contravention of this Act, the regulations or the code and may cause, are causing or have caused damage to Crown resource lands or forest products on Crown resource lands, the minister may issue a forest remediation order… (3) … the minister may, in a forest remediation order, require a person to whom the forest remediation order is directed to do all or any of the following: (a) investigate the situation; (b) lessen or prevent further damage to the Crown resource land or forest products; (c) remedy the damage; (d) restore the Crown resource land or forest products to a condition satisfactory to the minister; (g) cease or suspend any activity for a period specified in the order or permanently; (4) A forest remediation order may specify: (a) the method or procedures to be used in carrying out the measures required by the order …; and (b) the period within which any measure required by the order is to be commenced …

Table 13. (*continued*) Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Forest Resources Management Act*.

The Forest Resources Management Act	
Section	**Description**
63	**Duty re designated insects and diseases** 1(1) Every person who owns, occupies or controls any land that is designated land shall take measures to remove, dispose of, control and prevent the spread of all designated insects or diseases on that land.
78	**Administrative penalty** (1) The minister may assess a penalty in the prescribed amount against any person if the person: … (c) harvests forest products in contravention of the terms of a licence, an approved plan or the code;
79	**Offences and penalties** (1) No person shall: (a) harvest forest products except in accordance with this Act, the regulations and the code; (d) fail to comply with the terms of any licence or plan approved pursuant to this Act, the regulations or the code; (2) Any person who contravenes any provision of this Act, the regulations or the code is guilty of an offence and liable on summary conviction: (a) in the case of an individual, to a fine not exceeding $250,000, to imprisonment for a term not exceeding five years or to both; (b) in the case of a corporation, to a fine not exceeding $1,000,000.
80	**Additional powers of court** (1) In addition to any penalty imposed on a person … the court …, may make an order doing any one or more of the following: (a) prohibiting the person from doing any act or engaging in any activity that, in the opinion of the court, may result in the continuation of the offence; (b) directing the person to take any action the court considers appropriate to: (i) repair any damage to any Crown resource land or forest products on Crown land that resulted from the commission of the offence; or (ii) prevent any damage to any Crown resource land…
99	**Regulations** (1) The Lieutenant Governor in Council may make regulations: (g) governing the alteration or disturbance of any forest vegetation on Crown land;… (r) respecting tree preservation and the renewal, reforestation or reclamation of Crown resource land or portions of Crown resource land;

Table 14. Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Environmental Management and Protection Act, 2010*.

The Environment Management and Protection Act, 2010	
Section	**Description**
3	**Responsibilities and powers of minister re the environment** (2) …, the minister may: (a) create, develop, adopt, co-ordinate and implement policies, strategies, objectives, guidelines, programs, services and administrative procedures or similar instruments respecting the management, protection and use of the environment; (b) sponsor, undertake and co-ordinate planning, research and investigations respecting the environment; (c) establish a system of monitoring the quality of the environment and collect, process, correlate, store and publish data on: (i) the quality of the environment; and (ii) activities that have or may have an adverse effect; … (g) provide information to the public on: (i) the quality and use of the environment; (ii) the quantity of any substances or things in the environment; and (iii) any activity that has an adverse effect; (3) The minister shall recommend to the Lieutenant Governor in Council the adoption of a code. (5) …at the request of a person proposing to engage in an activity governed by this Act, the minister may approve criteria, terms, conditions or requirements submitted by that person as alternatives to those set out in the code if the minister is satisfied that: (a) those alternative criteria, terms, conditions or requirements provide an equivalent or better level of safety or protection to human health and the environment; and (b) it is in the public interest to do so.
5	**Preparation of report** (2) The minister shall ensure that a report is prepared every two years, to be known as the State of the Environment Report, concerning the current condition of the environment in Saskatchewan and the relationships between the condition of the environment and the economy of Saskatchewan. (3) The minister may use any environmental indicators that the minister considers relevant in the preparation of a report. (4) The report must: (a) present baseline information on the environmental indicators…; (c) identify, and present analyses, respecting how the environment is changing; and (d) identify emerging concerns for the environment.
8	**Prohibition on discharges** (1) No person shall discharge or allow the discharge of a substance into the environment in an amount, concentration or level or at a rate of release that may cause or is causing an adverse effect…
10	**Duty to take immediate action** … any person who owns or occupies land respecting which a report is filed … shall, as soon as possible, take all reasonable emergency measures consistent with public safety: (a) to repair or remedy any undue risk; or (b) to reduce or mitigate danger to life, health, property or the environment that results or that may reasonably be expected to result from the discharge of the substance.

Table 14. (*continued*) Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Environmental Management and Protection Act, 2010*.

The Environment Management and Protection Act, 2010	
Section	**Description**
14	**Corrective action plan** (1) If a site assessment discloses that the site is an environmentally impacted site, the person required to conduct the site assessment … shall prepare a corrective action plan that satisfies any prescribed requirements or any requirements set out in the code.
16	**Minister's consideration of corrective action plan** (1) The corrective action plan … must be immediately submitted to the minister for review after it has been prepared. (2) If the minister is not satisfied with the corrective action plan, the minister may require that the person preparing the corrective action plan resubmit it with any changes that the minister may direct.
22	**Registry** (1) The minister shall establish an environmentally impacted sites registry. (2) The registry is to contain the following documents that are accepted or received by the minister: (a) notices of site condition; (b) corrective action plans; (c) site assessments; (d) environmental protection orders;…
38	**Offences under Part** … (4) … no person shall directly or indirectly: (a) alter or cause to be altered the configuration of the bed, bank or boundary of any river, stream, lake, creek, marsh or other watercourse or water body; (b) remove, displace or add any sand, gravel or other material from, in or to the bed, bank or boundary of any river, stream, lake, creek, marsh or other watercourse or water body; or (c) remove vegetation from the bed, bank or boundary of any river, stream, lake, creek, marsh or other watercourse or water body. (5) A person may engage in an activity mentioned in subsection (4) if expressly authorized to do so pursuant to: (a) this Act or the regulations;…
49	**Prohibition respecting abandonment of waste** No person shall discard or abandon or cause to be discarded or abandoned or allow to be discarded or abandoned, any waste other than: (a) in a waste management works for which a permit has been issued…
55	**Immediate environmental protection orders** (1) …, if the minister is satisfied that a person is doing any thing or carrying out any activity that may cause or is causing an immediate or significant adverse effect, the minister may issue an immediate environmental protection order that is directed to a person requiring that person: (a) to immediately cease or suspend doing the thing or carrying out the activity identified in the order; and (b) to do any other thing that the minister considers appropriate, …

Table 14. (continued) Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Environmental Management and Protection Act, 2010*.

