Range Plan for Woodland Caribou in Saskatchewan

Boreal Plain Ecozone – SK2 Central 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). They were also listed as threatened under *The Species at Risk Act* (SARA) when it was proclaimed in 2003. As required under SARA, Canada developed a Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada (the recovery strategy), which was released in October 2012. The document identifies 65 per cent undisturbed habitat in a 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 much of the Saskatchewan woodland caribou population is at risk from landscape-level disturbance.

Saskatchewan, 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 and the protection of woodland caribou habitat. They provide the federal government with a clear understanding of~~,~~ the measures, tools and targets for woodland caribou habitat management being deployed in the province.

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. This approach recognizes the variation of fire regimes, ecological conditions, land-use activity and human-caused disturbance across Saskatchewan's boreal forest.

Four fundamental principles guide the development of range plans:

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

The range planning approach is focused on inclusiveness and participation to ensure Indigenous and Métis communities, along with other stakeholders, have the opportunity to engage and be part of the planning process.

With a staged approach to range planning, efforts to date have focused on the central portion of the Boreal Plain (SK2 Central), forming the foundation for the planning process. This provides a solid approach to landscape-level planning and management strategies that can be deployed in other parts of the Boreal Plain (SK2 West, SK2 East) and the Boreal Shield (SK1), with the ability to refine or supplement management strategies as required.

As part of the SK2 Central range planning process, Saskatchewan has identified five primary management strategies that can be taken to reduce landscape disturbance. These strategies include:

- 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 development of new associated regulations and policies.

Specific areas (i.e. caribou habitat management 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. The management strategies 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 Central area, landscape management goals are as follows:

- Reduce the current level of human-caused disturbance;
- Maintain ≥ 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 different areas of SK2 Central and adjacent caribou administration units and the SK1 caribou conservation unit;
- Use forest harvesting to create natural forest patterns that more closely resemble the range of variation of natural disturbances, both in distribution and scale; and
- Decrease the total amount of non-permanent legacy roads.

According to a 50-year scenario model, the amount of human-caused disturbance in the SK2 Central area could increase unless further actions and strategies are identified to keep disturbance levels in check. Annual 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 Central population status.

The model also suggests:

- 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 maintain connectivity within the SK2 Central area and its adjacent areas;
- Natural forest harvest pattern 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 forest structure that more closely emulate natural disturbance patterns; and
- 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 similar levels of land use activity as currently observed within the administration units.

Saskatchewan has several legislative tools and processes to support 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.

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 towards the provision of recovery measures that benefit Saskatchewan's woodland caribou. The modelling conducted and illustrated within the plan and 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, 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.

This initial range plan forms the basis for future planning by ensuring that foundational legislation and regulations are in place for critical habitat protection. Timelines for completion of the draft range plans are anticipated to be as follows:

- SK2 Boreal Plain West – October 2019
- SK2 Boreal Plain East – March 2020
- SK1 Boreal Shield – October 2020

Through research, assessment and work with key partners, 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. 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 (Rangifer tarandus caribou), Boreal Population, in Canada* (the recovery strategy) which was released in October 2012 (Environment Canada, 2012). The recovery strategy identifies 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 much of the Saskatchewan 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.

Saskatchewan, as a 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 other stakeholders to develop a provincial *Conservation Strategy for Boreal Woodland Caribou in Saskatchewan* (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 how 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 the *Conservation Strategy for Boreal Woodland Caribou in Saskatchewan* (2014).

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 the management of woodland caribou habitat being deployed that effectively protect woodland caribou habitat. Additionally, as the 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 *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 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 the 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 the 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 provided 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 foundational 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.

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. 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[1].

[1] At this time, 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). Directed studies are underway that may identify biologically meaningful sub-divisions in the future (Priadka et al., 2018).

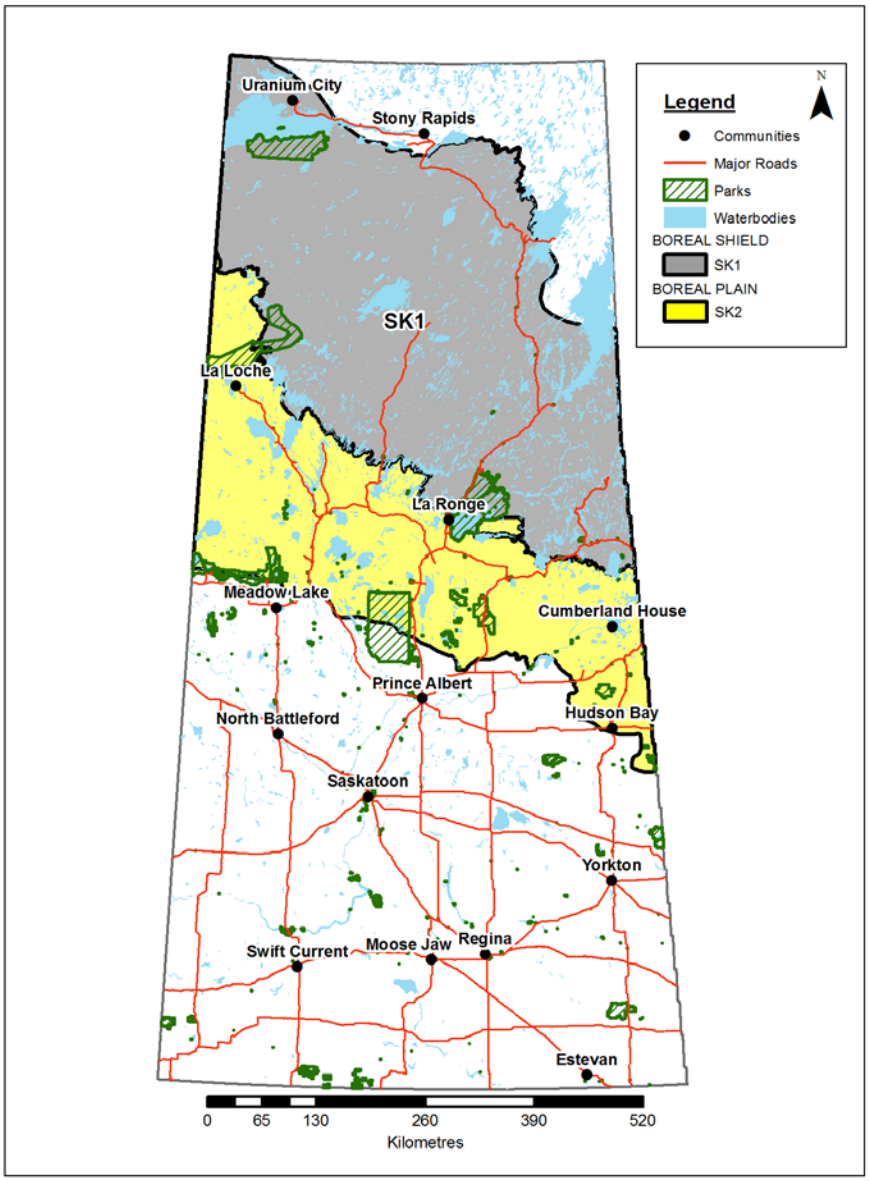

Figure 1. The caribou conservation units of Saskatchewan[2].

Caribou Administration 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).

[2] 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

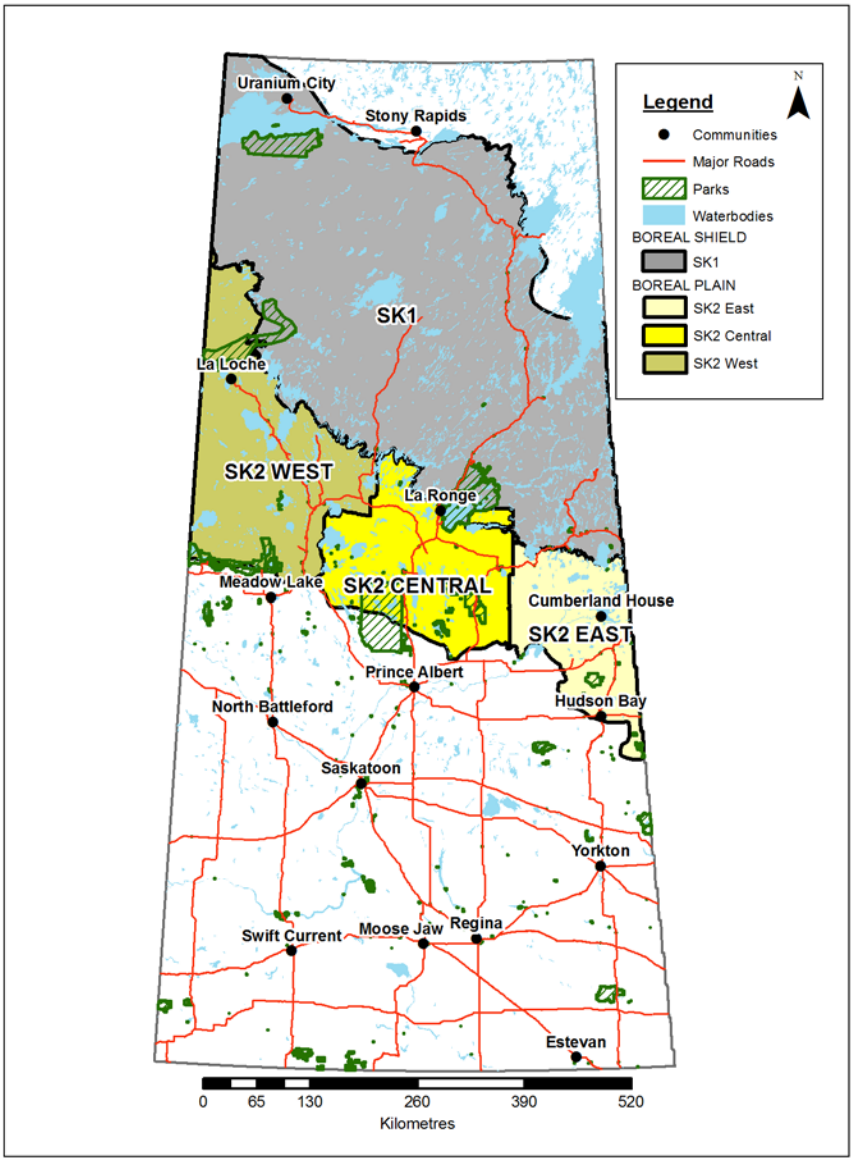

Figure 2. The caribou administration units associated with the SK2 caribou conservation unit[3].

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.

[3] 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

- Contain at least one operational forest management area.
- 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 administration 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 and best current science, as well as stakeholder input.

Saskatchewan has implemented a staged approach to range planning, with efforts to date focused on SK2 Central, forming the foundation for the planning process. This also provides a solid approach to landscape-level planning and management strategies that may well be deployed in SK2 West, 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, Métis, 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, tribal councils, Métis regions, Métis locals and Indigenous communities that may have interests in the particular caribou administration unit.
- Establishing a discussion table consisting of representatives from Indigenous communities, Métis locals, industry, non-governmental organizations, and municipalities, with additional smaller tables to ensure effective and meaningful dialogue during the planning process and provide an opportunity to discuss specific interests of particular groups, reconvening into the single discussion table as planning purposes require.
- Engaging and consulting with those participants in the form of 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.
- Preparing a cohesive plan that has been developed with the 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.

The anticipated timeline for the completion of range plans associated with the caribou administration units is outlined in Table 1.

Table 1. Anticipated completion dates of draft range plans.

Unit	Target Completion
SK2 Central	October 2017
SK2 West	October 2019
SK2 East	March 2020
SK1	October 2020

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 2). 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.

Monitoring of caribou productivity in Saskatchewan in the 1990s has shown that their reproductive success within the SK2 Central area was barely sufficient to maintain their numbers (Rettie and Messier, 1998). Subsequent work by Parks Canada and the Saskatchewan Ministry of Environment (Arseneault and Manseau, 2010) in a similar area has shown reduced movement of female caribou within the various groups studied, little or no mixing of groups and reduced adult survival. Results from these studies point toward a population decline, which is in line with the reduced population status (based on the fact that caribou have rarely been seen in the last 10-20 years by study participants) identified by traditional knowledge (Mamun and Brook, 2017).

The very high fire disturbance, in combination with low human-caused disturbance in northern Saskatchewan's Boreal Shield range (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 is reported as "unknown", and a schedule of studies was identified to better understand population trend and critical habitat in the SK1 area.

Research is currently underway to assess the population size, trend and distribution of woodland caribou in both the Boreal Plain and Boreal Shield ecozones.

Initial results from research in the Boreal Shield suggested a stable population (McLoughlin et al., 2016) and these results were submitted to Environment and Climate Change Canada in 2016. This research will conclude with a final report in 2019.

Table 2. Boreal caribou local population condition and habitat condition information (Environment and Climate Change Canada, 2017).

Range Identification	Range Name	Range Type	Population Size Estimate	Population Trend	Disturbed Habitat (%)			Risk Assessment
					Fire (1)	Anthropogenic (2)	Total (3)	
SK1	Boreal Shield	Conservation unit	Not available	Not available	58	3	60	Stable[4]
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 (area) disturbances.
3 For total disturbance, anthropogenic (human-caused) and fire disturbances that overlap are counted once in the total.

The province initiated Boreal Plain (SK2) caribou population size and trend assessments in 2017. This collaborative research with the University of Manitoba, Parks Canada and Trent University is built upon previous work from 2005-16 to delineate the landscape-level population structure. Results from this work demonstrate weak population structure although the predominance of isolation by distance indicates it is largely a continuous population of woodland caribou within the province and is connected to the caribou populations in Manitoba and Alberta (Priadka et al., 2018). Ongoing research will provide a complete assessment of caribou population size and trends.

[4] McLoughlin et al., 2016. Initial (2016) indications suggested a stable population. The final report is due in 2019.

4.0 Current Habitat Condition and Important Areas for Boreal Caribou

The three caribou administration units, 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 Central and will be updated as the subsequent planning areas are completed.

4.1 Overview of SK2 Central

The SK2 Central is within the Mid-Boreal Upland and Boreal Transition ecoregions; it is the characteristic landscape of Saskatchewan's central Boreal Plain ecozone with low rolling forested hills and plains interspersed by many wetlands (e.g., fens, bogs, marshes of different classes) and lakes.

Approximately 55 per cent of SK2 Central is considered to be the productive upland timber harvest land base, with the remaining areas in wetland (32 per cent) and open water (12 per cent; Table 3).

The reason SK2 Central is considered an important area for woodland caribou in Saskatchewan is it provides the physical connection between caribou in the eastern and western portions of SK2 and to SK1. SK2 Central 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 Central has the highest level of human-caused disturbance and has an intermediate fire cycle, which is lower than SK2 West, but higher than SK2 East.

Table 3. Summary of the SK2 Central land base.

Land Class	Area (km²)	Area (%)
Upland *	20,051	55.6
Wetland	11,624	32.2
Water	4,377	12.1
Total	36,052	100.0

** The Saskatchewan forest inventory identifies that the timber harvest land base covers 17,122 km² or 47 per cent of the SK2 Central area. The timber harvest land base accounts for the majority of the upland portion of SK2 Central.*

The SK2 Central area has a history of industrial forest management activities, resulting in an extensive network of permanent and non-permanent roads and trails, which make up a large part of the human-caused disturbance. Forestry is the primary land use sector, and the SK2 Central area is expected to receive slightly increasing levels of forest management activities in the future. There is a substantial overlap between the SK2 Central and the Prince Albert forest management agreement area as illustrated in Figure 3. A considerable portion of the southwest part of the forest management

agreement area, including some of the most productive forests, is outside of the SK2 Central boundary (Figure 3). The SK2 Central area is a combination of provincial, federal and municipal land categories as shown in Table 4.

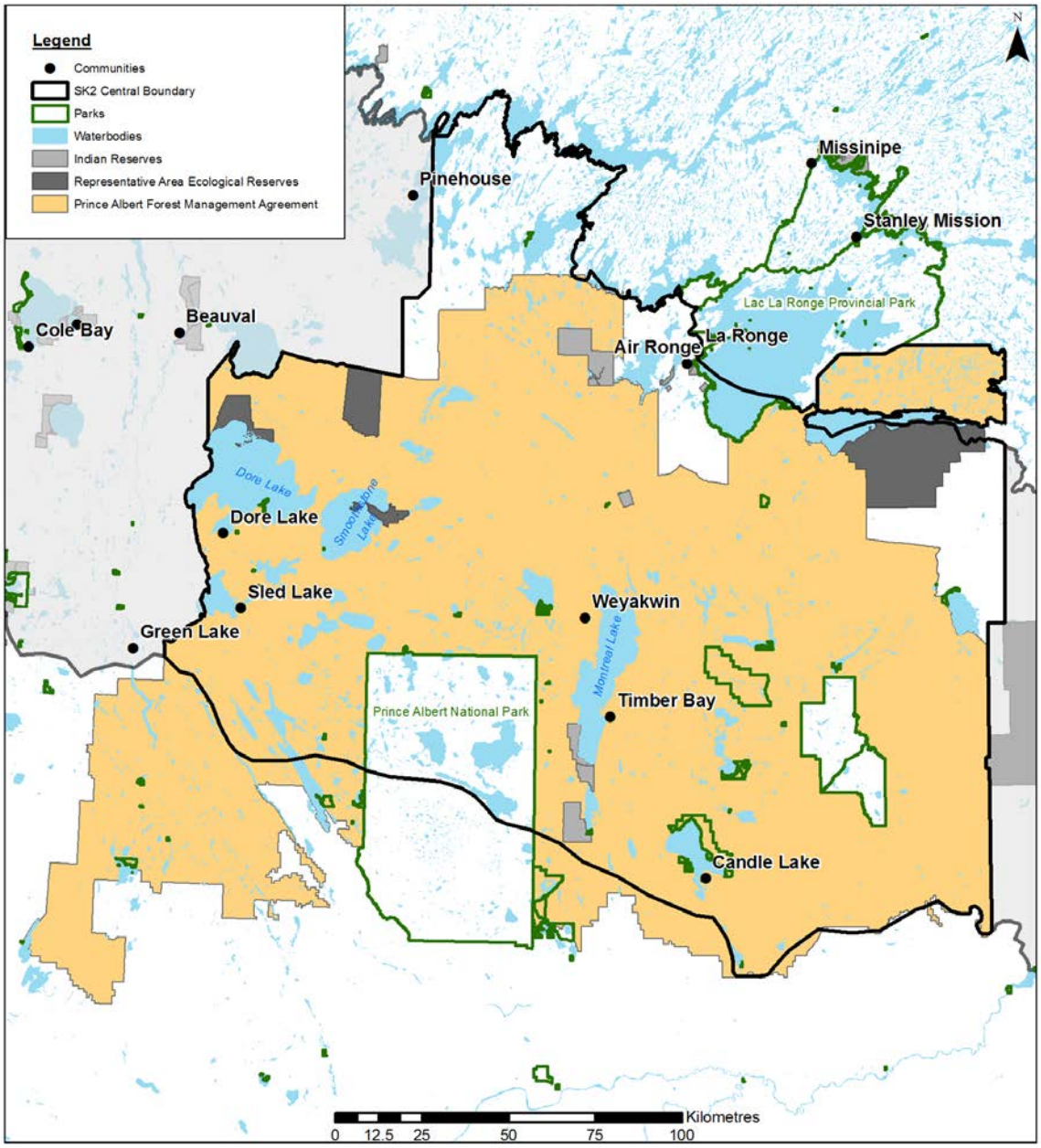

Figure 3. Overlap of the SK2 Central area and the Prince Albert forest management agreement area.

Table 4. Summary of SK2 Central land categories.

Land Category	Agency/Type	Area (km^2)	Area (%)
Provincial Crown Lands	Ministry of Environment Crown Lands	31,516	87.4
	Ministry of Agriculture Crown Lands	21	0.1
	Sub-Total	**31,537**	**87.5**
Provincial Parks and Conservation Areas	Provincial and Regional Parks	1,128	3.1
	Representative Area Ecological Reserves	950	2.6
	Sub-Total	**2,079**	**5.8**
Municipal Areas	Towns/Villages/Resort Areas/Other Private Lands *	169	0.5
	Sub-Total	**169**	**0.5**
Federal Lands	Prince Albert National Park	1,963	5.4
	Indian Reserves	304	0.8
	Sub-Total	**2,267**	**6.2**
	Total	**36,052**	**100.0**

** Other private lands represent a small proportion of SK2 Central.*

4.2 SK2 Central 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, and may 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 these human-caused changes occur over a large scale and encroach the southern-most provincial range boundary, they can lead to caribou range retraction as evidenced over the last century (Trottier, 1988; Arsenault, 2003). 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, cut lines and other linear developments discourage or impede 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 populations are likely to become genetically homogeneous and lack the diversity necessary for long-term survival, eventually leading to local extinctions.

4.2.2 Types of Disturbance

The federal recovery strategy identifies 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 (Environment Canada, 2012). Disturbance levels reported in this range plan are also calculated in this manner.

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, 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 resource roads. Non-permanent disturbances include forest harvest blocks and short-term access roads. Wildfire was also considered as a disturbance in the Environment and Climate Change Canada assessment and will contribute to disturbance mapping in the Saskatchewan disturbance assessment.

4.2.3 SK2 Central Disturbance Levels

In the 2015 Environment and Climate Change Canada disturbance assessment, the disturbance level of SK2 Central was assessed at 41.9 per cent (Environment Canada, 2015). Using up-to-date and quality controlled provincial datasets, Saskatchewan Ministry of Environment has updated the disturbance mapping in SK2 Central, and this mapping is consistent with Environment and Climate Change Canada human disturbance mapping (Appendix A: SK2 Central Disturbance Mapping). The Saskatchewan Ministry of Environment estimates that the 2015 disturbance level in SK2 Central is 42.8 per cent. Currently, approximately 28 per cent of SK2 Central is affected by human-caused disturbance and the associated 500 m buffer (Table 5). Forest harvest blocks, related access, in-block roads and the associated buffer account for greater than 80 per cent of the total human-caused disturbance in SK2 Central. Forest harvesting and transportation has resulted in a dispersed pattern of human-caused disturbance across SK2 Central and created a landscape with relatively small undisturbed patches existing within the matrix of roads and forest harvest blocks.

Table 5. Comparison of disturbance levels in the SK2 Central Administration Unit as assessed by Environment Canada (2015) and Saskatchewan Ministry of Environment (2015).

	Environment Canada 2015[5] Assessment		Saskatchewan Ministry of Environment 2015 Assessment	
	Area (km^2)	Area (%)	Area (km^2)	Area (%)
Human-caused Disturbance*				
Permanent	-	-	2,755	7.6
Non-Permanent	-	-	7,332	20.4
Total	8,946	24.8	10,086	28.0
Wildfire**				
Total	6,173	17.1	5,356	14.9
Disturbance Summary				
Total Disturbed	15,442	41.9	15,442	42.8
Total Undisturbed	20,934	58.1	20,610	57.2

* Human-caused disturbance includes 500-metre buffer.

** Environment Canada (2015) and the Saskatchewan assessment of wildfire disturbance is calculated based on the 1975 to 2015 period of fire record. Human-caused and wildfire disturbance is calculated based on the non-overlapping area of each, with human-caused disturbance taking priority over wildfire disturbance. Also, all waterbodies (as identified in the CanVec 1:50,000 dataset) were removed from the wildfire polygons and do not contribute to the total wildfire disturbance numbers.

There is large variation in the location and extent of area burned across the Boreal Plain, reflecting differences in fire regimes between the western and eastern areas. The total area burned from 1975 to 2015 is 8,502 km^2 or 23.6 per cent of the SK2 Central area (Figure 4). Approximately 15 per cent of the wildfire has occurred outside of human-caused disturbance. Under a natural fire regime, the SK2 Central area could have a higher proportion of area burned. Fire suppression efforts have reduced the overall area burned, but weather conditions in some years still result in large areas burned (Figure 5).

[5] 2015 represents the year of satellite imagery used.

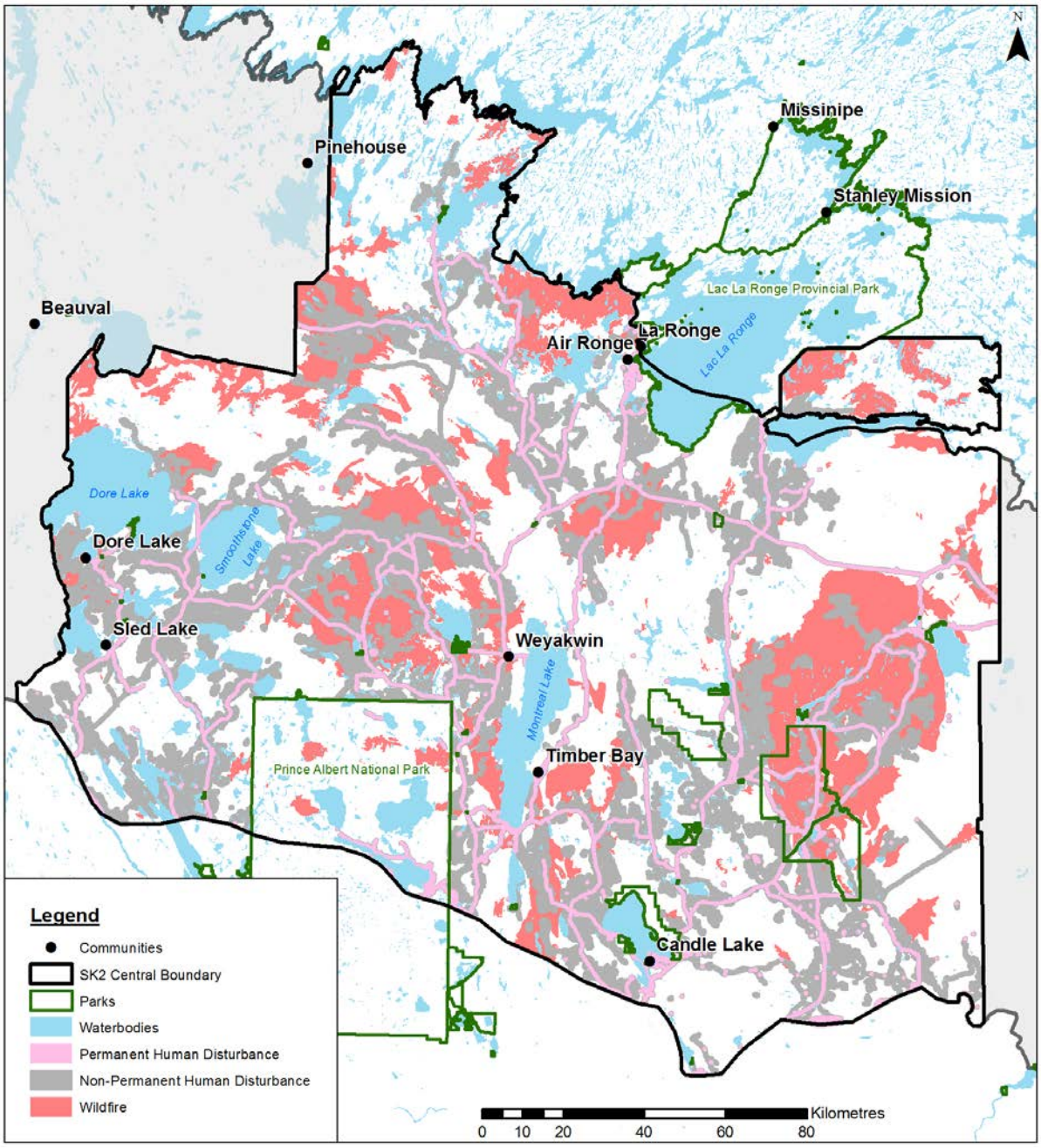

Figure 4. The extent of human-caused disturbance and wildfire in the SK2 Central area based on the 2015 Saskatchewan Ministry of Environment updated disturbance mapping assessment.