The Environment Management and Protection Act, 2010	
Section	**Description**
56	**Environmental protection orders** (1) If the minister is satisfied that a person is doing any thing or carrying out any activity that may cause or is causing an adverse effect, the minister may issue an environmental protection order against a person responsible directing that person to take any measures that the minister considers necessary to remedy, minimize, mitigate or prevent the adverse effect. … (6) An environmental protection order may specify: (a) the method or procedures to be used in carrying out the measures required by the order and the manner in which those methods or procedures are to be carried out; and (b) the period within which any measure required by the order is to be commenced and the period within which the order or any portion of the order is to be complied with.
84	**Offences** (1) No person shall: … (c) fail to comply with an order of the minister issued pursuant to this Act or the regulations; or (d) fail to comply with any provision of this Act, the regulations or the code. (2) … every person who contravenes a provision of this Act, the regulations or the code, for which no penalty is otherwise provided, is guilty of an offence and liable on summary conviction to: (a) a fine not exceeding $1,000,000 for each day or part of a day during which the offence continues; (b) imprisonment not exceeding three years; or (c) both that fine and imprisonment.
85	**Additional order from convicting court** In addition to or instead of any penalty imposed pursuant to this Act, the convicting court, having regard to the nature of the offence and the circumstances surrounding its commission, may make an order doing one or more of the following: (c) directing the convicted person to repair, mitigate or minimize any damage to the environment that resulted from the commission of the offence in a manner and within the period specified by the order, or to restore or reclaim any property that has been damaged as a result of the commission of the offence in a manner and within the period specified by the order; (d) requiring the convicted person to take steps to prevent any damage to the environment that may result from the commission of the offence in a manner and within the period specified by the order;…

Table 15. Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Provincial Lands Act, 2016*.

The Provincial Lands Act, 2016	
Section	**Description**
2-1	**Minister's responsibilities** (1) The minister is responsible for all matters … relating to the administration of provincial land. (2) For the purpose of carrying out the minister's responsibilities, the minister may do all or any of the following: (a) create, develop, adopt, coordinate and implement policies, strategies, objectives, guidelines, programs, services and administrative procedures or similar instruments respecting the administration of provincial land; (b) sponsor, undertake and coordinate planning, research and investigations respecting provincial land; (d) subject to the regulations, conduct public hearings or inquiries, or appoint a person to conduct public hearings or inquiries, respecting the use, management, establishment or enlargement of any ecological reserve or the revocation of a designation of any ecological reserve;…
2-2	**Administration of provincial land** (2) The minister may: (a) establish a planning area; and (b) prepare a land use plan for the purpose of coordinating policies, programs and activities to guide existing and potential uses of provincial land …
2-4	**Rights only acquired in accordance with this Act or the regulations** (3) Any disposition issued pursuant to this Act or the regulations with respect to provincial land is not binding on the Crown until the minister signs the disposition.
2-6	**Leases, permits, licences, easements and other dispositions** (1) Subject to the regulations, the minister may issue any or all of the following dispositions on any terms and conditions that the minister considers appropriate: (a) a lease of any provincial land; (b) a permit with respect to any provincial land; (c) a licence with respect to any provincial land; (d) an easement over, under or through any provincial land; …
2-7	**Categories and uses of vacant provincial land** (1) The minister may establish categories of vacant provincial land and permissible uses for those categories of provincial land, including restricting the activities that may be conducted on any identified parcel of vacant provincial land or any category of vacant provincial land. (2) … the minister shall issue an order that specifies the nature of the restriction and the land to which the restriction applies.
2-12	**Amendment or cancellation of authorization, consent or disposition** … , if the minister is satisfied that any person has obtained an authorization, consent or disposition by misrepresenting or failing to disclose any material fact, the minister may: (a) amend or correct the authorization, consent or disposition; or (b) cancel the authorization, consent or disposition.
2-16	**Amendment of terms and conditions or withdrawal of land from or cancellation of disposition** (2) … ,if the minister is of the opinion that it is in the public interest to do so, the minister may amend a disposition,

Table 15. (*continued*) Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Provincial Lands Act, 2016*.

The Provincial Lands Act, 2016	
Section	**Description**
2-19	**Liability continues** The cancellation of a disposition by the minister, or the termination of a disposition by a disposition holder, does not: … (b) relieve the disposition holder of any outstanding debt or other obligation owing to the Crown with respect to the disposition.
2-23	**Minister's consent required re certain improvements** (1) A disposition holder who intends to construct or alter an improvement on provincial land shall obtain the written consent of the minister before commencing the construction or alteration.
2-24	**Restoration of provincial land—removal of improvements or other property, etc.** … (2) A disposition holder shall restore the provincial land that is the subject of his or her disposition to a condition satisfactory to the minister… (3) If the minister believes the disposition holder has not satisfactorily restored the provincial land, the minister may issue a written order to the disposition holder requiring the disposition holder to restore the provincial land in the manner and within the period set out in the order.
3-1	**Ecological reserves designated** The Lieutenant Governor in Council may make regulations designating, as an ecological reserve, any provincial land that sustains or is associated with unique or representative parts of the natural environment, …
3-2	**Ecological reserves not to be transferred, assigned, etc.** … no ecological reserve, and no right, title, interest or estate in an ecological reserve, shall be granted, assigned or otherwise disposed of pursuant to any other Act or law.
3-3	**Entry or activity re ecological reserves** The Lieutenant Governor in Council may make regulations: (a) prescribing the circumstances and conditions under which an ecological reserve may be entered, …; (c) respecting the activities that may be conducted on an ecological reserve;
4-6	**Damage prevention and repair order** (1) An officer may make an order requiring any person to stop any activity on provincial land if the officer believes, … that the person has done or is doing anything to alter provincial land in a manner contrary to this Act, the regulations or the terms and conditions of a disposition.