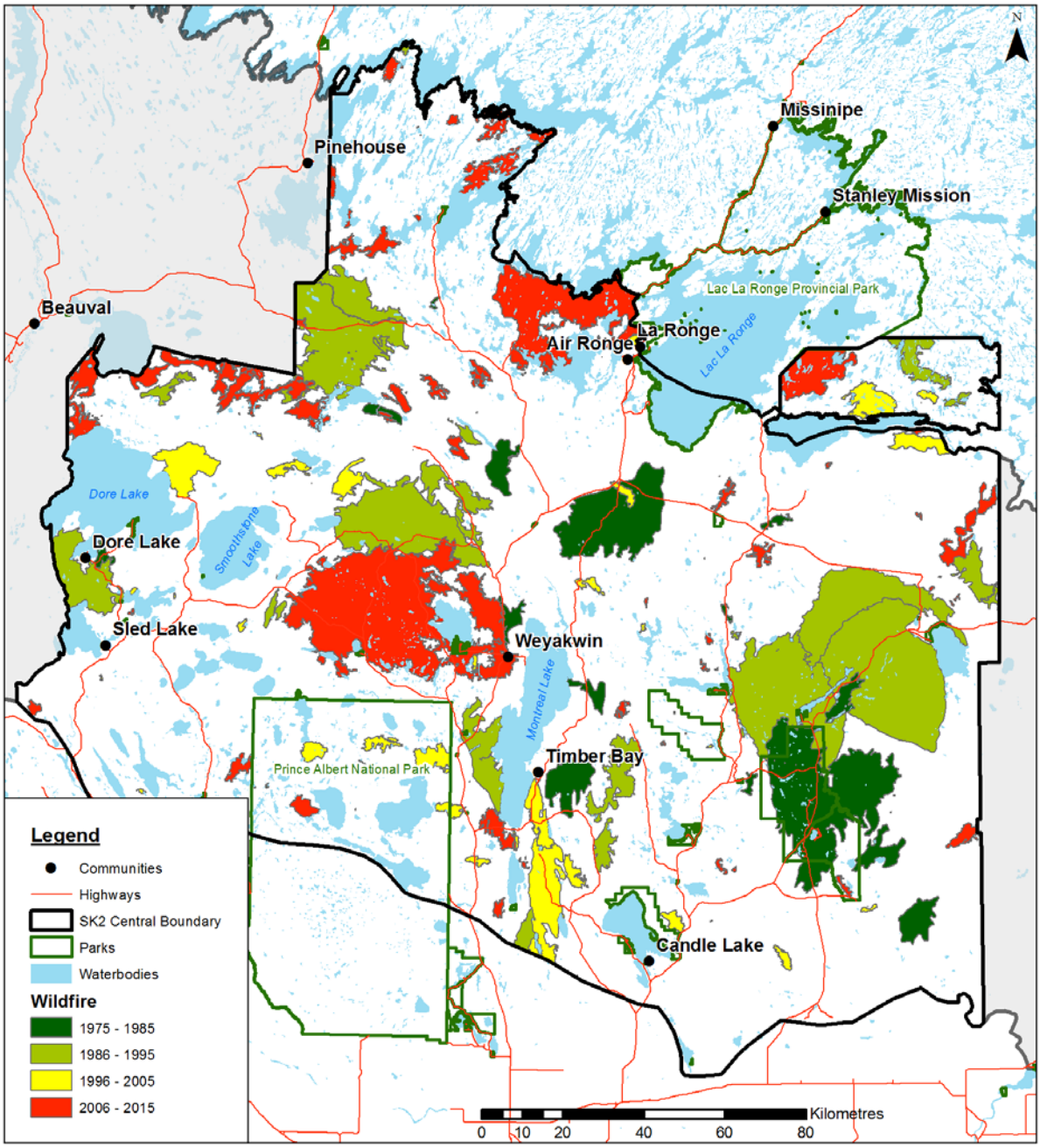

Figure 5. Wildfire history from 1975 to 2015 in the SK2 Central area[6].

[6] Different colours represent when fires occurred grouped by decade.

4.3 Important Areas for Caribou

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

- ranking ecosites and mapping habitat potential; and
- considering the current suitability of potential habitats.

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 Central 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. The ecosite rankings were completed for the Boreal Shield and Taiga Shield (SK1), and the Boreal Plain (SK2) by a panel of biologists with expertise on woodland caribou habitat use in Saskatchewan (see Appendix C). Forest ecosites were mapped with the assigned habitat potential value (Figure 6). This approach to defining habitat potential provides similar results to outcomes of habitat modelling based on Indigenous traditional knowledge done by Mamun and Brook (2017) as seen in Figure 7. Both methods correspond in defining a landscape with the potential to provide contiguous, high-quality caribou habitat.

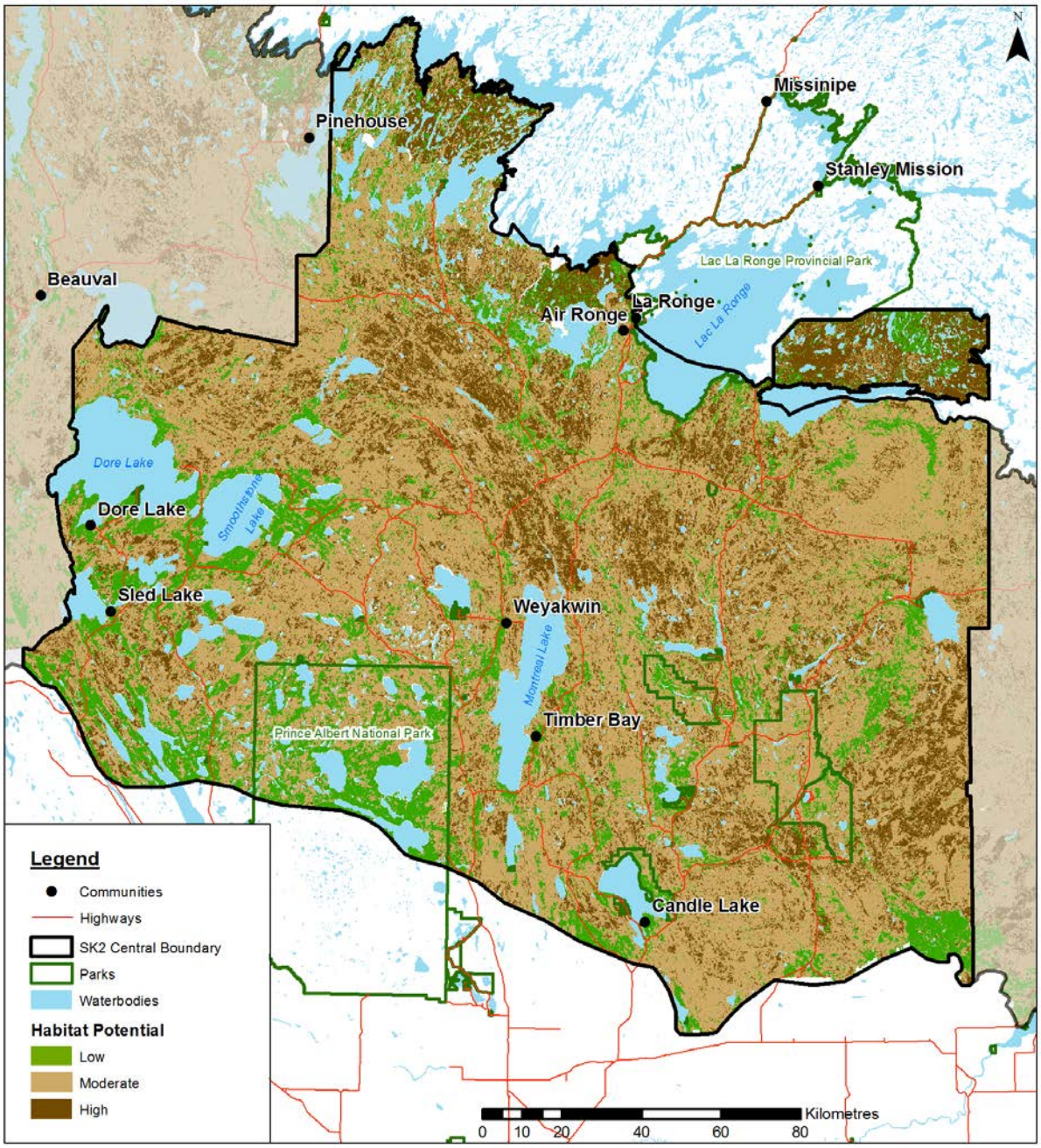

Figure 6. Caribou habitat potential in SK2 Central[7].

Habitat potential refers to the ability or capability of a habitat type to support a wildlife species for its various life requirements. Potential does not consider the current state of the habitat (e.g., recently

[7] The caribou habitat potential spatial layer is available on the Hunting, Angling and Biodiversity Information (HABISask) web application (https://gisappl.saskatchewan.ca/html5ext/?viewer=habisask) in raster format for viewing via sign-in for detailed users (definition of a detailed user is provided here: http://www.biodiversity.sk.ca/HABISask.htm).

burned or harvested), 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 features, increased risk of mortality and other factors. Current suitability shows a fragmented landscape of suitable habitat patches, somewhat isolated from others (Figure 8). In a retrospective study of part of the SK2 Central landscape between 1966 and 2006, Arlt and Manseau (2011) showed higher levels of mature, suitable habitat in 2006, but it was less connected than in 1966. This change in landscape pattern may result in animals using sub-optimal patches of habitat if that is all that remains available. 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 future.

Recent work from the Boreal Shield 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 where human-caused disturbance levels are much higher and often overlap fire boundaries.

Additional studies will also increase understanding of how the use of residuals may affect caribou survival and recruitment.

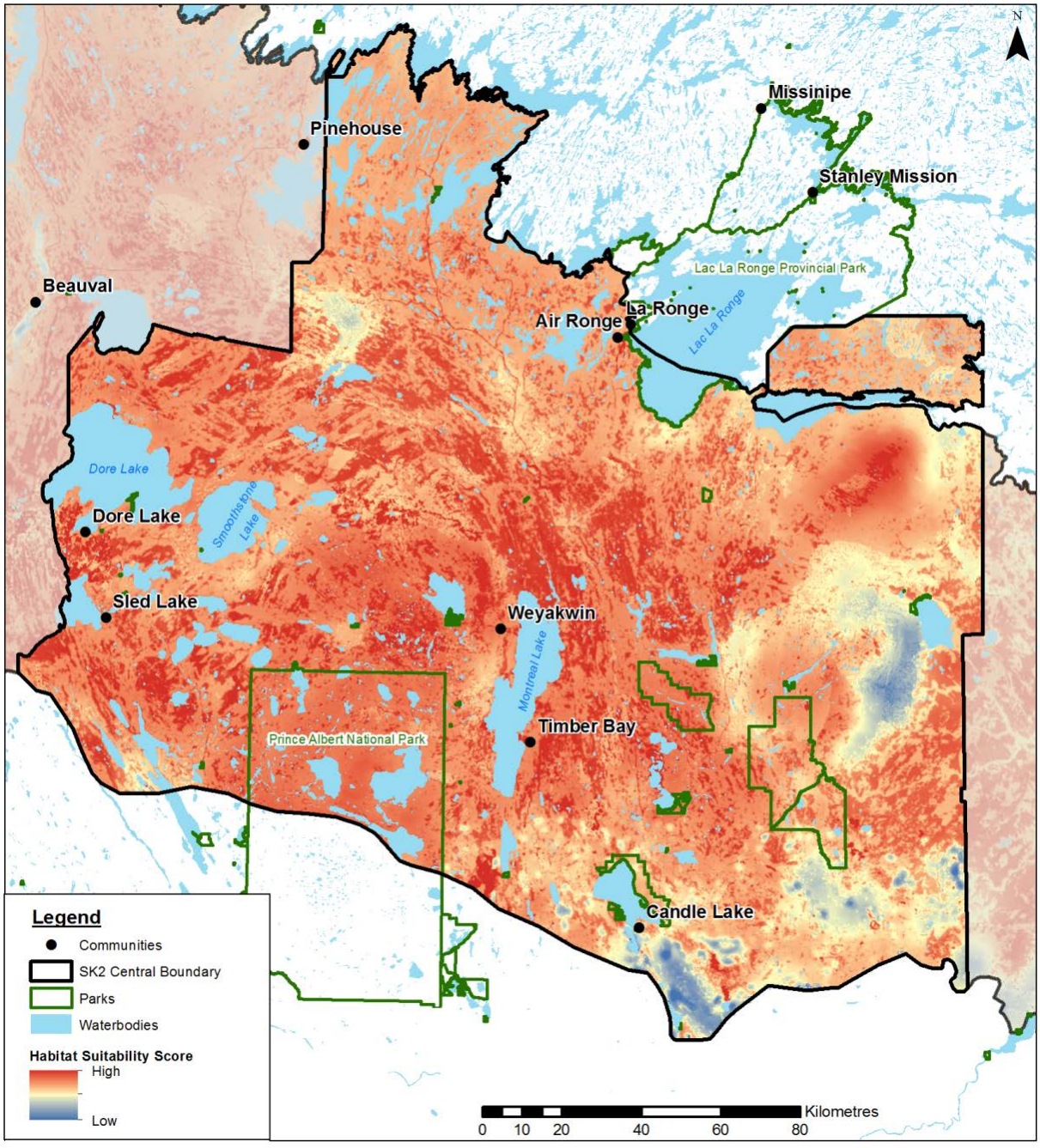

Figure 7. Suitability score of caribou habitat for the SK2 Central area based on Indigenous traditional knowledge (Mamun and Brook, 2017).

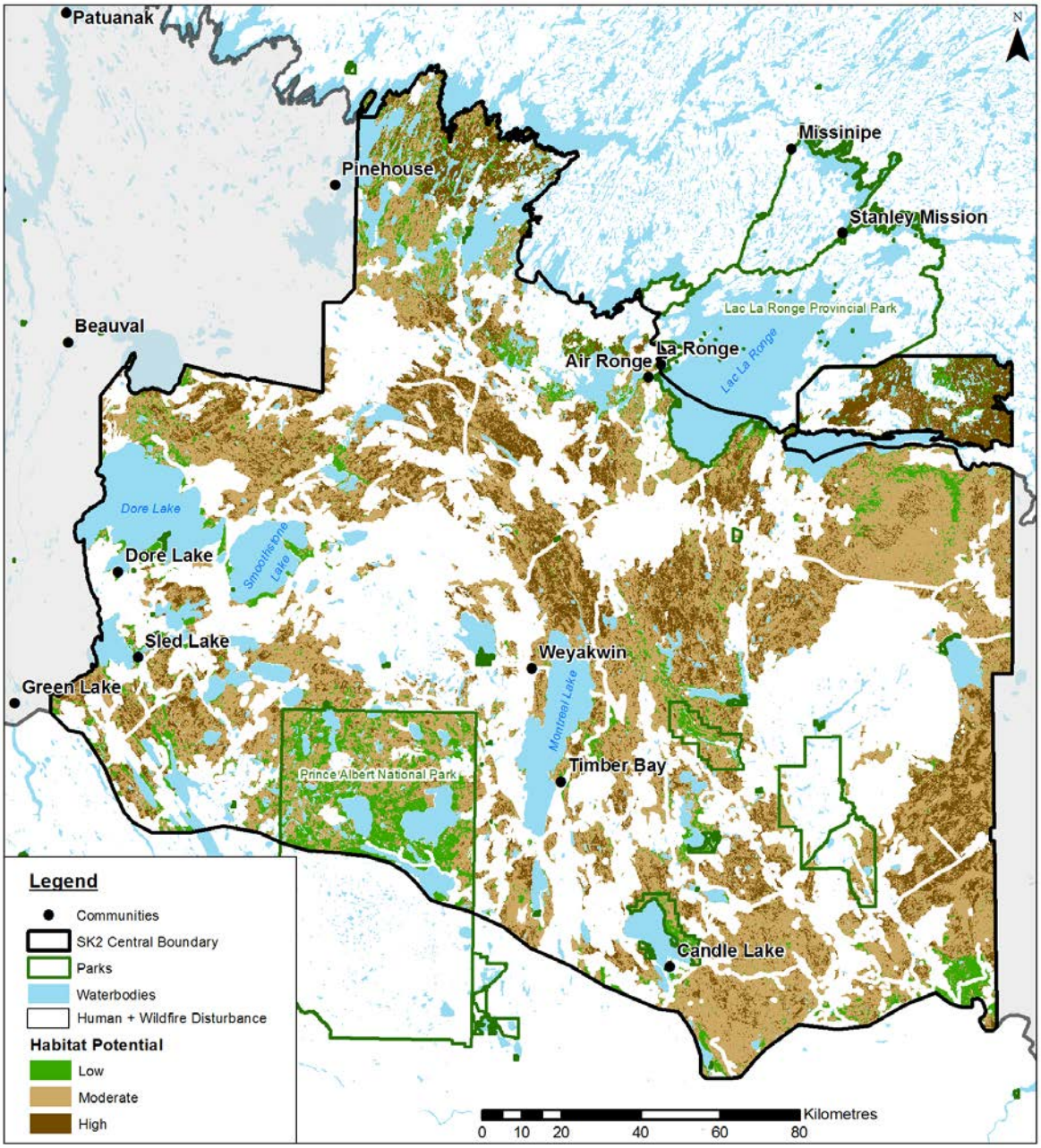

Figure 8. The current distribution of undisturbed habitat and its habitat potential score across SK2 Central.

4.3.1 Disturbance Levels by Habitat Potential Class

Over half of SK2 Central falls in the moderate habitat potential class, while less than 20 per cent of the area is made up of each of the low and high classes (Table 6).

Table 6. Area summary of caribou habitat potential classes in the SK2 Central area.

Habitat Potential Class	Area (km²)	Area (%)
Low	5,643	15.7
Moderate	19,546	54.2
High	6,389	17.7
Total *	31,578	87.6

* The total SK2 Central area covers 36,052 km^2. The remaining SK2 Central area is composed of unknown/unclassified land cover (97 km^2 or 0.3 per cent) and water (4,376 km^2 or 12.1 per cent).

Figure 9 shows the overlay of the human-caused disturbance with habitat potential. A high proportion of the low potential category has experienced human-caused disturbance (Figure 10). This is not surprising since this represents upland hardwood and mixedwood forests, which are the focus of a large proportion of forest harvesting and associated access roads. The proportion of undisturbed habitat in the moderate and high potential classes is higher and expected to remain higher as these classes contain a higher proportion of wetland and forest classes that are considered non-timber productive. Also, permanent human-caused disturbance such as permanent roads and settlements overlaps 15.7 per cent of low, 7.1 per cent of moderate, and 3.9 per cent of the high habitat potential classes (Figure 11).

Figure 9. Habitat potential classes in SK2 Central area overlaid with the current (2015) human-caused disturbance (cross-hatched areas).

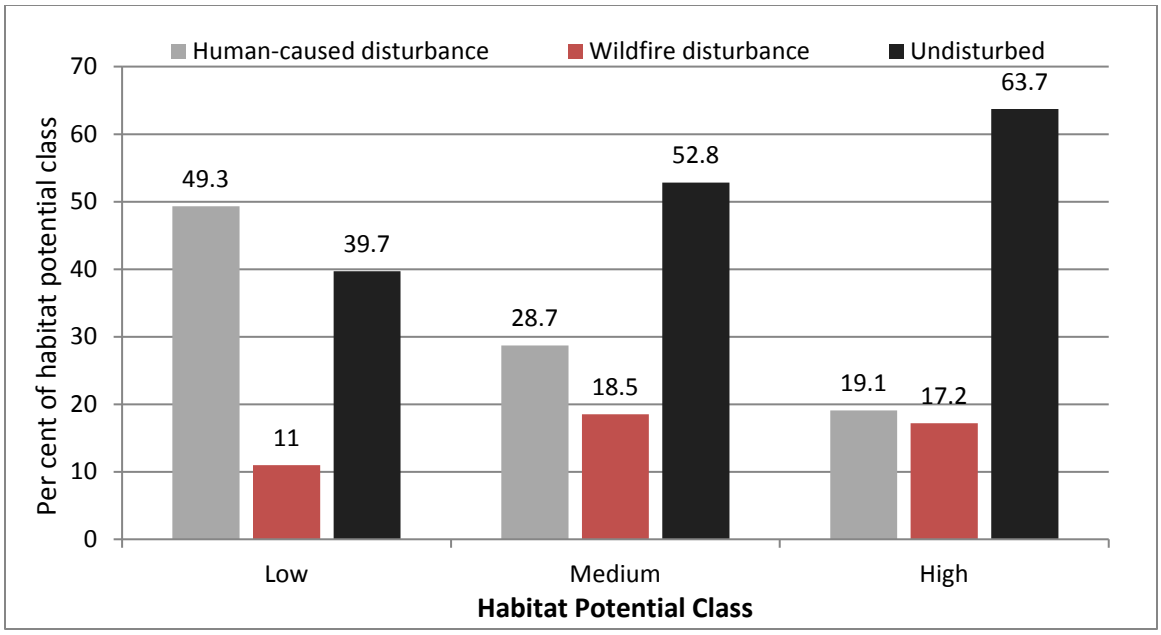

Figure 10. Current types and proportion of disturbance associated with each of the caribou habitat potential classes across the SK2 Central area.

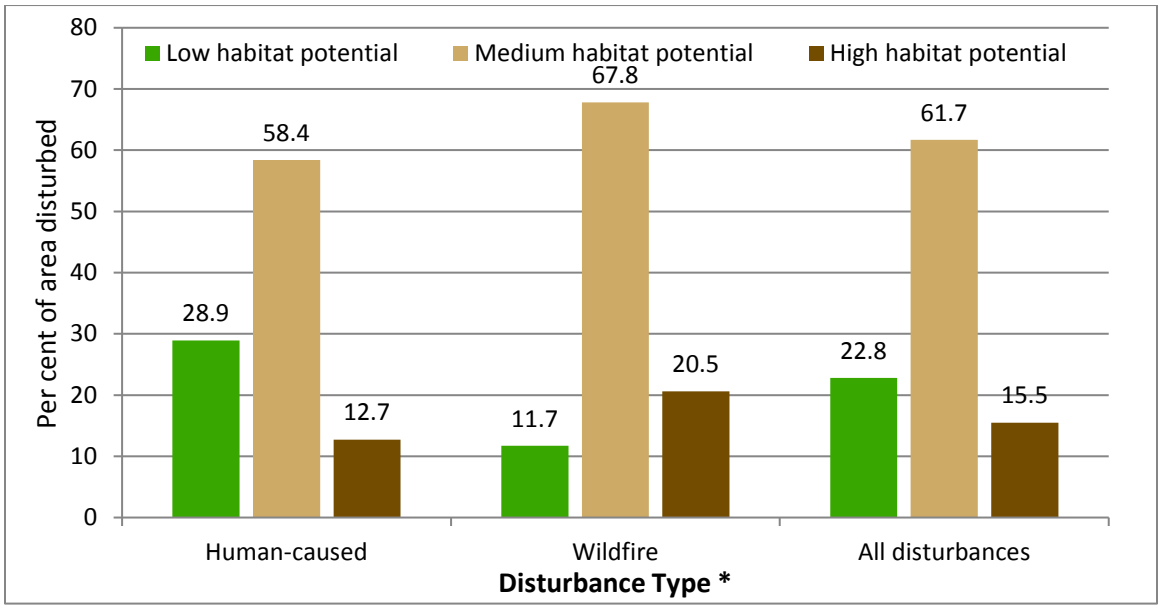

Figure 11. Current types and proportion of habitat potential associated with the two primary forms of landscape disturbance in the SK2 Central area.

**Effects of human-caused and wildfire disturbance are calculated separately based on the non-overlapping area of each and in cases where human-caused disturbance overlaps wildfire the resulting disturbance area is assigned to human-caused disturbance. Total disturbance represents the combined spatial extent of non-overlapping human-caused and wildfire 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., ≥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. 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, 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 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).

To understand geographic patterns of caribou habitat use in the SK2 Central, caribou location information has been compiled from a combination of incidental sightings (e.g., “Report a woodland caribou sighting” database, Saskatchewan Conservation Data Centre), surveys (i.e., industrial and provincial government surveys), fecal pellet collections (Saskatchewan Ministry of the Environment) and telemetry information (Rettie and Messier, 2000; Arlt, 2009). This information was collected between the years 1903 and 2017. 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 Central. 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 12) represents knowledge to date on caribou locations and habitat use in SK2 Central. Without having long-term and systematic surveys, the absence of caribou observations in Figure 12 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).

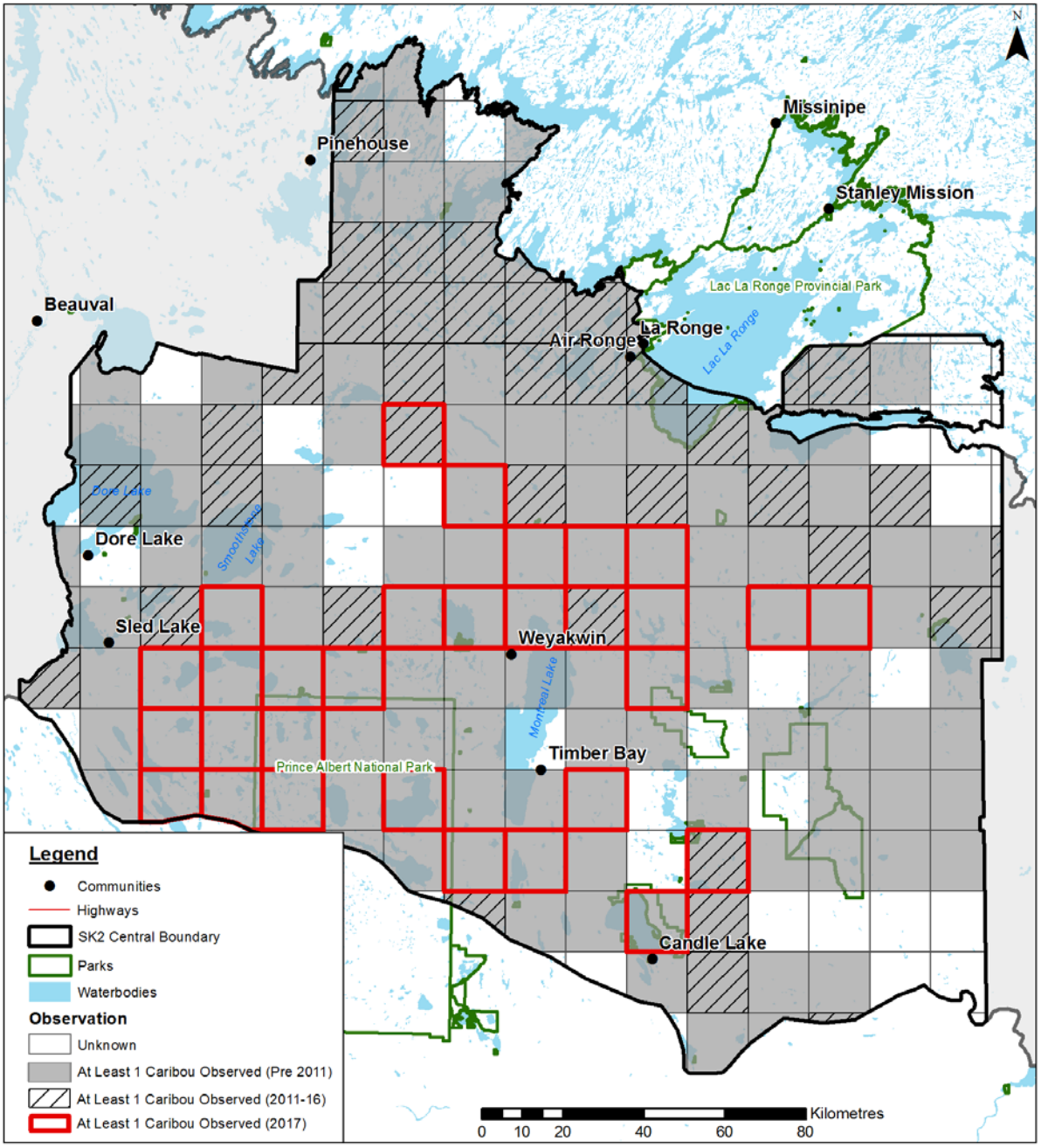

Figure 12. Areas with woodland caribou observations in SK2 Central.