Table 15. (*continued*) Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Provincial Lands Act, 2016*.

The Provincial Lands Act, 2016	
Section	**Description**
4-7	**Minister's order** (2) … the minister may make an order requiring a person to do all or any of the following: (a) to cease or suspend the doing of an act or cease failing or neglecting to do an act; (b) to comply with this Act, the regulations or the terms and conditions of a disposition; (c) to do or refrain from doing any other thing that the minister considers necessary. 3) … the minister may require a person who is the subject of the order to do all or any of the following: (a) to lessen or prevent further damage to provincial land specified in the order; (b) to remedy the damage to provincial land specified in the order; (c) to restore the provincial land specified in the order to a condition satisfactory to the minister; … (f) to cease or suspend any activity for a period specified in the order or permanently; 4) The minister's order may specify: (a) the method or procedures to be used in carrying out the measures required by the order …; and (b) the period within which any measure required by the order is to be commenced…
7-1	**Offences** (1) No person shall: … (e) abandon property on provincial land; (f) make any alteration to provincial land without a disposition, authorization or a minister's written consent; … (h) enter or conduct an activity on an ecological reserve contrary to this Act, the regulations or a permit issued pursuant to the regulations; … (3) Every person who contravenes any provision of this Act or the regulations is guilty of an offence and liable on summary conviction: (a) for a first offence: (i) in the case of an individual, to a fine of not more than $100,000; and (ii) in the case of a corporation, to a fine of not more than $500,000; and (b) for a second or subsequent offence: (i) in the case of an individual, to a fine of not more than $100,000 for each day or part of a day during which the offence continues; and (ii) in the case of a corporation, to a fine of not more than $500,000 for each day or part of a day during which the offence continues.
9-1	**Regulations** The Lieutenant Governor in Council may make regulations: …(d) prescribing the conditions that a plan respecting the long-term use of provincial land must satisfy;… (n) establishing an ecological reserve or enlarging any ecological reserve;
10-5	**Ecological reserves continued** …, Crown land designated as an ecological reserve in accordance with *The Ecological Reserves Act* on the day before section 1-1 of this Act comes into force is continued as an ecological reserve and: (a) may be dealt with as if it were designated as an ecological reserve pursuant to this Act; and (b) any conditions or restrictions placed on the activities that may be conducted on the ecological reserve are deemed to have been made in accordance with this Act.

Table 16. Examples of specific legislative sections describing protection and conservation measures of species in *The Wildlife Act, 1998*.

The Wildlife Act, 1998	
Section	**Description**
2	**Interpretation** "wild species at risk" means any native wild species that have been designated and listed by the Lieutenant Governor in Council…
9	**Agreements** Subject to the regulations, the minister may enter into an agreement with any person, Indian band or government for any of the following purposes: (a) protecting, managing, conserving, reintroducing or encouraging the propagation of wildlife and wild species and protecting, managing and conserving their habitats; (b) establishing and promoting programs respecting public safety, education about wildlife or wild species or other conservation-oriented programs;…
17	**Amendment, suspension or cancellation of licence** (2) The minister may amend, suspend or cancel a licence or cancel a person's licence and prohibit that person from applying for or obtaining a licence where, in the opinion of the minister: … (b) the person has contravened any provision respecting firearms, hunting or the protection of wildlife or wild species at risk of any other Act, Act of the Parliament of Canada or regulation made pursuant to any other Act or Act of the Parliament of Canada; (c) it is necessary for the protection of wildlife or wild species at risk; or (d) it is in the public interest to do so.
21	**Licence Required** (2) … no person shall conduct surveys, research or other activity to detect or observe any species, wild species or wild species at risk, or assess the habitat of any species, wild species or wild species at risk, for a commercial, scientific, academic, or other purpose prescribed in the regulations without a licence issued by the director.
45	**Protection of Wild Species at Risk Interpretation of Part** "designated species" means any extirpated, endangered or threatened native wild species designated and listed in the regulations…
48	**Minister determines wild species to be at risk** 41) The minister may determine any of the following: (a) whether or not a wild species is to be classified as extirpated, endangered, threatened or vulnerable; (b) whether or not a wild species at risk is to be reclassified or is to be deleted from the list mentioned in section 49; (c) whether or not a wild species is to be added to the list …
49	**Designation and listing of wild species** (1) Where the minister determines that a wild species is to be classified as extirpated, endangered, threatened or vulnerable, the Lieutenant Governor in Council may, by regulation, designate and list the wild species as: (a) extirpated; (b) endangered; (c) threatened; or (d) vulnerable.

Table 16. (*continued*) Examples of specific legislative sections describing protection and conservation measures of species in *The Wildlife Act, 1998*.

The Wildlife Act, 1998	
Section	**Description**
50	**Recovery plans** (1) Subject to the regulations, the minister may prepare and implement a recovery plan to protect each designated species. (2) A recovery plan may identify any of the following: (a) the needs of and threats to any designated species or its habitat; (b) the viable status needed for recovery of any designated species; (c) the options for the recovery of any designated species; (d) the costs and benefits of the options mentioned in clause (c); (e) a course of action or a combination of actions for the recovery of any designated species. (3) A recovery plan may include provisions respecting: (a) one or more designated species; and (b) ecosystem management. (4) The minister may determine the priority with which any recovery plan or any portion of a recovery plan will be implemented. (5) The factors that the minister may take into consideration when determining the priority to be assigned to a recovery plan or any portion of a recovery plan include: (a) whether scientific evidence indicates that the designated species mentioned in the recovery plan is naturally becoming extirpated; (b) whether it is technically or economically feasible to recover the designated species; and (c) the status of the designated species elsewhere. (6) The minister may, to the extent possible, prepare a recovery plan in co-operation with other jurisdictions where the designated species is also found.
51	**Activity prohibited** (1) … no person shall do any of the following: (a) kill, injure, possess, disturb, take, capture, harvest, genetically manipulate or interfere with or attempt to do any of those things to any designated species; (b) export or cause to be exported from Saskatchewan any designated species; (c) traffic in any designated species.
74	**Offences and penalties – Part IV** (1) Any person who contravenes a provision of Part IV or the regulations with respect to wildlife for which no monetary penalty is specified is guilty of an offence and liable on summary conviction to a fine of not more than $100,000.
75	**Offences and penalties – Part V** 75(1) Any person who contravenes any provision of Part V or the regulations with respect to wild species at risk for which no monetary penalty is specified is guilty of an offence and liable on summary conviction: (a) in the case of an individual: (i) for a first offence, to a fine of not more than $5,000; and (ii) for a second or subsequent offence, to a fine of not more than $10,000; (b) in the case of a corporation: (i) for a first offence, to a fine of not more than $20,000; and (ii) for a second or subsequent offence, to a fine of not more than $50,000.

Table 16. (*continued*) Examples of specific legislative sections describing protection and conservation measures of species in *The Wildlife Act, 1998*.

The Wildlife Act, 1998	
Section	**Description**
83	**Regulations** (1) The Lieutenant Governor in Council may make regulations: … (b) constituting any area of the province as an area for protecting, propagating, perpetuating, managing, harvesting, controlling or regulating wildlife or wild species at risk or protecting, controlling or managing habitat; (c) respecting the management, control and protection of any of the areas constituted in accordance with clause (b) and the wildlife, wild species at risk or habitat in those areas, and regulating hunters, trappers and other persons in those areas; (d) respecting the protection, management, regulation and use of any wildlife, wild species at risk or habitat; … (viii) the delivery of any wildlife or wild species at risk taken for the purposes of management or research of wildlife or wild species at risk; (kk) respecting programs of land use as to the preservation, maintenance and restoration of habitat and public access to land; (ll) respecting co-operative programs to maintain the habitat of wildlife or wild species at risk and public access to land; (pp) respecting the designation and listing of wild species at risk, including the establishment, maintenance, amendment and distribution of the list; (qq) respecting programs to prepare status reports with respect to wild species at risk and to prepare and implement recovery plans; (rr) respecting emergency provisions to designate and list wild species at risk and protect their habitats; (ss) respecting the monitoring, assessment and reporting of the status of wild species at risk; …

The management strategies identified in this plan are supported by existing statutes and can be implemented within the context of existing legislation, and new associated regulations/standards and policies (Table 17). In addition, the province continues to investigate possible voids, inconsistencies, and misalignment between existing Saskatchewan policies, regulations and legislation and the range plans as well as engage in and contribute to provincial legislative and regulatory review when legislation relevant to woodland caribou comes open for revision.

Table 17. Provincial statutes supporting management strategies.

Management Strategy	Supporting Legislation/Tools
Avoidance	*The Forest Resources Management Act* *The Forest Resources Management Regulations* *Forest Management Planning Standard (Saskatchewan Environmental Code)*[1] *The Provincial Lands Act, 2016* *The Crown Resource Land Regulations, 2019* *The Parks Act* *The Wildlife Act, 1998*
Reclamation	*The Crown Resource Land Regulations, 2019* *The Environmental Assessment Act* *The Forest Resources Management Act* *Forest Operating Plan Standard (Saskatchewan Environmental Code)* *Forest Regeneration Assessment Standard (Saskatchewan Environmental Code)* *The Forest Resources Management Regulations* *Linear Corridor Standard (Saskatchewan Environmental Code)* (in progress) *The Parks Act* *The Provincial Lands Act, 2016* *Roads on Provincial Forest Lands Standard (Saskatchewan Environmental Code*) (in progress)
Mitigation Offsets	*The Crown Resource Lands Regulations, 2019* *The Environmental Assessment Act* *Linear Corridor Standard (Saskatchewan Environmental Code)* (in progress) *The Provincial Lands Act, 2016* *Roads on Provincial Forest Lands Standard (Saskatchewan Environmental Code)* (in progress)
Forest Harvest Patterns	*The Forest Resources Management Act* *The Forest Resources Management Regulations* *Forest Management Planning Standard (Saskatchewan Environmental Code)* *Forest Operating Plan Standard (Saskatchewan Environmental Code)* *The Parks Act*

[1] The *Forest Management Planning Standard* states that the licensee shall adapt their forest management plan, to meet objectives and targets of the corresponding woodland caribou range plan within the licence area.

Table 17. (*continued*) Provincial statutes supporting management strategies.

Management Strategy	Supporting Legislation/Tools
Access Management	*The All Terrain Vehicles Act* *The Crown Resource Land Regulations, 2019* *The Environmental Assessment Act* *The Forest Resources Management Act* *The Forest Resources Management Regulations* *Linear Corridor Standard (Saskatchewan Environmental Code)* (in progress) *Forest Wetland and Watercourse Crossing Standards (Saskatchewan Environmental Code)* (in progress) *The Operation of All Terrain Vehicles on Crown Land Prohibition Regulations* *The Parks Act* *The Provincial Lands Act, 2016* *Roads on Provincial Forest Lands Standard (Saskatchewan Environmental Code)* (in progress) *The Snowmobile Act* *The Snowmobile Regulation, 1998*

6.3 Steps Being Taken by Jurisdiction

With a sound legislative foundation in place for the protection of critical habitat, Saskatchewan has identified several actions and suggested timelines that would support the effective implementation of the management strategies (Table 19), in order to address considerations identified in Section 5.

Parts of the woodland caribou range in Saskatchewan fall under federal jurisdiction (e.g. the Prince Albert National Park) and will require federal plans which will complement actions being taken by the province to ensure critical habitat is maintained for woodland caribou.

Table 18. Actions proposed to support effective implementation of management strategies.