** Fifteen square kilometre grid squares that are marked as unknown reflect a lack of survey information to detect caribou and not necessarily the 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, 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 Central 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. This approach should provide sufficient habitat availability on the Saskatchewan landscape in which the natural fire regime, if unchecked, would result in a highly disturbed land base. 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 some 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 are with an objective of habitat restoration. Tier 3 areas represent general matrix caribou habitat where maintaining connectivity is an important objective.

Saskatchewan has identified five landscape management goals for SK2 Central:

Landscape Management Goal #1:

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

Based on the Saskatchewan Ministry of Environment 2015 disturbance assessment[8], the current level of human-caused disturbance in SK2 Central is approximately 10,086 km^2 (28.0 per cent of SK2 Central). Saskatchewan aims to reduce this level of human-caused disturbance through enhanced reclamation, the application of mitigation off-sets to new development, access management and by using a natural forest pattern-based harvesting approach to reduce the dispersion of forest harvesting areas and the associated amount of road access infrastructure.

Landscape Management Goal #2:

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

Based on Saskatchewan Ministry of Environment's habitat potential mapping, the amount of high potential woodland caribou habitat in the SK2 Central area is approximately 6,389 km2 or 17.7 per cent of SK2 Central. These areas are largely comprised of treed wetlands, but also include upland jack pine-lichen and black-spruce lichen ecosites. High potential habitat provides necessary forage and refuge and is heavily used during the sensitive late-winter, calving and post-calving periods. Tier 1 caribou habitat management areas contain the highest proportion (39.8 per cent) and square kilometres (2956.6) of high potential caribou habitat in large relatively contiguous patches.

Currently, approximately 19 per cent of high potential habitats are affected by direct and/or indirect human-caused disturbance, with Tier 3 containing most of the disturbed area. The Saskatchewan Ministry of Environment aims to maintain ≥80 per cent of high potential habitats in a condition unaffected by human-caused disturbance. Achieving this objective will ensure that nodes of important caribou habitat remain in a largely undisturbed condition (from human activities). 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.

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

Landscape Management Goal #3:

Maintain adequate connectivity between different areas of SK2 Central and adjacent caribou administration units.

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 a 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 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 central and northern Saskatchewan, maintaining adequate landscape-level connectivity within the SK2 Central area and adjacent caribou administration units is required. Currently, a specific metric to measure and report on finer scale landscape connectivity has not yet been developed, but reducing disturbance in Tier 1 and Tier 2 areas will help to maintain large patches of undisturbed and connected habitat throughout SK2 Central. This finer scale indicator of caribou habitat connectivity will be used to support planning in all tiers, but 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 patch, and harvest event sizes that more closely emulate natural disturbance patterns, and as importantly, will also 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 Central has a large network of non-permanent legacy roads on provincial Crown lands. Most legacy roads were created for forest resource access before the implementation of *The Forest Resources Management Act* in 1999, and are now the responsibility of the Saskatchewan Ministry of Environment.

The re-vegetation status and level of human activity associated with many roads is currently uncertain. However, based on available information[9] the total length of non-permanent roads in SK2 Central is estimated to be approximately 6,500 km. Approximately 2,400 km of these roads are located outside of historical forest harvest blocks. 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. The Tier 2 and Tier 3 caribou habitat management areas will be initially prioritized for these activities. Tier 1 areas are not as suitable because by definition they contain very little disturbance. Through future detailed access management planning, road reclamation plans and targets will be created for different areas of the SK2 Central area.

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:

- Avoidance
- Reclamation and restoration
- Mitigation offsets
- Forest harvest patterns
- 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 a 50-year time horizon of this range plan. Saskatchewan anticipates the management strategies identified here, while having been developed for SK2 Central area, will be similarly utilized in the other caribou administration units and the SK1 caribou conservation unit, with the ability and intent to refine or supplement strategies based on the situations within each.

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 Section 6.

[9] Non-permanent roads are considered to be Class 2, 3, and 4 and public roads from the Saskatchewan forest road network (SFRN) database. Road length calculations are current as of October, 2016. See Appendix A for detailed disturbance mapping methods.

Table 7. Summary of SK2 Central 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 and the relevancy of these areas may change over time.
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 the 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 the 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 a 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.

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.

Considerations:

- Areas to be avoided are anticipated to be dynamic 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 selected, greater planning, mitigation and monitoring will be required.
- Avoidance may not necessarily be desirable in cases such as 1) the potential activity or development would yield greater and shared societal benefits (e.g., public infrastructure), or 2) 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. Reclamation and restoration applies

to both legacy and recent human-caused linear and area-based disturbances. Reclamation and restoration of legacy disturbances 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 sufficiently maintain the extent and connectivity of caribou habitat across the landscape and to prevent ongoing human use of the disturbed feature.

Linear Features

Linear features and their associated buffer are responsible for the majority of the human-caused disturbance footprint in the SK2 Central area; much of the linear features were associated with previous forest harvesting. 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 SK2 Central, historical land use practices have resulted in a large number of legacy roads and trails, 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.

Area-based Features

In the SK2 Central area, forest harvest blocks are the main source of the human-caused area-based disturbance. Since 1999, *The Forest Resources Management Act* has required the Saskatchewan forest industry to reforest all harvested areas and in-block roads when harvesting activities are complete. Non-in-block roads are also required to be reclaimed once they are no longer required. 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, under the Forest Renewal Program, has addressed previously not sufficiently regenerated harvest blocks resulting from harvesting activities conducted before 1999.

Other land uses also contribute to area-based disturbance in SK2 Central. 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. This will establish management practices to reduce the impact of roads to wetland ecosystems on provincial forest lands.

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 of these.
- Access management planning will assist in identifying appropriate locations for the reclamation of legacy linear features.
- 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.

Considerations:

- Expectations and reclamation standards currently differ among various land-use activities.
- While reclamation is a requirement for most natural resource development activities, greater coordination and compliance with explicit standards is required to improve effectiveness.
- 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 Central 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.

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.

Application:

- Mitigation offset requirements will be applied to provincial Crown land users.
- While requiring further documentation, mitigation offset requirements will be administered through an existing environmental assessment, leasing and permitting processes.
- 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 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 a description of the caribou management area tiers); and
    - 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[10].

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.
- 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.

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.

Forest harvest management approaches, such as the Saskatchewan Environmental Code's Forest Management Planning Chapter and Standard, outline 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

[10] 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.

larger patches of future caribou habitat. Figure 13 compares a traditional forest harvest block pattern with a natural forest pattern harvest event.

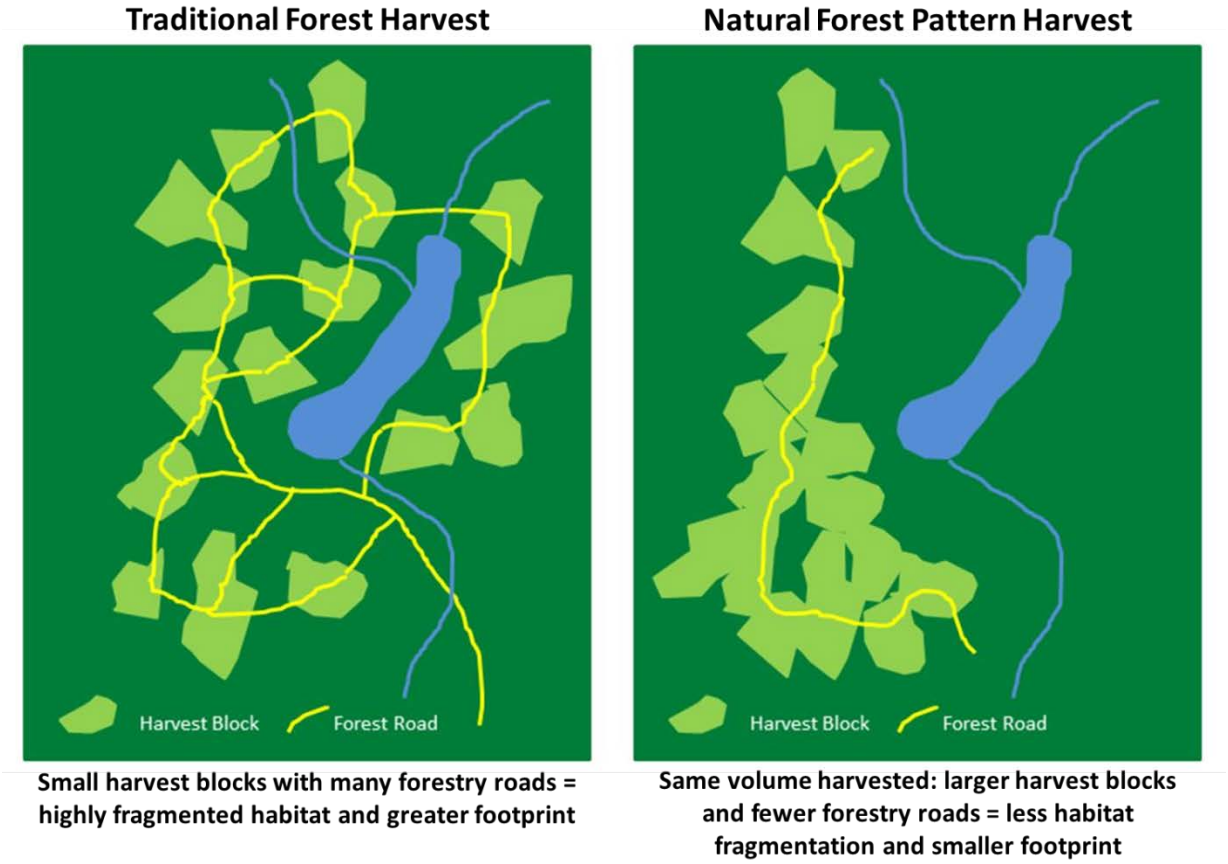

Figure 13. Comparison of a traditional harvest block pattern (left) with natural forest pattern harvesting event (right)[11].

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 area as residual patches within the harvest event boundary (Figure 14).

[11] 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

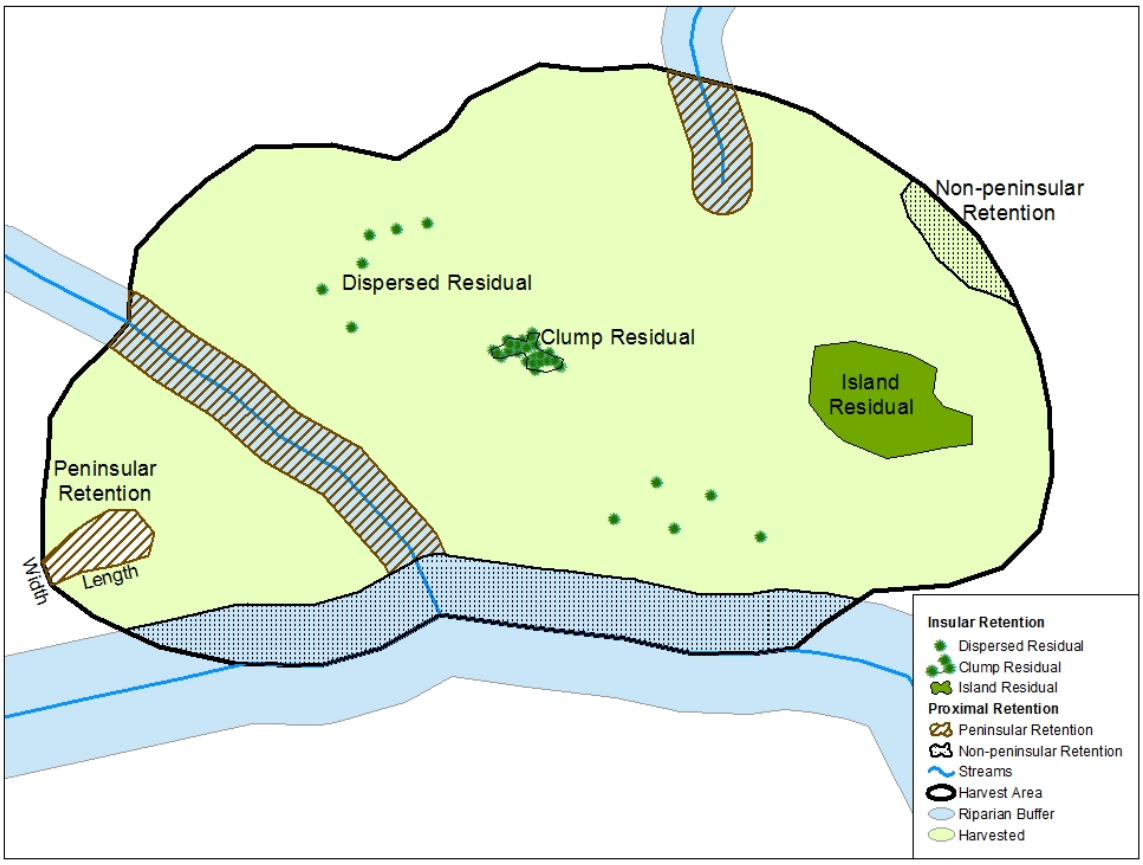

Figure 14. Illustration of how tree retention may occur within a harvest block (Government of Saskatchewan, 2017).