Action	Intent / Purpose	Timeline	Status
Finalize and implement the *Forest Management Planning Standard*.	Provide standards for forest harvest patterns in forestry sector operations to support long term caribou habitat restoration.	2017	Complete
Identify caribou best management practices to provide insight into the development of standard permitting conditions.	Develop caribou protection measures to restrict activities during periods when caribou are vulnerable to sensory disturbance.	2019	In development
Develop and implement a habitat mitigation framework for Crown lands.	Provide land users with a habitat mitigation framework that defines principles and standards for habitat mitigation offsets.	2020	In development
Undertake access management planning in caribou habitat management areas.	Work with land-use groups to identify non-permanent roads for closure, develop access management plans, and provide educational opportunities for client groups and communities.	2020	Delayed
Enhance existing processes and tools to capture and manage disturbance features.	Improve disturbance tracking, status of legacy features, and cumulative effects assessment required for landscape level planning and assessment of development initiatives.	2020	In development
Finalize and implement the *Linear Corridor Standard and Roads on Provincial Forest Lands Standard* under the *Saskatchewan Environmental Code*.	Define required outcomes for the reclamation and regeneration of linear corridors in the provincial forest, regardless of land user origin.	2023	In development
Amend *The Operation of All Terrain Vehicles on Crown Land Prohibition Regulations.*	Protect regenerating caribou habitat from recreational ATV use to promote the recovery of disturbed habitat.	2023	Not started

6.4 Range Plans as Evidence of Critical Habitat Protection

The legislative tools and regulations identified in this initial range plan for the SK2 West area are in place to ensure critical habitat protection. These legislative tools are also applicable for the eastern and central portions of the Boreal Plain and the Boreal Shield ecozones.

In addition to the numerous regulatory instruments available for the protection of woodland caribou and their habitat, this plan also identifies and outlines principles, activities, programs, and management strategies that work toward the provision of recovery measures that benefit Saskatchewan's woodland caribou. The modelling conducted and illustrated within the plan and the appendices provide insight into the sensitivity associated with various disturbance factors and management strategies. While initial aspatial projections of a 65 per cent undisturbed habitat appear difficult to demonstrate, and will not be met within the first 50 years of the assessment, it is recognized that habitat management strategies such as avoidance, reclamation and restoration, and access management will benefit the landscape on which the woodland caribou depend. It is also recognized that the benefits of some activities on the landscape such as reclamation and restoration cannot be immediately appreciated, but their early and continued implementation are essential to long-term landscape integrity and connectivity of woodland caribou habitat.

7.0 Monitoring

As part of the provincial commitment to an adaptive management approach, Saskatchewan will continue to monitor population trends, habitat condition, protection measures and range plan implementation.

7.1 Population Monitoring

Caribou population monitoring will be done using a variety of methods, which will include genetic sampling using capture/mark/recapture, telemetry, surveys and traditional knowledge to estimate population size, trend and occupancy (Table 19). Work began in January of 2020 to collect fecal DNA in order to identify population status and trend of woodland caribou in the SK2 West. This work is expected to continue in 2021 and 2022 with results becoming available in 2023. Further to this initial and baseline sampling, it is proposed that this reoccur approximately every 10 years thereafter. In this way, it may be feasible to track longer-term population trends across all of the province's caribou administration and conservation units. This work will be conducted to provide baseline information and to evaluate the effectiveness of management strategies. Species response to management actions may be reviewed under the *Species at Risk Act* Section 11 conservation agreement and used to make necessary program refinements to ensure the sustainability of the species.

Additionally, the Report a Woodland Caribou[1] sighting database compiled through the Saskatchewan Conservation Data Centre tracks caribou occurrence information to help understand woodland caribou

[1] - http://www.biodiversity.sk.ca/ReportaCaribou.php

distribution throughout SK1 and SK2. Similarly, caribou sighting occurrences may also be reported on the Saskatchewan Co-operative Wildlife Management survey app. Further related information is also sometimes gathered in the process of providing information for environmental assessments. Further population and distribution monitoring approaches will be considered as they become available.

Table 19. Proposed timings to monitor various caribou population indicators.

Indicator	Timeline
Population size	2023
Population demographic rates and growth (lambda/adult survival and recruitment)	2023
Occupancy	Annual updates

7.2 Habitat Condition Monitoring

Saskatchewan will continue to monitor caribou habitat condition and suitability using key disturbance metrics (e.g. the area of caribou range affected by human caused disturbance, buffers, and wildfire) on a regular basis to assess whether we are meeting the stated landscape goals. Habitat condition will be further informed as new science and tools become available. Metrics (Table 20) will be fully supported by information technology systems and processes, to assist in determining and managing overall habitat condition. In doing so, this monitoring will provide Saskatchewan with a means to assess:

- changes in suitable caribou habitat over time since range plan implementation;
- changes in disturbance amounts, types and levels (severities/intensities) over time since range plan implementation;
- amount of linear and area-based disturbances reclaimed or currently being reclaimed;
- functionally restored habitat (will be done in conjunction with occupancy information from population monitoring surveys); and,
- cumulative impacts of all disturbances at a landscape level.

Table 20. Habitat condition indicator monitoring.

Measure	Indicator	Description
Human caused disturbance	Footprints and buffers.	Area of human-caused direct and indirect disturbance, both permanent and non-permanent.
Reclaimed disturbance areas	Footprint reclaimed (i.e. areas in the early stages of revegetation and on a trajectory to becoming mature forest habitat).	Reclaimed habitat areas, both linear and area based.
Caribou habitat restored	Footprint functionally restored (i.e. areas that have reached a mature forest habitat conditions [> 40 years old]).	Disturbed area restored to functional caribou habitat.
Wildfire disturbance	Wildfire perimeter boundaries.	Area of wildfire disturbance.

7.3 Protection Measures Monitoring

Saskatchewan will monitor protection measures that support protection of critical habitat to verify that protection is effective over time, as outlined below (Table 21).

Table 21. Protection measures indicator monitoring.

Protection Measure	Tool	Indicator
The Forest Resources Management Act	Forest management agreements Forest management plans Operating plans	Forest management plans and operating plans incorporate management strategies identified.
The Forest Resources Management Act	Forest product permits	Permits issued under *The Forest Resources Management Act* incorporate management strategies identified.
The Environmental Assessment Act	Environmental assessment approvals	Approvals issued under *The Environmental Assessment Act* incorporate management strategies identified.
The Provincial Lands Act, 2016	Permits and dispositions	Permits and dispositions related to boreal Crown lands incorporate management strategies identified.
Enterprise Law Enforcement Records Management System	Enforcement and compliance actions reported	Enforcement and compliance actions related to the statutory tools are tracked and reported.