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 15).

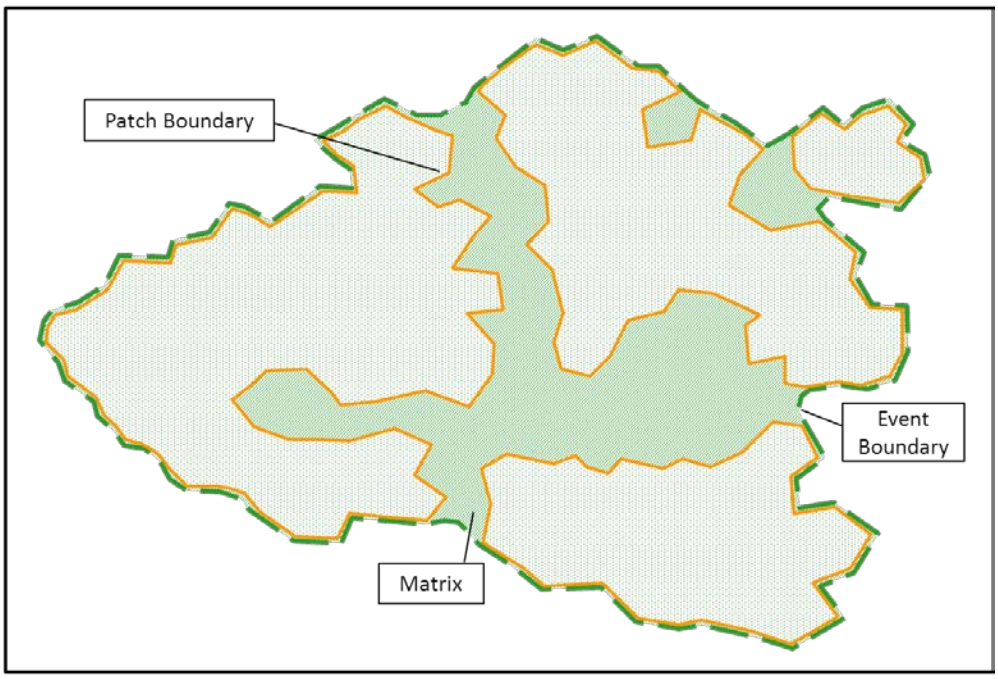

Figure 15. Illustration of unharvested areas (i.e., matrix residual) within a harvesting event (Government of Saskatchewan, 2017).

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 administration units for consolidated harvest around existing disturbances will provide the forest industry guidance for forest harvesting planning. Forest management plans currently in development will implement natural forest pattern strategies at both the stand and the landscape-level. Future operational planning will take direction from these plans; natural forest planning harvest events will become the prevailing forest harvesting practice across Saskatchewan's commercial forest. The new forest management plan for the Prince Albert forest management agreement area, which substantially overlaps the SK2 Central area, was approved in 2018.

Application:

- The natural forest harvesting patterns approach is being embedded in new forest management plans and through these plans will direct harvest operations by the forest industry under term supply licenses or forest management agreements.
- Natural forest pattern harvesting will also be promoted as the conventional approach for application in other areas of forest harvesting or where vegetation management is required (e.g., provincial parks for vegetation or fuel management).

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.

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.

Also, policy will identify the necessary restrictions on 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 periods (e.g., 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. The extent of open and treed peatlands based on ecosite mapping is shown in Figure 16.

Application:

- Access management will be applied to all areas of SK2 Central 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.

Considerations:

- This will require high levels of education, compliance and enforcement in order to manage or prevent motorized access on established roads and trails.
- Developing detailed access and reclamation plans for all of SK2 Central, 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.

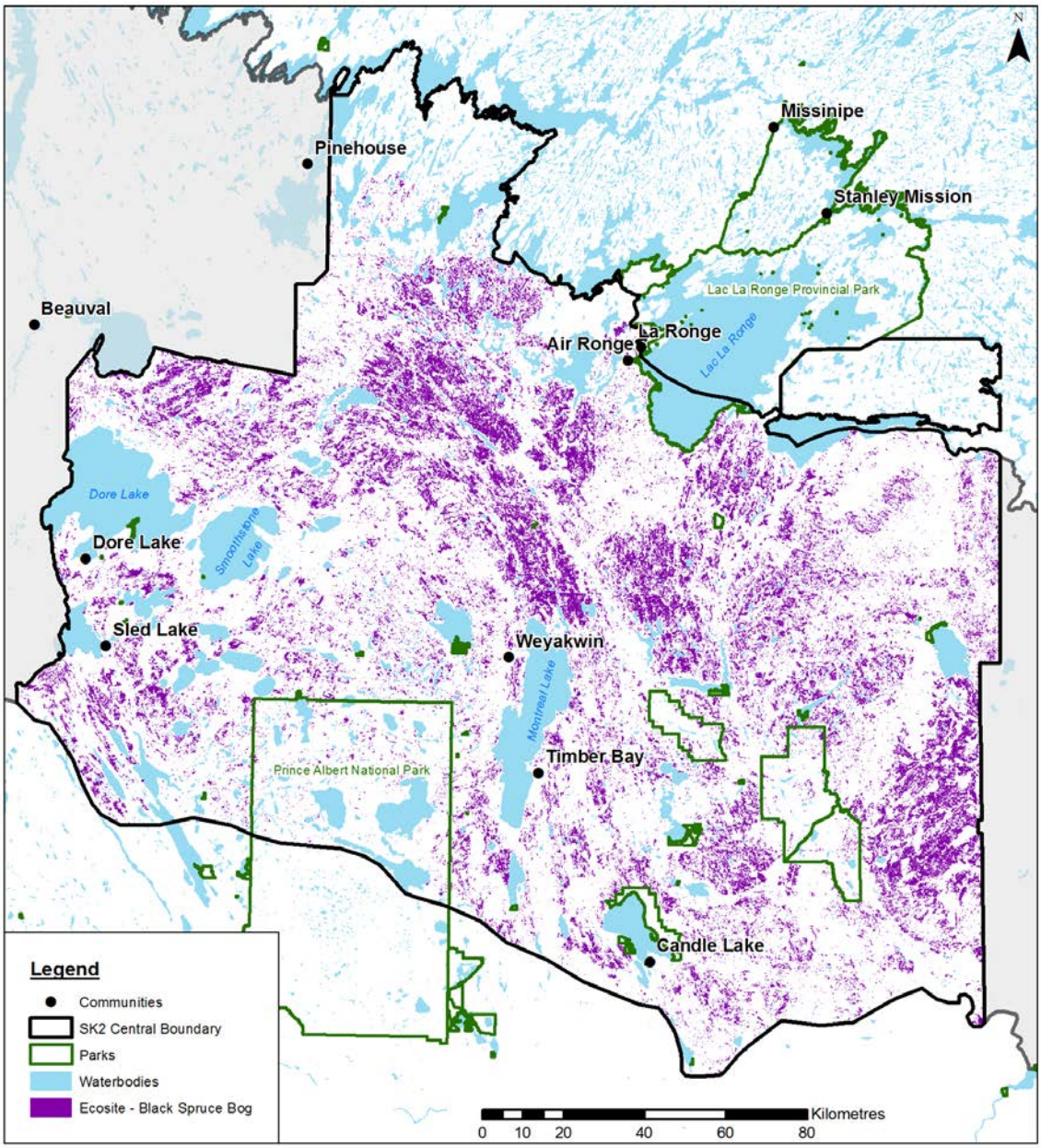

Figure 16. Potential late-winter, calving and post-calving caribou habitat in the SK2 Central area based on the extent of BP19 (Black spruce treed bog) ecosite[12].

[12] BP19 mapping includes a range of treed wetland types.

5.3 Spatial Application of Management Strategies

5.3.1 Caribou Habitat Management Areas

Provincial Crown lands within the SK2 Central area have been divided into three types of caribou habitat management areas: Tier 1, 2 and 3 (Figure 17). 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 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.

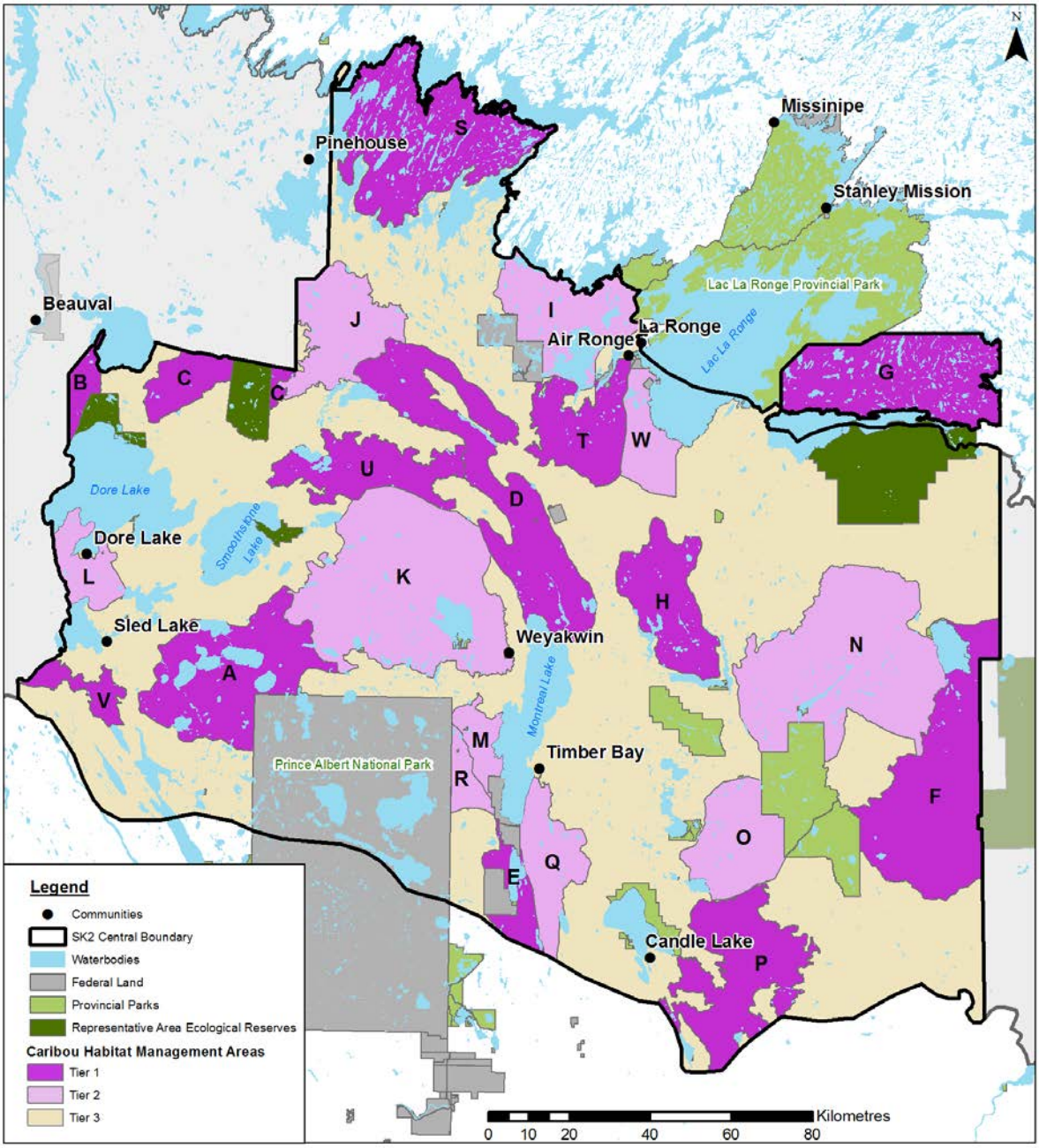

Figure 17. Location of caribou habitat management areas[13] on provincial Crown lands in the SK2 Central caribou administration unit[14].

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

[14] Shapefiles of the caribou habitat management areas are available on HABISask for detailed users https://gisappl.saskatchewan.ca/html5ext/?viewer=habisask

Table 8. Area summary, criteria for selection, management objectives and strategies for the caribou habitat management area tiers, Representative Area Ecological Reserves and provincial parks on SK2 Central provincial Crown lands[15].

CHMA Tier	Area (km^2)	Area (% SK2 Central)	Criteria for Selection	Management Objectives	Management Strategies
Tier 1	8,664	24.0	Areas of high-moderate caribou habitat potential with high levels of observed caribou use** 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.	• Mitigation offsets[16]. • Access management.
Tier 2	6,302	17.5	Areas of high-moderate caribou habitat potential with observed caribou use and higher levels of wildfire and human-caused disturbance.	• Caribou habitat restoration.	• Reclamation and Restoration[17]. • Mitigation offsets. • Access management.
Tier 3	16,579	45.9	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.[18] • Mitigation offsets • Reclamation and restoration. • Access management.
Representative Area Ecological Reserves	950	2.6	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.

[15] Detailed descriptions of the caribou habitat management areas are provided in Appendix B.

[16] Mitigation offsets associated with the various tiers of caribou habitat will assigned based on risk.

[17] 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 road reclamation.

[18] 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, Representative Area Ecological Reserves and provincial parks on SK2 Central provincial Crown lands.

CHMA Tier	Area (km^2)	Area (% SK2 Central)	Criteria for Selection	• Management Objectives	• Management Strategies
Provincial Parks	1,128	3.1	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*	33,623	93.3			

** Note: The remaining 6.7 per cent of SK2 Central area is comprised of federal lands (e.g., Prince Albert National Park, Indian Reserves), and municipal lands (including small parcels of private or leased lands).*

***A map showing areas of caribou use in SK2 Central is presented in Figure 12.*

5.3.2 Other Provincial Lands

Provincial parks are within the Government of Saskatchewan's management authority, under the Ministry of Parks, Culture and Sport. Representative Area Ecological Reserves are managed by the Ministry of Environment under *The Provincial Lands Act, 2016*. Provisions and mechanisms to manage provincial Crown lands are summarized in Table 8.

5.3.3 Federal Lands

Federal lands such as Prince Albert National Park and Indian Reserves are not within Saskatchewan's management authority and may have different management objectives. Where integration, co-operation, and collaboration is possible, we will endeavour to coordinate our habitat management strategies with those on adjacent provincial Crown lands and Federal lands. Suggested management objectives and strategies for the different areas are shown in Table 9.

5.4 Achieving Landscape Management Goals in SK2 Central

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).

Table 9. Coordination and management for federal lands.

Land Category	Area (km^2)	Per cent of the SK2 Central Area	Responsible Management Authority
Federal Lands (Prince Albert National Park)	1,963	5.4	Responsible management authorities will determine specific management objectives and strategies for this area. Under SARA, the portion of Prince Albert National Park that is within the SK2 range boundary is designated as critical woodland caribou habitat. Efforts will be made to coordinate the objectives and strategies developed within this plan as closely as possible with adjacent lands.
Federal Lands (Indian Reserves)	304	0.8	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.
Total	2,267	6.2	

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 Central woodland caribou habitat over a 50-year future time horizon. 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 Central. Given these complications, it is unlikely that these projected disturbance levels in SK2 Central will match realized disturbance levels. However, annual reporting of disturbance levels in SK2 Central and monitoring of the caribou population status and trends will provide a more robust method for assessing whether Saskatchewan is meeting the landscape management goals above and whether those tools are effective for managing a self-sustaining caribou population in SK2 Central.

Based on these analyses, a most likely land use scenario[19] was evaluated and is described in Table 10.

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

Table 10. The most likely land use management scenario parameters and assumptions to be applied in the SK2 Central area.

Management Factor	Assumptions
Forest Harvest Utilization	Given existing mill capacity and forest product market conditions, future forest harvest levels in SK2 Central are likely to slightly increase from historic levels. This projection is based on new information since the first draft of the SK2 Central range plan. Since 2012, the annual area harvested in SK2 Central ranged between 3,500 ha and 7,300 ha. This level of harvest represents less than 50 per cent of the maximum annual allowable cut to be harvested in SK2 Central but may increase to between 50-60 per cent in the coming years. Therefore, a 50-60 per cent harvest area utilization level has been assumed to represent the probable harvest level over the 50-year scenario. However, approved forest management plans do allow for 100 per cent utilization.
Location of Forest Harvest	The majority of future forest harvesting will continue to occur in low and moderate potential caribou habitats. The Tier 3 CHMA is anticipated to receive the majority of forest harvesting, and limited forest harvest is expected to occur within Tier 2 areas.
Forest Harvest Patterns	Saskatchewan natural forest pattern-based harvesting standards will be implemented for all future commercial forest harvesting
Reclamation of New Non-permanent Roads	As per *The Forest Resources Management Act*, all new in-block roads will be reforested within two years of harvesting and are assumed 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 Non-permanent Roads	Through a combination of focused reclamation, mitigation off-sets and access management planning, largely in Tier 2 and Tier 3 areas, the amount of legacy non-permanent roads will decline over the 50-year scenario period.
Reclamation Time	For all base scenarios, a 40-year time period was assumed for all human and wildfire disturbances to become undisturbed caribou habitat.
Other Land Uses	The location and intensity of all other land uses (peat harvesting, mineral exploration, settlements, etc.) are assumed to occur in similar locations and amounts as the current situation for the duration of the 50-year scenario period.
Wildfire	To account for fire overlap with direct and indirect human-caused disturbance, the adjusted annual disturbance associated solely with fire was modelled at 0.37 per cent of SK2 Central or 134 km^2 per year. Thus, the projected total future disturbance is the sum of human-caused disturbance, and the adjusted fire caused disturbance. To calculate projected future total disturbance, this indexed rate was aspatially added to human-caused disturbance.
Wildfire Management	Future wildfire management objectives and suppression efforts are not expected to change. The SK2 Central 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.

5.4.2 The Projected Landscape Management Outcomes and Goals

Based on the most-likely scenario and despite key uncertainties, the following outcomes were projected to occur in SK2 Central (more detailed outcomes for each landscape management goal are discussed below):

- Ultimately, the population status and trend of woodland caribou in SK2 Central will be used as the benchmark for assessing the effectiveness of management strategies in SK2 Central (see Section 7.0 Monitoring). Also, regular reporting of disturbance levels in SK2 Central will help the Ministry of Environment continually assess actual, not projected, disturbance levels on the landscape (see Section 7.0 Monitoring) and whether we are meeting the stated landscape management goals.
- The amount of projected human-caused disturbance is expected to increase compared to current conditions. However, a large proportion of high potential woodland caribou habitat is expected to remain in a condition largely undisturbed by human activities, and disturbance levels in Tier 1 and Tier 2 areas are expected to decline significantly.
- The location of CHMAs and associated management actions within those CHMAs are anticipated to contribute to maintaining connectivity within SK2 Central and between SK2 Central and adjacent areas.
- 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) is expected to be reduced through the combined application of reclamation, mitigation offsets, access management and natural forest pattern-based forest harvesting.

Landscape Management Goal #1:
Reduce the amount of human-caused disturbance below current levels.

Disturbance levels in Tier 1 and Tier 2 CHMAs will be significantly reduced. It is expected that disturbance levels in Tier 1 areas would be reduced from 11 per cent (current) to 3.3 per cent in 50 years and in Tier 2 areas, disturbance would be reduced from 40.4 per cent (current) to 10.6 per cent in 50 years. However, based on our management assumptions and proposed strategies, the projected level of future human-caused and cumulative disturbance in SK2 Central over the 50-year scenario period increases by 3.7 per cent compared to current levels (Figure 18), mostly contained within Tier 3 areas. Maps illustrating how the SK2 Central landscape may change as a result of human-caused disturbance over 50 years are provided in Appendix C.

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. Assuming a constant wildfire rate of 0.78 per cent (0.37 per cent indexed for overlap with human-caused disturbance), total disturbance in SK2 Central is anticipated to range between 44.6 per cent and 48.3 per cent over the 50-year period.

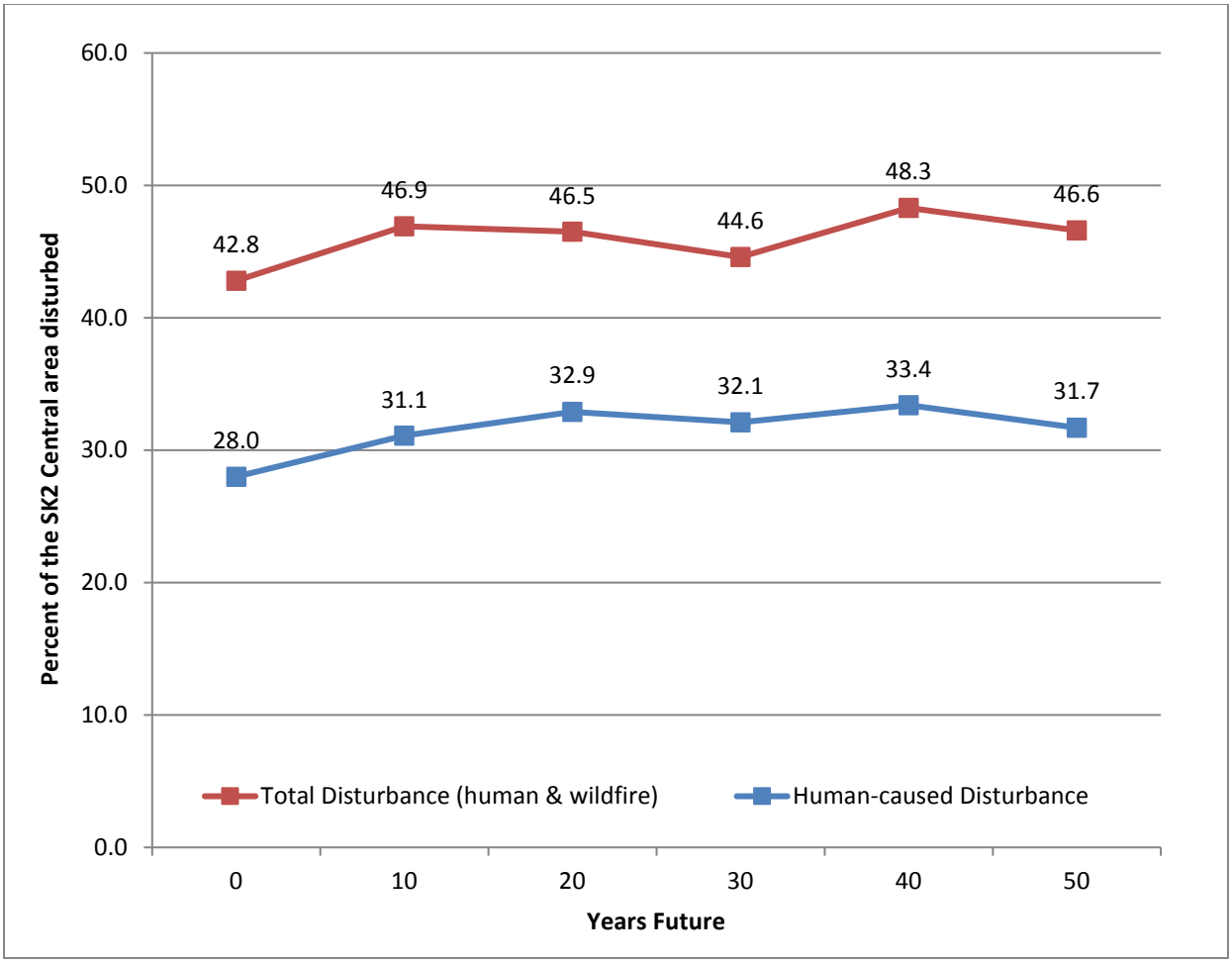

Figure 18. Projected total and human-caused disturbance in the SK2 Central area resulting from the most likely land use management scenario.

Landscape Management Goal #2:
Maintain ≥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 modelling results the projected amount of high potential habitat affected by direct and indirect human-caused disturbance is anticipated to range between 19.1 per cent and 24.9 per cent (Figure 19). These results suggest that with appropriate management actions, the ≥80 per cent undisturbed high potential habitat goal is very achievable.

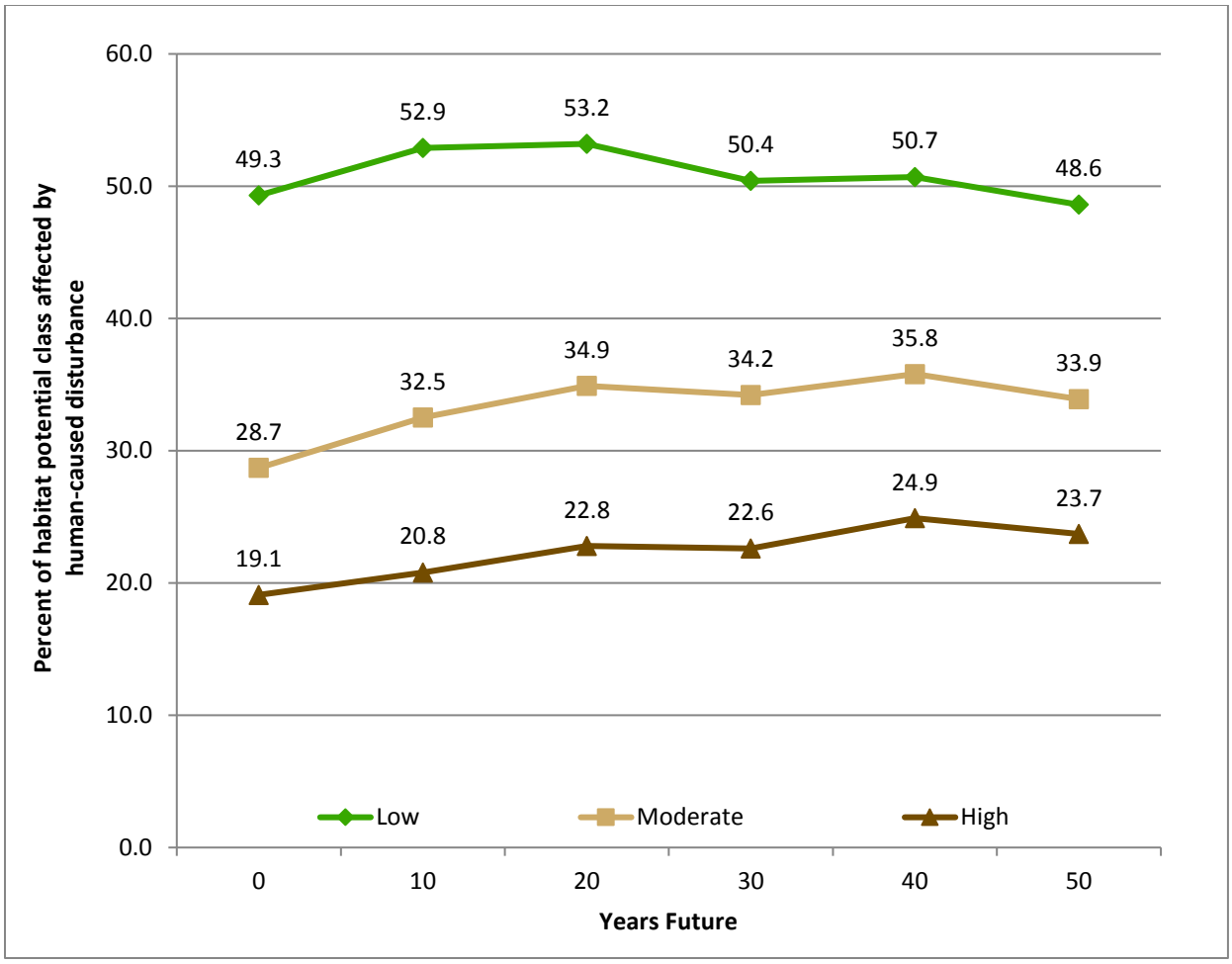

Figure 19. The projected proportion of total habitat potential class affected by human-caused disturbance resulting from the most likely land use management scenario.