7.4 Research

Saskatchewan is committed to ongoing assessment and integration of research into range planning to support adaptive management and to inform habitat indicators and targets. Examples of themes and topics that may be explored in collaboration with appropriate researchers, communities, and agencies to deliver research priorities, are identified in Table 22.

Table 22. Themes and topics of research to explore to enhance range planning and implementation.

Research Themes or Topics	Application
Define the post-disturbance successional pathways to determine when caribou habitat is functionally restored following wildfire and forest harvesting.	Determine which practices hasten and promote the return of harvest blocks and events to caribou habitat.
Evaluate linear feature restoration success following natural and managed processes.	Understand which reclamation and restoration practices on linear features contribute to effectively restored caribou habitat.
Investigate possible effects and outcomes of climate change on Saskatchewan's boreal forest/woodland caribou habitat.	Update and incorporate climate change vulnerabilities and associated strategies within Saskatchewan woodland caribou range plans.
Explore and develop opportunities and mechanisms to establish community-based monitoring programs.	Foster local stewardship of woodland caribou by involving caribou range communities, subsistence users, and the general public in research and population monitoring.
Develop landscape level models of caribou habitat to assist decision makers to plan for caribou habitat connectivity.	Incorporate models and analysis of caribou habitat change in decision support tools to enable the prioritization of landscape areas for different planning responses, and the exploration of habitat connectivity under several management scenarios.
Investigate the risk of caribou infection with chronic wasting disease in areas of range overlap with infected white-tailed deer.	If risk is significant determine if management actions are required.
Investigate Indigenous knowledge around woodland caribou trends, condition, and conservation.	When and wherever provided, review and incorporate Indigenous knowledge into woodland caribou conservation into range plans and their implementations where appropriate.

7.4.1 Research Progress

Since the drafting of the initial range plan for the SK2 Central caribou administration unit, considerable progress has occurred in understanding the species both in Saskatchewan and beyond. Advancements in woodland caribou research contribute to improved decision-making. Examples of previously identified research needs have yielded knowledge that is in the process of being applied in woodland caribou conservation.

7.4.1.1 Climate Change Considerations

Climate change research to date points to an undeniably somber forecast of future conditions and challenges for the conservation of woodland caribou. Cascading, cumulative, and consequential climate change effects such as habitat degradation and loss (Price et al., 2020; Masood et al., 2017), increased predation (Racey, 2005; Barber et al., 2018; Seip, 1992), increased disease (Pickles et al., 2013), and other factors (Witter et al., 2012) make management planning for woodland caribou particularly challenging. Given the global effects of climate change, a concerted national, provincial, and territorial effort is required to devise possible approaches to accommodate and mitigate the direct and indirect effects of climate change on woodland caribou.

7.4.1.2 Woodland Caribou Habitat Connectivity Modelling Considerations

Habitat connectivity at multiple scales is important for woodland caribou as it facilitates movement in response to disturbance, resource needs, and allows gene flow. Habitat fragmentation can create pockets of genetically distant animals, as such, there is a need to allow for woodland caribou movement between large patches of intact habitat (Priadka et al., 2018).

Currently, a pilot project is in progress to identify and prioritize potential movement corridors in SK2 Central through the creation of a fine-scale decision-support tool. This project is incorporating previously developed habitat and disturbance datasets (natural and human-caused), to determine linkages between clusters of high quality habitat using connectivity modelling techniques such as circuit theory. The resulting product will help inform management guidance for resource development and identify priority areas for the restoration of the historical human footprint.

7.4.1.3 Woodland Caribou Use of Post-Wildfire Habitat Considerations

Wildfire is the dominant natural ecological process responsible for forest stand replacement in boreal forests. Fires consume not only the tree species, but also the shrub, herb, and lichen and moss layers although not necessarily entirely. Depending on previous stand composition and structure as well as fire characteristics (e.g. intensity), and other characteristics, the level of 'vegetation' layer removal and subsequent recovery will vary.

In the Boreal Shield ecozone for example, a terrestrial caribou forage lichen (i.e. *Cladonia arbuscula* subsp. *mitis*) has been found to recover as early as 21-30 years following fire in jack pine stands. However, optimal habitat may not occur until 100 years post fire (Skatter et al., 2014). The relatively prompt recovery of this lichen has implications for woodland caribou forage availability and habitat use especially during winter periods when other food sources are not readily available.

In addition to forage lichen availability, woodland caribou habitat resource selection also reflects other conditions. Another example from the Boreal Shield identified that while woodland caribou prefer mature (i.e. > 40-year-old) habitat for both calving and post-calving periods, they will also use residual patches dominated by bogs and fens within burned areas (Skatter et al., 2017). In the Boreal Plain in Alberta, Koncolics et al., (2018) found that even though fire boundaries may contain a large proportion of unburned residual patches, habitat selection results suggested that caribou avoided burned

landscapes, including the residual patches and that this avoidance persisted for up to 30 years after the fire.

Becoming more sophisticated in our understanding of caribou habitat use will enable us to better plan for the future.

7.4.1.4 Landscape Level Population Structure Analysis Considerations

Genetic patterns are commonly described by the pattern of isolation-by-distance (IBD), which indicates naturally decreasing gene flow based on the average dispersal range of individual animals (Strien et al., 2015). In a landscape level population structure analysis of genetic connectivity, Priadka et al., (2018) found that isolation by distance was significant across Saskatchewan, providing additional evidence that spatial proximity among individuals explains some of the genetic variation within clusters. This study also confirmed that discrete population boundaries do not exist. Caribou dispersal is based more on geographic distance than on social behavior that would support demographically and structurally independent groups (Priadka et al., 2018).

Analysis of caribou spatial familial networks by McFarlane et al., (2021) identified tight family groups within SK2 West, which has high levels of both human-caused and fire disturbance. This may be a result of a decreased likelihood of dispersal because of the high levels of fragmentation between local areas.

8.0 Timelines: Reporting and Range Plan Updates

8.1 Reporting on Range Plan Implementation and Monitoring

Saskatchewan will report on a five-year basis on range plan implementation, habitat condition, population trends, and protection measures as identified in Section 7. This reporting will include elements such as monitoring observation information, management strategy effectiveness in improving habitat conditions, and identifying required management approaches necessary or beneficial to the desired outcomes. As more or better monitoring information becomes available for woodland caribou habitat condition or population, it will be included as appropriate in revised range plans or other reporting mechanisms and requirements.