Landscape Management Goal #3:
Maintain adequate connectivity between different areas of SK2 Central and adjacent caribou administration units.

Developing a fine-scale, science-based, caribou decision-support tool to identify potential caribou movement corridors and where impediments to potential movement occur on the landscape (see Section 7.4 Research) will be essential, especially for proper management of Tier 3 areas that provide essential connectivity between Tier 1 and Tier 2 areas. The tool will be useful for:

- Identifying priority areas where mitigation offsets and reclamation would be most beneficial for restoring landscape connectivity for caribou.
- 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 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. This is why it is so important to reduce human disturbance and maintain connectivity in areas where natural landscape features present barriers to movement.

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. Before 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 11.

Table 11. Forest management planning standard harvest event size classes for 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 plan for the Prince Albert Forest Management Agreement, largely contained within the SK2 Central range plan boundaries, has identified harvest event size distribution targets as shown in Table 12. The proposed distribution of harvest event sizes for the Prince Albert forest management agreement area will mean that 70 per cent to 85 per cent of harvest events will be in the range of 100 ha to 3,500 ha. 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.

Complementary sensitivity analyses suggested that shifts toward a distribution favouring even larger event sizes compared to the natural forest pattern requirements could result in significant gains in disturbance reduction (Appendix D).

Table 12. Prince Albert forest management agreement harvest event size distribution targets.

Size Range (ha)	Event Size Distribution Target	Acceptable Variance
< 100	10 per cent	± 10 per cent
100 - 1500	65 per cent	± 10 per cent
1,500 - 3500	15 per cent	± 10 per cent
3,500 - 8000	10 per cent	± 5 per cent
> 8001	0 per cent	0 per cent

Landscape Management Goal #5:
Decrease the total amount of non-permanent legacy roads.

Non-permanent roads are considered to be Class 2, 3, 4, and trails (identified as Class 5 and 6 within the database) from the Saskatchewan forest road network 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 roads is currently uncertain, the total length of non-permanent roads represented in the SK2 Central disturbance assessment is estimated to be approximately 6,500 km. Most (4,100 km) of the legacy roads are within historical harvest blocks and resulted from forest harvesting activities before current road reclamation standards being put in place (i.e., before implementation of *The Forest Resource Management Act* in 1999). The remaining 2,400 km of non-permanent roads occur outside of historical harvest blocks, connecting forest harvest areas to more permanent roads, or were created for other purposes.

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 they will be responsible for restoring and reclaiming the road before the disposition terminating. Figure 20 illustrates the potential future trajectories of total non-permanent road length in SK2 Central under different assumptions regarding the ratio of required road length to future harvested area. Focusing near-term harvesting close to previously disturbed areas, and implementation of natural forest pattern-based forest harvesting practices, will result in 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.

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. Detailed access management planning and enhanced inventory information is required before specific target development. Current assumptions and projections about reclamation activity, reclamation lag time, amount of future forest road requirements and the modern reclamation standards indicate a declining trend in total non-permanent road length (Figure 20).

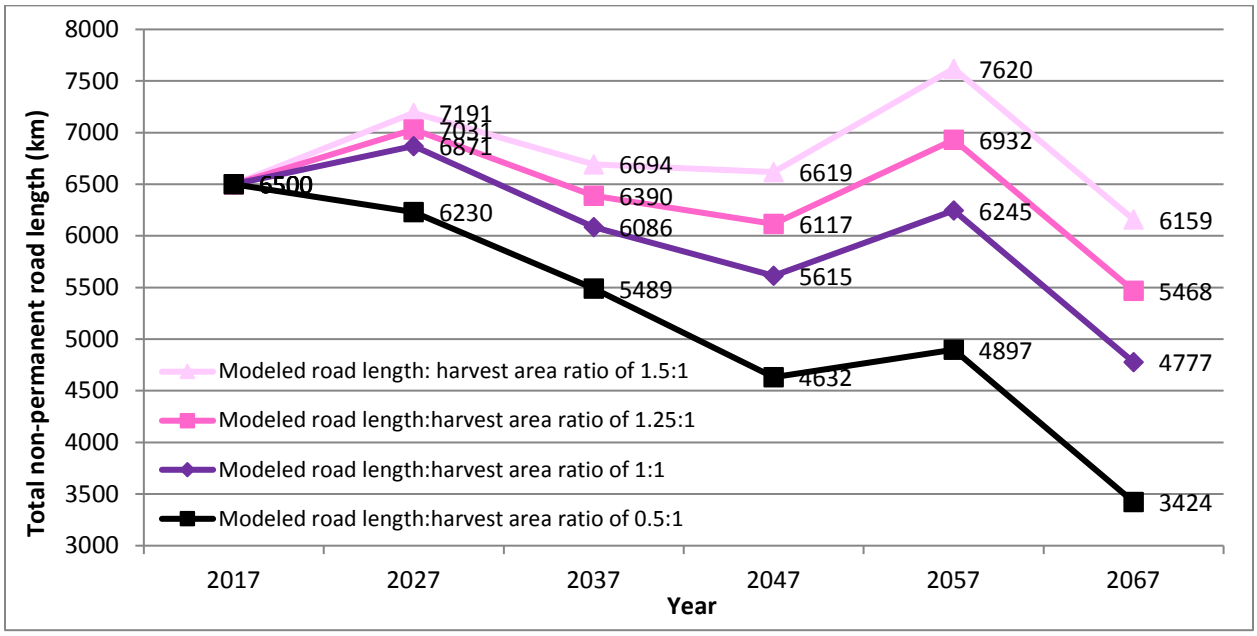

Figure 20. Predicted trends in future total length of non-permanent roads resulting from the expected land use scenario and varying levels of management strategy application[20].

[20] Different cumulative road lengths result from different assumptions regarding the future ratio of roads to harvested area. Natural forest pattern-based harvesting will result in lower ratios.

6.0 Critical Habitat Protection

Identifying 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 several 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, cut 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 destroy 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, flooding).
- Any activity resulting in the **fragmentation** of habitat by man-made linear features (e.g., road development, seismic lines, pipelines, hydroelectric corridors) (Environment Canada, 2012).

Current and foreseeable activities in the Boreal Shield and Boreal Plain ecozones likely to affect critical habitat are identified in Table 13.

Table 13. Current and foreseeable activities likely to destroy boreal caribou critical habitat in Saskatchewan.

Activities likely to destroy boreal caribou critical habitat in Saskatchewan	Activities likely to destroy boreal caribou critical habitat in SK2 Central
Direct loss of habitat	
Conversion of habitat to agriculture	X
Forestry cut blocks	X
Human-caused wildfire	X
Mining development – peat	X
Mining development – oil and gas	
Mining development – other	X
Urban/community development	X
Degradation of habitat	
Human-caused wildfire	X
Pollution – mining development	X
Pollution – oil and gas development	
Drainage – peat development	X
Flooding – hydroelectric power development	
Habitat fragmentation	
Road/Trail development	X
Snowmobile/ATV trail development	X
Seismic/Exploration/Geophysical lines	X
Pipelines	
Electrical power transmission lines	X
Flooding – hydroelectric power development	

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* (Regulations and Environmental Code)
- *The Provincial Lands Act, 2016*
- *The Environmental Management and Protection Act, 2010* (Regulations and Environmental Code)

The Provincial Lands Act, 2016 will work in conjunction with *The Environmental Management and Protection Act* and *The Forest Resources Management Act* to reinforce the strength of these two statutes and provide 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 Central area 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 14.

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 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 15, 16, 17 and 18 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 the Saskatchewan Environmental Code have been omitted.

Table 14. Statute relevance to activities likely to destroy 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		
Electrical power transmission lines		X	X	X				X	X			X		

Table 15. 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 15. (*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 15. (*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 15. (*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 16. Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Environmental Management and Protection Act, 2010*.

The Environmental 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 16. (*continued*). Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Environmental Management and Protection Act, 2010*.

The Environmental 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 16. (*continued*). Examples of specific legislative sections describing protection and conservation measures of habitat (land) in *The Environmental Management and Protection Act, 2010*.

The Environmental 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 17. 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 17. (*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 17. (*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 18. 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 18. (*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 18. (*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 19).

Table 19. Provincial statutes supporting management strategies.

Management Strategy	Supporting Legislation/Tools
Avoidance	*The Forest Resources Management Act* *The Forest Resources Management Regulations* *The Provincial Lands Act, 2016* *The Crown Resource Land Regulations, 2019* *The Parks Act* *The Wildlife Act, 1998*

Table 19. (*continued*) Provincial statutes supporting management strategies.

Management Strategy	Supporting Legislation/Tools
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	Forest Management Planning Standard (Saskatchewan Environmental Code) *Forest Resources Management Act* Forest Operating Plan Standard (Saskatchewan Environmental Code) *Forest Resources Management Regulations* *Parks Act*
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 Regulations, 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 20), in order to address considerations identified in Section 5.

Table 20. Actions proposed to support effective implementation of management strategies.

Action	Intent / Purpose	Timeline
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
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
Finalize and implement the Forest Management Planning Standards	Provide standards for forest harvest patterns in forestry sector operations to support long term caribou habitat restoration.	2017
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
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
Enhance existing processes and tools to capture and manage disturbance features	Improve disturbance tracking, the status of legacy features and cumulative effects assessment required for landscape-level planning and assessment of development initiatives.	2020
Develop caribou best management practices for use in environmental assessment and permitting processes	Develop caribou protection measures to restrict activities during periods when caribou are vulnerable to sensory disturbance.	2019

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.

6.4 Range Plans as Evidence of Critical Habitat Protection

The legislative tools and regulations identified in this initial range plan for the SK2 Central area are in place to ensure critical habitat protection. These legislative tools are also applicable for the eastern and western portions of the Boreal Plain and the Boreal Shield ecozones. The anticipated timelines for completion of the remaining plans are outlined in section 2.2.

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 insights 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, 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 may include genetic sampling using capture/mark/recapture, telemetry, surveys and traditional knowledge to estimate population size, trend and occupancy (Table 21). 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 agreements and used to make necessary program refinements to ensure the sustainability of the species.

Additionally, the Report a Woodland Caribou Sighting[21] database compiled through the Saskatchewan Conservation Data Centre tracks caribou occurrence information to help understand woodland caribou distribution throughout SK1 and SK2. Similarly, caribou sighting occurrences will soon be reportable on the Saskatchewan Co-Operative Wildlife Management survey app. Additionally, related information is 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 21. Proposed frequency of monitoring of various caribou population indicators.

Indicator	Frequency of Evaluation
Population size	Estimates every 10 years
Population demographic rates and growth (lambda/adult survival and recruitment)	Estimates every 10 years
Occupancy	Reported every 10 years

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) 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 22) will be fully supported by information

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

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.
- Functionally restored habitat (will be done in conjunction with occupancy information from population monitoring surveys).
- Cumulative impacts of all disturbances at a landscape level.

Table 22. 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.

7.3 Protection Measures Monitoring

Saskatchewan will monitor protection measures that support the protection of critical habitat to verify that protection is effective over time, as outlined below (Table 23).

Table 23. 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 24.

Table 24. 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.
Investigate the effect that wildfire disturbance has on caribou population demography in the Boreal Shield ecozone.	Understand how caribou use of unburned residual forest affects caribou survival and recruitment.
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.
Complete landscape-level population structure analysis across caribou range in Saskatchewan.	If significant population structure exists, determine if there is a need for management actions to be taken.
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 in planning 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 the risk is significant, determine if management actions are required.

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 identify required management approaches necessary or beneficial to the desired outcomes.

The implications associated with implementing this range plan to maintain a self-sustaining caribou population and their habitat have yet to be fully and completely ascertained. In addition to identifying and quantifying the effectiveness of management strategies on our desired outcomes, Saskatchewan also has a responsibility to identify consequential effects of the plan on both the societal and economic elements that are essential to the province. To provide for transparency in plan implementation and monitoring, Saskatchewan will also endeavour to provide environmental full-cost accounting including socio-economic analysis of plan strategies, their effectiveness and implications.

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.

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Glossary

The following terms are defined by their use in this document.

Biophysical attributes: habitat characteristics required by boreal caribou to carry out life processes (Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal population, in Canada, Appendix H \) (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, 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 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.

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 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.

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).

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.[22] (Environment Canada, 2012).

[22] 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.