The complexity, diversity, and breadth of application of the management strategies and goals identified in this range plan necessitates a successful integration, collaboration, and cooperation of numerous agencies. Additionally, the regulatory instruments and policies necessary to implement the strategies and goals must be aligned and consistency applied. To ensure the alignment across government, an internal implementation committee has been developed. The goal of the Woodland Caribou Range Plan Implementation Committee is to lead necessary policy and procedure development for consistent and coordinated implementation of actions in the caribou range plans. Specific objectives of this committee include:

- prioritizing policies and procedures that require development or adaptation in order to implement caribou range plan recovery actions;
- ensuring that range plan recovery implementation actions are coordinated across branches;

- providing input to the Woodland Caribou Steering Committee and recovery planning tables on future opportunities or recommendations on actions;
- providing gap analysis and guidance documents that will provide direction until all plans are approved; and
- providing coordination with the planning committee.

8.2 Range Plan Updates

Following the population and habitat condition monitoring identified in this plan, Saskatchewan will be in a position to update range plans in response to the management strategies deployed and the outcomes attained. Management strategies will then be revised within the range plan to improve habitat and population outcomes. Range plans may also be updated following landscape disturbance which significantly exceeds the norm or as new information on important areas for woodland caribou becomes available.

9.0 Range Planning Engagement

The development of the SK2 West range plan has involved the input and insight of numerous organizations and individuals from across the province. Range planning table meetings were held in Meadow Lake, Saskatchewan to gather perspectives, information and direction on how best to manage for woodland caribou and its habitat while allowing for continued economic activity in northern Saskatchewan. The planning table was comprised of First Nations and Métis communities, various sectors of industry and consulting, other levels of government and jurisdictions, non-governmental organizations and others.

9.1 Planning Table Insight and Context

Assessment of proposed management strategies and scenario implications were also obtained from the planning table and other groups. This input was carefully considered when preparing the plan and reflected in the plan as it currently stands. Among the diversity of perspectives received, agreement on all issues was not necessarily obtained, so the following reflect input from the scenario assessments. Some key messages expressed by members of the planning table can be summarized as follows:

- Status quo or modest increases in forest harvesting was recognized to provide employment and economic benefit, but at a cost to woodland caribou and other species habitat.
- A substantial (i.e. 50 per cent) decrease to forest harvesting was identified to have numerous environmental benefits, but little (-2.0 per cent) benefit in terms of woodland caribou habitat disturbance reduction, and would have a significant negative impact on the viability of a forest industry.
- More and smaller harvest blocks was identified to benefit other species, but may have unintended negative effects on woodland caribou.
- The configuration and distribution of forest harvest blocks was identified to be as important as size of blocks.

- More and larger forest harvest blocks were identified to provide numerous economic and environmental benefits, including some to woodland caribou, but also were identified to have a higher likelihood of affecting a single trapper or outfitter due to concentration of activities.
- Reclamation and restoration were identified to hold substantial opportunity to reduce landscape disturbance and improve connectivity, but it was noted that standards need to be developed that address the details associated with site restoration.
- Increasing event sizes was perceived to hold similar characteristics to that of increasing block sizes, but it was noted that larger events require greater planning, logistics, engineering, and may not always be practical.
- While an increase in new (more) gas wells was identified to bring economic benefits, it was also identified to carry substantial risk factors to both humans and the environment.
- While it was indicated that reclamation of linear disturbances would have multiple benefits for multiple species including substantial ones for woodland caribou (Singer et al., 2020), it was also identified that linear restoration can be complex and expensive.

In addition to the scenario evaluations, a multitude of impressions, ideas, and suggestions were provided according to (at least) five themes:

- Engagement – Including enhancing engagement, involving communities in local decisions, listening to elders and traditional knowledge, the recognition of lack of capacity to participate, enhancing communication by using the right medium to communicate, having community education to better understand the issue, and recognition of cultural protocols;
- Forestry – Including its effect on the landscape, presentation of alternative harvest methods, retention and configuration of harvests, and changing rotation periods;
- Roads – Including the longer term effect of roads (vs forestry), lowering the footprint when establishing them and restoring of legacy roads;
- Reclamation – Including methods and standards to restore to the previous condition, responsibility to reclaim, community involvement in determining where activities should occur and taking part in the reclamation itself, and combining reclamation with access management planning; and
- Protected areas – Including the establishment of additional protected areas[1].

As noted, the Saskatchewan Ministry of Environment considered all of the input received and appreciates the candor and sincerity with which it was shared. The province recognizes the value of an inclusive process and looks forward to continued cooperation and collaboration with local and regional groups in the implementation of the range plans.

[1] Currently approximately nine per cent of the province is protected under some form of protection. The goal of representative areas network is to preserve ecologically important land and aquatic areas across the province. The target for the program is to have 12 per cent of the province protected (Government of Saskatchewan, 2019b).

9.2 Supporting and Validating Western Science with Traditional Knowledge

This section of the range plan has been deliberately added to the SK2 West range plan and constitutes a substantial enhancement from the earlier range plan (i.e. the SK2 Central caribou administration unit range plan). It represents not an afterthought, but a concerted deliberation of the numerous factors that must be considered from both traditional knowledge and western science perspectives which are more in alignment than they are in discord.

Various work has been conducted by researchers, land-use planners, non-governmental organizations, and others across northern Saskatchewan to identify and better appreciate aspects of traditional and local ecological knowledge. Some work has been *ad hoc* and some has been part of a larger directed study. One such important piece of work previously cited is the report: *Characterizing, Mapping and Modelling Aboriginal Traditional Knowledge about Woodland Caribou in Saskatchewan in Support of Range Planning* (Mamun and Brook, 2017). In addition to identifying information on population distribution patterns and habitat use of woodland caribou within their historic and contemporary ranges in northern Saskatchewan, it has enabled individual communities to shape and direct attention to a better understanding of land use by woodland caribou and people. This work also validates the habitat potential mapping that has been conducted in the preparation of this plan (Figure 8) and has contributed to the development of the caribou habitat management areas (Figure 18).

Other important work, both complete and ongoing, that continues to support woodland caribou range planning includes efforts of the Prince Albert Model Forest (PAMF), the Prince Albert Grand Council, and others. Insights obtained from documentation of shared traditional and local knowledge through past and ongoing Prince Albert Model Forest projects continue to enhance understanding and appreciation of woodland caribou, its habitat, and management options. Among some of the documented observations included a ubiquitous concern for declining numbers that were often attributed to predation, notably from wolves but also from black bears, humans, the effect of forest harvesting and associated roads, mineral exploration, and general human activity (Carriere, 2010; PAMF, 2019). Other factors identified include a change in climate conditions and the associated influence on wildfire frequency and size that affect availability of habitat (PAMF, 2019; Schmid, n.d.).

The ministry's own structured and formal range planning process[1] in the SK2 West has been valuable in acknowledging First Nations and Métis local Traditional and local knowledge about species sightings, condition, population trend, and other factors. Further and concurrent to these efforts, the Buffalo River Dene Nation have been working with knowledge holders to develop an Indigenous knowledge-based woodland caribou range plan and has allowed their elders and knowledge holders to share knowledge of the cultural importance of caribou and important caribou habitat, their understanding of the causes of woodland caribou decline, and their recommendations to reverse the decline.

In addition to observations of condition and causes, was the identification of management actions and options that demonstrate respect for the species and the environment. Examples of actions

[1] Meeting dates: May 25, 2016; September 21, 2016; July 12, 2018; May 7, 2019; December 11, 2019; Public review period December 10, 2019 – February 8, 2020; Final date for SK2 West planning table member draft plan review: February 28, 2020.

documented to respect and help maintain woodland caribou include the identification of specific important habitat areas, the maintenance of muskeg areas (e.g. for food, shelter, and calving), the avoidance of invasive monitoring techniques (e.g. radio collaring), and the selective harvest of only bulls for subsistence or voluntarily hunting avoidance. Further actions identified to enhance species management included community education, supporting youth awareness of traditional knowledge around woodland caribou and developing enhanced stewardship opportunities (Prince Albert Model Forest, 2019).

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Glossary

The following terms are defined in accordance with their use in this document.

Biophysical attributes: Habitat characteristics required by boreal caribou to carry out life processes (see Appendix H in the recovery strategy) (Environment Canada, 2012).

Caribou conservation unit: A type of caribou range with low certainty in the delineated boundary because of a lack of information (Environment Canada, 2012).

Caribou range: A geographic area occupied by a group of boreal woodland caribou that are subject to similar factors affecting their demography and used to satisfy their life history processes (e.g., calving, rutting and wintering) (Environment Canada, 2012).

Critical habitat: The habitat that is necessary for the survival or recovery of a wildlife species that is listed in the federal *Species at Risk Act* and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species.

Disturbance (habitat): Habitat that has been affected either directly or indirectly by human or natural disturbances. Human activities such as forest harvesting or agriculture, or natural disturbances such as wildfire, either temporarily or permanently remove or alter habitat, resulting in a direct habitat disturbance. Indirect or functional habitat disturbance results when animals use habitats differently or they alter their behaviour adjacent to the direct disturbance. These indirect effects are measured by a zone of influence around the direct disturbance.

Disturbed habitat: Habitat showing: i) anthropogenic disturbance visible on Landsat satellite imagery at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer) (Environment Canada, 2012).

Fragmentation (habitat): The process by which habitats are increasingly divided into smaller units. Habitat fragmentation results in increased isolation of habitat patches, reduced habitat areas, and smaller habitat patches with reduced interior area relative to edge.

Harvest volume schedule: The maximum sustainable timber volume that can be harvested each year, as determined or approved by the minister, and includes a timber depletion schedule (Government of Saskatchewan, 2020).

Human development footprint: The area directly disturbed by human development and land use activities (e.g. roads, gravel pits, residential lots, agricultural fields, etc.). The human development footprint results in the physical loss or alteration of wildlife habitat.

Human zone of influence: The area around a human development footprint that is indirectly influenced by the human activities. Sensory disturbance, increased mortality risk or similar factors may influence the use of areas by wildlife adjacent to human developments. Wildlife may avoid or use areas less intensively within the zone of influence, resulting in indirect habitat loss and reduced habitat effectiveness.

Matrix: All undisturbed land (young, immature, mature, old and very old forest together with wetlands, grasslands, water bodies, and other non-forested land) that is within the boundaries of an event and is usually contiguous with the surrounding undisturbed forests, wetlands, or openings (Government of Saskatchewan, 2017a).

Non-permanent disturbance: Existing features found within a range, such as seismic lines and commercial foresting areas that do not currently possess, but have the potential to possess the biophysical attributes of critical habitat for boreal caribou.

Permanent alterations: Existing features found within a range, such as industrial and urban developments, permanent infrastructure, and graded or paved roads that do not currently possess, nor have the potential to possess, the biophysical attributes of critical habitat for boreal caribou (Environment Canada, 2012).

Range assessment: A process that examines habitat conditions and population trends for a wildlife species and identifies key risk factors affecting the viability of the species.

Range plan: A document that demonstrates how the habitat condition within a given range will be managed over time and space to ensure that critical habitat for boreal caribou is protected from destruction with the aim of ensuring that each local population will either continue to be self-sustaining or become self-sustaining over time (Environment Canada, 2012).

Residual effects: Residual effects are the environmental effects predicted to remain after all practical avoidance, minimization, and mitigation options have been implemented. Residual effects are generally described by their direction (i.e. nature of effect), magnitude, geographic extent, duration/frequency, reversibility, and other factors. (Government of Saskatchewan, 2014).

Threatened (population status): Under the federal *Species at Risk Act*, a status of threatened means "a wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction".

Undisturbed habitat: Habitat not showing any: i) anthropogenic disturbance visible on Landsat satellite imagery at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction (without buffer). Disturbance within the 500 m buffer would result in a reduction of the undisturbed habitat.[1] (Environment Canada, 2012)

[1] This specific definition of disturbance was used in Environment Canada's 2011 scientific assessment to develop the disturbance-recruitment relationship upon which the categories of risk for the disturbance thresholds were derived.